

2016 International Symposium

Evidence-Based Exercise Medicine for the Promotion of Lifelong Health

Friday, May 20th, 2016, 13:00~18:00
Grand Ballroom, Baekyangnuri, Yonsei University, Seoul, Korea



FRICSS
Frontier Research Institute of
Convergence Sports Science



Department of Physical Education
Department of Sport and Leisure Studies



National Research
Foundation of Korea



YISSEM
Yonsei Institute of
Sports Science and Exercise Medicine

Opening address

Director of the FRICSS



As the Director of the Frontier Research Institute of Convergence Sports Science (FRICSS), I sincerely welcome all of you!

First of all, I would like to express my sincere appreciation to Yong Hak Kim, the President of Yonsei University, Sang Nam Nam, the President of Korean Alliance for Health, Physical Education, Recreation and Dance, San Jin Kang, the Dean of the College of Sciences in Education and the Director of the National Research Foundation.

Since the foundation of the “Institute of Sports Sciences” in 1993, the institute has carried out various researches and developments in the field of sports sciences. In 2014, with renaming the institute as the FRICSS, the institution has been made its best efforts to pursue the sports science-centered convergent researches by collaborating with related areas in order to resolve health-related conundrums.

In 2015, the institute was given a valuable opportunity from the National Research Foundation to perform multidisciplinary researches entitled “Evidence-Based Exercise Medicine for the Promotion of Lifelong Health.” and our convergent research team, which consists of researchers from exercise, medical and health sciences, is working hard on it.

Throughout this project, the institute is highly expected to contribute to expand “lifelong health”, the current social issue, and looks forward to open a new horizon for the role of convergent sports science. In addition, I anticipate that the outcomes of this project will contribute to lay the groundwork of “Creative Economy and People’s Happiness through Science, Technology and ICT” set forth by the current Government.

Lastly, I would like to thank Prof. George A. Brooks, Walter Herzog, SoJung Lee, Brian Pietrosimone for their fabulous contribution to this symposium.

May 20, 2016
Associate Professor, Department of Physical Education
Director of the Frontier Research Institute of Convergence Sports Science
Yonsei University
Hae Dong Lee, PhD

개회사

Director of the FRICSS

안녕하십니까? 융합체육과학선도연구소 소장 이해동입니다.

우선 저희 연구소에서 주최하는 국제심포지엄에 함께하셔서 자리를 빛내주신 연세대학교 김용학 총장님, 남상남 한국체육학회 학회장님, 강상진 교육과학대학장님, 그리고 한국연구재단의 서태열 본부장님, 오수학 사업단장님을 비롯한 모든 참여자 분들께 진심으로 감사 드립니다.

저희 연구소는 1993년 체육연구소로 개소하여 체육과학 연구에 매진해 왔습니다. 2014년에는 현재 연구소명의로의 개칭과 함께 운동과학을 중심으로 관련 학문 분야와의 유기적인 융복합연구 선도를 통한 문제해결 형 연구소로의 도약을 위해 최선의 노력을 기울이고 있습니다.

지난 2015년 저희 연구소는 한국연구재단 대학중점연구소에 선정되어 “건강증진을 위한 근거중심 운동의학적 융합연구”를 수행할 수 있는 값진 기회를 부여 받았습니다.

체육학과 의보건학 융합연구팀이 수행하게 되는 본 사업을 통한 저희의 노력이 기대수명 증가에 따른 건강수명 연장을 위한 운동과학의 역할에 대한 새로운 지평을 열기를 기대합니다. 더 나아가 “과학기술과 ICT 혁신을 통한 역동적 창조경제 실현”에 부합하여 보다 건강한 삶을 위한 연구개발 및 신 산업 개척의 밑거름이 되고자 합니다.

마지막으로 본 심포지엄에서 국제적 선도연구 소개 및 교류의 물꼬를 터주시기 위해서 이 자리에 참석해주신 Prof. George A. Brooks, Walter Herzog, SoJung Lee, Brian Pietrosimone께 감사 드리며, 이 심포지엄이 함께 해주신 모든 분들께 값진 시간이 되시기를 기원합니다.

2016년 5월 20일
융합체육과학선도연구소 소장
이해동

Welcome address

President of Yonsei University



Good afternoon, ladies and gentlemen. I would like to extend a warm welcome to all participants attending the 2016 International Symposium of Evidence-based Exercise Medicine for the Promotion of Lifelong Health held by the Frontier Research Institute of Convergence Sports Science (FRICSS) at Yonsei University.

FRICSS emerged following the launch of the exercise science laboratory in 1993. It changed its name to FRICSS in 2014 and has been further committed to the development of academics and society through exercise science and integrated research since its designation for 'Evidence-based Exercise Medicine for the Promotion of Lifelong Health' as its Priority Research Centers Program by the National Research Foundation of Korea (NRF). I look forward to the successful research of FRICSS.

Korean society has been rapidly industrialized and developed, thus enhancing our standard of living. However, it simultaneously causes a lack of physical activities, which threatens our daily lives. Therefore, there has been a greater interest and higher investment in sports and physical education in order to overcome the side-effects of bettering the Quality of Life (QoL). I believe that FRICSS performs crucial roles to meet and accomplish these social demands to develop and implement sports science and medicine-based exercise programs. The FRICSS research team, consisting of researchers from the College of Sciences in Education (Physical Education and Sport & Leisure Education departments), College of Medicine (Sinchon and Wonju campuses), and Graduate School of Public Health, will provide the platform for such converged research. These programs can positively affect the QoL of patients who suffer from cancer, diabetes, hypertension, degenerative osteoarthritis arthritis, back pain, and other diseases.

In this light, I believe that this symposium is a wonderful opportunity to actively share ideas and seek cooperative measures of exercise medicine. I hope it will become an important stepping stone for cooperative relationship among researchers, and will help participants consider ways to promote exercise medicine study and build happiness in our society.

Finally, I would like to acknowledge the Head of FRICSS and all members of the organizing committee for successfully preparing this wonderful congress. In particular, I would like to thank all world-class scholars from the United States and Canada who are here today. Once again, I would like to thank and welcome all participants for being here today.

May 20, 2016
President of Yonsei University
Yong-Hak Kim, Ph.D

환영사

President of Yonsei University

안녕하십니까? 화창한 5월의 봄날에 연세대학교 융합체육과학선도연구소가 개최하는 국제심포지엄에 함께 해 주신 모든 참가자 여러분, 진심으로 환영합니다.

연세대학교 융합체육과학선도연구소는 1993년 '체육연구소'로 개소하여 한국 체육과학 연구의 장을 열었습니다. 2014년 '융합체육과학선도연구소'로 연구소명 개칭과 더불어 체육과학 및 융합연구 활성화를 통해 학문 및 사회 발전에 기여하고자 다각도로 노력하고 있는 것으로 알고 있습니다. 융합체육과학선도연구소가 2015년 한국연구재단의 대학중점연구소사업에 '건강 증진을 위한 근거기반 운동의학적 융합연구'라는 주제로 선정된 후 연구개발에 한층 더 박차를 가하고 있음을 잘 알고 있습니다. 또한 앞으로도 훌륭한 연구 성과를 낼 것으로 기대하고 있습니다.

오늘날 우리사회는 급격한 산업화와 기계문명의 발달로 국민생활 수준이 크게 향상되었으나, 그로 인한 신체활동 부족 및 다양한 만성질환이 건강한 삶 자체를 위협하고 있습니다. 이와 같은 상황에서 수동적인 건강 유지를 넘어서 보다 능동적으로 삶의 질 향상을 도모할 수 있는 가장 안전하고, 경제적이며, 효율적인 방법은 체육과학과 의학에 근거한 운동 프로그램에 보다 많은 사람들이 참여할 수 있는 사회적 패러다임 도출이 아닐까 싶습니다.

이러한 패러다임 도출을 위해 융합체육과학선도연구소가 큰 역할을 할 것으로 기대됩니다. 특히 교육과학대학(체육교육학과, 스포츠레저학과), 의과대학(신촌, 원주), 보건대학원 연구진으로 구성된 융합연구팀은 문제 해결을 위한 실질적 융합연구의 장을 마련할 것으로 믿습니다. 융합연구를 통해 암, 당뇨병, 고혈압, 퇴행성관절염, 요통과 같은 질환으로 고통 받는 환자들을 위한 운동의학 근거기반 운동프로그램 개발, 검증, 보급을 성공적으로 추진할 수 있다고 확신합니다.

체육과학분야의 저명한 학자들과 함께 "건강증진을 위한 운동의학적 융합연구"라는 주제의 학술적 교류의 장이 마련되어 그 의미가 크다고 생각합니다. 금번 국제심포지엄을 통하여 체육과학의 역할이 확대되고, 이로 인하여 체육과학에 대한 다양한 학술적 교류협력이 꽃을 피우는 소중한 시간이 되기를 바랍니다. 마지막으로 본 국제 심포지엄이 성황리에 개최될 수 있도록 애써주신 융합체육과학선도연구소 소장님을 비롯한 관계자 여러분의 노고에 진심으로 감사 드리고, 특히 이 행사를 빛내기 위해 먼 길을 오신 해외석학 여러분과 이 자리에 참가해 주신 여러분께 감사와 환영의 말씀을 전합니다.

2016년 5월 20일
연세대학교 총장
김용학

Congratulatory speech

President of KAHPERD, Nam Sang Nam



Good afternoon. I am Nam Sang Nam, the president of Korean Alliance for Health, Physical Education, Recreation and Dance (KAHPERD).

I sincerely congratulate the holding of '2016 International Symposium: Evidence-based Exercise Medicine for the Promotion of Lifelong Health'. I want to welcome all world-renowned scholars and honorable guests who have joined us for this momentous occasion.

First of all, it is grateful that Yonsei University has joined the Priority Research Centers Program through the National Research Foundation of Korea (NRF). I offer my best wishes for the continued prosperity and further development of the Frontier Research Institute of Convergence Sports Science (FIRSCSS).

Sports medicine has focused on helping athletes improve their athletic performance, recover from injury, and prevent future injuries. However, it also provides a fast-growing health care field for even non-athletic people nowadays. Especially, exercise medicine is considered as a combination of sports science and medicine and has been developed as a recent field. This symposium will provide a greater opportunity to develop this field of exercise medicine through academic and social contribution.

By providing this symposium for exchange of experience and expertise, this year's symposium aims to foster closer collaboration among many professionals in this field. I believe that all those who involved in the various aspects of Sports Medicine will embrace this opportunity to learn from each other and share experience.

In closing, I would like to thank George Brooks, Walter Herzog, SoJung Lee, and Brian Pietrosimone who will give a remarkable speech at the symposium. I would also like to give an appreciation to all of the guests who came and to all of the people for their efforts in preparing this symposium. I hope that all the participants will have good memories during symposium. Thank you.

May 20, 2016
President of KAHPERD
Nam Sang Nam

환영사

President of KAHPERD, Nam Sang Nam

안녕하십니까? 한국체육학회 회장 남상남입니다.

먼저 「2016 건강 증진을 위한 “근거기반” 운동의학적 융합연구 심포지엄」 개최를 축하 드리며, 참석해주신 국내·외 학자 및 내빈 분들께 진심 어린 환영의 인사를 전합니다.

또한 한국연구재단에서 시행하는 대학중점연구소 사업에 연세대학교가 선정된 것을 축하 드리고, 연세대학교 융합체육과학선도연구소의 무궁무진한 발전을 기대합니다.

현대사회에서 체육과학은 전문적인 선수들의 경기력 향상에 도움을 주고 부상 예방 및 치료 등에 주된 초점이 맞춰져 있었지만, 최근 체육과학은 운동선수뿐만 아니라 일반인에게도 폭발적인 관심을 받고 있으며 이를 바탕으로 빠르게 발전하고 있습니다. 특히 운동의학은 체육과학과 의학의 융합적 연구개발 분야로서 아직 국내에서는 다소 생소한 분야로 이번 심포지엄을 통하여 체육과학 내 운동의학의 영역 정립, 학문적·사회적 기여 기반 마련을 통한 발전에 큰 기회를 마련할 것이라 기대합니다.

본 심포지엄은 다양한 경험과 지식 교류의 장으로써, 운동의학 분야 전문가들 간의 국제적 협조체계를 구축하고 더불어 운동의학 분야의 최신 동향 및 발전 방향에 대한 정보를 제공해 줄 것으로 기대합니다.

끝으로, 본 심포지엄에서 발표해주시기 위해 멀리서 와 주신 Prof. George A. Brooks, Walter Herzog, So Jung Lee, Brian Pietrosimone 네 분의 학자와 이 자리가 빛나도록 애써주신 관계자 여러분의 노고에 진심으로 감사 드립니다. 참가하신 모든 분들께 소중하고 보람 있는 시간으로 기억되시기 바랍니다.

감사합니다.

2016년 5월 20일
한국체육학회 회장
남상남

Welcome address

Dean, college of sciences in education



On behalf of the College of Sciences in Education of Yonsei University at Seoul, I have the great pleasure to welcome you all to the first International Symposium of the Frontier Research Institute of Convergence Sports Science(FRICSS). I am happy to welcome, most especially, the keynote speakers Professor Walter Herzog from the University of Calgary, Canada, and Professor George A. Brooks from the UC Berkeley, USA. I also would like to appreciate and welcome the faculties who will present valuable research experiences and findings here at Yonsei. Welcome Professor Brian Pietrosimone from the University of North Carolina, and Professor SoJung Lee from the University of Pittsburgh, USA.

When I first read the title of the symposium, "Evidence-Based Exercise Medicine for the Promotion of Lifelong Health," I was glad at the title because its meaning was easy for me to understand, even though I was not in the field of Sports Science. I expect, I would not understand much of the presentations in each of the sessions. Even though I like the words "Evidence-Based!" which has been my mission in my field. "The approach based on the evidence of solid research" is the key to resolve the problems of real life. I hope this conference can provide meaningful messages to all the participants and that all you have good experiences and enjoy this conference.

As the dean of College of Sciences in Education, I am proud of this academic event carefully prepared by the faculty members and graduate students of the Department of Physical Education and of Sports Leisure. The faculties and graduate students in sports science at Yonsei made grate achievement in the past several years. This is one of the product. I am happy to meet you in this Grand Ballroom, which is located at the center of the campus. Lastly I sincerely thank you for honoring our invitation in spite of your very busy and tight schedule. Thank you very much, and hope you have good memories of Korea and Yonsei university when you get back to your home.

Professor, Department of Education
Dean, College of Sciences in Education
Sang-Jin Kang, Ph.D



FRICSS

Frontier Research Institute of
Convergence Sports Science

2016 International Symposium

Evidence – Based Exercise Medicine for the Promotion of Lifelong Health

Friday, May 20th, 2016, 13:00~18:00

Grand Ballroom, Baekyangnuri, Yonsei University, Seoul, Korea

Keynote Speakers



"Risk factors, prevention and treatment of knee osteoarthritis"

Prof. Walter Herzog
Faculty of Kinesiology
University of Calgary, Canada



"History of the lactate shuttle with implications for clinical practice"

Prof. George A. Brooks
Department of Integrative Biology
University of California, Berkeley, USA

Speakers



"Post-traumatic knee osteoarthritis: the inconvenient consequence of injury"

Prof. Brian Pietrosimone
Department of Exercise and Sports Science
University of North Carolina, USA



"Obesity and physical activity in youth: Does the type of exercise matter for health?"

Prof. SoJung Lee
Department of Pediatrics
Children's Hospital
University of Pittsburgh, USA



"Evidence-based exercise medicine for diabetes and cancer patients: How good is exercise?"

Prof. Justin Y. Jeon
Department of Sport and Leisure Studies
Exercise Medicine Center for Diabetes and Cancer Patients, ICONS
Yonsei University, Korea



"Intervention strategies for the prevention of post traumatic knee osteoarthritis"

Prof. Sae Yong Lee
Department of Physical Education
Yonsei Institute of Sports Science and Exercise Medicine, YISSEM
Yonsei University, Korea

Program and Registration: <http://fricss.weebly.com>

Frontier Research Institute of Convergence Sports Science, Tel: 82-2-2123-4759, Email: fricss@yonsei.ac.kr

Presented by



Department of Physical Education
Department of Sport and Leisure Studies



FRICSS
Frontier Research Institute of
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YISSEM
Yonsei Institute of
Sports Science and Exercise Medicine

Program Agenda

Time	Program	Speakers
13:00~13:30	Poster Session & Registration	
13:30~13:50	Welcoming Address	
13:50~14:40	Project Introduction	Prof. Hae Dong Lee Yonsei University
	Evidence-based exercise medicine for diabetes and cancer patients: How good is exercise?	Prof. Justin Y. Jeon Yonsei University
	Intervention strategies for the prevention of post traumatic knee osteoarthritis	Prof. Sae Yong Lee Yonsei University
14:40~14:50	Coffee Break	
Session I	Evidence-based exercise medicine from the perspective of musculoskeletal health	Moderators Prof. Hae Dong Lee, Prof. Sae Yong Lee Yonsei University
14:50~15:40	Risk factors, prevention and treatment of knee osteoarthritis	Prof. Walter Herzog University of Calgary
15:40~16:10	Post-traumatic knee osteoarthritis: the inconvenient consequence of injury	Prof. Brian Pietrosimone University of North Carolina
16:10~16:20	Q & A	
16:20~16:30	Coffee Break	
Session II	Evidence-based exercise medicine from the perspective of metabolic health	Moderators Prof. Justin Y. Jeon, Prof. Sang-Hoon Suh Yonsei University
16:30~17:20	History of the lactate shuttle with implications for clinical practice	Prof. George A. Brooks University of California, Berkeley
17:20~17:50	Obesity and physical activity in youth: Does the type of exercise matter for health?	Prof. SoJung Lee University of Pittsburgh
17:50~18:00	Q & A	



FRICSS

Frontier Research Institute of
Convergence Sports Science

Project Introduction

Prof. Hae Dong Lee
Yonsei University

Evidence-based exercise medicine for diabetes and cancer patients: How good is exercise?

Prof. Justin Y. Jeon
Yonsei University

Intervention strategies for the prevention of post traumatic knee osteoarthritis

Prof. Sae Yong Lee
Yonsei University



Current Affiliation

Yonsei University
Associate Professor, Department of Physical Education

Education

- 1999-2002 University of Calgary, Graduated with PhD in Kinesiology (Biomechanics)
- 1997-1999 University of Calgary, Graduated with MSc in Kinesiology (Biomechanics)
- 1993-1995 Yonsei University, Graduated with MSc in Sports Science (Sports Biomechanics)
- 1988-1993 Yonsei University, Graduated with BSc in Physical Education

Career highlights

- 2015-2018 Principle Investigator, "Evidence-based Exercise Medicine for Lifelong Health", funded by the National Research Foundation
- 2014-2018 Director, Frontier Research Institute of Convergence Sports Science, Yonsei University
- 2007-2009 Director, Sports-Care Techno-Design Research Center, ICONS, Yonsei University
- 2015-2017 Associate Editor, Korean Society of Sports Biomechanics
- 2011-2013 Member, Executive Council, International Society of Biomechanics
- 2006-2010 Research Professor, BK21 Mechatronics Research Group, Chungnam National University
- 2003-2005 Postdoctoral Research Fellow, Radiological Sciences, UCLA

Biography

Hae Dong's research is focused on the biomechanics of the neuromuscular system. Expertise is in the area of adaptation of skeletal muscle-tendon complex to altered loading environment, aging, rehabilitation from injuries, exercise and training. Within this area, work is carried out experimentally and theoretically at in vivo levels. In addition, he has been collaborating with researchers from various areas, such as biomedical, electrical, and cloth & textile engineering, and orthopedics and rehabilitation medicine, for convergent sports science researches.

Risk Factors, Prevention and Treatment of Knee Osteoarthritis

Summary of the Project

As many other countries, we, Koreans, faces serious social and economic burden, which results from an unprecedented increase in aging population in history. As one of ways to resolve this pending issue, the institution is given to a task by the National Research Foundation (NRF) to promote “Evidence-based Exercise Medicine” as a prevention and treatment option for fatal and chronic diseases.

In order to achieve this object, the institution organized a convergent research team from sports & exercise sciences and medical and health sciences. After setting forth a vision that “healthier life for happier life”, the institution have been focusing on collecting and accumulating the evidence for supporting the statement that *“if exercise could be packed in a pill, it would be the single most widely prescribed and beneficial medicine”* by Robert N. Butler (Director, the National Institute on Aging (NIA)).

Specifically, the institution will focus on providing “evidence-based exercise medicine” for the top three life-threatening fatal diseases (cancer, hypertension, and diabetes) and the two most common chronic musculoskeletal diseases (osteoarthritis and low back pain).

Expected Contributions

- The institution's efforts will live up to the visions and strategies, “Creative Economy and Peoples Happiness through Science, Technology and ICT” set forth by the current Government.
- Throughout the convergent researches, our efforts will raise the importance of multidisciplinary collaborative researches and create future research collaboration environment. Based on it, the institution is expecting to play important roles as a leading international research institution.
- The outcomes of this project are expected to contribute to create new paradigms in future physical education.
- This effort is expected to influence the formation of new policies and the creation of future sociocultural paradigm.



Current Affiliation

Yonsei University

Professor, Department of Sport and Leisure Studies

Professor, Cancer Prevention Center, Yonsei Cancer Center, Yonsei University College of Medicine Head, Exercise Medicine Center for Patients with Diabetes and Cancer (ICONS)

Education

1989-1995 B.A., Yonsei University, Department of Physical Education & Recreation

1995-1998 M.S., University of Alberta, Department of Physical Education & Recreation

1999-2003 Ph.D., University of Alberta, Department of Physical Education & Recreation

Biography

Justin has various research experiences on exercise and health from molecular biology, animal science, physiology, endocrinology, clinical and epidemiology studies in three different countries including South Korea, Canada and United States. Justin has either led or been integrally involved with 12 completed trials investigated the effects of exercise on various diseases among people with and without disabilities (Spinal cord injured, Children with Epilepsy, Obese children, Obese adolescents, Obese adults, Type 2 diabetic and Cancer patients) and currently the PI or co-investigator on four ongoing trials investigating the role of exercise in cancer population including colorectal and breast cancer patients.

Justin Jeon has also led several epidemiological studies which investigated the effects of fatness and fitness on metabolic diseases among adolescents and adults. Korean Physical Activity and Health Study was a three year study which followed male high school students' (about 400 students) physical activity levels, fitness, fatness, metabolic parameters and intima media thickness (IMT). Another epidemiological study was performed (Study 1 with 15000 participants, and study 2 with 60000 participants) which investigated the effects of high school fitness and fatness levels on obesity and metabolic syndrome risk factors during adulthood (22 year follow up).

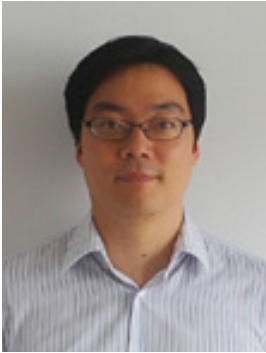
Evidence-based exercise medicine for diabetes and cancer patients, How good is exercise?

The beneficial effect of exercise on diabetes cancer patients has previously been reported. However, what does it really mean to be beneficial for diabetes and cancer patients? Is exercise beneficial for the prevention of disease or beneficial in improving the prognosis of disease? Does exercise improve disease-related and non-disease related symptom management and eventually improve the quality of life of patients? The meta-analysis studies consistently reported that the higher level of physical activity participation is associated with reduced risk of various disease, including diabetes and cancer patients. Furthermore, the higher level of physical activity participation is also associated with significant reduction in diabetic complication, cancer recurrence and the risk of mortality in various cancer. In other word, more physically active patients have better prognosis of diseases.

How does exercise participation would influence diabetes and cancer prognosis? The mechanism on how exercise participation would prevent diabetes, cancer and improve prognosis includes exercise-induced change in insulin sensitivity, circulating insulin, growth factors, adipocytokines, immune function, and more recent epinephrine and interleukine-6 dependent NK cell mobilization. In this presentation, the mechanism on exercise associated improvement on factors associated with diabetes and cancer will be discussed.

Most diabetes and cancer patients suffer from treatment-related side effects as well as non-treatment related musculoskeletal disorders. These conditions include urinary and bowel incontinence, peripheral neuropathy, low level of physical fitness, reduced range of motion due to surgery, and joint problems. Our surveys at the Yonsei Cancer Prevention Center showed that up to 80 percent of our cancer survivors complain about joint problems, especially on the knee, lower back, shoulder, and neck. Furthermore, diabetes patients would benefit from exercise associated reduction on cardiovascular disease risk, most prevalent cause of mortality among diabetic patients. Therefore, we can speculate that patients with diabetes and cancer could benefit from exercise participation for not only to manage their disease but also to improve secondary complications as well as their quality of life.

Since 2010, our laboratory have developed 10 steps to develop evidence-based exercise program for patients with different diseases. Until now, we have developed exercise programs for diabetic patients, breast cancer patients, colorectal cancer patients, stomach cancer patients, patients with kidney dysfunction, hypertensive patients, patients with Parkinson's disease, people with spinal cord injury and children with epilepsy. In this presentation, process of evidence-based exercise of diabetes and cancer patients will be discussed.



Current Affiliation

Yonsei University
Assistant Professor, Department of Physical Education,
Director, Yonsei Institute of Sports Science and Exercise Medicine

Education

2006-2009 Ph.D., Sports Medicine, Department of Kinesiology, University of Virginia
2003-2005 M.S., Athletic Training CAAHEP Accredited Entry-Level Graduate Program
Department of Exercise and Sport Science, University of North Carolina
1999-2002 Ph.D., Sports Biomechanics, Department of Kinesiology, Yonsei University
1996-1998 M.S., Sports Biomechanics, Department of Kinesiology, Yonsei University
1990-1996 B.A., Department of Physical Education, Yonsei University

Career Highlights

2014-Present Department chair, Department of Physical Education, Yonsei University
2012-Present Assistant Professor, Department of Physical Education, Yonsei University
2009-2012 Assistant Professor, Department of Kinesiology and Sport Sciences, the University of Miami
2010-Present Founding lab director, Sports Medicine and Motion Analysis Laboratory

Biography

Sae-Yong's research as an athletic trainer has been focusing on recovery from damage of sport players to exhibit their maximal performance, however, the subjects are not limited only within sport players but normal persons. Specifically, work is carried out for the effect of preceded knee damages (especially, anterior cruciate ligament injury) on knee osteoarthritis (OA) by analyzing big data from the National Health Insurance Service (NHIS) and develop prognostic technique utilizing epidemiological data extracted from the NHIS and biomechanical characteristics of OA patients. Another multidisciplinary way of analysis is also about to be done by comparison between the physiological characteristics of OA patients and that of normal persons to extract the risk factors affecting pathogenesis of OA.

Intervention Strategies for the Prevention of Post Traumatic Knee Osteoarthritis

There is a growing number of post-traumatic osteoarthritis, which is an early development of knee joint degeneration after traumatic injuries such as ACL rupture and/or meniscus tear. In 2015, the National Health Insurance System in South Korea reported that there are more than 2.5 million in/out patients visiting the hospital for the treatment of knee osteoarthritis (KOA) that spend more than 1 billion dollars per year nationally. It is 5th leading cause of disease in Korea. Interestingly, it has been noted that there is a growing number of people in the younger and athletic population that develop KOA. Anecdotally, previous history of acute injuries may be a cause of hastened knee joint degeneration. The signs and symptoms of patients with KOA following acute knee injury emerge within 15 years without prognostic sign and symptom. Researchers and clinicians are trying to seek more efficient ways to detect KOA following acute knee injury earlier and develop prevention strategies. However, plenty of unknown gray areas in terms of the risk of post traumatic KOA and effective treatment strategies still exist: 1) We still need to know what type of previous acute injury is predisposed to KOA, since previously reported studies analyzed contain a relatively small sample size; 2) The risk factors of post traumatic KOA has not been thoroughly investigated; 3) There is an insufficient evidence of various treatment options.

In 1992, van Mechelen published a conceptual model called the “sequence of prevention model”. In addition to this model, our lab developed a five step model, with the addition of evidence based on sports medicine along with the identification of the epidemiological aspect of injury prevention. This model is a thorough model that includes the following five steps: 1) Meta-analysis/systematic review of risk factors and intervention program of post traumatic KOA; 2) risk factor and mechanism study using biomechanical big data collected by Yonsei institute of Sports Science and Exercise Medicine (YISSEM); 3) epidemiological study using big 15-years half million per year patient’s cohort data; 4) development of intervention program based on previous three steps; 5) assessment of effectiveness of intervention program.

We will be discussing each of a five stages of on-going studies to prevent post traumatic KOA. We hope that the new sequential model may provide more sound scientific evidence to provide better prevention strategies for post traumatic KOA.



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Evidence-based exercise medicine from
the perspective of musculoskeletal health

Moderators

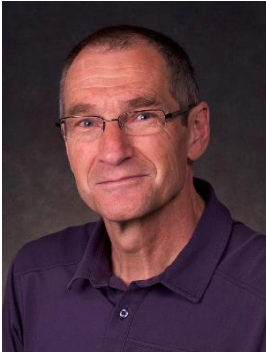
Prof. Hae Dong Lee, Prof. Sae Yong Lee
Yonsei University

Risk factors, prevention and
treatment of knee osteoarthritis

Prof. Walter Herzog
University of Calgary

Post-traumatic knee osteoarthritis:
the inconvenient consequence of injury

Prof. Brian Pietrosimone
University of North Carolina



Current Affiliation

University of Calgary
Professor, Faculty of Kinesiology, Engineering, and Medicine
Director, Human Performance Laboratory

Education

1979-1985 University of Iowa, Iowa City Graduated with PhD degree in Biomechanics
1977-1978 Federal Technical Institute Zurich Graduated with Diploma II in Physical Education
(Biomechanics)
1974-1977 Federal Technical Institute Zurich Graduated with Diploma I in Physical Education

Career Highlights

2007-2009 President-International Society of Biomechanics
2006 Winner, ASB Borelli Award, Premier Research Award of the American Society of Biomechanics
2003-2004 President, American Society of Biomechanics
2001 Canada Research Chair in Cellular and Molecular Biomechanics, Tier I
1995-1997 President, Canadian Society for Biomechanics

Biography

Walter's research is focused on the neuro-biomechanics of the musculoskeletal system. Expertise is in the area of growth, healing, and adaptation of soft (ligament, tendon, muscle, and articular cartilage) and hard (bone) tissues. Within this area, work is carried out experimentally and theoretically at molecular/cellular, in vitro, in situ and in vivo levels. It also includes cell manipulation and mechanical testing, and finite element modeling, continuum mechanics, simulations and theories of growth and adaptation.

Risk Factors, Prevention and Treatment of Knee Osteoarthritis

Background: According to the World Health Organization, approximately 10% of all men and 20% of all women past the age of 60 years have symptomatic osteoarthritis (OA) [1]. In Canada, there are approximately 4.6 mill OA sufferers and this number is expected to increase to about 10 mill by 2040, leaving one in four Canadians suffering from OA [1]. Our research over the past 20 years has been focused on animal models of post-traumatic OA (anterior cruciate ligament, ACL, transection in the knee, meniscectomy), the effects of muscle weakness on knee OA, and the effects of diet-induced obesity and associated metabolic disease on knee OA.

Specifically, I will be talking about the progression and long-term effects of ACL transection in a cat model, the determination of muscle weakness as a potential risk factor for knee OA in the rabbit, and obesity as an independent risk factor for knee OA independent of the increased loading of joints caused by the additional weight in obese subjects.

In the ACL transected cat, we found that ground reaction forces, muscular forces and muscle activation patterns were affected by ACL transection for 3-6 months [2], but after 6 months, the mechanics of cat locomotion and behaviour went back to normal [3]. Nevertheless, the disease progressed indicating that restoring normal joint loading does not necessarily stop or reverse OA disease in a post-traumatic scenario [3]. We identified that the loading across the knee was dramatically changed in as little as four weeks post ACL transection, thus changing the knee internal loading while the apparent external loading remained the same [4]

In the rabbit, we investigated the effects of muscle (quadriceps) weakness and instability on the onset and progression of knee OA. We determined that muscle weakness, induced by controlled botulinum toxin type-A injections into the quadriceps muscles, was an independent risk factor for knee OA [5, 6], but did not accelerate the rate of OA progression in a post-traumatic model of knee OA [5, 6]. However, this latter result may possibly be explained by the lack of sufficiently early time points, and the OA observed in our ACL transection model and our model of ACL transection with muscle weakness may have converged to an end stage condition that was reached with a different time trajectory.

In our rat model of diet (high fat, high sucrose) induced obesity, we established that diet-induced obesity and associated metabolic disease was an independent risk factor for knee OA, and also accelerated knee OA in a post-traumatic model (ACL transection) of OA [7]. However, in the diet-induced obesity subjects, we identified two sub-types, subjects that had a high body fat percentage and high weight and subjects with a normal weight but still a high body fat percentage. Interestingly, the subjects with the high body fat, independent of their weight, had a similar progression of knee OA that was significantly different from animals receiving a normal diet, resulting in normal body weight and fat percentage [8]. These results suggest that it is the body fat percentage, and not the body weight that is crucial for the induction of knee OA in these subjects, thereby contradicting the long-held believe that obese individuals were more prone to OA because of their body weight. It appears however, that the low level inflammation in obese subjects, characteristic of metabolic disease, presents a far greater risk than the increased body weight associated with obesity.



Current Affiliation

University of North Carolina
Assistant Professor, Department of Exercise and Sports

Education

2006-2009 Doctor of Philosophy, Athletic Training (Sports Medicine), University of Virginia
2005-2006 Master of Education, Athletic Training (Sports Medicine), University of Virginia
2002-2005 Bachelor of Science, Athletic Training, Springfield College

Career Highlights

2013-Present Assistant Professor, Co- director of neuromuscular Research Laboratory at the University of North Carolina at Chapel Hill
2009-2013 Assistant Professor, Director of Joint Injury and Muscle Activation Laboratory at the University of Toledo
2008-2009 Study Coordinator for NIH R21 (NCT00601341) Clinical Trial
2007-2008 Research Assistant, Exercise and Sport Injury Laboratory

Biography

Brian's research seeks to decrease disability related to knee injury with a focus on maximizing long-term joint health following traumatic joint injury. Dr. Pietrosimone has authored or co-authored over 80 peer-reviewed publications and over 150 scientific abstracts presented at national and international scientific meetings. His previous and current research has evaluated the neuromuscular, biomechanical and biochemical mechanisms related to disability following lower extremity joint injury. He has also sought to develop intervention strategies to treat neuromuscular impairments and improve clinical outcomes. The National Athletic Trainers' Association Research and Education Foundation, National Institute of Arthritis, Musculoskeletal and Skin Disease Research, and the Army Medical Department currently fund his research. He was also fortunate to receive the Freddie Fu New Investigator Award from the National Athletic Trainers' Association Research and Education Foundation in 2015.

Post-traumatic Knee Osteoarthritis: The Inconvenient Consequence of Injury

Knee osteoarthritis is the 11th leading cause of global disability. Post-traumatic osteoarthritis (PTOA), or accelerated joint degeneration following acute injury, is common in young and otherwise healthy people who sustain a lower extremity joint injury. The pathophysiology that leads to PTOA likely begins soon after injury and progresses often unnoticed by many clinicians. Patients with osteoarthritis exhibit clinical symptoms of joint degeneration in the first two decades following traumatic injury. Unfortunately, by the time patients seek medical care the extent of structural joint damage limits treatment options and leads to long-term disability. People with PTOA develop arthritic joints early in life; therefore, individuals with PTOA are often forced to live many years with disability and demonstrate worse outcomes following joint replacement than people with idiopathic forms of osteoarthritis. Many clinicians underestimate the prevalence of early onset PTOA following joint injury and may not understand the degree of disability that ensues in those who develop PTOA. Furthermore, clinicians report that the major constraints to treating PTOA are that: 1) it is difficult to identify which patients will develop PTOA following joint injury, and 2) they are unsure of the best current treatments to limit the development of PTOA. Therefore, this presentation will describe the evidence surrounding the prevalence of PTOA following common lower extremity injuries, such as anterior cruciate ligament rupture. We will briefly explore how multiple factors, such as alterations in joint metabolism and lower extremity biomechanics, lead to the development of PTOA. Finally, we will discuss some emerging methods for identifying patients at risk of PTOA and evidence for early treatments that may decrease disability and limit the progression to PTOA following joint injury.



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**Evidence-based exercise medicine from
the perspective of metabolic health**

Moderators

Prof. Justin Y. Jeon, Prof. Sang-Hoon Suh
Yonsei University

**History of the lactate shuttle with implications for
clinical practice**

Prof. George A. Brooks
University of California, Berkeley

**Obesity and physical activity in youth:
Does the type of exercise matter for health?**

Prof. SoJung Lee
University of Pittsburgh



Current Affiliation

University of California, Berkeley
Professor, Department of Integrative Biology

Education

- 1966 B.S., Queens College, CUNY
- 1968 M.S., University of Michigan
- 1970 Ph.D., University of Michigan
- 2013 Docteur Honoris Causa, de l'Université Montpellier 1

Fields of interest

Acute and Chronic Metabolic Adaptations to Exercise, Lactate Metabolism During Exercise and Recovery, "Oxygen Debt", Metabolic Regulation, Energy Substrate Partitioning, Glucose and Glycogen Metabolism, Lipid Metabolism, Amino Acid Metabolism, Mitochondrial Biogenesis, Exercise Energetics, Tracer Methodology, Adaptation to High Altitude, Evaluation of Human Performance.

Lecture outline

Decades of research in the area of metabolic adjustments to exercise led to articulation of two working hypotheses: the "Lactate Shuttle," and the "Crossover Concept." Research on the Lactate Shuttle was to elucidate the pathways and controls of lactate formation and removal before, during and after exercise. That work involved studies on humans and animals, indirect calorimetry, isotope tracer technology, classic arterial-venous difference measurements, and muscle biopsies. As well, we sought to determine the factors that determine the expression of lactate transport proteins and their cellular domains. In recent years, generality of the Lactate Shuttle mechanism has impacted diverse fields such as neuro- and cancer cell biology. Most recently, from our collaboration with colleagues in Neurosurgery at UCLA we have made important discoveries on the fueling of body and brain following Traumatic Brain Injury (TBI). Hence, from a basic understanding of energy substrate utilization during physical activity we are now in position to improve standard of care, increase survival, and improve outcomes for people suffering brain and other forms of trauma. By virtue of significant research collaborations with other laboratories in the University of California and elsewhere, students, post-doctoral fellows, research staff, and visiting scientists the opportunity to work in important and exciting areas of science all with goal of improving the human condition.

HISTORY of the lactate shuttle with implications for clinical practice

For almost a century lactate has been regarded as a dead-end metabolite, a fatigue agent and the product of oxygen-limited (anaerobic) metabolism. As the 1970's approached, sophisticated biochemical analyses and isotope tracer technology were introduced into studies of physiology and metabolism and new thinking affected articulation of the Lactate Shuttle (LS) hypothesis (Brooks 1984, Brooks 2009). Radiotracer studies on exercising rats showed lactate production and oxidation to significantly exceed glucose disposal owing to the role of muscle glycogen. Studies with stable isotope tracers on resting and exercising humans confirmed results on rats and other mammals. The major effect of training was to improve lactate clearance via oxidation, although lactate was the main gluconeogenic precursor (Bergman, Wolfel et al. 1999, Messonnier, Emhoff et al. 2013). Western blotting, immunoprecipitation and confocal, laser-scanning microscopy showed the presence of lactate transporters (MCTs) in plasma and mitochondrial membranes (Hashimoto, Hussien et al. 2007). Measurements metabolite exchange across working muscles (Bergman, Wolfel et al. 1999) and brains (Brooks and Martin 2014) showed simultaneous uptake and production of lactate, but not glucose. Lactate fluxes down concentration and pH gradients owing to presence of a mitochondrial lactate oxidation complex (mLOC). Realization that lactate was a major metabolic fuel and gluconeogenic precursor led to lactate polymers being included in sports drinks and strata for the incubation of stem cells. LS theory has been incorporated into cancer research where disrupting cell proliferation and tumor growth by blocking MCTs is being evaluated. And, in the field of neurobiology and critical care medicine we are exploring the use of lactate formulations to provide direct (oxidative) and indirect (gluconeogenic) support to traumatic brain injury (TBI) patients (Brooks and Martin 2014). In the field of cancer research, investigators are exploring ways to kill cancer cells by blocking lactate transport proteins. And in the field of critical care medicine, investigators are using lactate formulations for acute treatment of hepatitis, sepsis and dengue fever in children. Although controversial at its inception the LS concept has survived intellectual and experimental scrutiny. Understanding the LS is key to understanding metabolic regulation in health, after trauma and in disease.



Current Affiliation

University of Pittsburgh

Associate Professor of Pediatrics, Childhood Obesity, Exercise Physiology, Metabolism

Education

2005-2007 Queen's University, Obesity, Exercise Physiology, Cardiometabolic Risk

2001-2005 University of Manitoba, Exercise Physiology

1996-2001 Ewha Womans University, Physical Education and Leisure

Career Highlights

2007-Present Assistant Professor of Pediatrics, Children's Hospital of Pittsburgh. University of Pittsburgh

2005-2007 Post-Doctoral Research Associate, Children's Hospital of Pittsburgh. University of Pittsburgh

Biography

I have a long-standing interest in examining the role of physical activity on reducing obesity and related co-morbidities in children and adolescents. My research interest in obesity began during my doctoral training at Queen's University in Canada. During my PhD training, I was actively involved in clinical trials examining the influence of exercise-based lifestyle intervention on cardiorespiratory fitness, abdominal obesity and insulin resistance in adults with and without type 2 diabetes mellitus (T2DM). Understanding the close relationship between childhood and adulthood obesity, I joined the Division of Weight Management and Wellness at Children's Hospital of Pittsburgh of University of Pittsburgh Medical Center in 2005 to pursue training in childhood obesity. Over the past years, my research has been supported by the National Institute of Diabetes and Digestive and Kidney Disease (R21) and the American Diabetes Association Junior Faculty Award to examine the independent effects of exercise on abdominal obesity, non-alcoholic fatty liver and insulin resistance in obese adolescent boys and girls. Currently, my research is supported by the National Heart, Lung and Blood Institute (1R01HL114857, total amount: \$5.3 million) to examine the effects of long-term aerobic exercise, resistance exercise and a combination of both exercises on risk factors for T2DM in overweight and obese adolescents. Leading a multidisciplinary team of pediatric endocrinologists, cardiologists, dietitians, epidemiologists, biostatisticians, nurses and physicists, I have the expertise and leadership to successfully conduct the proposed research programs.

Obesity and Physical activity in youth: Dose the type of exercise matter for health?

Despite considerable efforts to reverse the childhood obesity epidemic, more than one-third of U.S. adolescents (12-19 yrs) are still considered either overweight or obese. The current rate of childhood obesity is a major public health concern since overweight and obese youth suffer from cardiovascular disease (CVD), dyslipidemia, hypertension, metabolic syndrome and type 2 diabetes mellitus (T2DM); conditions once seen only in adults. Given that childhood obesity is a strong predictor of adulthood morbidity and mortality, effective intervention strategies are needed to reverse obesity-related health risks in youth.

Although the causes of childhood obesity are not fully understood, physical inactivity is a major factor. Adult studies have shown that regular exercise (approximately >150 minutes per week) is associated with significant reductions in obesity, in particular abdominal obesity, and risk factors for T2DM. In this presentation, we will discuss the effects of regular exercise alone (e.g, without calorie restriction) on total and regional body fat distribution, skeletal muscle mass and risk factors for T2D and CVD in previously sedentary, obese youth. We will also discuss the effects of different exercise modalities on reducing adiposity and obesity-related co-morbid conditions to explore the potential mechanisms by which regular exercise provides health benefits in obese youth.

Organizing Committee

Hae Dong Lee (Chair), Dept. of Physical Education, Yonsei University
Justin Y. Jeon (Co-chair), Dept. of Sport & Leisure Studies, Yonsei University
Sae Yong Lee (Co-chair), Dept. of Physical Education, Yonsei University
Dong Won Yook, Dept. of Physical Education, Yonsei University
Han Joo Lee, Dept. of Physical Education, Yonsei University
Sang-Hoon Suh, Dept. of Physical Education, Yonsei University
Young Shin Won, Dept of Sport & Leisure Studies, Yonsei University
Cheol Won Lee, Dept. of Sport & Leisure Studies, Yonsei University
Do Yeon Won, Dept. of Sport & Leisure Studies, Yonsei University
Sun Ha Ji, Graduate School of Public Health, Yonsei University
Doo Sup Kim, Dept. of Orthopedic Surgery (Wonju), Yonsei University
Se Ho Park, Dept. of Surgery, Yonsei University
Eun Seok Kang, Dept. of Endocrinology and Metabolism, Yonsei University
Hyunseok Jee, FRICSS, Yonsei University
Ji Hye Park, FRICSS, Yonsei University