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JPA

IAPA

ABSTRACT BOOK

17th International Congress of Physiological Anthropology

10 - 12 September, 2025
Enschede, the Netherlands

Program and Abstracts

September 9
18:00 - 22:00 Early Researchers Social (U ParkHotel. Prioir registration is required)

September 10
09:00 - 09:10 Welcome
09:10 - 10:00 Keynote Speaker Wouter D. van Marken Lichtenbelt.
School for Nutrition and Translational Research in Metabolism (NUTRIM), Maastricht University, Maastricht, The Netherlands.
Human thermal adaptation and health: Individual and cultural aspects
10:30 - 12:00 Early Researchers Session
12:00 - 13:30 IAPA Executive Meeting (Carre CR3446 meeting room)
13:30 - 15:00 Topical Session 1: Biological Rhythms and Sleep 1
15:30 - 17:00 Topical Session 2: Thermoregulation
18:00 - 22:00 Welcome Reception (U ParkHotel)

September 11
09:00 - 10:00 Topical Session 3: Biological Rhythms and Sleep 2
10:00 - 10:20 IAPA Assembly
10:20 - 10:30 Lightning Poster Presentations
10:30 - 12:00 Poster Session 1
13:30 - 15:00 Topical Session 4: Genetics, Growth and Development
15:30 - 17:00 Topical Session 5: Neural and Brain Function
18:00 - 22:00 Visit to Grolsch Brewery (Prior registration is required)

September 12
09:00 - 10:00 Keynote Speaker Hugo D. Critchley
Trafford Centre for Medical Research, University of Sussex, UK
How our bodily state shapes the way we perceive the world
10:30 - 12:00 Poster Session 2
13:30 - 15:00 Topical Session 6: Public and Planetary Health
15:30 - 16:15 Closing Discussion: The Next Generation
16:15 - 17:00 Awards

September 13
09:00 - 12:00 JPA Editorial Meeting (U ParkHotel Room C4)

Early Researchers Session
September 10, 10:30 AM - 12:00 PM

Rinka Miura[1)], Hinata Miyazaki[2)], Hitomi Ogami[2)], Koji Soga[3)], Midori Motoi[4)], Takashi Ito[3)], Kazuhiko Arima[5)], Takayuki Nishimura[4)]
1) Graduate School of Design, Kyushu University, Japan
2) Undergraduate School of Design, Kyushu University, Japan
3) Rinnai Corporation Innovation Center, Japan
4) Faculty of Design, Kyushu University, Japan
5) Graduate School of Biomedical Sciences, Nagasaki University, Japan

An Interventional Study on the Effects of Different Bathing Methods to Physical and Psychological Symptoms Associated with the Menstrual Cycle

Women experience cyclical physiological and psychological changes associated with the menstrual cycle. Symptoms accompanying this cycle, including those related to premenstrual syndrome (PMS), have been identified as potential barriers to women's full participation in society. Therefore, self-care practices integrated into daily life are essential for maintaining women's overall health and well-being. Among these, hot bathing has been recognized as a common and accessible method of self-care. The present study aimed to physiologically investigate the effects of two different bathing methods namely immersion bathing (i.e., bathing in a tub) and showering on premenstrual physical and psychological symptoms. A bathing intervention experiment was conducted with 10 young women who were not using hormonal contraceptives. The interventions were implemented over five consecutive days during the luteal phase under two separate conditions: immersion bathing and showering. On the first and fifth days of each intervention, physiological measurements were taken in a controlled laboratory environment. Premenstrual symptoms were assessed using the Daily Record of Severity of Problems (DRSP). The results showed marginally higher DRSP scores in the bathing condition compared to the showering condition. Additionally, a significant increase in sweat volume was observed in the bathing condition. These findings suggest that hot bathing may enhance sympathetic nervous system activity, potentially exacerbating premenstrual symptoms. In the presentation, further discussion will include additional physiological markers to better understand the underlying mechanisms.

Kokoro Ebina[1)], Fumiaki Ishibashi[2)], Kosuke Okusa[1)]
1) Chuo University, Japan
2) International University of Health and Welfare, Japan

A study on the relationship between eye movement patterns and ADR during colonoscopy

The adenoma detection rate (ADR) in colonoscopy is a pivotal quality indicator because it correlates with earlier tumour recognition and lower colorectal-cancer

mortality; it therefore serves as a benchmark for endoscopist proficiency and drives quality-improvement initiatives. To clarify whether quantitative eye-movement characteristics predict ADR, we analysed eye-tracking data from 40 examinations conducted by five endoscopists with varying experience. Spatiotemporal descriptors of gaze trajectories were extracted after dividing the visual field into 7 × 7, 8 × 8, and 9 × 9 sub-regions, and XGBoost models were trained to estimate ADR; feature contributions were evaluated using SHAP values. Higher ADRs were associated with trajectories exhibiting low variability and smooth, continuous vertical sweeps. An 8 × 8 grid produced the most informative feature set, closely followed by 7 × 7; in contrast, the 9 × 9 grid yielded less informative features, and gaze biased toward either the centre or the periphery predicted diminished ADR. These results imply that disciplined, evenly distributed eye movements facilitate lesion detection and could underpin structured gaze-training programmes for novice endoscopists. Although peripheral gaze within a segmented screen showed a potential benefit, the current sample size limits statistical certainty; larger prospective studies are required to confirm causality and refine training protocols aimed at enhancing endoscopic quality and the early detection of colorectal cancer.

Kanon Nakayama[1)], Yuko Tsunetsugu[1)], Tuula Jyske[2)]
1) Graduate School of Agricultural and Life Sciences, The University of Tokyo, Tokyo, Japan
2) Faculty of Agriculture and Forestry, Department of Forest Sciences, University of Helsinki, Finland

The Influence of thermal sensation and perceived roughness on the perception of "woodiness" and "comfort" of wood

This study explored how tactile and visual sensations influence human perceptions of 'woodiness' and 'comfort' of wood, with a focus on perceived warmth and roughness.
Test samples that varied across three categories were prepared: a thermal group (6 samples with varying thermal conductivity), a roughness group (5 samples with veneers sanded at different grits), and a color group (6 samples with veneers oil-painted in various colors). All samples were faced with white oak quarter-sawn veneers (0.2-0.5 mm thick) to ensure consistent visual and surface properties. Sixteen participants (8 males and females, 23.8±1.1 years) evaluated these samples in terms of subjective physical perceptions and holistic perceptions under "touch only," "sight only," and "touch and sight" conditions. In "touch only" evaluations, perceived woodiness was significantly impacted by warmth and roughness. Tactile comfort was consistently enhanced by smoothness across all groups. Under "sight only" conditions, woodiness was influenced by visual warmth, smoothness, dryness, hardness, and sharpness. Specifically, visual warmth and distinct grain (sharpness) enhanced "woodiness" for the color group. Visual comfort was affected by smoothness, dryness, and lightness; brighter samples often evaluated as smoother, contributing to greater comfort in the color group. For "touch and sight" conditions, perceived woodiness was

significantly influenced by warmth, roughness, wetness, and hardness. Perceived comfort was significantly influenced by smoothness, wetness, and sharpness.
These findings confirm that warmth and roughness are critical factors for perceived "woodiness" and "comfort" in wood. The results highlight the complex, interactive nature of visual and tactile processing in forming impressions of wooden materials.

Takahide Akama[1)]
1) Department of Environment and Design, Faculty of Engineering, Maebashi Institute of Technology, Japan

The Effect of Resting with Environmental Sounds on Mental Fatigue Recovery: A Study Considering Individual Mindfulness Tendencies

Mindfulness meditation, which emphasizes awareness of breathing and the present environment, is widely recognized for alleviating mental fatigue. However, the ease of achieving a mindful state varies across individuals. This study investigated the effect of environmental sound during resting on recovery from mental fatigue, while considering individual mindfulness tendencies as assessed by the CAMS-R (Cognitive and Affective Mindfulness Scale – Revised). Thirty participants were randomly assigned to one of two groups: resting with environmental sound or resting without sound. They performed a sequence of cognitive tasks—calculation, anagram, and color Stroop—across six sets (59 trials per set), with a 15-minute resting period after every three sets. Respiratory rate was recorded during resting. Subjective workload was assessed using the NASA-TLX before each resting period, and CAMS-R scores were obtained after the experiment. A mixed-design ANCOVA was conducted with resting condition as the between-subject factor, task period (first vs. second half) as the within-subject factor, and CAMS-R scores as a covariate ($p < .05$). Results showed a divergent pattern in subjective workload: NASA-TLX weighted workload (WWL) increased across both halves in the environmental sound group, whereas it decreased in the no-sound group. No significant main effects or interactions were found for respiratory rate. These findings suggest that environmental sound during resting may affect subjective recovery from mental fatigue, even without changes in physiological arousal.

Topical Session 1: Biological Rhythms and Sleep 1
September 10, 1:30 PM - 3:00 PM

Roelof Hut[1)]
1) University of Groningen, The Netherlands

The Non-Visual Effects of Light: Mental Performance, Sleep and Thermoregulation

Around the turn of the millennium, the circadian field discovered the non-image forming light sensing system. Through this system, light influences not only our circadian (daily) rhythms, but also several aspects of mental performance, subsequent sleep quality, and even thermoregulation. As one of the first, we were able to study these aspects of bright light in a forced desynchrony protocol, where the circadian influence of bright light responses can be separated from the light effects as a function of prior wakefulness. These experiments gave rise recent studies on the influence of bright light on thermoregulation, showing that light selectively affects heat production only in a cooling climate. This information can be useful to further understand the complexity of light effects on human performance and well being.

Taisuke Eto[1)], Shingo Kitamura[2)]
1) Department of Ophthalmology, Keio University School of Medicine, Japan
2) Department of Sleep-Wake Disorders, National Center of Neurology and Psychiatry, Japan

Associations between outdoor light at night and chronotype, subjective quantity/quality of sleep: a study using satellite data

Purpose: Recent studies have reported that outdoor light at night (OLAN) may have various biological effects. This study examined the relationship between OLAN brightness and chronotype indices, as well as subjective sleep quantity and quality, using satellite data in Japan. Methods: Data from the Morningness-Eveningness Questionnaire (MEQ), Munich Chronotype Questionnaire (MCTQ), and Pittsburgh Sleep Quality Index (PSQI) were obtained via a web-based survey conducted in 2017 (N = 2,358; mean age = 50.3 ± 15.4 years; 50.0% male). OLAN radiance (nW/cm²/sr) was extracted from Google Earth Engine and averaged by municipality from July 2016 to June 2017. OLAN was divided into quartiles (Lowest, 2nd, 3rd and Highest) and treated as a categorical variable. Multiple regression analyses were performed with ME score from MEQ, MSFsc (mid-sleep on free days corrected for sleep debt) from MCTQ, subjective sleep duration, and global score (subjective sleep quality) from PSQI as dependent variables, and OLAN level as the primary predictor. Covariates included sex, age, BMI, population size, geographic coordinates, length of residence, education level, and use of alcohol, caffeine, or sleep medication.
Results: MSFsc was significantly associated with OLAN level ($p < 0.001$); those in the Highest OLAN quartile had a delayed MSFsc by 18.4 minutes (95% CI: 7.58–29.2)

compared to those in the Lowest quartile. ME score, subjective sleep duration and sleep quality were not significantly associated with OLAN level. Conclusions: These findings suggest that greater outdoor nighttime brightness is associated with delayed chronotype, but not with subjective sleep duration or quality.

Yujiro Yamanaka[1)]
1) Hokkaido University, Japan

Physical exercise enhances light input to the circadian pacemaker in humans

The natural light-dark cycle is the primary zeitgeber for the human circadian system. The light information is transmitted to the central circadian pacemaker in the SCN through the retina-hypothalamic tract. Regarding the effects of physical exercise on the human circadian system, physical exercise influences the circadian rhythms and sleep-wake cycle, which are dependent on light conditions. Physical exercise under dim light conditions did not affect the circadian rhythms of plasma melatonin (Yamanaka et al. AJP 2010), whereas the exercise under bright light could largely shift the circadian rhythm of plasma melatonin (Yamanaka et al. AJP 2014). The results imply that physical exercise might enhance the phase shift of circadian rhythms by bright light. To investigate this hypothesis, we have examined whether physical exercise could enhance the light sensitivity of the eye by measuring pupil size, cardiac sympathetic activity, and salivary melatonin concentration before and after either the low or high-intensity exercise interventions under light at ca. 1000 lux. The results indicated that exercise elicited pupil dilation during the exercise compared with the no-exercise condition. The amount of pupil dilation did not differ between the low and high-intensity exercise. The salivary melatonin concentration was significantly suppressed during the exercise to the same extent as in the low and high-intensity exercise. These findings suggest that physical exercise might be useful to promote phase adjustment by bright light in humans.

Topical Session 2: Thermoregulation
September 10, 3:30 PM - 5:00 PM

Takayuki Nishimura[1)], Hitoshi Wakabayashi[2)]
1) Kyushu University, Japan
2) Hokkaido University, Japan

Recent update in cold adaptation studies, and future directions for physiological anthropology

Our ancestors rapidly dispersed across the Earth during the Last Glacial Period, following their migration out of Africa around 70,000 years ago. During their great journey, they had to adapt to cold environments. Many researchers have investigated our physiological and genetic adaptations to cold using a variety of approaches. In this presentation, I will summarize both classical and recent studies on cold adaptation and the associated mechanisms of thermoregulation. To maintain core body temperature in cold environments, both a decrease in heat loss through vasoconstriction and an increase in heat production through thermogenesis are necessary. I will introduce recent insights into the physiological mechanisms of cold-induced vasoconstriction, with particular focus on cold-induced vasodilation (CIVD), which occurs during cold immersion. A greater CIVD response in populations in cold regions has been reported, whereas recent laboratory studies suggest no increase in CIVD after repeated cold exposure. Next, I will discuss cold-induced thermogenesis, highlighting the roles of shivering and non-shivering thermogenesis (NST), especially involving brown adipose tissue (BAT). We found that individuals with less BAT activity rely more on shivering to compensate for less non-shivering thermogenesis. We also found an association between BAT activity and genetic background. Finally, I will present the recent intersection of physical and physiological anthropology related to cold adaptation and discuss future directions for our research.

Joo-Young Lee[1)], Andrew Gorski[2)]
1) Seoul National University, Seoul, Korea
2) College of Korean Medicine, Kyunghee University, Seoul, Korea

Relationships among morphological variables, cardiovascular fitness during exercise, and thermo-physiological responses under passive heat stress according to Sasang typology

The present study explored relationships how Sasang constitutional types were related to morphological characteristics, cardiovascular fitness during exercise, and thermo-physiological responses under passive heat stress. Twenty four healthy males participated in this study. With a questionnaire, the 24 males were

classified into the four Sasang constitutional types: 4 Tae-Eum (TE), 5 So-Yang (SY), 15 So-Eum (SE), but 0 Tae-Yang (TY) type. Morphological characteristics (height, weight, body surface area, total body fat, and body mass index), cardiovascular fitness during exercise (maximum oxygen consumption [VO2max] and maximum heart rate) and thermos-physiological responses during passive heat stress test (rectal temperature, total sweat rate, thermal sensation, and thermal comfort) were recorded. The results showed that the TE group had smaller standardized VO2max (ml/kg/min) than the SE and SY group ($P<0.05$), but unstandardized VO2max (ml/min) showed the opposite tendency (TE > SE). There were differences in thermoregulatory behavior to cold stress between the TE and SY groups ($P<0.05$). However, no differences among the three constitutional types in rectal temperature, total sweat rate, or subjective perception were found during the passive heat stress. Irrespective of the Sasang types, heavier and fatter subjects showed lower maximum rectal temperature under the passive heat stress ($P<0.05$). These results indicated that the Sasang constitutional types correspond to cardiovascular fitness level during exercise rather than thermo-physiological responses during the passive heat stress. Further studies with a sufficient number of subjects including TY individuals during both heat and cold stress tests are required in order to verify the scientific ground of the Sasang typolgy.

Nadzirah Ikasari Syamsul[1)], Keneth Bautista Sedilla[1)], Ilham Bakri[1)], Takafumi Maeda[1)]
1) Kyushu University, Fukuoka, Japan

Revitalizing Recovery: The Impact of Hyperbaric Oxygen Therapy on Thermoregulation and Heart Rate After Heat Exposure during Recovery

Hyperbaric oxygen therapy (HBOT), which involves breathing oxygen at pressures above atmospheric levels, enhances oxygen delivery and supports physiological recovery. This study investigated the effects of HBOT on recovery after exercise in a hot environment, simulating conditions faced by firefighters in protective gear. Twelve healthy males (aged 20–25) performed 20 minutes of low-intensity cycling (60% predicted maximal heart rate) at 31°C and 60% relative humidity while wearing full firefighter protective clothing. Participants then recovered for 20 minutes in a hyperbaric chamber at 1.0, 1.5, or 1.7 ATA with ambient oxygen (20.9%).

Key physiological variables measured included ear canal temperature (Tear), finger skin temperature (Tfinger), mean skin temperature (MST), heart rate (HR), and skin blood flow (SkBF). Data were analyzed using two-way ANOVA and Generalized Linear Mixed Models (JASP 18.0). A significant decrease in HR was found at 1.5 ATA (average 93 bpm, $p = 0.027$), indicating reduced cardiovascular

strain. Tear remained stable, reflecting maintained core temperature. MST was lowest at 1.0 ATA; however, at 1.5 and 1.7 ATA, skin temperature declined more gradually, likely due to protective clothing limiting heat loss. Tfinger and SkBF also declined at 1.5 ATA, though not significantly. Thermal comfort ratings decreased over time, with no significant differences among conditions. Overall, HBOT at 1.5 ATA improved physiological recovery by reducing HR through parasympathetic activation and aiding thermoregulation via vasoconstriction. These findings highlight potential benefits of HBOT for individuals recovering from physical and thermal stress.

Keneth Bautista Sedilla[1)], Takafumi Maeda[1)]
1) Department of Human Life Design and Science, Faculty of Design, Kyushu University, Japan

Sex-related differences in subjective and autonomic responses preceding thermal behavior through neck cooling during passive exposure to a hot and humid environment

This study examined the potential sex-related differences in subjective and autonomic responses preceding thermal behavior through neck cooling during passive exposure to a hot and humid environment. Considering the known differences in subjective and autonomic responses to thermal load between males and females, we hypothesized that sex-related differences exist in relation to the temporal recruitment of autonomic thermoeffectors and changes in subjective responses preceding thermal behavior. Nineteen young adults (ten males and nine females) agreed to participate in this study, where neck cooling as a thermal behavior was permitted at any point during the experimental trial while they were passively exposed to humid heat (33°C and 80% RH). Physiological measurements include core, mean body, and skin temperatures, as well as skin blood flow and local sweat rate, all of which are obtained before initiating thermal behavior. Subjective thermal responses at the baseline and upon initiating neck cooling were also recorded. The results have shown that in both males and females, acute changes in skin blood flow, as well as a rise in sweat rate, are not necessary for thermal behavior to be initiated. However, it was observed that female participants perceived a lower level of skin wetness perception and thermal comfort than males at the time when they decided to initiate local cooling. Lastly, no differences were observed in the subjective responses and the temporal recruitment of autonomic thermoeffectors preceding thermal behavior, suggesting that both males and females follow the orderly recruitment of autonomic thermoeffectors preceding thermal behavior.

Topical Session 3: Biological Rhythms and Sleep 2
September 11, 9:00 AM - 10:00 AM

Heidi M Lammers-van der Holst[1)], Fleur van Elk[1)], Suzan JW Robroek[1)], Alex Burdorf[1)], Karen M Oude Hengel[1), 3)]
1) Department of Public Health, Erasmus University Medical Center, Rotterdam, The Netherlands.
2) Netherlands Organization for Applied Scientific Research TNO, Sylviusweg 71, 2333 BE Leiden, the Netherlands.
Shift work, crucial for 24/7 healthcare, has negative health impacts. Therefore, we developed a multi-faceted 'PerfectFit@Night' intervention to improve sleep, recovery and fatigue among healthcare shift workers. This study evaluates the effects and implementation of PerfectFit@Night using the RE-AIM model, assessing Reach, Effectiveness, Adoption, Implementation and Maintenance. We conducted a 3-month prospective pre–post study (n=210) with measurements at baseline, 3, and 6 months. PerfectFit@Night included environmental components (powernap bed, healthy food at night, rostering workshop) and individual components (e-learning, sleep coaching). Healthcare shift workers completed surveys on insomnia, sleep, recovery, and fatigue. Effectiveness was analyzed using mixed effects models. Reach, Adoption, Implementation, and Maintenance were assessed through follow-up data, interviews, and logbooks. PerfectFit@Night significantly reduced night shift-related insomnia (−11 %-points, 95 % CI: −19 %, −4 %) at three months, need for recovery (β: −2.45, 95 % CI: −4.86, − 0.03) and fatigue (OR: 0.46, 95 % CI: 0.25, 0.86) at six months. No changes were observed in sleep quality and duration. These results were attributed to the combined intervention elements. Implementation barriers and facilitators emerged at individual (dietary preferences), organizational (e.g., work responsibilities), and workplace levels (location power nap bed), and intervention level (e-learning content). Although satisfaction and interest in continuation were high, integration into daily routines was limited. Future implementation may benefit from clear guidelines, shift-worker ambassadors and supportive work conditions. The multi-faceted PerfectFit@Night intervention improved sleep, fatigue, and recovery. Using the RE-AIM approach, key barriers and facilitators were identified to guide future workplace health promotion for night shift workers.

Dominika Kanikowska[1)], Maki Sato[2)]
1) Department of Pathophysiology, Poznań University of Medical Sciences, Poland
2) Institutional Research, Aichi Medical University School of Medicine, Aichi, Japan
Seasonal Effects on Healthy and Obese Adults: Associations with Selected Hormones and Lifestyle Factors
The biological relevance of seasonal and circadian environmental rhythms has long been recognized. Like other organisms, humans possess an internal timing system

composed of self-sustaining oscillators that are entrained by external synchronizers, primarily the light–dark cycle. This cycle plays a pivotal role in aligning the circadian system with the external environment. Hormonal outputs such as melatonin and cortisol serve as critical conveyors of both daily and seasonal photoperiodic information and exhibit seasonal variation in their secretion patterns. Evidence suggests that reduced photoperiods contribute to the development of seasonal affective disorder (SAD), often characterized by increased appetite, sleep disturbances, and elevated cortisol levels. Seasonal changes may also influence dietary behaviors and patterns of daily activity. In industrialized societies, the influence of seasonality has diminished due to widespread use of artificial lighting and temperature control systems, which buffer natural fluctuations in environmental cues. Nevertheless, disregarding seasonal variation altogether may heighten the risk of misalignment between artificial indoor environments and endogenous biological rhythms. Such desynchronization has been implicated in disturbances of metabolism and thermoregulation, potentially contributing to the development of obesity.

Shigekazu Higuchi[1)], Kazuki Imaizumi[2)], Yusuke Nakazawa[2)], Nuo Xu[2)], Taisuke Eto[3)], Toshiyuki Hayakawa[4)], Sei-ichi Tsujimura[5)]
1) Department of Human Life Design and Science, Faculty of Design, Kyushu University, Japan
2) Graduate School of Design, Kyushu University, Japan
3) Department of Ophthalmology, Keio University School of Medicine, Japan
4) Faculty of Arts and Science, Kyushu University, Japan
5) Faculty of Design and Architecture, Nagoya City University, Japan

A study on ethnic differences in the non-visual and visual effects of light: using pupillary light response and subjective brightness

Recommended lighting conditions have been recently proposed to help maintain a healthy circadian rhythm. However, it may be necessary to consider potential ethnic differences in light sensitivity. Therefore, this study was conducted to clarify ethnic differences in the non-visual and visual effects of light. The participants consisted of 18 East Asians and 17 Europeans, all of whom were young adults with normal color vision. The lighting conditions consisted of three illuminance levels (100 lx, 400 lx, and 1100 lx) and two correlated color temperatures (3000 K and 6000 K). For each condition, three stimuli were prepared that varied only in the level of stimulation of ipRGCs (intrinsically photosensitive retinal ganglion cells). The pupillary light reflex was measured as an indicator of the non-visual effect, and subjective brightness was measured as an indicator of the visual effect. Both pupil constriction rate and perceived brightness were significantly affected by illuminance, color temperature, and ipRGC stimulation. Regarding ethnic differences, a significant difference was found only in pupil constriction rate but not in subjective brightness. The European group showed a significantly higher pupil constriction rate compared to the East Asian group. These results suggest that there are ethnic differences in the non-visual effects

of light, with the European group being more sensitive to light than the East Asian group. Such differences may reflect evolutionary adaptations of human populations to different natural light environments. These differences may reflect the evolutionary history of human adaptation to natural light environments.

Topical Session 4: Genetics, Growth and Development
September 11, 1:30 PM - 3:00 PM

Yuka Ishida[1)], Mami Matsushita[2)], Takeshi Yoneshiro[3)], Masayuki Saito[4)], Kazuhiro Nakayama[1)]
1) Department of Integrated Biosciences, Graduate School of Frontier Sciences, The University of Tokyo, Japan
2) Department of Nutrition, School of Nursing and Nutrition, Sapporo, Hokkaido, Tenshi College, Japan
3) Department of Molecular Metabolism and Physiology, Graduate School of Medicine, Tohoku University, Japan
4) Department of Biomedical Sciences, School of Veterinary Medicine, Hokkaido University, Japan

In search of brown fat-related genes that underwent adaptation to cold in Eurasians

It has been believed that dispersal during the last glacial period led to genetic adaptation to cold in humans outside Africa. Brown adipose tissue (BAT), an organ responsible for non-shivering thermogenesis in humans, is considered to play a role in the process of cold adaptation. The rapid accumulation of human genome sequence data at the population level allowed us to discover genes under local selection related to various traits; however, natural selection on BAT function remain a challenge, mainly due to incomprehensiveness in understanding of genetic basis for the BAT function, and difficulties in testing whether the genes identified by the population genetic approach are truly related with human BAT. To search for more convincing evidence for the BAT-mediated cold adaptations in humans, we study focused sets of genes that were differentially expressed between white adipose tissues and BAT in cold-challenged human subjects (Perdikari et al. 2018). The array of single nucleotide polymorphisms in/near the focused genes has been scanned for effects on transcription in subcutaneous adipose tissues reported on Genotype-Tissue Expression Project, signatures of recent positive natural selection among the 1000 Genome Project populations, and associations with cold-induced BAT activity measured with FDG-PET/CT or infrared thermal imaging in our cohorts. In this presentation, we will report several genes identified by our approach, with evidence at molecular, physiological, and population levels supporting the involvement of BAT in cold adaptation that occurred in out-of-Africa populations.

Nakyeong Shin[1)], Yuki Ikeda[2)], Yuki Motomura[1)], Shigekazu Higuchi[1)]
1) Kyushu University, Fukuoka, Japan
2) National Center of Neurology and Psychiatry, Japan

Neural Characteristics of Self–Other Distinction in Children: An EEG Study

The ability to distinguish between self and other plays a fundamental role in the development of social cognition. This study examined the neural characteristics of self–other distinction in children by focusing on mu rhythm suppression as a marker of mirror neuron system activity. While adult studies have shown mu suppression reflects self-related motor resonance, little is known about how this mechanism develops in children. EEG was recorded while elementary school-aged children observed hand movement videos from first-person and third-person perspectives, depicting either their own or another person's hand. The results revealed that mu suppression was generally weaker than in adults, and children showed perspective-dependent modulation of mu suppression that was not observed in adults. Specifically, greater suppression occurred for other-hand movements in the first-person perspective and for self-hand movements in the third-person perspective, indicating possible ambiguity in associating perspective with bodily self-representation. In contrast, in the occipital region, the degree of suppression was comparable to that of adults, suggesting intact early visual processing of biological motion. Furthermore, mu suppression to self-hand movements in the third-person perspective correlated positively with autistic traits, as measured by the Autism-Spectrum Quotient (AQ). These findings suggest that mu suppression during self–other distinction reflects developmental immaturity in the integrating of motor representations of the self and others, and highlight the potential utility of EEG mu suppression as an index for tracing the development of self–other processing and evaluating individual differences in social cognitive development.

Satoshi Mizukami[1)], Hiroki Nakashima[1)], Haruyuki Watanabe[1)], Serina Koto[1)], Ayuko Takatani[1)], Yoshihito Tomita[2)], Naoko Yamamoto[3)], Yosuke Kusano[4)], Yasuyo Abe[5)], Mitsuo Kanagae[6)], Kiyoshi Aoyagi[7)], Kazuhiko Arima[1)]
1) Department of Public Health, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan
2) School of Rehabilitation, Department of Physical Therapy, Tokyo Professional University of Health Science, Tokyo, Japan
3) Department of Nursing Science, University of Nagasaki, Japan
4) Department of Nursing, Nishikyushu University, Ogi, Japan
5) Department of Health and Nutrition Science, Nishikyushu University, Kanzaki, Japan
6) Department of Rehabilitation, Nishi-Isahaya Hospital, Isahaya, Japan
7) Department of Rehabilitation, Nishikyushu University, Kanzaki, Japan

SNP of FTO was associated with psychological distress among community-dwelling elderly women in Japan.

Objective: To investigate the association between single nucleotide polymorphisms (SNPs) on the fat mass and obesity-associated (FTO) gene and mental health among community-dwelling elderly women. Materials and Methods: This cross-sectional

study was nested in the Nagasaki Islands Study, a prospective observational study in Goto City. Participants were recruited through health examinations of local residents. The Kessler Psychological Distress Scale– 6 items (K6) was used to measure psychological distress. Psychological distress was defined as K6 scores of ≥ 5.
Peripheral blood mononuclear cells were obtained from 1,412 women. Genotyping of the obese-associated SNP (rs1421085) on the FTO gene was performed using the TaqMan SNP Genotyping Assay kit (Thermo Fisher Scientific, Tokyo, Japan). Participants were grouped by genotype: CC, CT, and TT(CC: CT: TT=27: 382: 1003). Odds ratios were estimated by logistic regression adjusting for age and other possible confounders. Results: Participants with the CC/CT genotype had a higher prevalence of psychological distress and BMI compared to those with the TT genotype (13.4% in CC/CT vs 9.5% in TT, p=0.028, 22.8 [20.5-25.4] in CC/CT vs 22.4 [20.1-24.7] in TT, p=0.025). Logistic regression analysis showed that participants with CC/CT genotype were independently associated with psychological distress compared to those with TT genotype (OR: 1.55, 95%CI: 1.09-2.23) after adjusting for age, BMI categories, alcohol consumption, current smoking and exercise. Conclusions: Participants with the CC/CT genotype were associated with higher BMI and psychological distress in Japanese elderly women. However, further studies are needed to elucidate the association between psychological distress and FTO gene.

Can Ozan Tan[1)]
1) University of Twente, the Netherlands

From Genes to Machines: Technoadaptability of the Body—Assemblages for Human and Planetary Health

In the context of accelerating technological change and ecological challenges, human adaptation has become a multidimensional process in which physiology, genetics, development, and technology are deeply intertwined. This talk will examine the human body as a dynamic system, shaped by the interplay of genetic diversity, physiological plasticity, coordinated organ function, and continual interaction with evolving environments and technological innovations. Wearable health devices, digital learning platforms, and advanced prosthetics exemplify the emergence of novel adaptive contexts, illustrating how technology has become an integral extension of human biology and behavior. These developments contribute to changes in health, metabolic responses, and cognitive patterns, reshaping the potential boundaries of the human body. The relationship between individual adaptation and collective resilience can be framed with attention to current planetary health issues, including climate change and urbanization, highlighting the need for integrative solutions that support both personal and population-level well-being. Ethical considerations surrounding inclusive and responsible innovation further shape the adaptive landscape. These principles are linked to neural and brain function, demonstrating how adaptability is embodied at multiple levels and setting the stage for future inquiry into human diversity and resilience in a rapidly evolving world.

Topical Session 5: Neural and Brain Function
September 11, 3:30 PM - 5:00 PM

Maryam Amir Haeri[1)]
1) University of Twente, The Netherlands

The Human Mind's Reflection: How We Engineered Our Own Problem-Solving into AI

This talk explores the historical connection between human and artificial intelligence, arguing that AI's most effective problem-solving methods are a direct reflection of human cognitive strategies. I will trace the development of AI evolution through the lens of a central, enduring dilemma: exploration versus exploitation. From early heuristics to modern deep learning, the challenge has consistently been to balance the search for new solutions with the optimization of known ones. This overview of computational history highlights how human strategies for navigating complex problems have been systematically embedded and codified into algorithmic design. This perspective provides a framework for understanding the future of problem-solving. By examining how we have encoded our cognitive biases and strengths into AI, we can gain new insights into human adaptability and the potential for a new era of collaborative human-AI intelligence.

Yuki Motomura[1)], Riku Nagamune[2)], Tamaki Ueda[2, 3)], Takayuki Momoi[2)]
1) Faculty of Design, Kyushu University, Japan
2) Graduate School of Integrated Frontier Science, Kyushu University, Japan
3) Railway Technical Research Institute, Japan

Postural Modulation of Autonomic Activity Alters Heartbeat-Evoked Potentials and Subjective Mood

This study manipulated autonomic nervous system (ANS) activity via passive head-up tilt (HUT) to assess its effects on cardiac interoceptive processing, as indexed by heartbeat-evoked potentials (HEPs), and on subjective mood. Thirty-five healthy graduate students (18 males, 17 females; mean age 21.9 ± 2.7 years) underwent three 3-minute conditions: supine (0°), 45° passive HUT, and posture control (PC) conditions with lying by oneself on 45-degree tilting bed. Continuous electroencephalogram (EEG) and electrocardiogram (ECG) recordings enabled extraction of HEPs relative to R-wave peaks over six frontocentral channels (F3, Fz, F4, C3, Cz, C4) in the 200–300 ms and 400–500 ms post-R windows. Heart rate variability (HRV) analysis yielded high-frequency (HF) power and the LF/HF ratio. Subjective assessments comprised the Karolinska Sleepiness Scale, a bespoke face scale, and the State-Trait Anxiety Inventory. Compared with the supine condition, both HUT and PC elicited significant reductions in HF power (parasympathetic suppression) and increases in LF/HF ratio and heart rate (sympathetic activation). HEP amplitude in the 200–300 ms window differed between HUT and PC, with lower

amplitudes in the PC condition. Face scale negative mood ratings increased during HUT and decreased during PC, while anxiety scores remained unchanged. No significant correlations emerged among HEP amplitudes, HRV metrics, and face scale scores. These findings indicate that acute ANS modulation via posture alteration influences cortical processing of cardiac signals and subjective mood, supporting the utility of HEPs as markers of interoceptive–emotional integration.

Keita Ishibashi[1)], Takahide Akama[2)], Hisao Yoshida[1)], Koichi Iwanaga[1)]
1) Chiba University, Japan
2) Maebashi Institute of Technology, Japan

Changes in brain functions under transient cerebral hypoperfusion induced by orthostatic stress

Adequate cerebral blood flow (CBF) perfusion is crucial to maintaining brain function. On the other hand, humans have larger brains and long legs with an upright posture and are more susceptible to temporary decreases in CBF to orthostatic stress than other animals. Very few studies examine changes in brain function during transient cerebral hypoperfusion. This is because, in a natural state, transient hypoperfusion itself is a less reproducible phenomenon. In this study, we used the oscillatory lower body negative pressure (OLBNP), which induces transient reductions in CBF with high reproducibility, to investigate brain function changes during CBF fluctuations, analysing responses at the brainstem and cortical levels. The sinusoidal pattern of an 18-sec period of OLBNP at 0 ~ −40 mmHg was used. Here, we measured auditory brainstem response (ABR) and CBF velocity (MCAv) in 12 subjects, and measured event-related potentials (ERPs) related to a spatial stimulus-response compatibility (SRC) task and MCAv in 9 subjects, under OLBNP and control (no-OLBNP) conditions. We observed that OLBNP caused cyclic fluctuations of MCAv ($p < 0.001$) and the delayed latency of ABR ($p < 0.05$). Moreover, the incompatibility of the SRC task caused increased ERP amplitude ($p < 0.001$) and reaction times ($p < 0.001$). However, we found no significant effect of OLBNP on ERPs or task performance. Our results showed that OLBNP causes periodic fluctuations in CBF and affects responses at the brainstem level, but the impact of OLBNP on cortical-level responses was unclear. These results might indicate redundancy or robustness in the brain functions of cortical-level responses to transient hypoperfusion.

Yuki Nishimura[1)], Hiroki Ikeda[1)], Shun Matsumoto[1)], Tomohide Kubo[1)], Xinxin Liu[1)]
1) National Institute of Occupational Safety and Health, Japan

An ERP study on the impact of rest patterns during simulated driving on brain activities associated with detecting novel stimuli

Considering the importance of truck drivers to modern logistics, their occupational health is a national concern. Adequate rest is vital for maintaining their safety and health. However, there is limited scientific evidence on ideal rest patterns, particularly concerning the impacts of rest duration and whether rest is consolidated or separate.

Therefore, this study investigated the impact of rest patterns on brain activity during simulated driving. In total, 47 licensed male drivers (mean age: 49.3 ± 5.0 years) participated in a 6-h driving simulation. Due to equipment failure and low signal quality, 36 participants were included in the analysis. They were randomly assigned to either long (60 min) or short (30 min) rest group, each with either a single or separate rest. Lunch break was set after 4 h of driving; those in the separate-rest group had an additional 10-min rest after 2 h of driving, deducted from their lunch break. Brain activity was evaluated using event-related potentials (ERPs) via a passive auditory oddball paradigm. The effects of rest duration, rest style, session, and their interactions on ERP indices were analyzed using a mixed-effects model. Significant interactions were detected between session and rest separation for N1 latency and MMN amplitude. Specifically, separate rest was associated with delayed early-stage processing and reduced ability to detect deviations in the final session. Hence, consolidated rest may be more effective than separate rest in sustaining brain function during prolonged driving. These results provide empirical support for revising rest guidelines to prioritize rest structure over duration.

Topical Session 6: Public and Planetary Health
September 12, 1:30 PM - 3:00 PM

Taro Yamauchi[1)], Yumiko Otsuka[2)], Ken Ushijima[3)], Sintawardani Neni[4)]
1) Hokkaido University, Japan
2) University of Bristol, UK
3) Hokkaido Research Organization, Japan
4) National Research and Innovation Agency, Indonesia

Child Health Risks Associated with Household Water and Hygiene Practices in Densely Populated Urban Indonesia

Unsafe drinking water, inadequate sanitation, and poor hygiene are critical contributors to poor child health in low- and middle-income countries. This study investigated the associations between household WASH (Water, Sanitation, and Hygiene) conditions and children's health and nutritional status in a densely populated urban slum in Bandung, Indonesia. Data were collected from children and their caregivers at one preschool and two elementary schools using anthropometric measurements, handwashing observations, microbial testing of hand contamination, and structured questionnaires. Results showed that children from households using tap water instead of tank water had significantly higher risks of stunting and thinness. Open container water storage was associated with increased prevalence of diarrhea. Not drying hands with a towel after washing was also linked to a higher risk of stunting. Fecal contamination was found on the hands of 98.7% of children, with significantly lower Escherichia coli (E. coli) counts among girls compared to boys. Higher E. coli levels were associated with inadequate handwashing techniques and absence of soap use. A composite WASH index score was inversely correlated with bacterial contamination, suggesting that better hygiene practices at home can reduce exposure to harmful pathogens. These findings underscore the importance of practical household-level interventions to improve water quality and hygiene behaviors in order to support child health and development in urban underserved communities.

Rie Goto[1)]
1) Imperial College London, UK

Data to Diet: Estimating Food Consumption and Fortification Impact in Tanzania

This study evaluates the potential contribution of large-scale food fortification (LSFF) to reducing micronutrient inadequacies in Tanzania, using Household Consumption and Expenditure Survey (HCES) data from the 2014–15 Tanzania National Panel Survey (TNPS). Household-level consumption of fortifiable food vehicles was estimated and standardised using the adult female equivalent method. The prevalence of inadequate apparent intake of five micronutrients targeted by national fortification policy (vitamin A, iron, zinc, folate, and vitamin B12) was modelled under four

scenarios: no LSFF, current implementation, and full compliance with and without maize flour fortification. Edible oils, wheat flour, and maize flour (including derived products such as bread and cakes) were consumed by 91%, 88%, and 53% of households, respectively. Modelling suggested that vitamin A-fortified oil alone could reduce the prevalence of vitamin A inadequacy from 92% (no LSFF) to 80% under current implementation. However, low compliance with flour fortification standards limited the impact on other micronutrients. Full compliance, particularly including cereal flours, could substantially reduce inadequacies in iron, zinc, folate, and vitamin B12. This study demonstrates the utility of HCES data for estimating dietary risks and evaluating the impact of the national fortification programme. It also reveals regional and urban–rural disparities, offering critical insights to inform LSFF policy and programme design. Enhancing compliance and expanding coverage could help reduce micronutrient inadequacies through LSFF in Tanzania.

Abhijeet Singh Dewari[1)], **Barry Bogin**[2, 3)]
1) Laboratory of Kinanthropometry, Ergonomics and Physiological Anthropology, Department of Anthropology, University of Delhi, India
2) School of Sport, Exercise & Health Sciences, Loughborough University, UK
3) UCSD/Salk Center for Academic Research and Training in Anthropogeny (CARTA), University of California, San Diego, USA

Influence of Social-Economic-Political-Emotional (SEPE) factors on the physical performance and health of older people across India

Social- Economic-Political-Emotional (SEPE) factors are associated with human physical growth and development from conception to maturity. The impact of SEPE factors on physical performance and health of older people is less well-understood. We searched for SEPE associations in the Longitudinal Ageing Study in India (LASI). LASI is a multidisciplinary, internationally harmonized panel study of 73,396 older adults aged 45 and above including their spouses less than 45 years, representative to India and all of its states and union territories. LASI is designed to provide researchers and policymakers with comprehensive data on health characteristics of India's older population and some of the factors associated with healthy aging. We extracted from the LASI data set physical performance data (e.g., hand grip strength, gait speed, balance), health data (height, weight, waist and hip circumference), and 31 SEPE variables related to overall well-being, satisfaction with life, and religious/spiritual practice. We applied St Nicholas House Analysis (SNHA) -- a statistical method that calculates ranked correlations (from most to least correlated) and produces a network graph for the visualization of these associations in Hermanussen et al. 2021. Results indicate no direct association between the SEPE variables and the physical performance/health variables. Greater hand grip strength associated with a faster gait speed. SEPE variables associated with hopefulness, life satisfaction, physical activity, and diet tended to cluster together, but with few statistically significant associations.

J. Josh Snodgrass[1)], Alicia M. DeLouize[1)]
1) Department of Anthropology, University of Oregon, USA

Inflammation, aging, and cardiometabolic health among the Shuar of Ecuador

Over the past several decades, researchers have demonstrated that chronic, low-grade systemic inflammation, most often measured using C-reactive protein (CRP) in blood, is associated with numerous health conditions, including cardiovascular disease, diabetes, several cancers, chronic kidney disease, and neurodegenerative disorders. Furthermore, chronic inflammation has been shown to increase with age ("inflammaging"), leading many to conclude that this is universal and reflects intrinsic aging mechanisms driven by immunosenescence. However, this assumption, along with other key aspects of the relationship between inflammation and health, remains uncertain—largely because previous research has primarily been conducted in high-income settings with low infectious disease burden and greater exposure to lifestyle-related determinants of systemic inflammation. Research conducted over the past 20 years by the Shuar Health and Life History Project (SHLHP) among an Indigenous, subsistence-focused population from Amazonian Ecuador provides an extremely valuable perspective on chronic inflammation over the life course. The present paper discusses two important findings from the SHLHP: 1) CRP levels among Shuar adults and kids are very low, with weekly variability reflective of transient immune response and little evidence of chronic inflammation; and 2) No significant relationship between CRP and age was observed in remote areas, whereas in more market-integrated communities CRP was higher with age, an association that was fully attenuated by adjusting for central adiposity, lipids, and glucose. This pattern of inflammation documented among Shuar is distinct compared to high income populations and changes our understanding of aging-related decline and disease with important implications for public health and clinical medicine.

Poster Session 1
September 11, 10:30 AM - 12:00 PM

Hiroaki Arima[1)]
1) Institute of Tropical Medicine, Nagasaki University, Japan

Impact of Persistent Volcanic Activity of Mount Sakurajima on Air Pollution and Mortality Risk in Surrounding Areas, Japan

Volcanic eruptions are known sources of air pollution that pose health risks to nearby residents. However, the effects of continuous eruptions—such as those at Sakurajima in Japan—on air pollutant concentrations under seasonal and meteorological influences, and their association with mortality risk, remain insufficiently studied.
This study analyzed monthly data from 2015 to 2020, including eruption counts by crater at Sakurajima, air pollutant concentrations, precipitation, and mortality in nearby public health jurisdictions. Using generalized estimating equations and mediation analysis, we assessed how persistent eruptions influence pollutant levels and how these pollutants contribute to mortality risk. We found that volcanic ash deposition, PM2.5, SPM, SO_2, nitrogen oxides, NMHC, and CH_4 were significantly higher in some jurisdictions during months with more eruptions. Notably, elevated CH_4, NO_x, and volcanic ash significantly mediated the relationship between eruption frequency and mortality or sex ratio of mortality. These findings suggest that volcanic pollutants disperse differently by region depending on geographic factors such as distance and wind direction. In some areas, volcanic ash, CH_4, and nitrogen oxides may mediate the link between volcanic activity and mortality outcomes, offering new insight into the public health impact of long-term volcanic emissions.

Mutsuki Tsuchiya[1)], Aoi Watanabe[1)], Takashi Ota[1)], Okusa Kosuke[1)]
1) Chuo University, Japan

Development of a Non-Contact Stress-Estimation Method Based on Cardiac Motion Modeling Using Microwave Doppler Radar

Accurate stress assessment is critical in domains such as environmental and service design. Although salivary cortisol and heart-rate-variability (HRV) analysis derived from the R-R interval (RRI) recorded with contact sensors are widely used, each has significant drawbacks: cortisol assessment requires intermittent sampling and laboratory analysis, and contact sensors can cause discomfort during prolonged wear. Microwave Doppler radar offers a promising non-contact alternative for heartbeat monitoring, yet its signal is highly susceptible to body motion, restricting deployment in real-world settings. To overcome this limitation, we propose a method that achieves robust RRI extraction and subsequent stress estimation under motion conditions through mathematical modeling of cardiac motion. The approach applies template matching between the radar signal and a library of simulated heartbeat waveforms, enabling accurate RRI estimation even when the subject moves. Stress is then

quantified from time- and frequency-domain HRV indices, including the root mean square of successive differences (RMSSD) and the low- to high-frequency (LF/HF) power ratio. We validated the method in a laboratory stress experiment using the Trier Social Stress Test. The radar-based stress estimates were comparable to those obtained from salivary cortisol, demonstrating the technique's potential for continuous, non-contact stress monitoring. Future work will aim to enhance signal robustness in real-world environments, integrate respiratory modeling, and explore applications in healthcare, occupational safety, public spaces, and wearable device-free contexts where unobtrusive physiological monitoring is essential.

Aoi Watanabe[1)], Kosuke Okusa[1)]
1) Chuo University, Japan

Non-Contact Identification of Sleep Apnea Using Integrated Cardiac and Respiratory Models on Microwave Doppler Signals

Sleep apnea syndrome (SAS) poses serious health risks, making early detection and continuous monitoring essential. Non-contact, low-burden measurement techniques are especially valuable for home monitoring. The standard contact-based test for SAS is polysomnography (PSG), yet attaching multiple sensors to the body causes discomfort and restricts natural movement during sleep. To address these limitations, this study proposes a contact-free SAS detection method using microwave Doppler radar. Because radar echoes are highly susceptible to noise generated by body movements, earlier studies required subjects to remain partially immobilized, limiting practical use. Our approach mathematically models the cardiac and respiratory components contained in the radar signal and applies dynamic template matching, enabling apnea estimation under ordinary sleeping conditions. Previous work (Ota & Okusa, 2024, J. Physiological Anthropology) showed that heartbeats can be estimated in the presence of motion by treating the heart as an expanding–contracting sphere. Conversely, earlier respiratory models (Kubo et al., 2010, Trans. Jpn. Soc. Med. & Biol. Eng.) treated the thorax as a flat plate and assumed purely sinusoidal movement, resulting in poor agreement with measurements. In the present study we develop a new mathematical model of respiratory motion and integrate it with the cardiac model to construct a unified apnea-detection framework. Data are collected from healthy volunteers lying supine during natural breathing and voluntary breath-holding. Using the recorded microwave Doppler signals, we evaluate the accuracy of apnea detection achieved by the proposed method.

Zofia Strojny[1)], Magdalena Lewandowska[2)], Marcin Strojny[3)], Joanna Żuraszek-Szymańska[2)], Tomasz Deja[3)], Elżbieta Paszyńska[1)], Andrzej Bręborowicz[2)], Katarzyna Korybalska[2)], Janusz Witowski[2)], **Dominika Kanikowska**[2)]
1) Department of Conservative Dentistry and Endodontics, Poznan University of Medical Sciences, Poznań, Poland

2) Department of Pathophysiology, Poznan University of Medical Sciences, Poznan, Poland
3) Department of Urology with the Sub-Department of Oncological Urology, Hospital of the Ministry of Internal Affairs and Administration, Poznan, Poland

Assessment of chronotype, chrononutrition, lifestyle, and selected salivary and serum biomarkers in patients diagnosed with bladder cancer

Despite significant progress in the field of oncology, the number of cancer cases and deaths is constantly growing. In light of this trend, it seems necessary to search for new, alternative secondary prevention paths and biomarkers as effective diagnostic methods. The misalignment of sleep and eating patterns with biological cycles is a significant issue that may have detrimental effects on health and neoplastic processes, in particular bladder cancer - the most frequently diagnosed cancer in the urinary system. The study involved 98 patients hospitalized in the Urology Department of the MSWiA Hospital in Poznań. Based on histopathological examination, they were divided into a cancer group (n=69) and non-cancer group (n=29). The study assessed chronotype, chrononutrition and lifestyle using a dedicated questionnaire, as well as measurements of angiopoietin-like 4 (ANGPTL4) and vascular endothelial growth factor (VEGF) concentrations in serum and saliva. In the analyzed groups, we found no differences between chronotypes ($p=0.063$), and the total sleep duration was similar ($p>0.99$). Participants with bladder cancer exhibited lower regularity in eating meals, were more likely to skip breakfast, and their eating window (EW) was shorter. At the same time, there were significant differences in serum ANGPTL4 levels between the groups of patients with and without cancer ($p=0.043$), as well as between male and female patients ($p=0.034$). Similarly, the level of VEGF in saliva was almost twice lower in obese cancer participants. We believe that this study provides a solid basis for further clinical considerations.

Nuo Xu[1)], Yusuke Nakazawa[1)], Shigekazu Higuchi[2)]
1) Graduate School of Design, Kyushu University, Japan
2) Faculty of Design, Kyushu University, Japan

Evaluation of Circadian-Relevant Light Output of Commercial Virtual Reality Displays

Virtual reality (VR) displays are gaining popularity as screen use has become increasingly personalized and immersive. However, their proximity to blue light raises concerns regarding potential circadian disruptions. This study evaluated the spectral distribution and circadian impact of different VR head-mounted displays (HMDs) under various conditions. Three VR devices, Meta Quest 2, Vision Pro, and Google Cardboard (equipped with iPhone 14 Pro) were tested. In the immersive mode, red, green, blue, and white stimuli were displayed and measured 2 cm from the screen using a CL-500A spectroradiometer. In non-immersive mode, Quest 2 and Vision Pro were assessed under four ambient lighting conditions. The circadian impact was evaluated using melanopic equivalent daylight illuminance (mEDI). Spectral outputs

vary across devices, reflecting differences in display technology. The smartphone-based Google Cardboard produced the highest mEDI when displaying white light at full brightness. However, overall melanopic exposure from all HMDs was significantly lower than that from typical indoor lighting. Given the increase in VR usage for work, education, and entertainment, the result is now leading to a concern that cumulative reductions in natural daylight exposure, rather than excessive blue light alone, may pose a long-term circadian risk.

Sawako Sasai[1, 2)], Megumi Nishikawa[3)], Yoshiko Matsushima[1)], Hiroto Matsuyama[1)], Madoka Osawa[1)], Sayaka Uij[1)], Isuzu Nakamoto[1)], Saeka Ajiki[3)], Shigeyuki Ogawa[3)], Eiko Masutani[1)], Tomoko Wakamura[1)]
1) Human Health Sciences, Graduate School of Medicine, Kyoto University,
2) Department of Nursing, Morinomiya University of Medical Sciences
3) New Business Development Division, Septem Soken Co., Ltd.,

Circadian rhythm entrainment factors and premenstrual syndrome: a cross-sectional study focusing on chronotypes

Objective: Premenstrual syndrome (PMS) is a common condition among women, characterized by physical and emotional symptoms. Although pharmacological treatments are available, their side effects limit their suitability for all women. Circadian rhythms disruption might affect mental and physical health. The purpose of this study was to determine how lifestyle factors (light exposure, exercise, and food intake) related to circadian rhythm entrainment contribute to PMS severity based on chronotype. Methods: This cross-sectional study was analyzed 564 Japanese women aged 20-49, excluding 221 neither types, consisting of 249 morning types and 315 evening types. PMS severity was measured using the Menstrual Distress Questionnaire (Moos 2010) and its association with lifestyle factors related to circadian rhythm entrainment were assessed by multiple regression analysis. This study was conducted with the Ethics Committees. Results: The percentage of women reporting mild or worse PMS score were 93.3% for pain, 90.4% for water retention, 47.0% for autonomic reactions, and 85.5% for negative affect, many women suffer from PMS. For morning types, 4 or more hours of screen time after sunset was associated significantly with higher negative affect scores. Conversely, for evening types, less than 2 hours of daytime light exposure was associated with increased negative affect and water retention, and engagement in exercise was associated with reduced water retention. Meal timing was not associated with PMS severity. Conclusions: Circadian rhythm entrainment through appropriate light exposure and exercise could alleviate PMS. The consideration of individuals' chronotypes may enhance the effectiveness of lifestyle-based interventions for PMS relief.

Momo Hama[1)], Yukitaro Yasuda[2)], Midori Motoi[3)], Shin Nakyeong[3)], Takayuki Nishimura[3)], Eigo Nishimura[3)], Hideo Toyoshima[4)], Yuiko Araki[1)], Yali Xia[5)],

Tomoaki Ohashi[5)], Nariaki Kuriyama[5)], Yuna Miyauchi[5)], Shigekazu Higuchi[3)], Yuki Motomura[3)]
1) Graduate School of Integrated Frontier Sciences, Kyushu University, Japan
2) Graduate School of Design, Kyushu University, Japan
3) Faculty of Design, Kyushu University, Japan
4) Fukuoka Urazoe Clinic, Japan
5) Honda R&D Co., Ltd., Japan

Effects of alcohol consumption and sleep deprivation on psychomotor vigilance task performance: A study in Japanese participants

Background: Alcohol consumption and sleep loss are well-known causes of cognitive and driving impairment; however, most evidence is derived Western cohorts. Data from East Asians who carry polymorphisms that affect alcohol and aldehyde metabolism are scarce. Therefore, we examined the effects of acute alcohol intake and extended wakefulness on cognitive performance in healthy Japanese adults. Methods: Preliminary screening of 102 Japanese adults excluded individuals homozygous for ALDH*2/*2 using an alcohol patch test. Eighteen participants were selected based on their breath alcohol concentration (BrAC) responses and genotypes. In a randomized crossover design, each completed two sessions included (1) an alcohol condition (0.6 g/kg vodka over 30 min) and (2) a sleep-deprivation condition (26 h wakefulness). Psychomotor Vigilance Task (PVT) performance was analyzed using linear mixed models. Results: PVT performance declined under both the conditions. A BrAC of 0.25 mg/L—the Japanese legal limit—produced an impairment equivalent to 20.4 h of wakefulness. Each additional hour of wakefulness caused a decrement comparable to that observed with a 0.034 mg/L BrAC increase. The BrAC equivalent to one hour of wakefulness was similar to that observed in previous findings. Conclusions: These findings suggest that, despite differing genetic backgrounds, similar patterns of impairment were observed in East Asian participants. These results highlight the need to address cognitive risks associated with sleep deprivation. However, it should be noted that participants with high BrAC reactivity were selected, which may have influenced the observed alcohol-related effects.

Yusuke Nakazawa[1)], Kazuki Imaizumi[1)], Nuo Xu[1)], Taisuke Eto[2)], Toshiyuki Hayakawa[3)], Shigekazu Higuchi[4)]
1) Graduate School of Design, Kyushu University, Japan
2) Department of Ophthalmology, Keio University, School of Medicine, Japan
3) Faculty of Arts and Science, Kyushu University, Japan
4) Faculty of Design, Kyushu University, Japan

Ethnic differences in circadian photo sensitivity of melatonin suppression by light at night

In today's 24-hour society, artificial lighting at night is essential; however, it also induces non-visual effects that have been associated with various health disorders. In recent years, research has been conducted to elucidate the mechanisms of these effects

and their variability; however, ethnic differences in light sensitivity remain unclear. This study examined ethnic differences in light sensitivity by comparing melatonin suppression. The study included 17 healthy East Asians (EA, 22.4 ± 1.57 years, nine males and eight females) and 20 healthy Europeans (EU, 25.9 ± 4.12 years, nine males and 11 females). First, melatonin concentration under dim light (< 3 lx) was measured as a control. Saliva samples were collected hourly to quantify the melatonin concentration. The subjects were then exposed to three lighting conditions (30, 100, and 400 lx) for three hours at night. The interval between experiments was approximately one week. Based on a visual inspection, certain data were excluded, resulting in final datasets of 30 lx (EA, n = 10; EU, n = 8), 100 lx (EA, n = 9; EU, n = 10), and 400 lx (EA, n = 13; EU, n = 8). As a result, under the 30 lx condition, melatonin suppression tended to be higher in the Western group than in the East Asian group ($p = 0.081$). These findings suggest that ethnic differences in light sensitivity may emerge at low light levels.

Joo-Young Lee[1)], Dohee Kim[1)]
1) Seoul National University, Seoul, Korea

Thermoregulatory Responses to Air Temperature of −5 °C at Different Wind Speeds: Significance of Strong Wind in a Mild Cold Environment

Urban people who live in temperate climates are accustomed to mild cold with varying wind speeds. We examined thermoregulatory responses to varying wind speeds in mild cold, considering anthropometric characteristics of individuals. Ten males (23.9 ± 3.3 y in age, 175.8 ± 4.9 cm in height, 74.4 ± 7.0 kg in body weight) participated in the following four wind conditions (0, 2, 4.5, and 7 $m \cdot s^{-1}$) at an air temperature of −5°C (Wind chill temperature: −5 °C ~ −12 °C). Subjects wore winter clothing (IT, 2.1 clo) and every trial consisted of 80 min (10-min rest, 60-min walking, and 10-min recovery). Rectal and gastrointestinal temperatures remained stable across all the conditions, suggesting sufficient insulation from the winter clothing. However, peripheral skin temperatures, particularly on the hand, foot, and finger significantly decreased with higher wind speeds. At 7 $m \cdot s^{-1}$, the temperature of the fingers dropped to an average of 12.7°C. Overweight subjects showed less frequent shivering compared to normal-weight subjects. Body surface area (BSA) negatively correlated with cold sensations, highlighting that individuals with higher BSA experienced less cold stress. Subjective thermal and wind sensations also increased with wind speed. While typical winter clothing (2.1 clo) effectively maintains core temperature in wind chill conditions down to −12.3°C, extremities, particularly the hands, require better insulation. Peripheral skin temperatures and subjective sensations, such as thermal comfort, provide reliable indicators for assessing cold stress. Physical properties also influenced cold responses, with overweight individuals exhibiting less frequent shivering and larger body surface areas correlating with greater cold sensitivity. These findings offer insights into optimizing winter clothing design to improve comfort and safety in windy conditions in mild cold.

Sayaka Matsuo[1)], Rinka Miura[1)], Yoshihito Tomita[2)], Ping Yeap Loh[3)], Jundai Fukuda[4)], Hitoshi Wakabayashi[4)], Kazutaka Oka[5)], Junya Takakura[6)], Kazuhiko Arima[7)], Takayuki Nishimura[3)]
1) Graduate School of Design, Kyushu University, Japan
2) School of Rehabilitation, Tokyo Professional University of Health Sciences, Japan
3) Faculty of Design, Kyushu University, Japan
4) Faculty of Engineering, Hokkaido University, Japan
5) Center for Climate Change Adaptation, National Institute for Environmental Studies, Japan
6) Social Systems Division, National Institute for Environmental Studies, Japan
7) Graduate School of Biomedical Sciences, Nagasaki University, Japan

Associations of Perceptual temperature sensitivity and Physiological Responses to Temperature Changes with Meteoropathy

"Meteoropathy" refers to physical and psychological symptoms—such as headaches, dizziness, and irritability—triggered by weather changes, particularly drops in atmospheric pressure and temperature. Animal studies suggest that cold intolerance–induced pain may involve TRP channel activity and sympathetic nervous system excitability. However, human studies on the relationship between perceptual temperature sensitivity, physiological responses to temperature changes, and meteoropathy remain limited. This study aimed to clarify (1) the relationship between perceptual temperature sensitivity and meteoropathy, and (2) the association between physiological responses to temperature changes and meteoropathy. Sixty-nine participants, including 25 university students (mean age: 22.4 ± 1.1 years) and 44 older adults (mean age: 65.5 ± 4.5 years), took part in a meteoropathy questionnaire, a perceptual temperature sensitivity test, and physiological measurements under cold (15℃, 5min) and warm (40℃, 5min) stimulation to the hand. There was no significant association between perceptual temperature sensitivity and meteoropathy scores which describes the level of meteoropathy, suggesting perceptual temperature sensitivity may not directly contribute meteoropathy. However, physiological data showed that heart rate and blood pressure tended to be higher in participants with higher meteoropathy scores, in both sexes, indicating sympathetic nervous system involvement. Furthermore, in women, a smaller decrease in hand temperature during hand-cooling tended to be associated with higher meteoropathy scores, suggesting the possibility of sex-specific physiological differences. These findings offer preliminary insight into physiological and individual differences associated with weather sensitivity.

Sachiko Takahashi[1)], Akiko Maeda[1)], Naomi Maruta[1)], Kazuhiko Yamasaki[2)]
1) Kyoritsu Women's University, Japan
2) Jissen Women's University, Japan

Research and experiments on dressing and undressing of upper body clothes

There are many factors that can limit physical mobility, such as frozen shoulder, fractures, and aging. The ultimate aim of this study is to design clothes that are easy for many people to put on and take off. As part of this study, a questionnaire survey, experiments on dressing and undressing, and a study of the working range of the upper limb were conducted. The questionnaire survey included an online survey of 642 men and women between the ages of 40 and 60. Approximately 40% had experienced frozen shoulder, and many of them experienced difficulty in with dressing and undressing. For the dressing and undressing experiment, the subjects were 12 adult females and 10 males. Subjects wore a frozen shoulder simulator fabricated by the authors and performed the dressing and undressing movements. It was confirmed that the time required for dressing and undressing increased significantly as the range of motion was restricted. For the working range of the upper limbs study, the subjects were 13 adult females and 10 males. The evaluation method consisted of having the subjects wear a vest made of grid-patterned fabric and having them trace the trajectory of their fingertips on their backs. A significant correlation was found between shoulder flexibility and maximum range of motion.

Akiko Maeda[1)], Sachiko Takahashi[1)], Naomi Maruta[1)]
1) Kyoritsu Women's University, Japan

Clothing, Climate, and Comfort in Daily Life — A yearlong study of thermal conditions and clo values

In daily social life, individuals choose clothing appropriate to the time, place, and occasion (TPO). This study aimed to investigate whether female university students maintain thermal comfort in daily life by adjusting their clothing according to seasonal climatic conditions. Seventeen female students participated in the study, and measurements were conducted on commuting days over one year. The measurement items were clothing microclimate, ambient temperature and humidity at locations of movement and stay, simplified behavior logs, clothing configurations, and subjective thermal sensation and comfort. Clothing microclimate and ambient conditions were measured using IoT sensors. Clo values were estimated based on the clothing configurations. The results showed that the clothing microclimate generally remained within the thermal comfort zone during spring, autumn, and winter. However, in summer, both temperature and humidity within clothing were elevated, exceeding the comfort threshold. Seasonal variations in clo values were observed: 0.58 clo in spring, 0.47 clo in summer, 0.96 clo in autumn, and 1.15 clo in winter. These findings indicate that participants actively adjusted their clothing in response to seasonal temperature variations. Subjective comfort was mostly reported as “comfortable” or “neutral” in all seasons except summer. Japan's hot and humid summer climate increases heat stress risk in daily life, particularly as elevated clothing microclimate correlates with heatstroke risk. This study provides empirical data supporting appropriate clothing practices for thermal comfort. These findings may contribute to heatstroke prevention and urban environmental adaptation strategies.

Poster Session 2
September 12, 10:30 AM - 12:00 PM

Megumi Nishikawa[1)], Sayaka Uiji[2)], Saeka Ajiki[1)], Shiyori Takamine[2)], Shigeyuki Ogawa[1)], Tomoko Wakamura[2)]
1) Septem Soken Co., Ltd. Japan
2) Graduate School of Medicine, Kyoto University, Japan

The relationship between the severity of premenstrual symptoms and lifestyle factors related to circadian rhythm entrainment in Japanese women

Premenstrual symptoms (PMS) varies among individuals and can affect their daily life. Circadian rhythms in humans are influenced by entrainment factors such as light exposure, meals, exercise, and social contact. This study aimed to clarify the relationship between the PMS severity and lifestyle factors associated with circadian rhythm entrainment. Method: A web survey was conducted from August to September among women aged 20-49 years in Japan. PMS was assessed by the 35-item Menstrual Distress Questionnaire (MDQ; Moos, 2010). Lifestyle factors were investigated the breakfast timing, natural light exposure, and screen time (ST) after 19:00. Social jet lag (SJL) was calculated based on weekdays and free days sleep schedules. Participants with menstrual irregularities, oral contraceptive, or shift work were excluded. This study was conducted with the approval of the Ethics Committees. Results: MDQ scores were significantly higher in the 20-39 age group (236 participants, 33.8 ± 22.9 points) than in the 40-49 age group (263 participants, 28.1 ± 21.3 points) ($p < .01$). In the younger group, higher MDQ scores were associated with skipping breakfast on weekdays, longer ST on free days and greater SJL, however, in the elder group, were associated with skipping breakfast on weekdays and shorter natural light exposure on free days. Conclusion: PMS may be associated with lifestyle habits related to circadian rhythm entrainment, and these associated factors may vary with age. Lifestyle recommendations focusing on circadian rhythm may be relevant for alleviating PMS.

Shiyori Takamine[1)], Mahiro Furubayashi[1)], Shushi Ishiguro[1)], Sayaka Uiji[1)], Hiroto Matsuyama[2)], Yumi Fukuda[3)], Hiroshi Kirihara[4)], Takeshi Morita[1)], Motoharu Takao[5)], Tomoko Wakamura[1)]
1) Kyoto University, Japan
2) Kyoto Koka University, Japan
3) The University of Kitakyushu, Japan
4) ELM Inc., Japan
5) Tokai University, Japan

Human pupil response to light flickering of different frequencies under the equivalent ipRGCs stimulus dose

Purpose: The purpose of this study was to investigate intrinsically photosensitive retinal ganglion cells (ipRGCs)-driven pupil response by light flickering at different frequencies in humans.Methods: Effects of three different frequencies (non-flickering, 100-Hz and 1000-Hz) of light were evaluated in the morning. The light source was white LED (illuminance 500 lx, melanopic ELR 0.9 mW/lm). The light was presented to the left eye, and the consensual pupil response was measured in the right eye. Pupillary recording was preceded by 5-minutes dark adaptation. The recording for 30-seconds before the light presentation was used as a baseline. The 10-seconds during light presentation and 80-seconds after the presentation were analyzed as light response and post-illumination pupil response (PIPR), respectively. The 6s PIPR (n=20) and the 30s PIPR(n=19) were calculated by % of baseline and statistically analyzed (one way ANOVA with repeated measures). This study was approved by the Kyoto University Graduate School and Faculty of Medicine, Ethics Committee. Result and Discussion: There was no effect of light frequencies on ipRGCs inputs to the human pupil control pathway. The previous study (Kozaki 2018, 2020) indicated that melatonin secretion is suppressed by prolonged nocturnal exposure of blue light flickering at 100-Hz, which has a strong stimulation effect on ipRGCs. However, diurnal white light exposure for a short time did not evoke such pupil responses in the present study.

Yui Matsuyama[1)], Kohei Mimori[2)], Shota Hosogai[3)], Yuki Motomura[4)]
1) Kyushu University, Japan
2) Industrial Design Course, Department of Design, School of Design, Kyushu University, Japan
3) Department of Kansei Studies, Graduate School of Integrated Frontier Sciences, Kyushu University, Japan
4) Department of Human Life Design and Science, Faculty of Design, Kyushu University

Selective Effects of Sleep on Emotional Habituation and Generalization

Sleep plays a crucial role in emotional processing and memory consolidation. In particular, REM sleep has been suggested by previous studies to play a role in emotional regulation. While most prior studies have focused on comparisons between negative and neutral emotions, few have investigated positive emotions.

This study examined whether sleep facilitates habituation to negative, neutral, and positive emotional stimuli, and whether these effects generalize to new but emotionally similar images. Twenty-four Kyushu University students were randomly assigned to either a sleep group (n = 12, 6 females; M = 22.92) or a wake group (n = 12, 5 females; M = 21.58). To promote REM sleep and sleep onset, participants were restricted to five hours of sleep and woke up earlier than usual on the day of the experiment. At 9:00 AM, they rated 90 emotional images across three valences. After a 1-2 hour nap or an equivalent period of wakefulness with a tangram task, they completed a post-test with 135 images, including 90 old and 45 novel but similar

images. Bayesian repeated-measures ANOVA focusing on negative arousal revealed strong evidence for a Time × Group interaction (BF= 10.386), indicating that emotional responses decreased following sleep. Notably, this habituation effect extended to novel images, suggesting that sleep facilitates emotional regulation that generalizes beyond repeated exposure. In contrast, effects for positive and neutral stimuli were smaller. These results suggest that sleep may support habituation and generalization of emotional responses, particularly in the context of negative emotions.

Sayaka Uiji[1)], Aya Chiba[2)], Shiyori Takamine[1)], Ryoutarou Yanagisawa[2)], Tomoko Wakamura[1)]
1) Human Health Sciences, Graduate School of Medicine, Kyoto University, Japan
2) Human Health Care, Global Research and Development, Kao Corporation, Japan

Lifestyle Factors Associated with Sleep Duration and Daytime Sleepiness in Japanese Elementary School Children: Focus on Japanese-Style Bathing

Japanese-style bathing (JSB), which involves soaking in a warm-water bathtub almost every evening, has been associated with improving sleep quality. This study aimed to identify lifestyle factors, including JSB, that are associated with sleep duration and daytime sleepiness in Japanese elementary school children. A web-based survey was conducted in November with 2,400 pairs of elementary school children and their parents living in Japan. The questionnaire collected data on demographic characteristics, chronotype, sleep duration, screen time after 5:00 p.m., and JSB-related habits such as the frequency and duration of bathtub soaking. Daytime sleepiness was assessed using the Pediatric Daytime Sleepiness Scale (PDSS), completed by the children; all other items were answered by the parents. After excluding cases involving sleep medication use or incomplete responses, the final sample consisted of 1,042 pairs. The mean sleep duration was 9 h 3 min (SD = 44 min), and the mean total PDSS score was 9.8 (SD = 5.4). Multiple regression analysis revealed that sleep duration was significantly associated with commuting time, frequency of caffeine intake after 5:00 p.m., screen time after 5:00 p.m., and the interval between evening bathing and bedtime on weekdays ($p < .05$). PDSS scores were significantly associated with commuting time, screen time after 5:00 p.m., social jetlag, and frequency of bathtub soaking. ($p < .05$). These findings suggest that the interval between evening bathing and bedtime may contribute to longer sleep duration, while the frequency of bathtub soaking may help reduce daytime sleepiness in children.

Yuki Ikeda[1)], Kyosuke Hanafusa[2)], Shinnosuke Hoshino[3)], Yuka Egashira[1)], Nagahide Takahashi[1)], Tomoaki Atomi[2)]
1) Department of Developmental Disorders, National Institute of Mental Health, National Center of Neurology and Psychiatry, Kodaira, Japan
2) Department of Physical Therapy, Faculty of Health Sciences, Kyorin University, Mitaka, Japan

3) Setagaya Orthopaedic Clinic, Setagaya, Tokyo, Japan;

Neural Activity During Foot Perception Varies with Visual Perspective: An EEG Study

Perception of one's own foot relies on the body schema, which is influenced by visual perspective. While many studies have examined hands or the whole body, little is known about how the feet are processed. This study investigated how different perspectives of foot stimuli affect brain activity through two experiments. In Experiment 1, event-related potentials (ERPs) were recorded while 39 right-handed university students performed a visual oddball task. Stimuli included images of a right foot from first-person and third-person perspectives, along with control symbols (upward/downward triangles). Each block assigned either the first- or third-person perspective images as targets. Results showed a significant interaction between images and perspective, a trend toward larger P300 amplitudes for first-person foot images compared to third-person ones, whereas symbolic images showed the opposite pattern. In Experiment 2, alpha band event-related desynchronization (aERD) was measured while 23 right-handed university students observed videos of right-foot dorsiflexion from both perspectives. Each video was shown 16 times per condition, and participants were instructed to engage in motor imagery during observation. A significant main effect of perspective was observed at central electrodes (C3, Cz, C4), with stronger aERD in the first-person condition ($p = .042$). At parietal sites, there were significant interactions between perspective and electrode location (ps $< .001$, $.002$), with stronger aERD for the first-person view at P3 and Pz ($p < .001$). These findings suggest that neural responses to foot observation are enhanced when the visual perspective aligns with the body schema, particularly in the first-person view.

Yuka Egashira[1)], Sayuri Hayashi[1, 2)], Shota Uono[1, 2)], Miki Takada[1, 3)], Masatoshi Ukezono[1, 4)], Yuki Ikeda[1)], Nagahide Takahashi[1)], Takashi Okada[1, 5)]

1) Department of Developmental Disorders, National Institute of Mental Health, National Center of Neurology and Psychiatry, Kodaira, Japan

2) Institute of Human Science, University of Tsukuba, Tsukuba, Japan

3) Frontier Medicine and Pharmacy, Graduate School of Medical and Pharmaceutical Sciences, Chiba, Japan

4) Department of Environmental Information, University of Human Environments, Matsuyama, Japan

5) Department of Psychiatry, Nara Medical University, Kashihara, Japan

Time Perception in Adults with ADHD, ASD, and ADHD+ASD Comorbidity

Time perception is altered by arousal and attention, and recent research suggests that individuals with attention-deficit/hyperactivity disorder (ADHD) may experience impairments in temporal processing, such as reduced accuracy in time reproduction and elevated discrimination thresholds. However, most evidence comes from studies in children, and the nature of time perception in adults with ADHD remains unclear,

particularly considering its high comorbidity with autism spectrum disorder (ASD). This study aimed to investigate and compare temporal processing in adults with ADHD, ASD, comorbid ADHD+ASD, and typically developing (TD) adults. Data were collected from 200 participants (50 per group, ages 18–48), who completed three time perception tasks: (1) time reproduction (reproducing a 5000 ms visual stimulus), (2) time discrimination (identifying the deviant tone among three auditory stimuli), and (3) a tapping task (synchronizing and continuing taps). Participants also completed assessments of sustained attention, inhibitory control, full-scale IQ, and working memory, to evaluate cognitive functions necessary for task performance independently of time perception. Results revealed no significant group differences in time reproduction or tapping stability. In the discrimination task, although overall accuracy did not differ significantly across groups, the ASD group outperformed the ADHD and comorbid groups under the most difficult discrimination condition. These findings suggest that ADHD exhibits a different temporal processing profile from ASD, and time perception deficits commonly observed in children with ADHD may be less prominent in certain aspects of temporal processing in adulthood. Nevertheless, difficulties in real-life temporal organization persist, warranting further study.

Yoshihito Tomita[1)], Kazuhiko Arima[2)], Takayuki Nishimura[3)], Koji Shigekuni[1)], Kunihiro Arimoto[1)], Hiromichi Tokoro[4)], Masakazu Kanetaka[4)], Satoshi Mizukami[2)], Ayuko Takatani[2)], Hiroki Nakashima[2)], Yosuke Kusano[5)], Yasuyo Abe[6)], Mitsuo Kanagae[7)], Kiyoshi Aoyagi[8)]

1) School of Rehabilitation, Department of Physical Therapy, Tokyo Professional University of Health Science, Tokyo, Japan

2) Department of Public Health, Nagasaki University Graduate School of Biomedical Sciences, Nagasaki, Japan

3) Faculty of Design, Kyushu University, Japan

4) Jujo-Kanetaka Orthopedic Clinic, Japan

5) Department of Nursing, Nishikyushu University, Ogi, Japan

6) Department of Health and Nutrition Science, Nishikyushu University, Kanzaki, Japan

7. Department of Rehabilitation, Nishi-Isahaya Hospital, Isahaya, Japan.

8. Department of Rehabilitation, Nishikyushu University, Kanzaki, Japan

Association between fear of falling and mental health among Japanese orthopedic outpatients

Introduction: Fear of falling (FOF) is a common psychological concern among older adults, often linked to anxiety, depression, and changes in physical function. FOF can develop after a fall or even in those who have never fallen, and it can significantly impact daily activities, quality of life, and mental health. This study aimed to investigate the association between fear of falling and mental health, quality of life among Japanese orthopedic outpatients. Methods: The participants included 105 people aged ≥40 years. All participants had sufficient cognitive function to complete

the questionnaire and were asked if they had any comorbidity (heart disease, lung disease, stroke, or diabetes mellitus). Body mass index (BMI) was calculated as weight divided by height squared (kg/m2). The Kessler Psychological Distress Scale (K6) was used to assess mental health. Quality of life was assessed using the Euro-QOL. The association between fear of falling and mental health, quality of life was assessed using logistic regression analysis, adjusting for age, sex, BMI, and comorbidity. Results: The prevalence of fear of falling was 74.8%. After adjustment for age, sex, BMI and comorbidity, fear of falling was significantly associated with anxiety and depression states of Euro-QOL and nervous and depressed of K6 among Japanese orthopedic outpatients. Conclusion: The prevalence of fear of falling was high and associated with poor mental health in orthopedic outpatients. This study suggested that people who are nervous or depressed may be more likely to have a fear of falling.

Megumi Shimura[1)], Yoshihiro Shimomura[1)]
1) Design Research Institute, Chiba University, Japan

Longitudinal Analysis of Muscle Activation Patterns During Repeated Motor Task Practice

Motor learning not only enhances task performance but also reshapes the spatiotemporal structure of muscle activity. Despite growing interest in motor adaptation, few studies have longitudinally quantified how individuals reorganize neuromuscular coordination. From a physiological anthropology perspective, such inter-individual differences in adaptive strategies represent a core facet of human flexibility. This study aimed to evaluate neuromuscular adaptation patterns during repeated execution of a four-finger button-press task resembling piano playing. Surface EMG signals were recorded from 10 upper limb muscles in 11 healthy adults over 30 learning sessions. Muscle activation patterns were normalized and quantified using information entropy, which reflects the spatial distribution of activity. Entropy values were z-scored and clustered across individuals. In addition, timing error and principal component analysis (PCA) of EMG patterns were assessed to evaluate task performance and coordination structure, respectively. Results revealed three entropy-based clusters with distinct temporal profiles, suggesting diverse adaptation strategies. Linear mixed-effects modeling (LMM) showed significant main and interaction effects of session and cluster on entropy ($p < .001$), whereas timing error improvements were consistent across clusters. PCA results were not statistically significant, though Cluster 3 showed marginal interaction trends. These findings suggest that while performance outcomes converge through learning, the underlying neuromuscular adaptation strategies differ across individuals. Entropy may serve as a valuable index of adaptive flexibility beyond task accuracy. This approach offers a novel framework for characterizing human motor variability and holds implications for personalized training, rehabilitation, and human-centered design.

Kentaro Nishiyama[1)], Kazuyuki Ogiso[2)], Ban Yamaguchi[1)], Atsuhiro Fukai[1)], Masato Tokui[1)]
1) Kyushu Kyoritsu University, Japan
2) Aoyama Gakuin University

Immediate Effects of Consecutive Rebound Jump Training with Calf Muscle Electromyostimulation on Jump Performance in Track and Field Jumpers

This study aimed to investigate the immediate effects of consecutive rebound jump (RJ) training combined with electromyostimulation (EMS) applied to the calf muscles on jump performance in collegiate track and field jumpers. Six male university-level athletes specializing in jumping events performed three sets of 10 RJs with EMS applied bilaterally to the calf muscles. The EMS intensity was adjusted to produce an ankle dorsiflexion torque equivalent to 5% of each participant's pre-measured maximum torque. Jump performance was evaluated before and after the intervention using squat jumps with (SJAS) and without (SJ) arm swing, as well as five consecutive RJs with (RJAS) and without (RJ) arm swing. Each test was conducted twice, and for RJ conditions, the RJ index (jump height [m] divided by ground contact time [s]) was calculated. Additionally, participants were surveyed regarding their subjective perception of jumping performance post-intervention. Statistical analysis revealed significant improvements in RJAS and RJ jump height, as well as in the RJ index for RJAS. No significant differences were observed in SJAS or SJ measures. Subjective responses indicated that participants "felt more rebound" and "jumped more easily" following RJ tasks, suggesting a perceptual change specific to rebound-type movements. These findings suggest that the application of EMS to the calf muscles during RJ training may acutely enhance jump performance, potentially through increased activation of muscle fibers, particularly those of the fast-twitch type.

Chikako Yoshino[1)], Yoshihiro Shimomura[1)]
1) Chiba University, Japan

Investigation by grasping classification according to the opposing ratio of the thumb and 4 fingers

Our purpose was to measure the gripping force coordination ability of healthy subjects and to examine the opposing ratio of the thumb and 4 fingers when grasping an object by gripping category. In this study, a pressure measurement system was used. We recruited 20 healthy adults (10 males and 10 females) with no history of hand problems. According to classification in previous research on grasping behavior (Kamakura, 1989, cf : Napier1956), they gripped three types of objects: power grip (PO), intermediate grip (M), and precision grip (PR). A pressure sensor was attached and while the object was being grasped and measurements were taken for 90 seconds. For each of the 4 products, PO (Hammer, ice pick, stapler, knitting stick), M (pencil, key, tablespoon, chopsticks), and PR (sake cup, tea caddy, bowl, handkerchief), the opposing ratio was calculated for each of the four objects, using the thumb as the numerator and sum of the 4 fingers as the denominator. The results of one-way

analysis of variance showed that, PO was significantly lower than M and PR. A higher opposing ratio indicates a higher involvement of the thumb. In PO, the involvement of the thumb was lower and the involvement of the 4 fingers was higher in grasping compared to M and PR. M and PR. PO maintains a grip by exerting force with 4 fingers rather than the thumb. In this study, the opposing ratio was calculated, making it possible to determine the opposing ratio between the thumb and the 4 fingers.

Xinxin Liu[1)], Hiroki Ikeda[1)], Yuki Nishimura[1)], Shun Matsumoto[1)], Tomohide Kubo[1)]
1) National Institute of Occupational Safety and Health, Japan.

Differences in cardiovascular responses during city and highway driving in a simulator

In Japan; about 150 people in the transportation industry are authorized as Karoshi (having died from overwork) each year due to overwork-related cerebrovascular/ cardiovascular diseases. According to the latest guidelines regarding drivers' work and rest hours, the maximum working hours should be within 13 hours on a workday, with a maximum continuous driving time of 4 hours or less. Drivers are recommended to take at least 30 minutes of break for every 4 hours of driving. The purpose of this study is to clarify the cardiovascular burden while driving and to establish an effective break time to reduce this burden. Because drivers often drive both in city areas and on highways, we compared cardiovascular responses during city and highway driving in a simulator. Twenty-four males in their 40s and 50s drove a simulator for 6 hours, with a 30-minute (n=12) or 60-minute (n=12) lunch break after 4 hours of driving. The participants alternated between 1 hour of city driving and 1 hour of highway driving. Cardiovascular responses were measured at the end of each hour of driving. The results of three-way ANOVAs and multiple comparisons showed that highway driving induced significantly greater blood pressure, cardiac and vascular responses than city driving. A 60-minute lunch break is more effective at moderating these responses than a 30-minute lunch break. These results suggest that drivers who spend long periods on highways, such as long-distance drivers, may suffer a greater cardiovascular burden during their shifts.

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