221. Estimation of body composition from morphological index in athletes

Kayo Shutara, Noriko Hakamada

[Methods] The anthropometric dimension and body composition of 73 senior male athletes (5 sports events) were determined using the 3-dimensional photonic image scanning technique and the underwater weighing method, respectively. Stepwise multiple linear regression analysis was performed using percent body fat (%fat) and fat free mass (FFM) as dependent variables, and body mass index (BMI), the circumferences of upper arm, forearm, thigh, calf, waist and hip, the ratio of upper and lower limb length to height, the ratio of forearm circumference to upper arm circumference, the ratio of calf circumference to thigh circumference and the ratio of waist to hip, as independent variables. The circumference was corrected by dividing by the 1/3 power. [Results] The explanatory variables of %fat were waist/weight1/3, forearm/upper arm, BMI and lower limb length/height (R²=0.82). The explanatory variables of FFM were BMI, waist/weight1/3, upper arm/weight1/3 and lower limb length/height (R²=0.76). [Conclusions] These results indicated that BMI, the circumferences of waist and upper arm corrected by weight, the ratio of forearm circumference to upper arm circumference and the ratio of lower limb length to height can be indicators to estimate body composition in athletes.

Keywords: percent body fat, fat free mass, circumference

222. Association between anthropometric measurements and sprint ability of preschool children

Yoshihiko Ishihara, Hayao Ozaki, Pengyu Deng, Toshiharu Natsume, Takahiro Sudate, Hiroaki Kondo, Hisashi Naito

[Background] To the best of our knowledge, the potential association between toe muscular strength and grip strength has not been studied in detail. [Objective] The present study aimed to investigate the association between toe muscular strength and grip strength from early childhood to school-age period. [Methods] The study evaluated grip strength and toe muscular strength in 100 boys and 100 girls (15 boys and 21 girls, 17 boys and 12 girls, 20 boys and 16 girls, 18 boys and 15 girls, 16 boys and 15 girls, and 14 boys and 21 girls aged 5, 6, 7, 8, 9, and 10 years, respectively). Statistical analysis (mean ± standard deviation) was performed for each age. To evaluate the differences in mean physical strength according to age, a two-way (age × physical strength) analysis of variance was performed wherein both the factors were unpaired. If a significant correlation or main effect was identified, a multiple comparison test was performed with the Tukey method. To identify differences in regression coefficients, regression formulas between mean values of toe muscular strength and grip strength for different ages were calculated. The significance level was set at p < 0.05. [Results] A significant main effect was noted between toe muscular strength and grip strength. In addition, toe muscular strength and grip strength increased with age. For each sex, both the regression formulas between mean values of toe muscular strength and grip strength were significant. Based on the regression coefficient difference test, homogeneity was rejected (there was a significant difference between regression coefficients). [Conclusion] The study indicates a potential relationship between toe muscular strength and grip strength in childhood.

Keywords: Toe muscular strength, grip strength, development

223. Comparison of changes in toes muscle strength and grip strength in childhood

Sakiko Ukitad

[Background] To the best of our knowledge, the potential association between toe muscular strength and grip strength has not been studied in detail. [Objective] The present study aimed to investigate the relationship between toe muscular strength and grip strength from early childhood to school-age period. [Methods] The study evaluated grip strength and toe muscular strength in 100 boys and 100 girls (15 boys and 21 girls, 17 boys and 12 girls, 20 boys and 16 girls, 18 boys and 15 girls, 16 boys and 15 girls, and 14 boys and 21 girls aged 5, 6, 7, 8, 9, and 10 years, respectively). Statistical analysis (mean ± standard deviation) was performed for each age. To evaluate the differences in mean physical strength according to age, a two-way (age × physical strength) analysis of variance was performed wherein both the factors were unpaired. If a significant correlation or main effect was identified, a multiple comparison test was performed with the Tukey method. To identify differences in regression coefficients, regression formulas between mean values of toe muscular strength and grip strength for different ages were calculated. The significance level was set at p < 0.05. [Results] A significant main effect was noted between toe muscular strength and grip strength. In addition, toe muscular strength and grip strength increased with age. For each sex, both the regression formulas between mean values of toe muscular strength and grip strength were significant. Based on the regression coefficient difference test, homogeneity was rejected (there was a significant difference between regression coefficients). [Conclusion] The study indicates a potential relationship between toe muscular strength and grip strength in childhood.

Keywords: Toe muscular strength, grip strength, development

224. Effects of Exercise Habits from Elementary School to University Excluded the Regular Physical Education Class on the Various Physical Fitness of University Students

Ryosuke Okano

[Background] To the best of our knowledge, the potential association between toe muscular strength and grip strength has not been studied in detail. [Objective] The present study aimed to investigate the relationship between toe muscular strength and grip strength from early childhood to school-age period. [Methods] The study evaluated grip strength and toe muscular strength in 100 boys and 100 girls (15 boys and 21 girls, 17 boys and 12 girls, 20 boys and 16 girls, 18 boys and 15 girls, 16 boys and 15 girls, and 14 boys and 21 girls aged 5, 6, 7, 8, 9, and 10 years, respectively). Statistical analysis (mean ± standard deviation) was performed for each age. To evaluate the differences in mean physical strength according to age, a two-way (age × physical strength) analysis of variance was performed wherein both the factors were unpaired. If a significant correlation or main effect was identified, a multiple comparison test was performed with the Tukey method. To identify differences in regression coefficients, regression formulas between mean values of toe muscular strength and grip strength for different ages were calculated. The significance level was set at p < 0.05. [Results] A significant main effect was noted between toe muscular strength and grip strength. In addition, toe muscular strength and grip strength increased with age. For each sex, both the regression formulas between mean values of toe muscular strength and grip strength were significant. Based on the regression coefficient difference test, homogeneity was rejected (there was a significant difference between regression coefficients). [Conclusion] The study indicates a potential relationship between toe muscular strength and grip strength in childhood.

Keywords: Toe muscular strength, grip strength, development
225. Change of physical activity and time spent performing specific activities in sixth grade children over 10-year period

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[Aims] The physical activity and time spent performing specific activities of children was investigated in the same elementary school that had been surveyed in 2009 to evaluate changes over a period of 10 years. [Methods] Anthropometric characteristics and accelerometer-based physical activity were studied in 169 sixth-graders of an urban elementary school on 5 weekdays in Feb 2017 and 2018. Minute-by-minute activity records were used to assess the lifestyle by the same method as in the previous surveys. [Results] The percentage of overweight/obese children was lower than it was 10 years ago, but the decreases were not significant. The physical activity and activity time at each intensity were significantly higher than they were 10 years ago. The time spent watching television significantly increased, and the time spent in study increased significantly, playing outdoor and programmed exercising were not significant, compared with 10 years ago. [Conclusions] One cause of the increase in physical activity compared with 10 years ago is possibility of reduction of TV viewing. The effects of the use of the smartphone, which is spreading quickly, on lifestyle of children are unclear, and it is considered necessary to update the contents of the questionnaire used for a long-term follow-up study, there is difficulty of comparison of the life activity item by change of period.

Keywords: preventive care projects, pre-frail

226. Relationship of estimated hemoglobin levels with quality of life and lifestyles in schoolchildren

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[Aim] Haemoglobin (Hb) level is associated with heartiness among children. To our knowledge, few studies examined an association of the Hb level with quality of life (QOL) and lifestyles among children. Therefore, The aim of this study was examined the association of the Hb level with QOL and lifestyles. [Methods] A total of 92 (including 46 girls) elementary school children graded from 4th to 6th participated in our cross-sectional study. All data were collected at February 2019. Moderate-to-vigorous physical activity (MVPA) and sedentary behavior (SB) were estimated by the triaxial accelerometer. The Hb level was assessed by noninvasive measurement device. QOL was assessed by the PedsQL questionnaire. Children's usual bedtime was asked by self-administered questionnaire. A multiple linear regression analysis was calculated to predict Hb value based on PedsQL, MVPA, SB, and bedtime including moderator variables of sex, grade, and height. [Results] A significant regression equation was found (F (1, 18) = 8, P = 0.001) (n = 70). We found that their bedtime was significant predictors of the Hb level (β = -0.49, 95%CI [-0.82, -0.15], P = 0.005). Girl of moderator variables was also significant moderated of the Hb level (β = -0.73, 95%CI [-1.46, 0.00], P = 0.049). [Conclusion] Staying up late of children has affected their low Hb level, whereas Hb level has no association with QOL, MVPA, and SB.

227. Effects of Preventive care Projects in Depopulated Area

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[Aims] Age-related deterioration in physical function, frailty, is serious concern in elderly people. Especially both geographical isolation and depopulated area are related with a lack of local professional resources. The aim of this study is to prevent frailty, we have conducted preventive care project for elderly people who lived in depopulated area. [Methods] The participants were 6 elderly people (age 82.5 ± 2.3 years old, pre- frail) who were assessed as the condition of pre-frail by medical screening test and 16 elderly women (age 76.5 ± 5.2 years, healthy elderly group) who lived independently without any physical problem were recruited in this study. Exercise and Nutrition guidance sessions occurred every 2 weeks for a total of 8 months. In addition, BMI, percutaneous hemoglobin (SpHb), muscle strength, the weight loss rate were measured. [Results] At the start of the project, participants who had obesity in BMI in both the pre-frail group and the elderly group. Participants who lower leg circumference cut-off value were observed in 17% in the pre-frail group and 19%in the elderly group. Participants with a weight loss rate of 10% or more were not observed in the pre-frail group, but were 37% in the elderly group. There was significant improvement pre- and post-test differences in in SpHb in the pre-frail group. In the elderly group, BMI was decreased significantly. There was no significant change in the balance evaluation such as BBS and TUG in either group. [Conclusions] These results suggest that it has a positive effect on frail prevention in the elderly in the community. Even in the depopulated area, the preventive care projects has significant potential to improve in their issues.

Keywords: preventive care projects, pre- frail

228. Relationship between cardiac growth and intensity of daily physical activity in early childhood

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[Aims] For appropriate growth in very young children, how much intensity of daily physical activity is essential is not known. The present study investigated the relationship between cardiac growth and the different levels of physical activity (low, moderate or high intensity) in 19 healthy children aged from 11 to 37 months. [Methods] By using echocardiogram, left ventricular end-diastolic internal diameter (LVIDd), end-systolic internal diameter (LVIDs), interventricular septum thickness (IVST) and posterior wall thickness (PWT) were measured. Left ventricle mass (LVM) was calculated from the following equation of 0.8 (1.04((LVIDd+PWT+IVST)³ - LVIDs³)) + 0.6. From the data obtained by an accelerometer, the cumulative time spent at low (1.1 - 2.7 METs), moderate (2.7 - 4.4 METs) or high (> 4.4 METs) intensity of physical activity was determined. Linear regression formula for the relationship was calculated by a least square method. [Results & Conclusion] LVM, LVIDd, or LVIDs, an index of growth of ventricular capacity, showed a significant correlation to the high-intensity physical activity but not to the low- or moderate- intensity physical activity. However, PWT, an index of growth of cardiac muscles, had no correlation to neither high- nor low-and moderate-intensity of physical activity. These results suggest that, during early childhood, high-intensity physical activity over 4.4 METs plays an important role in the growth of cardiac structure, especially ventricular capacity.

Keywords: echocardiography, left ventricle mass, high-intensity physical activity
A study of the developmental process of motor ability from characteristic movements of children. Measuring voluntarily moving speed and kinds of activities

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[Background] The motor ability that a child wants to acquire is a lively, variety of creative ideas and not limited to physical strength measurement items. If we can do a tracking analysis of the development stage, it will be possible to watch as a change in line with the characteristics of the individual. [Aim] The purpose was to measure the speed, moving distance, and number of steps that the kindergarten children move around the kindergarten site, and to explore the developmental process of motor skills by capturing the characteristics of movements that appear in spontaneous activities. [Method] Using a watch-shaped device equipped with GPS sensors and also had an activity meter, the movement satiated by four boys and four girls during childcare hours in early December 2017 and 2018. In addition, the data was compared with continuous observation by the teachers. [Result] The maximum speed increased by seven people, and an average of 31.8m/min. The moving distance increased by 0.9m/min when corrected by the measurement time. The moving distance increased in two boys and decreased the others and in one girl increased and decreased in three others. The total number of steps decreased by four girls and increased by boys. [Conclusion] It was thought that everyone developed in the athletic ability because the movement speed became fast. From the distance they moved and the playground trajectory, it was suggested that the boys tended to move more vigorously, and girls tended to spend less time moving.

Keywords: voluntarily action, GPS sensor, movement trajectory, follow up study

The sustained effects of a single bout of before-school exercise on cognitive function in elementary school children: a preliminary study

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[Aims] A single bout of exercise has been shown to induce cognitive enhancement. However, it remains unclear how long the positive effects of acute exercise on cognitive function last in children. The purpose of this study was to examine the sustained effects of a single bout of before-school exercise on cognitive function. [Methods] Twenty-eight elementary school children aged 9-11 years old participated in this study. They were randomly assigned into two groups: an exercise-first and a rest-first group. In a cross-over with-participants design, they completed exercise and rest conditions. The exercise intervention consisted of sprinting, rudder drill, and zig-zag running for 15 min. Participants performed a flanker task to assess cognitive control before, immediately after, 1-hour after, and 3-hour after interventions. [Results] Results revealed that reaction time 3-hour after exercise intervention was shorter than pre-test in the exercise first group, whereas such change was not observed for the rest condition and in the rest-first group. A single bout of before-school exercise induces cognitive enhancement and the effects would sustain for three hours. Thus, physical exercise in the morning in elementary school may be an effective strategy for enhancing learning.

Keywords: voluntary action, GPS sensor, movement trajectory, follow up study

Quantitative analysis of physical activity and sleep characteristics in preschool children

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[Aims] This study aimed to quantitatively measure physical activity and sleep characteristics in preschool children and examine their interrelationship. [Methods] Fifty-four children attending kindergarten (age: 6.12 ± 0.275 years) participated in this study. Each participant was asked to wear an activity tracker on the waist during waking hours to measure step count and energy expenditure. A sleep recorder was placed around the waist at bedtime to monitor the time they went to bed, time taken to fall asleep, total sleep hours, and time they got out of bed. The participants were divided into two groups based on the sleep time. [Results] The step count and energy expenditure showed significant negative correlation with sleep time. The bedtime was earlier and the time taken to fall asleep was lesser in the long sleep time group than in the short sleep time group. The step count and energy expenditure after 5 p.m. were lower in the long sleep time group than the short sleep time group. [Conclusion] In the modern Japanese lifestyle, higher levels of physical activity in preschool children led to a shorter sleep time. Significant differences in physical activity were observed after 5 p.m. In our view, vigorous physical activity performed by preschool children in the evening hours was associated with a late bedtime, difficulty in falling asleep, and a shorter sleep cycle.

Keywords: Hemoglobin level, Sleep time, High school students

Relationship between estimated hemoglobin levels, lifestyle and physical fitness in high school students

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[Aims] The anemia can adverse health effects in high school students. However, The relationship between hemoglobin (Hb) levels and related lifestyle and physical fitness (PF) is not clear. Therefore, this study investigated the relationship between Hb levels, lifestyle and PF in high school students. [Methods] A cross-sectional study including 32 high school students (including 19 girls) was undertaken. The Hb level was assessed by a noninvasive device ASTRIM FIT [Sysmex Corp., Japan] and were evaluated with an average of 2 to 3 measurements. The lifestyle was examined for six items: club activities, exercise time, exercise frequency, breakfast intake, sleep time, and TV watching time by self-administered questionnaire. The PF test included eight test items (hand grip, sit-ups, sit and reach, side-to-side steps, 50-m dash, standing broad jump, handball throwing and endurance run). All measurements were conducted from April to August 2017. [Results] There was a tendency for girls (29.4%) that the Hb level was not normal. On the other hand, all boys' Hb levels were in the normal range. There was an association between girls' Hb levels and sleep time (Fisher's exact test, P=0.037). There was no significant correlation between Hb levels and PF items in boys and girls. [Conclusions] These results suggest that high school girls had lower Hb levels than boys and a higher proportion of anemia trend. In addition, the girls' anemia trend may be related to sleep time.

Keywords: Hemoglobin level, Sleep time, High school students
The effect of longitudinal changes in physical activity on weekdays on physical fitness in preschool children

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Background: Our previous study showed that physical activity amount (PA) in preschool children is clearly different between weekdays (D) and weekends (E). However, longitudinal changes in PA with growth and the effects of PA on physical fitness (PF) are not well studied from the point of view of PA on D or/and E. Propose: The purpose of this study was to clarify the relationship between longitudinal changes in PA on D or/and E and PF in preschool children.

Methods: 96 boys and 120 girls were followed from 4 to 6 years old every year. PA was measured by a uniaxial accelerometer (Lifecorder EX) and separately assessed on D and E. Based on the longitudinal changes (increase “+” or decrease “-”) of PA on D and E, they were divided into 4 groups (D+E+, D+E-, D-E+, D-E-). PF was assessed by 25m sprint, standing broad jump and softball throw.

Results: In both boys and girls, the increase of PA was mainly observed on D (p<0.05) and less on E, and compared that of PA E to the D-E+ group, the improvements in PF, especially jumping ability were significantly higher in the D+E+ group (p<0.05).

Conclusions: It was suggested that an increase of PA on weekdays may be important for preschool children to develop PF.

Association of physical fitness and motor ability at young age with locomotive syndrome risk of middle-aged and older men: J-Fit+ Study

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[Aims] The purpose of this study was to examine the association between physical fitness, motor ability at college student and the risk of locomotive syndrome in middle-aged and older men. [Methods] 231 male alumni aged 48-65 years who were graduated school of health and sports science. The physical fitness tests were included 7 tests: side-step test, vertical jump test, back muscle strength, grip strength, trunk lift, trunk-forward flexion, and step-test. The motor ability tests were included 5 tests: 50m run, 1,500m run, running long jump, hand-ball throw and pull-up. The risk of locomotive syndrome was evaluated by the loco-check questionnaire which was developed by the Japanese Orthopaedic Association. We divided the participants into three groups (low, medium, and high) based on data of each physical fitness and motor ability test, and compared the risk of locomotive syndrome among the three groups using the Cox proportional hazards models. [Results] Higher side-step performance associated with a lower risk of locomotive syndrome (HR 0.22; 95% CI, 0.058-0.798, P = 0.022). [Conclusions] In male alumni of school of health and sports science, good agility (side-step test) at university student may be reduce the risk of locomotive syndrome after graduation.

Keywords: physical fitness, motor ability, locomotive syndrome

Relationship between bone density, physical fitness and dietary intake in early adolescents

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[Aims] The purpose of this study was to examine association between bone density, physical fitness and dietary intake in early adolescents.

[Methods] The subjects of this study consisted of 112 students (56 males and 56 females) at junior high school student in Yokohama, Kanagawa. Bone density was measured by ultrasound bone densitometer 'Achilles' (Lunar). Physical fitness test (8 items) was measured according to the standard guidelines of physical fitness assessment from the Japanese Ministry of Education, Culture, Sports, Science and Technology. Physical activity was evaluated by the modified version the IPAQ for Japanese Early Adolescents (IPAQ-JEA). Dietary intake estimated using a brief self-administered dietary history questionnaire (BDHQ) for Japanese children and adolescents.

[Results] Bone density was correlated with weight, BMI, grip strength, 20m shuttle run, 50m running time, standing broad jump, handball throw, fat, natrium, and vitamin D in males. On the other hand, bone density was correlated with sit-ups, side-to-side jump, 50m running time, standing broad jump, handball throw, physical activity, energy intake, protein, carbohydrate, natrium, calcium, magnesium, and phosphorus. Stepwise regression analysis indicated that 50m running time, BMI and vitamin D were independently associated with bone density in male; and physical activity was independently associated with bone density in female.

[Conclusions] Bone density was strongly associated with sprint ability in male, and with physical activity in females.

Intervention study on the effects of efforts to improve physical fitness in elementary school

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[Purpose] In this study, we conducted an intervention study using the “challenge calendar” created based on the results of previous research studies at four elementary schools in Kagawa Prefecture. The purpose of this study is to elucidate the effects on performance, motor competence, and intrinsic motivation. [Methods] The survey included 1,205 children attending 4 elementary schools in Kagawa Prefecture. The purpose of this study is to elucidate the effects on performance, motor competence, and intrinsic motivation. [Methods] The survey included 1,205 children attending 4 elementary schools in Kagawa Prefecture. The purpose of this study is to elucidate the effects on performance, motor competence, and intrinsic motivation. [Results] In the analysis of variance based on repeated measures with the presence or absence of intervention as the independent variable and the score of each item of the new physical fitness test as the dependent variable, the item that had an interaction and the score after the intervention was higher than that before the intervention was 1 In grader, it was repeated side jump and shuttle run, in grade 3, it was grip strength, repeated side jump, and in grade 5, it was repeated side jump. For these items, it was suggested that the score could be improved by the practice of jumping rope using the challenge calendar.

Keywords: Physical Fitness, Challenge Calendar
237. Research on the effects of efforts to improve physical fitness in elementary school

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[Aims] The purpose of this study is to investigate the results of physical fitness tests conducted at elementary schools in Kagawa Prefecture in 2017 and efforts to improve physical fitness at each school, and verify the results of efforts to improve physical fitness at schools.

[METHOD] For 154 elementary school (5th graders) in Kagawa Prefecture, we analyzed the school average score calculated by gender for each test item of the new physical fitness test and its overall evaluation score. Each school’s efforts were classified into 30 and the degree of implementation of each school’s efforts was evaluated by the physical education chief of each school according to the four methods. A multiple regression analysis was conducted with each test item and overall evaluation score as the dependent variable and each school’s approach as an independent variable.

[RESULT] For boys, it was found that “use of challenge card” had a positive effect on the result of raising the body, and “individual target setting” had a positive effect on the result of shuttle run. In addition, the girls raised their bodies, and in the 50m run and overall score, “Implementation of jump rope” and “Implementation of marathon” in the shuttle run had gender effects. And it became clear that “vertical jump” has a positive effect on repeated side step and shuttle runs.

238. Correlation between physical fitness and age for junior athletes (3) -Month of birth-

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When selecting and training athletes, the Hyogo Junior Sports Academy (HJSA), talent identification project in Hyogo prefecture, focus on the relationship between physical fitness, maturity and month of birth. [Aims] The purpose of this study is to examine changes in physical strength accompanying the growth of academy students, and to examine differences due to their month of birth. [Methods] Subjects were 79 Hyogo Junior Sports Academy students who enrolled between 2011 and 2016 and trained for 3 years (38 boys and 41 girls) and divided into three groups according to their month of birth (E group: Apr-Jul, M group: Aug-Nov, L group: Dec-Mar). We measured height, body mass, selective reaction time, 20m run, 4-way agility run, T-run, vertical jump, hand grip, back strength and 20m shuttle run, and examined the differences between the three groups. [Results] All data, except the boy's 20m shuttle, improved significantly (p<0.05) as the school year progressed. For height and body mass, there were lower in the L group than in the E group for both boys and girls. There were tended to be slightly lower in hand grip and back strength in L group, but there were no differences in physical fitness between each group for both boys and girls. [Conclusions] It suggested that there was a difference in physique depending on the month of birth for junior athletes, but there was no significant difference in physical strength except muscle strength. It is important to identify and train individual abilities regardless of physique or birthday.

239. The relative age effect of the Hyogo talent identification and development program

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[Aims] Hyogo talent identification and development (HJSA) carries out selection in consideration of a relative age effect (RAE). I examined the change of the motor ability of longitudinal study of the person from HJSA and the relations of the birth month.[Method] Subjects were 63 (28 boys, 35 girls) elementary school students belonging to HJSA for three years. We divided it into three groups from April birth to July birth (4-7), August birth to November birth (8-11), December birth to March birth (12-3). We carried out the measurement in May of the fourth grader, March of the fourth grader, March of the fifth grader, March of the sixth grader. Measurement items were exercise capacity for 20 m run, stepping for 10 sec (ST), rebound jump (RJ), drop jump (DJ), vertical jump, height, weight. [Result] In fourth grader May of boy and girl of RJ, significant difference was between 4-7 and 8-11 in a sixth grader with the fifth grader of girl of ST. The height of the boy significantly had a bigger 4-7 in all than 12-3. The height of the girl significantly had a bigger 4-7 from a fourth grader to a fifth grader than 12-3. As for the weight of the girl of a boy and the fourth grader of the fifth grader, 4-7 was significantly heavier than 12-3. In addition, as for the boy, 4-7 was significantly heavier than 8-11 in fourth grader March. [Conclusion] The influence of the birth month was seen in a physical constitution from a fourth grader to the sixth grader, and the influence was seen in a part of the motor ability. This study proved that the superiority of the build was not necessarily reflected by an athletic capability. It is thought that this is the influence that revised the age of the month at a selection stage.

240. Longitudinal study of children’s running with stages of development

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[Aims] Earlier studies have suggested that children become to be able to run at around age 2 and their running form gets closer to adults’ one by the time they turn 7 years old. As far as we know, there have been few reports about longitudinal studies related to children’s running from a kinetic point of view. The purpose of this study was to clarify the kinetic characteristics of children’s running compared with adults. [Methods] 7 children (3 boys and 4 girls, 3-15 yrs) participated in this study for 3 consecutive years. We captured their running form in various speeds while the speed and ground reaction force (GRF) were measured. 1330 adult cross-sectional data (842 men and 488 women, 18-64 yrs) were also collected in running for comparison at the same speed range (200 m/min). [Results] Running form: Larger movements in arm and leg swing were observed among infants (3-6 yrs) GRF. The vertical first peak was larger in infants than adults. Those tendencies were shown until around 6-7 years old in both interpersonal and intrapersonal changes. [Conclusions] It was suggested that infants have larger landing impact force with different foot contact patterns in fast running compared with adults. In addition, we concluded that infants come to be able to acquire the skill of running form around 6-7 years old.

Keywords : children’s running, longitudinal research, ground reaction force
Information gathering and application by preschool teachers regarding children's physical activity

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[Aims] This study aims to explore the extent of information seeking and utilization about children’s physical activity by preschool teachers. [Methods] We collected data from 1,976 teachers in kindergarten and nursery schools. The investigation aspects were individual data (sex, age, work experience duration, sports experience, public/private schools), and the extent of information seeking and utilization about children's physical activity. We conducted a t-test and a one-way ANOVA to examine differences within the individual data. [Results] There were no notable differences between the individual data regarding the frequency of information seeking. The public school teachers scored significantly higher than the private school teachers did in the frequency of information utilization using books or study sessions (p < .05). The short career group scored notably higher than the long career group in the frequency of information utilization using the internet (p < .001). [Conclusions] Information utilization among teachers regarding the children's physical activity signifies differences between organizations or career lifespans. We propose the need to devise an information transmission method based on the teacher's tendency to select the information source.

Keywords: Information, Children, Physical Activity

Physical activity and/or high protein intake maintains fat-free mass in older people with mild disability; the Fukuoka island city study

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[Aim] Body composition changes with age, with fat mass (FM) increasing and fat-free mass (FFM) decreasing. Higher physical activity and high or adequate protein intake are thought to be beneficial in preventing the loss of skeletal muscle mass in the elderly. We aimed to investigate the relationships between physical activity, protein intake and FFM in older people with mild disability by studying 55-89-year-old community-dwelling Japanese adults. [Methods] Total energy expenditure (TEE) under free-living conditions was assessed using the doubly labeled water (DLW) method and physical activity was measured using a triaxial accelerometer. Dietary intake was assessed using a self-recorded food intake diary during the measurement period. [Results] %FFM was significantly positively correlated with protein intake and physical activity level (PAL) after adjustment for age and sex (protein intake r = 0.652, p < 0.001, PAL r = 0.345, p = 0.011). In multiple linear regression analysis, when PAL or protein intake were included, 31% and 55%, respectively, of the variation in %FFM was explained. Moreover, the addition of both PAL and protein intake explained 61% of the variation in %FFM. [Conclusions] Either protein intake above the currently recommended level or higher levels of physical activity would be beneficial for the maintenance of high %FFM.

Keywords: physical activity, protein intake, fat-free mass

Effects of aerobic training on S-nitrosylation of insulin-degrading enzyme in the brain of aged mice

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Alzheimer’s disease is caused by the accumulation of amyloid β (Aβ) in the brain. Insulin-degrading enzyme (IDE), which degrades Aβ, is inhibited when it undergoes S-nitrosylation (SNO) by nitric oxide. Epidemiological and experimental studies have suggested that regular exercise can reduce the risk of the disease and ameliorate the accumulation of Aβ. However, it is unclear whether exercise affects SNO-IDE level in the brain. Aims: To investigate the effects of aerobic training on SNO-IDE in the brain of aged mice. Methods: Male C57BL/6 mice at 7 (young) and 10 months (old) of age were randomly assigned to control and exercise groups (n=4 per group). The exercise group was trained on an animal treadmill for 60 minutes at a running speed of 8 to 26 cm/sec, four times a week for 8 weeks. The hippocampus, striatum and cerebral cortex were removed for biochemical analyses. Results: Neither age nor exercise altered protein expression of IDE and nNOS in the hippocampus, striatum and cerebral cortex. In contrast, SNO-IDE was increased in old control mice compared to young mice. Exercise significantly decreased SNO-IDE and increased significantly IDE activity in the hippocampus in the old, but not young, mice compared to old control mice. Conclusions: Aerobic training reduces SNO-IDE in the brain of aged mice and increases IDE activity in the hippocampus. These results suggest that decreased SNO-IDE, which paralleled increased IDE activity, may contribute to reductions in Aβ accumulation and the risk of Alzheimer’s disease by exercise.

Lower muscle mass inhibits improvement of the physical function induced by exercise

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[Aims] The aim of this study was to clarify whether the appendicular muscle mass improves the physical function induced by a ready-made exercise intervention in community-dwelling Japanese adults. [Methods] Data were collected from 51 community-dwelling adults who participated in a ready-made exercise intervention program performed between May 2017 and September 2017. The subjects participated once a week in the intervention program which included stretching and resistance exercise. The appendicular muscle mass was measured at baseline using bioelectrical impedance analysis. The cut-off for the muscle mass was based on a reference value given by the Asian working group for sarcopenia. The physical functionality, including the 30-s chair stand test and gait speed, was obtained at baseline and at the end of the program. The purpose was to determine if appendicular muscle mass affected the physical function in a general linear manner. [Results] The interaction (muscle mass × time) was significantly associated with the score of the 30-s chair stand test. Scores of the test on the subjects having normal muscle mass were improved by the exercise intervention. However, the scores of the same test in subjects having lower muscle mass were not improved by the exercise intervention. [Conclusions] Lower muscle mass may inhibit improvement of physical function induced by exercise.
245. Association between locomotive syndrome and health-related quality of life

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[Aims] The present study investigated the influence of locomotive syndrome (LS) on health-related quality of life (HRQOL). [Method] The participants included 384 elderly individuals (mean age: 73.6 ± 5.8 years). LS and HRQOL were evaluated using the 25-question Geriatric Locomotive Function Scale (GLFS-25) and the Short Form 36 (SF-36). The GLFS-25 divided the subjects into three groups: non-LS, stage 1, and stage 2. The SF-36 provided three component summary scores: the Physical Component Summary (PCS), the Mental Component Summary (MCS), and the Role-Social Component Summary (RCS). We compared the three summary scores among the three LS risk stages by using analysis of covariance adjusted for age and sex. [Results] There were 109 people (28.4%) in the stage 1 group and 39 people (10.2%) in the stage 2 group. As LS progressed, all HRQOL scores decreased. PCS showed significant differences among all groups. In contrast, in term of the MCS, significant differences were found only between the non-LS group and the stage 1 and 2 groups. Furthermore, RCS showed significant differences only between the non-LS and stage 1 groups and the stage 2 group. [Conclusions] We found that LS strongly impacted the HRQOL. Our results suggest that the HRQOL decline with LS progression and this decline differ according to LS stage.

Keywords: locomotive syndrome, health-related quality of life, elderly people

246. Age-related changes in speed and asymmetry of circular gait in older women

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[Aims] The purpose of this study was to investigate age-related changes in speed and side-to-side asymmetry of circular gait test in older adults. [Methods] The participants comprised 249 community-dwelling older women. The circular gait test was evaluated as the time required to walk twice around a 1-m diameter circle for right and left rotations at comfortable walking speed. Average speed of right and left rotations and side-to-side difference (right rotation - left rotation) were calculated. In addition, walking speeds during 10 m straight-line gait under maximum and comfortable walking conditions were measured. One-way ANOVAs were used to determine the differences between four age groups: early-60s, late-60s, early-70s, and late-70s. [Results] Significant main effects were found in circular gait speed and maximum straight-line gait speed. Circular gait speed in late-70s was significantly lower than those in the other age groups. There were no main effects in asymmetry of circular gait and comfortable straight-line gait speed. [Conclusions] Noticeable decrease of circular gait speed was observed in old-old adults, whereas there was no age-related change in straight-line gait speed under comfortable walking condition.

Keywords: older adults, circular walking, gait speed

247. Effect of bench step exercise for prevention of locomotive syndrome -study of group exercise for elderly-

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[Aims] Bench step exercise is known as low impact and much effective aerobic exercise. Positive effects of step exercise were already reported, but most of them were independently done as home exercise of individuals and less inspections were done for group exercise. This study was designed to investigate the effects of group exercise program of bench step for prevention of locomotive syndrome. [Methods] 9 elderly (2males, 7females) were recruited for 12 weeks workout programs. At the first and end of the program period, fitness tests were done, including stand up test, 2 step test, knee extension endurance test, balance test and 25 questions for estimate disfunction and disorder of daily activities. [Results] After 10weeks group exercise program of step seems effective to prevent locomotive syndrome for old even though the frequency is only once a week.

Keywords: Bench step, locomotive syndrome, group exercise

248. Mechanical properties and collagen fiber orientation of tendon in young and elderly

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[Aims] The purpose of this study was to investigate differences in the mechanical properties and collagen fiber orientation of tendon structures between young and elderly groups. [Methods] The mechanical properties of tendon structures in medial gastrocnemius muscle were measured using ultrasonography during ramp and ballistic contractions. Tendon collagen fiber orientation was estimated from coefficient of variation (CV) of echogenicity on transverse ultrasonic images of Achilles tendon. [Results] Differences in elongation between ramp and ballistic contractions of elderly were significantly smaller than those of young group at 20-80% of MVC. During ramp contraction, hysteresis of elderly was significantly higher than that of young, whereas no difference in hysteresis during ballistic contraction was found between the two groups. Difference in hysteresis between ramp and ballistic contractions of elderly tended to be lower than that of young group. Mean echogenicity of elderly was significantly higher than that of young group, whereas no difference in CV of echogenicity was found between the two groups. [Conclusions] These results suggest that smaller differences in elongation and hysteresis between ramp and ballistic contractions of elderly may be related to decreased water content within tendons. Furthermore, no difference in collagen fiber orientation of tendons was noted between the two groups.

Keywords: elongation, hysteresis, echogenicity
249. Forward leg reach in Elderly Persons
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[Aims] We compared forward leg reach between elderly and young persons. We revealed the relationship between the knee extension strength, 5-m walking speed and duration of standing on one-leg with the eyes open. [Target] Elderly persons (N=21; 5 men and 16 women, mean age=72.8±5.2) and young persons (N=14, all women, mean age=19.4±0.5) participated in the survey. [Methods] The forward leg reach was standardized with Trochanto-Malleolus Distance (the sliding ratio). The knee extension strength was measured using Micro FET2 and standardized by weight. The 5-m walking speed was measured by conducting a 1-m acceleration and a 1-m deceleration task on a 7-m walkway. Participants were required to maintain their posture by keeping both hands on their hips for the duration of standing on one-leg with the vision intact, and the duration was measured. [Results and Discussion] 1) The sliding ratio in elderly (0.80±0.11) was significantly lower than in young persons (0.96±0.10). 2) The sliding ratio in the elderly had significant correlation with the duration of one-leg standing (r=0.54, p<0.05) and 5-m walking speed (r=0.46, p<0.05). On the other hand, there was no significant correlation with the supporting leg knee extension strength (r=0.27, p=0.24). 3) It is suggested that the sliding ratio of a forward leg reach motion could be a simple, objective index of motor function for elderly persons.

Keywords: elderly persons, forward leg reach, motor function

250. A longitudinal study investigating the relationship between the GLFS-25, new physical fitness tests, and muscle mass in community-dwelling elderly individuals
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1Doshisha Univ., Kyoto, Japan, JSPS DC2 [Background] The 25-question Geriatric Locomotive Function Scale (GLFS-25) is a diagnostic tool for locomotive syndrome. Some cross-sectional studies have examined the relationship between GLFS-25 scores and health-related physical fitness. However, no studies have investigated the relationship between GLFS-25 scores and health-related physical fitness longitudinally. [Aims] This longitudinal study aimed to investigate the relationship between health-related physical fitness and changes in GLFS-25 scores. [Methods] The study included 19 community-dwelling elderly individuals (6 men and 13 women) aged 65-90 years (mean: 76.2±4.3 years) who had physical fitness measurements recorded in both 2017 and 2018. Each individual was assessed using the GLFS-25, new physical fitness tests, appendicular muscle mass (AMM), skeletal muscle index (SMI, AMM/height2), and AMM per body weight (AMM/bw, AMM*100/weight). Appendicular muscle mass was assessed by bioelectrical impedance analysis. [Results] Changes in GLFS-25 scores over 1 year showed a significantly positive correlation with changes in the 10-m obstacle walking time (r = 0.51, p<0.05), but a significantly negative correlation with changes in AMM/bw (r = -0.31, p<0.05). [Conclusions] Walking ability and AMM/bw strongly influence changes in GLFS-25 scores.

Keywords: GLFS-25, locomotive syndrome, health-related physical fitness

251. The exercise intensity of square-stepping exercise in community-dwelling late elderly women
Ryota Uchida1, Ayaka Noma1, Shigeharu Numao1, Masaki Nakagai1

1Natl. Inst. of Fitness & Sports in Kanoya, Kagoshima, Japan [Aims] Square-stepping exercise (SSE) is an exercise that is attracting attention as a preventive care exercise. Nakagaichi et al. (2014) reported that participation in the SSE program for three months influenced the physical and cognitive functions of community-dwelling elderly people. There are many other studies the effects of SSE, but there are few studies that have examined the exercise intensity of SSE in detail. The aim of this study was to examine the exercise intensity of SSE. [Methods] Study1: The subjects were 57 community-dwelling late elderly women (81.2±4.3 years old). Metabolic equivalents (METs) and heart rate (HR) for 90 minutes SSE program were measured by using an accelerometer and heart rate sensor. After SSE program, rate of perceived exertion (RPE) was measured. Study 2. The subjects were 16 community-dwelling late elderly women (82.0±4.8 years old). METs and HR, and of 5 target steps were measured by using expired gas analyzer and heart rate sensor. After each target step, RPE was measured. [Results] Study1. The average METs for 90 minutes SSE program by accelerometer was 2.1±0.2, %HR reserve was 19.5±10.2, RPE was 11.3±1.4. Study 2. The average METs of the five steps by the breath gas analyzer were 1.9±0.4, %HR reserve was 19.5±10.2, RPE was 9.6±1.9. [Conclusions] SSE is a safe exercise for community-dwelling late elderly women. However, the intensity of SSE was low intensity for aerobic exercise.

Keywords: square-stepping exercise, METs, late elderly women

252. Comparison of physiological responses during unsteady slope treadmill walking between elderly and young people
Kazuki Nishimura1, Yutaro Tamani2, Koji Nagasaki1

1Hiroshima Institute of Technology [Aim] We hypothesized that adaptability to slope changes would be lower in elderly people compared to younger people. The present study aimed to verify these hypotheses to compare the amplitude and the phase lags in heart rate (HR) and oxygen intake during unsteady slope treadmill walking. [Methods] Twenty-three elderly (68±4 years) and 14 young (21±1) individuals volunteered to participate in the study; they provided written informed consent. Before the experiment, each subject performed a graded treadmill exercise test for calculating their peak oxygen intake (0° slope). All subjects performed a treadmill walking exercise for 32 min. The walking speed was set at 25% of the peak oxygen intake. The steady-state exercise test included three 4-min bouts of walk at 0°, 8°, and 4° at slope, whereas the unsteady workload exercise test consisted of 4-min bouts of exercise with gradual increases and decreases in workload at 0° and 8° at slope. During the exercise test, HR and oxygen intake were measured. The HR and oxygen intake maximal values, minimal values, amplitude, and phase lag during unsteady workload exercise were calculated. [Results] During exercise, HR and oxygen intake were lower in the elderly group. Both the HR phase lags and the oxygen intake phase lags were significantly slower in the elderly group. The amplitude in HR and oxygen intake were also significantly lower in the elderly group. [Conclusion] The human adaptability to unsteady slope exercise decreases with age.

Keywords: human adaptability, unsteady slope walking, elderly people
253. Effect of 6-month square-stepping exercise program on physical fitness and cognitive function in the latter-stage elderly women

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[Aims] Square-stepping exercise is a novel multiple-task exercise for maintaining and improving physical fitness and cognitive function in elderly people. The purpose of this study was to examine the effects of 6-month program on physical fitness and cognitive function in the latter-stage elderly women. [Methods] Twenty-three elderly (≥75 years old) women (mean age: 81.1±4.2 years) were participated in the square-stepping exercise program (once a week, 90 minutes/session, for 6-month). Physical fitness age calculated by grip strength, single-leg balance with eyes opened, chair-stand, and walking round two cones, and cognitive function (Five Cog test) were measured before and after the program. [Results] Physical fitness age did not improve during the square-stepping exercise program. Significant improvements in memory, language fluency and abstract thinking in Five Cog test were observed. The total score of Five Cog test increased significantly 51.3±14.0 to 59.9±15.3. [Conclusions] Six months square-stepping exercise program is an effective exercise for improving the cognitive function of the latter-stage elderly women. 

Keywords: elderly, square-stepping exercise, cognitive function

254. Follow-up Study on the Cognitive Function of Middle-Aged and Elderly Women Participating in a Pilates Class

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[Purpose] The purpose of this study was to investigate changes in the cognitive function of middle-aged and elderly women who participated in a Pilates class from a follow-up survey over 1 year. [Methods] Twenty-two middle-aged and elderly women (12 in the class group and 10 in the control group) were participated in this study. Between February and April 2017, the Pilates group practiced Pilates twice weekly (a total of 20 times), and the control group received monthly health lectures. A pre-survey was conducted in February 2017, a post-survey in April 2017, and a follow-up survey in July 2018. Cognitive function was assessed using the Five-Cog test global score and sub-items (attention, verbal memory, visuospatial cognition, word fluency, and associate learning) and the Trail Making Test parts A and B. [Results] Two-factor analysis of variance showed no interaction in any of the items related to cognitive function. At the post-survey and follow-up, Five-Cog test in both groups was significantly better than the pre-survey. At the post and follow-up points, attention and memory were significantly better in the Pilates group than in the pre-survey. [Conclusion] The practice of Pilates improves attention and memory function in middle-aged and elderly women, and its effects may persist after approximately 1 year and 4 months.

255. Relationships of social activities with mortality and long-term care need among community-dwelling older people in Hokkaido

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[Aim] The purpose of the present study was to demonstrate the relationship of social activities with mortality and long-term care need among community-dwelling older people in Hokkaido. [Methods] The participants of this study were 419 men and women (baseline age: 60 to 79 years) who were age- and gender-stratified random samples selected from A city in Hokkaido. They participated in the baseline survey in 2015 and had not moved out during the 2.5 years follow-up. The incidence of death, long-term care need and hospitalization in the participants was confirmed by the city officials. Frequency of going outdoors, participation in social activities, social networks, life space and the index of competence for the elderly were checked by a questionnaire. The relationship between the life events and social activities was analyzed using Fisher’s exact test and Dunnett’s test. [Results] The incidence of each event during the follow-up were 13 dead (3.0%), 14 long-term care needs (3.3%) and 14 hospitalizations (3.3%). Participants who died had significantly less frequency of going out, doing housework and sport activity, and lower instrumental ADL than the intact participants (p<0.05). Participants who needed long-term care also significantly less engaged in sport activities (p<0.05). [Conclusion] Our results suggested that sport activity is associated with a healthy life span, however further follow-up research to find out predictors for healthy longevity is needed. 

Keywords: long-term care need, social activity, older people

256. Effects of multicomponent exercise and ingestion of chlorella on dementia prevention in older adults

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[Aims] In recent years, it has been identified that multicomponent exercise, combining physical activity and cognitive training, suppresses cognitive decline. In addition, chlorella intake has been reported to reduce erythrocyte peroxidized phospholipids, which are often found in patients with dementia. This study aimed to verify the combined effect of multicomponent exercise and chlorella administration on dementia prevention. [Methods] The participants included 14 elderly people (average age: 76.3±0.4 years old) who had the habit of walking around in Kyoto. Seven participants in the chlorella intake groups (3 men, 4 women) and 7 participants in the placebo intake groups (3 men, 4 women) were randomly divided to receive 20 test foods twice a day (chlorella 4 g, oral intake). The multicomponent exercise was held once in a classroom for 60 minutes, twice a month and which participants were instructed to perform the exercise at home, in addition to normal walking. The intervention period was 6 months. Moreover, NCCG-FAT (National Center for Geriatrics and Gerontology-Functional Assessment Tool) was used for evaluation of cognitive function before and after the intervention. Memory function, executive function, processing function, and attention function were measured to complete evaluation. [Results] There was a significant improvement in the memory function of word-memory-delayed recognition before and after the intervention, only in the chlorella intake group (p<0.05). [Conclusions] Our study suggests that the combined use of multicomponent exercise and chlorella intake has an effect on the memory function of older adults. 

Keywords: multicomponent exercise, chlorella, dementia prevention
Relationship between physical functions and nephron index in middle-aged and older adults

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[Aims] Physical functions can gradually decrease as the severity of renal dysfunction progresses. Recently a nephron index, which is calculated by the ratio of urinary phosphate excretion to serum fibroblast growth factor 23 (FGF23) levels, has reported as a new index that can be likely to estimate the number of functional nephrons. The purpose of this study was to examine whether the nephron index (the estimated number of functional nephrons) is associated with physical functions in middle-aged and older adults. [Method] The nephron index was calculated for 299 adults (64 ± 9 years old) using the following formula: Nephron index = fractional excretion of phosphorus × estimated glomerular filtration rate (eGFR) × serum phosphate/serum FGF23 levels. Physical functions (handgrip strength, knee extension muscle strength, one-leg standing duration with vision, 10m walking speed, seat body forward bending, and 30-second chair-stand test) were evaluated. [Results] In the participants stratified in accordance with the tertiles of nephron index, the physical functions such as 10m walking speed (p = 0.012), seat body forward bending (p = 0.001), 30-second chair-stand test (p < 0.001) significantly differed between lowest and highest groups. Furthermore, these association remains significant after the consideration of covariates including age, sex, and BMI. [Conclusion] Our findings suggest that the estimated number of functional nephron evaluated by the nephron index was associated with specific physical functions in middle-aged and older adults.

Keywords: Nephron index, FGF23, phosphate metabolism, physical function

Aerobic fitness is linked to interhemispheric functional connectivity in prefrontal cortex during working memory task in older adults: an fNIRS study

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Introduction: Working memory (WM), which is mediated by prefrontal cortex (PFC), declines with aging. To prevent the cognitive aging, older adults could recruit more bilateral prefrontal activation during WM process than young adults. Recently, we preliminary found that older adults with higher aerobic fitness had greater WM performance and recruited more bilateral activation in PFC. Thus, older adults with higher aerobic fitness might have stronger interhemispheric functional connectivity in PFC during WM task. Methods: Forty-seven healthy older adults conducted graded exercise test to obtain their ventilatory threshold (VT) as an index of aerobic fitness. On another day, they performed computer-based verbal Stroop tasks and, in fact, the degree of inverse Stroop interference was improved the cognitive performance assessed with Stroop/inverse Stroop tasks and, in fact, the degree of inverse Stroop interference increased after EC. [Conclusion] These results suggest that both EC and CC transiently improves mental and physical state of community-dwelling older people in Hokkaido.

Keywords: lifestyle, long-term care need, older people

Effects of single-session exercise versus cosmetic classes on mental and physical state of community-dwelling older women

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[Aim] To investigate the effects of single-session exercise versus cosmetic classes on physical and mental state of community-dwelling older women. [Methods] Twenty community-dwelling older women aged 71.8 ± 6.2 yr participated in this study. Each participant underwent a 60-min session of both exercise and cosmetic classes (group lessons) in a randomized order. The exercise class (EC) included the instruction and practice of oral exercises, whole-body rhythmic exercises, body-weight resistance exercises, and stretching. The cosmetic class (CC) consisted of some exercises with hands and arms, self-massage, facial skin treatment with lotion and emulsion, making up the face, and hairdressing. Psychological state, cognitive performance, and some measures of autonomic activity were determined before and immediately after the sessions. [Results and Discussion] Both EC and CC decreased the level of anxiety and increased the subjective scores of vitality and pleasure. These psychological improvements were accompanied by the physiological changes such as the decreases in heart rate and hand skin temperature measured at sitting rest. However, neither class improved the cognitive performance assessed with Stroop/inverse Stroop tasks and, in fact, the degree of inverse Stroop interference increased after EC. [Conclusion] These results suggest that both EC and CC transiently improves mental and physical state of community-dwelling older women and that care should be taken in the timing of EC.

Keywords: mood, Stroop task, autonomic activity
Sex differences in obese children from the viewpoint of long-term hospitalization

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Background: Sex differences in the pathology of obese children have been observed in visceral fat accumulation, blood pressure, lipid metabolism, liver / kidney function, and insulin resistance, similar to in adults. Although there are many observational studies on sex differences in obese children, there is little information on sex differences based on the results of responses aimed at improving obesity. [Purpose] The purpose of this study was to examine sex differences in hospitalized treatment results for obese children in order to create measures that account for sex differences. [Methods] The subjects were 53 obese children who had been hospitalized for one semester, and were treated using diet and exercise therapy. Diet therapy was set at 75-80% of the energy requirements of each child, and exercise therapy included walking, stepping exercises, ball games, etc. for approximately 60 minutes every day. [Results and discussion] Obese boys had significantly higher weight, body fat, visceral fat area, and subcutaneous fat area reduction rates than obese girls. (P<0.05). As there was no sex difference in obesity at the start of treatment, obese girls, similar to adults, were consid­ered highly resistant to treatment aimed at reducing body fat. On the other hand, the rate of decrease in visceral fat in obese boys was approximately twice as high as that in obese girls, and the rate of decrease in AST and ALT was also significantly higher in boys (P<0.05). The visceral fat of obese boys can be relatively easily reduced by obesity treatment based on diet and exercise therapy, and reasonable weight loss guidance is considered to be effective at preventing and improving liver function abnormalities in boys.

Keywords: obese children, sex differences, hospitalized treatment

Effects of exercise on visceral fat, body composition, and physical fitness in Japanese older adults with normal BMI

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[Aims] To elucidate the effective type of exercise on the improve­ment of an abdominal fat area, whole-body composition, and physical fitness in older adults with normal body mass index(BMI). [Methods] 156 persons were randomly assigned to four groups: 1) control, 2) aerobic exercise(AE), 3) resistant exercise(RE), and 4) aerobic and resistant exercise(MIX). Before and after the ex­ercise interventions participants performed tests including timed stands test-5(TST5), timed up and go(TUG) test, and 6-min walk­ing distance(6MD), and visceral fat area(VFA), subcutaneous fat area(SFA), and body fat percentage(BFP) were measured. [Results] In the male participants, BMI, BFP, and SFA of the AE group de­creased most among the four groups. In the female participants, BFP and SFA decreased in all the groups. VFA decreased only in the male participants of the AE group. The multiple regression analysis revealed the rates of change in BMI, BFP, SFA, and 6MD were af­fected by AE, while those in TST5 and TUG test were affected by RE and MIX. VFA was not affected by any type of exercise. [Con­clusion] These results suggest that RE and MIX are effective on the increase of physical strength, while AE decreases whole-body fat including abdominal SFA and improves walking ability in older adults with normal BMI.

Keywords: exercise, older adults

Level of lower limb muscle strength before training does not influence the effects of low-load resistance training

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[Aims] In this study, we sought to determine whether the level of lower limb muscle strength before training influenced the effect of low-load resistance training. [Methods] A total of 70 Japanese participants (49 women aged 68.2±6.9 years and 21 men aged 72.3±4.2 years) volunteered to participate in this study. All participants par­ticipated in a low-load resistance training program using their own bodyweights and elastic tubes. Training was conducted twice per week, for 12 weeks. Each participant completed a physical perfor­mance test, which included an isometric knee extension strength test and the 30-s chair stand test (CS-30), before and after the training program. The weight-bearing index (WBI) was calculated as each participant’s maximum extension strength (kg) divided by the body weight (kg). We adopted WBI = 0.6 kg/kg and CS-30 = 21 times as the cut-off criteria for reduced lower limb muscle strength. Par­ticipants were divided into two groups in each criterion, and their data were analyzed using two-way ANOVA. [Results] When using the criteria as mentioned above, 19 women and 4 men for WBI and 24 women and 12 men for CS-30 were categorized as exhibit­ing reduced lower limb muscle strength. Twice-weekly low-load resistance training increased the lower limb muscle strength in each group after 12 weeks of training, and there were no interactions between time and groups. [Conclusions] The level of pre-training lower limb muscle strength did not influence the effects of low-load resistance training.

Relationship between average race speed, age, and distance of middle-aged and older male citizen runners

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[Aim] A number of middle-aged and older runners have participated in marathon race, but important information as to how the perfor­mance and race distance change with aging is not clear. This re­search provides information for effective practice and race planning by clarifying the relationship between age and marathon records, average race speed and race distance of citizen runners. [Methods] Seventy middle-aged and older male citizen runners who belong to various local running clubs and have participated in marathon races were recruited for this research. Their age and competition results were obtained from individual interviews with the runners and analyzed in a cross-sectional way. [Results] The average race speed became slower with age, and the slope was -2.3 m/min/year. For runners who participated in four kinds of competitions from the marathon to 5-km race, comparing the case where the vertical axis is the average race speed and the horizontal axis is the logarithmic value of the race distance and the absolute value of the race dis­tance. There were many runners with high correlation coefficients in the latter case. [Conclusion] In middle-aged and older male citi­zen runners, it is indicated that the average race speed of marathon decreases linearly with aging. Concerning about the relationship between race distance and average race speed, the average race speed is considered to decreases linearly when the horizontal axis is the logarithmic value of the race distance at the world record level while at the citizen runner level, it is indicated the average race speed decreases linearly when the horizontal axis is the value (km) itself of race distance.

Keywords: marathon, citizen runner, aging
265. Physical fitness changes after four years in community-dwelling prefrail elderly adults who participated in preventative healthcare classes

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Purpose: There are few reports of long-term follow-up of changes in health status, including convalescent rehabilitation, in frail elderly adults. This study aimed to compare changes in physical strength between community-dwelling elderly adults with and without prefrailty after 4 years of participation in a preventative healthcare class. Methods: Prefrailty was defined as grip strength <30 kg for the men and <20 kg for the women. Health exercise classes had been conducted since 2011. Subjects were divided into two groups (with prefrailty and without prefrailty) based on grip strength before participation. We compared the changes in grip strength and 10-m walking speed after 4 years between the two groups. Results: From 2011 to 2015, 178 people (50 men and 128 women) participated in the classes, including 19 men and 35 women with prefrailty. Twenty-two men and 43 women participated in the classes for 4 years, including 3 men and 6 women with prefrailty. Change in grip strength after 4 years was -0.49±1.11 kg for those with prefrailty and -1.34±0.50 kg for those without. Change in walking speed was +0.10±0.17 m/s for those with prefrailty and +0.04±0.08 m/s for those without. There were no significant gender differences. An analysis of covariance using age as a covariate showed that the change in grip strength was significantly different between two groups (with prefrailty and without prefrailty)(p<0.05). Conclusions: Continued participation in preventative healthcare classes effectively increases leg strength, even in elderly adults with prefrailty.

266. Influence of a health course on the body composition, physical fitness and baPWV of participating middle-aged males

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[Aims] This study aimed to validate the influence of once-weekly classes, held over a period of nine months, on the participants’ body composition, physical fitness and baPWV. [Methods] Average age was 51.8 ± 12.2 yrs. The courses featured aerobic exercises, moderate-intensity muscle strength and training, and resistance training using their own body weight. They were measured by the body composition and physical fitness before and after the course. Body composition was measured using the impedance method, and body weight, skeletal muscle mass, body fat mass, and body fat percentage were evaluated. baPWV and ABI were measured by blood pressure pulse wave propagation device (BP-203RPE III; Colin Med. Tech. Co.). [Results] The subjects’ body composition remained unchanged. However, their scores for the 3-second chair stand test had risen significantly three months after starting the course. Systolic and diastolic blood pressure remained unchanged. Three months after the start of the course, baPWV had dropped significantly and remained low for the following nine months. [Conclusions] The beneficial effects of the health course were observed three months later, and were sustained due to the subjects having made physical exercises part of their daily routine.

Keywords: baPWV, Middle elderly male, Combined-training

267. Association of plasma calciprotein particles levels with muscular strength and muscle mass in middle-aged and older adults

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[Aims] Calciprotein particles (CPP), which is tiny nano-aggregates containing calcium-phosphate and fetuin-A, have been reported to be associated with chronic inflammatory and atherosclerosis. Higher serum phosphate levels are likely to be associated with lower muscular strength. We therefore investigated whether the CPP is associated with muscular strength and muscle mass in middle-aged and older adults. [Methods] A total of 188 adults (63 ± 9 years) were included in this study. Plasma CPP levels were measured using an infrared fluorescent and a gel filtration method. Muscular strength (hand grip strength, knee extension strength), skeletal muscle mass, and lean body mass were assessed. [Results] Plasma CPP levels were inversely correlated with hand grip strength (r = -0.283), knee extension strength (r = -0.200), skeletal muscle index (r = -0.283), and upper limbs lean body mass (r = -0.233). Furthermore, in the women (n = 140), the relations of plasma CPP levels, knee extension strength, skeletal muscle index, and upper limbs lean body mass remains significant after adjusting age, body mass index, and estimated glomerular filtration rate. [Conclusions] Our findings suggest the decline in muscular strength and muscle mass is likely to be associated with plasma CPP elevations in especially middle-aged and older women.

Keywords: calciprotein particles, phosphate, muscular strength, muscle mass

268. Influence of solar radiation on self-regulated exercise intensity in the heat outdoors

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[Aim] High radiant heat load reduces endurance exercise performance in the heat indoors, but this remains unconfirmed in outdoor exercise. We investigated the effects of variations in solar radiation on self-regulated exercise intensity and thermoregulatory responses in the heat outdoors at a fixed rated of perceived exertion (RPE). [Methods] Ten male participants completed 45-min cycling exercise in hot outdoor environments (about 31°C) at a freely chosen resistance and cadence at an RPE of 13 (somewhat hard). Participants were blinded to resistance, pedal cadence, distance and elapsed time and exercised at three sunlight exposure conditions: clear sky (244±54 W/m²; LOW); medium sky (294±62 W/m²; MID); and thick cloud (306±52 W/m²; LOW). [Results] Power output (HIGH 96±22 W; MID 103±20 W; LOW 108±20 W) and resistance were lower in HIGH than MID and LOW (P<0.001). Pedal cadence was lower, the core-to-skin temperature gradient was narrower, body heat gain from the sun (SHG) was greater and thermal sensation was higher with increasing solar radiation and all variables were different between trials (P<0.01). Mean skin temperature was higher in HIGH than MID and LOW (P<0.01), but core temperature was similar between trials. [Conclusions] We conclude that self-regulated exercise intensity in the heat outdoors at a fixed RPE of somewhat hard is reduced with increasing solar radiation because of greater thermoregulatory strain, perceived thermal stress and SHG.