

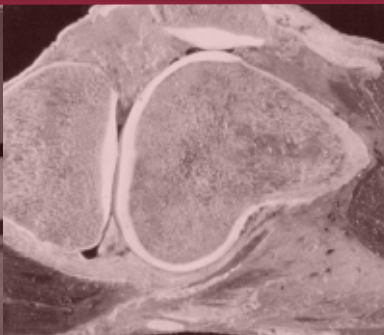


2010 Annual Report



Roger Jackson Centre for Health and Wellness Research

Roger Jackson Centre
for Health and Wellness Research



Human Performance Laboratory



Sport Medicine Centre

Knowledge translation, or KT for short, has become the new buzz word of academic science. Universities push it, granting agencies like to see it, and governments insist on it. The vast knowledge created every day in academic centres, like the University of Calgary, needs to be made available to other scientists, commercial enterprises, patients, "end users", the public. Seminars on KT have exploded, definitions of KT change on a daily basis, and the philosophical implications of toying with KT are hotly debated among academics.

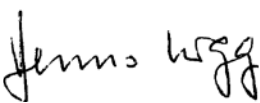
A simple definition of KT for academia may be to make your research findings available, disseminate them widely, and apply them for use in practical settings. Without being fully aware of it, we have been practicing KT in our research centre before it became a buzz word and the property of granting agency and governments. Since the founding of the Human Performance Laboratory in 1981, commercial partnerships, experiential learning, development of athletic apparel with the purpose of injury reduction and performance enhancement, the training of Olympic athletes, and direct involvement of patient populations in our research have been the norm rather than the exception.

In 2010, we opened a new centre for cancer survivors exposing them to the benefits of Yoga exercising in groups, we started an "osteoarthritis clinic" in conjunction with a team grant from the Alberta Heritage Foundation for Medical Research, we organized an open house attended by over 450 high school students and an even greater number of people from around the city of Calgary, and we accepted approximately 20 students from abroad for experiential learning experiences in our centre through exchange programs with partners from around the globe. We are proud to be a centre where KT is not adopted based on pressures from the outside, but where KT is a natural outcome of what we do and who we are.

However, we are not perfect by any means. There are many opportunities to improve on what we do in terms of KT. Two examples come to mind: our involvement with athletes and our research with patients. Systematically combining and integrating our expertise in the physiology of exercise, movement control, sport psychology, sport medicine, rehabilitation science, nutrition and biomechanics, we have untapped potential to continue our research while simultaneously making substantial contributions to athlete and patient populations. Through thoughtful development our centre is uniquely positioned to be a model of academically meaningful KT.

Our successes would not be possible without the generous support through the da Vinci Foundation (Don Taylor), the Sport Medicine Foundation (the Simpson family), support from the University of Calgary and the Faculty of Kinesiology, government and private sponsors, and all of you who quietly share your knowledge, insight and ideas. Thank you!

Calgary, Winter 2011



Benno M. Nigg
Co-Director



Walter Herzog
Co-Director



Cy Frank
Co-Director



Highlights

- Honor Xu Dai – Teaching Assistant Excellence Award, Schulich School of Engineering, University of Calgary.
- Honor Savatore Federico – Mechanical Engineering 2010 Early Research Excellence Award.
- Honor Walter Herzog – Plenary Lecture at the World Congress of Biomechanics, Singapore (August 1-6, 2010).
- Honor Walter Herzog – President’s Lecture at the American College of Sport Medicine, Baltimore, MD, USA (June 2-5, 2010).
- Honor Sarah Manske – PhD student, Young Investigator Award at CSB 2010.
- Honor Darren Stefanyshyn – James G. Hay Memorial Award, American Society of Biomechanics.
- Honor Preston Wiley – President of the Canadian Academy of Sport and Exercise Medicine.
- Honor Preston Wiley – Lance Richard Lecture, Canadian Academy of Sport and Exercise Medicine Annual Scientific Meeting, Toronto.
- Appointed Brian MacIntosh – Executive Director, Canadian Society for Exercise Physiology.
- Award Carolyn Emery – Professorship in Paediatric Rehabilitation (2009 – 2014).
- Award Carolyn Emery – Alberta Heritage Foundation for Medical Research Population Health Investigator Award renewal (4 year salary support-additional year renewal in 2010).
- Award Eveline Graf – RJC Student Award.
- Award Walter Herzog – Paper of highest public interest award from the Journal "Sportorthopaedie and Sporttraumatologie".
- Award Nick Mohtadi – Research (Clinical) Award for Clinical, Adjunct and Research, Faculty of Medicine, University of Calgary, April 2010.
- Award Jenelle McAllister – RJC Staff Award.
- Award Kyle Nishiyama – PhD student, Vanier Canada Graduate Scholarships, CIHR.
- Award Raylene Reimer – BMO Financial Group Co-Chair in Healthy Living in conjunction with the Alberta Children’s Hospital Research Institute and the Alberta Children’s Hospital Foundation. (2010–2015).
- Award Vinzenz von Tscharnner – RJC Faculty Award.
- Ph.D. Brian Benson – Supervisor: Dr. Willem Meeuwisse, PhD candidacy: Concussion Prevention in Ice Hockey.



Highlights

- Ph.D. Helen Buie – Supervisor: Dr. Steven Boyd, Thesis: Analysis techniques and bone developmental patterns in normal and swim-trained mice using micro-computed tomography.
- Ph.D. Graeme Campbell – Supervisor: Dr. Steven Boyd, Thesis: An assessment of the potential for recovery of bone quality after osteoporotic bone loss.
- Ph.D. Julia Devonish – Supervisor Dr. Nicole Culos-Reed, Thesis: Physical Activity for Lung Cancer.
- Ph.D. Tiffany Edgecombe – Supervisor: Dr. Darren Stefanyshyn, Thesis: The Effects of Ramp Angle in Alpine Ski Boots on On-Hill Turning Kinetics and Postural Control.
- Ph.D. Lindsay Eller – Supervisor: Dr. Raylene Reimer, Thesis: The Role of Dairy Protein and Dietary Calcium in Weight Regulation and Glucose Homeostasis.
- Ph.D. Eskofier, Björn – Supervisor: Dr. Benno Nigg, Thesis: Application of pattern recognition methods in biomechanics.
- Ph.D. Erika Kristensen – Supervisor: Dr. Steven Boyd, Thesis: The role of growth hormone in the development of bone microarchitecture, craniofacial shape and bone strength.
- Ph.D. Tim Leonard – Supervisor: Dr. Walter Herzog, Thesis: Force production in lengthened myofibrils and single sarcomeres.
- Ph.D. Chris MacKay – Supervisor: Dr. Ronald Zernicke, Thesis: Adaptive Responses of Bone to Mechanical Loading.
- Ph.D. Sarah Manske – Co-Supervisors: Dr. Ronald Zernicke and Dr. Steven Boyd, Thesis: Muscle Disuse and Vibration Effects on Bone.
- Ph.D. Stephen Martell – Supervisor: Dr. Joan Vickers, Thesis: The Optimal Quiet Eye Period and the The Regulation of Visual Information In Complex Aiming.
- Ph.D. Melissa Thomas – Supervisor: Dr. Russ Hepple, Thesis: Changes in Muscle Calcium Handling, Oxidative Stress and Contractile Function with Aging and Longterm Exercise Training in Senescent Rats.
- Ph.D. Hongfa Wu – Supervisor: Dr. Janet Ronsky, Thesis: Predicting progression of scoliosis with neural networks and surface modeling.
- Ph.D. Aliaa Youssef – Supervisor: Dr. Walter Herzog, Thesis: The development of botulinum type-A toxin induced-muscle weakness model of osteoarthritis.



Highlights

- M.Sc. Graeme Challis – Supervisor: Dr. David Smith, Thesis: The effect of acute heat exposure and handcooling on power output during ballistic strength training.
- M.Sc. Elysia Davis – Supervisor: Dr. Benno Nigg, Thesis: Reliability and sensitivity of basketball tests.
- M.Sc. Andrew Marsh – Co-Supervisor: Preston Wiley, Thesis: The Efficacy of Hip Strengthening Exercises Compared to Leg Strengthening Exercises on Knee Pain, Function and Quality of Life in Patients with Knee Osteoarthritis.
- M.Sc. Meaghan Nolan – Supervisor: Dr. Tish Doyle-Baker, Thesis: Development and Validation of the Apple iPhone/iPod as a Physical Activity Monitor.
- M.Sc. Sean Osis – Supervisor: Dr. Darren Stefanyshyn, Thesis: Upper Extremity Proprioception in the Golf Swing.
- M.Sc. Stephanie Paulson – Supervisor: Jamie Johnston, Thesis: The influence of body-part preprogramming on visual search strategy.
- M.Sc. Kim Pyra – Supervisor: Dr. Raylene Reimer, Thesis: Prebiotic Fibre Supplementation in Combination with Metformin Modifies Appetite, Energy Metabolism, and Gut Satiety Hormones in Obese Rats.
- M.Sc. Danielle Reid – Supervisor: Dr. Raylene Reimer, Thesis: Prebiotic fiber supplementation differentially affects metabolic parameters regulating obesity in rats raised in small versus large litters.
- M.Sc. Ashley Ross – Supervisor Dr. Nicole Culos-Reed, Thesis: Yoga for Prostate Cancer Survivors.
- M.Sc. Sharon Rowan – Supervisor: Dr. Russ Hepple, Thesis: Impact of denervation on myofiber atrophy in senescent skeletal muscle.
- M.Sc. Stacy Ruddell – Supervisor: Preston Wiley, Thesis: The Use of Tension Night Splints in the Treatment of Plantar Fasciitis.
- M.Sc. Katharina Schackenburg – Supervisor: Dr. Steven Boyd. Thesis: The role of bone quality and muscle strength in lower limb stress fractures in female athletes.
- M.Sc. Elana Taub – Supervisor: Dr. Brian MacIntosh, Thesis: Voluntary muscle activation and exercise recovery in chronic fatigue syndrome.
- M.Sc. Jeffrey Zahavich – Supervisor: Dr. Tish Doyle-Baker, Thesis: Examining the Freshman Weight Gain Phenomenon, with Measures of Fat-free Mass and Fat-mass.



General comments

Biomechanics

**BENNO M. NIGG, PETER FEDEROLF
& LISA STIRLING**

This year has been distinguished by the publication of the book "Biomechanics of Sport Shoes", which summarizes much of the work done in our group with respect to (a) impact forces and soft tissue vibrations and (b) the preferred movement path.

With respect to impact forces, we have made progress in the understanding of the biological effects of vibrations, the effects of amplitude and frequency of vibrations on force production and the effect of apparel on the modulation of soft tissue vibrations.

Furthermore, our group made progress in developing a multi-factorial fatigue index that can be used to quantify fatigue during physical activity. The correct identification of fatigued individuals during running was in some cases higher than 95 %.

Another group of projects concentrated around the effects of stability and instability in shoe construction. Specifically, the quantification of dynamic stability during locomotion has been in the center of interest in our group.

WALTER HERZOG

Our research can be divided into (i) mechanisms of contraction and properties of striated muscles, (ii) joint biomechanics and osteoarthritis,

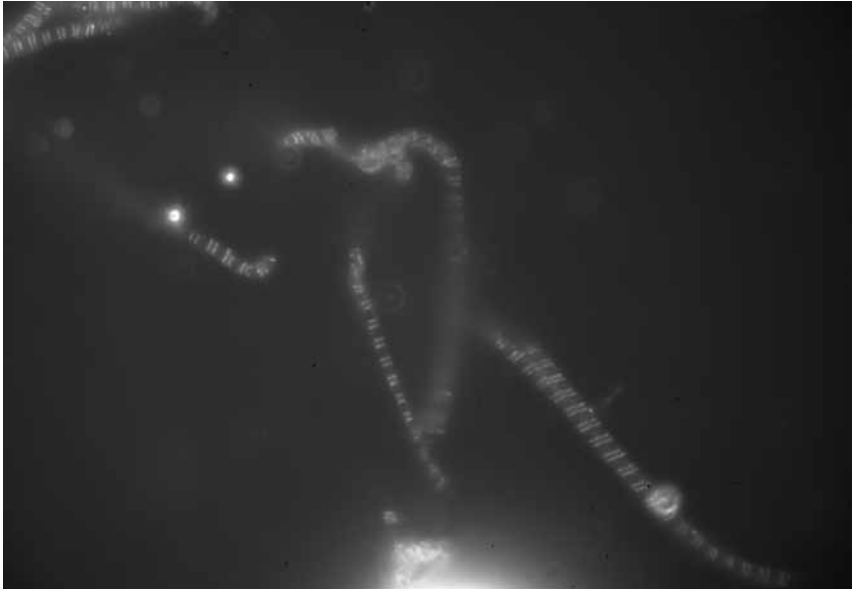
and (iii) clinical and sports applications. In our muscle research, we demonstrated that force regulation occurs not only in the contractile proteins, actin and myosin, but also in the structural protein, titin. This force regulation was shown to dominate at long muscle/sarcomere lengths. Furthermore, we found that a large part of titin's force regulation may be associated with calcium binding to titin's Ig-domain.

In the area of joint biomechanics, we published the first ever data on chondrocyte deformations inside an intact joint loaded through controlled muscular contraction. We further demonstrated that eccentric joint loading causes increased cell death in articular cartilage chondrocytes.

In the area of clinical and sports applications, we determined why cross-country skiers take up a gait pattern at very high speeds that was rejected at a lower speed.

We made first ever measurements of strains in the vertebral artery at the level of C1-C6 during neck spinal manipulative therapy and found the strains to be small compared to normal head and neck movements. Finally, we demonstrated that children with Cerebral Palsy (CP) have much shorter muscle fibres than matched controls, but that excursion of these fibres is the same as in controls, suggesting that excursion on the sarcomere level is vastly increased in children with CP.





Fluorescent quantum dots have been attached to the molecular spring "titin" within muscle myofibrils. These dots demarcate the functionally unique region within titin, enabling us to study its elastic properties under different contractile conditions. We believe the fluorescent striations will not elongate uniformly when these myofibrils are stretched, which would suggest titin has a more complex role than merely a passive spring.

STEVEN BOYD

BONE IMAGING LABORATORY

Our research group focuses on the use of micro-computed tomography (micro-CT) for the study of bone disease and joint injury. The work in the Bone Imaging Laboratory involves clinical measurements of 3D bone architecture in patients. We are studying patients receiving experimental treatments for osteoporosis, and developing a baseline database of bone quality in a population based study. In addition to our clinical work in the RJC, we also are doing pre-clinical research at our facilities in the Heritage Research Medical Centre where we

have in vivo micro-CT equipment for studying bone quality in models of osteoporosis. The pre-clinical work in the hospital and the clinical work in the RJC allows for so-called bench-to-bedside application of our research findings.

The lab consists of eight full-time graduate students all registered in the graduate program of the Schulich School of Engineering or Faculty of Kinesiology, a Research Assistant, a Research Engineer, a Technician, three postdoctoral fellows and several undergraduate students coming from Calgary, other schools in Canada, and international (Switzerland and France).



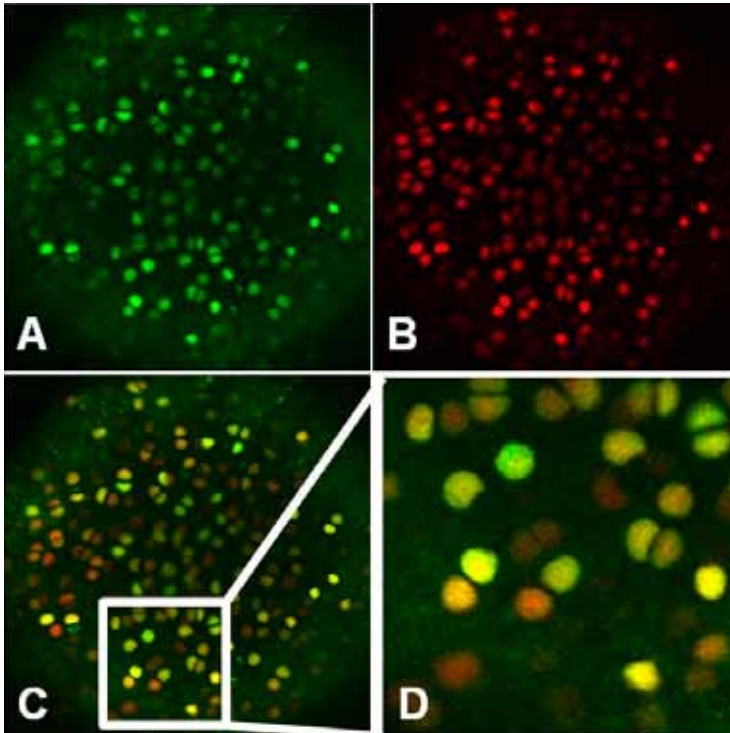
General comments

Our work was published in international journals, and in November 2010 received media attention specifically for our work determining differences in how bone microarchitecture develops across the lifespan between men and women.

ANDREA CLARK

Arthritis is the most common joint disease in the world, affecting more than 4.2 million Canadians during the year 2007-08. Osteoarthritis is a crippling form of arthritis which is

classified as deterioration of cartilage with thickening of the underlying bone, resulting in damage, pain and stiffness to the affected joints. Current treatment options include surgical intervention or pain medications that prolong joint function and/or lessen the pain. There is currently no treatment that can stop or reverse the progression of osteoarthritis. Our research group continues to study two protein targets on the cartilage cell that could potentially be targeted by a pharmaceutical agent to treat



A confocal microscope image showing cartilage cells in intact murine femoral condyles containing the calcium sensitive dyes Fluo 4 (A) and Fura Red (B), the overlaid Fluo 4 and Fura Red image (C) and a portion of the overlaid image increased in magnitude to demonstrate resolution (D). Image captured at 40x.

osteoarthritis disease. These targets are integrin $\alpha 1 \beta 1$ and cilia.

This year we have measured the intracellular calcium responses of cartilage cells in mice that have been genetically altered to be without integrin $\alpha 1 \beta 1$. The calcium responses of these cells to a change in osmolarity (solute concentration) similar to that which occurs during walking were different than cells from mice that have integrin $\alpha 1 \beta 1$. This difference included a larger number of cells responding under unstimulated control conditions, and an apparent insensitivity of the integrin $\alpha 1 \beta 1$ -null cells to a decrease in osmolarity. These data provide the first evidence that integrin $\alpha 1 \beta 1$ may be necessary for cartilage cells to sense and biologically respond to changes in osmolarity.

In addition to our measurements of intracellular calcium, we have also developed new methods this year that will enable us to measure sodium flux in cartilage cells. Sodium plays an important role in regulating cell metabolism and thus the ability of cartilage cells to maintain the cartilage tissue.

SALVATORE FEDERICO

Continuum Mechanics is the study of matter at a length-scale at which the existence of the atomic structure can be neglected, and matter can be treated as continuous rather than discrete. Research in our group is devoted to the mathematical foundations of Continuum Mechanics and its applications to the Biomechanics of Soft Tissue.

In particular, we are interested in modelling soft tissue accounting for its structural elements, i.e., collagen fibres, cells, non-fibrous extracellular matrix, and fluid. In the past years, we have worked on the modelling of the elastic properties of articular cartilage, as well as on the fluid-solid interactions occurring in the tissue.

Articular cartilage is the thin layer of connective tissue covering the end of bones in our joints: for the span of a lifetime, it provides stress redistribution and an incredibly low friction contact. When the tissue degenerates because of diseases as osteoarthritis, it cannot perform its function properly and this results in pain, limitation of mobility, and ultimately a decrease in quality of life. Understanding the relationship between the tissue structure and its function, both in the healthy and in the diseased tissue, may shed light on the causes of the initiation of degeneration, and suggest possible treatments to prevent disease.

JANET RONSKY

The links between joint structure, function, and neuromotor control are the main focus of our research, specifically in the areas of knee joint injury and cartilage degeneration, scoliosis, and joint prostheses. Recently our scoliosis group, using non-invasive torso surface topography (ST), successfully quantified changes in 3D torso indices associated with clinically significant scoliosis progression. These indices were assessed relative to the minimal detectable



change (MDC). In the clinically significant progression group ($n=10$), 6 ± 2 indices out of 11 were greater than the MDC. The ST system shows substantial promise as a repeatable system for detecting clinically significant progression.

A novel loading device for non-invasive in-vivo MRI based characterization of the force-deformation characteristics of the complete knee joint has been extended to include a subject specific lumped parameter model. This model aims to predict load sharing among joint structures and prediction of stiffness characteristics of individual ligaments. The model, developed over the past year, is now being assessed and validated. It will be applicable across the spectrum of increased laxity conditions, as few material property assumptions are made.

We are investigating correlations between meniscus tissue composition, specifically proteoglycan content, and compressive and viscoelastic properties in a sheep model. Significant progress has been made, as proteoglycan assay can now be successfully applied to the test material, and sample cutting jigs have been fully designed. The tensile properties of normal meniscal tissue will be described and compared against an ACL-deficient model. An extensive review of the meniscus as a shock absorber was prepared, concluding that research regarding tissue engineered constructs or artificial replacements should focus on its role as load dis-

tributor and secondary stabilizer, not its ability to absorb shock.

TANNIN SCHMIDT

Our research involves mechanistic based, multidisciplinary study of articular cartilage and ocular surface lubrication with biomechanical-biotribological, biophysical, and biochemical methods.

For articular cartilage lubrication, relevant areas include the study of normal, injured, and diseased cartilage and synovial fluid, where composition and interactions of mechanically relevant biomolecules can be altered, as well as other tissues in the joint affected by injury and disease.

For ocular surface lubrication, relevant areas include the study of lubricating macromolecules present at ocular surfaces and the role they play in maintaining ocular surface integrity. Our current work involves examination and elucidation of the structure-function relationship governing the multiple biological properties of lubricating macromolecules present in synovial fluid, as well as at the ocular surface. The desired outcome of our research is to develop new cell or tissue based treatments and/or therapeutics that 1) stop, slow, and/or reverse the progressive degeneration of articular cartilage after a sports injury that leads to the well-established high occurrence of osteoarthritis in knee joints; and 2) provide effective relief for those who suffer from symptoms associated with dry eye disease.



DARREN STEFANYSHYN

The general research interests of our group focus on questions related to human locomotion, sport performance and sport injury biomechanics. Our research extends to functional sport equipment with a goal of tuning the properties of the equipment to specific athlete characteristics in order to maximize the athlete's performance and minimize the risk of injury. Performance research involves developing a basic understanding of the mechanics of human movement during various locomotor and athletic movements. The goal is to determine the mechanical factors dictating an athlete's performance and how performance can be improved by manipulating these particular factors.

Injury research involves identifying potential injury factors such as global loading characteristics associated with ankle and knee sport related injuries as well as developing an understanding of the role played by equipment.

In 2010 one of our main research directions was investigating footwear traction. We had several ongoing projects in this area and made great progress in determining the traction requirements of basketball footwear for optimal performance and understanding how traction is related to injury in high school football. In addition we worked together with some of our industrial partners to develop traction concepts that ranged from sprint spikes that will be used at the London Olympics to anti-slip

footwear for wet and icy conditions.

VINCENT VON TSCHARNER

For the studies on the behavior of muscles during movements we applied linear classifiers to the wavelet transformed EMG signals (patterns). The patterns contained enough information to differentiate between the degrees of fatigue of the muscle of a runner. Surprisingly, the information resided in the fine structure of the intensity pattern. To assess the fine structure, the wavelet analysis has been further developed and the new theory on wavelet coherence and wavelet based phase shift analysis has been published. The coherence analysis becomes important when investigating the synchronization of muscle activation. The resolution of the wavelet analysis was sufficient to resolve synchronization of motor unit action potentials that caused rhythms in the EMG power at frequencies corresponding to the ones of the beta waves of the brain's motor cortex. We have developed and published the methods that allow monitoring the rhythms which most likely reflect the central control of muscle activity. In the abductor pollicis brevis muscle, the rhythms changed their frequency with fatigue thus reflecting fatigue of the central control. To further advance the study of EMG rhythms, we started improving the spatial resolution of the EMG signal by building and testing new recording and filtering systems. A filter for eliminating disturbing electrocardiogram signals from the EMG signal was developed based on



an independent component analysis of wavelet spectra.

Mind Sciences

S. NICOLE CULOS-REED

HEALTH & EXERCISE PSYCHOLOGY

Research focuses on quality of life and physical activity for cancer survivors (on or off treatment). This research has resulted in the development of exercise programs, educational events and lectures for cancer survivors. Educational events include presentations by oncologists, world-class researchers, cancer survivors and fitness industry professionals. These events are an opportunity for professionals and patients to learn about the evidence and resources we have and to encourage physical activity in cancer survivors to assist in improving their quality of life. In addition, these events provide an opportunity for graduate students to apply their knowledge, engage in presentations, and interact with other health care professionals and patients.

As an example of what our research has accomplished and how it has grown: A Level 2 program has been added to Yoga Thrive which has evolved into a successful and stable resource open to all cancer survivors (on or off treatment) and their support persons in our community. Building on this success, we have opened the Thrive Lab and the Thrive Centre. The Thrive Lab is an innovative facility created to empower and improve the quality of life of participants, through individualized and specific exer-

cise assessment and individualized program design. The Thrive Centre provides a safe and supportive fitness facility for people affected by cancer and equally important, it provides greater accessibility. Various programs and open gym times supervised by trained personnel are offered for all individuals affected by cancer, including clinically underserved populations of head/neck and neuro-oncology and to parents of pediatric oncology patients at the Alberta Children's Hospital.

JAMIE JOHNSTON

MOVEMENT NEUROPHYSIOLOGY LAB

The goal of the Movement Neurophysiology Lab is to address key issues in motor neuroscience, including, but not limited to, understanding multi-modal sensorimotor integration, the neural mechanisms underlying the coordination of multiple joints, muscles, motor units, etc., adaptation to environmental and task constraints as well as motor learning. We also aim to apply the knowledge gained through our basic research to improve clinical assessment and rehabilitation protocols and further biotechnological development.

This year in the Movement Neurophysiology Lab was a busy one. While we continue to examine the hand functional deficits in patients with carpal tunnel syndrome, we have initiated a number of additional projects.

First, we have started a project to examine how touch sensory deficits in certain fingers affect the ability



to manipulate objects with different physical properties (texture, weight, center of mass). This, in conjunction with our work on carpal tunnel syndrome, will provide significant information about how the Central Nervous System integrates sensory information with motor commands for successful (or unsuccessful) motor actions.

Similarly, we have examined the use of vision in object manipulation. Vision has been considered subservient to the touch sensory system in object manipulation as its processing time is generally slower. We have examined whether visual information complements or disrupts that of touch sensation during manipulation.

Lastly, we have designed a novel quantitative hand function assessment tool for stroke patients. Once validated as an assessment tool, the device will be examined as a possible hand rehabilitation tool as well.

JOAN VICKERS

NEURO-MOTOR PSYCHOLOGY

2010 saw my laboratory expand and add new research projects in the Faculty of Medicine, University of Calgary, at the University of Exeter in the UK and at the University of Minnesota in the USA. The impetus for the research expansion is the growth of "quiet eye", a discovery of my laboratory, and its increasing acceptance as a cognitive variable that is a reliable indicator of expertise in a wide range of motor skills. The project in Medicine involves collecting eye data from expert endocrine surgeons

and trainees as they operate on the recurrent parasympathetic nerve. The goal is to develop a training program that will increase the surgical skills of new doctors. The project at the University of Exeter investigates the quiet eye of children involved in elite sport and those with developmental coordination disorder (DCD), while the project at the University of Minnesota is in law enforcement. In addition our work in sport continues with on-going projects in soccer, ice hockey, ballet and speedskating.

Nutrition, Metabolism & Genetics

RAYLENE REIMER

The human food supply has changed drastically over the past 50-75 years with an alarming increase in obesity following close behind. The objective of my research program is to identify effective nutritional strategies to prevent and/or treat obesity and type 2 diabetes. The projects we are currently working on to achieve this objective include:

Role of Early Diet in Programming Lifelong Obesity Risk: It is now clear that dietary influences exerted early in life have long-term consequences, many of which are pathological or lead to disease. The goal of this work is to undertake basic research on how dietary patterns during growth and development affect physiological responses related to lipid and glucose metabolism in later life and program risk for obesity and type 2 diabetes. This past year we made the



novel observation that specific high fiber diets can mitigate some of the detrimental "programming" of obesity that takes place with compromised nutritional environment during early development.

Role of Intestinal Adaptation in Obesity: Using both the genetically obese JCR:La-corpulent rat and diet-induced obese rat models we are examining the role of diets high in protein and fiber in regulating body weight. The contribution of gut hormones involved in satiety, gut microbiota, and hepatic lipid synthesis are investigated as potential mechanisms of action. Other novel nutrients we are examining include novel fiber and starch ingredients derived from pulses and calcium and specific proteins and bioactive ingredients found in dairy products which are linked to improved weight loss. We are specifically addressing the mechanisms by which these dietary components promote weight loss and regulate adiposity. Most recently we have translated the findings of our animal work into human clinical studies separately evaluating the effects of a prebiotic fiber supplement and high dairy product intake on weight loss.

The long-term goal of our work is to identify novel nutritional therapies to prevent and treat chronic disease.

Physiology / Biology

P. TISH K. DOYLE-BAKER

Chronic diseases, specifically those induced by lifestyle behaviours, are major public health problems, af-

fecting millions of people worldwide. The associated health care costs are growing in parallel with increases in obesity, cardiovascular disease and osteoarthritis incidence, all areas in which our group is involved in research. The preventive value of physical exercise lies not only in its potential to reduce the burden of chronic disease and all-cause mortality, but also in its profound benefits of improving quality of life. For the past 7-8 years our goal has been to develop diet and exercise interventions that will be effective independent of *person, place or time*. We completed two studies in the community this year where we collaborated with other local public health professionals.

The first study was designed to: 1) raise awareness about the severity and prevalence of cardiovascular disease (CVD) among working women, 2) assist women in understanding their risk for CVD, and 3) identify the feasibility and impact of a lunch time intervention within the workplace. The worksite, i.e. *place*, can avoid: 1) the clinical model of just targeting only high-risk individuals and can increase the potential for prevention of disease, and 2) "decontextualizing" risk behaviours which allows for identifying ways individual behaviours might be culturally and habitually maintained. For example one of the participants in this study started an exercise program to show others that they could achieve their 5000 steps during their lunch break. Many participants, i.e. *person*, identified that small individual changes can make big



differences, and this is exactly what we want to achieve in our research because these changes can translate into large benefits at the population level.

The second study was an after-school, i.e. *time*, physical activity intervention in 5-12 year olds. This is an age group in which we have previously demonstrated that diet and exercise interventions produce positive health results. The difference with this study was that children were enrolled at several Y locations across Alberta. Similar to our previous research an after school program produces fitness changes but the level of these changes was influenced by the commitment of the leader at the site.

In summary, this past year our group was exposed to community-level interventions where study design and creativity are equal partners for successful implementation of change. These opportunities to research outside the lab and collaborate with other partners has given us some experience in addressing the social and cultural context in which individual behaviours in group settings are both manifested and can be *ameliorated*.

WAYNE GILES

Present research projects are directed toward understanding the electrophysiological mechanisms for pacemaker activity in the heart and for repolarization of the action potential in atrial and ventricular myocytes. In addition, electrophysiological properties of isolated chondrocytes are studied. This experimental work is

complemented with development of mathematical models of the human ventricular action potential.

RUSSEL T. HEPPLE

Our major focus this year was on understanding the extent to which long term exercise training initiated at late middle age could attenuate muscle atrophy, muscle contractile impairment, and cardiac impairment in very advanced age. Significantly, our results showed that although exercise training had benefits for the survival and overall health (body fat, running capacity), it was largely ineffective in attenuating the muscle contractile dysfunction and actually exacerbated muscle atrophy. The importance of our results is that they show muscle has a markedly diminished ability to respond favorably to an exercise training stimulus in very advanced age, even though there are other important benefits for other aspects of health. They also show that changes in muscle mass and function with aging are not the exclusive result of a less physically active lifestyle and implicate intrinsic processes of aging in these changes. Future studies aim to better define the nature of these processes, with a particular focus on loss of motor neurons in aging muscle and what role this plays in muscle atrophy and dysfunction with aging.

DUSTIN HITTEL

The incidence of obesity, metabolic syndrome, and type-2 diabetes is an epidemic in all industrialized populations. Metabolic syndrome or "pre-diabetes" is considered a har-



binger of full-blown type 2 diabetes, heart disease, vascular disease, and increased cancer risk. Obesity, one of the indicators for metabolic syndrome, is a major clinical and public health problem facing young adults in Canada. There are three primary and inter-related causes of the recent, rapid increase in obesity rates: inactivity, easy access to inexpensive high caloric food, and genetics. Of these three, genetics plays a key role, with estimates of the underlying genetic component of obesity suggesting that about 75% of variation is genetic, and 25% environmental. With the help of a generous donation from several prominent Calgary philanthropists we have launched an international study of the relation between genetics and predispositions to type-2 diabetes in young adults. This study, *Assessing Inherited Markers of Metabolic Syndrome in the Young (AIMM Young)* will examine the occurrence of metabolic syndrome in 500 adults recruited from the University of Calgary student and staff population. In collaboration with other research sites in the US the ultimate goals of AIMMY are to: (a) Define the individual genetic risks for developing the metabolic syndrome in young adults, (b) Target the "at risk" individuals for specific interventions (personalized therapy), (c) Prevent symptoms early in the process, before the person even knows there is a problem.

In addition to this exciting new project, we are continuing our research on the muscle-wasting protein myostatin, which we reported in a highly

cited publication in 2009, is abundant in the muscle and blood of overweight and pre-diabetic patients. We believe that myostatin contributes significantly to the metabolic syndrome that precedes type 2 diabetes. We recently published a study showing that myostatin causes insulin resistance in both human and mice and is reduced with aerobic exercise training. These and other findings have generated significant interest from and ultimately an active collaboration between my laboratory and the pharmaceutical GlaxoSmithKline. Together we will be evaluating myostatin as a new "biomarker" and potential therapeutic target for the treatment of type 2 diabetes.

BRIAN MACINTOSH

The central theme of research in my laboratory is the study of force modulation in skeletal muscle. This includes the study of force-velocity and force-length relations, and the interactions of these with and without prior activity. Prior activity can be an acute modifier, as in potentiation and fatigue, or a chronic modifier as in training and disuse atrophy. Skeletal muscle contractile responses (twitch and incompletely fused tetanic responses) are modified by regulatory light chain phosphorylation, and my research is concerned with understanding the role of this process in modifying the contractile response, and how certain conditions may modify the interaction of light chain phosphorylation and potentiation or fatigue. My research group has made



several key observations recently. Recent work has demonstrated that it is inappropriate to subtract the passive force measured at the initial whole muscle length to estimate active force of contractions. This common approach results in an underestimation of active force at long lengths. Passive force is now known to change during contraction of a muscle that has substantial series elastic properties. Future work will consider the impact this revelation has on some fundamental properties of muscle. Current and recently completed projects address the questions: i) How does stroke or congestive heart failure alter the fundamental contractile properties: fatigue and potentiation? ii) How does summation occur in incompletely fused tetanic contractions, iii) How does breathing a helium oxygen mixture enhance exercise performance when respiratory limitations are not expected? iv) Can sequential bouts of exercise 24 hours apart be used to objectively identify chronic fatigue syndrome? and v) What is the appropriate warm-up for performance of athletic events? My work uses a number of approaches to study the contractile properties of skeletal muscle, including in vitro single intact or skinned fibers and fiber bundles, in situ whole muscle and intact human subjects performing in vivo isolated muscle or muscle group contractions or performing whole body exercise.

JANE SHEARER

Worldwide, it is estimated that over 1 billion people are overweight and 300 million are obese. If current trends continue, 700 million adults will be obese by the year 2015 while one in three children will develop type 2 diabetes in their lifetime. As such, obesity represents the single most preventive factor leading to decreased individual health. The goal of the Shearer laboratory is to examine the interactions between nutrition, genes and the development of metabolic diseases including diabetes and cardiovascular disease.

Cardiovascular Disease Prevention and Management: Under normal conditions, 60–80% of energy required by the beating heart is derived from fat with the remaining supplied by glucose. Numerous pathological conditions, including diabetes perturb this balance resulting in abnormal heart function and further pathological declines. Projects in this area examine why this imbalance occurs and potential therapeutic strategies including stem cell therapy.

Metabolic Consequences and Markers of Obesity: There is increasing evidence that defective mitochondrial energetics and abnormal substrate metabolism are fundamental characteristics of the failing heart. This project examines how obesity alters both skeletal muscle and cardiac mitochondrial integrity and function. Specific markers of metabolic dysfunction in the blood and tissues are also being explored (metabolomics).



DAVID J. SMITH, STEPHEN NORRIS

The research interests of our group include the enhancement of athlete exercise tolerance through hyperoxia, hypoxia and vibration; adaptations of the cardiovascular and muscular systems to training interventions; changes in oxygen uptake kinetics; and monitoring techniques to assess readiness for competition or degree of fatigue resulting from training. A traditional approach to training endurance athletes has been the use of hypoxia which is a general reduction in oxygen delivery. Our approach to hypoxia training is to use both a natural altitude environment as well as normobaric hypoxic interventions via oxygen filtration. Our research is focused on the degree of competitive edge these modalities may give high performance athletes. In monitoring athletes we are building up a long-term database of the effects of different training interventions on heart rate variability. The use of vibration for improving the training regimes of athletes is also part of our ongoing research. The potential training effects of vibration that may occur in the post-vibration period may lead to better warm-up protocols for athletes competing in sporting events that require high amounts of power output. In addition to our main focus of athlete performance, we are also continuing our studies on the effect of exercise for cancer survivors. Our interventions are examining the effect of different intensities and sequence of aerobic exercise for these survivors. Finally, our group continues to pro-

vide ongoing national leadership to athletes, coaches and sport organizations, in preparation for the upcoming London 2012 Olympic Games.

Sports Medicine Research

WILLEM MEEUWISSE & CAROLYN EMERY

The Sport Injury Prevention Research Centre continues to be recognized internationally as one of the four Centres of Excellence in Research in Injury Prevention in Sport by the International Olympic Committee (IOC). The first annual international IOC meeting for the four centres (University of Cape Town, Oslo Sport Trauma research Centre, Melbourne and Calgary) took place in Cape Town, South Africa in September 2010. This has led to additional international collaborative research opportunities.

This year, our group published the results of a National multicentre study of injuries related to body checking in youth ice hockey in the *Journal of the American Medical Association*. The results of this study were presented at the Mayo Clinic Ice Hockey Summit: Action on Concussion in October 2010. This research has had a great deal of media attention in 2010. The policy implications of this work regarding the age at which body checking is introduced in youth ice hockey are significant. This work has led to a consensus on policy change to delay the introduction of body checking in competition from age 11 to age 13. Hockey USA and Hockey Canada are currently considering a



policy change as a direct result of the impact of this research. Our group is also engaged and has completed the analysis of data from the National Hockey League Concussion study, which has accumulated 7 years of prospective data in collaboration with the University of Pittsburgh. In addition, studies examining the effectiveness of vestibular rehabilitation post-concussion as well as the utility of neurocognitive testing following concussion in youth ice hockey are in progress.

We also had the opportunity to collaborate with colleagues from the IOC and International Paralympic Committee (IPC) on the injury surveillance projects conducted at the Vancouver 2010 Olympics. This opportunity has led to ongoing research collaborations with the IOC and IPC.

We have also completed a 2-year research program demonstrating the effectiveness of a combined neuromuscular injury prevention strategy and obesity prevention strategy in the reduction of sport injury and increasing healthy outcomes in junior high school students. This broad school-based injury prevention initiative has evolved from lessons learned in the sport-specific injury prevention programs we have developed and evaluated to date in youth basketball and soccer. Ongoing research also includes the development and evaluation of a youth sport injury prevention clinic to identify predictors of injury in youth sport. The long-term goal of

this work is to maximize health and minimize the long-term impact of injury and joint osteoarthritis in the child and adolescent population. In addition, we continue our research program in community soccer with international colleagues to examine implementation strategies which will maximize adherence and optimize the preventive effect of a neuromuscular training warm-up program.

Other ongoing research activities included the examination of human risk factors in avalanche incident and examination of risk factors for injury in youth skiing and snowboarding.

NICK MOHTADI

In 2010, we reached several significant milestones with our hip outcome and knee-related research. The development of our quality of life outcome measure to help assess young and active patients with hip disease for clinical and research purposes was completed. This included evaluation of the outcome's psychometric properties: validity, reliability, responsiveness and minimal clinically important differences.

We successfully completed the 3-year recruitment period for the world's largest randomized clinical trial comparing three methods for anterior cruciate ligament reconstruction (patellar tendon, quadruple semitendinosus/gracilis and double-bundle semitendinosus/gracilis grafts). Recruitment was completed on time and on budget, with a total of 330 patients enrolled at the Sport Medicine Centre. Patient-based quality of life is measured at 1,



2, 5 and 10 years after surgery. Surgical failure, re-injury and complication rates, surgical times, knee stability, and the evaluation of long-term consequences of arthritis development in the knee are also being documented.

As a direct result of our previous research in improving access to care for patients with acute knee injuries, the Acute Knee Injury Clinic (AKIC) was opened. Patients are initially evaluated by a "Non-Physician Expert" (NPE), a certified athletic therapist who has been highly trained to evaluate and manage knee injuries by following evidence-based clinical guidelines. The NPE works directly with a Sport Medicine Physician to provide primary care at a specialist level. Patients are provided a management and follow-up plan, discharged or referred to an orthopaedic surgeon. The AKIC can provide timely diagnosis and quality treatment for up to 200 patients per month.

PRESTON WILEY & VICTOR LUN

The main focus of our research is currently the integration of research activity involving knee os-

teoarthritis through our innovative Knee Osteoarthritis Clinic. We have completed projects assessing hip strengthening and its role in treatment of knee osteoarthritis and are near completion of evaluating the role of corticosteroid injection as an adjunct to exercise prescription for knee osteoarthritis.

We are collaborating with other researchers with other projects as well. We collect synovial fluid and blood to assess changes found in patients with knee osteoarthritis. We recruit patients for biomechanical assessment and monitored exercise treatment programs.

Clinically we continue to assess new and innovative ways of treating tendon disorders. Our clinic has started to use platelet rich plasma injections for tendinopathy. We plan to evaluate this new and perhaps controversial treatment for its effect.



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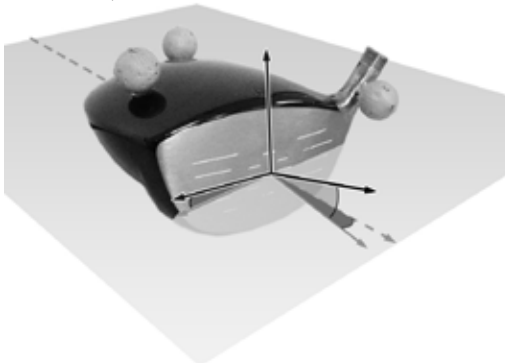
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The clubhead coordinate system of a golf club driver.



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- Worobets, J., Wannop, B. and Stefanyshyn, D. Powerweb Cycling Shorts. adidas International, 2010.
- Worobets, J., Wannop, B. and Stefanyshyn, D. Printed pu vs pressed tpu powerweb apparel. adidas International, 2010.

Keynote lectures

- Boyd, S.K. A biomedical engineering approach to investigating bone quality across the lifespan. City-wide Osteoporosis Research Rounds, University of Toronto, Toronto, ON, Canada. October 1, 2010.
- Boyd, S.K. MicroCT Workshop: In vivo imaging and investigation into the effects of anti-osteoporosis treatments on bone quality. Canadian Light Source 13th Annual Users' Meeting, Saskatoon, SK, Canada. June 17 - 18, 2010.
- Boyd, S.K. Public Forum: Using Stem Cells to Regrow Bone – Bone Microarchitecture. Osteoporosis Canada AGM, Calgary, AB, Canada. June 12, 2010.
- Boyd, S.K. Bone quality in osteoporosis: advances with micro-computed tomography. Faculty of Dentistry, Vancouver, BC, Canada. April 8, 2010.
- Doyle-Baker, P.K. Does the Built Environment Influence Health? Challenging the influence of the built environment on sedentary living. Physical



Keynote lectures

- Activity Forum in Alberta, Calgary - May 26, 2010, Lethbridge - June 1, 2010, Edmonton - June 4, 2010.
- Emery, C.A. Risk of injury in youth ice hockey. GF Strong Rehabilitation Research Symposium, University of British Columbia. Vancouver, BC, Canada, March 2010.
- Herzog, W. Revisiting Mechanisms of Muscle Contraction, 6th World Congress on Biomechanics, Singapore, August 1-6, 2010.
- Herzog, W. Insights into the Mechanisms of Muscle Contraction, Polish Society of Biomechanics, Warsaw, Poland, August 25-28, 2010.
- Herzog, W. Mechanisms of muscle contraction, UK Physiological Society Conference, Manchester, UK, June 30-July 2, 2010.
- Herzog, W. The role of muscles in sport performance: experimental and theoretical considerations in bicycling, International Society of Electrophysiology and Kinesiology, Aalborg, Denmark, June 16-19, 2010.
- Herzog, W. President's Lecture – The Biomechanics of Muscle Contraction, American College of Sports Medicine, Annual Meeting, Baltimore, MD, USA, June 2-5, 2010.
- Meeuwisse, W. The Periodic Health Examination –Evidence Base. Injury Prevention Symposium, IOC Medical Commission, Vancouver, BC, Canada, February 11, 2010.
- Meeuwisse, W. Sport Concussion Assessment Tool 2. 4th Olympic Symposium on Sport Medicine and Physiotherapy, Vancouver, BC, Canada, February 25, 2010.
- Meeuwisse, W. Return to Play: Applying a decision-based model. Clinical and Sports Medicine Conference, South African Sports Medicine Association, Cape Town, South Africa, October 14-15, 2010.
- Meeuwisse, W. Update on Concussion: from the Zurich Consensus to lessons learned in professional sport. Clinical and Sports Medicine Conference, South African Sports Medicine Association, Cape Town, South Africa, October 14-15, 2010.
- Nigg, B.M. Impact Forces, Soft Tissue Vibrations and Muscle Tuning. ISEA – Conference of the International Sports Engineering Association, Vienna, Austria. July 12-16, 2010.
- Nigg, B.M. Orthotics and Sports Shoes. Alex Stacoff Memorial Lecture, i-FAB Congress at the University of Washington, Washington, USA, September 16-17, 2010.
- Schmidt, T. Boundary Lubricating Properties of Proteoglycan 4 at Articular Cartilage, Ocular Surface, and Other Biointerfaces. Gordon Research Conference on Biointerface Science, Les Diablerets, Switzerland, 2010.



Keynote lectures

- Smith, D.J. Olympic Games Briefing: Sport Science, Own the Podium Post Games Conference, Calgary, AB, Canada, May 19-20, 2010.
- Stefanyshyn, D.J. Sport biomechanics: equipment and performance. 34th Annual Meeting of the American Society of Biomechanics. Providence, USA, August 18 - 21, 2010.
- Stefanyshyn, D.J. Biomechanics of performance footwear. 2010 International Conference of Korean Society of Sport Biomechanics. Busan, Korea, Oct 14-15, 2010.
- Stefanyshyn, D.J. Walking Biomechanics and Walking Shoes? Seventh Brazilian Symposium on Footwear Biomechanics. Novo Hamburgo, Brazil, April 10, 2010.
- Wiley, P. Lance Richard Lecture, Canadian Academy of Sport and Exercise Medicine Annual Scientific Meeting, Toronto, ON, Canada, June 10-12, 2010.

Contributions

EDITORIAL AND REVIEW BOARDS

Members of the RJC have served on the following editorial boards and review committees:

Acta Physiologica
American Journal of Clinical Nutrition
American Journal of Preventive Medicine
American Journal of Sports Medicine
American Journal of Physiology
American Journals of Physiology Regulatory, Integrative and Comparative Physiology
Appetite
Applied Physiology, Nutrition and Metabolism
Attention, Perception and Psychophysics
Biomechanics and Modeling in Mechanobiology
Brazilian Journal of Biomechanics
British Journal of Nutrition
British Journal of Sports Medicine
Canadian Journal of Applied Physiology
Canadian Journal of Physiology and Pharmacology
Canadian Journal of Public Health
Canadian Medical Association Journal



Contributions

Center for Sport Science and Sport Medicine Berlin (CSSB)
Clinical Biomechanics
Clinical Investigative Medicine
Clinical Journal of Sport Medicine
Clinical Nutrition
Computer Methods in Biomechanics and Biomedical Engineering
Diabetes, Obesity and Metabolism
European Journal of Applied Physiology
European Journal of Neuroscience
European Journal of Sport Sciences
Exercise and Sports Science Reviews
Experimental Brain Research
Experimental Physiology
Footwear Science
Human Movement Science
IEEE Transactions in Neural Systems and Rehabilitation Engineering
Injury Prevention
International Journal of Sport Medicine
International Journal of Sport Psychology
Journal of Applied Physiology
Journal of Applied Physiology, Nutrition and Metabolism
Journal of Behavioural Medicine
Journal of Biomechanical Engineering
Journal of Biomechanics
Journal of Clinical Nutrition
Journal of Electromyography and Kinesiology
Journal of Exercise and Sports Psychology
Journal of Experimental Psychology
Journal of Food and Nutrition Research
Journal of Hand Therapy
Journal of Neurophysiology
Journal of Manipulative and Physiological Therapeutics
Journal of Motor Behavior
Journal of Nutrition
Journal of Orthopaedic Research
Journal of Pediatrics
Journal of Physical Activity and Health
Journal of Rehabilitation Medicine
Journal of Science and Medicine in Sport
Journal of Sport and Exercise Psychology
Journal of Sports Biomechanics
Journal of Sports Sciences



Contributions

Journal of the American Medical Association
Journal of the Canadian Chiropractic Association
Journal of the Canadian Diabetes Association
Leistungssport
Medical Engineering and Physics
Medicine and Science in Sports and Exercise
Molecular and Cellular Biomechanics
Muscle & Nerve
Neuroscience
North American Journal of Sport Physical Therapy
Open Biomedical Engineering Journal
Orthopädische Zeitschriften
Pflugers Archiv
Physical Review E
Physical Review Letters
Physician and Sportmedicine
Physiotherapy Canada
Psycho-Oncology
Regulatory Peptides
Rehabilitation Psychology
Scandinavian Journal of Medicine and Science in Sports
Sportorthopädie Sporttraumatologie
Sports Medicine
Sports Orthopaedics and Sports Traumatology
Sportverletzung Sportschaden
Supportive Care in Cancer
The Dietitians of Canada

REVIEW OF GRANT APPLICATIONS

Members of the RJC have served reviewing grant application for:

Agriculture Funding Consortium
Alberta Children's Hospital Foundation - Allied Health Research Award and
Shaikh Family Research Award
Biomedical Research Council (Singapore)
Canadian Foundation for Innovation (CFI)
Canadian Institutes of Health Research (CIHR)
– Biomedical Engineering
– Institute of Aging Age Plus Prize
– Movement and Exercise
– Research Grants
– Respiratory Systems
Canada Research Chairs Program
Canadian Orthopaedic Research Society



Contributions

Defence R&D Canada, Technology Investment Fund Grant Review
Natural Sciences and Engineering Research Council Canada (NSERC)
– Collaborative Health Research Projects Program (CHRP)
– Discovery Grants
– Industrial Research Assistance Program (IRAP)
– Research Tools and Instruments Grants (RTI)
Netherlands Disease Prevention Programme
The Netherlands Organization for Health Research and Development

Official research related functions

STEVE BOYD

Logistics coordinator for "Tour for Kids" a 2 day cycling fund raising event for sending kids with cancer to camp.

DALE BUTTERWICK

Board of Directors, Canadian Professional Rodeo Sport Medicine Society.

NICOLE CULOS-REED

Oncology Nurse Practitioners of Alberta – Provincial Retreat (May 15, 2010).
Organizer and host, Physical Activity for Cancer Survivors – Educational Day, Calgary AB. Culos-Reed Health and Wellness Lab (January 22, 2010).
Symposium for Yoga Research (October 1-3, 2010).
2010 American Society of Clinical Oncology (ASCO) Annual Meeting.
10th Biennial Behavioural Research in Cancer Control Conference, Perth, Australia.

P. TISH K. DOYLE-BAKER

Sport Medicine Representative (SMCA) for Hokkaido delegation.
Arthur JE Child Chair search and selection committee.
Affiliate, Population Health Intervention Research Centre and International Physical Activity and Environment Network (IPEN).

CAROLYN EMERY

Chair National Sport Injury Prevention Research Centre- Canadian Academy of Sport Medicine Research Symposium (2010)
Chair Scientific Review Committee Chair (2010) – Canadian Physiotherapy Association National Congress
Canadian Physiotherapy Research Advisory Consortium Chair (2010).
Canadian Physiotherapy Association Divisions Research Liaison (2010).



Official research related functions

SALVATORE FEDERICO

Organiser and Scientific Chair, Continuum Mechanics and Microstructure.
ICNAAM, Rhodes, Greece, September 2010.

Secretary Treasurer, Canadian Society for Biomechanics (from July 2010).

RUSS HEPPLÉ

Career Panel member, Heritage Youth Scholarship Program, Alberta
Innovates Health Solutions (Summer 2010).

Advisory Board Member, CIHR Institute of Aging Advisory, Mobility in Aging
Priority Working Group (2007-2010).

WALTER HERZOG

Provost/VPA, Advisory Review Committee, Arthritis Society Chair in
Rheumatic Diseases/Rheumatology (2009-2014).

Past President of International Society of Biomechanics (2009-2011).

JAMIE JOHNSTON

Session Chair, Finger control and coordination. World Congress on
Biomechanics, Singapore 2010.

VICTOR LUN

Chairperson, Research Committee, Canadian Academy of Sport Medicine.

BRIAN MACINTOSH

Past-President, Canadian Society for Exercise Physiology (November
2009-November 2011).

Associate Dean, Faculty of Graduate Studies (since Jan, 2009).

Executive Director, Canadian Society for Exercise Physiology (November,
2010-2014).

WILLEM MEEUWISSE

Steering Committee, "Ice Hockey Summit: Action on Concussions" event,
Mayo Clinic, Rochester, MN, October 2010.

Member, Scientific Committee, 3rd World Congress on Sports Injury
Prevention, Monaco, April 2011.

NICK MOHTADI

Clinical Research Director, McCaig Institute for Bone & Joint Health,
Research Portfolio. Sept. 2008 – Present.

Co-Director, University of Calgary Sport Medicine Centre. 2005-Present.

Orthopaedic Consultant, Canadian National Sport Centre – Calgary.

Orthopaedic Consultant, University of Calgary Dino Teams.

Orthopaedic Consultant, Hitmen Junior Hockey Team.

Orthopaedic Consultant, Roughnecks Professional Lacrosse Team.

Orthopaedic Surgeon, Calgary Flames Hockey Team.

BENNO M. NIGG

Member, IOC Medical & Science Commission.



Official research related functions _____

Scientific Board Member, Jacobs Center, Bremen, Germany.
Member, International Academy of Biology and Engineering in Medicine.
Member, Swiss Academy of Medical Science.

RAYLENE REIMER

Canadian Nutrition Society Student Abstract Competition Judge, April 2010.
Abbott Nutrition, Prebiotics Advisory Board (Abbott Canada, Saint-Laurent, Québec).

Associate Editor, Applied Physiology, Nutrition and Metabolism (2010-2013).

JANET RONSKY

Selection Committee Member, Manning Innovation Awards.

Director, Biovantage Inc. – Alberta Ingenuity Centre.

Director, BOSE Biomaterials and Tissue Engineering Technology Development Centre.

DAVID SMITH

Canadian Olympic Team – Own the Podium Observer

Director of Sport Science, Canadian Sport Centre – Calgary.

Treasurer, Sport Science Association Alberta (SSAA).

DARREN STEFANYSHYN

Executive Board member, International Society of Biomechanics.

Associate Editor, Footwear Science.

Editorial Board member, Sports Technology.

PRESTON WILEY

Co-Director, University of Calgary Sport Medicine Centre.

Chair, Planning and Scientific Committee, Sport Medicine Conference in Preparation for 2010, Vancouver, Canada.

Credentials Committee Member, Canadian Academy of Sport and Exercise Medicine.

How to contact us _____

www.kin.ucalgary.ca/hpl and www.sportmed.ucalgary.ca





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