357. Athletic achievement and satisfaction in athletes who changed athletic event after talent identification and development program

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[Aims] In this study, athletic achievement and satisfaction in athletes who changed athletic event after talent identification and development program. [Methods] The participants were 36 athletes (12 male, 24 female, 21.1±1.8 years) From the questionnaire, subjects answered their age, project participation years, athletic event, athletic achievement, and satisfaction. [Results] There were 18 competition events, such as track and field, fencing, volleyball, hockey, and cycling etc. Project participation years were 4.3±0.9 years. Most of the motivation to participate talent identification and development program were “recommendation of parents” and “recommendation of school teachers and coach”. However, seven participants answered that they wanted to participate. Their athletic achievement were 7 international tournament, 17 national tournament a prize winner, 7 national tournament participants, and 5 others. [Conclusions] There was no relationship between the athletic achievement and satisfaction of participants in athletes who changed athletic event after talent identification and development program. In addition, in the case of participation at a young age, there were many recommendations by others.

Keywords: talent identification, development program, questionnaire

358. Exercise intensity of triathlon -Focus on Olympic distance race-

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[Aims] There are few reports of exercise intensity during Olympic distance triathlon race, in particular, non-drafting races. The purpose of this study was to investigate the exercise intensity of each discipline of actual non-drafting Olympic distance triathlon race. [Methods] Twenty triathletes (16 males and 4 females) who have a history of triathlon competition over a year participated in this study. To measure heart rate (HR) and workload correspond to each anaerobic threshold (AT1 and AT2), three incremental tests of each exercise modality, that is swimming, cycling, and running were performed. The incremental swimming tests were conducted in a swimming flume, and blood lactate concentration and HR were measured during the test. The incremental cycling tests were performed using the cycle ergometer onto which a subject’s own bicycle is attached. The running tests were performed using a motorized treadmill. During these two tests, expired gas and HR were measured. AT1 was considered lactate threshold in swimming, and ventilatory threshold in cycling and running. AT2 was considered onset of blood lactate accumulation in swimming, and respiratory compensation point in cycling and running. In addition, HR and workload during the actual non-drafting triathlon race within 3 months from incremental tests were measured. During the race, subjects put portable global positioning watch on wrist and HR monitor on chest to determine workload (velocity) during the swim and run, and HR during overall discipline. Also, to determine workload (power output) during bike, subjects’ bicycles were fitted with a calibrated power meter. Exercise intensity of each discipline during the race was evaluated according to following three zones: zone 1 < AT1, AT1 ≤ zone 2 < AT2, AT2 ≤ zone 3. [Results] All subjects (n = 20) completed the race in 2 hours 24 minutes ± 12 minutes and 38 seconds [mean ± SD]. The interval between the race and the incremental tests was 4 to 25 days. The HR during race was 167 ± 10, 165 ± 9 and 173 ± 10 bpm in the order of swim, bike and run, which were 95 ± 5, 91 ± 4 and 90 ± 5% of the maximal HR, 122 ± 11, 116 ± 8 and 109 ± 9% of the HR of AT1 and 112 ± 9, 103 ± 7 and 99 ± 6% of the HR of AT2. The workload during race was 165 ± 10 Watts (98 ± 9% of the maximal workload obtained during incremental swimming, 120 ± 15, 100 ± 11 and 109 ± 11% of the workload of AT1 and 112 ± 13, 78 ± 8 and 92 ± 8% of the workload of AT2). [Conclusions] The exercise intensity of the non-drafting Olympic distance triathlon was shown to be higher than AT1, for swim, approximately equivalent to AT2, for bike and between ATM, for run.

Keywords: triathlon, anaerobic threshold, exercise intensity profile

359. The effect of aquatic exercise on the women elderly

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Background Aquatic exercise is reported to effectively improve the health of the elderly while causing little physical strain. Objective In order to examine the effectiveness of an aquatic exercise program in which floats (1 kg) were attached to the wrists, ankles, and torso, changes in aspects of the aquatic exercise program and changes in an individual’s physical shape were noted. Methods Data were obtained from 42 subjects with a mean age of 67.2±8.9 years and body fat of 28.1%. Weight, percent body fat, and basal metabolism were measured, and subjects subjectively assessed their shoulders, lower back, knees, hips, sleep, and physical shape on a 5-point scale (5 points for very good, 4 points for good, 3 points for average, 2 points for poor, and 1 point for very poor). Aquatic exercise was performed in an upright position and in a supine position with floats attached to the wrists, ankles, and torso. The program consisted of a total of 9 sessions over a period of about 2 months, and the program was intended to strengthen intrinsic muscles, increase joint range of motion, and to relax the antagonistic muscles. Results Weight and body fat tended to decrease from the baseline. Results of the subjective survey of different joints revealed that subjects tended to rate their shoulders and lower back, sleep as “very good” (close to 5 points). Conclusion The current results revealed that Improvement was admitted in the item of the shoulder and the sleep by aquatic exercise with floats.

360. The effects of different temperature of seawater on muscle hardness during long-distance swimming

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[Aims] The purpose of this study was examined to the effects of different temperature of seawater on muscle hardness during long-distance swimming. [Methods] The research was held from Jul., 2016, 2017 and 2018 in Iwai beach area. The total of 24 male subjects (ranged 20 to 22 years, n=8, 2016), (n=8, 2017) and (n=8, 2018) participated in this study. All subjects voluntarily gave written informed consent to participate in this study. We measured the muscle hardness and the muscle tenderness threshold in each muscle (trapezius muscles and vastus lateralis muscles) at before and after of swimming. We also measured the swimming distance, duration time and seawater temperature during swimming. [Results] Each swimming distance was ranged from 3.4 to 3.9 km, and duration time was ranged from 127 to 138 min. The seawater temperature (ranging from 24.7 to 25.0 °C) during swimming in 2016 was much lower than those (ranging from 25.9 to 27.8 °C) in 2017 and 2018. The muscle hardness of trapezius muscles in all years was enhanced in after swimming. Also, the muscle hardness of vastus lateralis muscles in 2016 was much higher increased in after swimming. However, those in 2017 and 2018 were no changed. [Conclusions] Our results suggested that the low temperature of seawater (under 25°C) enhanced in the muscle tension of vastus lateralis muscles after the long-distance swimming.
Acute effects of exercise at the lactate threshold intensity on appetite and food intake in young adult males

Takako Nishimura, Hideaki Kumahara, Haruka Tai, Michika Imamura, Yuuri Itoh, Yuko Ichida, Makoto Ayabe, Takuro Tobina, Eiichi Yoshimura, Shuji Nakano

[Aims] To investigate the acute effects of exercise at the lactate threshold intensity (LT) on diurnal appetite and food intake from the perspectives of the difference in implementation frequency and comparison with a high-intensity exercise. [Methods] This randomized crossover study included 7 males aged 22±2 yrs. The subjects completed a 1-day protocol with three bicycle ergometer trials (P1, LT over 90 min×1 time; P2, LT over 30 min×3 times; P3, intensity at 4 mmol/L of a blood lactate accumulation over the duration which has an equivalent energy expenditure (EE) of P1) and a controlled trial (P4). Appetite was recorded using 100-mm VAS. Food intake as desired (ad-libitum) at lunch, afternoon snack, dinner, and night snack were noted. [Results] The total EE of P1, P2, and P3 were significantly higher than that of P4. The total energy intake (EI) did not differ significantly among trials. The desire to eat immediately after exercise was significantly lower in P3 than in P4. The percentage of total EI at lunch in P3 was lower than that in P1 and P4. [Conclusions] The present study could not find the significant effect of exercise at LT on diurnal appetite and feeding behavior. In contrast, decreased appetite may be observed after high-intensity exercise, but it does not affect the daily EI.

Keywords: exercise-induced anorexia, energy balance, hunger

Lateral dominance of fluctuations in the gravity center during one-leg standing with eyes open in selected elderly women and university students

Yoshimasa Matsuura, Shinichi Demura, Yoshinori Nagasawa, Yu Uchida, Haruka Kawabata

[Background] In the elderly, training for one-leg standing with eyes open has been found to be effective for fall prevention. Although the procedure is to be performed three times daily with the left or right leg, many elderly women are unable to perform it. [Aim] This study aimed to examine the lateral dominance of fluctuations in the gravity center during one-leg standing with eyes open for 1 min in selected elderly women and university students. [Methods] In total, 31 elderly women participated in the study. Another set of 31 female university students who could perform the one-leg standing procedure with eyes open for 1 min with the right or left leg also participated. Each of the participants performed the test first with the dominant leg followed by the use of the non-dominant leg. The total movement length, x-axis path length, y-axis path length, and outer peripheral area were used as evaluation variables. [Results] The results of two-way ANOVA test showed no significant interactions among the four body sway variables. However, the effect of age was significantly greater in the elderly women. [Conclusion] Lateral dominance of fluctuations in the gravity center during one-leg standing with eyes open was not significantly observed in the elderly women as well as the female university students. However, it was greater in the elderly participants.

Keywords: Abdominal breathing, Mental stress, Cerebral blood flow

Does slow abdominal breathing reduce stress responses? A study based on mood state and cerebral oxygen dynamics

Kazufumi Matsuura, Fumio Yamazaki

[Methods] Ten healthy adult subjects performed slow (4-6 cycles per minute) abdominal breathing or normal control (12-20 cycles per minute) breathing in a sitting position for 10 minutes. This was followed by a Stroop task (i.e. mental stress) for 3 minutes. During the experiments, frontal oxygenated hemoglobin (Oxy-Hb) was continuously measured using functional near-infrared spectroscopy (fNIRS). Total mood disturbance (TMD) scores were evaluated using a mood profile test before and after the abdominal or control breathings and after the Stroop tasks. [Results] The Oxy-Hb decreased with the abdominal breathing but increased with the normal breathing (p<0.05). The Stroop task increased the Oxy-Hb after both the abdominal and control breathings. The TMD scores were lower (p<0.05) after the abdominal breathing than after the normal control breathing. The Stroop task increased the TMD scores after both breathing conditions. [Conclusions] These results suggest that slow abdominal breathing reduces cerebral blood flow and improves negative mood but does not affect the responses to acute mental stress.

Keywords: Abdominal breathing, Mental stress, Cerebral blood flow

autonomic nervous system, zazen

autonomic nervous system, zazen
365. Differences in the touch times of trails by left and right hands in a successive-choice touch reaction test of upper limbs among young males
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[Aims] A necessity prevails for developing an adequate test to assess the upper limb agility of open skill sports players. The first step was to develop a new test. Subsequently, differences in the touch times of trails by left and right hands in a successive-choice touch reaction test of upper limbs in young males were examined.[Methods] The sample comprised of 30 young males. Square shaped touch panels (15 × 15 cm) were placed at different positions on a desk (height: 70 cm) at diagonal forward, to the side (side), and diagonal back (rear) positions. A gap of 30 cm was maintained between the subject and the side panel, and a gap of 60 cm existed between the front and back panels. During the test, subjects stood at the side of the desk with their right (or left) hand on their hip, and after touching the panel indicated on a computer screen, they again placed their right (or left) hand onto their hip and waited for an indication regarding touching the next panel. The stimulus indications (40 bpm) were displayed on a computer screen, and the subjects were asked to touch each of these panels only once. The instructions about which panel to touch with which hand were random in order. In all, three trials were conducted for each hand. The mean time of the three trials was utilized for the purpose of evaluation. [Results] The results of the two way analysis of variance (hands × trials) revealed no significant interaction or main effect. [Conclusions] The successive-choice touch reaction test of the upper limbs in young males exhibited no significant differences between the reaction times of the left and right hands. Further, no significant difference was discovered between the trials conducted.

366. Effects of Jumping Exercise Post-Activation Potentiation based on Subjective Fatigue of Active Muscles
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[Aim: Post-Activation Potentiation refers to the increase of muscle strength for a duration of several minutes after moderate or high intensity exercise. Previous research has shown that post-activation potentiation after performing multiple sets of moderate or high intensity lower body dynamic exercises increased following a 7-10 minute rest (Wilson et al., 2013). Thus, finding the type of exercises which could boost post-activation potentiation through practical means at competition sites may also lead to performance enhancement. However, inappropriate intensity and longer rests during pre-game locomotor stimulation meaning not enough exercise was done for post-activation potentiation. Therefore, this study has tried to examine the effect of bodyweight continuous jump, as a way to induce post-activation potentiation, on lower body muscle strength and bicycle pedaling power after a 7-10 minutes interval. Method: Subjects chosen were 9 female students (21.2 ± 2.1 years old) who are a member of university athletics club. The warming-up exercise assigned was one set of bodyweight continuous jump (80 bpm) for which the subjects must jump until they reach a level of exertion they perceived as difficult (Borg-RPE Scale of 15), or when the active muscles have reached subjective fatigue, then rest for 7-10 minute. Counter movement jump (CMJ) and rebound jump (RJ) performance, as well as bicycle pedaling power (PP) were assessed both before and after the warming-up exercise. The highest value for both CMJ height (CMJ-h) and RJ index (RJ-i) was taken from 4 and 5 jumps respectively with few practices beforehand. PP was calculated as the peak power during 8 second of maximal pedaling with load set at 7.5% of bodyweight. Results: The number of continuous jumps before the subjects reached a level of exertion they perceived as difficult (Borg-RPE Scale of 15), or before the active muscles reached subject fatigue, was 47.7 ± 13.6 times. While no significant effect was found for both CMJ-h and PP, RJ-i was significantly lower when contact time was longer. The degree of such decline was moderate (ES = 0.37). Conclusion: The warming-up exercise in the form of continuous jump until active muscles reached subject fatigue had no impact on lower body muscle strength but caused a decline in bicycle pedaling power. This indicates the possibility that recovery from fatigue for such exercise may not have been sufficient enough to satisfy the physical condition required for inducing post-activation potentiation.

367. A survey of food items carried during hiking
Yuka Nose1, Takuma Wada2, Yuko Ogura3, Masayuki Hakoda2
1Yasuda Women’s University, 2Kawasaki Medical Welfare [Aim] This study aimed to explore the kind of food items that hikers prefer to carry during hiking. [Methods] A descriptive, analytical study was conducted on 345 female undergraduate students of a university. They were asked about the number of hikes they had undertaken during the previous five years, the contents of lunch and other food items (rations) they consumed during the hikes, and the conditions under which the subject desired for lunch and rations. [Results] The percentage of subjects who undertook hikes was 39.9%, of which 86.3% hiked without lodging. Most hikers carried rice balls and homemade lunch boxes for lunch; further, we observed that more experienced the hiker, higher the prevalence of subjects who got rice balls and dietary supplements (p < 0.05). With respect to the rations, the percentage of those who did not consume anything was higher among the subjects who were less experienced in hiking (p < 0.05). In contrast, most people who hiked carried chocolates as rations. Weight was the most important consideration for hikers when deciding on the food items to be carried. The efforts of hiking experts have increased the opportunities for hiking at high altitudes for several hours; therefore, leading to a rise in the importance of carrying lightweight nutritious foods, such as rice balls and chocolates. However, these food items cannot provide sufficient energy and nutrients necessary for mountain climbing. Thus, hiking experts have a higher risk of being involved in accidents due to lack of energy and nutrients. [Conclusions] There is a relationship between the number of hikes undertaken and food items carried on the hike, and experts tend to neglect the importance of carrying nutritious foods on hikes.
Keywords: hiking, rations, food education

368. Blood pressure management in patients with atrial fibrillation: Seasonal variation of BP, thermal sensation, tympanic temperature and skin temperature-
Masatoshi Shiota1,2,3
1Yamaguchi University, 2Niibon University, 3Ishiki University [Background] Even in patients with atrial fibrillation using anti-hypertensive agents, their blood pressure (BP) is affected by the season, and it was showed that BP fluctuations from winter to summer tend to be higher than those from summer to winter at the same room temperature. This seasonal difference in BP is thought to cause thermal sensation (TS) and skin temperature (Ts), but is not clear. [Purpose] In this study, we investigated the seasonal variation in BP, TS, tympanic temperature (Tty), and Ts in patients with atrial fibrillation, and examined the cause of the seasonal difference in BP fluctuations. [Method] The subject was an elderly patient with atrial fibrillation (68 years old, height 170 cm, weight 65 kg) taking antihypertensives, antiplateletants, etc. BP, TS, Tty, Tsk (index finger, wrist, chest, upper arm, thigh, calf) were measured in a sitting position within 1 hour after getting up over one year from September 2018 to August 2019. [Results] Seasonal fluctuations of BP measured showed a tendency for BP fluctuations from winter to summer to be higher than those from summer to winter at the same room temperature. The Tty, TS, and mean Tsk (Ramanathan’s four-point method) also tended to show higher fluctuations from winter to summer than those from summer to winter. However, the index finger temperature tended to be lower with fluctuations from winter to summer than fluctuations from summer to winter. [Conclusion] The reason why the BP fluctuation from winter to summer was higher than the BP fluctuation from summer to winter was suggested to be due to the difference of the palm forefinger in both periods.
Keywords: Seasonal blood pressure, thermal sensation, tympanic temperature, mean skin temperature, index finger temperature.
369. The relationship between physiological load and endurance during sub-maximal exercise testing in the elderly
Yoko Saito

[Aims] Fatigue are known as one of the major complaints for elderly. The previous study suggested that aging may develop the individual gap between subjective fatigue and physiological load during exercise. In the present study, we assessed the individual variation of physiological load during submaximal exercise with the same subjective fatigue. Additionally, we examined whether the variations were influenced by their endurance. [Methods] Nineteen 70s-elderly underwent the incremental cycling testing. They reported subjective fatigue by the Borg scale of perceived exertion every minutes during exercise, and continued it until reaching to the rating of 17. Exercise time, VO2peak, VT, and DPBP were measured during the testing. In the present study, we defined the ratio of HRpeak of age-predicted HRmax as a physiological load (PL). We examined the relationships between the index and the endurance parameters by the Pearson’s coefficient. [Results] The average value of PL showed 85.0 % with large standard deviation (i.e., 14.5%). Although the correlations were observed between PL and VO2peak (r=0.59, p=0.008) and between PL and DPBP (r=0.58, p=0.03), there were no relationships between PL and the other endurance parameters. [Conclusions] The present result showed that considerable variation in physiological load of the elderly in spite of the same subjective fatigue, and it may be explained in a part by their endurance.

Keywords: aging, physiological load, subjective fatigue

370. Hydrogen-saturated alkaline ionized water attenuates eccentric contraction-induced reduction in muscular performance
Kiuchi Masatake

[Aims] Some antioxidants can suppress decrement in muscle performance by eccentric exercise-induced muscle damage. Previously, we have reported that hydrogen-dissolved alkaline-ionized water (AIW) attenuated exercise-induced oxidative damage. Thus, the purpose of the present study was to investigate the ergogenic effects of AIW on muscle performance and damage responses after strenuous eccentric exercise protocol. [Method] Sixteen healthy young males were randomly assigned into normal (CON) water (pH 7.6; H2 conc. 0.0 ppm) and AIW (pH 9.5; H2 conc. 1.0 ppm) drinking groups (both, n = 8). All participants completed muscle damaging isokinetic eccentric exercise (EE, 10 × 20 repetitions of knee flexion and extension, 60 degree/sec) protocol. Before, and immediately, 24h, 48h and 72 h after EE, exercise performance test (maximal voluntary isometric and isokinetic contraction of knee flexion and extension, height of countermovement jump, and 20 s of repeated side steps) were conducted. The subjects consumed CON water or AIW water (700 ml/day) over the experiment. Blood samples were obtained to measure muscle injured markers (i.e., creatine kinase and aldolase) before exercise test in each experimental day. [Results] Maximal voluntary isometric and isokinetic contraction of knee flexion and extension were decreased in CON group as day passed, whereas the reduction in muscle performances were not observed or attenuated in AIW group. Although the changes in any other exercise performances and muscle injured markers did not differ between CON and AIW groups, the reductions in muscle performances were partly associated with the rise of muscle damages. [Conclusions] Our results indicate that AIW might have a preventive effects against EE-induced reduction in muscular performance.

371. Effects of a mailing support program on long-term exercise adherence in community-dwelling older Japanese adults: A two-year randomized controlled trial
Songee Jung1,2, Yoshiro Okubo1,2,3, Yosuke Osuka2,4, Satoshi Seino1,2, Ryosuke Shigematsu1,2, Taeko Kim1, Kyosuke Wakaba1,2, Hiroyuki Kobayashi1,2, Kiyoji Tanaka3

[1]Hirosaki University, 2University of Tsukuba, 3Neuroscience Research Australia, 4Tokyo Metropolitan Institute of Gerontology. [Aim] We aimed to examine the effect of a mailing support program after an exercise class on long-term exercise adherence among older adults. [Methods] This 27-month randomized controlled study included 158 older community-dwelling Japanese aged 65 to 84 (mean 70.7 ± 4.6) years. In the initial 3-month exercise class, participants were instructed to enjoy brisk walking (3.5 × METs) (BW), muscles strengthening (MS), stretching exercises (SE), to use a tri-axial accelerometer and to record an exercise diary for self-monitoring. At the end of the exercise class, the participants were randomized into either a mailing program (MP) group who exchanged the exercise diaries with instructors monthly for one year or a non-mailing program (NMP) group. Exercise adherence during the exercise class, the first and second years was compared between the MP and NMP groups using a mixed-effect model analysis. [Results] During the exercise class, the both groups increased adherence in BW, MS, and SE (group × time interaction P < 0.05). During the first follow-up year, BW, MS, and SE decreased more in the NMP group compared to the MP group (interaction P < 0.05). During the second follow-up year, the MP group maintained the higher MS and SE relative to the NMP group (interaction P > 0.05) but the group difference in BW disappeared (interaction < 0.05). [Conclusions] The post-exercise class mailing program can facilitate long-term exercise adherence in older adults for one year. The effect of the one-year mailing program on adherence to muscle strength and stretching exercises may continue over two years but not in brisk walking.

372. Effect of watching professional baseball at a ballpark on health outcomes among older adults
Ryoko Kawakami, Susumu Sawada, Tomoko Ito, Yoko Gando, Tomohiro Fukushima, Atsushi Yoshino, Satoshi Kurita, Koichi Oka, Shizu Sakamoto, Mitsuru Higuchi

[1]Waseda Univ., [2]Nat. Inst. of Biomed. Innovation, Health & Nutrition, [3]Seibu Lions Co., Ltd., [3]Natl. Ctr. for Geriatrics & Gerontology. [Aims] Watching sports at stadiums will positively influence health outcomes in older adults. However, to our knowledge, there have been no studies examining the effects of sports stadium visits on health indicators in older adults. We examined the effect of watching professional baseball at a ballpark on health outcomes in older adults through a randomized controlled trial. [Methods] A total of 58 participants aged 65-85 years were randomized into a spectator group (n = 29) and waiting-list group (n = 29). During the 2 month intervention, there were 21 games. The spectator group watched professional baseball games at the ballpark for free. Before and after the intervention, health outcomes including executive and cognitive functions, health-related quality of life, depression symptoms, subjective happiness and physical activity were assessed. [Results] The median number of days that the spectator group watched baseball games was 6 days (interquartile range 4-10 days). Executive function assessed by the reverse Stroop interference rate showed a non-significant trend of improvement in the spectator group compared with the waiting-list group (P = 0.06). The spectator group showed a significant reduction in depressive symptoms assessed by CES-D compared with the waiting-list group (P = 0.02). There were no significant differences between the two groups in regard to the other health outcomes. [Conclusion] Watching professional baseball at a ballpark reduced older adults’ depression symptoms.
373. **Comparison of body weight changes between volunteer-led and expert-led weight-loss interventions**

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**Aims** We implemented a volunteer-led, community-based weight-loss intervention and compared body weight changes between the volunteer- and expert-led interventions. **Methods** Participants were 145 overweight or obese adults, aged 20-69 years, comprising of 77 in volunteer-led group and 68 in expert-led group. The program content and intervention period were the same in both groups. Male and female participants were instructed to maintain a well-balanced, low-energy diet of 1,680 kcal/day and 1,200 kcal/day, respectively. Community volunteers were trained over 4-5 training sessions (3 hours per session), while experts were highly qualified and experienced. The primary outcome measure was body weight change. **Results** In the volunteer- and expert-led groups, 58 of 77 (75%) and 61 of 68 (95%) participants completed the 12-week program and the mean (95% confidence interval) weight loss was 6.4 (5.6-7.2) kg and 6.3 (5.5-7.1) kg, respectively. The completion rate was significantly higher in the expert-led group (P<0.05); however, the body weight change was similar in both groups. **Conclusion** With an improvement in the completion rate of volunteer-led weight-loss intervention, such a program could provide an alternative for wide-scale dissemination of a low-cost approach for obesity prevention.

**Keywords** : obesity, community-based, weight-loss program

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374. **Impact of changing work posture on computer task performance and postprandial blood glucose response in early afternoon**

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**Aims** Sit-stand workstation is gradually introduced in workplace to reduce excessive prolonged sitting duration and to decrease the risk factors for cardiovascular diseases (e.g. postprandial hyperglycemia). Conversely, there are concerns over the accumulative fatigue in locomotor organs and deterioration in work efficiency by prolonged standing. We thus investigated whether work posture changing of alternate sitting and standing improve computer task performances, and postprandial blood glucose response as well. **Method** Nine healthy young males completed 4 × 20-min computer tasks 30 min after lunch under three different work conditions; no posture change (only sitting, Control), and two types of posture change every 20 min (sitting→standing→sitting→standing, SIT-STAND and standing→sitting→standing→sitting, STAND-SIT). In the computer tasks, all participants were required to subtract a two-digit number from a four-digit number and to input the answer to the answer cell on the computer. Moreover, blood glucose concentrations were assessed before, and immediately, 30 min, 52 min, 74 min, 96 min, 118 min after lunch. **Results** The number of achievements and accuracy rate in computer tasks did not differ between the three conditions. Area under the curve of the changes in blood glucose concentrations were significantly lower in SIT-STAND and STAND-SIT conditions compared with Control condition, whereas no significant difference were observed between SIT-STAND and STAND-SIT conditions. **Conclusions** Our results indicate that work posture changing of alternate sitting and standing attenuates postprandial blood glucose surge without reducing task performances, irrespective of the changing order of work posture.

**Keywords** : sit-to-stand workstation, postprandial hyperglycemia, computer subtraction task

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375. **The effects of incline board stretching on autonomic nervous activity in low-activity young male adults**

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**Aims** The aim of this study was to examine the effects of static stretching on the incline board on autonomic nervous system activity. **Methods** Ten low-activity young male adults were recruited voluntarily as the subjects. The study protocol consisted of resting in the spine position for 15 min, resting in the sitting position for 5 min, ST session, and resting in the spine position for 15 min. The study subjects performed a 1-min calf stretching on the board repeated five times with 1-min interval between sets in the ST session. The parasympathetic nervous system activity (lnHF) was obtained before, during, and after the stretching. The angle of the incline board (ST angle) was also measured. The stretching incline board angle was set to the maximum angle that does not cause pain. The test was performed randomly in these two conditions: stretching condition [standing on the incline board (ST)] and no stretching condition [in an upright position on a level floor (CON)]. **Results** There were no significant differences in ST angle within sets of stretching. In addition, there were no stretching-induced changes for lnHF. lnHF during ST session decreased in standing position and increased in sitting position, but there were no significant differences between conditions. **Conclusion** These findings suggested that static stretching in the standing position on the incline board performed in this study did not affect parasympathetic nervous system activity.

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376. **Characteristics of the examinee of health checkup and locomotive checkup (investigation of 4 years)**

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**Aims** Disability of exercise equipment (25.0%) was the first leading cause of long-term care. So, we have conducted locomotive checkup at the same time to health checkup examinees from 2015. The purpose of this study was to examine the cut-off value in each locomotive and metabolic measurement item of the person who received a health checkup and locomotive checkup at the same time. **Methods** Conducted health checkup and locomotive checkup in fiscal 2015 - 2018 as an industry-government-academia collaboration project. The subjects were 1,106 first-time examinee (male: 434, female: 672 / age: 65.4 ± 7.9). The reference value of each physical test was determined using receiver operating characteristics analysis. ROC curves were drawn based on the presence or absence of locomotive syndrome risk level and presence or absence of metabolic syndrome or metabolic syndrome preparatory group (metabolic group). **Results** There were 633 people with the locomotive syndrome risk level or metabolic syndrome or metabolic syndrome preparatory group (metabolic group). **Conclusions** There were 633 people with the locomotive syndrome risk level of 1 or more in the locomotive checkup, and 181 persons in the metabolic group at the health checkup. The cut-off value of the ratio of lower limb muscular strength corresponding to the metabolic group was 0.62 (AUC: 0.69, sensitivity: 0.68, specificity: 0.59), and the locomotive syndrome risk level was 0.72 (AUC: 0.68, sensitivity: 0.58, specificity: 0.69). **Conclusions** It suggested that the ratio of lower limb muscle strength could use as the cut-off indicator for both Locomotive and Metabolic syndrome.
Objectively-evaluated Moderate-to-Vigorous Physical Activity and Weight Status in adults

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[Aims] The purpose of this study was to examine the association between objectively-evaluated moderate-to-vigorous physical activity (MVPA) with discrimination between ambulatory and non-ambulatory physical activity and body mass index (BMI) among Japanese adults. [Methods] In 486 women and 269 men aged 18-64 years, MVPA was assessed using triaxial accelerometer. Weight was classified as underweight, normal-weight or obese according to the Japan Society for the Study of Obesity cut-offs for BMI. [Results] For women, all variables of obesity were significantly lower than those of normal weight. Time in total MVPA for overweight participants tended to be lower than that of normal-weight participants. On the other hand, for men, time in non-ambulatory MVPA was significantly affected by weight status. Underweight and obese men had significantly lower MVPA compared with that of normal-weight men. The obese participants spent significantly less time in total MVPA. [Conclusions] These findings suggest that underweight as well as obesity is associated with MVPA in both genders. The findings also indicate that the type of MVPA for Japanese men was affected by weight status.

Keywords: physical activity, underweight, obese

Influence of exercise group characteristics on participation intention in elderly individuals via conjoint analysis

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The purpose of the present study was to examine the influence of exercise group characteristics on participation intention in elderly individuals via conjoint analysis. A total of 977 individuals (591 males and 386 females) aged ≥60 years were enrolled in the study. The included exercise groups comprised five factors: 1) instructor (professionals, university students, or volunteers); 2) place (1, 5, or 10 km); 3) expected effect (maintaining or increasing physical fitness, 4) self-pace, and 5) fee (free, 500 yen, or 10 km); 3) expected effect (maintaining or increasing physical fitness, 4) self-pace, and 5) fee (free, 500 yen, or 10 km). A total of 18 exercise groups were created by the orthogonal table. The choice-based conjoint comprised nine choice tasks. Among these, participants were required to choose between two exercise groups or no-choice option. The utility was higher for females and university students than males, and those who had regular exercise habits. Specifically, females had higher utility for university students than males, and those who had regular exercise habits. The included exercise groups comprised five factors: 1) instructor (professionals, university students, or volunteers); 2) place (1, 5, or 10 km); 3) expected effect (maintaining or increasing physical fitness, 4) self-pace, and 5) fee (free, 500 yen, or 10 km). A total of 18 exercise groups were created by the orthogonal table. The choice-based conjoint comprised nine choice tasks. Among these, participants were required to choose between two exercise groups or no-choice option. The utility was higher for females and university students than males, and those who had regular exercise habits. Specifically, females had higher utility for university students than males, and those who had regular exercise habits.

Keywords: exercise intention, elderly individuals, conjoint analysis

Reasons behind Long-Term Continuation of Exercises among Senior Exercise Class Attendees

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[Aims] The objective of this study is to ascertain reasons for long-term exercise continuation among those who have continued exercising for a period of three years or more, with the attendees of a senior exercise class held at a university as participants. Clarifying why those who have engaged in exercises for a long period of time continue exercising will not only provide resource materials for supporting exercise continuation; doing so will also enable the examination of the practical value of exercise classes and student volunteers at universities. [Methods] The participants were those who attended senior exercise classes for three years or more continuously, with the participation conditions for the exercise classes being the following: 1) the participant was an elderly person aged between 65 and 75 years old residing within the same requirements as the university in which the classes were held, and 2) the participant was not prohibited from exercising. Continuation factors were examined by using a qualitative research method on “what they feel after having attended exercise classes for three or more years continuously.” [Results] The participants were 10 people (male: 4, female: 6), with a mean age of 72.3 ± 2.9 years. For the research result, 275 codes were extracted. From the 25 sub-categories, the following 6 categories were summarized: 1) change in self-awareness, 2) exercise content, 3) student staff members, 4) involvement of the municipality, 5) attendees, and 6) the university. Student volunteers, with whom the elderly could interact across generations, were a factor affecting class enjoyment. The exercise classes held at universities allowed the attendees to use the university’s enhanced facilities, which may have heightened the added value of continued exercise. [Conclusion] It was suggested that those who continue exercising over the long term perceive satisfaction from various factors within the environment surrounding the exercise class, which leads to continuation.

Keywords: exercise continuation

Conditioning evaluations using cardiac autonomic function

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[Background] To date, various types of fitness tests and movement analyses have been used to evaluate conditions in all sports, athletes of all ages, from an Olympic to recreational athletes. [Aim] The purpose of this study was to investigate a new conditioning evaluation method using cardiac autonomic function, i.e., heart rate variability (HRV), respiratory sinus arrhythmia (RSA), and interview of subjective fatigue or feeling of conditioning. [Method] An athlete from National team participated in this study. HRV was measured according to the following protocol: at rest in the supine position for 5 min, five deep breaths, at rest in the supine position for 3 min, postural change to standing position, at rest in the standing position for 3 min, and five deep breaths at the rate which each participant felt comfortable. At the time of measurement, the athlete was interviewed whether she had fatigue in the last few weeks and her feeling about conditioning. The ECG data were derived from the chest II leads using the Biopac MP36 data acquisition system. [Results] The interview of the athlete was conducted a few days before a national game that she has been aimed for. The athlete reported the needs of improvement of physical conditioning. Her heart rate decreased and showed increased cardiac sympathetic functions. [Conclusion] The novel finding of the present study is mind-body connection; subjective feelings can affect athlete’s physiological functioning, and we propose that the markers of cardiac autonomic function (i.e., heart rate, HRV, RSA) is a useful conditioning evaluation tool in athletes.

Keywords: HRV, RSA, autonomic nerve, conditioning, archery
381. Exercise practices and environment of college students between Japan and China for developing health promotion

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[Aims] The physical strength and mental condition of young generation are not satisfactory. There are concerns about their confidence in their strength and their future health. [Methods] This survey was conducted targeting eight Japanese universities and five Chinese universities, and responses were obtained from 3,950 students (2,341 males and 1,609 females) respondents. They were surveyed regarding their exercise practices, factors influencing these, and the correlation between daily habits and health. The surveys were compared to establish basic data for the purpose of formulating health promotion policy for future generations of young people. [Results] Although Japanese students, both male and female, were more involved in sports than Chinese students, exercise practices were better in Chinese students. Female Japanese students were distinguished between those who exercise regularly, and those who have no plans to exercise. “Physical strength/health promotion” was the goal of exercise practices at a high rate in both countries, but for Chinese students, the status of exercising environment, daily habits, confidence in physical strength, and health was good overall. [Conclusions] This study suggested the success of efforts in China to issue a five-year health plan (as part of the 2011) for the purpose of promoting exercise practices and to establish exercising environment. At the same time, it was suggested that organization leadership needs to establish a sports environment in order to improve daily habits and health in Japanese students.

Keywords: SNS, health class, acquiring health information

382. Preoperative weight loss support by nurses as surgery preparation for colorectal cancer outpatients: A qualitative interview study

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[Aims] This study elucidated inhibitory and promotional factors for patient weight loss based on investigation of preoperative weight loss support by nurses for colorectal cancer outpatients as preparation for surgery. [Methods] This mixed method research interviewed five nurses who provided preoperative weight loss support to outpatients with a body mass index of ≥25 kg/m2 scheduled for an elective colorectal cancer surgery. [Results] The body weight of 26 patients significantly decreased from 79.8 (15.6) kg at baseline to 75.7 (14.3) kg at the time of surgery (p < 0.05); their weight loss percentage was −4.9%. In 14 patients, the weight loss percentage was −5% or more. Additionally, four patients who had −8.8% or more weight loss did not manifest surgical site infection. In the content analysis by a focus group interview of such nurses, following four weight loss promotional factors were found: rebound experience, knowledge acquisition about obesity and postoperative complications, family support, and alleviation of knee osteoarthritis and low back pain, whereas following three weight loss inhibitory factors were found: weight loss from preoperative surgery visits, motivation for weight loss, and time and duration required for weight loss. [Conclusions] These weight loss inhibitory factors indicated that support that could improve weight loss efficiency needed to be implemented from prior to surgery.

383. Viewing pattern of person acquiring health information using SNS, and their characteristics

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[Aim] The purpose of this study was to clarify on characteristics of persons acquiring health information via Social Network Services and their viewing patterns. [Methods] The subjects were 66 participating in health classes. An existing free communication application was used to disseminate the health information. Articles were posted for 14 weeks. The subjects were measured of the subjective health by questionnaire, rate of participation in health class, body composition and physical fitness level. [Results] The H group showed a higher level of participation in health class than the L group (p < 0.05). Focusing on the viewing pattern of the H group, a higher proportion of high viewing participants viewed articles within 24 hours after they were posted and tended to view articles at the same time of day. [Conclusion] These results suggest the possibility that subjects with a high rate of acquisition of health information have a high rate of participation in health class and are more able to actively manage their health.

Keywords: SNS, health class, acquiring health information

384. Estimating energy expenditure during regular work by firefighters

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[Aim] Long-term disaster activities such as the recent large-scale fires in Itoigawa City and the ASKUL warehouse fire in Saitama Prefecture are endless. In such a long-time disaster during regular work, it is most important to replenish nutrients so that firefighters can perform well. However, due to the large number of daily disasters, it is difficult to eat on time, and firefighters are extremely hungry, which can lead to poor physical condition and reduced physical activity. Therefore, it is extremely important to understand the energy expenditure of regular work. The purpose of this study was to estimate energy expenditure during regular work and use it as an index of energy intake. [Methods] We measured a total of 880 regular works energy expenditure for 55 firefighters who were on work 24 hours a day using an accelerometer (OMRON HJA-750C) and an activity recording questionnaire. [Results] The average energy expenditure for 24 hours per work was 3237 ± 430 kcal, and the maximum value among all firefighters was 4776 kcal. [Conclusions] This study revealed that the energy expenditure of firefighters during regular work was very high. Therefore, in order not to run out of energy intake, it is necessary to immediately prepare a situation where it can be taken at any time.

Keywords: Firefighters, Energy expenditure, Regular work
ever, these changes were not observed when replacing SB with LPA in vitality scores (B = 0.395) and arousal scores (B = 0.322). How­
temporal substitution model was performed to estimate the effects of replacing 30 min/day of SB with LPA resulted in a significant increase (P<0.05) in two-dimensional mood scale were used including vitality, stability, pleasure, and arousal. Multiple regression analysis utilizing an iso­temporal substitution model was performed to estimate the effects of replacing one activity with another for the same amount of time. Data were collected in 30-minute intervals, and covariates included age, sex, and sleep medication. [Results] In this study, replacing 30 min/day of SB with LPA resulted in a significant increase (P<0.05) in vitality scores (B = 0.395) and arousal scores (B = 0.322). However, these changes were not observed when replacing SB with MVPA. Conversely, similar significant associations between stability and pleasure were not observed when replacing SB with LPA and MVPA. [Conclusions] These results indicate that substituting 30 min/day of SB with LPA is possibly associated with vitality and arousal in middle-aged and older individuals.

Keywords: mood, sedentary behavior, isotemporal substitution model

The relationship between the levels of negative feeling and the characteristics of facial expression drawing

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[Aims] It is highly important to develop an easy assessment tool that can be freely expressed and can be objectively evaluated. Therefore, this study aimed to examine the relationship between levels of negative feeling (N feeling) and characteristics of mouth parts when feeling is drawn as facial expressions. [Methods] A questionnaire survey consisting of participant characteristics, the Japanese version of Profile of Mood States 2nd Edition-Adult Short (POMS 2R-A), and Facial Expression Drawing sheet was conducted for university students, and 1069 were analyzed. Drawn sheets were imported into a PC, and mouth characteristics, such as lengths of drawn line and between both corners, circularity, and roundness, were manually assessed by using an image-analysis software. [Results] Based on TMD scores as an index of N feeling, the participants were divided into four groups: Low-, Average-, High-, and Very high-groups. The lengths of drawn line and between both corners, circularity, and roundness were significantly higher in Low group than in the other groups. With the levels of N feeling increasing, significant decreasing trends were observed in the lengths of drawn line and between both corners. [Conclusions] These findings suggest that levels of N feeling relate to characteristics of mouth parts when feeling is drawn as facial expressions.

Keywords: feeling, facial expression, drawing
389. Influences of communication of face to face with friends on health related indicators in older people: Cross-sectional study
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[Aims] To examine influences of regular communication of face-to-face with friends on arterial stiffness and cognitive function in older people. [Methods] Participants were 163 older people (male of 62-94 years old and female of 61-91 years old) living in Kawakami village, Yoshino-gun, Nara Prefecture. Arterial stiffness (carotid-ankle vascular index; CAVI), cognitive function (Cognitive Assessment for Dementia iPad version; CADi and pegboard test), physical fitness (Sit-and-reach and walking speed), and lifestyle questionnaires were assessed. In the lifestyle questionnaires, based on the answer of "how many friends do you meet and talk at least once a month?", the participants divided into four groups; no interaction-, low communication-, middle communication-, and high communication-groups. [Results] No significant differences in CAVI and physical fitness were observed among each group. However, the scores of pegboard test were significantly higher in the low- and high-communication groups than in the non-communication group. Significant increasing trend was found in pegboard. Although no significant difference in CADi score was observed among groups, CADi scores tended to be higher in the low- and high-communication groups than in the non-communication group. [Conclusion] Our results suggest that high-frequency communication of face-to-face with friends could relate to an increase in hand-finger dexterity in older people.

Keywords: physical fitness, abdominal obesity, prevalent diabetes

390. Cardiorespiratory fitness and visceral fat on prevalent diabetes in Japanese adults: WASE-DA’S Health Study
Chiyoko Usui1, Ryoko Kawakami1, Kumpei Tanisawa1, Hiroki Tabata1, Tomoko Ito1, Satoshi Iizuka1, Takui Kawamura1, Taishi Midoriwaka1,2, Susumu Sawada1, Suguru Torii1, Shizuo Sakamoto1, Katsuhiko Suzuki1, Kaori Ishi1, Koichiro Oka1, Mitsuru Higuchi1

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[Aims] The purpose of this cross-sectional study was to evaluate the relationship of cardiorespiratory fitness (CRF) and visceral fat area (VF) with the prevalence of pre-diabetes and diabetes. [Methods] The study population included 991 adults (median age 54 years) who participated in the WASEDA’S Health Study. CRF was evaluated based on the maximum oxygen uptake measured with a cycle ergometer exercise test, and was divided into tertiles according to CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into two groups (low VF, high VF) using median VF. CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into tertiles according to CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into two groups (low VF, high VF) using median VF. CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into tertiles according to CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into two groups (low VF, high VF) using median VF. CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into tertiles according to CRF by sex. VF was measured on MRI at the level of umbilicus, and was divided into two groups (low VF, high VF) using median VF. CRF and the prevalence of pre-diabetes and diabetes. [Results] There were 117 adults with pre-diabetes or diabetes. A negative relationship was shown between CRF and the prevalence of pre-diabetes and diabetes (P for trend = 0.04). In stratified analysis by VF status, the high VF group showed no significant relationship (P for trend = 0.44). [Conclusion] Lower cardiorespiratory fitness was associated with a higher prevalence of pre-diabetes and diabetes, especially in Japanese adults with high visceral fat.

Keywords: physical fitness, abdominal obesity, prevalent diabetes

391. Changes in physical activity, sedentary behavior, and cardiometabolic risk factors among employees by office relocation including height adjustable desk and activity-based working
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[Aim] Office environment can affect physical activity (PA) and sedentary behavior (SB) of employees. Impact of change in office environment, however, remains unclear. This study, thus, aimed to examine the effect of change in office environment on PA, SB, and cardiometabolic risk factors among employees. [Methods] The sample, consisting of 95 employees of the same company, was transferred to a renewed office, which adopted height adjustable desks and activity-based working (ABW). ABW allows employees to choose workstations depending on their mood or tasks. Cardiometabolic risk factors, including anthropometric indexes, blood pressure, and glucose and lipid metabolism indicators, were measured at an annual health checkup. The control group, constituting 2975 employees, participated in the same health checkup as the relocation group. Propensity score matching was adopted to enhance the comparability between the two groups. PA and SB in the relocation group were evaluated before and after the relocation. [Results] PA and SB significantly improved after the relocation. Two-way ANOVA revealed significant interactions in waist circumference, diastolic blood pressure, HDL cholesterol, and HbA1c, and the relocation group maintained or improved the scores on these factors. [Conclusions] Incorporating an ABW environment could improve PA and SB, which may contribute to reduce the cardiometabolic risk among employees.

Keywords: occupational health, sitting behavior, sit-stand desk

392. Associations between neighborhood environment and lifestyle in preschool children
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[Aims] The aim of this study was to examine associations between neighborhood environment and lifestyle in preschool children. [Methods] This cross-sectional study was conducted in 2018. The study sample was 878 Japanese preschool children and their parents from Ena city, Gifu prefecture. Lifestyle and the built environment were examined using question items from Physical activity guidelines for preschool children in Japan and International Physical Activity Questionnaire Environmental Module. Multinomial logistic regression analysis was used to examine the associations between the built environment and lifestyle after adjustment for age, sex and relationship to the child. [Results] Data from 830 participants were analyzed. In multinomial logistic regression analysis, having a good lifestyle in children was associated with better walking facilities, often see exerciser, attractive aesthetics, and having exercised habits and eating breakfast with parents. [Conclusion] The associations between having a good lifestyle in children and their parents and better built environment were observed. These results suggest possible targets for environmental and household interventions to promote having a good lifestyle in preschool children.

Keywords: preschool children, lifestyle, neighborhood environment
A relationship between skin hardness and arterial stiffness in young people

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1Osaka Institute of Technology, 2Prefectural University of Kumamoto [Aims] Previous studies have reported that scores of sit-and-reach, as an index of body flexibility, relate to levels of arterial stiffness. Regular static stretching is also accepted to reduce arterial stiffness in middle-aged men. However, the physiological mechanisms underlying a relationship between flexibility and arterial stiffness have not yet been elucidated. Therefore, the present study aimed to examine a relationship between skin hardness and arterial stiffness in young people. [Methods] Subjects were 52 young healthy men and women (age, 21±1 years). Skin hardness was assessed by using an evertone sensing-device SOFTGRAM (SHINKO DENSHI CO., LTD.) at right periphery parts of antebrachial regions on the front and back and right cheek. Arterial stiffness was assessed by using baPWV (heart-brachial pulse wave velocity), haPWV (heartankle pulse wave velocity), and CAVI (Cardio-ankle vascular index). [Results] Each part of skin hardness did not significantly correlate with baPWV, haPWV, or CAVI. [Conclusions] Therefore, our results suggest that skin hardness would not relate to arterial stiffness, especially in young people.

Keywords: Cardio-ankle vascular index, Pulse wave velocity, Softgram

Comparison of circulating fatty acid binding protein 4 concentration in venous and capillary blood

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1Natl. Inst. Fitness & Sports in Kanoya, Kagoshima, Japan, 2Kyoto Pharm. Univ., Kyoto, Japan, 3Yamashina Takeida Racto Clinic, Kyoto, Japan [Aims] Circulating fatty acid binding protein 4 (FABP4) concentration is associated with various diseases. Moreover, the response of FABP4 concentration to acute exercise may reflect fat metabolism. Therefore, simple and less invasive techniques for assessment of FABP4 concentration are required in clinical research setting. The purpose of the present study was to assess the correlation of FABP4 concentration between venous and capillary blood in healthy young adults. [Methods] Twenty-eight healthy young adults (14 males and 14 females) aged from 20 to 26 years were recruited. Paired resting blood samples were taken from the cubital vein (venous) and fingertip (capillary) blood. FABP4 concentration in both bloods was analyzed by enzyme-linked immunosorbent assay. [Results] FABP4 concentration did not differ significantly between venous and capillary blood. Pearson’s correlation coefficient for FABP4 concentration between venous and capillary blood samples suggests strong correlation. The Bland & Altman plot showed a non-significant bias and the range of the 95% limits of agreement was narrow. [Conclusion] These results suggest that capillary blood sampling is useful for the assessment of FABP4 concentration in clinical research setting.

Keywords: blood concentration, reliability, Bland & Altman plot

Importance of self-control in a health promotion support system for relative moderate exercise intensity

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1Laboratory of Physical Science Inc., Fukuoka, Japan, 2Health Promotion Division, Chikuzen, Fukuoka, Japan [Aims] The study objective was to examine the effectiveness of self-control on a support system for relative moderate exercise intensity. The support system involved running at a pace which the runner can “pace challenge with smile” (PCS). (Methods) The intervention group (IG) comprised 29 subjects who participated in the PCS and the control group (CG) comprised 23 subjects who did not participate in the PCS. We conducted five PCS during a 3-month health promotion course. In the PCS, subjects adjusted their walking speed to moderate intensity solely by self-awareness. Relative moderate physical activity intensity was defined as a walking speed equivalent to 50% VO2 max. Daily physical activity in both groups was measured using a pedometer with an accelerometer from 1 week before the course to 1 month later. (Results) PCS performance in the IG improved significantly before and after the course (p<0.01). (Conclusion) This suggests that the ability to self-control exercise intensity improved. Relative moderate physical activity in daily life increased in both groups during the course. However, 1 month after the end of the course, the IG maintained the increase in relative moderate physical activity, whereas the CG significantly decreased their activity (p<0.01). (Conclusion) The findings suggest that a support system involving self-control is effective in promoting voluntary daily relative moderate-intensity exercise.

Keywords: self-control, relative moderate exercise intensity, health promotion

Association of objectively measured moderate-vigorous intensity physical activity with obesity in Japanese elementary school children

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1University of Yamashita, 2Kitasato University, 3Aichi Medical University [Aim] A paucity of material is available on the association of objectively measured physical activity (PA) with obesity in elementary school children. This study aimed to examine the association of objectively measured moderate-vigorous intensity physical activity (MVPA) with obesity in elementary school children. [Methods] In total, 287 fifth-grade children (aged 10-11 years) at 13 schools in Koshu, Yamashita Prefecture were included. Each PA parameter was stratified by recommended PA guideline (>=60 min/day of MVPA). Height and weight were measured at regular health check-ups. Obesity was defined as weight >=20% of the standard weight calculated by age, sex, and height. Poisson regression analysis was used to assess the association of MVPA with obesity after adjusting for age in months and socioeconomic status evaluated by a family affluence scale. [Results] Among 100 boys and 126 girls, obesity prevalence was 11.0% and 9.5%, respectively; 34.0% of boys and 49.2% of girls were <60 min/day of MVPA. In boys, the prevalence ratio (PR) of obesity higher in the <60 min/day of MVPA group than in the >=60 min/day of MVPA group (PR: 3.51, 95% confidence interval [CI]: 1.09-11.30). No significant association was found in girls (PR: 2.09, 95%CI: 0.63-6.94). [Conclusion] Low MVPA (<60 min/day) may be a risk factor for obesity in boys of fifth-grade children.

Keywords: objectively measured physical activity, obesity, children
397. Investigating how the psychological well-being of freshman university students changes relative to their physical fitness level over the course of one year
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[Purpose] The present study aimed to determine whether changes in psychological well-being over one year were related to physical fitness level in freshman university students. [Method] Immediately after enrolling in April 2018, 222 freshman university students underwent the new physical fitness test set by the Ministry of Education, Culture, Sports, Science and Technology and consisting of 8 physical performance tests. They were divided according to their physical fitness level and put into a high physical fitness group (n=59), a medium physical fitness group (n=94), and a low physical fitness group (n=69). Their psychological well-being was assessed by using each of the items (Anger-Hostility; AH, Confusion-Bewilderment; CB, Depression-Depression; DD, Fatigue-Inertia; FI, Tension-Anxiety; TA, Vigor-Activity; VA, Friendliness; F) comprising the Profile of Mood States (POMS). POMS2 was assessed twice in April 2018 during the first semester and February 2019 during the second semester. Statistical analysis applied a two-way covariance analysis with adjusted gender and physical activity. [Results] There were no interactions in each item of POMS2. However, a high physical fitness group showed significantly higher VA than a low physical fitness group in the second semester. The main effect of time was observed for AH and F, and AH increased and more than a low physical fitness group in the second semester. The main effect of time was observed for AH and F, and AH increased and

398. Relationships between sit-to-stand strength from chair standing and metabolic risk factors in middle-aged and older individuals who underwent a regional medical examination—The Wakayama Health Promotion Study—
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[Aims] Changes in muscular strength with age have been known to have a link to metabolic syndrome (MS)-related factors, such as hypertension and lipid metabolism disorder (Carrea-Rodriguez, 2018). The incidence of MS is lower in individuals with better strength of upper and lower limbs, regardless of BMI or age (Jura et al, 2005). Among strength of various muscles, relationships with the incidence of MS have been reported for knee extension strength, leg extension strength, and grip strength; however, the relationship between a measure of muscle strength approximating activities of daily living has not been clarified. In this study, relationships between sit-to-stand (STS) strength from chair standing (CS) and metabolic risk factors (accumulation of excess visceral fat, elevated blood pressure, elevated blood glucose, and lipid metabolism disorder) were examined in middle-aged and older men and women who underwent medical examinations for residents in Town K, Wakayama prefecture. [Methods] This study enrolled a total of 760 subjects comprising 315 men and 445 women aged 40–90 years who underwent regional medical examinations in 2016. The STS strength from CS was evaluated as a ratio between the maximum load on a force plate during one attempt and the body weight (SUI). The subjects were divided into three groups according to the tertile values of SUI, and analysis of covariance (ANCOVA) with age as a covariate was used to analyze possible associations of SUI levels with metabolic risk factors. [Results] The analysis showed significant intergroup differences in prevalence rates of accumulation of excess visceral fat in men and visceral fat accumulation, lipid metabolism disorder, and hyperglycemia in women (P<0.05), and revealed that prevalence rates of metabolic risk factors were lower among subjects with higher STS strength. [Conclusions] The result demonstrated that the STS strength from CS correlated with metabolic risk factors in different manners in men and women.

399. Efficacy of physical activity evaluation using an accelerometer in elementary schoolchildren
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[Aims] Few studies have examined the relationship between physical activity and other indicators such as obesity level in Japanese children. This study aimed to investigate the efficacy of physical activity evaluation using a triaxial accelerometer, and examine sex, obesity level, and regional differences among children from rural and urban elementary schools.

[Methods] The participants were 262 fifth or sixth graders (124 boys and 138 girls) from 5 schools in 2 rural areas and 1 urban area who had parent consent for participation. Height, weight, body composition (TANITA DC-217A), and physical activity were measured using a triaxial accelerometer (TANITA AM-161). The children wore the accelerometer during two consecutive weeks, and the data for the last week were analyzed. For the analysis, children whose step counts were <1000 were excluded, and 231 children (99 boys and 132 girls) were finally included.

[Results] The girls had significantly lower values for all the parameters than the boys. Living activity expenditure/weight and physical activity energy expenditure/total energy expenditure were significantly lower in the obese group than in the nonobese group. The urban schoolboys had significantly higher living activity expenditure/ weight than the rural schoolchildren.

[Conclusions] Differences in sex, obesity level, and school region could be evaluated with a triaxial accelerometer. Our results suggest the efficacy of physical activity evaluation using a tri-axial accelerometer.

400. Effects of sleep deprivation on arterial stiffness in healthy subjects
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[Aims] Sleep deprivation is associated with an increased risk of cardiovascular disease. However, little is known about the early effect of acute sleep deprivation on the arterial function. In the present study, we examined the effect of sleep deprivation on arterial stiffness and the profile of mood states in healthy subjects.

[Methods] Ten healthy, recreationally active adult males were studied under 2 experimental trials (8h regular sleep: RS, 4h partial sleep state: PS) on at 7 separate days. All subjects underwent evaluations of their brachial systolic and diastolic blood pressure (SBP / DBP), heart rate (HR), arm-to-ankle propagation velocity (PWV), and the Profile of Mood States (POMS) test was also applied for the subjects. All measurements were obtained immediately after waking up.

[Results] RS resulted in higher values of HR, SBP, and DBP than RS, but no significant differences were observed between the two trials.

[Conclusion] Even with transient PS, high values were observed for the SBP, DBP, and HR, suggesting that establishing regular sleep habits may lead to a reduced arterial function decline and cardiovascular disease risk.
401. Vascular Aging Index of the Finger Photoplethysmogram: A Validation study with acute mental stress and day-to-day variability
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Background: Daily assessment of vascular health may predict cardiovascular incidence. Vascular aging index (VAI) calculated from the second derivative of photoplethysmogram (SDPTG) is a simple, non-invasive measurement possibly reflecting vascular stiffness. However, the effects of mental stress and day-to-day variability on VAI remain unclear. Purpose: To determine whether VAI measured by finger SDPTG is altered by acute mental stress and affected by day-to-day variability. Methods: Finger photoplethysmogram was measured in 68 healthy subjects (age=22-64 years) of whom 31 subjects were tested during a 30-second mental arithmetic and 10 subjects underwent day-to-day variability assessment for 5 consecutive days. VAI was calculated from a 20-second segment of photoplethysmogram data. [Results]: During mental arithmetic, VAI increased when compared with the control condition (P=0.032) while heart rate was also increased with mental stress. Five-day measurements of VAI demonstrated the overall coefficient of variation of 21.1±13.7% across all subjects. In subjects whose VAI measurements were performed before 10 AM, the coefficient of variation was lower than those measured after 10 AM. Conclusions: VAI calculated from the finger SDPTG is sensitive to mental stress with fair day-to-day variability. These findings suggest that VAI assessment needs to be performed at the quiet resting condition.

402. Effect of breakfast skipping and irregular sleep-wake rhythm on energy balance during daily life in Japanese female university students
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[Aims] The aim of this study was to investigate the effect of breakfast skipping on energy balance and irregular sleep-wake rhythm during daily life. [Methods] Thirty-one female university students conducted two 7-days free-living recording sessions during the follicular and luteal phases. During the sessions, participants recorded food intake (mobile phone photographs and text messages), and physical activity (PA: Actigraph, AMI). Energy intake (EI) and energy expenditure (EE) was estimated from food records and PA. In this study, we divided participants into two groups: breakfast skipper (BS group; skipping breakfast more than two days a week) and breakfast eater (BE group). We compared EI (for each meal and daily), EE (daily), PA after midnight (0:30-5:30), and negative peak time of PA fluctuation cycle between BS and BE groups. [Result] EI at breakfast for BS group was significantly larger than that for BS group, and EI with all snacks for BE group tended to be smaller than that for BS group. Also there were no significant differences in EI at lunch, EI at dinner, daily EI, and daily EE between two groups. PA after midnight for BS group tended to be larger than for BE group, and negative peak time of PA for BS group was significantly later than that for BE group. [Conclusion] BS group compensates for EI deficit at breakfast with all snacks, and increases PA after midnight due to delay of sleep-wake rhythm.

Keywords: Breakfast skipping, energy intake, physical activity

403. Association of 7 types of physical fitness and occupational activity level in workers of car manufacturing industry
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[Aims] Physical fitness may be associated with work ability and presentism. On the other hand, many studies suggested that high occupational activity promoted the reduction of physical fitness and increased risk of mortality. Measuring physical fitness level and occupational activity and sedentary behavior would be important for health and safety of workers. The purpose of this study was to investigate physical fitness, occupational activity and sedentary work time in workers of a car manufacturing industry. [Methods] Male workers in a car manufacturing industry (n=885) aged 35 to 59 years participated in this study. The participants were divided into non-clerical and clerical workers (office and technical workers). Non-clerical workers were further divided according to their work category as line work, supervision and assist of line work, transporting, maintenance, leading, and sedentary work. The participants of missing data, dialysis patient, or engaging unclassified works were excluded. The occupational physical activity and sedentary behavior levels were assessed using triaxial accelerometer (Active style Pro HFA-750C, Omron Healthcare). The participants attached the accelerometer during work time more than 8h at least 3 work days. We adopted 10 sec. for epoch time length. Physical fitness performances including 30 sec. chair-stand (muscle endurance), handgrip strength (upper limb muscle strength), toe flexor strength (lower limb muscle strength), 20 sec. seated stepping (agility), and 2-step test (balance), sit-and-reach test (flexibility), and Minnesota test (dexterity) were also measured. [Results] The rank order of moderate to vigorous physical activity (>3.0 METs) time was “line work” > “supervision and assist of line work” and “transporting” > “maintenance” and “leading” > “sedentary works” > “office and technical works”. The age and BMI-adjusted fitness performance levels including 30 sec. chair-stand, handgrip strength, toe flexor strength, 20 sec. seated stepping, and 2-step test were lower in line workers. These fitness performances were negatively associated with low (1.6-2.9 METs), moderate to vigorous, and total physical activity times, and positively associated with sedentary behavior time (<1.6 METs) during work. [Conclusions] The results suggested that occupational activity of male workers in a car manufacturing industry was negatively related to physical fitness.

Keywords: occupational activity, physical fitness, sedentary work

404. Physical fitness level and need for promoting physical activity in colorectal cancer survivors with stoma
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[Aims] Survivors of colorectal cancer in Japan are becoming aged. Colorectal cancer patients with stoma construction are reported to have reduced physical activity, but there are no prior studies on the level of physical fitness. Clarifying physical fitness levels can help maintain and improve physical activity in colorectal cancer patients. This study was aimed at comprehensively grasping the physical fitness level of stoma carriers using physical fitness age. [Method] We measured the one leg standing time with the eyes open and close, grip strength, front and back steps, the 30-sec chair-stand test, chair-arching body ante flexion, and age estimation formula Was used. We also surveyed their exercise habits. Paired t-test was used for testing the difference between chronological age and physical fitness age. [Results] The chronological age of 17 subjects (six women) was the median 77 (minimum 57 - maximum 82). The physical fitness age was 83 (48-104) years, which was significantly higher than the chronological age (p<0.001). In addition, standing with one foot closed (equilibrium) was the worst. Eleven (64.7%) responded that they had exercise habits after surgery. [Conclusions] The physical fitness age of stoma holders was higher than the chronological age. This suggests that it is necessary to continue exercise habits and exercise to maintain physical activity.
405. Body image, dietary habits and anemia of females
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[Background] Japan places emphasis on the viewpoint of reproductive health and rights, and promotes measures to maintain and promote women’s health throughout their lives by building a women’s health education and consultation system and a system for addressing issues at each life stage. [Purpose] The thinness of young women has been a problem in recent years. It is possible that dietary restrictions are related to health problems such as the onset of anemia. Therefore, we conducted a survey of junior college female students and aimed to obtain basic materials for maintaining and improving the health of women throughout their lives. [Method] Subjects were 142 students at a junior college; they were surveyed on food intake frequency questionnaire (Excel Eiyo-kun FFQg :Kenpakuha). Hemoglobin estimated value measurement (ASTRIMUM FIT:Sysmex Corporation), and questionnaire survey. SPSS Statistics 16.0 was used for statistical analysis. Statistical significance level was less than 5%. [RESULTS] 30.3% of the students had hemoglobin estimates less than 12 g/dl. The average BMI was 21.3. But 77.5% of those who were dissatisfied with their weight, 68.3% of those who thought they needed to lose weight. Those with severe menstrual pain had significantly lower intakes of energy, protein, carbohydrates, and iron (p<0.05). [Conclusion] The necessity of health and nutrition education was suggested from the fact that there was a possibility of health problems due to incorrect body image and diet.

Keywords: body image, anemia, dietary habits

407. Effect of daily vigorous-intensity physical activity on brown adipose tissue density in the supraclavicular region
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[Aims] Brown adipose tissue (BAT) increases adaptive heat production during cold exposure and dietary intake. BAT is reported to be activated by increased secretion of catecholamine and myokines induced by exercise. But, there are few studies focusing on the effect of the intensity of physical activity on BAT activity. In this study, we investigated the effect of high-intensity physical activity on BAT density (BAT-d). [Methods] Three hundred fifty-eight subjects (135 males; 43 ± 13 years old, 223 females; 46 ± 16 years old, mean ± standard deviation) were categorized by age and gender. Using the International Physical Activity Questionnaire (IPAQ), we compared BAT-d in the following two groups: a group for performing all intensities (walking, moderate, and vigorous physical activity, WMV group) and a group for W and M intensities (WM group). The BAT-d of the supraclavicular region was measured using near-infrared time-resolved spectroscopy in winter (Nirengi et al, 2015). [Results] BAT-d (70.8 ± 24.3 μM) in WMV group was significantly higher than that in WM group (63.0 ± 20.4 μM) (p<0.01). There was no difference in BAT-d by age (p = 0.19), but BAT-d in males was significantly higher than that of females (p<0.05). [Conclusion] The results suggest that daily high-intensity physical activity may contribute to the increase in BAT-d.

Keywords: near-infrared time-resolved spectroscopy, brown adipose tissue density, physical activity

408. Physical activity and sedentary time in first and fourth grade university students
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[Aims] Prolonged sedentary time (ST) has demonstrated consistent associations with increased risk of metabolic disease and mortality, but ST in university students has not been greatly studied. The purpose of this study was to investigate the physical activity (PA) and ST in first and fourth grade university students who do not have exercise habit. In addition, the grade difference of ST according to the amount of PA was also examined. [Methods] The subjects were forty-three freshman and thirty-four fourth grade students. PA and ST were measured for one week. Based on the amount of PA, subjects were classified into a high activity group (HG, >23Mets·hour/w) and a low activity group (LG). [RESULTS] The subjects who were above 23Mets·hour/w were 63.6% in first-grade students and 38.2% in fourth-grade students respectively (p<0.028). Weekday ST was significantly shorter in fourth-grade (p=0.026), but there was no difference in holiday ST. In HG, there were no grade difference in ST on weekday and holiday, but in LG, weekday ST was significantly shorter in fourth-grade (p=0.045). [Conclusions] The fourth-grade students had less moderate to vigorous PA per week, but ST on weekday was shorter than first-grade students. It was suggested that the short ST in LG affects the shortness of ST in fourth-grade students.

Survey on Acupuncture for Tsukuba Marathon Participants -Challenges and Prospects as Sports Acupuncture-
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[Background] There are many sport scenes in which acupuncture is used such as marathon, and it is known as useful for maintaining and improving condition and performance. Acupuncture has been shown to be useful for skeletal muscle fatigue and psychosomatic recovery, but the recognition is still low. [Purpose] We asked the athletes who came to the Volunteer Booth at the Marathon about their awareness of acupuncture and measured improvement of their awareness. [Method] The subjects were 191 athletes who came to Volunteer Booth sponsored by the Ibaraki Acupuncturist Association at the 38th Tsukuba Marathon. In the survey, we prepared questionnaires regarding the recognition of acupuncture. Unanswered questions were not included in the analysis and a chi-square test was performed. [Results] The percentage of athletes who had experienced acupuncture treatment once or more responded that they had a good impression of acupuncture was high in full marathon participants. In addition, athletes who had experienced acupuncture treatment in the past showed a higher level of recognition of acupuncture (sports, beauty, infertility treatment, insurance application, etc.) than athletes who had never experienced it. [Conclusion] The results suggest that the experience of acupuncture may improve understanding of sports acupuncture and acupuncturists. Therefore, experience of acupuncture treatment is an important factor for improving the recognition of sports acupuncture.
409. From nail weight density measurements in search of seasonal variation in nail growth
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[Background / Purpose] We have reported that nails grew faster in summer and slower in winter. The weight of clipped nails showed a difference of 1.1 times, while longitudinal development rates toward the tip along the nail bed showed a larger seasonal difference of 1.3 times. To resolve the cause of the larger variation in the longitudinal development rates, we examined the seasonal variation in the volume and density of the nails with the Archimedes method. [Method] We weighed the clipped nail at 0.01 mg resolution with a chemical balance (A&D, GH-202) in air and then in pure water to extract buoyancy, which reflects the excluded volume of the nails. [Result] The average density over a year was 1.24 ± 0.05 mg/μL. Seasonal variation was not significant in nail volume but the nails clipped in winter showed a slightly higher density. Actually, nails soaked in KI solution of a critical density demonstrated substantial differences in the nail density. Careful observation of the evaporating process of water from the nails once immersed in water for buoyancy measurements revealed that the high density nails adsorbed a larger amount of water at an evaporation resistive state. [Discussion] Seasonal variation of wet volume of clipped nails was not as significant as that of their development rates along the nail bed. When the weight of adsorbed water is taken into account, seasonal variation of the density of wet nail would possibly demonstrate a more significant seasonal variation.
Keywords: nail, density, seasonal variation

411. The effects of exercise on stress and mood of workers
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[Aims] The purpose of this study was to examine the effects of exercise on stress and mood of workers. [Method] Participants were 37 office workers who were randomly assigned to either exercise group (EG) or control group (CG). In prior to start the experiment, a questionnaire survey for exercise, working hours, job stress and mood was conducted for all participants. EG was exposed to 30minutes of moderate intensity exercise per week for 4weeks. Mood of immediately before and after exercise was examined by using Two-dimensional Mood Scale-Short Term. Mood after 4weeks intervention was assessed by Profile of Mood States Second Edition (POMS2). [Results] Participants who have exercise habits decreases in Pace in the Final stage of a Marathon
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[Aim] The purpose of this study was to investigate the relationships between stride length, stride rate, muscle damage and the rate of decrease in pace in the final stage of a marathon. [Methods] Twenty-three healthy, male non-professional runners who participated in the 38th Tsukuba Full-Marathon race (Tsukuba-city Japan) were recruited as volunteers. They ran with a GPS watch and a heart rate band with a built-in accelerometer. Stride rate and stride length were obtained from the watch. Serum creatine kinase (CK), Myoglobin (Mb), and C-reactive protein (CRP) concentration, as well as systemic fatigue and muscle soreness, were measured before, immediately after, and 1 day after the event. [Results] We defined the Opening stage as the segment from 5 to 10 km and the Final stage as the segment from 35 to 40 km, and calculated the ratio of change in pace. The ratio of change in pace significantly negatively correlated with time and positively correlated with the ratio of change in stride rate and stride length. Total steps during the marathon significantly positively correlated with time, as well as CK, Mb and CRP one day after the marathon. [Conclusions] The present results suggest that the decreasing rate of pace in the Final stage was affected the ratio in stride rate and stride length, and that the increase in total steps during a marathon might have induced muscle damage.
Keywords: Muscle damage, Hitting the wall, Creatine kinase
413. Examination of method to improve cognitive function
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[Aims] Exercise increases cerebral blood flow and improves executive function. Recent study reported that cerebral blood flow increases after exercise even with low intensity exercise for less than 10 minutes. Moreover, it has been reported that finger movement has a very low exercise intensity and stimulates the frontal lobe well. Thus, finger movement may increase cerebral blood flow and improve executive function. This present study investigated acute effect of finger movement on executive function. [Methods] Seven healthy young adults (23.6 ± 1.6 years) performed finger movement (FM) for 5 minutes and control (seated rest) for 5 minutes each trial. The new Stroop test II (executive function) and the Miyake’s paired verbal learning task (short-term memory) was measured at baseline and immediately after exercise. The regional cerebral blood flow was evaluated using Hemo-dynamics by NIRS, and was measured during each test and exercise. [Results] The new Stroop tests II was improved only in after the FM trial (p=0.001). However, the Miyake’s paired verbal learning test did not significantly difference between trial and after exercise. Also, the regional cerebral blood flow did not significantly differ between them. [Conclusions] Acute finger movement improve the executive function in healthy young adults. These results suggest that finger movement may be effective as an exercise prescription for prevention of dementia.

Keywords : exercise, cognitive function, executive function

414. Cross-cultural comparison of body image and weight loss behavior in Asian Female Adolescents
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Background: Having a positive body image and healthy weight loss is beneficial to physical and mental health of adolescents. Objective: This study aimed to investigate the body image and weight loss behavior of Asian female adolescents and the differences in 8 Asian metropolitan cities. Methods: 5,970 youth aged 12 to 15 years from 8 cities (Hong Kong: HKG, Tokyo: TKY, Shanghai: SIH, Taipei: TPE, Bangkok: BKK, Kuala Lumpur: KUL, Seoul: SEL, and Singapore: SG), Body image and weight loss behavior was investigated by 5 questions. The t-test was used for comparison. Results: 49.9% of participants considered body image as overweight (SHH: 39.9% - KUL: 56.8%). The rate of actual overweight was 23.7% (TKY: 15.5% - SEL: 34.1%). 39.1% of participants disliked their body shape (TPE: 26.6% - KUL: 59.2%). 20.6% of the participants often tried to lose weight (TKY: 3.4% - SEL: 39.4%). To lose weight, 15.5% of the subjects preferred to eat less or not eat (TKY: 4.1% - SEL: 33.2%). 17.5% of the subjects achieved 60 minutes of daily MVPA (TKY: 36.6% - SEL: 11.3%). Conclusion: There were significant differences both in body image and weight loss behavior in female adolescents among 8 cities. In these cities, health educators and researchers should pay high attention to the high prevalence of body-imaged overweight and extreme weight loss behavior among female adolescents. Funding Acknowledgement: This work was funded by the NUS Initiative to Improve Health in Asia (NIHA) research grant (NIHA-2011-1-007).

Keywords : Overweight and obesity, Physical activity, Healthy lifestyle

415. Standing hip joint rotation angle measurement method and hip joint rotation exercise
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[Aims] Rotational movement is a repetitive antagonistic movement (Diadochale movement, Diadochokinesis) related to the posture control system controlled by the cerebellar basal ganglia system. Here, we report the results obtained from the instructors about the case where the rotation movement is incorporated. [Methods] The subjects were 9 elderly women and 4 men who attended a care prevention exercise class. There, a rotating movement for warm-up and cool-down was performed before and after the main movement. For exercise, the hip joint was rotated once a week for one year on a commercially available rotating disk while holding a bar. [Results] More than two months after the start of the rotation exercise for warm-up and cool-down, all of them were able to perform both internal and external rotations at the same time. A year later, it became easier to rotate. They also improved their posture. The physical fitness test was better than 1 year ago in all 8 items, and the results were the same as or better than 3 years before except for standing on one leg with eyes open. [Conclusion] The standing hip rotation exercise is a repetitive exercise of light stretching and relaxation on the muscles throughout the body. In addition, it is suggested that good test results were partly due to easiness of the performed exercises.

Keywords : standing hip rotation movement, repetitive antagonistic movement, motivation of exercise habits

416. Relationships between the ability of mastication and physical fitness in university students
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[Aims] Chewing ability, biting force, masticatory muscles and forces are important for sports. It is known that strong masticatory muscle activity is manifested by volleyball spikess, handball shots and strong golf swings. The purpose of this study was to clarify the state of masticatory ability, and to clarify the relationship between the ability of mastication and physical fitness in university students. [Methods] The participants were female university students in this study. [Conclusions] Chewing ability check gum (manufactured by Lotte) was used to measure the ability of mastication. The results of the physical fitness test were used as index of physical fitness. [Results] It was understood that there was no subject with extremely low chewing ability in this study. In addition, there was no significant relationship between current regular exercise habits and masticatory ability. As for the relationship between masticatory ability and physical fitness test, those with strong masticatory ability showed significantly faster in 50m-dash running, the number of times in upper body wake-up test was higher for higher students than for students with lower mastication ability. [Conclusions] The characteristics of physical fitness test related to mastication ability are strength and stickiness. It is known that the element of biting in the chewing ability is related to those fitness test. The chewing movement contributes to the stability of posture maintenance of the whole body, and is therefore effective in maintaining the posture at the start of 50m-dash and upper body wake-up. Therefore, it was considered that there was a relationship between masticatory ability and these tests results.

Keywords : Mastication ability, University students, Physical fitness test
417. Are Lower-leg and Thigh Muscle Resistance Training Methods Equally Effective to Dynamic Balance and Fear of Falling for Community-Dwelling Elderly Females?

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PURPOSE: To compare the magnitude of lower-leg training program and thigh muscle training program to dynamic balance ability changes for community-dwelling elderly Japanese women. METHODS: The subjects were divided into a lower-leg training group (LLG; 10 females, 72.9±4.2 yrs, BMI 22.1±1.8) and a thigh muscle training group (TMG; 10 females, 70.6±2.5 yrs, BMI 22.1±1.2). The program was 60min. two times per week for 16 weeks. LLG participated in the program using unstable disk and elastic band. TMG learned program was to strengthen their thigh muscles with elastic band. Dynamic balance ability was measured by one-leg standing with their eyes open, the area covering and total length of the center of gravity sway (COP) with eyes open or close by stabilometer. Knee extension strength was evaluated. Questioner evaluated fear of falling score. Student’s t-test and two-way repeated measures ANOVA were used to test the effectiveness. RESULTS: The class participation rates were 82± 4% and 81± 8% and home participation rates were 85± 20% and 41± 24% respectively. One-leg standing time with their eyes open (P=0.038), area covering of COP with eyes open (P=0.009), total length of COP (P=0.046) improved significantly in LLG. TMG knee extension strength improved significantly (P=0.029). Fear of falling score reduced to same. CONCLUSIONS: Lower-leg muscle training was found more effective to improve dynamic balance ability than thigh muscle training for community-dwelling females.

418. A relationship between walking speed and arterial stiffness in elderly people

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[Aims] The present study aimed to examine a relationship between walking speed and arterial stiffness in elderly people. [Methods] Participants were 354 Japanese community dwellers aged >65 y in Osaka and Kawakami village, Nara (age, 76 ± 1 years). In physical fitness test, the participants walked 6 m as fast as possible without running, and walking speed calculated as the ratio between distance and time. Arterial stiffness was assessed by using CAVI (Cardio-ankle vascular index), baPWV (brachial-ankle pulse wave velocity), haPWV (heart-ankle pulse wave velocity), and hhPWV (heart-brachial pulse wave velocity). [Results] Walking speed were significantly correlated with the scores of CAVI, baPWV, and haPWV (All p < 0.05). Based on tertiles of the walking speed, participants were divided into three groups (lower (LQ), middle (MQ), and upper (UQ)). CAVI, baPWV, and haPWV were significantly higher in LQ than in MQ and UQ (All p<0.01). With the level of walking speed increasing, a significant decreased trend was observed (p<0.01). However, no significant difference and trend were found only in the hhPWV. [Conclusions] Our results suggest that a reduction in walking speed relates to an increase in arterial stiffness. In addition, these results indicate that walking speed-arterial stiffness relationship can vary at different sites.

Keywords: cardio-ankle vascular index, locomotion, pulse wave velocity

419. Characteristics of the elderly with exercise habits according to the timing of daily walking

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[Aim] The purpose of this study was to clarify the difference in characteristics between elderly people who often walk in the morning and those who often walk in the evening. [Methods] Ninety-four elderly men and women over 65 years old participated in this study. All participants wore a pedometer (HJA-326F, Omron Healthcare) to measure daily steps and bout steps (walking periods lasting at least 10 minutes or longer at a pace of at least 60 steps per minute) for two weeks. Based on the results of the bout steps, participants were classified into: the morning walking group (MW group: n = 32), the evening walking group (EW group: n = 23), and the irregular walking group (IW group: n = 39).

[Results] There were no differences in daily steps and bout steps between the MW group and the EW group. Grip strength, one-leg standing time with eyes open and 6-min walk in the EW group were significantly higher than those of the IW group. It was found that the MW group always walk alone in the same place, and the EW group walk in unspecified places with someone.

As for sleep, the EW group had a late wake-up time and bedtime, and tended to have poor sleep quality.

[Conclusion] These findings suggest that elderly people with evening walking habits had a high level of physical fitness but had a negative effect on their quality of sleep.

420. A mainstream cigarette smoke extract affects skeletal muscle atrophy in mice

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[Aims] The purpose of our research is the effect of cigarette mainstream smoke on skeletal muscle atrophy and the effect of voluntary exercise after smoke exposure. [Methods] Mainstream smoke extract was dissolved in PBS. Seven-week-old C57BL/6d were divided into three groups: 1)control group (C); 2)cigarette smoke extract administered intraperitoneally once a week (T); 3)cigarette smoke extract administered + voluntary exercise group (T + Ex), and raised for 3 weeks. Lower limb muscles were extracted after the period, and mRNA expression of the muscle atrophy markers, Muscle RING-Finger Protein (MuRF)1 and Muscle F-box Protein (Atrogin)-1 were measured. [Results] In the T group, the MuRF1 gene expression level was significantly increased as compared to the C. As well as MuRF1, Atrogin-1 gene expression level was also significantly higher than that of C, and the cigarette smoke extract administration increased the expression of muscle atrophy related genes. In the T + Ex group, the MuRF1 gene expression level was significantly lower than in the T group, suggesting that exercise suppresses muscle atrophy caused by the administration of cigarette smoke extract. [Conclusions] The mainstream cigarette smoke promote skeletal muscle atrophy. It may accelerate to become sarcopenia in the future, in addition, an exercise can be a suitable way to suppress it.

Keywords: Smoking, Muscle, Atrophy

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[Amis] The study aimed at examining changes in eating habits by conducting a self-assessment of dietary habits using university student athletes. [Methods] The subjects were 348 students (236 boys, 112 girls) who live alone among the first-graders belonging to T University Sports Club Movement Division. The survey periods were April (1st), May (2nd), and June (3rd) in 2018 and 2019. They were asked to self-evaluate their meals (categories given below) using dietary assessment self-check-sheet (Omi et al., 2008). They selected one version among 4 version (Ver.1800kcal, Ver.2500kcal, Ver.3500kcal, Ver.4500kcal) in consideration of their own physique.  

[Results] The score was low in both the clubs. [Conclusions] Club focused on improving competitiveness have significantly higher scores for height and weight, Rohrer index, Shusai.  

Keywords: ADL age

422. Relationships between obesity and cognitive appraisal for health risk and exercise self-efficacy among middle-aged men in Okinawa Prefecture

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[Aims] The purpose of this study was to examine the relationships between cognitive appraisals for health risk and exercise self-efficacy among obese middle-aged men in Okinawa Prefecture. [Methods] The participants included 100 middle-aged (age, 45-64 years) men in Okinawa Prefecture. Participants with BMI≥25 (53±6 years, n=55) and BMI<25 (53±61 years, n=45) were classified into the obese and non-obese groups, respectively. [Results] ANCOVA adjusted for age showed that the total score of the cognitive appraisal for health risk did not significantly differ between the obese and non-obese groups. However, the threat of cognitive appraisal for health risk in the obese group was significantly higher than that in the non-obese group. In addition, exercise self-efficacy in the obese group was significantly lower than in the non-obese group. A partial correlation analysis adjusted for age revealed a significant relationship between the cognitive appraisals for health risk and exercise self-efficacy in the non-obese group, but not in the obese group. [Conclusions] Obese middle-aged men in Okinawa Prefecture, who were possibly less confident of performing regular exercise, felt the threat of cognitive appraisal for health risk. It is necessary to improve both health risk and exercise self-efficacy in obese middle-aged men in Okinawa Prefecture.

Keywords: coaching policies, dietary intake, Shusai

423. Effects of high-molecular weight polyphenol MAF on middle-aged and older women performing a light circuit exercise

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[Background] Prof. Numata discovered high-molecular-weight polyphenol from black tea or oolong tea that activates mitochondria, so he named it mitochondria activation factor (MAF). With mice experiments, MAF has been demonstrated to increase muscle endurance or muscle mass in combination with endurance or resistance exercise, respectively. [Aim] An intervention study was conducted to verify whether MAF is effective for middle-aged and older women performing light circuit training. [Methods] Seventy-five women aged 55 to 69 years were divided into MAF group (35 women) and placebo group (35 women), and a double-blind study was conducted. During the intervention study period of 80 days, participants took part in the experiment on the condition that light circuit training was conducted at least twice a week. Before and after the intervention period, body composition was measured by DXA and physical fitness was assessed by 8 physical fitness tests (hand-grip strength, one-leg balance with eyes closed, trunk flexion, time to stand from a supine position, arm curling with 2-kg dumbbell, walking in a figure 8, functional reach, 30-sec chair stand). [Results] The light circuit training improved ADL (activity of daily living) age and bone density, decreased body fat, and increased skeletal muscle mass. [Conclusion] A combined use of MAF with light circuit training may rejuvenate ADL age.

Keywords: ADL age

424. Comparison of players’ dietary intake under different coaching policies for junior high school soccer clubs

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[Aims] We compared the dietary intake of junior high school soccer players belonging to two clubs with different coaching policies. [Method] This study investigated first, third-year junior high school students belonging to the club focusing on improving the competitiveness of players, and second, third-year junior high school students belonging to the club focusing on development, such as acquiring social and responsibility for players through competition. Physique measurements such as height and weight were performed. The dietary intake was evaluated using the “Balance Up Sheet” and was compared by food group and nutrients. There are five food groups: Shushoku, Shusai, Hukusai, Dairy products, and Fruits. For nutrients, there are six groups: energy sources, protein sources, lipid sources, vitamin sources, mineral sources, and dietary fiber sources. [Results] Club that focuses on improving competitiveness have significantly higher scores for height and weight, Rohrer index, Shusai and lipid sources than the club that focuses on development. However, the score of meat, seafood, eggs, and beans contained in the protein sources score was biased, and as a result, the protein sources score was low in both the clubs. [Conclusions] Club focused on improving competitiveness may have a larger physique than club focused on development, and may have more Shusai necessary for physical development. However, it is suggested that there is a bias in the types of Shusai.

Keywords: coaching policies, dietary intake, Shusai
425. Step count and physical activity patterns in older adults

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[Aims] We aimed to investigate how daily step count relate to activity behaviors time use composition of the day, using compositional data analysis.

[Methods] These cross-sectional data were derived from 444 older Japanese adults (56.7% men, mean 74.3 years) who were randomly selected from communities and responded a survey. Daily step count and intensity of activities were measured by a validated wearable technology (Active style Pro HJA-350IT) for seven consecutive days. Associations between step count and activity behaviors were examined by linear regression models using isometric log-ratio transformations of the time-use composition, adjusting for gender, age and city of residence.

[Results] Overall, participants took on average 5,483 (SD: 2,830) steps per day and accumulated percent time spent in SB, LPA, MVPA during wearing time (mean 14.6 hours) correspond to 60.8, 35.1, and 4.1, respectively. The relative proportion of time among the three behaviors was significantly related to daily step count. Step count increased with increase in time spent in MVPA relative to SB and LPA and in the ratio of LPA to SB.

[Conclusions] Daily step count was significantly related to relative proportion of SB and LPA as well as MVPA.

Keywords: accelerometry, exercise, sedentary lifestyle

426. Cross-sectional associations of reallocating time from sedentary behavior to sleep and physical activity with mental health in employees: results from MYLS study

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[Aims] We aimed to investigate the effect of reallocating time from sedentary behavior (SB) to sleep and physical activity (PA) with mental health in Japanese employees.

[Methods] Study participants were 928 Japanese employees from the 2017-18 Meiji Yasuda Lifestyle study. Time spent in SB (≦1.5 METs), light-intensity PA (LPA; 1.6-2.9 METs), and moderate- to vigorous-intensity PA (≧3.0 METs) were evaluated using an accelerometer. Sleep duration was evaluated by self-reported. Each behavior was assessed separately for weekday and weekend. Psychological distress and work-related vigor were assessed using K6 and UWES, respectively. The compositional isotemporal substitution model was used to investigate effects of reallocating time.

[Results] In weekday, independent of potential confounders, reallocating 60 min/day of SB into an equal duration of sleep was related with lower prevalence of psychological distress (OR=0.78) and poor work-related vigor (OR=0.90). Concerning to work-related vigor, reallocation to LPA was favorably associated (OR=0.90). In contrast, any time reallocation was significantly associated with mental health.

[Conclusions] For mental health in employees, our results suggested an importance of behaviors in weekday. Especially, replacing SB with sleep or LPA seems to be effective.

427. Prototype of physical activity evaluation system using voice recognition application

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[Aims] In recent years, voice recognition technology using AI and machine learning has progressed remarkably as seen in OK google and Amazon Alexa. And these technologies are positioned as IoT in automatic driving of cars and daily life, and there is a possibility to change people’s lives dramatically. The purpose of this study was to examine the validity of the voice recognition application physical activity using the tri-axial accelerometer.

[Methods] Thirty healthy subjects (18-24 years, 22 male and 8 female) participated in this study. The behavior of all participants recorded using a smartphone APP voice recognition physical activity systems over 1 week. At the same time, a tri-axial accelerometer (Active style PRO HJA-750C, Omron) was attached to the wrist. The metabolic equivalents (METs) for the participants was assessed everyday using the tri-axial accelerometer and compared with the respective METs estimated using the APP voice recognition systems. The criteria for the data to be analyzed by ACC were set to 10 hours or more per day. [Results] Under the condition that the behavior recording by the voice recognition app is 14 hours or more per day, the average METs by the voice recognition app and the accelerometer are 1.58 ± 0.28 and 1.48 ± 0.24 (p <0.05), respectively. There was a significant correlation of r = 0.750 (p <0.01). Under the condition of 10 hours or more per day, r = 0.545 (p <0.01). [Conclusions] Although there was a high correlation between behavioral recordings by voice recognition apps and METs by three-axis accelerometers, it was thought that compliance of voice recordings was important for ensuring validity.

428. Association of endocrine therapy, physical activity, and dietary intake with changes in body weight after diagnosis among Japanese breast cancer patients: study protocol for an observational study

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[Aims] Some breast cancer patients experience progressive weight gain during and after treatment. Since excessive weight gain is related to all-cause mortality, it is necessary to explore the risk factors of weight gain. Some previous studies have reported that endocrine therapy may be related to weight gain; however, a literature review revealed the need for further research because of inconsistent findings. According to this review, future studies need to explore not only patients’ treatment through endocrine therapy but also their physical activity and dietary intake. The purpose of this study is to investigate the association of the abovementioned factors with changes in body weight after diagnosis among Japanese breast cancer patients.

[Methods] This research is an observational study. We began recruiting patients in December 2018 and the target sample size is 250. The primary outcome is a change in body weight. Physical activity is examined using a tri-axial accelerometer, and dietary intake is assessed using the questionnaire. We will use t-tests and multivariate analyses. [Conclusions] Considering the lack of information on risk factors for weight gain, this study will yield important data for weight management program of breast cancer patients.

Keywords: Cancer survivor, exercise, food
429. How do workers accumulate sedentary behavior in time period of day?

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Keywords: physical activity, sedentary, diurnal patterns

[Aims] The present study examined which time period of day sedentary behavior (SB) and physical activity (PA) were higher/lower among Japanese workers.

[Methods] The cross-sectional study recruited 405 workers aged 40 to 64 years and extracted accelerometer data and sociodemographic characteristics. SB and light- and moderate-to-vigorous-intensity of PA (LPA and MVPA) as a proportion of accelerometer wear time were calculated in each period of the day [morning (06:00-11:59), afternoon (12:00-17:59), evening (18:00-23:59)] on workdays and non-workdays. Multivariate regression analyses adjusting sociodemographic variables were performed.

[Results] Both on workday and non-workday, SB in the afternoon and evening was significantly higher compared with that in the morning, and also significantly decreased between afternoon and evening. Significant inverse trend for LPA was observed. On workday, MVPA in the afternoon and evening was significantly lower compared with that in the morning, and also significantly decreased between afternoon and evening. On non-workday, significant decrease of MVPA was observed between afternoon and evening, but not between the morning and afternoon.

[Conclusions] The highest SB were observed in the evening both on workday and non-workday. Further studies aiming to define characteristics of those who have higher proportion of SB in this period and context related with increased SB are required.

Keywords: physical activity, sedentary, diurnal patterns

430. Relationship between Physical Fitness and Dietary Intake in Junior High School Students

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[Aims] Various factors related to the physical fitness and athletic ability of adolescents have been studied, such as exercise time and frequency, sleep time, TV viewing time, and breakfast consumption. However, few studies have examined dietary intake. This study aims to examine the relationship between physical fitness and dietary intake in junior high school students. [Methods] The subjects are boys and girls (442 students) from 1st -3rd grade in junior high school. For evaluation of dietary intake, "Balance up sheet (Exercise and Nutrition Lab., Univ. of Tsukuba)" was used. A "new physical fitness test (MEXT)" was used to evaluate physical fitness. Five groups (A, B, C, D, E in descending order of physical fitness) classified based on the comprehensive physical fitness evaluation criteria were divided into a group with high physical fitness (A and B) and a group with low physical fitness (D and E), and the dietary intake between the two groups was compared using scores according to the food category (Staple Food/Main dish/Side dish/Dairy Products/Fruits) of the Balance up sheet. [Results] Among boys, the high fitness group(A and B) scored higher than the low fitness group (D and E) in the Staple Food, Main dish, Side dish, and Dairy Products. Conversely, for girls, no significant difference was observed between the two groups. [Conclusions] Our data suggests a relationship between adequate intake of Staple Foods, Main Dish, Side Dish, Dairy Products, and physical fitness. Half of the female subjects belonged to group A, which is characterized by high physical fitness. However, the distribution is biased, and it is necessary to increase the number of research subjects in future studies.

Keywords: physical fitness, dietary intake, adolescents

431. Coaching elementary school fifth graders in the menko card game

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[Objective] The present study analyzed features of throwing in menko (a traditional Japanese card game) by elementary school fifth grade menko experts, in an attempt to find ways to improve throwing ability through menko practice. The results were used to find points for coaching that might improve children's menko play.

[Methods] The children's movements to throw menko cards were recorded using high-speed cameras, and the obtained data were analyzed using video analysis software. [Results] The item having the strongest correlation with menko performance was the initial velocity of the menko. When beginners and the experts' initial menko velocity was compared, it was found that the velocity of the experts' throws was significantly faster than that of the beginners. This suggests that a priority coaching point should be to increase the initial velocity of the menko. In order to do that, a series of motions is necessary, including standing with the feet wide apart, bending the knee of the stepping leg deeply, extending the knee of that leg broadly and bending the trunk far forward when throwing the menko, and throwing the menko immediately below the release point. In addition, these motions are also important to release the menko from as low a position as possible. [Conclusion] It is possible that the throwing ability of elementary school fifth graders will improve if coaching emphasizes those points.

Keywords: shoe midssole, running injury, kinetics

432. The effect of mechanical characteristics of the shoe midssole material on the ground reaction force profiles during landing

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[Aims] Shoe midssole material (EVA) has the potential to impact kinetics during landing; however, it is not fully understood. The aim of this study was to examine the effect of mechanical characteristics of EVA on ground reaction force (GRF) profiles during landing. [Methods] Eight healthy males participated (age: 22 ± 2 years, body mass: 67 ± 9 kg). Participants laid on the sliding bed of the sledge apparatus with an inclination of 30° from the level floor and landed with their right leg on the six types of the EVA sheets (soft, medium, hard, elastic, shock absorption, anti-deformation) attached to the force plate. The right ankle and knee angles during landing were recorded by goniometers. A one-way ANOVA was performed to examine the effects of EVA on GRF profiles and the joint angles. Pearson product-moment correlation coefficients were calculated to examine the relationships between peak values of GRF of the direction of the sledge (sGRF) and mechanical characteristics of EVA. [Results] Different types of EVA did not cause inasubject variations of joint angles. Peak sGRF of hard EVA was 0.15 N/BW higher than that of elastic EVA. There was a positive correlation between peak sGRF and Young's moduli of EVAs (r=0.91). [Conclusion] These results suggest that lower Young's moduli of EVAs, showing more deformation, enables to reduce the peak sGRF during landing, which might contribute to reducing the risk of running injury.

Keywords: shoe midssole, running injury, kinetics