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**【Poster Presentation by Teachers】**

**Altered epidermal barrier functions by free-living daily physical activity in elderly**

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Our previous study reported the effects of free-living daily physical activity on the epidermal barrier in 63 elderly volunteers. The present study increased the number of elderly volunteers and investigated the relationship between free-living daily physical activity and the epidermal physical barrier in more detail. A total of 105 healthy elderly volunteers (age 66–93 yr) participated in the study. To assess the physical activity, we used an electric pedometer. We measured moisture content of the stratum corneum with moisture checker and transepidermal water loss (TEWL) with VapoMeter. Moisture content of the stratum corneum ( $p < 0.01$ )

and TEWL ( $p < 0.05$ ) on the forearm were significantly lower than those on the corner of an eye. In moisture content of the stratum corneum ( $r = 0.411$ ,  $p < 0.01$ ) and TEWL ( $r = 0.202$ ,  $p < 0.05$ ), there were significant correlations between the forearm and the corner of an eye. Additionally, on the forearm ( $r = 0.402$ ,  $p < 0.01$ ) and the corner of an eye ( $r = -0.326$ ,  $p < 0.01$ ), there were significant correlations between moisture content of the stratum corneum and TEWL. The relationship between free-living daily physical activity and the epidermal physical barrier is under analysis.

## Characteristics of sedentary behavior associated with mental health among adults

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**Background:** Depression, a common mental illness, has a high global incidence. From 1999 to 2005, the number of cases of mood disorders has doubled, and in Japan, these trends are high (Ministry of Internal Affairs and Communications of Japan, 1999; Ministry of Internal Affairs and Communications of Japan, 2005). Recently, engaging sedentary behavior such as television viewing and computer use associated with depression is becoming clearer. However, a consensus on sedentary behavior for preventing depression has not yet been reached.

**Purpose:** The present study examines the association between sedentary behavior and depression among Japanese adults. **Methods:** The present study was performed using a cross-sectional study. The participant included 3,000 Japanese adults who lived in

Japan. Objective sedentary behavior was measured using accelerometer for seven consecutive days. The self-administered questionnaire survey which included questions on the Center for Epidemiologic Studies Depression Scale, and sociodemographic status such as gender, age, educational attainment (graduate school or university, 2-years university, high or junior high school), employment status (office worker, student, housewife, part-time worker, unemployed), marital status (married, unmarried), household income (<3,000,000, <5,000,000, <7,000,000, <10,000,000, ≥10,000,000 yen), and body mass index) was conducted by mail. Logistic regression analyses will be conducted to examine the independent relationships between sedentary behavior and mental health. At present, the researchers are gathering data.

**Lipopolysaccharide-stimulated inflammatory responses by macrophages are suppressed at the post-transcriptional level in middle-aged mice.**

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The intensities of macrophage inflammatory responses to bacterial components gradually decrease with age. Given that a reduced rate of protein synthesis is a common age-related biochemical change, which is partially mediated by increased phosphorylation of eukaryotic initiation factor-2 $\alpha$  (eIF-2 $\alpha$ ), we investigated the mechanism responsible for the deterioration of macrophage inflammatory responses, focusing specifically on the age-related biochemical changes in middle-aged mice. Peritoneal macrophages isolated from 2-month-old (young) and 12-month-old (middle-aged) male BALB/c mice were stimulated with lipopolysaccharide (LPS). Although LPS-stimulated secretion of tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) by the macrophages from middle-aged mice was

significantly lower than that from young mice, LPS caused marked increases in levels of TNF- $\alpha$  mRNA in macrophages from middle-aged as well as young mice. Moreover, LPS evoked similar levels of phosphorylation of c-Jun N-terminal kinase (JNK) and nuclear factor- $\kappa$ B (NF- $\kappa$ B) in young and middle-aged mice. In contrast, the basal level of phosphorylated eIF-2 $\alpha$  in macrophages from middle-aged mice was higher than that in macrophages from young mice. Salubrinal, an inhibitor of the phosphatase activity that dephosphorylates eIF-2 $\alpha$ , suppressed the LPS-stimulated inflammatory responses in a murine macrophage cell line RAW264.7. These results suggest that post-transcriptional suppression of macrophage inflammatory responses during middle age requires phosphorylation of eIF-2 $\alpha$ .

**The feasibility and preliminary effectiveness of an exercise program  
in patients with depression**

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**OBJECTIVE:** To investigate the preliminary effectiveness, feasibility and acceptability of an exercise program for the patients with depression and related mental illness

**DESIGN:** Single-arm study

**SETTING:** Psychiatry clinic

**PARTICIPANTS:** Thirty-one patients (age: 26-56 years) who was participating a return-to-work program following mental health problems

**METHODS:** Participants attended the exercise program once a week in the gym during the return-to-work program participation. The exercise program was 60 minutes per session, and consisted of aerobic exercise and muscle training. We evaluated participants' depressive symptom by Beck Depression Inventory (BDI) at baseline and every month. Aerobic capacity and morphometry were measured as secondary outcomes.

## What factors determine the fastest start performance in front crawl swimming

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The purpose of this study was to investigate correlation between 15 m time and kinematic variables in 25 m sprint by front crawl swimming. Twelve college male swimmers participated in this study. Their swimming performance ranged national to international levels. The participants swam 25 m sprint swimming three times by front crawl with maximum effort. Four video cameras were placed on the poolside deck and under water to record swimming motion. The elapsed times at taking off from the start block, 15 m and 25 m were measured by counting the number of the video frames. Two-dimensional co-ordinates during motion

were obtained from the video images using direct linear transformation methods. Pearson's correlation coefficients were calculated between 15 m time and the variables (block time, horizontal take off velocity, take off angle, flight distance, entry angle, start depth). Flight distance strongly correlated with 15 m time ( $r = 0.74$ ,  $P < 0.01$ ). Coefficients of correlation  $r$  in horizontal take off velocity and block time were  $-0.51$  ( $P > 0.05$ ) and  $0.52$  ( $P > 0.05$ ), respectively. We suggested that long flight distance and water-entry with low water resistance were key factors for successful swimming start in front crawl.

## Cardiovascular responses to stretching exercise in younger and older adults

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Stretching exercise induce cardiovascular responses through the modulation of muscle mechanoreceptors and metaboreceptors. Previous study showed that the cardiovascular responses to graded intensities of passive stretch were positively correlated to muscle tension. Subjects with low level of flexibility probably display greater muscle stiffness. Therefore their muscle tension will more increase to sustain the stretching position. Because flexibility decreases with age, we hypothesized that cardiovascular responses to stretching exercise would be more likely to occur in older subjects compared to younger subjects. The purpose of this study was to determine the acute effects of stretching exercise on arterial stiffness, blood pressure, and heart

rate in younger and older adults. Forty nine healthy adults (24 younger and 25 older adults) participated in this study. Arterial stiffness (baPWV; brachial-ankle pulse wave velocity), systolic blood pressure and heart rate were measured before and immediately after the stretching exercise. There were no significant interactions (age × time) of baPWV, systolic blood pressure, and heart rate. There were only significant effects ( $P < 0.01$ ) of time for baPWV, systolic blood pressure, and heart rate. The baPWV and systolic blood pressure significantly increased and heart rate decreased after stretching exercise. These results suggest that stretching exercise acutely increases arterial stiffness and systolic blood pressure and decrease heart rate in both age groups.

## Effects of circadian rhythm and acute endurance exercise on insulin sensitivity

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Exercise therapy is effective for the treatment of diabetes. Endurance exercise has beneficial effects on insulin sensitivity via PPAR $\gamma$  and C/EBP $\alpha$ . PPAR $\gamma$  and C/EBP $\alpha$  are essential transcription factor for the differentiation of fat cells and insulin sensitivity. Biological response to exercise is different in the morning and evening because of the fact that material related to the metabolism is under the involvement of clock genes. Although PPAR $\gamma$  and C/EBP $\alpha$  are affected by clock-genes, effects of exercise performed in different timing on PPAR $\gamma$  and C/EBP $\alpha$  are not clear. Considering more effective exercise therapy against diabetes, especially insulin sensitivity, it is important to investigate the impact of exercise timing on PPAR $\gamma$  and C/EBP $\alpha$ . The purpose of this study

was to examine whether the timing of exercise influences PPAR $\gamma$  and C/EBP $\alpha$ , insulin sensitivity on the next day morning in humans. Nine healthy young men participated in three trials in a randomized cross-over design: (1) morning exercise (0900-1000) (2) evening exercise (1800-1900) (3) control trials. At exercise trials, participants walked for 60 minutes at 60% of maximal oxygen uptake on a treadmill. We used oral glucose tolerance test before and after exercise or control day to assess insulin sensitivity. Subjects' average maximum oxygen uptakes per body weight before trials were not significantly different between in the morning and evening. The additional data is now under analysis.

**Use of the pregnancy physical activity questionnaire (PPAQ) to identify physical activity associated with gestational weight gain during pregnancy**

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The purposes of this study were to (1) test the reliability and validity of PPAQ; (2) investigate the association between physical activity (PA) measured by the PPAQ and GWG for Chinese pregnant women. First, the validation of the PPAQ was carried out among 27 women. Second, PPAQ and food frequency questionnaires (FFQ) were completed among 203 women. The associations between PA during pregnancy and GWG were explored in linear logistic regression models.

The results of this study showed that the scale was reproducible (ICC = 0.77), and correlation between PPAQ and pedometer was significant ( $r = 0.63$ ). PA (METS > 3)

measured with PPAQ were  $12.8 \pm 11.1$ ,  $19.0 \pm 17.1$ , and  $26.6 \pm 25.5$  MET · h/week, respectively for women at 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> trimester. The GWG was 1.9 kg, 7.9 kg and 12.1 kg, respectively. In adjusted analysis, exercise habits before pregnancy was associated with GWG. The associations between PA (METS > 3), education, job, and income were not significant. The study provides evidence that the PPAQ is acceptable for pregnant women. However, PA measured with PPAQ was found not related with GWG. Further study should be carried out whether PPAQ can be used to identify the relationship between PA and GWG.



## Does exercise training prevent against stress-induced atherosclerosis?

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Chronic stress is an important risk factor for atherosclerosis, which is a chief process in the development of cardiovascular disease. Increased circulating levels of corticosterone have been documented in several animal models of chronic stress, which may be one of the mechanisms of atherogenesis. Here, we hypothesized that 1) corticosterone treatment induces atherosclerosis 2) exercise training prevents against stress-induced atherosclerosis. To test these hypotheses, apolipoprotein E (ApoE)-deficient mice were fed a high-fat diet for 13 weeks with exposure to either corticosterone or vehicle in the drinking water (CORT and Con). Corticosterone treatment significantly increased atherosclerotic plaque area at the aortic root. Such exacerbation of

atherosclerosis was accompanied by significantly lower levels of circulating white blood cells and serum interleukin-1 $\cdot$  (IL-1 $\cdot$ ), and significantly elevated serum concentrations of total cholesterol, low-density lipoprotein (LDL), very-low-density lipoprotein (VLDL) and small dense low-density lipoprotein (sd-LDL) in CORT mice when compared to Con mice. Corticosterone treatment did not change CCR2 expression on monocytes *in vivo* and *in vitro*. These findings demonstrate that corticosterone is sufficient to exacerbate atherosclerosis *in vivo*. Further studies are needed to clear whether exercise training prevents against atherosclerosis by reduction of stress.

## Effects of exercise training on leukocytes infiltration in adipose tissues

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Obesity is associated with adipose tissue inflammation, which has been attributed to changes in the number and types of leukocytes infiltrated in adipose tissues. In particular, macrophages play an essential role in the development of adipose tissue inflammation. Interestingly, neutrophils produce macrophage specific chemokines, which enhance infiltration of macrophages into adipose tissues. In contrast, eosinophils are reduced in adipose tissue in obesity, which inhibit activation of macrophages in adipose tissues.

Exercise training is thought to be important for the reduction of adipose tissue inflammation, but the mechanisms by which this may occur are incompletely understood. This study aimed to evaluate the effects of exercise training on infiltration of neutrophils

and eosinophils in adipose tissues.

Four-week-old male C57BL/6J mice were randomly assigned to four groups that received a normal diet (ND) plus sedentary, an ND plus exercise training, a high-fat diet (HFD) plus sedentary, and an HFD plus exercise training. Mice were fed the ND or the HFD from 4 to 20 wk of age. Mice in the exercise groups ran on a treadmill for 60 min/day, 5 times/week with the same time. Body weights were significantly increased in the HFD group than in the ND group ( $p < 0.01$ ). However, body weights were significantly decreased in the HFD plus exercise training group than in the HFD plus sedentary groups ( $p < 0.01$ ). At present, we are investigating flow cytometry analyses to clarify infiltration of neutrophils and eosinophils in adipose tissues.

**Acupuncture treatment modified the mRNA expression  
of SERCA related genes induced by spiral wire immobilization in mice**

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The purpose of this study was to examine whether acupuncture treatment is available to affect the muscle contractile function. Sarcoplasmic reticulum Ca<sup>2+</sup>ATPase (SERCA) resides in the sarcoplasmic reticulum (SR) within muscle cells. SERCA transfers Ca<sup>2+</sup> from the cytosol of the cell to the lumen of the SR at the expense of ATP hydrolysis during muscle relaxation. . Calsequestrin is a Ca<sup>2+</sup>-binding protein of the sarcoplasmic reticulum. Electroacupuncture (EA) and manual acupuncture (MA) were conducted on the atrophic gastrocnemius muscles induced by spiral wire immobilization (SWI) for 2 weeks. A total of 32 male mice (8 weeks), were randomly placed into 4 groups: A) control, B) SWI, C) SWI + MA and D) SWI+

EA 1 Hz (n = 8/each groups). We measured the mRNA expression levels of SERCA1 in soleus is significantly increased by the SWI ( $P < 0.001$ ) and significantly decreased by the MA and EA treatment ( $P < 0.05$ ,  $P < 0.05$ , respectively). Surprisingly, we found the mRNA expression level of Calsequestrin1 in SWI group was significantly increased than control group ( $P < 0.01$ ) and the EA group expression level was significantly increased than in the SWI group ( $P < 0.05$ ), however, we could not find the significant difference between the MA group and the control group. We concluded that acupuncture treatment is available to affect the muscle contractile function.

**Menstrual cycle phase does not influence resting energy expenditure  
of collegiate Japanese female athletes**

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In order to manage nutritional status of athletes, estimated energy requirement (EER) should be calculated using the estimation equation based on resting energy expenditure (REE). The menstrual cycle is one of the important factors which influence REE in women. The aim of the present study was to examine whether there is a difference in REE during the different menstrual cycle phases in female collegiate athletes with normal menstrual cycle. Eight subjects were participated in this study (height  $165.4 \pm 5.1$ cm, body weight (BW)  $58.1 \pm 4.5$ kg, and fat-free mass (FFM)  $45.5 \pm 3.5$ kg). REE was measured by indirect calorimetry using Douglas bag technique, and body composition was estimated by dual energy X-ray

absorptiometry. All measurements were collected at follicular and luteal phases for the duration of one complete menstrual cycle in all subjects. REE of each phase were not different in terms of kcal/day adjusted by BW and FFM. Shorter luteal phase and lower production of progesterone (P4) level, due to the earlier gynecological age of our subjects (<10 years), may consequently result in no significant difference in REE between the follicular and luteal phases. In conclusion, REE for female collegiate athletes with normal menstrual cycle were not different between the two menstrual phases. To assess the EER of collegiate female athletes, consideration of gynecological age would be required.

**Relationship between self-reported history of the head impact and the performance on cognitive tests of sports-related concussion in collegiate rugby football players**

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Sport-related concussion cause short-lived impairment of neurological function that resolves spontaneously. However, there is a long-term effect of repetitive concussion in the retired athlete. The purpose of this study was to examine the relationship between self-reported concussion history and the performance on neurocognitive test battery in collegiate rugby football players.

Collegiate rugby football players (n=468) participated the neurocognitive test battery of sports-related concussion (CogSport : CogState Ltd, Australia) and answered concussion history questionnaire (number of

concussion and loss of consciousness) before the start of the 2013 autumn season. Participants were categorized into 3 concussion history groups ( non-concussion: n=113, 3 times or less: n=218,  $\geq 4$  concussion history: n=137). In the result, the CogSport score (visual memory and reaction time) of participants who reported  $\geq 4$  concussion history lower than those who reported 3 times or less concussion history ( $p < .05$ ). These results suggested that neurocognitive function decline in collegiate rugby football player with multiple concussion history.

## Dehydration attenuates heat sensation: another etiology of heat stroke?

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Dehydration attenuates heat tolerance, which could be involved in an incidence of heat stroke. Using mice, we tested the hypotheses; i) dehydration attenuates their thermal preference and behavior, and ii) spontaneous exercise training augments heat tolerance by modulating behavioral thermoregulatory responses. Mice housed with or without a running-wheel for 8 wks (WR and NWR groups, n=47 and 40, respectively) were used. Implanted a body temperature ( $T_b$ ) measurement device, the mice received s.c. injection of isotonic- or hypertonic-saline (1 ml/100 g of body wt; 154 or 2,500 mM, IS or HS subgroup) and were placed in a box with 5 Peltier boards at the bottom. Three experiments were conducted for 90 min, using different controlling programs of the board temperatures: 1) constant board temperatures of 28°C or 39°C; 2) an operant-behavior setting: each board was set

at 39°C and the right-end board was changed to 20°C within 60 s only when the mouse moved to the left-end board; and 3) a thermal mosaic setting: each board was set at either 15°C, 22°C, 28°C, 35°C, or 39°C with a 6-min interval. In *Experiment 1*,  $T_b$  increased at 39°C without any differences between the IS and HS subgroups and the NWR and WR groups. In *Experiment 2*, the NWR group showed smaller operant counts in the HS subgroup than the IS subgroup; however, the WR group did not. In *Experiment 3*, the WR group preferred lower temperatures than the NWR group without any differences between the subgroups (e.g.,  $33.4 \pm 0.3^\circ\text{C}$  and  $34.7 \pm 0.1^\circ\text{C}$  in IS groups). Dehydration attenuates heat escape behavior. In addition, exercise training may alter thermal preference and behavioral responses, which prevents the attenuation of heat tolerance.

## **The Effect of Hip Abductor Muscle Strength and Ankle Dorsiflexion Range of Motion on Injury Risk of Anterior Cruciate Ligament**

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The purpose of this study was to examine the effect of hip abductor muscle strength and ankle dorsiflexion range of motion (ROM) on injury risk of anterior cruciate ligament (ACL). Eighteen collegiate female basketball players participated (Age:  $20.2 \pm 1.3$  years). Two-dimensional (frontal and sagittal plane) knee kinematics data during drop vertical jump (DVJ) were captured with digital video camera (Myer et al.). Knee valgus motion and knee flexion ROM were calculated from video frame at the initial contact, and the video frame at maximum knee valgus motion and maximum knee flexion ROM. Body mass, tibia

length and Q/H ratio were measured. Using these parameters, the probability of high knee load (PHKL) were calculated by Nomogram (Myer et al.) in both knees. Ankle dorsiflexion ROM and hip abductor strength were measured. There was a poor negative correlation between PHKL and hip abductor muscle strength. Ankle dorsiflexion ROM was small in high PHKL group compare with low PHKL group. These results indicate that hip abductor muscle strength and ankle dorsiflexion ROM influence to ACL injury risk. So, the hip and ankle functions are important to consider the ACL injury risk.

**The economic and social psychological impact of Sporting event:  
An Analysis of the SAITAMA Criterium by Le Tour de France**

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The purpose of this study was to measure the economic and the social psychological impact of the sport event. Holding a sport event brings the local government various effects. The two major effects are the economic and social psychological impact, which could be brought at one sport event. Sport events have economic impact via the direct expenditure from tourists who attended the event. On the other hand, sport events have social psychological impact to the residents.

This survey is intended to inspect these impacts by the investigation using the questionnaire survey using quantity and quality. The questionnaire was taken at the sport event called, Saitama Criterium by Tour de France held at 26<sup>th</sup> October 2013.

The sample of the economic impact was

956 Japanese adults who watched the criterium. Of all spectators, 36.2% came from the Saitama city, 27.3% came from the Saitama prefecture (except Saitama city) and 36.5% came from any place other than the Saitama prefecture.

The social psychological impact was measured by questionnaire before and after the event by comparing the score of each time. The target of this study was the people who live in Saitama-city, and 2000 questionnaires were distributed to the residents by mail-in survey. As a result, 678 questionnaires were collected before the event and we also distributed them to the people who returned the questionnaires after the event. Now we are waiting for returning questionnaire, therefore we're going to show the results of this study in detail at the symposium.



## The psychology of spectators in live sporting events

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This study examined the psychological changes that occur during the act of watching live sporting events, with a focus on the expectancy disconfirmation theory. The study employed 105 undergraduate students and was conducted during the FIFA Confederations Cup Brazil 2013.™ The matches investigated were Japan vs. Brazil (n=40), Japan vs. Italy (n=34), and Japan vs. Mexico (n=31). The first questionnaire survey was conducted 30 minutes before the game and the second, 10 minutes after the game. The questionnaire comprised items taken from Richins (1997) and Chitturi et al. (2008). Scales were developed to analyze the spectators' emotions. First, a one-way ANOVA was conducted to verify that there was no difference between each game's pre-match conditions in terms of spectator expectations and emotions. Second, an ANOVA and

multiple comparisons were performed to analyze the conditions before and after the games and the differences among the emotions felt after watching them. The results revealed that spectators' disconfirmation of the game against Italy (3-4) were higher than for the other two games (against Brazil [0-3] and Mexico [1-2]) after being watched ( $p < .01$ ). Further, positive emotions (e.g., pride, joy, delight) predominated during the game against Italy ( $p < .01$ ) even though Japan lost every game. These findings indicated that applying the expectancy disconfirmation theory leads to a better understanding of spectators' psychological changes than using the other variables, such as game results (i.e., victory or defeat) that are often used in similar studies.

## **Proteomic analysis of proteins regulate ATGL lipolytic activity in skeletal muscle**

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Intramuscular lipid provides much of the energy for prolonged exercise in well-trained athlete. Adipose triglyceride lipase (ATGL) was identified as a main triglyceride lipase in adipose tissue. Recent studies provided evidence that ATGL also plays an important role in intramuscular lipid breakdown and provide fatty acid for ATP synthesis. However, the molecular mechanisms which regulate ATGL activity in skeletal muscle are not completely understood. To identify the regulatory mechanisms of ATGL activity during exercise, we performed proteomic analysis of proteins associate or dissociate with ATGL during exercise in skeletal muscle. Male Sprague-Dawley rats were exercised by

swimming for 3 hours. Immediately after exercise, triceps muscles were dissected out. Muscle homogenates were immunoprecipitated with anti-ATGL antibody overnight at 4°C. The following morning, protein A-agarose beads was added, and the samples were mixed for 1 hour at room temperature with rotation. Precipitated complexes were eluted in citric acid buffer (pH 2.0), and Tris buffer (pH 9.0) were added to neutralized. Eluted proteins were analyzed using a LC-MS/MS. We are expecting identification of proteins which associate or dissociate with ATGL to control lipolytic activity during exercise.

**Intrahepatic triglycerides is associated with insulin sensitivity  
in male athletes: MR imaging and spectroscopy study**

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The purpose of this study was to examine how intrahepatic triglycerides (IHCL), visceral fat (VF), and total body fat mass (FM) are correlated with insulin sensitivity in male athletes who regularly participates in overfeeding and high intensity exercise.

Subjects were thirty-three college male American football and Rugby players aged 19-23 years. Body composition was measured by DXA. Insulin sensitivity was measured by oral-glucose tolerance test (OGTT) expressed as area under the curve (AUC) for glucose and insulin responses. IHCL was measured using noninvasive <sup>1</sup>H-magnetic resonance spectroscopy and VF was measured by magnetic resonance imaging. Positive correlations were observed between

insulin AUC with IHCL ( $r=0.681$ ,  $p<0.001$ ) and VF ( $r=0.405$ ,  $p<0.019$ ). The correlation between insulin AUC and FM ( $r=0.342$ ,  $p=0.051$ ) was weaker compared to its correlation with IHCL or VF. Among these fat stores, only IHCL was the independent predictor of insulin sensitivity ( $\beta=0.681$ ,  $p<0.001$ ), according to the multiple regression analysis. Notably, IHCL is a much stronger predictor than with VF or FM for insulin sensitivity.

In conclusion, these results suggested that hepatic triglycerides accumulation has important consequence that may adversary affect insulin sensitivity even in trained athletes.

## The influence of postural differences on movement speed

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**【Purpose】** This study aims to investigate the influence of posture control, especially pelvic tilt, on response and movement speed during the acceleration phase from squat start position.

**【Method】** Subjects were 13 collegiate male soccer players, and they undertook 2.5 m forward sprints from two different squat positions: a pelvic-neutral position (NP) and a posterior tilt position (PT). Subsequently, we measured sprint time, start speed, ground reaction force (GRF), and electromyography (EMG) activity in the biceps femoris (BF), rectus femoris, rectus abdominis (RA), and multifidus. In addition, 2D motion analysis from the sagittal plane was undertaken and

trunk tilt, upper back tilt, pelvic tilt, and center of gravity (COG) were calculated.

**【Result】** Start speeds in the PT condition were significantly slower than those in the NP condition. In this condition, the COG was in more back backward, and the GRF was smaller. Moreover, EMG values in the BF and RA were smaller in the PT condition than in the NP condition.

**【Discussion】** These results showed that posterior pelvic tilt causes a back-leaning COG, a lower level of activity in the BF and RA, and a smaller GRF. These kinetic and/or kinematic changes could potentially hinder movement speed during the acceleration phase.

## Cutting movement characteristics in reaction and nonreaction tasks in youth soccer players with functional ankle instability

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**Background:** Functional instability (FI) of the ankle joint may cause insufficient flexibility in movement such as change of direction. In this study, we investigated the differences in cutting movement in reaction and nonreaction conditions in youth soccer players with FI of the ankle.

**Methods:** Six high school soccer players (males) with FI of the ankle performed cutting movements (at 45 and 90 degrees) with a reaction and nonreaction task. All movements were recorded by four high-speed cameras. We analyzed the center of gravity (COG) and landing times and then compared these parameters in the two conditions using a t-test.

**Results:** A larger instability of COG was found in the reaction condition ( $24.4 \pm 3.4$  cm) than in the nonreaction condition ( $19.1 \pm 3.5$  cm) in the 45-degree task ( $p < 0.05$ ). However, no significant difference was observed between the COG in the reaction and nonreaction conditions in the 90-degree task. Same tendency was observed for the landing times ( $0.33 \pm 0.04$  sec. vs.  $0.41 \pm 0.04$  sec.).

**Conclusion:** These results suggest that FI of the ankle may influence movement during cutting tasks. However, this adverse effect on the cutting movement varies with direction (45 degrees > 90 degrees) and task condition (reaction > nonreaction).

## Effect of foot alignment on planter pressure during turn movements

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The purpose of this study is to investigate the correlation between foot alignment and plantar pressure distribution at turn movements.

Eighteen collegiate football players participated in this study. The assessment included (A) arch height, (B) leg-heel alignment (LHA) in a weight-bearing position, (C) LHA in a non weight-bearing position, (D) forefoot angle, (E) plantar pressure at turn movements.

As for data collection for (E), subjects were instructed to run and turn with right leg for 3 directions; (1) side-cut task which is defined as a right foot plant cutting to the left, (2) straight running, (3) crossover-cut task which is defined as a right-foot plant with the left foot crossing over the right foot. We divided plantar area into nine different anatomic regions and collected peak pressure,

mean pressure, peak loading quantity, mean loading quantity during each task.

In all 3 courses, a significant positive correlation was found in LHA in the non weight-bearing and a loading quantity of the lateral toes. In a straight running, a significant positive correlation was found between a forefoot angle and peak contact pressure of the lateral rearfoot.

The present study reveals that the foot, which tends to be everted, gets higher load to plantar lateral part, since a significant correlation was observed for LHA in the non weight-bearing position and forefoot angle between loading quantity and contact pressure of the plantar lateral part. This indicates that it is necessary to pay attention to alignment of foot in the non weight-bearing position.

**Effect of fatigue on fascicle behavior of human biceps femoris  
in eccentric knee flexions in vivo**

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The purpose of this study was to measure the effect of fatigue on in vivo fascicle behavior of the biceps femoris (BF) muscle in eccentric contraction. Five healthy males performed maximal eccentric knee flexions before and after the fatigue task in the prone position. The fatigue task was consisted of 10 sets of 5 maximal isokinetic concentric and eccentric knee flexions at the velocity of 60 deg/s with 30 second rest between the sets. The range of motion was set from 0° (knee fully extended) to 100° for both of the maximal eccentric contractions and the fatigue task. The BF fascicle lengths at every

10° knee angle in the range from 10° to 80° were obtained from the ultrasonography. The BF fascicle lengths were found not to be significantly different between pre and post the fatigue task ( $p > 0.05$ ).

The BF fascicle lengths between 10° and 80° were significantly different both pre and post the fatigue task ( $p < 0.05$ ).

Maximal eccentric knee flexor torque between pre and post the fatigue task were not significantly different ( $p > 0.05$ ). This might be the main reason for the BF fascicle lengths didn't change pre and post the fatigue task.

## Characteristics of cutting maneuver in female college soccer players at a high risk of anterior cruciate ligament injury

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The purpose of this study was to examine characteristics of a cutting maneuver in female college soccer players at a high risk of anterior cruciate ligament (ACL) injury.

Thirty female college soccer players participated in this study. A drop vertical jump (DVJ) and a shuttle run cutting (SRC) maneuver were captured with high speed cameras.

The probability of ACL injury risk was calculated using the kinematics variables during DVJ. The knee abduction angle during SRC was calculated using the Frame-DIAS V.

The correlation between the knee abduction angles of SRC and probability of ACL injury risk was evaluated using the

Pearson correlation coefficient.

The knee abduction angle was compared between the low-risk group (probability of ACL injury risk < 62%) and high-risk group ( $\geq 62\%$ ).

A moderate positive correlation ( $r=0.663$ ,  $p < 0.01$ ) was found between the knee abduction angle of SRC and the probability of ACL injury risk. A significantly greater maximum knee abduction angle was observed with the high-risk group than low-risk group ( $p < 0.001$ ).

The results of this study suggested that the athletes who were categorized as being at a high risk of ACL injury might demonstrate increased knee abduction angle during SRC.



## Relationship between anticipation and kinematic parameter in tennis serve

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Skilled tennis players can predict ball direction even before the opponent's racket-ball contact. Such a superior anticipatory performance depends on the visual information that is available from the essential kinematics of opponent's motion. The aim of this study is to clarify the relationship between tennis server's kinematic pattern and receiver's anticipation performance by using multiple regression analysis with the racket parameter (explanatory variable) anticipated ball direction (dependent variable). 23 participants (10 expert players and 13 novices) voluntarily participated in the experiment. They were asked to response the serve direction to a live-action video clip of

the model tennis server. Test serve was performed by two professional tennis players in the deuce side aiming at two targets on the service box (center and wide). The test films were occluded when the foot of the participants touched one of two mat-switches. The participants viewed 40 video clips and they scored their anticipatory judgment of the ball direction on a visual analogue scale (VAS), respectively. The result of multiple regression analysis, motion parameters of racket explained ball direction. These results indicated that experts and novices were able to pickup anticipatory cue. The anticipatory cue is the information of the motion parameters of server's racket.

**The metamorphosis of the “Sick man of East Asia”:  
Bodily discourse in the Chinese Press Coverage of Foreign  
and Chinese Athletes at the Olympics, 1984-2012**

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The purpose of this research is to conduct a content analysis of bodily-related discourse in the Chinese press coverage of Chinese athletes and foreign athletes to test the hypothesis that the growing success of Chinese participation in the modern Olympics has reshaped the Chinese body perception. It also attempts to explore modern China's role in the world and its relations with other countries and regions. The content analysis searched for Olympic-related sport articles and/or headlines containing the Chinese characters for body '身' (pinyin: Shen) / '体' (pinyin: Ti) during the eight summer Olympics that China has taken part in since 1984, in two Chinese newspapers: Titan

Sport and the People's Daily. The articles were analyzed for positive and negative bodily characteristics, and coded for the attribution of these characteristics to Chinese and foreign athletes. Further comparisons were made between the Chinese and major opponents from East Asia and the West (namely Europe and North America). The presentation will interpret the hidden message behind the bodily representation of Chinese athletes such as the ways in which Chinese athletes are perceived to be physically inferior to athletes from the west but physically superior to fellow East Asian athletes.

**Importance of Possessing Junior Players Training Class  
"Junior Team" in Commercial Tennis club:  
Focusing on Advantages and Disadvantages in Club Management**

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The purpose of this study was to clarify advantages and disadvantages in club management by possessing junior team, and study on considerations about junior team management in commercial tennis clubs. In order to examine that, we conducted 2 studies as follows:

【 Study1 】 : To clarify advantages and disadvantages in club management by possessing junior team, we conducted interview researches for junior team managers of tennis clubs that possess junior team.

【 Study2 】 : We studied on considerations about junior team management in possessing junior team by data obtained from Study1.

We analyzed the data obtained by snowball

sampling, using the KJ method. The main findings are summarized as follows.

1) We clarified 18 factors as advantages and disadvantages in club management by possessing junior team.

2) We clarified the considerations about junior team management "keeping management out of the red for good training environment", "securing of a given number of players", "system construction of cooperation with community", "system construction of supply from general junior class", "responding to the hollowing", "supplying early elementary school child for the junior team", "cost-effective in payment method", "growing up mentally in junior players", "connecting club members with junior players".

## **Effects of lifestyle intervention on biomarkers of depression and oxidative stress**

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The purpose of this study was to investigate the effects of 12 weeks of lifestyle intervention on depression and oxidative stress status in middle-aged and older adults. Twenty-seven middle-aged and older adults are placed on a health promotion program including exercise, nutrition, and social participation. This program will be provided the health education classes related to topics of exercise, nutrition, and social participation every month. Blood samples will be taken at baseline and after 12 weeks. Fasting serum biomarkers of depression, oxidative stress, and antioxidant capacity markers will be measured. In addition, depressive symptoms will be evaluated using the 20-item version of

the center for epidemiologic studies depression scale (CES-D). Presence of significant depressive symptoms is defined by the established cut-off point of CES-D score >16. We are currently conducting to assess the baseline values and preparing the post-intervention measurement on December. At baseline, nine participants were defined the presence of significant depressive symptoms. It would be interesting to assess whether this intervention effect differs according to depression status. We hypothesize that this program would improve depression and oxidative stress status, especially in participants who exhibit higher depression scale score at baseline.

**A correlation between bradycardia during cold face test and heart rate recovery immediately after exercise**

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Heart rate recovery immediately after exercise reflects a reactivation of the parasympathetic system, and is a powerful predictor of mortality. However, it is hard to apply heart rate recovery to epidemiological studies because the measurement of heart rate recovery needs physical load to participants by a maximal exercise test. In contrast, cold face test is a non-invasive and easy maneuver to assess vagal activity. Therefore, we investigated a correlation between bradycardia during the cold face test and heart rate recovery immediately after exercise.

Eight males (age:  $25.6 \pm 1.8$  years, body mass index:  $22.9 \pm 2.1$  kg/m<sup>2</sup>) performed the cold face test with face immersion in cold

water and apnea for 40 seconds before a graded exercise test. R-R intervals were recorded before and during the cold face test. Heart rate recovery was determined by the graded exercise test on a treadmill. The value for the recovery of heart rate was defined as the reduction in the heart rate from the rate at peak exercise to the rate one, two and three minutes after the cessation of exercise.

The latency of maximal bradycardia correlated well with the heart rate recovery, especially two minutes after peak exercise ( $R = -0.968$ ,  $P = 0.000$ ). The present study suggests that bradycardia during the cold face test are associated with heart rate recovery immediately after exercise.

## Applying a low-cost wireless EEG system to baseball batters

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Takahiro Hirao, and Kazuyuki Kanosue  
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Debener et al (2012) devised a low-cost, wireless electroencephalogram (EEG) system, integrating an EEG electrode cap (Easy Cap) with commercially available EEG wireless hardware (less than \$1,000, Emotiv). Using the wireless EEG system and applying independent component analysis (ICA) to recorded EEGs for artifact rejection, they succeeded in recording clear P300s during walking. Their approach provides sport scientists with a tremendous advantage for investigating the decision making processes of performing athletes. Only a few studies have succeeded in directly recording brain activity of athletes during physical activity. This is largely due to contamination of EEGs by muscular activity. However, recent technical improvements in EEG analysis, including ICA, have solved these problems. In order to examine brain activity of performing

athletes, we constructed the same wireless EEG system of Debener et al and utilized it to record EEGs from baseball batters. Our initial goal is to confirm that we can record EEGs from batters while they are making a decision to either attempt to hit a ball or let it go. It is well known that P300, a positive component of event-related potentials, reflects the decision making process. For example, if a batter takes long to evaluate an incoming ball, P300 latency should become longer. If the batter has to allocate more attention in order to evaluate a particular incoming ball, P300 amplitude should become larger. We propose to investigate the decision making process of batters by utilizing these mental chronometric indices. This study will both contribute to sport science research and open the area to a new approach.

**On the validity of evaluation of human tendinous tissues elasticity  
in vivo by ultrasonography**

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The tendinous tissues possess elasticity, and are elongated when the load is applied and then shorten to the original length after the load is removed, thereby creating a so-called load-deformation relationship. This knowledge is based on animal studies (e.g., Alexander and Bennet-Clark, 1977) and in human studies that followed, tendon deformation has been conventionally measured as longitudinal length change (elongation) by B-mode ultrasonography. In these studies, applied loads are controlled by setting target torque levels (graded contraction of muscles that connect to the tendinous tissues, e.g., Kubo et al., 1999) or by changing joint angles (passive lengthening of the muscle-tendon unit, Kawakami et al., 2008). But this approach inherently possesses limitations such as 1) uncertainty in tendon stress that is estimated from joint torque in a straightforward way (without

considering the force distributions over synergistic or antagonistic muscles), 2) neglecting contributions of other soft tissues that may act as series elastic components. Our studies have accumulated findings to raise a need for serious attention to the above limitations (Kawakami, 2012). Recent progress in technology has made possible quantitative assessment of tissue elasticity by ultrasonography. This technique (compression elastography) is based on external tissue compression with subsequent computation of the strain profile along the transducer axis (Ophir et al., 1991). We propose a series of studies to challenge the above limitations by combining B-mode ultrasonography and elastography. Presently we are carrying out preliminary studies to decide testable experimental conditions and target tissues, and some data will be presented at the symposium.

## Association of disabling foot pain with foot disorders among community-dwelling older adults

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**Background:** Foot pain is a common and severe problem among community-dwelling older adults. Disabling foot pain is associated with decreased ability to perform activities of daily living (Black et al., 1987; Bowling et al., 1997), problems with balance and gait (Gorter et al., 2000; Menz et al., 2001; Menz et al., 2005) and increased risk of fall (Leveille et al., 2002; Menz et al., 2006). However, there are few studies about estimates of the population prevalence on disabling foot pain, and the relationship with foot disorders and functional fitness among Japanese older adults.

**Purpose:** The purpose of the present study is (i) to determine population prevalence of disabling foot pain, and (ii) to examine the association of disabling foot pain with foot disorders and functional fitness among community-dwelling older Japanese.

**Methods:** The study design is a longitudinal study (baseline and 3-year follow-up). Baseline assessment consisted of a two-stage process involving an initial postal questionnaire and a subsequent health

check-up. A total of 3,000 residents aged over 65 years and living in metropolitan area (Matsudo city) were randomly selected from the residential registries of the city to request the cooperation in the present study. Disabling foot pain was measured using Japanese version of the Manchester Foot Pain and Disability Index (MFPDI; Garrow et al., 2000). The MFPDI is a 19-item self-administered questionnaire that assesses foot pain-related problems across four constructs: pain, function, appearance, and work and leisure. Foot disorders and foot symptoms were assessed using the validated Foot Assessment Clinical Tool to capture the main features of common clinical foot disorders. In addition, functional fitness parameters were selected lower and upper body strength, agility/dynamic balance, and were measured by the following tests: chair stand repetitions, functional reach test, timed up-and-go test, 5-m walk test, hand grip test. Baseline data by postal survey was collected. At present, we are gathering data on foot disorders and functional fitness by health check-up.



**Longitudinal changes in performance outcome and shoulder configuration  
of baseball pitching: A preliminary report**

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The purpose of this study was to examine longitudinal changes in selected performance outcome (speed and spin rate of pitched fastball) and the configurations of the shoulder complex in baseball pitching. In this presentation, we present preliminary results of a prospective cohort study undertaken over two-year period from 2011. Measurement sessions were conducted three times a year and seven times in total. Five collegiate baseball pitchers threw two fastballs from a pitching mound to a catcher, and the ball speed and spin rate were measured. The shoulder configuration exhibited at the beginning of the arm acceleration phase was determined using an electromagnetic tracking device. A one-way repeated-measures ANOVA was conducted to determine the differences in the ball speed,

spin rate, and nine variables representing the shoulder configuration among the seven measurement sessions. There was no significant difference in the ball speed and spin rate among the seven measurement sessions ( $p > 0.05$ ). The glenohumeral-joint elevation angle was significantly increased by  $11 \pm 7^\circ$  between 1<sup>st</sup> and 2<sup>nd</sup> sessions ( $p < 0.05$ ), and maintained nearly constant from 2<sup>nd</sup> to 6<sup>th</sup> sessions. However, the shoulder joint elevation angle was not significantly increased between 1<sup>st</sup> and 2<sup>nd</sup> sessions ( $p > 0.05$ ). These results indicate that the performance outcome was not improved in the two years of regular practices, although the glenohumeral joint mobility was improved, enabling better joint alignment for baseball pitching.

## Exome-wide association study of elite Jamaican and African-American sprint athletes

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Elite human athletic performance is a multifactorial trait and previous candidate gene studies have been inconclusive.

**Purpose:** Two exome-wide association studies (EWAS) of elite Jamaican and African-American sprint athletes and respective matched controls were performed to identify common genetic variants.

**Methods:** 95 Jamaican sprint athletes and 102 Jamaican controls, 108 African-American sprint athletes were genotyped using the Illumina® HumanExome BeadChips. Standard EWAS quality control (QC) and population stratification correction were applied to the genotype data. Genetic associations were evaluated by logistic regression/standard allelic association analysis. Meta-analyses were performed for SNPs with association P-value  $< 5 \times 10^{-5}$  across the two sprint EWAS sample sets using a fixed-effects model. New significance level was re-defined based on the number of extra meta-analysis tests carried out.

**Results:** After QC, 96,698 autosomal non-synonymous SNPs in 88 Jamaican sprint athletes and 87 Jamaican controls, *ca.* 153,807 autosomal non-synonymous SNPs in 79 African-American sprint athletes and 391 African-American controls were available for analysis. The genomic inflation factor values were calculated for Jamaican and African-American EWAS sample sets, respectively. Various SNPs showed association with P-value  $< 5 \times 10^{-5}$  in the respective cohorts. Several SNPs remained significant after meta-analyses.

**Conclusion:** Two putative loci for elite sprint performance across Jamaican and African-American sprinters have been discovered using an exome-wide association approach followed by meta-analyses. Further validation of these signals requires replication before functional dissection can be carried out.