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### Standard cuff pressure in blood flow restriction training does not achieve sufficient blood flow restriction

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[Background] Blood Flow Restriction Training (BFRT), which involves performing low-load exercises under cuff-induced occlusion at the limb base, has recently standardized the cuff pressure setting to 40% of Resting Arterial Occlusion Pressure (RAOP). However, this standard may not achieve sufficient blood flow restriction. [Aims] To elucidate the dynamics of cuff pressure during exercise with the standard BFRT cuff pressure setting. [Methods] Six adult participants wore BFRT cuffs (3 cm width) on the upper arms. The cuffs were set at 40% RAOP, and participants performed arm curls at 20% of their one-repetition maximum (1RM). Cuff pressure was recorded during exercise. [Results] The average 40% RAOP was 76.6 mmHg, and the average load for 20% 1RM was 2.5 kg. The mean cuff pressure during exercise was 109 mmHg, with a maximum of 145.1 mmHg. The average resting diastolic cuff pressure with the BFRT cuff was 113.4 mmHg. In all cases, the mean exercise cuff pressure at the 40% RAOP setting was lower than the resting diastolic cuff pressure. [Conclusion] To achieve the specific exercise effects of BFRT, a cuff pressure higher than the diastolic cuff pressure is required. The standard cuff pressure setting may not result in sufficient blood flow restriction. Therefore, cuff pressure setting should consider not only RAOP but also diastolic cuff pressure.

**Keywords** : blood flow restriction, cuff pressure, arterial occlusion pressure

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### Effects of Inorganic Salt Bath Containing Hydrogenated Magnesium on Oxidative Stress

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**Introduction** In recent years, it has been reported that consuming hydrogen-rich water, which has an increased concentration of hydrogen molecules, can reduce oxidative stress. However, few studies have been conducted on the effects of bathing in hydrogen-rich water on oxidative stress. The purpose of this study was to investigate the effect of low concentration dissolved hydrogen baths, which can be achieved with bath additives, on oxidative stress. **Method** Six healthy men took 40-minute full-body baths (20 minutes bathing, 20 minutes resting) with either a magnesium hydride bath additive (experimental) or plain hot water (control) at 40°C. Sublingual temperature, deep thigh temperature and skin blood flow were measured during the bath. Markers of oxidative stress, including serum reactive oxygen metabolite concentrations (d-ROMs) and antioxidant power (BAP), were assessed before and after bathing. **Results** Although a tendency to retain body heat was observed after bathing with the bath additive, no significant main effects were found between the experimental and control conditions for d-ROMs before and after bathing (experimental condition:  $269.3 \pm 84.3$  vs.  $293.3 \pm 65.7$  U. CARR, control condition:  $321.2 \pm 57.7$  vs.  $279.7 \pm 80.7$  U. CARR). Likewise, no significant main effects were observed for BAP (experimental condition:  $3221.3 \pm 499.4$  vs.  $2725.3 \pm 881.3$   $\mu$ M, control condition:  $2984.0 \pm 1115.0$  vs.  $2860.7 \pm 978.4$   $\mu$ M). **Conclusion** A single bath with magnesium hydride bath additive with inorganic salts showed no significant effect in reducing oxidative stress in the blood.

**Keywords** : hydrogenated magnesium, physiology, bathing

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### Acoustic Grove System-associated environment suppresses sympathetic nervous system activity following cycling exercise

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[Background] Although the exposure to forest environment is considered to have a relaxing effect, the details for this effect remain unclear. [Aims] We investigated the effects of an environment with an Acoustic Grove System (AGS, Nihon Onkyo Engineering, Japan), which has acoustic characteristics similar to forest echoes, on sympathetic nervous system activity following exercise. [Methods] The protocol of this study was approved by the Research Integrity Committee, Toyohashi SOZO University (H2021009). All subjects gave written informed consent. Fifteen healthy adult males (20-30 yrs) participated in the study. All participants underwent 6 minutes of cycling exercise under 2 conditions: with or without AGS, with a 1-hour interval between trials. Maximum exercise intensity was set at ~80% of the estimated maximal heart rate within 6-minute exercise. Sympathetic nerve activity was evaluated by the ratio of the low- (LF) and high-frequency (HF) bands of the heart rate variability. [Results] Since six subjects were excluded from the post-exercise analyses due to unsuitable physical conditions, the LF/HF values of nine subjects were used for analyses. In seven of these nine subjects, the mean LF/HF during the first 4 minutes of chair-sitting rest after exercise with AGS was lower than without AGS. [Conclusion] The results indicate that the exposure to an AGS-installed environment has a relaxing effect on mental stress following physical exercise.

**Keywords** : acoustic grove system, autonomic nerves, exercise

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### Relationship between different mattress, lumbar back muscle activity, and autonomic function

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[Aims] To clarify the impact of different mattresses on motor and neurological functions, lumbar muscle activity and autonomic functions were compared in 16 healthy subjects lying on two mattresses: a common market type (Mattress A) and our custom-developed one (Mattress B). [Methods] Surface electromyography of the dorsal lumbar muscles and an autonomic function were recorded in 16 healthy subjects in the supine position on two types of mattresses: one generally available on the market (Mattress A) and another developed by our team (Mattress B). [Results] Results showed significantly lower lumbar muscle activity and a trend towards parasympathetic dominance on Mattress B. However, the study didn't account for mechanical effects, personal preferences, or body size. [Conclusions] This study demonstrated that the originally developed mattress significantly reduced lumbar muscle activity, suggesting improved relaxation and comfort. These findings indicate that our originally developed mattress could potentially alleviate lower back pain and enhance sleep quality. Based on the results of this study, it is expected that knowledge gained can help improve individual sleep quality and reduce complaints such as lower back pain and stress through the appropriate selection and development of bedding. Future research should further investigate the impact of mattress characteristics on sleep quality and autonomic function, taking into account individual differences and preferences.

**Keywords** : mattress, electromyography, autonomic function

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### Plasma brain-derived neurotrophic factor and thiobarbituric acid reactive substances in response to cognitive fatigue during aerobic exercise were not affected by flavanol-rich cocoa consumption

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[Aims] The purpose of the present study was to examine whether flavanol-rich cocoa consumption decreases circulating thiobarbituric acid reactive substances (TBARS) as a biomarker of oxidative stress and increases circulating brain-derived neurotrophic factor (BDNF), based on the findings of improving cognitive fatigue during aerobic exercise. [Methods] 18 young participants (aged  $22 \pm 2$  yrs and peak oxygen uptake [ $\dot{V}O_2$  peak]  $46 \pm 4$  ml/kg/min) performed two trials (high and low cocoa flavanol; HCF and LCF) in a randomized, double-blind crossover design. The prolonged cognitive activity during aerobic exercise protocol utilized a 50-min color-word Stroop task and a 50-min moderate-intensity cycling exercise (60%  $\dot{V}O_2$  peak). Plasma samples were collected before and after prolonged cognitive activity during aerobic exercise and used to determine TBARS and BDNF levels. [Results] Both TBARS and BDNF before and after prolonged cognitive activity during aerobic exercise were not significantly changed by HCF. [Conclusions] HCF-improved cognitive fatigue during exercise may not be associated with TBARS and BDNF.

**Keywords** : neurotrophin, antioxidant, cognition

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### Verifying the effectiveness of conditioning intervention to prevent industrial accidents among road service personnel

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The desire for health management is increasing due to the increase in the proportion of older workers and the number of work-related accidents. The purpose of this study was to verify the effectiveness of conditioning interventions to prevent work-related accidents in road service personnel. 15 men (age:  $46.8 \pm 8.1$  years, height:  $171.1 \pm 4.4$  cm, weight:  $69.2 \pm 11.6$  kg) who work as roadside assistance were interviewed by an orthopedic surgeon and measured body composition, body alignment, lower limb muscle tightness and isokinetic strength. The same measurements were taken again after a 3-month conditioning intervention, and the results were compared before and after the intervention. As a result, the number of patients who had a history of lower back injuries, including chronic lower back pain, decreased from 8 (53.3 %) to 2 (13.3 %) after the intervention. Comparing the results of each measurement between subjects with a history of lower back injury (LBI group) and those without (NS group), it was found that lower limb muscle tightness observed in LBI group before the intervention disappeared after, and isokinetic lower limb muscle strength significantly improved in all groups. In addition, the poor lumbar-pelvic rhythm during standing forward bending that was observed in the LBI group before the intervention almost disappeared after. In conclusion, it was thought that continuous conditioning for road service personnel that improves the flexibility and muscle strength of the lower limbs would lead to the prevention of their work-related accidents.

**Keywords** : health management, occupational accidents prevention, conditioning interventions

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### Effects of physical activity volume on sleep quality in children with neurodevelopmental disorders

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[Aims] This study aimed to clarify the association between sleep quality and physical activity (PA) levels in children with neurodevelopmental disorders (NDD), compared with that in children with typical development from a sleep disorder perspective. [Methods] This study included students enrolled in special-needs classes at elementary schools and students from another elementary school. Sleep quality was assessed using the "Children's Sleep Questionnaire for Elementary School Children." PA level, namely total duration of PA in a week, was calculated based on the frequency and duration of PA obtained from a parental questionnaire. The relation between sleep quality in children with NDD and quantity of PA was examined in Study A. Sleep quality between children with typical development and NDD was compared in Study B using the chi-squared test. [Results] Study A showed that the proportion of children with symptoms of "insomnia" was lower in the high PA level group than in the low PA level group. Study B showed that the proportions of children with symptoms of "insomnia" and "daytime behavior" were significantly higher in the NDD group than in the control group. [Conclusion] PA may play a role in reducing the risk of insomnia, which is often observed in children with NDD.

**Keywords** : neurodevelopmental disorder, sleep quality, physical activity volume

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### Differences in alcohol consumption due to transient drinking are effect on arterial stiffness

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[Aims] Increased alcohol consumption and arterial stiffness have been shown to be related to cardiovascular mortality, and it is important to drink moderately, within the amount of alcohol consumption that increases the risk of lifestyle-related diseases. In this study, we examined the effect of different amounts of alcohol consumption due to transient drinking on arterial stiffness. [Methods] We evaluated arterial function in alcoholic beverages in 10 healthy male adults using a randomized controlled trial. Brachial-ankle pulse wave velocity (baPWV), brachial artery systolic/diastolic blood pressure (SBP/DBP), and heart rate (HR) were measured before and after alcohol consumption in two trials: 135 mL of alcoholic beverage (135mL trial) and 350 mL (350mL trial). [Results] There were no significant differences in SBP, DBP, or HR before and after alcohol consumption. Compared to before drinking, baPWV was significantly lower in the 350 mL trial at 30 minutes after drinking, and there was a significant difference between the two trials at 60 minutes after drinking. [Conclusion] In young adult males, transient, but within the moderate drinking range, moderate alcohol consumption suggested that moderate alcohol consumption may reduce the increase in arterial stiffness.

**Keywords** : alcohol consumption, arterial stiffness, brachial-ankle-pulse wave velocity

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### Relationship between mental health and social support among community-dwelling older adults: An investigation from 2017 - 2023

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[Aim] Mental health is important for the fulfilling lives of community-dwelling older adults, and an influencing factor is social support (SS). The study aim was to clarify changes in the relationship between mental health and SS among community-dwelling older adults for the period 2017-2023. [Methods] We conducted a questionnaire survey targeting older adults living in the village near a large city in 2017 (n=1,125), 2020 (n=715), and 2023 (n=651). Participants were asked about their mental health using a 10-point scale, and SS items included relationships with family and friends, whether they had someone to talk to other than family and friends, etc. Based on the responses to each SS item, mental health was compared by survey year. [Results] In all survey years, mental health was significantly better among people who had family or friends to talk with or listen to their worries or complaints. In 2020 and 2023, it was significantly better among people who had met with friends in the past month. In 2023, it was significantly better among people who had someone to talk to other than family or friends. [Conclusions] Between 2017 and 2023, for the mental health of community-dwelling older adults, building SS networks which had their families and friends, and the entire community including local governments became increasingly important.

**Keywords** : mental health, social support, older adults

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### Verifying the effectiveness of intervention using matched gymnastics

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<sup>1</sup>Kao Corporation, <sup>2</sup>PCP Corporation

[Background and Purpose]

Basic movement tests are useful for discovering physical challenges. Examples include tests such as the Functional Movement Screen (FMS), but common issues include expertise and objectivity. Therefore, we conducted a study to discover movement issues using a gait monitoring system and proposed exercises matching the issues, and verified the effectiveness of the intervention.

[Methods]

Subjects performed exercises for one month (about 5 minutes a day) that were matched to the results of the gait monitoring system (Walk Coordinator, Kao Corporation). Pre- and post-measurements included longitudinal forward bending, hip joint range of motion, hip joint range of motion during walking (Walk Coordinator), and a questionnaire.

[Results]

The number of subjects analyzed was N=39 (21 males and 18 females) with a mean age of 46.9 years. After the intervention, the distance of longitudinal forward bending, hip angle (flexion, internal/external rotation ROM, and internal/external rotation ROM), and sagittal ROM during walking increased significantly.

[Discussion and Conclusion]

The results suggest that the matched exercises may have an effect on the body.

**Keywords** : monitoring, flexibility, range of motion

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### Association between physical activity and glucose tolerance in Japanese young adult women using the doubly labelled water method

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[Aims] This study investigated the association between physical activity (PA) and glucose tolerance and confirmed the current PA level (PAL) values in Japanese young adult women.

[Methods] 32 healthy young adult women were evaluated in terms of PAL using the doubly labelled water method. The daily PA measured using an accelerometer. A 75-g oral glucose tolerance test was performed.

[Results] The average PAL ( $1.58 \pm 0.16$ ) was not significantly different from the result of a previous study. Partial correlation analysis, adjusted for age, sleeping time, and some variables related to body composition, revealed that the muscle insulin sensitivity index was negatively associated with % of sedentary behaviour and positively associated with step counts.

[Conclusions] The results indicated comparable current PAL in healthy young adult women with no exercise habits to that of 20 years ago. Moreover, the importance of daily PA to maintain favourable glucose tolerance was indicated.

**Keyword** : DLW

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### Transient change in the cardio-ankle vascular index by mini-trampoline exercise: Differences by age groups

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[Background] Various improvements in health is reported with mini-trampoline exercise. However, its effect on arteriosclerosis has not yet been examined. [Objective] We aimed to compare the transient change in the arteriosclerosis index after mini-trampoline exercise between young and middle-aged women. [Methods] The participants were 31 women without medication, including 22 women aged <40 years (young group), and nine women aged ≥40 years (middle-aged group). Cardio-ankle vascular index (CAVI), an arteriosclerosis index, was measured at rest and 5 min after exercise. The results were analyzed by two factorial analysis of variance and paired t-test. The mini-trampoline exercise was performed for 20 min with music at 118-130 beats/min. [Results] There was no significant interaction in CAVI before and after the exercise; however, significant main effects were detected for temporal and age group factors. The mean CAVI value significantly decreased after exercise ( $6.2 \pm 0.8$  vs  $5.7 \pm 1.0$ ,  $p < 0.01$ ) in the young group, whereas no significant change was observed in the middle-aged group ( $7.3 \pm 0.9$  vs  $7.2 \pm 0.6$ ). [Conclusion] The study demonstrated that CAVI significantly decreases transiently by mini-trampoline exercise in young women, but show no changes in middle-aged women.

**Keywords** : CAVI, arteriosclerosis, mini-trampoline exercise



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### Examination of factors related to the prevalence of shoulder stiffness stiff shoulders in Japanese: An ecological study

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[Aims] To exploratively analyze factors associated with reported shoulder stiffness separately for men and women. [Methods] This study is an ecological study at the prefectural level. The prevalence of reported shoulder stiffness in 47 prefectures was calculated from the number of reported cases in the 2022 Comprehensive Survey of Living Conditions and the population of each prefecture, and used as the dependent variable. Demographic characteristics and lifestyle-related items were collected from public data as independent variables. Statistical analysis was performed using stepwise multiple regression analysis separately for men and women. [Results] The prevalence of shoulder stiffness was 5.3% in men and 10.3% in women, with women being significantly higher. Multiple regression analysis showed that for men, life expectancy, married rate, and agricultural/forestry/fishery workers rate were positively associated, average residential altitude was negatively associated. For women, latitude, life expectancy, prevalence of general fatigue, vegetable intake, and number of treatment facilities per 100,000 persons were positively associated, married rate, habitual drinking rate, working hours, and the proportion of people who try not to accumulate stress were negatively associated. [Conclusions] This study found gender differences in factors associated with reported shoulder stiffness among Japanese people. Further verification is needed to determine whether similar results can be obtained at the individual level.

**Keywords** : shoulder stiffness, musculoskeletal pain, Comprehensive Survey of Living Conditions

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### Relationship between different physical activity patterns and gut microbiota

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**Aim:** This study aimed to investigate the relationship between physical activity patterns and gut microbiota. **Methods:** A total of 890 adults (468 women and 422 men) aged 20 years or older (52.4 ± 15.4 years) were included in this study. Participants were asked to wear a triaxial accelerometer to assess their physical activity patterns. They were divided into three groups based on the time of day at which they were physically active: morning (06:00-12:00), afternoon (12:00-18:00), and night (18:00-24:00). Participants were also divided into groups based on the number of steps taken and moderate-to-vigorous physical activity (MVPA) performed. Associations between different physical activity patterns and gut microbiota were examined at the genus level. **Results:** Both the step count and MVPA showed that alpha and beta diversity varied with physical activity patterns ( $P < 0.05$ ,  $P < 0.01$ ). The morning group had a significantly higher relative abundance of genus *Agathobacter* than did the afternoon ( $P < 0.01$ ,  $P < 0.001$ ) and night ( $P < 0.05$ ,  $P < 0.001$ ) groups. In contrast, the relative abundance of genus *Fusobacterium* was higher in the afternoon group than in the morning and night groups. **Conclusions:** The results suggest that the effects of morning physical activity on gut microbiota may differ from those of afternoon and night physical activity.

**Keywords** : physical activity patterns, gut microbiota, genus level

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### Comparison of bone density of freshman in Faculty of sports by high school extracurricular activities

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[Aims] This study aimed to compare the calcaneal bone density (BD) values among freshman students in a sports university, categorized by the type of sports they were involved in during high school. [Methods] Freshman students enrolled in the sports faculty in 2023 were surveyed for their high school sports activities. Bone density was determined using an ultrasound bone densitometer, recording the Speed of Sound (SOS) while the subjects were seated. Subjects were grouped according to the characteristics of the sports, and SOS measurements were compared. Groups were classified based on impact categories, and further divided by specific sports groups. Differences among groups were analyzed using one-way ANOVA, with post-hoc testing performed using the Bonferroni method. [Results] Bone density measurements were conducted for 274 participants. Of these, 240 who provided responses about their high school sports activities were analyzed. The results showed that the high-impact and multidirectional group had higher SOS values compared to non-impact groups. Additionally, the short sprint, jump and gymnastic groups showed higher SOS values than the swimming group. [Conclusions] It was evident that aquatic exercises like swimming resulted in lower bone density compared to groups performing running and jumping activities. It is suggested that sustained load-bearing stimuli from moderate high-impact movements are necessary to increase BD.

**Keywords** : bone density, high-impact, sports

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### Physical fitness, physical activity and psychological well-being of first-year university students: differences in participation in extracurricular sports activities

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[Purpose] The present study aimed to determine whether physical fitness, physical activity and psychological well-being differ depending on whether first-year university students participate in extracurricular sports activities (ESA) or not.

[Methods] Comparisons were made between two groups of first-year university students: 37 students who participated in ESA (participants) and 37 students who did not participate in ESA (non-participants). Physical fitness was evaluated by measuring grip strength (GS), sit and reach (SR) and maximum oxygen uptake ( $\dot{V}O_{2max}$ ). Physical activity was assessed using the Japanese version of the short form of the International Physical Activity Questionnaire (IPAQ). Psychological well-being was assessed using the Kessler 6-item Psychological Distress Scale (K6). Data are presented as means (95% confidence intervals).

[Results] Physical fitness was significantly higher in participants than in non-participants in all three categories. Physical activity was 5934 (5114-6854) METs min/kg in participants and 856 (530-1226) METs min/kg in non-participants, with participants significantly higher than non-participants. K6 scores were 2.8 (1.9-4.0) in participants and 5.4 (4.1-6.6) in non-participants, with participants significantly better than non-participants.

[Conclusion] Participation in ESA in the first year of university promotes physical fitness and physical activity levels and contributes to the maintenance of psychological well-being.

**Keywords** : first-year university students, extracurricular sports activities

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**A novel case study to evaluate gait in three steps**Ken Yamauchi<sup>1</sup>, Susumu Hashiguchi<sup>1</sup>, Tsutomu Ichikawa<sup>2</sup>, Takashi Miyahira<sup>3</sup>, Hironori Yoshida<sup>4</sup>, Naoki Obayashi<sup>5</sup><sup>1</sup>Institute of Physical Education, Keio University, <sup>2</sup>Matsuyama Shionome Junior College, <sup>3</sup>Chikushi Jogakuen University, <sup>4</sup>Ashikaga University, <sup>5</sup>Color Chips Co.,Ltd.

The method of evaluating gait in a 5m section is widely used in medical and welfare settings. However, it cannot be denied that this method is harsh for people with walking difficulties. The purpose of this study is a pilot study to pursue a universal measurement design for gait evaluation for people with walking difficulties. Elderly people attempted comfortable walking from their walking intention. The first three steps from the start of walking were defined as the initial stage, and the subsequent stable stage was defined as the stable stage. Gait was extracted using a monocular measurement method. Other measurement items were TUG and health-related physical fitness (HRPF). Features were analyzed using t-tests and correlation. Stride length and speed in the stable stage showed a significant increase and correlation compared to the initial stage. Initial stride length and speed were correlated with HRPF, and initial speed was also correlated with TUG. These phenomena suggest the possibility of predicting walking ability in three steps from walking intention. Among them, the case where the initial gait and HRPF were correlated was interesting, and since gait can be evaluated with only three steps, it leads to universal design, including consideration for reducing the physical burden on clients. Therefore, this study is expected to play a role in evaluating gait improvement and become a hot topic in the field of physical therapy as a novel exercise prescription.

**Keywords** : gait, health-related physical fitness, development

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**Effects of voluntary exercise on physiological indexes, brain monoamines and emotional behavior during pair rearing in rats**Takayuki Ishiwata<sup>1</sup>, Daisuke Matsunaga<sup>2</sup>, Akihiro Takekawa<sup>1</sup>, Hikaru Nakagawa<sup>1</sup><sup>1</sup>Rikkyo University, <sup>2</sup>Osaka Electro-Communication University

[Aims] Many previous studies in rodents and humans have reported the physical and mental benefits of exercise. However, most studies in rodents have been conducted in isolation, and there have been no studies examining the effects of exercise in groups (pair-rearing). The purpose of this study was to clarify the effects of voluntary exercise on physiological indices, brain monoamine, anxiety-like behavior, and social behavior in rats during pair-rearing. [Methods] Male Wistar rats (6 weeks old) were divided into pairs and kept in normal cages or voluntary exercise cages for one month at an ambient temperature of 23°C with a 12h:12h light:dark cycle and free intake of food and water. Before the start of the experiment, all rats underwent intraperitoneal implantation of a device (Nanotag®) to measure core body temperature and locomotor activity. 1 month later, emotional behaviors were measured (open field test, social interaction test). The monoamines (serotonin, dopamine, and noradrenaline) in the brain were measured by a homogenization and HPLC method. [Results] The results of body weight and brain monoamine showed that voluntary exercise in paired rearing had a positive effect, but the results of core body temperature and emotional behavior showed that it may increase mental stress. [Conclusions] Adding an exercise component to group rearing of rats may cause unnecessary stress, and more appropriate rearing methods need to be considered in order to validate the effects of voluntary exercise.

**Keywords** : voluntary exercise, group rearing, monoamine

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**Observation of the temperature inside the hat and the intensity of ultraviolet rays in an outdoor environment in early summer : Pilot study of design development for social implementation of new children's hats**Tetsuro Kita<sup>1</sup><sup>1</sup>Musashino Art University

[Background] According to a report by JAPAN SPORT COUNCIL (2014), heatstroke incidences during physical education classes in elementary schools are 4-9 times higher than in junior high schools and high schools (es26.2%, jhs6.5, hs3.5). This study developed and examined anti-heatstroke hats for social implementation. [Aims] Based on the presenters' earlier works, the study prepared nine types of hats with different colors, materials, and designs to observe differences in their temperatures and UV intensity. [Methods] 12 May 2024, from 10am to 12 at a ground covered with artificial turf, the study measured the surface temperatures with thermography with 15 minutes' intervals, while measuring the internal temperatures of the hats and UV intensity every 10 seconds. The observation site on the day marked 25.7 in temperature and 21.6 in WBGT at the maximum. [Results] Internal temperatures of the cotton-polyester hats were as follows: white body / red visor (mean25.1, max27.9); yellow (25.5, 28.2); red (27.9, 32.2); pink (25.8, 29.3); red body / white mesh cover (25.6, 28.4); pink body / red stripes (26.1, 29.4); pink with holes (25.3, 28.2); pink with holes and white mesh inner lining (25.2, 28.2); and 100% polyester pink mesh (26.7, 30.4). As for internal UV, only 100% polyester pink mesh hat was observed with UV transmission. The red hat marked the highest surface temperature. [Conclusions] A hat with a new design with either red or pink visor may be useful. The study is planning further observations during extreme heat or while being in use.

**Keywords** : children's hats, heatstroke, anti-heatstroke hats for social implementation

344.

**The relationship between Grit and physical activity among university students**Naoyuki Kurokawa<sup>1</sup>, Mizuki Sakurai<sup>1</sup>, Shohei Iwabuchi<sup>1</sup>, Shiho Kobashi<sup>1</sup><sup>1</sup>Miyagi University of Education

[Aims] Grit, a combination of 'passion' and 'perseverance' towards long-term goals, is a key factor in personal self-realisation and happy life. It has also been linked to lifestyle habits. Our study set out to determine the current state of grit among university students and to clarify its relationship with physical activity, a significant lifestyle habit. [Methods] Our study focused on 1st-year to 4th-year university students. We employed a comprehensive questionnaire that included the Japanese version of the grit scale, a daily life questionnaire. The participants willingly consented to the survey, and we conducted a rigorous statistical analysis using JMP Pro 17, with a significance level set at 5%. [Results] Questionnaires were collected from 554 students. The mean grit score was 3.09. Multiple regression analysis confirmed a significant relationship between Grit scores and class attendance, living situation, Grit Grid from high school, and total physical activity. [Conclusions] The study's results significantly impact understanding and enhancing grit among university students. The observed relationship between grit and class attendance suggests that efforts to improve grit could focus on promoting perseverance and self-control in academic settings. The association between physical activity and grit score implies that motivation could influence non-cognitive abilities, opening new avenues for enhancing grit. These practical applications of our findings can empower and motivate educators, policymakers, and researchers in their efforts to enhance student well-being and academic performance.

**Keywords** : grit, life style, physical activity

345.

**Relationship between psychological state and handgrip strength in healthy adults**Yuma Yamashita<sup>1</sup>, Yukiya Tanoue<sup>1</sup>, Akari Horita<sup>1,2</sup>, Miu Abe<sup>1</sup>, Kaito Ebisawa<sup>1</sup>, Takashi Murakami<sup>3</sup>, Yasushi Shinohara<sup>1</sup>, Motoyuki Iemitsu<sup>1</sup>, Haruka Murakami<sup>1</sup><sup>1</sup>Ritsumeikan University, <sup>2</sup>Fukuoka University, <sup>3</sup>Kyoto Prefectural University of Medicine

[Aims] While handgrip strength has shown potential as an objective index of the psychological state, most existing studies have been conducted on patients with mental illness. The association between short-term psychological state and handgrip strength in healthy adults remains largely unexplored. This study aimed to elucidate the relationship between short-term psychological state and handgrip strength. [Methods] Thirty-six adults participated in the study. The participants were assessed for handgrip strength once a week, while their psychological state was assessed daily each morning using a questionnaire over an eight-week period. Handgrip strength was assessed six times at maximal strength. Additionally, the average psychological state scores were calculated for each of the two to six days preceding handgrip strength measurement, and their relationship with handgrip strength was assessed using a linear mixed model. [Result] Negative correlations were observed between handgrip strength and average fear score ( $\beta = -2.43$ ,  $p < 0.05$ ) or average sadness ( $\beta = -1.70$ ) over the five-day period. Furthermore, negative correlations were observed between handgrip strength and the average fear score over 3, 4, 5, and 6 days (6 days  $\beta = -4.02$ ), and the average high tension score over a six-day period ( $\beta = -1.83$ ). [Conclusion] This study suggests that negative psychological states sustained over several days may lead to decreased handgrip strength in healthy adults.

**Keywords** : handgrip strength, psychological state, day-to-day fluctuation

347.

**DX Training approach for Para-ski (Nordic) athletes**Hiroshi Shinohara<sup>1,5</sup>, Junpei Sasadai<sup>2</sup>, Yuha Watase<sup>3</sup>, Yasuyuki Umezaki<sup>1</sup>, Daichi Kawamura<sup>1,5</sup>, Riku Sugawara<sup>4</sup>, Hikaru Suzuki<sup>1</sup>, Takashi Komatsu<sup>5</sup><sup>1</sup>Dept. Phys. Ther., Aomori University of Health and Welfare, Aomori, Japan, <sup>2</sup>Janan Institute of Sports Sciences, <sup>3</sup>Japan Para-Ski Federation, <sup>4</sup>Aomori Prefectural Institute for Sports Sciences, <sup>5</sup>Komatsu Seikei-Geka Sport Clinic

Digital Transformation (DX) is a concept proposed by Eric Stolterman in 2004, in which the penetration of IT changes lives for the better. In recent years, training support utilizing DX (hereafter referred to as "DX training") has been attracting attention, and its usefulness in para-sport is expected to increase. The purpose of this presentation is to examine the approach and effectiveness of DX training in para-sports. The subjects were Para-Nordic athletes belonging to the Japan Ski Federation for the Disabled. The training was delivered for four days during a two-month period and was conducted at their own homes and training camps. The content was core muscle training such as crunches and planks, which were performed for about 45 minutes per session. The evaluation items were: the standing athletes' foot forward reach distance and vertical jump distance in the standing position, hip abduction angle while maintaining vertical trunk in the standing position, and the sit athletes' lateral reach distance and left-right arm swing speed in the seated position. As a result, there were no significant differences in outcomes before and after DX training for both standing and sit athletes, suggesting that there may be challenges in communicating DX training, including whether or not it is feasible for some athletes to perform, when it is implemented for para-sport competitions.

**Keywords** : DX training, Para-ski, core muscle training

346.

**Effects on posture and respiratory function when wearing a rib flare prevention supporter**Gou Hayata<sup>1</sup>, Michio Ito<sup>1</sup><sup>1</sup>Dept. Physical Education., International Pacific University, Okayama, Japan

[Background] Rib flare is a condition in which the lower ribs are raised and the area below the ribs opens outward. This is related to poor posture called swayback, which is caused by excessive tension in the posterior trunk muscles. As a countermeasure, a rib flare supporter that compresses the underbust has been developed. However, the effects of wearing the supporter on posture and respiratory function are unclear. [Aims] The objective of this study was to clarify the effects of wearing a rib flare supporter on posture and respiratory function. [Methods] The subjects were eight healthy female university students. Posture was measured by calculating the sway angle from images taken with a posture measuring device, and the center of gravity was measured by weighted balance measurement. Respiratory function was measured at rest and during exercise using a pulmonary exercise load monitoring system. [Results] As a result of wearing the supporter, the sway angle tended to bend backward, and the center of gravity was significantly shifted backward. Although there was no significant difference in ventilation volume at rest, it was significantly higher when wearing the support when walking at 3km/h, and no significant difference was observed when walking at 5km/h. [Discussion] By wearing the support, posture was corrected by the swayback, and the center of gravity was shifted backward. Respiratory function affected ventilation volume at low intensity, but no significant difference was observed in oxygen intake, suggesting that the effect during exercise is minimal.

**Keywords** : rib flare, supporter, effects on posture and respiratory

348.

**Effect of 8 weeks of unsupervised high-intensity interval training on exercise adherence in young healthy adults with no exercise habits**Yuto Nakayama<sup>1</sup>, Kumiko Ono<sup>1</sup>, Akira Ishikawa<sup>1</sup><sup>1</sup>Kobe University Graduate School of Health Sciences, Hyogo, Japan

Background: In Japan, the number one reason for not engaging in regular physical activity is "busy with work and household chores" (nearly 40%), and lack of time is the most significant barrier to developing an exercise habit. In this study, we focused on high-intensity interval training (HIIT) as a time-efficient exercise. Objective: To compare the rates of unmonitored HIIT and running exercise during an 8-week period. Methods: The subjects were 30 healthy young adults (20 males) with no exercise habits and low to moderate physical activity on the IPAQ Short version. After a 2-week preintervention period, subjects were randomly divided into three groups: Group H, which performed HIIT three times a week for 8 weeks without supervision; Group M, which performed running; and Group C, which did not change its lifestyle. 2-week postintervention measurements were taken after the 8-week intervention period. The main outcome was the rate of exercise implementation, which was objectively measured by a triaxial accelerometer, and the sub outcomes were body weight, muscle mass, body fat percentage, blood pressure, maximal oxygen uptake, fasting blood glucose level, and change in blood glucose level after glucose intolerance. Results: The exercise uptake rate was significantly higher in group H ( $77.1 \pm 24.1\%$ ) than in group M ( $32.1 \pm 21.2\%$ ) ( $p < 0.001$ ). However, there were no significant differences in any of the sub outcomes. Conclusion: Eight weeks of unmonitored HIIT resulted in significantly higher exercise uptake compared to similar running.

**Keywords** : high intensity interval training, exercise adherence, unsupervised exercise



349.

### Post-enrolment changes in female students' eating habits

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In recent years, nutritional intakes of young women has very poor nutrition due to unnecessary dietary restrictions caused by desire to lose weight. In addition, young women of 18-19 year olds are likely to change their lifestyle habits due to their higher education and employment, and it is expected that their lifestyle habits, including their eating habits, will deteriorate, especially for students who start living alone. Under these circumstances, it is essential to understand the current eating habits of young women in order to provide guidance on eating habits and lifestyle. The aim of this study was to clarify the eating habits of female college students using a briefed self-administered dietary history questionnaire (BDHQ) and to obtain research results that can be used to guide students. The BDHQ questionnaire was compiled in Excel and used for analysis. The subjects in this study had a low intake of calories and vegetables compared to the standard intake. The results also showed that the overall caloric intake of the students decreased before and after enrolling in school, while the intake of fat increased after enrolling in school. These results suggest that the amount of food consumed by students has decreased in recent years due to an desire to lose weight. The fact that lipid intake has increased while total intake has decreased suggests that energy intake is skewed towards lipids. The policy of dietary guidance for students in the future should basically be to increase energy intake, but at the same time it is also necessary to control lipid intake.

**Keywords** : female students, eating habits, post-enrolment

351.

### Development of a method for estimating the risk of heat stroke in junior high school students using 20-m shuttle run

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<sup>1</sup>Joetsu Univ. Educ. Grad. Sch. Educ., Niigata, Japan

[Aims] This study investigated the potential utility of the 20-meter shuttle run test results in estimating the risk of infirmity visits attributed to heat stroke.

[Methods] Data from 315 male and 260 female students in one junior high school district in Niigata Prefecture from April 7, 2011, to December 13, 2023, were included in the analysis. Data from 1,973 infirmity visits during the period covered, 20-meter shuttle run records, and mean daily temperature data from the Automated Meteorological Data Acquisition System (AMeDAS) in the target area were analyzed.

[Results] Compared with March, when students were most likely to be thermally unacclimated, the frequency of infirmity visits exhibited a significant increase in July and August for females and in July for males. In addition, the physical fitness levels of female visitors from May to July tended to be lower than those of the non-visitors. However, this tendency was not observed in males. Furthermore, ANOVA revealed that the daily mean temperature and its interaction with the 20-m shuttle run performance potentially influenced the frequency of infirmity visits among females. For males, only the daily mean temperature was a potential factor.

[Conclusions] The findings suggest that the 20-m shuttle run performance could be utilized to estimate the risk of infirmity visits due to heat stroke among female junior high school students.

**Keywords** : heat stroke, 20-m shuttle run, junior high school students

350.

### The effects of acute Ishizuchi dark tea consumption on arterial stiffness after hyperglycemia in middle-aged individuals

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<sup>1</sup>Osaka Institute of Technology, <sup>2</sup>National Institute of Advanced Industrial Science and Technology

[Aims] Ishizuchi dark tea is a legendary tea traditionally produced in Saijo Ehime, and is one of only four post-fermented teas in Japan. Generally, the postprandial hyperglycemia is known to increase both blood glucose levels and brachial-ankle pulse wave velocity (baPWV), as an index of arterial stiffness. This study thus aims to investigate the effect of acute consumption of Ishizuchi black tea on arterial stiffness during hyperglycemia in middle-aged individuals. [Methods] Eight healthy middle-aged males and females participated in three trials in random order on separate days; 1) Control hot water intake condition (C), 2) Green tea intake condition (G), and 3) Ishizuchi dark tea intake condition (IK). After 30 minutes of rest, they firstly consumed 200 mL of one of three beverages and then consumed 250 mL of 75 g glucose solution. Blood glucose levels and baPWV were measured at baseline and 30 and 60 minutes after the consumption. [Results] Blood glucose levels significantly increased 30 and 60 minutes after hyperglycemia in all three conditions. While baPWV significantly increased in the C and G conditions, no significant increase was observed in the IK condition. [Conclusions] These findings suggest that acute consumption of Ishizuchi dark tea in middle-aged individuals may suppress the increase in arterial stiffness after hyperglycemia.

**Keywords** : post-fermented tea, postprandial, pulse wave velocity

352.

### Body fat percentage in young women is associated with equol production ability

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[Background] Equol (EQ) has estrogen-like effects and plays an important role in women's health. Recently, the EQ production capacity of young Japanese women has decreased. However, the reasons for this decrease remain unclear.

[Purpose] To clarify factors related to the EQ production capacity of young women.

[Methods] Of 395 female university students (20.0±1.1 years old), 273 were included in the final analysis because they had no deficiencies in any of the measurement items and were not taking any hormonal medication. Body composition was measured using a multi-frequency body composition analyzer MC-780A-N (Tanita) based on the bioelectrical impedance method. EQ production was measured using SoyCheck (Healthcare Systems). Logistic regression analysis was performed using EQ production as the objective variable and soybean intake, body mass index (BMI), and body fat percentage as the explanatory variables.

[Results] The low body fat percentage group showed a significant negative association with EQ productivity ( $B = -0.835$ ,  $p < 0.05$ ). In contrast, the high group showed no significant association with the medium group. Additionally, soy intake and BMI were not significantly associated with EQ production capacity.

[Conclusion] Body fat percentage was more related to EQ production capacity in young women than soy intake and BMI. A low body fat percentage was associated with decreased EQ production.

**Keywords** : women's health, life course, equol production

353.

### The necessity of athlete medical examinations - Study on female athletes at high schools in Saga Prefecture -

Naoko Shono<sup>1,2</sup>, Noriko Horita<sup>1</sup>, Michihiko Otonari<sup>2</sup>, Atsushi Kurihara<sup>1</sup>

<sup>1</sup>Nishikyushu University, Kanzaki City, Japan, <sup>2</sup>Institute of Lifestyle Medical Science, Saga City, Japan

[Aims] High school athletes are prone to relative energy deficiency, but they have few opportunities to undergo blood tests at medical institutions unless they have obvious symptoms. [Methods] Athlete health checkups have been conducted regularly since 2023 as a model project in Saga Prefecture. In this study, the results of the initial blood tests of 94 female high school track and field athletes (36 long-distance and 58 sprinters) were examined. [Results] Thirteen athletes (11 long-distance and 2 sprinters) were receiving oral medication for anemia, and 14 athletes (4 long-distance and 10 sprinters) were under observation for fatigue fractures or shin splints. Seven athletes had obvious anemia (Hb less than 12), regardless of whether they had been treated, and 45 athletes (48%) had latent iron deficiency (ferritin: less than Ferr20 and Hb 12 or more). Twenty six athletes had high CPK (over 250), 5 had high LDH (over 250), 45 had low haptoglobin (less than 50), and 21 had low cholinesterase (less than 250), and many of the athletes were suspected to have muscle fatigue, hemolysis, or energy deficiency. [Conclusions] Ferr values in untreated anemia tended to be low in first-year students and sprinters, and overall fatigue accumulation and energy deficiency were suspected, so early detection through blood tests was considered to be necessary.

**Keywords** : female, high school athletes, medical examination

355.

### Validity of wrist-worn heart rate monitor for monitoring moderate-to-vigorous physical activity

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[Aims] WHO recommends 150-300 minutes per week of moderate-to-vigorous physical activity (MVPA) for health. The development of wearable devices has made it possible to measure heart rate at all times. However, the predictive performance of the wrist-worn device on MVPA is still unknown. The purpose of this study was to investigate the predictive performance of %HRR measured by Fitbit Luxe for MVPA. [Methods] Study 1: Twenty-one healthy adults (22.9±3.4 years old) performed resting sitting, typing, reading, stretching, standing with weights, walking, bicycling, and running in this order. HR was measured by Fitbit Luxe, and %HRR was calculated. Oxygen uptake was measured by expiratory gas analyzer. Study 2: Forty-one healthy adults (22.4±4.0 years old) participated in this study. Participants wore the Fitbit Luxe and GT3X-BT+ for 4 days. HR and acceleration values were measured during daily activities. The cut-point of %HRR for MVPA was calculated in study 1. The cut-point of acceleration value for MVPA was Freedson adult VM3. [Results] Receiver operator characteristic analyses resulted in area under the curve values of %HRR 0.940 for MVPA. The cut-points of %HRR for MVPA was 16.5% in study 1. The mean absolute percent error between the cut-points of %HRR and acceleration was 536.3 % in study 2. [Conclusion] %HRR calculated by Fitbit Luxe has a very high MVPA prediction performance. However, the implementation of this method in daily life requires further consideration.

**Keywords** : mvpa, %hrr, cut-points

354.

### Changes in daily physical activity of the elderly in micro activity time

Mieko Shimada<sup>1</sup>, Taro Okamura<sup>1</sup>, Yuya Narita<sup>1</sup>, Masahiro Edo<sup>1</sup>, Minako Kudo<sup>1</sup>, Makoto Arakawa<sup>1</sup>, Mizuho Sasaki<sup>1</sup>, Chisa Matsuki<sup>1</sup>, Michiyo Asai<sup>1</sup>, Jun Kaneko<sup>2</sup>, Mai Kono<sup>2</sup>

<sup>1</sup>Chiba Prefectural Univ. of Health Sciences, Chiba, Japan., <sup>2</sup>Meikai Univ.

**Purpose:** The study aimed to quantify the changes in physical activity of the elderly residing in Japan before and after the state of emergency during the COVID-19 pandemic.

**Method:** Twenty-six participants who have continued to participate in the exercise class during the pandemic. This exercise class has been held twice a month. Every day, the participants wore an electronic pedometer (Kenz Lifecoder-Gs). Four phases were analyzed. Phase1: Before the emergency declaration, Phase 2: All classroom education was canceled, Phase 3: Classroom education resumed, Phase 4: All classroom education canceled again. The differences among the groups were examined by repeated measures one-way ANOVA.

**Results:** Eighteen participants (9 males, average age 76.3±3.4 years) completed the survey. The average number of daily walking steps were no significant differences during any of these four Phases. Total minutes of the 0 intensity were 836 ±187, 850±205, 834 ± 196, 889 ± 189 minutes / day. The total minutes of micro activity level (sedentary, inactivity) were 524 ± 191, 508 ± 207, 528 ± 199, 470 ±170 minutes / day. There were significant differences on the Phases (p = 0.01, p <0.0001, respectively).

**Discussion:** Health-conscious elderly people attending exercise classes continued to walk as a form of physical activity even under a state of emergency during the pandemic. When the exercise class was not held, the 0 activity minutes increased, suggesting the need for guidance to reduce the sitting time.

**Keywords** : elderly, physical activity, micro activity time

356.

### Effect of 10 weeks of additional regular exercise or dietary/nutritional guidance on skin AGEs levels in young women

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[Aims] This study experimentally examined whether habitual exercises or additional dietary and nutritional guidance could reduce skin Advanced glycation end products (AGEs) levels in young women. [Methods] Healthy young women average age: 20±1 years were divided into an exercise (Ex) group and a dietary/nutritional guidance (Nu) group. The Nu group received weekly feedback on their dietary records. Skin AGE levels, blood glucose levels, and blood HbA1c levels were measured. The Ex group performed 30-min ergometer exercises at 70%-75%  $\dot{V}O_2$ max intensity, twice a week for 10 weeks. Measurements were taken before the intervention (week 0) and at 5 weeks, 10 weeks, and 25 weeks after the intervention. [Results] In the Ex group, fasting blood glucose levels significantly decreased at 5 weeks compared with those at 0 week (p<0.05). In both groups, blood HbA1c levels significantly decreased at 10 and 25 weeks compared with those at 0 weeks (p<0.05). However, no significant changes in skin AGE levels were observed in either group at any time point. [Conclusions] The increase in blood HbA1c levels suggested that blood glucose control improved during the exercise intervention period compared with that at 0 weeks. However, the lack of change in skin AGE levels indicated that in young women, the frequency and duration of two 30-min exercise sessions per week for 10 weeks are insufficient to produce a noticeable effect. Because skin AGEs may take longer to reflect changes in blood glucose levels than HbA1c, a longer observation period is necessary to more thoroughly assess temporal changes.

**Keywords** : AGEs, exercise



357.

### A study on the perception of benefits from physical activity practices among college students

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[Aims] The purpose of this study is to investigate the perception of temporal distance among university students concerning the benefits of physical activity.

[Methods] An anonymous web survey was conducted among college students. A total of 17 items were asked, including age, grade, gender, exercise habits, and perception of temporal distance to the benefits of physical activity (13 items). Of the 221 responses, 213 valid responses were included in the final analysis.

[Results] The perceived temporal distance of the benefits of physical activity, from closest to furthest, were as follows: improvement in sleep quality, quality of life, concentration, reduced obesity risk, reduced anxiety, depression, and stress, improved creativity and memory, reduced risks of hypertension, diabetes, cancer, mortality, and dementia. A significant difference was found between two adjacent items: improved memory and decreased risk of hypertension. Significant differences were found between several other items.

[Conclusions] The results indicate that the benefits such as improved sleep quality, QOL, and concentration are perceived as being temporally close among younger adults. When planning message interventions to promote physical activity in younger adults, it may be beneficial to consider the perception of temporal distance.

**Keywords** : temporal distance, physical activity

359.

### Development and application of a lifestyle questionnaire to support the health promotion of residents of Mine city

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<sup>1</sup>Yamaguchi Prefectural University, Department of Nursing, <sup>2</sup>Department of Social Welfare, <sup>3</sup>Department of Human Nutrition, <sup>4</sup>Division for the Promotion of Yamaguchi-SPARC

[Aims] We developed a lifestyle questionnaire to create a tool for community residents to learn about disease and lifestyle risks, improve their lives, and support health promotion. [Methods] The questionnaire consists of eight major items (1. diet, 2. eating behavior, 3. physical activity, 4. sleep, 5. social interaction, 6. stress coping ability, 7. psychological condition, 8. health condition, medical history, and economic status), for a total of 82 questionnaire items. The questions were displayed on a tablet PC and were answered by tapping. [Results] The response time ranged from 10 to 25 minutes. Five items related to eating behavior, physical activity, sleep, mental health, and social network were selected from the questionnaire and represented on a 5-point radar chart to visually demonstrate the individual's healthy balance. Immediate feedback was provided to participants by a radar chart that appeared after completing the questionnaire. Later, the chart was printed on a special form and returned to the individual. [Conclusions] Analyzing the lifestyle questionnaire alongside health checkup results helps individuals understand their risk of lifestyle-related diseases and the effects of their health behaviors. This process encourages behavioral changes for better health by prompting a review of lifestyle habits.

**Keywords** : health promotion, behavioral change, prevention of lifestyle-related diseases

358.

### Association between self-efficacy and changes in walking behavior of dog owners in the COVID-19

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<sup>1</sup>Univ. Tsukuba, <sup>2</sup>Univ. Juntendo

[Aims] This study aims to compare the association between walking behavior and self-efficacy in dog owners before, during, and after the COVID-19 pandemic. [Methods] A web-based questionnaire of dog owners was conducted between August and November 2023. The items investigated included basic characteristics, frequency and duration of walking behavior with dog, dog walking self-efficacy (15-point scale), and dog-related obligation (5-point scale). Responses were obtained using the recall method. One-way ANOVA was used to compare dog-walking activity (frequency × duration), dog-walking self-efficacy, and dog-related obligation at the three-time points. Multiple regression analysis was conducted to examine the relationship between dog-walking activity, self-efficacy, and dog-related obligation at each time point. [Results] There were 102 participants (50 males, 48.5 ± 10.4 years), and one-way ANOVA revealed no significant changes in dog-walking activity, self-efficacy, or dog-related obligation. Multiple regression analysis showed that self-efficacy was significantly associated with the dog-walking activity at all three-time points after multivariate adjustment ( $p < 0.001$ ). [Conclusions] Dog owners' dog-walking activity did not change significantly and significantly associated with dog-walking self-efficacy. These results suggest that dog-walking self-efficacy may be an essential factor influencing dog-walking activity even in restricted environments.

**Keywords** : dog ownership, COVID-19, self-efficacy

360.

### Relationship between adherence to 24-Hour Movement Guidelines for the Early Year and physical fitness in preschool children

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Background: Preschoolers' physical fitness is declining globally. The WHO has established the 24-Hour Movement Guidelines for preschoolers, which include recommended physical activity (PA), sedentary screen time (ST), and sleep duration. However, limited research in Japan uses these guidelines. This study explored the relationship between adherence to the WHO 24-Hour Movement Guidelines and preschoolers' physical fitness. Methods: In 2020 and 2022, 14 public preschools and childcare facilities cooperated in the study with 1,503 children. Parents were surveyed via a questionnaire to assess their children's PA, ST, and sleep duration. The WHO guidelines recommend at least 180 minutes of PA per day, less than 1 hour of ST per day, and 10 to 13 hours of sleep per day. The children's physical fitness was evaluated using fitness measurement data at each childcare center. Results: Since only a tiny percentage (2.3%) met all the guideline criteria, the participants were categorized based on adherence to individual criteria as follows: 1) PA adherence (17%), 2) ST and/or sleep adherence only (50%), 3) non-adherence to all criteria (33%). No significant differences were found in physical fitness. Conclusion: No correlation was found between adherence to the individual components of the WHO 24-Hour Movement Guidelines and preschoolers' physical fitness.

**Keywords** : preschool, WHO guidelines, physical fitness

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### Trends in calibrated energy intake and physical activity in Japanese adults: 1995-2019 National Health and Nutrition Survey

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[Aim] In Japan, an increase in body mass index (BMI) and a decrease in energy intake (EI) have been reported over the past few decades. However, self-reported EI has systematic errors. We aimed to clarify the annual changes in calibrated EI (CEI) and BMI with respect to physical activity among Japanese adults. [Methods] This was a cross-sectional study of 200,629 Japanese adults who participated in the 1995-2019 National Health and Nutrition Examination Survey. EI was estimated by the one-day proportional distribution method of dietary records, and CEI was calculated by a previously developed calibration formula using biomarkers. BMI was calculated by dividing body weight by the square of height. CEI per 100 steps evaluated with a pedometer was calculated as EI per amount of physical activity. Annual changes in uncalibrated EI, CEI, and BMI were analyzed using a general linear model. [Results] The decrease in CEI was smaller than that in uncalibrated EI (uncalibrated EI, annual percentage change [APC]: -0.23%, CEI, APC: -0.04%), while BMI and CEI per 100 steps increased (BMI, APC: 0.02%, CEI, APC: 0.43%). There were gender differences in these trends. [Conclusions] Over the past 25 years, BMI has increased in Japanese adults, and calibrated energy intake per physical activity has shown an increasing trend. Accurate assessment of EI and physical activity independent of self-reports is important to understand the dynamic equilibrium of energy balance.

**Keywords** : body mass index, energy intake, calibration approach

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### Sleep hours, wake-up time, and bedtime, breakfast skipping, and Japanese-style diet: a cross-sectional study of schoolchildren in Saga

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**Background** In Japan, "Shokuiku" has been implemented under the slogan "Go to bed early, get up early, and have breakfast." However, there have been few reports on breakfast consumption, wake-up time, and bedtime among schoolchildren.

**Objective** This study aimed to evaluate the relationship of sleep hours, wake-up time, and bedtime with breakfast skipping and keeping a Japanese-style diet with staple foods, main dishes, and side dishes (SMS) among elementary school children in Japan.

**Methods** A self-administered questionnaire survey was conducted in 2015-2016 among parents of 2,303 children in seven elementary schools in Saga, Japan.

**Results** School children who "slept for short times" or "went to bed late" were less likely to have exercise habits ( $p < 0.001$ ). Those who "slept for short times," "did not wake up early," or "went to bed late" were less likely to have breakfast ( $p < 0.0001$ ). Those who woke up before 6:30 a.m. were more likely to have SMS meals than those who woke up after 6:30 a.m. (Odds ratio = 0.77, 95% CI: 0.63-0.94).

**Discussion** Our results suggest that waking up before 6:30 a.m. is crucial to school children in Saga having breakfast and SMS meals.

**Conclusion** For school children, Shokuiku with the slogan "Go to bed early, get up early, and have breakfast" can lead to keeping a Japanese-style diet with SMS.

**Keywords** : schoolchildren, sleep, breakfast

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### Relationship between health behavior and Negative Health Condition among university student of diverse national backgrounds

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This study examine the relationship between health behaviour and negative health condition (NHC) among university student of diverse national backgrounds. A cross-sectional study was conducted across six of Japan's eight regions from February 20 to August 10, 2023. A web-based questionnaire collected data on International Health Behaviors Surveys (IHBS) and NHC *being sick or injured in the past year* in English and Japanese. Respondents were university students in Japan ( $n=1,364$ ). The study found that 64% of university students reported NHC, with international students showing a higher prevalence compared to their Japanese counterparts ( $p<0.006$ ). NHC was associated with certain health behaviors such as smoking, alcohol consumption, and physical activity. After adjusting for age and marital status, university students who consume alcohol were found to be 1.3 times more likely to report NHC (odds ratio (OR) 1.30, 95% confidence interval (CI) 1.00-1.70,  $P<0.04$ ). Conversely, students who reported being physically active in the past two weeks were also 1.3 times more likely to indicate NHC (OR 1.34, CI 1.05-1.70,  $P<0.01$ ). Furthermore, international students engaging in risky health behaviors are 1.4 times more likely to report NHC compared to domestic students (OR 1.45, CI 1.07-1.96,  $P<0.01$ ). In conclusion, risky health behaviors contribute to higher NHC among students, irrespective of nationality, with international students engaging in such behaviors facing a higher NHC

**Keywords** : health behavior, nationality, negative health condition

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### The number of steps between weekdays and weekends in community-dwelling older adults

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[Aims] People aged 20-65 years have been reported to take fewer steps on weekends than on weekdays. It remains unclear whether the number of steps taken varies by day of the week in older age, when employment status and other lifestyle factors change. The aim of this study is to determine the number of steps taken on weekdays and weekends in the elderly and the factors associated with these steps. [Methods] Physical activity was measured for 10 days using a triaxial activity meter in 849 community elderly ( $72.1 \pm 5.4$  years old; male: 419, female: 430) aged over 65 years. Weekdays were defined as Monday through Friday, and Saturdays and Sundays were defined as weekends. The number of steps taken on weekdays and weekends was compared for each gender. To determine the factors that define the difference in the number of steps taken on weekdays and weekends, a correlation analysis was conducted with physical and cognitive functions and lifestyle habits. [Results] Both men and women took significantly fewer steps on weekends compared to the steps on weekdays ( $p<0.01$ ). No consistent results were obtained for the factors defining the number of steps taken on weekdays and weekends for both men and women. [Conclusions] The number of steps on weekends were lower than those on weekdays in older adults

**Keyword** : step counts

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### Which muscle mass indicators are useful as a predictor of mortality among older adults?

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[Aims] In addition to the skeletal muscle mass index (SMI), new indices such as the muscle-to-fat ratio (MFR) and appendicular MFR (aMFR) have recently been proposed. However, there is insufficient research on the relationship between these indices and health outcomes. We aimed to compare the predictive power of various muscle mass indices for mortality. Methods: We analyzed data from 1795 older adults who participated in health check-ups. Participants were followed for an average of 5.7 years. A Cox proportional hazards model was used with all-cause mortality as the dependent variable. Independent variables included age, sex, region, year of first examination, alcohol consumption, smoking, medical history, hypoalbuminemia, anemia, chronic kidney disease, low physical activity, depression, and cognitive decline. C-statistics, net reclassification improvement (NRI), and integrated discrimination improvement (IDI) were calculated for models with the addition of each muscle mass index: SMI, MFR, aMFR, fat mass-to-total muscle mass ratio (FMR), and fat mass-to-appendicular muscle mass ratio (FaMR). Results: During the follow-up period, 167 participants (9.3%) died. The C-statistics, NRI, and IDI for each muscle mass index were as follows: SMI (0.773, 0.225, 0.013), MFR (0.769, 0.073, 0.0002), aMFR (0.769, 0.024, 0.0001), FMR (0.769, 0.012, 0.001), and FaMR (0.769, 0.086, 0.001). Conclusion: SMI appears to be the most useful predictor of mortality in older adults.

**Keywords** : older adults, muscle mass, predictive ability

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### Validation of the one-leg standing test with eyes open as a screening tool for prefrailty

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[Background] This study aimed to verify the relationship between the one-leg standing test with eyes open (OLST) and prefrailty, and to validate the effectiveness of the OLST as a screening tool for prefrailty in older Japanese women. [Methods] This study included 208 participants who underwent frailty assessments and OLST. Prefrailty was assessed using the Japanese version of the Cardiovascular Health Study (J-CHS) criteria. The association between prefrailty and OLST was assessed by binary logistic regression analysis, and ROC analyses were performed to examine the effectiveness of OLST as a screening tool for prefrailty. [Results] OLST time was significantly associated with prefrailty, and those with higher OLST times were less likely to have prefrailty (ORs: 0.98; 95%CI: 0.97-0.99;  $p < 0.001$ ). The AUC of the OLST for prefrailty was 0.713 ( $p < 0.001$ ) and the optimal OLST cut-off time for discriminating prefrailty was 24-s (sensitivity: 0.56, specificity: 0.77). [Discussion] Our results indicated a clear association between OLST and prefrailty among older Japanese women. OLST, as a simple physical fitness test, may apply to large-scale screening assessments. [Conclusions] OLST can be used as a screening tool for prefrailty in older Japanese women. These findings may contribute to the early detection and prevention of frailty.

**Keywords** : prefrailty, early detection, static balance

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### The Relationship between Balance, Cognitive and Physical function to Predict Fall Risk in Older Population

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Purpose: This study examines the inter-relationships among balance, cognitive function, and physical fitness and their collective impact on predicting fall-related outcomes in older adults. Method: This study consisted of 52 healthy older adults aged 50 years and above. A balance test was conducted to assess the fall risk ability through the Center of Pressure (COP) measurements. We measured objective cognitive function. Brain function was measured with electroencephalogram recording of brain activity with the resting-state EEG. Various physical functions were measured. Results: Our findings reveal significant correlations between cognitive functions related to the theta beta ratio EEG ( $p < 0.05$ ) and both total COP sway ( $p < 0.05$ ) area and anteroposterior sway velocity ( $p < 0.05$ ). Cognitive decline demonstrated a linear and exponential association with total sway of COP. Furthermore, significant correlations were also established between cardiorespiratory fitness and lower limb strength. Higher alpha band power and lower theta band power and peak alpha frequency were observed with lower cardiovascular fitness and fall risks. Conclusion: The study conclusively demonstrates that balance ability, cardiovascular fitness, cognitive function, and brain activity are critically interrelated and collectively contribute to improving fall risk factors in this population. These findings support the implementation of comprehensive assessments and targeted interventions to effectively reduce the risk of falls.

**Keywords** : fall risk, cognitive function, physical function

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### Exercise environments associated with physical activities between more or less walkable neighborhood: J-MICC Kyoto field

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[Aims] Neighborhood walkability is consistently associated with higher level of physical activity. However, exercise environment which is associated between physical activity in less walkable neighborhood is unclear. The purpose of this study is to clarify exercise environments associated with adults' physical activity in less walkable neighborhood.

[Methods] 3,865 adults (39-75 years old) were targeted for the analysis. Regarding low physical activity (LPA), moderate physical activity (MPA) and vigorous physical activity (VPA), the frequency and time of each physical activity were asked. Japan Postcode-level Walkability Index was used to estimate participant's walkability index. Based on median of participant's walkability index, two groups were divided into walkable neighborhoods and less walkable neighborhoods. Exercise environments (e.g., parks, sports facilities) were assessed within 1km from participant's address.

[Results] We used ordinal logistic regression analyses adjusted for participant's sex, age, body mass index and walkability index. Particularly, more sports facilities were associated with higher level of MPA frequency (OR=1.08,  $p < 0.01$ ) and MPA time (OR=1.08,  $p < 0.01$ ) among less walkable neighborhoods.

[Conclusion] Sports facilities can provide to residences with opportunities to try various sports under less walkable neighborhood, where need environmental approach different from walkable neighborhood.

**Keywords** : physical activity, built environment, walkability



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### Relationship between breakfast intake habits and chronotypes in Japanese university students

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[Background] Skipping breakfast is a recognized global health issue, particularly concerning in Japan among university students. According to the 2019 National Health and Nutrition Survey, around 23% of males and 12% of females in this age group skip breakfast. Our preliminary study found a positive correlation between academic performance and breakfast frequency ( $r = .31$ ,  $p < .05$ ). However, it is unclear whether breakfast habits directly influence academic performance, leading us to consider other factors. Since evening-types tend to exhibit unhealthier behaviors than morning-types, we focused on chronotype. This study aims to explore the relationship between breakfast consumption habits and chronotype. [Methods] A total of 193 healthy university students (96 males and 97 females) were surveyed regarding their breakfast consumption habits, including weekly and monthly frequency and timing. Chronotype was assessed using the Japanese version of the Morningness-Eveningness Questionnaire (MEQ). Spearman's rank correlation coefficient was used to analyze the relationships between breakfast frequency, timing, and MEQ scores. [Results] A positive correlation was observed between breakfast frequency and MEQ ( $\rho = .37$ ,  $p < .01$ ), while a negative correlation was found between breakfast timing and MEQ ( $\rho = -.26$ ,  $p < .01$ ). [Discussion] The findings suggest a possible association between breakfast habits and chronotype, with morning-types showing healthier breakfast patterns compared to evening-types.

**Keywords** : breakfast skipping, morningness-eveningness, lifestyle habits

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### Relationship between school and leisure time physical activity and injuries in junior high school students

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[Aims] Physical activity should be promoted, however it has the inherent risk of injury (Bloemers et al., 2012). However, relationship between physical activity and the number of injuries has yet to be clarified. The aim of this study was to clarify the relationship between physical activity and the number of injuries that occur in each physical activity situation among junior high school students. [Methods] A web-based questionnaire was administered to 819 boys and 804 girls in grades 1 through 3 at 10 junior high schools. Physical activity was asked how many days per week they engaged in moderate to vigorous physical activity using the HBSC-J. Zero days were defined as 0-day, 1-4 days as low frequency, and 5-7 days as high frequency. Injuries were assessed by the number of physical activity-related injuries in physical education (PE), after-school sports activity, and leisure time during the past 12 months. [Results] There was no relationship between physical activity and injuries in PE. Compared to 0 days, high frequency was associated with more injuries during after-school sports activity (boys: ORs 3.65, 95%CI = 1.36-9.81; girls: 1.85, 0.83-4.08). The risk of injury during leisure time was higher for boys who were more physically active than for boys who were less active ( $P = 0.001$ ). [Conclusion] High frequency junior high school students were suggested to be at higher risk of injury during after-school sports activity and leisure time.

**Keywords** : physical activity, injury, junior high school student

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### Association between personality traits and physical activity in older adults

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[Aims] Environmental, social, and personal factors influence the implementation of physical activity. This study examined one personal factor, personality traits, and its relationship with physical activity in older adults.

[Methods] A total of 732 men and women aged 60-79 years participated in an online survey. Physical activity was assessed using the IPAQ-SV. Moderate or vigorous physical activity was defined as "physically active." Five personality traits (extraversion, agreeableness, conscientiousness, neuroticism, and openness) were assessed using the Ten-Item Personality Inventory. Multivariable logistic regression analysis examined the association between personality traits and physical activity, adjusting for sex, age, education, subjective economic status, chronic disease, instrumental activities of daily living, and social networks.

[Results] A total of 58.6% participated in physical activity. Higher extraversion was associated with participation in physical activity (aOR, 1.27; 95% CI, 1.09-1.47).

[Conclusions] Extraversion is characterized by sociability, involvement, and positive emotions. Higher levels of extraversion, such as self-maintenance of health, enjoyment of exercise, and preference for group activities, are thought to impact participation in physical activity. Study findings suggest that considering individual personality traits may be important in promoting physical activity among older adults.

**Keywords** : physical activity, personality traits, older adults

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### Stress-strain relationship of individual hamstring muscles: a human cadaver study

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Purpose: This study aimed to clarify the stress-strain relationship of hamstring muscles using soft-embalmed Thiel cadavers.

Method: Eight cadavers were dissected to examine the biceps femoris long head (BF), semimembranosus (SM), and semitendinosus (ST) muscles. Tendons at the proximal and distal ends were connected to a mechanical testing machine. Slack length was defined as the muscle length at initial tension application, measured with a tape measure. The anatomical cross-sectional area (ACSA) of each muscle was determined at both ends using B-mode ultrasonography. The loading protocol involved elongating muscles from slack length to a maximum of 8% strain at 0.83 L/s, recording displacement and tensile load. Strain (%) and stress (kPa) were calculated by dividing displacement by slack length and tensile load by ACSA, respectively.

Result: There was a significant interaction between muscle and strain regarding stress ( $P < 0.01$ ). Post-hoc tests indicated higher stresses in BF and SM compared to ST beyond 3% strain. At 8% strain, recorded stresses were 63.7±12.1 kPa for BF, 53.7±23.2 kPa for SM, and 21.0±11.9 kPa for ST.

Discussion: Differences in stress changes associated with strain were noted among the muscles. Higher stresses at equivalent strains suggest BF and SM experience more mechanical stress during elongation, possibly contributing to their higher susceptibility to injury. This highlights the need for specific preventive measures tailored to these muscles to mitigate the risk of strain injuries.

**Keywords** : human cadaver, hamstring muscle, mechanical properties