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The analysis of postural control ability in athletes with rotational motion

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Figure skate, ballet dance and contest dance are sports including rotational motion. Athletes in these sports are required good ability in postural control in response to the rotational stimulation. The better they adapt to the rotational stimulation, the better they can perform, particularly, right after a rotational movement. The purpose of this study is to investigate how athletes can adapt to the quick and continuous rotation. The difference in the intensity and number of rotation in each sports suggests that these athletes employ distinct skill in order to adapt to the rotation. Elucidating in these athletes' skill and adaption would be beneficial for coaching and training. Subjects are eight female ballet or contest

dancers, eight figure skaters, and eight healthy females with no experience in rotational training. They sit in a computerized rotary chair and experience rotations (1 Hz) for ten seconds. Electrodes are put on both temples to record electro-oculogram. Change in subjects' center-of-mass is recorded with 3D motion analysis. Change in their center-of-pressure is recorded by force plate. This study would supply the fundamental data of direction, velocity, and acceleration of the rotation. Subjects' techniques and adaptation to rotation stimulation will be compared. The present study will also investigate the role of visual and vestibular information for the adaptation.

The effects of high-intensity endurance exercise on skin immunity

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The aim of this study was to determine the effects of high-intensity endurance exercise on skin immunity, especially secretory immunoglobulin A (SIgA) on skin surface. Seven healthy adult males participated in the study. Each of the participants performed bicycle exercise at 75%HRmax for 60 min (20:30 p.m.-21:30 p.m.). Skin surface samples were collected at 20:30 p.m.(B1), 21:30 p.m.(B2), 22:30 p.m.(B3), and next morning at 7:00 a.m.(B4). SIgA was obtained from 1 ml extraction liquids stirred with the microtube homogenizer in the polypropylene tube for 60 sec on middle of chest and medial side of the forearm. Staphylococcus aureus was harvested by pressed agar-based media composed of

Tellurite-glycine-salt-egg yolk(TGSE) against the skin surface on middle of chest and medial side of the forearm. On medial side of the forearm, SIgA concentration was significantly lower at B1 than B2 ($p < 0.05$), and the number of staphylococcus aureus was significantly higher at B1 than at B2 ($p < 0.01$). However, on middle of chest, they showed no significant differences. These results suggest that high-intensity endurance exercise might depress immune function and enhance infectious risk on skin surface. From a practical point of view, we recommend that athletes should keep their skin surface clean such as immediately taking a shower after sports activities.

The body composition and resting energy expenditure of collegiate freshman football players: Preliminary measurements of weight gain intervention study

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The purpose of this study was to obtain the preliminary measurements of body compositions and resting energy expenditure (REE) for freshman football players who participate in the weight gain intervention study. Twenty-five freshman football players (age 18.6±0.6 years) were measured in this study. The systemic and regional body compositions were determined by dual-energy x-ray absorptiometry (DXA). The REE was measured by indirect calorimetry using Douglas bag method. The anthropometric characteristics of the subjects were followings; height 173.3±6.7 cm; body weight (BW) 71.8±10.5 kg; fat free mass (FFM) 61.7±6.8

kg; fat mass 10.1±4.6 kg; and % fat mass 13.7±3.9 %. The measured REE was resulted in 1694 ±155 kcal/day, which can be expressed as 23.8±2.1 kcal/kgBW/day and 27.8 ± 1.9 kcal/kgFFM/day. Organ-tissue mass, evaluated using magnetic resonance imaging technique and echocardiograph, as well as daily energy intake and expenditure are currently analyzed. Based on these measurements, we further investigate in the intervention study; 1) whether organ mass increase according with weight gain, 2) the contribution of organ-tissue mass to REE with weight gain.

Estimation of the lumbar intervertebral disc degeneration in collegiate rugby players by magnetic resonance diffusion- and T₂-weighted imaging

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The present study aimed at evaluating the prevalence of lumbar intervertebral disc degeneration (LIDD) in collegiate rugby players, who were expected to be imposed high physical loads on their lumbar intervertebral disk, using magnetic resonance diffusion-weighted (DW) and T₂-weighted (T₂W) imaging. Sagittal DW (repetition time/echo time = 6000 ms/76.4 ms, b-value = 500 s/mm²) and T₂W images of lumbar intervertebral discs were obtained from 28 collegiate rugby players (aged 18.4±0.6 years, height 176.2±5.5 cm, and weight 79.4±9.5 kg) using 1.5-tesla magnetic resonance device and spine coil. The apparent diffusion coefficient (ADC) values of lumbar intervertebral discs were calculated from DW images. In

addition, the state of lumbar intervertebral discs was visually evaluated by Pfirrmann's classification, which was based on the degree of signal intensity in the nuclear region of lumbar intervertebral disc on T₂W images. In both images, the prevalence of LIDD was evaluated from the disk level of L1-2 to that of L5-S1. Statistical analyses were performed using the Spearman's rank correlation by SPSS. The present study show that there is a significant correlation between the ADC and Pfirrmann's classification ($r_2=-0.39$, $p=0.00$). Therefore, it was suggested that the ADC will be an effective estimation of the lumbar intervertebral disc degeneration for young athletes.

The psychological effects of watching a sport: An analysis of the 2010 FIFA WORLD CUP SOUTH AFRICA™

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The purpose of this study is to verify the change in spectators' emotions after watching a particular sport. The study employed 10 graduate students and was conducted during the 2010 FIFA WORLD CUP SOUTH AFRICA™; the matches under investigation were Japan

vs. the Netherlands, and Japan vs. Demark. The first survey was conducted thirty minutes before the game and the second was conducted ten minutes after the game using the questionnaire. The questionnaire comprised items taken from Terasaki et al. (1991) and Ootomo et al.

(2009). These scales were developed to analyze various feelings and emotions. ANOVA was conducted to verify that there was no difference between the pre-match conditions of both games in terms of the emotions, and MANOVA was performed to analyze the conditions before and after the games (pre-post) and the game outcomes (negative-positive). In addition, multiple comparisons were performed. The results revealed that

positive emotions (ex. *Pride*) were the predominant emotions in a positive game (vs. Denmark) ($p < .01$), and negative emotions (ex. *Fatigue*) were the predominant emotions in a negative game (vs. the Netherlands) ($p < .05$). The findings of the study contributed to “visualizing” the positive psychological effect brought about by watching football.

The effects of passive static stretching and contract-relax proprioceptive neuromuscular facilitation stretching program on muscle architecture and elongation of achilles tendon

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Stretching is a type of exercise designed to elongate the contractile and/or noncontractile components of muscle-tendon units and periarticular structures (Kisner and Colby, 2002). It has previously been reported that range of motion and tendon elongation significantly increased by static stretching (Kato et al., 2010), while contract-relax proprioceptive neuromuscular facilitation (CRPNF) stretching has been reported to promote muscle relaxation and subsequently increase muscle compliance (Nicolas et al., 2010). Although the effects of these two stretching programs on the mechanical properties of muscle-tendon unit are widely examined, it is unclear which of the muscle and tendon are more affected by each of passive static and CRPNF stretching. The purpose of this study was to investigate the short-term effects of passive static and CRPNF stretching program on muscle

architecture and on tendon elongation. Before and immediately after passive static and CRPNF stretching, the muscle architecture (fascicle length and pennation angle) of the medial gastrocnemius and Achilles tendon elongation were determined with ultrasonography during passive ankle joint dorsiflexion. The passive static stretching consisted of 4 repetitions of 10 degrees ankle joint dorsiflexion for 30 s. The CRPNF stretching consisted of 4 repetitions of three phases; (1) maximal voluntary contraction of plantar flexion at neutral ankle position for 5 s, (2) relaxation for 5 s at neutral ankle position, and (3) 10 degrees ankle joint dorsiflexion for 25 s. We will present the results about the change in fascicle length, pennation angle, and elongation of Achilles tendon after each of passive static and CRPNF stretching in GCOE symposium.

The effects of perceived motivational climate on goal orientations across Japanese high school ice hockey season: Study design and methods

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The purpose of this study is to examine the influence of perceived motivational climate on their goal orientations among Japanese high school student-ice-hockey-players. Here we report the study design and method. Now, we are conducting longitudinal questionnaire surveys to approximately 300 student-ice-hockey-players in baseline (T1), 3 months (T2), and 6 months (T3). T1 is before 3 months of the national convention and T3 is after 2 months of the convention. Research items include perceived motivational climate (task-involving or ego-involving) and goal orientations (task orientation or ego orientation). We will conduct a repeated measures analysis of variance (ANOVA) for examining the relationships between perceived motivational climate and

goal orientations. Anticipated result is, 1) those who have a high task orientation and a perceived low task-involving climate will experience a significant decrease in their task orientation across the season, 2) the low task orientation and perceived high task-involving climate will demonstrate a significant increase from T1 to T3, 3) a perceived high ego-involving climate and low ego orientation will influence on the increase of ego orientation across the three time periods, 4) the reverse case of 3) is also noted. These anticipated results would indicate that when the perceived motivational climate is incompatible with their goal orientation, there would be a significant shift in student-ice-hockey-players' goal orientation over time.

Ground reaction force acting on a healthy male runner performing rectilinear and curvilinear change of direction

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The rectilinear and curvilinear change of direction (cutting and curving) is performed frequently in ball game to fend off the opponent in various situations. The purpose of this study was to compare GRF acting on a runner performing cutting and curving. A healthy male subject was asked to perform 10 trials of cutting and

curving. GRF was recorded for the right (outside) leg. Cutting angle was defined at 30 degree, and curving radius was defined so that the circumference of the circle path equals 12 stride length (30 degree change of direction per 1 stride). Two horizontal components of Peak GRF ($F_{\text{mediolateral}}$, $F_{\text{anteroposterior}}$) and impulse ($I_{\text{mediolateral}}$,

$I_{\text{anteroposterior}}$) were compared between cutting and curving. $F_{\text{mediolateral}}$, $I_{\text{mediolateral}}$, $F_{\text{anteroposterior}}$ and $I_{\text{anteroposterior}}$ for propulsive phase were significantly larger in curving than cutting ($p < 0.05$). The result indicated that a greater momentum for propelling the body toward new direction was obtained in curving than in cutting. On contrary, $F_{\text{anteroposterior}}$ and $I_{\text{anteroposterior}}$ for braking phase were

significantly larger in cutting than curving ($p < 0.05$), indicating that the velocity of the runner's center of mass on horizontal plane was reduced to a greater extent in cutting. These results suggest that cutting be characterized as a motion of rapid deceleration with changing direction, and curving as a curvilinear motion with a limited speed fluctuation.

Lacrosse injuries in female collegiate athletes: A prospective study

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The purpose of this prospective study was to examine the lacrosse injuries in female collegiate athletes. The subjects were 46 female collegiate lacrosse athletes. The data collected included the frequency and hours of participation, number of injuries, location of injury, and type and mechanism of injury during lacrosse practice and games. An injury was defined as any musculoskeletal complaint occurring during practice and/or games that resulted in received treatment from the team trainer. The overall injury incidence was 21.4 injuries per 1000 athlete-hours. The most frequently injured part of the body was the ankle, followed by the lower leg, and thigh (3.4, 3.1, 1.9 injuries per 1000 athlete-hours, respectively).

The percentage of all injuries according to injury type was contusion/bruise (31.7%), disability (25.0%), and sprain (20.1%). The most common injury scenarios according to injury mechanism were non-contact injury (25.1%), contact injury with lacrosse equipment (e.g., cross, ball; 24.6%), and overuse injury (20.6%). The most common locations of injury in female collegiate lacrosse athletes were the ankle, lower leg, and thigh, with contusion/bruise, disability, and sprain being the most common types of injury. Therefore, an understanding of these specific injury characteristics may help in developing an injury prevention program to reduce lower extremity injuries.

Association of eating behavior with demographic attributes and other health behaviors

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The present study examined the association of the stage of change for eating behavior with demographic characteristics and that for other health behaviors. The data sample consisted of 1211 respondents to an Internet-based survey. Respondents were randomly selected after stratification by an equal distribution of sex and age brackets. Stage of change for nine health behaviors, attitude for disease (prevention- or treatment-oriented), and demographic variables were obtained. Logistic regression, independent t-test, and chi-square test were utilized. The highest frequency among five stages of change was the preparation stage for eating and stress management, and contemplation stage

for exercise and health self-management. The number of those in active and later stages increased with age on all health behavior except get fit with sport. Participants in active and later stages for one health behavior were also likely to be in active and later stages for other health behaviors. Only for eating behavior, participants in active and later stages were more likely to report to behave in a prevention-oriented manner for disease than those in the earlier stage. Eating behavior was different from other health behaviors in attitude for disease, implying that eating behavior might be a potential gateway behavior for some health behaviors.

The factors related to low-back pain in elite junior divers - investigation on physical and technical factors-

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The purposes of this study were 1) to evaluate the prevalence of injuries in elite junior divers during a 5-year period, and 2) to extract possible factors involved in low-back pain from physical and technical characteristics. This study included 89 (48 males, 41 females) elite junior divers in Japan. Low-back pains that the divers experienced were assessed by questionnaires, interviews, and physical examinations during national training camps. Morphological data, physical fitness, and diving skills

were evaluated. The factors related to the low-back pain were extracted with logistic-regression analysis using the forward selection method (likelihood ratio). The major findings of this study were: 1) There was a high prevalence of the low-back pain (44.9%) in elite junior divers in Japan. 2) Most injuries occurred in the water entry phase. 3) Shoulder flexibility and handstand posture were related to the low-back pain among the males.

Accuracy of spatio-temporal perception, pitch prediction, and bat control in baseball hitting (Progress report)

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Baseball hitting is an integrative action of various skills and abilities. Hitters must judge when and where a pitched baseball would arrive and strike the ball with a small hitting area of a bat within a split second. This study is aiming to clarify the relevance of the hitters' ability in spatio-temporal perception, ball-trajectory prediction, and bat control skill to their actual baseball hitting performance. Our experiment consists of three tasks; 1) hitting fastball thrown by a pitching machine (assessment of actual baseball hitting performance), 2) taking same type of pitch then indicating the location of the passed ball while subjects wear a visual occlusion liquid-crystal

apparatus (assessment of spatio-temporal perception and ball-trajectory prediction), and 3) hitting a baseball off a tee (assessment of bat control skill). Ten to twelve highly trained male adult baseball hitters are expected to participate in this study. The findings of this study will identify distinctive ability or skill what superior baseball hitters possess. That will assist baseball coaches and players to modify their current baseball training and practice design in order to avoid working on unnecessary component and to focus on the essential component of baseball hitting.

Influence of the angular velocity on the extent of increase in the maximal voluntary concentric torque

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The twitch torque is increased after a high intensity contraction. This phenomenon is called postactivation potentiation (PAP). The conditioning contraction for inducing PAP is known to increase the maximal voluntary concentric torque as well. The purpose of this study was to examine the velocity dependence of the increase in

concentric torque. Healthy male subjects performed the maximal voluntary isometric plantar flexion for six seconds as the conditioning contraction. Before and after the conditioning contraction, they performed the maximal voluntary concentric plantar flexion at 30 and 180°/s, at separate occasions. The twitch torque was recorded

simultaneously to confirm whether the extent of PAP was comparable in each condition. The twitch torque was increased significantly in each condition ($p < 0.05$). In addition, the extent of PAP was not different between conditions ($p > 0.05$). The maximal voluntary concentric

peak torque was increased significantly only in the 180°/s condition ($p < 0.05$). These results suggest that the increase in the maximal voluntary concentric torque is velocity dependent, with a larger increase at a higher velocity.

A study of prospective fan behavior on the spectators of Japanese professional sports

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The main purpose of this study is to examine the factor behind spectators' prospective fan behavior. We will examine the following two aspects in particular: (1) an examination of the model that includes the relationships among spectators' satisfaction, emotions, and prospective fan behavior and (2) a comparison of the models on professional sports spectators and spectators' characteristics, for example, attendance at a game. Previously, we had examined the model of prospective fan behavior and verified the commonalities and specific traits of the spectators of professional baseball and professional football. However, the result of the test of

goodness of fit did not sufficiently indicate the numerical value to confirm reliability. Consequently, we intend to collect data from the spectators of professional baseball and professional football, and examine the model that implements the criteria of the test of goodness of fit. In this study, we will present the model of prospective fan behavior. We will present the commonalities and specific traits through a comparison of the models between spectators of professional baseball and professional football and through a comparison on the basis of spectators' characteristics. We expect the emotions that influence prospective fan behavior to be different.

Analysis of entire mitochondrial genome in the elite Japanese athletes

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From analysis of hypervariable sequence I, which is located in the non-coding region of mitochondrial DNA (mtDNA), we previously reported that mitochondrial haplogroups (mtHAPs) G1 and F were associated with elite Japanese endurance/middle-power and sprint/power athlete status, respectively (Mikami et al, Br J Sport Med, 2010 [Epub ahead of print]). The purpose of the present study was to identify functional polymorphisms specific to mtHAPs G1 and F in elite Japanese athletes. We directly sequenced the entire mtDNA of 96 Japanese Olympians from a variety of sports, and identified mtHAPs G1- and F-specific polymorphisms in the coding region. mtHAP G1 was characterized by 4 such polymorphisms: m.7867C>T, m.8200T>C, m.15323G>A and m.15497G>A. Two polymorphisms (m.15323G>A

and m.15497G>A) were non-synonymous substitutions (Ala193Thr and Gly251Ser, respectively) in cytochrome *b*. mtHAP F was also characterized by 4 coding region polymorphisms: m.3970C>T, m.6392T>C, m.10310G>A and m.13928G>C. One of the polymorphisms (13928G>C) causes an amino acid replacement (Ser531Thr) in the NADH dehydrogenase subunit 5. Two mtHAP G1-specific and 1 mtHAP F-specific functional polymorphisms have been identified as candidates to mediate the recent association between these mtHAPs and elite Japanese athlete status. Exercise performance is influenced not only by mtDNA polymorphisms, but also by nuclear DNA polymorphisms. We plan to investigate both nuclear and mitochondrial polygenic profiles of elite Japanese athletes.

Effect of exercise / exercise training on thermoregulation in mice

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It has been reported that exercise and/or exercise training affect autonomic thermoregulation. Our goal of the present study is to know if exercise and/or exercise training affect behavioral thermoregulation. And if so, we aim to investigate its neural mechanism. As the first step for the study project, we developed a system evaluating the behavioral response in the heat. In addition, the effect of osmotic stimulus, which is usually observed during exercise with heat exposure. Two groups of mice were used in the experiments: (1) mice received subcutaneous

isotonic saline injection; (2) hypertonic saline injection. The two groups of mice were put in the behavioral system consisting Plexiglas box (size 50 x 19 x 12 cm) with five computer-controlled Pertier board (10 x 10 cm) at the bottom. The mice were exposed two different conditions for 90 min: a) operant behavior available, the temperature of each board was set at 39°C, one board temperature was changed to 10°C for 60 sec only when a mice moved on a specific board; b) thermal gradient condition, the temperature of each board was set at either

15°C, 22°C, 28°C, 35°C, or 39°C, mice could select preferable position though the temperature setting was change each 6 min. We present that mice showed clear operant behavior in the system, and seek preferable board position though the temperature setting was change each

6 min. In addition, osmotic stimulus enhanced these thermoregulatory behaviors. It would be concluded that the system we developed could be used as a device evaluating behavioral thermoregulation.

Changes in the orientation of the longitudinal axis of the whole body during curved sprinting in Track and Field

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The purpose of this study was to describe the time-course of change in the orientation of the longitudinal axis of the runner's body passing through the center of mass (CM) during the maximum-effort sprinting on a curved runway. Ten male collegiate sprinters were asked to sprint along the 2nd lane on an official 400m track. The performances were recorded with four high speed cameras. The DLT algorithm was used for 3D reconstruction and the longitudinal axis of the whole body passing through the CM was calculated.

The results showed that the longitudinal axis of the whole body maintained leaning forward ($5.8 \pm 1.9^\circ$) and inward ($14.1 \pm 2.2^\circ$) during the entire stride cycle. The orientation, however, fluctuated during the stride cycle; leaning toward inward direction by $3.6 \pm 0.7^\circ$ during right contact phase and toward outward direction by $2.8 \pm 0.6^\circ$ during left foot contact phase. These results indicate that the ground reaction force exerted on the body during each contact phase changes the body leaning to contralateral orientation in curved sprinting.

Proximal and distal factors of lower extremity joint kinematics in running injuries: A gender-comparison

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The knee is the most common site of running injuries, typically prevalent in females. The purpose of this study

was to compare the differences in lower extremity kinematics between female and male runners and to

clarify the relationships between rearfoot and hip kinematics and knee joint kinematics.

Eleven female and 11 male runners participated in this study. Three-dimensional marker positions and ground reaction forces were simultaneously recorded with a motion analysis system while the subjects ran along a 25m runway at a speed of 3.5 m/s. Kinematic variables were analyzed for the stance phase of the right leg. Female runners demonstrated significantly greater peak knee abduction, hip adduction and internal rotation, whereas male runners demonstrated significantly greater

peak rearfoot eversion. The knee abduction and internal rotation angles were significantly correlated with rearfoot eversion and hip adduction angles. The foot contact position with respect to pelvis was similar between genders.

Greater knee abduction in females can be related to their higher knee injury risk, and rearfoot and hip kinematics are likely to be the distal and proximal factors, respectively. In particular, larger hip adduction may critically cause larger knee abduction because the foot contact position was similar between genders.

The relationship between performance and trunk movement during change of direction

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The purpose of this study was to obtain the trunk kinematics data during changes of direction task and to determine the relationship between trunk kinematics and change of direction performance. Twelve healthy male collegiate soccer players participated in this study. Participants performed shuttle run cutting task with pivot 180 degree as fast as possible. Shuttle run cutting time, ground contact time during change of direction, and the trunk inclination angle were measured. Shuttle run cutting time tend to correlate positively with ground contact time. During change of direction task, trunk forward inclination angle gradually increased during the first 0-50% of the

stance phase and decreased subsequently, while trunk flexed keeping left inclination during the first of 0-40% of the stance phase and changed opposite direction exponentially. Trunk forward angular displacement between foot-contact and maximum trunk inclination correlated positively with shuttle run cutting time ($r=0.61$, $p<0.05$) and ground contact time ($r=0.65$, $p<0.05$). This finding suggested that change of direction performance could be related to small angular displacement of the trunk during change of direction. Therefore, coaches in field sports should check the body posture and trunk movement during change of direction.

The relationship between ball spin rate and finger motion during the ball release in baseball pitching

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The spin of a thrown baseball affects the ball trajectory which relates to pitchers' performance. We investigated an unknown relationship between the motion of the fingers and the spin rate of pitched baseball. Five professional and three collegiate pitchers participated in this study. The motions of ball, hand and fingers during the ball release were recorded by 3 high-speed video cameras. Positions of 11 spherical markers and the ball were reconstructed to 3D coordinate system. We defined the amount of angle that the fingers actually rotated the ball as "the back spin angle" and the amount of extension

at PIP joint during the ball release as "the finger extension". The ball spin rate was correlated to 1) the back spin angle ($42 \pm 11^\circ$) and 2) the finger extension (index finger: $38 \pm 10^\circ$ ($p < 0.05$), and the middle finger : $36 \pm 5^\circ$ ($p < 0.01$)). These results suggest that delaying the ball release is an effective way to increase the ball spin rate, but pitchers are limited to change their timing of the ball release since the timing also determines the projection angle. We concluded that ball spin rate, ball velocity and ball spin axis angle are interrelated under the restriction of throwing the ball into the strike zone.

Effect of different type of sweeteners contained in drink on physiological response during prolonged exercise in women

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This study was examined the effect of different type of drinks which contain carbohydrate (CH) or artificial sweetener (AS) as a sweetener on physiological response during prolonged exercise in women. Six healthy young women (age = 20.8 ± 0.7 yr, maximal oxygen consumption = 41.3 ± 2.4 ml/kg/min) with regular menstrual cycle completed two trials consisting of 90 minutes cycling exercise at 50% VO_{2max} in the

controlled room (temperature; 30°C, relative humidity; 50%) during the follicular phase of their menstrual cycle with CH or AS drink ingestion. During cycling exercise, ventilation, VO_2 , VCO_2 , respiratory exchange ratio (RER), heart rate (HR), body core temperature (BCT), rating perceived exertion (RPE) were measured every 15 minutes and took blood sample every 30 minutes. VO_2 , HR and BCT were significantly increased in both trials.

Although RER in CH trial was higher than AS trial, there were no differences in other cardiovascular parameters. RPEs also did not differ between CH and AS drink ingestion. Leukocyte in AS trial was significantly increased after 60min compared with CH trial. This study

suggested that there was hardly any difference between CH trial and AS trial but CH drink ingestion increased carbohydrate metabolism, which might suppress the increase of leukocyte during exercise in a hot environment.

Time course changes of the kinematics and kinetics during double-poling technique in cross-country sprint skiing

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The purpose of this study was to examine time course changes of the kinematics and the kinetics during double poling techniques in cross-country sprint skiing. Subjects (n=5) were performed 3 min maximal double poling on oval track (320m). The kinematic parameters were measured as the mean velocity, cycle length, cycle rate, duration over one cycle, which consists of poling (0% - 30% of one cycle) and gliding (30% - 100% of one cycle) phases. The segment angles were measured for the upper and forward arms, trunk, thigh, lower limb, foot, pole from the horizontal plane. Distance from the most proximal edge of the foot to the pole contact point, which defined here as pole contact length, was also calculated. For the kinetic parameters, the peak and mean forces and impulse of poles were analyzed. The velocity, cycle

rate and peak and mean pole forces decreased significantly at 3rd lap compared with 1st lap of the round. In contrast, duration of the poling and gliding phases, impulse of pole and poling angle increased significantly at 3rd lap compared with 1st lap. There was no significant difference in the cycle length and pole contact length among laps. Thigh angle was greater and lower limb and foot angles were less at 3rd lap than at 1st lap in poling phase, indicating standing position while one cycle. In gliding phase, foot and thigh angles were greater and shank angle was less at 3rd lap than at 1st lap. These results suggested that double poling technique were changed to erect standing position the body and decreased flexing and extending action of legs with time course.

Object-specific modulation of corticospinal excitability during motor imagery of actions with objects

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We investigated whether corticospinal excitability during imagery of actions with objects was influenced by touching the same or different sized objects with imagined actions. Corticospinal excitability was assessed by monitoring motor evoked potentials (MEPs) in the first dorsal interosseous muscle following transcranial magnetic stimulation over the motor cortex. MEPs were recorded during the imagery of squeezing a palm-size ball (7 cm) or pinching a small-size ball (3 cm) - with or without passively holding the palm-size ball or the small-size ball. The MEPs amplitude during motor imagery was larger when a ball was being held than that when a ball was not held. While touching the small-size

ball enhanced corticospinal excitability only during the imagery of pinching the ball, touching the palm-size ball enhanced corticospinal excitability both during the imagery of pinching the small-size ball and during squeezing of the palm-size ball. To examine the effect of the area touched, we recorded MEPs during the imagery of pinching the small-size ball while touching various hand pads. The MEPs amplitude was not affected by touching the hand pad. These findings suggest that corticospinal excitability during imagery of an action involving an external object is influenced by the size of the object touched.

The role of sensory feedback in sensory-motor learning

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The purpose of this study is to investigate the role of sensory feedback (visual feedback, somatosensory feedback, auditory feedback,) in sensory-motor learning. In this study, we focus on auditory feedback in speech articulatory movements, and we examined the relationship between the auditory feedback and the speech dynamics. In particular, we examined the effect of

masking noise to cancel the born conduction auditory feedback during speaking in the alternate auditory feedback experiment where the time-scale of the feedback speech is temporally modified. TD-PSOLA (Time-Domain Pitch Synchronous Overlap and Add) method was used for the real-time time-scale modification. The temporal perturbation was applied at

the transition interval of semi-vowel /ya/. Experiments are conducted to study effects on the temporal speech compensation for the time-scale modification scale. We

show that the speech compensation effect and the masking noise effect for the altered auditory feedback.

Electromyography analysis of scapular muscles in baseball pitching

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The purpose of our investigation was to measure dynamically EMG activity of scapular muscles in baseball pitching. 9 male subjects without a history of shoulder pain or pathology joined. After stretching and warming up, the subjects threw ten fastball pitches overhand. Pitching phase was determined with High-speed digital camera and we intended for five pitching phase. EMG recording was recorded 8 muscles: rhomboid major (RMJ) and minor (RMN), supraspinatus (SSP), infraspinatus (ISP), upper /middle / lower trapezius (UT/ MT/LT) and serratus anterior muscles (SA). The RMN activity demonstrated high activity during deceleration phase and it was significantly

different to late cocking phase ($P < 0.05$). Also in RMJ, the activity in deceleration phase was the highest and it was significantly difference to early cocking and late cocking phase ($P < 0.05$). SA activity was significant difference in late cocking phase than early cocking and deceleration phase. From late cocking to deceleration phases are an explosive, short stage during which forward protraction to retraction of the scapula continues while the humerus is horizontally forward flexed to extend. Thus, it is considered that RMN, RMN and SA worked traction force for scapular and controlled the scapularthoracic joint for providing a stable glenoid against which the humerus could rotate.

Efficacy of the F-MARC “The 11” training program on collegiate football teams

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Objective: To elucidate the efficacy of “The11” and “The11+ α ” training program. Participants: One-hundred

eighty two collegiate male football players participated. Players divided into three groups: “The11” group (n=62),

“The11+ α ” group (n=60) and “Control” group (n=59). Interventions: The two training programs were conducted once or twice a week for 6 months. “The11” program is F-MARC original program. “The11+ α ” was focused on plyometrics training and slightly different from “The11”. Main Outcome Measures: Incidence rate during Soccer (game and training), game, and training were denoted per 1000 player-hours (PH), respectively. Using several field tests (Sprint, Pro-agility, Bounding, and Star Excursion Balance Test), each subject’s physical fitness level was evaluated prior to training as well as six months after training. Results: For both training groups,

incidences in soccer were significantly lower than “Control” group (p<0.05). Pro-agility time was significantly decreased in both training groups than “Control” groups (p<0.05). Balance ability was significantly improved in only “The11” group (p<0.05). Conclusions: It has been reported that “The11” program helps prevent soccer injuries and this results supported those studies. But efficacy of “The11” program to physical fitness is unknown. The results of this study indicated that “The11” and “The11+ α ” programs may have the added benefit of improving physical ability.

Impact of competition among J-League clubs on distance decay parameters of season ticket purchase rate

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Competition have traditionally been identified in influencing store performance in marketing study. It is important to clarify the impact of competition among J-League clubs on distance decay parameters of season ticket purchase rate for J-clubs marketing. The purpose of this study was to examine the J-clubs competitive situation and to clarify the relationship between the impact of club’s performance and the distance decay parameters of J-league season ticket purchase rate when clubs are located close together. The respondents were all of J-League season ticket holders of four clubs which are Yokohama F•Marinos, Shonan Bellmare, Gamba Osaka and Cereso Osaka. Post code were collected 2008 January.

Season ticket purchase rate and the distance between each stadium and center of cities were calculated using geographic information system. The result of this study suggested that the season ticket purchase rate of the influential club is widely distributed (distance decay slope is gentle), while the season ticket purchase rate of the uninfluential club is precipitous distributed (distance decay slope is steep). In conclusion, we found that the catchment area of J-clubs season ticket purchase rate is overlapping and the distance decay parameters are affected by the impact of club’s performance when two clubs are located close together.

Validity of prediction equations for resting energy expenditure in Japanese female athletes

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The aim of the present study was to examine the validation of prediction equation of resting energy expenditure (REE) in Japanese female athletes. This study population consisted of 122 Japanese female athletes (age 20.2±1.3 years, height 162.5±6.3 cm, body weight (BW) 57.4±7.7 kg, and fat-free mass (FFM) 45.5±5.1 kg). Body composition was estimated by using air displacement plethysmography (BOD POD System). Resting energy expenditure (REEm) was measured by indirect calorimetry, and predicted resting energy expenditure was calculated from four equations based on

FFM. When compared with REEm, predicted REE from the new equation ($REE \text{ (kcal/day)} = 26.9 \times FFM(\text{kg}) + 36$, Taguchi et al. 2010) was not significantly different. Whereas, REE from equation of JISS ($REE \text{ (kcal/day)} = 28.5 \times FFM(\text{kg})$) was significantly different from REEm. Prediction equations based on REE from Western population were poorly-matched with REEm. The new equation (Taguchi et al.) was found to predict REE most accurately. In conclusion, accurately predicted REE from FFM will be the best alternative for direct measurement of REE in Japanese female athletes.

Influence of 3 consecutive days of high intensity exercise on resting salivary antibacterial peptides in young male subjects

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The purpose of this study was to examine the influence of 3 consecutive days of high intensity exercise on resting salivary antibacterial peptides. Six young male sedentary (24.8 ± 3.0 year) participated in 3-day exercise sessions. They exercised on bicycle ergometers for 60 min at 75% of their VO₂max. Saliva samples were collected before

exercise in the first (D1), the third (D3) and the fourth (D4) days. Samples were measured for the beta defensin 2 (hBD2) concentrations by using enzyme-linked immunosorbent assay. hBD2 secretion rate (pg/2min) was calculated by multiplying absolute hBD2 concentration (pg/ml) by saliva flow rate (ml/2min). Mean saliva flow

rates at D1, D3 and D4 were 2.71 (0.38), 3.39 (0.50), and 2.86 (0.33) ml/2min respectively. The rate did not show significant change during study period. Mean hBD2 concentrations at D1, D3 and D4 were 27.8 (6.0), 25.2 (8.2), and 35.7 (14.1) pg/ml respectively. Salivary hBD2 concentration did not show significant change during the study period. The calculated mean hBD2 secretion rates

at D1, D3 and D4 were 76.5 (18.7), 88.6 (34.0), and 91.9 (34.9) pg/2min respectively. Salivary hBD2 secretion rate had increased slightly at D3 and D4, but the difference was not significant. Although consecutive high intensity exercise might increase resting antibacterial peptides, further study is required to examine more closely these responses in exercise.

The effect of forward trunk inclination on knee kinematics and kinetics during shuttle run cutting

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Purpose: Our purpose was to identify the effects of forward trunk inclination on knee kinematics and kinetics during shuttle run cutting. **Methods:** The study participants were 7 men and 7 women high school athletes. The subjects performed a shuttle run, a cutting task, twice: (1) the first time the participants performed the task, they were not instructed about posture, and (2) the second time, they were instructed to tilt their trunk forward during the task. The task performance was recorded using a high-speed (200 Hz) motion analysis system. Three-dimensional knee kinematics and kinetics were recorded. **Results:** Forward trunk inclination during the task had significant effects on the knee-flexion angle ($p < 0.05$) and knee-extension torque ($p < 0.05$). In particular, the knee-flexion angle at the time of foot

contact increased with forward trunk inclination ($p < 0.05$). The peak knee-extension torque significantly decreased. However, forward trunk inclination did not significantly affect the knee-abduction angle, tibial rotation angle, knee-abduction torque, and tibial rotation torque. **Conclusion:** Forward trunk inclination during cutting-type movements increases the knee-flexion angle and decreases the knee-extension torque. Therefore, active forward trunk inclination may be associated with a reduced risk of anterior cruciate ligament (ACL) injury. However, forward trunk inclination could not alter the knee-abduction angle, tibial rotation angle, knee-abduction torque, or tibial rotational torque during the task.

Architectural factors influencing maximal muscle power in vivo

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The purpose of the present study was to examine the relationship between the muscle architectural factors and the maximal muscle power in vivo. Seventeen healthy men performed maximal concentric elbow extensions against eight different loads to calculate joint power. Muscle length, cross-sectional areas (CSA) and volume of the triceps brachii were measured from magnetic resonance images. Pennation angle of the triceps brachii was determined by ultrasonography. There was a significant correlation between the muscle volume and the joint power ($r = 0.61$, $P < 0.01$). This was due to a significant correlation between the CSA and joint power ($r = 0.62$, $P < 0.01$), but not to a relation between the

muscle length and joint power ($r = -0.06$, $P > 0.05$). On the other hand, large inter-subject variability existed in joint power to muscle volume ratio ($0.52 \sim 1.01$ W/cm³). The pennation angle was not correlated with the joint power to muscle volume ratio ($r = 0.40$, $P > 0.05$). This result may be due to the interaction between the positive effect of pennation angle on the muscle shortening velocity and the negative effect on the force. The present results indicated that (1) muscle volume is a determinant of the maximal muscle power, although there is substantial inter-subject variability in the power to volume ratio, (2) pennation angle does not have a strong influence on power-generation capacity.