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【Oral Presentation / Abstract】

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**Symposium**  
**Roles of physical activity for older adults**

**Maximizing brain plasticity with physical exercise**

Dr. Michelle Voss, PhD

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Although healthy aging is associated with decline across a broad range of cognitive abilities, the extent of decline is widely variable across people. Individual differences in cognitive aging may stem in part from differences in lifestyle and health behaviors. This presentation will discuss my research related to the cognitive benefits associated with different types of physical exercise and studies examining the neural mechanisms of these benefits with structural and functional neuroimaging of aging humans. I will highlight relationships between physical activity and exercise, brain structure, brain activation and functional connectivity, and cognition. For instance, we have shown that increased aerobic fitness from one year of moderate walking in healthy elderly adults is associated with increased hippocampal volume as measured with high-resolution structural magnetic resonance imaging (sMRI). Increases in hippocampal size were associated with increases in spatial working memory exclusively for the walking group and not for a stretching and toning control group, suggesting that aerobic fitness gains from

walking may lead to improved hippocampal function in part from the structural plasticity that aerobic exercise stimulates in the hippocampus. In the same randomized controlled trial, we found aerobic training was associated with increased frontal and temporal white matter integrity as measured with diffusion tensor imaging (DTI), again suggesting that both exercise type (aerobic) and intensity may be important factors for exercise-induced brain benefits. Based on animal models, I will discuss potential cellular mechanisms for these effects measured in humans, such as increased dendritic complexity and synaptogenesis, increased myelination and axonal branching, increased blood vessel density, and increased neuronal and glial cell size and number. Using functional MRI (fMRI), we have also shown that one year of moderate intensity walking is associated with increased functional connectivity in frontal and temporal aspects of brain networks that typically deteriorate with age, including the Default Mode Network (DMN) and a cognitive control network associated with sustained goal maintenance. DMN dysfunction has been associated with

progression of normal aging to mild cognitive impairment and dementia; therefore the benefit of exercise on this network may provide one avenue for the role of exercise in neurological disease prevention. Potential neurobiological mechanisms for these effects will be discussed. Overall, results provide evidence for exercise-induced structural and functional plasticity in brain networks disrupted with aging, and offer insight for understanding how aerobic fitness attenuates age-related brain dysfunction.

Brief summary of career and research interests:

Dr. Michelle Voss, Assistant Professor in the Department of Psychology, received a Ph.D.

degree in Psychology from the University of Illinois at Urbana-Champaign in 2011. She was a Beckman Institute Predoctoral Fellow in 2008 and 2009, and was awarded the Paul D. Doolen Scholarship for the Study of Aging in 2009. She studies the neuroscience of aging. Her research program focuses on cognitive impairment during aging, the determinants of healthy aging (such as physical activity and cognitive engagement), learning-related changes in brain and behavior, and the translation of laboratory measures of cognitive and brain health to everyday function. To this end, her research draws on theoretical frameworks of cognition and aging and on neuroimaging techniques, such as structural and functional magnetic resonance imaging.

## Physical activity and musculoskeletal health in older adults

Dr. Hyuntae Park

Section Head, Section for Physical Activity and Health

Department of Functioning Activation, National Center for Geriatrics and Gerontology

Physical activity has both preventive and therapeutic effects across several diseases and conditions. It not only enhances the quality of life and prolongs independent living, but is also associated with a reduced risk of various chronic health conditions, including musculoskeletal disease. The loss of bone and muscle mass with musculoskeletal disuse results in significant morbidity, so preventing or attenuating osteoporosis and sarcopenia can be one of the most important public health goals.

In older adults, habitual physical activity is key elements in achieving optimal musculoskeletal health. Habitual walking, a great way to do moderate-intensity physical activity, a relatively inexpensive and easily accessible form of physical activity, has been shown to be acceptable for older adults. However, we lack objective evidence on the type of physical activity needed to avert these health problems.

The primary objectives of this presentation are: (1) to provide a brief history of physical activity guidelines; (2) to review musculoskeletal health benefits of physical activity that are particularly important to older adults, such as prevention of osteoporosis and sarcopenia; (3) to comment on gaps in knowledge and future directions for physical activity guidelines.

This presentation will also highlight some of our recent work related to documenting the relationships between the musculoskeletal health of older adults and yearlong assessments of step count and activity at an intensity  $>3$  metabolic equivalents, using an optimal design of accelerometer. Our data from this project

indicate that, in older adults, many aspects of musculoskeletal health are associated with both the quality of the habitual physical activity. In men, the advantage of being healthy seems associated more closely with the daily duration of moderate exercise, whereas in women the closest association is with the daily step count. In both sexes, the threshold volume of habitual physical activity associated with musculoskeletal disorders such as osteoporosis, and sarcopenia is at least 7,000-8,000 steps/day and/or at least 15-20 min/day at an intensity  $>3$  METs in both men and women. Because of the associations between the dose of physical activity and health outcomes, older adults, including those who wish to improve their bone and muscle mass or further reduce their risk for musculoskeletal health problems, may need to exceed the minimum recommended amounts of physical activity.

### Brief summary of career:

Dr. Hyuntae Park, Section Head in the Section for Physical Activity and Health, received a Ph.D. degree in Education from the University of Tokyo in 2008. He was a Visiting Scholar in International Center for Medical Information at Keio University from 2008 to 2010, and was Research Scientist in Department of Genomics for Longevity and Health at Tokyo Metropolitan Institute for Gerontology from 2007 to 2011. Now, he is Visiting Scholar in Laboratory for Physical and Medical Education at Nagano Prefecture (fall and fracture project). He was awarded the Best Technical Paper Award of the Japanese journal of physiological anthropology in 1995, Young Investigator Travel Award from

the American Society of Bone and Mineral  
Research in 2008, Best Paper Award of the  
Korean Society of sports and leisure in 2009 and

Best Research Award of the 9<sup>th</sup> Japanese Fall  
Prevention Conference in 2011.

## Keynote Lecture 1

### Environment, habitual physical activity and health

Dr. Takemi Sugiyama

Senior Researcher, Behavioural Epidemiology laboratory,  
Baker IDI Heart and Diabetes Institute

Public health campaigns to promote physical activity have traditionally focused on individuals and their motivation to exercise. Such individual-level approaches can be effective in the short term, but tend to be less successful in long-term maintenance of behaviour change. In order to address this issue, researchers have begun to pay attention to the context of where activity takes place. The environment in which people live, play and work affects their physical activity patterns: some places offer opportunities for activity, while the others provide barriers. Based on *ecological models*, which incorporate a broad range of influences on physical activity, including individual, social, environmental and policy factors, an increasing body of research has examined environmental attributes associated with physical activity. This lecture will give you a brief account of the role of environments in the promotion of physical activity and health, focusing on adults.

#### Early days: From exercise to active lifestyle

In the 1990s, public health researchers who were aware of the importance of settings began to examine how access to sports facilities was related to exercise. As research established the health benefits of lower-intensity activity such as walking, the settings of interest shifted from facilities to neighbourhoods. With the help of researchers from different disciplines such as urban planning and transport, the concept of walkability was developed.

Current research: Increasing “specificity” in activity and context

Different types of physical activity (e.g., walking for recreation and for transport) occur in different settings and may be influenced by different factors. An important development was increased “specificity” in examining the relationships between environmental attributes and physical activity. Following this principle, research has begun to produce practical evidence that informs the planning and design of environments conducive to physical activity.

What next: Do environments support habitual physical activity?

Environmental interventions can be expensive. However, once built, they should theoretically help large numbers of people maintain physical activity. This is supposed to be an advantage of environmental approaches (compared to individual-level approaches). However, research has not yet examined how environmental attributes contribute to habitual physical activity.

Implications for sport sciences: Revisit sports/recreational facilities?

Building sports/recreational facilities is a valid approach for activity promotion. However, they may not attract people who really need to be physically active (e.g., older adults). Researchers in sport sciences and public health need to think about how to make use of such facilities within broader health promotion initiatives.

Brief summary of career and research interests:

Dr. Takemi Sugiyama, Senior Researcher in Behavioural Epidemiology Laboratory, received a Ph.D. degree in Environment-Behaviour Studies from University of Sydney in 2002. From 1985 to 1989, he worked at Toshiba Corporation as a mechanical Engineer. After working at Tohoku University of Art and Design as a Research Associate, he appointed to a Research Fellow at University of Sydney, Edinburgh College of Art, and the University of Queensland. Now, he is

Honorary Senior Fellow at University of Melbourne and Senior Researcher at Baker IDI Heart and Diabetes Institute. He was awarded Research Incentive Award at University of Queensland in 2008, 2009 and 2010. His research interests are built and natural attributes of neighbourhood environment conducive to active lifestyles, Health impacts of active transport and sedentary behaviours, and Office environmental attributes associated with workers' sitting time.

## Keynote Lecture 2

### Roles of Health and Sport Sciences on Recovery from the Great East Japan Earthquake

Ryoichi Nagatomi MD, PhD

Professor, Graduate School of Biomedical Engineering, Tohoku University

The 3.11 Great East Japan Earthquake deprived lives of 15,867, and 2,909 are still missing. Even now, 344,171 are forced to live as refugees due either to the loss of their homes or to the environmental contamination with radioactive materials.

Long-term health care of the survivors remains one of the major issues in the aftermath of great earthquakes such as in the Wenchuan and Sichuan great earthquakes in China in 2008 and the West Sumatra earthquake in 2009, as well as of Kobe and Chuetsu Earthquakes in Japan. Among the earthquakes and tsunamis experienced in modern Japan, the extent of devastation of 3.11 Earthquake was far beyond our prediction and preparation based on previous lessons. Initially, especially in the disaster area, the information regarding the disaster was far limited, because of the serious damages to the communication and transportation networks. It took months to realize what has actually happened.

To understand the health problems and provide efficient solution, surveys have been performed in the disaster area. From sports and exercise science point of view, inactivity due to loss of jobs and ordinary lives was assumed to lead to critical declines in the physical function and/or sarcopenia in the elderly survivors. Quick and simple screening survey based on regular elderly health-checkups was performed under the supervision of the Ministry of Health, Welfare and Labor, as early as June 2011. Preventive exercise classes were provided by various organizations including universities and groups

of exercise therapists for those considered as at higher risk of functional decline.

More serious seems to be the prevalence of mental distress including post-traumatic stress disorders. Elderly people with depression are not likely to attend health surveys, and moreover, even after decline in the physical function which requires extra exercise training was found, those people are likely to stay away from such intervention.

From my experience in supporting the survivors in the fishery villages in Miyagi prefecture, the health problem in the chronic phase in the aftermath of the Great Earthquake seems nothing else than the elderly health problems in general, just being emphasized because of the earthquake. In this context, it seems that earlier recovery was accomplished where people have been aware of the negative health impact of inactivity and had been taking actions not only individually but also in the community well before the earthquake. Exercise programs may be beneficial only when the community is recovered where people can work and lead their own lives.

We also performed analysis of risk factors contributing to the development of post-traumatic stress disorders (PTSD) in our work-site cohort study involving 1638 participants. The prevalence of PTSD was almost 20% among the participants whose worksites were within 1 km range from the tsunami-devastated area 5 months after the earthquake. Independent of the direct impact of earthquake or tsunami, lower physical function

and being depressive before the earthquake were significantly associated with the prevalence of PTSD.

Problems associated with physical activity and function are not only limited to the elderly people. According to our preliminary survey using accelerometer the duration of intense or vigorous activity from Monday to Friday at schools was significantly limited in the students of a junior high school in the tsunami swept Kesenuma City as compared to those in Sendai City where there was no tsunami damage. Physical fitness and sports skills of junior high school and primary school students in Miyagi prefecture were significantly inferior to the national average. Taken together the limited physical activity of children in the disaster area may have lead to reduced physical development.

Altogether, promotion of health-oriented life style in everyday life with sufficient amount of physical activity seems to be the key to earlier recovery even in the situation of great disaster. Recent study suggesting a beneficial effect of exercise on cognitive function and brain may further encourage the promotion of physically active life style.

Brief summary of career and research interests:

Dr. Ryoichi Nagatomi, the vice dean of the Graduate School of Biomedical Engineering, Tohoku University, received a Ph.D. degree in exercise and immunology studies from Tohoku University in 1992. From 1984 to 1986, he

worked as a medical intern at Sendai City Hospital. After 2 years in The 3<sup>rd</sup> Department of Internal Medicine of Tohoku University School of Medicine as a clinical research fellow, he was assigned to the Department of Physical Education, College of General Education, Tohoku University as an assistant professor, and engaged in sports education and sports science research. In 1993 he was transferred to the Department of Medicine & Science in Sports & Exercise, School of Medicine, and was promoted to the professor in 2002. In 2008, he was transferred to the professor at the newly established Graduate School of Biomedical Engineering and was appointed as the vice dean in 2011. His research started from the investigation of immunological impact of exercise, but his enthusiasm in exercise science have extended his interest from molecular and cellular mechanisms of skeletal muscle adaptation up to epidemiological studies investigating the role of physical activity and function in healthy life styles. He is the past president and the board member of International Society of Exercise & Immunology, and the board member of the Japanese Society of Physical Fitness and Sports Medicine. He established an information network for exercise instructors in the distressed area (Undo Network for the Distressed Area :UNDA) in March 2011, and is continuing support for the activities of exercise instructors in the disaster area for the prevention of inactivity.

### Keynote Lecture 3

#### Sitting and health – from associations through to recommendation

Genevieve Healy PhD

NHMRC Postdoctoral Research Fellow, Cancer Prevention Research Centre  
School of Population Health, The University of Queensland

Sedentary time (sitting or lying with low energy expenditure) is ubiquitous in modern society. We sit at work, we sit at home, and we sit while we travel. Indeed, the average adult is sedentary for 7 to 8 hours every day. Research has shown that time spent in sedentary behaviours is linked to poor health and early death. Importantly, these findings were observed even in adults whom we would normally consider to be “active”, that is, meeting the guidelines for regular moderate to vigorous intensity physical activity.

This presentation will provide an overview of the new field of sedentary behaviour research. Specifically, it will address:

- What is it?
- How might it be measured?
- How common is it and who is at risk?
- How is it related to health?
- How can we change it?
- What should we recommend?

The presentation will also highlight the several research gaps that remain in this field and argue that sedentary behaviour be acknowledged as a unique health risk behavior on the physical activity public health agenda.

#### Brief summary of career:

Genevieve Nissa Healy, Postdoctoral Research Fellow in Cancer Prevention Research Centre, received a Ph.D. degree from the University of Queensland in 2008. Her thesis title was Physical activity, sedentary time and blood glucose in Australian adults. Now, she is Postdoctoral Research Fellow in The University of Queensland and Adjunct Research Fellow in Baker IDI Heart and Diabetes Institute. She was awarded the European Association for the Study of Diabetes (EASD) Young Investigator Travel Grant Award and Heart Foundation Travel Award in 2007, and Australian Postgraduate Award (APA) scholarship from 2005 to 2008.

**Student Symposium  
Mega-sports Events**

**Assessing the legacies/impacts of the London 2012 Games  
(in a non-hosting region)**

Shushu Chen  
Loughborough University

This presentation outlines the articulation of a realist approach to policy evaluation. The study addresses the under researched nature of the Olympic legacies/impacts in a non-hosting region of the country hosted the 2012 Olympic Games. The approach identifies the seven key legacy themes adopted by the region, and constructs logic models to summarise the anticipated causes and effects relationships, underlying legacy claims and assumptions. It

assesses the effectiveness of these logic models for specific legacy policy programmes. In addition, it seeks to construct a meta-evaluation of a range of legacy interventions within the region, employing both meta-analysis and meta-synthesis on the one hand, and evaluating the evaluations on the other hand. Curtail to this analysis is establishing the additionality of outcomes the Games.

**Sponsorship of mega sport events:  
The effect of colors on sport viewer's attention**

Christopher Rumpf  
German Sport University Cologne

Sponsorship of mega sport events is widely used to build customer-based brand equity. However, there is still limited understanding about the processing of sponsorship information in the sport viewer's mind. Advertising research suggests that colors have significant impact on the consumer's information processing. In a mega sport event context, however, the effect of colors has not been researched to date. Therefore, the aim of this study is to investigate if the choice of colors has a substantial impact on

sponsorship effectiveness. Based on data from an experimental eye-tracking study we analyze the process of attention allocation and estimate the importance of colors on the viewer's attention. The results reveal that the capture of attention is determined by the contrast between the sponsor signage's color and the sports surface, for example, pitch or track. Implications for both sponsoring brand managers and managers of mega sport events are discussed.

## **Key Success Driver of Japanese Elite Sport System: Elite Athletes' and Elite Coaches' Perspective**

Hiroaki Funahashi

Waseda University

The purpose of this research was to examine policy-related success drivers of the Japanese elite sport system by conducting an evaluation of the elite sport climate with Japanese elite athletes (n=105) and coaches (n=62) as the survey subjects. The sub-analysis investigated which specific policy-related factors describe the difference between medallist (n=43) and non-medallist (n=62). The study was drawn from the research framework and scoring system developed by De Bosscher et al. (2006, 2008, 2009, 2010) that is built on the SPLISS (Sports Policy Factors leading to International Sporting Success) model. The result showed that the elite sport climate was very well maintained for the

evaluation items of 'training facilities', and this item could be considered to be policy-related success drivers in the Japanese elite sport system. In addition to this, the elite sport climate was not adequately maintained in terms of 'post career support', and this item could be regarded as an underdeveloped area in Japanese elite sport system policies. The sub-analysis revealed that there was no significant difference between medal winning and non medal winning athletes in the overall evaluation of elite sport climate, which suggested that the elite sport climate for medal-winning and non-medal-winning elite athletes are maintained to the same standard.

## **Research on Interaction Development between Sports Events and Metropolis Tourism Industry**

Luo Lei

Shanghai University of Sport

There is a natural relationship between sports events and Metropolis Tourism Industry. Sports events have become a vital component of the marketing mix for tourist destinations. Cities are increasingly using sports events to improve their image, stimulate urban development and attract visitors.

By the ways of literature study, expert interview and field investigation, the article focuses on the connotation of the interaction between sports events and urban tourism. It analyzes the positive influence of sports events on urban tourism, discusses the interaction development for sports events and urban tourism in Shanghai and puts forward some suggestions on enhancing the interactive development of

sports events and urban tourism. The aim is to help planners of sports events and governments to improve their forecasting and decisions.

Sports events play two roles. First, they can attract participants and spectators, thus boosting the number of visitors to the host destination during the time that the event takes place. Second, the attention that events receive through advertising and news coverage constitutes added exposure for the host destination. The economic impact of the event relies primarily on these two aspects. Visitors' spending brings money into the local economy; the event's advertising and news coverage can enhance the destination's image, thus helping to build visitation at other times of the year.

## **The comprehensive evaluation study of china's emergency response to major sports events based on AHP method**

Yunchao Ma  
Tsinghua University

In order to improve the level of emergency management to major sports events, and reduce the casualties, it is necessary to evaluate it comprehensively, so that the quantitative basis for emergency capability construction can be provided. By referring to the current research results at home and abroad in this field, the process of events emergency management could be divided into prevention and preparation stage, disposing stage and reconstruction stage based on the overall process idea. Therefore, events emergency management capacity should include prevention and preparation capacity, disposing

capacity as well as reconstruction capacity. Then, an evaluation index system could be built based on it which includes 3 levels, with 3 indicators in level one, 9 indicators in level two and 32 indicators in level three. This thesis aims to provide significant references for improving events emergency management capacity. Research into the establishment of major sports events emergency response capability evaluation system provides new insight and theoretical basis for evaluating the major sports events emergency capacity. The next step will be testing it on more sports events.

**Student Symposium  
Wellness in Athletes**

**The effect of positive affect on building mental resilience and predicting performance and satisfaction among collegiate athletes**

Szuyu Chen

National Taiwan Normal University

The purpose of this study was to examine the Broad-and-build theory (Fredrickson, 2002) in the sport setting. Specifically to examine (1) the mediating effect of mental resilience between positive effects and performance and satisfaction in sport, (2) the mediating effect of positive affects between mental resilience and positive outcomes. The participants were 119 collegiate athletes (males=64, females=55) in Taiwan; average age was 20.5 years. Participants were asked to collect affective data thorough online questionnaire during a period of one month (Time 1), which was a month before the 2011 National Intercollegiate Athletic Games. Then athletes' mental resilience data was collected in Time 2, which was just before the National Intercollegiate Athletic games. Finally, athletes' positive emotion, self-rated performance and sport satisfaction were collected at Time 3,

which was immediately after the National Intercollegiate Athletic Games. The results indicated that (1) In terms of examining the mediating effect of mental resilience between positive affect and performance and satisfaction in sport, results indicated that mental resilience had a mediating effect between long-term positive emotion experience and athletes' performance and satisfaction. (2) In terms of examining the mediating effect of positive affect between mental resilience and performance and satisfaction in sport, results indicated that positive emotion played as a mediator when athletes' performance and satisfaction were predicted by mental resilience. In sum, the results of this study supported the Broad-and-build theory and the hypotheses of "Upward Spiral" effect.

## The Body-Mind Connection in Athletic Well-Being

JuneHong Kim

Seoul National University

Many scientist and researchers have found that how much important physical activity is and how bad the sedentary lifestyle is for the health. At the present time, the term of wellness has become more prominent. Wellness as a process of moving toward optimal health, include not only physical wellness but also occupational, social, emotional, intellectual, spiritual wellness. Our mental processes are the most important influences on our health, because they determine how we deal with our physical and social surroundings, what attitudes about life we have and how we interact with others.

Wellness for athletes is no exception. Most people would agree that genetics and training are both factors in athletic achievement. However many researchers indicated that physical attributes are significantly less important than

mental and emotional dispositions in determining athletic excellence. Winning behaviors and psychological dispositions are the deciding factors in determining those who reach the top. Integration of the mental and emotional dispositions into the physical preparation is the balance that moves the super athletes into the zone where the mind, emotions and body execute in harmony. With the head and emotions out of the way, the body's muscle memory functions optimally.

Thus we take into account athletes' mental, emotional development course program for athletes' body-mind connection. We have to make the athletes to maintain optimal state of their body and mind for their performance at the game, their life as well.

## **An influence of breathing technique on the position of center of mass and buoyancy: Suggestion for the horizontal alignment of swimming**

Yusuke Maruyama

Waseda University

The purpose of this study was to test the hypothesis that the position of the center of buoyancy (CB) relative to the center of mass (CM) lay more caudally with the abdominal breathing technique than with the chest breathing technique. Ten healthy men who practiced the abdominal and chest breathing techniques participated in this study. The position of the CB, CM, and the distance between them (CB-CM distance) were determined as time-series data during inhalation with each breathing techniques, and the changes of the positions and distance due to the inhalation were compared between two breathing techniques. The results showed that both CB and CM translated due to the inhalation, but the amount and direction of the translations

differed between the breathing techniques ( $p<0.01$ ). The increase in the CB-CM distance was significantly smaller ( $p<0.01$ ) with abdominal breathing (1.11cm) than the chest breathing (1.21cm). For both breathing techniques, CB was located more cranial to CM regardless of the amount of inhalation. These data indicate clearly that the position of CB relative to the CM lies more caudally with the abdominal breathing technique than with chest breathing and, therefore, the hypothesis is supported. The results suggest that the breathing technique should influence the magnitude of the moment of buoyant force around CM and the swimmer's ability to float in a horizontally alignment on the water surface.

## **Optimal exercises to positively alter running biomechanics in older adults.**

Reginaldo K. Fukuchi

University of Calgary

Changes in biomechanics during locomotion have been associated with muscle weakness and increased joint stiffness with ageing. The greater incidence of injuries among older runners has been primarily related to changes in gait biomechanics. Muscle stretching and strengthening exercises counterbalance the effects of ageing on the musculoskeletal system. However, it is still unknown what impact such exercises will have on biomechanical patterns in older runners. In addition, it is unclear whether older runners can alter their biomechanical patterns using these exercises. Therefore this study will investigate the effects of specific exercises on gait biomechanics of older runners. Strength, flexibility and gait biomechanical

measurements will be taken in 105 male older runners (55-75yrs), at baseline and following an 8-week exercise program. Each runner will complete one of three exercise groups (stretching, strengthening and control). An additional 25 young runners (20-35yrs) will be recruited. Comparisons will be made prior to and following the exercise program in older adults and as well at baseline between young and older runners using a pattern recognition technique. This will determine which exercise is most effective in positively altering the biomechanical patterns in older runners. Therefore the results will help older runners remain injury-free and maintain a healthy lifestyle.