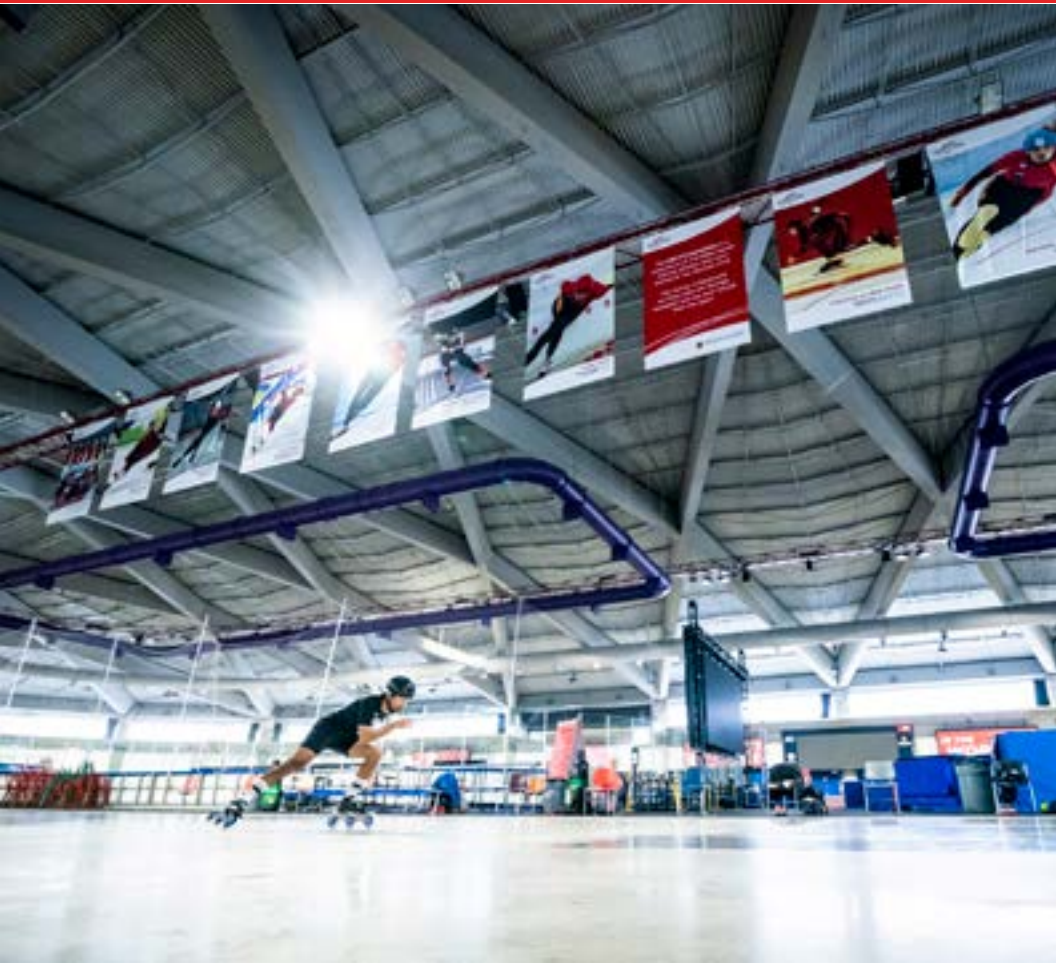




**UNIVERSITY OF CALGARY**  
FACULTY OF KINESIOLOGY



**Human Performance Laboratory**  
**2021 Annual Report**



Since 1981, the University of Calgary has had a Human Performance Laboratory. I have been part of this lab since 1985 and became its director in 2000. Despite this long history, I never gave the name "Human Performance Laboratory" too much thought, especially not the words "Human Performance", after all, most of my research is on the molecular and cellular level.

This all changed on February 19th, 2018. I remember the date, because it was not only my birthday, but also the birthday of Jennifer Doudna who on that evening gave a keynote lecture at the Biophysical Society Congress in San Francisco. I wanted to see Jennifer Doudna and I convinced my group to join me by telling them that Jennifer would be a future Nobel Prize winner.

Indeed, Dr. Doudna was awarded the Nobel Prize in Chemistry in 2020 for her work on CRISPR-Cas9. In her talk, Dr. Doudna explored and discussed the future of human gene editing with CRISPR-Cas9 and how it might help eliminate inherited diseases. Specifically, she was talking about tackling sickle cell disease, a disease that damages the red blood cells and leads to premature death, a disease also that is caused by a single mutation in a (the  $\beta$ -globin) gene. She was also hinting at non-disease related areas of gene editing, for example human height, muscularity, and other attributes that could lead to increases in Human Performance.

Gene editing in humans raises many questions of a fundamental ethical nature, particularly since the technique is easy to use and apply. While we might accept the idea of curing a disease using CRISPR-Cas9, are we equally comfortable about increasing a child's growth, or producing genetically modified athletes with superior muscles, strength, and speed. Most athletes who win gold medals at Olympic Games have some genetic advantage over the average person that allows them to stand out, to perform better physically. But what is Human Performance if we can genetically enhance it? Are we entering an era where only genetically altered athletes have a chance of succeeding in international sports, at Olympic Games? Where are the limits of what is acceptable, and who decides what those limits are?

Human Performance might soon take on a different meaning from what it has today, and we, as researchers working at the leading edge of human health, mobility, quality of life into old age, and athletic performance, we need to be prepared to be part of that discussion. Gene editing has the potential to do wonders for humanity, while at the same time might change in a profound way what it means to be human. Scientists in Human Performance starting their careers now will be faced with challenges not imagined just a decade ago. Be prepared for an exciting, challenging, and somewhat scary time where you want to be part of the discussion what Human Performance is.

It has been another exciting and successful year for the Human Performance Lab, and the faculty of Kinesiology, once again, ranked number 1 in terms of research in North America in its category. All this is only possible through the generous support of our families and friends, the faculty of Kinesiology, the University of Calgary, and all our external sponsors who have believed in our dream of being an internationally leading research laboratory for the past 40 years. We are dedicated to continuing this dream. My sincere thanks to all of you.

Handwritten signature of Walter Herzog.

Walter Herzog, Director

## HIGHLIGHTS

- Honour Walter Herzog – Outstanding Reviewer, CIHR College of Reviewers
- Honour Walter Herzog – Journal of Biomechanical Engineering Editor’s Choice Paper <https://doi.org/10.1115/1.4045660>
- Honour Walter Herzog – Named Award: Dr. Walter Herzog Young Investigator Award, Brazilian Society for Biomechanics
- Appointed Carolyn Emery – Co-lead Integrated Concussion Research Program, University of Calgary
- Appointed Carolyn Emery – Strategic Research Committee of the Canadian Physiotherapy Association
- Appointed Carolyn Emery – Chair Scientific Committee Sport Physiotherapy Canada Congress



## HIGHLIGHTS

- Award Tyler Cluff – National New Investigator Award, Heart and Stroke Foundation of Canada
- Award Carolyn Emery – Canadian Physiotherapy Association Medal of Distinction
- Award Carolyn Emery – Killam Annual Professors Award – Killam Trust Foundation
- Award Ash Kolstad – Frederick Banting and Charles Best Canada Graduate Scholarships 2021
- Award Jason Tabor – Frederick Banting and Charles Best Canada Graduate Scholarships 2021
- Award Walter Herzog – Researcher of the Year Award, Alberta Science and Technology Leadership Foundation
- Award Martin MacInnis – Journal of Sport and Health Science Outstanding Reviewer Award
- Award Heron Medeiros –Young Investigator Award, Brazilian Society for Biomechanics Congress
- Award Raylene Reimer – Earle Willard McHenry Award for Distinguished Service in Nutrition, Canadian Nutrition Society
- MSc Drew Lawson – Co-Supervisors: Dr Walter Herzog, Dr. Matt Jordan  
Thesis: Evaluation of the lower body strength and landing strategy of elite athletes after anterior cruciate ligament reconstruction with hamstring autograft.
- MSc Natalie Yeung – Supervisor: Dr. Tyler Cluff  
Thesis: Feedback responses must disengage from postural control to engage rapid movements.
- MSc Ryan Miller – Supervisor: Dr. Tyler Cluff  
Thesis: Modulation of upper limb feedback responses in unpredictable mechanical environments.
- MSc Ash Kolstad – Co-Supervisors: Dr. Carolyn Emery, Dr. Brent Hagel  
Thesis: Equipment and concussion in youth ice hockey and ringette.
- MSc Patrick Pankow – Supervisor: Carolyn Emery  
Thesis: Heads Above the Rest: Examining Head Impacts in Canadian High School Football.
- MSc Sarah Abramovic – Supervisor: Dr. Walter Herzog  
Thesis: The non-intuitive, in-vivo behavior of aponeuroses in a unipennate muscle.

- MSc Jessica Youngblood – Co-Supervisors: Dr. Meghan McDonough, Dr. Carolyn Emery  
Thesis: Adapted Physical Activity Camps: Family Experiences and Implications for Family Relationships.
- MSc Kara Sampsell – Supervisor: Dr. Raylene Reimer  
Thesis: The impact of exercise on gut microbiota in a survivor to germ-free mouse translational model of breast cancer.
- MSc Colton Quinn – Supervisor: Dr. Martin MacInnis  
Thesis: The influence of carbohydrate availability on exercise performed at the maximal lactate steady state.
- MSc Austin Beever – Supervisor: Dr. Martin MacInnis  
Thesis: The effects of simulated altitude on maximal and submaximal exercise.
- PhD Paul Eliason – Co-Supervisors: Dr. Carolyn Emery, Dr. Brent Hagel  
Thesis: Youth Ice Hockey Related Injury and Concussion: Informing Prevention Through Modifiable Risk Factors.
- PhD Fatima Chleilat – Supervisor: Dr. Raylene Reimer  
Thesis: Dietary manipulations at pre-conception and during development influence metabolism and gut microbiota in rats.
- PhD Nicole Cho – Supervisor: Dr. Raylene Reimer  
Thesis: Impact of alterations to early life microbiota (antibiotics, prebiotics, and C-section) on body weight and brain development.
- PhD Arash Khassestarash – Supervisor: Dr. Brent Edwards  
Thesis: Repeated bout effect and musculoskeletal loading during prolonged downhill running.
- PhD Colin Firminger – Supervisor: Dr. Brent Edwards  
Thesis: Experimental measurement and applied modelling of patellar tendon strain.



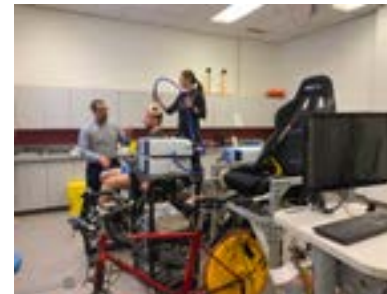
### Exercise Physiology and Nutrition in Health and Sport

#### ABOODARDA

##### Exercise Neurophysiology Laboratory

Dr. Jalal Aboodarda's research in 2021 focused on the integration of physiological and perceptual factors determining exercise tolerance in healthy individuals. Despite COVID-19 setbacks, the research group managed to coordinate a large study investigating the kinetics of neuromuscular and perceptual responses to different exercise intensities-durations.

In another project, they measured acute corticospinal excitability and inhibition responses to pre-induced fatigue and experimental pain conditions. Neurophysiological responses were quantified using non-invasive techniques such as transcranial magnetic stimulation of the brain and peripheral nerve electrical stimulation of the skeletal muscles.



#### DOYLE-BAKER

##### Doyle-Baker Lab

The Doyle-Baker lab focuses on health biomarkers and sport science research across athletic and healthy populations. The lab collaborates with sport organizations (Own the Podium, Alberta Alpine) and other labs on injury prevention (SPIRC) and health promotion interventions (Built Environment and Health Living Lab within the Department of Community Health Sciences in the Cumming School of Medicine). The study methodologies used in this lab involve mixed methods designs (qualitative, quantitative, sequential and or concurrent approaches; scoping reviews; and case studies) and biomarkers of health (bone parameters; heart rate variability, i.e., physical and mental well-being; and hormones). Dr. Doyle-Bakers' lab has experience with wearable technology and mobile health applications.

Currently, the research group is investigating the causes of variation in ovarian cycling in athletic and active women and the impact this has on their readiness to performance and future health. Granted, there are technological and logistical challenges and therefore our solution is to collect data from willing woman and recruit regardless of their current cycling status and or use of oral contraceptives. They are also partnering with mobile applications and evaluating their predictive capacities related to menstrual cycle length and ovulation given period tracking app downloads are the second most used health app today. The overarching goals with these emerging

analytics are to 1) help active and elite female athletes be the best stewards of their own health and performance, and 2) to contribute to the narrative on how the variation in menstrual cycles and hormonal patterns in women is studied.

## HOLASH

### Exercise Physiology Laboratory

The focus of Dr. Holash's work was continued development and modification of courses, and instructional materials within the Exercise Physiology group to leverage new technologies and instruments for course delivery.

Dr. Holash represents the faculty on the current "Learning Technologies Advisory Committee" and is part of the Student Orientation Committee with Dr. Cari Dinn, for the faculty of Kinesiology. Dr. Holash also sits on the National Survey of Student Engagement, and on the Kinesiology Ethics review panel. His primary role within the faculty is to develop and integrate new advanced teaching and learning techniques and resources for exercise physiology.

One of Dr. Holash's focuses is to develop within the exercise physiology umbrella, a team that hopes to integrate state-of-the-art computer-based methods for measuring, recording, and analyzing large data sets of physiological variables. The goal of this team will be to enhance the student experience by providing opportunities for: software product development, rapid prototyping, machine learning, data processing, and potentially some entrepreneurship opportunities that revolve around leveraging digital technologies and scaling them.

In 2021 Dr. Holash started a research project with an honours student to investigate if virtual reality games, that allow individuals to participate in physical activities and competitions, producing activity levels high enough to make them a viable source of exercise. This type of activity might help provide a bridge for individuals who are unable to gather in groups to still participate together in activities virtually.

Dr. Holash also was successful in applying receiving funding for a curriculum undergraduate research experience (CURE) grant to redevelop the course and lab material in Kinesiology 375 this year. The grant provided funding to two Kinesiology graduate students who participated in the project. Dr. Holash has been active in reviving and redeveloping the Masters of Kinesiology program and teaches a year-long course in the program where students are exposed to the practical and technical equipment involved in exercise physiology covering a widely diversity of topics from cardiovascular health to considerations for strength and conditioning.

## JORDAN

Excellent growth occurred in the Return to Health & Performance Research Program with the recruitment of new students, and ongoing funding from MITACS, the Canadian Sport Institute Calgary, and Own the Podium. The research program has evolved from a focus on winter slope sport athletes to a broad focus on primary, secondary, and tertiary knee injury prevention in athletes of all performance levels.

A second Strength & Power Laboratory space is being developed at the Olympic Oval, University of Calgary

to help with recruitment and testing. This lab will complement the Strength & Power Laboratory at the Canadian Sport Institute Calgary.

The Strength & Power Lab Team continues to advance scientific research in neuromuscular adaptations to resistance training to support Canadian Olympic athletes. Research collaborations in Perth Australia and South Africa have further advanced the scope of this research program to help improve outcomes for athletes who suffer serious knee injuries.

## MACINNIS

### Metabolic, Exercise, and Environmental Physiology Laboratory (MEEP)

The Molecular, Exercise, and Environmental Physiology (MEEP) Laboratory is an integrative physiology laboratory primarily interested in understanding how humans respond to individual exercise sessions and long-term exercise training. Led by Dr. Martin MacInnis, this research group investigates: (1) the effects of different exercise training programs on the skeletal muscle, cardiovascular, and hematological systems; (2) the molecular and physio-



logical mechanisms underpinning the plasticity of physiological systems; (3) the influence of oxygen availability on aerobic metabolism, neuromuscular fatigue, and exercise performance; (4) the use of wearable technologies and novel methods to improve exercise testing/prescription and to assess human physiology, and (5) the extent to which responses to exercise are influenced by nutrition, sex, and the environment.

The MEEP Laboratory employs a wide breadth of techniques, ranging from the biochemical and molecular analysis of human tissue to whole-body measures of exercise metabolism, tolerance and performance. The overall aim of their research program is to understand how humans respond to exercise and translate this knowledge to develop optimal strategies for improving the health and fitness of Canadians.

## REIMER

Dr. Raylene Reimer's research focuses on understanding how nutrition and the bacteria that live in our intestine (gut microbiota) interact to affect our risk of developing chronic diseases such as obesity, type 2 diabetes, and fatty liver disease. Changes to the gut microbiota in early life play a particularly strong role in increasing or decreasing the risk of many diseases later in life including obesity and asthma.

The Reimer lab has focused their recent animal work on several aspects of early life microbiota development. In the first instance, they examined changes in the gut microbiota that occur when offspring are born naturally or via Caesarean section and how this impacts obesity risk. A second focus is examination of how fathers' diet affects the metabolism of their offspring. The Reimer lab showed that in addition

to the profound impact of maternal diet on offspring health, a father's diet high in protein, or fibre, or fat and sugar also affects obesity risk in their offspring. A third focus has been the effects of human milk oligosaccharides on the metabolic health of newborn and young rats.

The Reimer lab is engaged in human clinical trial research and is studying

## Injury Prevention, Sport Medicine, and Rehabilitation

### BLACK

#### Injury Prevention, Clinical Intervention, and Implementation Science Research Group

The Injury Prevention, Clinical Intervention, and Implementation Science Research Group is a new group in the Sport Injury Prevention Research Centre. Core projects focus on 1) injury surveillance and epidemiology, 2) evidence-based practice and knowledge translation, and 3) theory-driven implementation, behaviour change and evaluation.

Ongoing projects include examining the implementation of concussion guidelines, education and management protocols for sporting organizations and high schools, examining the context for implementation for injury prevention initiatives, and injury surveillance in high school and university athletic populations.

how prebiotic fiber supplementation can improve health outcomes in children with newly diagnosed type 1 diabetes and in adults with knee osteoarthritis and obesity. Ultimately, the goal of the Reimer lab is to design and evaluate diets aimed at body weight management and optimal gut microbiota profiles.

### EMERY

#### Sport Injury Prevention Research Centre (SIPRC)

Dr. Carolyn Emery is the Chair of the Sport Injury Prevention Research Centre, co-leads the Integrated Concussion Research Program, and holds a Canada Research Chair (Tier 1) in Concussion. Her research program aims to reduce the burden of injuries/concussions and their consequences in youth sport through the development and evaluation of prevention and treatment strategies.

Highlights in 2021 include the evaluation of policy prohibiting body checking in adolescent (15-17 years) hockey players, demonstrating a 62% reduction in injury rates and 51% reduction in concussion rates. Further, body checking experience was not protective of injury/concussion in body checking leagues. Evaluation of a neuromuscular training warm-up (SHRed Injuries Basketball) in youth basketball (ages 11-18) demonstrated 36% lower rates of ankle and knee injury rates. Surveillance in High Schools and Community Sports to Reduce Injuries and their Consequences in Sport (SHRed

Injuries) and SHRed Concussions programs continue to focus on injury and concussion prevention and management across multiple sports nationally. Prevention strategies are being evaluated across training (e.g., neuromuscular training), equipment (e.g., helmet fit, mouthguards), and rules (e.g., zero tolerance for head contact).

The SHRed mobile will increase opportunities to scale up the SHRed Injuries/Concussions Program in partnership with rural and Indigenous communities. Dr. Emery's research group is also evaluating longer-term health outcomes (e.g., clinical, imaging) following youth sport-related concussion compared to uninjured and musculoskeletal-injured controls.

Dr. Emery's research program also focuses on pediatric rehabilitation and evaluation of youth adapted physical activity programs (Calgary Adapted Hub Power by Jumpstart) in the community on multiple health and wellness outcomes.

### SCHNEIDER

#### Concussion Prevention, Detection and Rehabilitation Lab

Dr. Kathryn Schneider's lab focuses on the prevention, detection and rehabilitation of concussion with a special interest in the role of the cervical spine and balance systems. The research group uses clinical and technological tests that evaluate multiple different areas of sensory and motor function, ultimately gaining insight into changes that may occur following a concussion and with recovery. Additionally, with the use of technological tests alongside clinical tests, they are gaining a better understanding of how to

best evaluate various components of function.

Ongoing projects in the lab focus on: (1) the role of neuromuscular training and sensorimotor training in the prevention of concussion; (2) changes in cervical spine, vestibular and sensory function with growth and development; (3) changes in cervical spine, vestibular and sensory function following a concussion; (4) optimizing assessment rehabilitation techniques to inform diagnosis and enhance recovery from concussion; and (5) evaluating implementation of concussion protocols.

The program of clinical research involves collaboration with multiple clinicians and researchers across the University of Calgary and other national and international groups, ultimately enabling clinically meaningful questions to be evaluated and translated back to the clinic.

### SMIRL

#### Cerebrovascular Concussion Research Laboratory

Dr. Jonathan Smirl's research team works in conjunction with the Sport Injury Prevention Research Centre and the Human Performance Laboratory. The research group is focused on understanding the basis of the physiological and autonomic disruptions which occur following concussion. The aim is to use this knowledge base to develop informed interventions (exercise, physiological and pharmacological) which can be used to aid in the recovery process during both the acute and chronic symptom periods.

Dr. Smirl's lab is currently leading the

## GENERAL COMMENTS

exercise-based measures in the Pan-Canadian Surveillance in High Schools to REDuce (SHRed) Concussions project. They are actively collaborating with other Canadian institutions on objectively quantifying the extent concussed athletes rest and exercise following concussions.

The build out of the research space for Dr. Smirl's lab was completed in August 2020 and they have spent the remainder of the year bringing in new equipment and training so they will be

### Human Locomotion, Sport Performance, and Sport Injury Biomechanics

#### KUO

Dr. Arthur Kuo's laboratory studies the biomechanics, energetics and neural control of human movement. They develop computational models of the human body dynamics and apply them to simulations and analyses of locomotion and upper extremity reaching movements. They also perform experiments to test model predictions of stability, motion trajectories and energy expenditure.

Ongoing projects include studies of human walking on uneven terrain, use of inertial measurement units to record locomotion in the real world, energetics of human reaching and modeling of neural central pattern generators for locomotion. These projects are intended to reveal basic mechanisms of locomotion and other movements, with applicability to neural rehabilitation and diagnosis of movement impairments.

able to perform in person testing in the upcoming year. Through an integrative approach to concussion research and collaboration network, Dr. Smirl's research group aims to create new approaches and interventions which will enable them to objectively assess physiological disruptions following concussion and improve outcomes for individuals following this traumatic injury.

#### NIGG

##### Biomechanig Sport & Health Research

The Nigg research group concentrates on locomotion topics that are health and performance related with special considerations for footwear, apparel, and equipment.

In the next five years, the research group plans to focus on the following key topics: 1) The influence of footwear design on lower limb work distribution; 2) applying machine learning tools to develop and validate algorithms; 3) using shape modelling techniques to help design better fitting sport shoes; 4) investigating the "teeter-totter" mechanism, to better understand enhanced running performance in specific long distance footwear; 5) the development of a soft tissue vibration quantification technique.

## GENERAL COMMENTS

#### STEFANYSHYN & WANNOP

Research within Dr. Stefanyshyn and Dr. Wannop's research group focuses on questions related to human locomotion, sport performance, and sport injury biomechanics.

Research interests extend to functional sport equipment with a goal of tuning the properties of the equipment to specific athlete characteristics 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 factors.

In 2021, industry work explored identifying methods of matching sport equipment and footwear to individual athletes. Investigations studied internal mechanisms using ultrasound imaging to explain an athlete's response to changes in shoe cushioning material and investigating how foot shape, size and sensitivity influence preferred insole selection.

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. This past year valuable insight was gained on the role of sport surface characteristics studying different compositions of infilled artificial turf as well as next generation non-infilled surfaces.

## Growth and Development

#### GABEL

Dr. Gabel leads a newly established group in the Human Performance Laboratory. Her research examines the role of physical activity and exercise on musculoskeletal health across the lifespan. Specifically, Dr. Gabel's lab is interested in the influence of sex and maturation on skeletal development in children and adolescents.

Dr. Gabel is also involved in spaceflight research to better understand the impact of unloading (e.g., microgravity) on skeletal adaptation.



## Movement Science and Musculoskeletal Health

### EDWARDS

Mechanical fatigue of load bearing biological tissue is an inevitable consequence of physical activity. Over time, habitual loading of the musculoskeletal system causes microdamage accumulation that reduces the overall quality of the tissue and leads to a reduction in stiffness and an increase in mechanical strain with continued loading. Without adequate tissue repair and adaptation, the evolution and accumulation of microdamage may eventually lead to musculoskeletal injury. Mechanical fatigue is believed to play a predominant role in the pathophysiology of musculoskeletal injuries such as bone stress fracture as well as Achilles and patellar tendinopathy.

Dr. Edwards' research combines biomechanical experimentation with advanced medical imaging and computational modeling to investigate tissue damage and fatigue in response to mechanical loading. This unique approach allows for the estimation of *in vivo* tissue mechanics in a non-invasive and subject-specific manner. The work in his research group spans multiple dimensional scales, from basic experiments at the tissue-level that enhance our understanding of the mechanical fatigue process, to applied experiments at the whole-body level for the development of treatments and interventions to improve tissue quality and decrease injury risk.

### FEDERICO

#### Continuum Biomechanics Group

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 this group is devoted to the mathematical foundations of Continuum Mechanics and its applications to the Biomechanics of Soft Tissue. In particular, they are interested in modelling soft tissue accounting for its structural elements, i.e., collagen fibres, cells, non-fibrous extracellular matrix and fluid.

Most phenomena of structural rearrangement in a biological tissue can be described under the umbrella of growth and remodelling. Structural damage is what can initiate injury and disease. A main theme is the modelling of articular cartilage. 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 extremely low-friction contact. When the tissue degenerates because of diseases such 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, remodelling and damage processes may shed light on the causes of the initiation of degeneration, and suggest possible treatments to prevent disease.

### HERZOG

This past year, Walter Herzog's research group solved a long-standing controversy in striated muscle physiology: does cardiac muscle possess residual force enhancement properties? In contrast to much of the literature, they unequivocally established that isolated myofibrils and single sarcomeres from the rabbit heart clearly possess this property.

They also identified that skeletal muscle in obese rats and spastic muscles from children with cerebral palsy have functional and strength deficits. In obesity, these deficits were associated with intra-muscular fat infiltration and fibrosis, and in cerebral palsy with a dramatic loss of the structural protein titin.

In the area of cartilage biomechanics and osteoarthritis, they wrote a comprehensive review on the role of muscles in human knee joint osteoarthritis and refined methods to make first-ever high-temporal resolution measurements of the deformations of chondrocytes during dynamic cartilage loading. These measurements are the product of year-long improvements in the microscopic approach and associated development of novel analysis software.



## Motor Behaviour and Neural Control of Movement

### CLUFF

#### Integrative Sensorimotor Neuroscience Laboratory

The Integrative Sensorimotor Neuroscience Laboratory is a growing group in the Human Performance Laboratory. Their work is focused on the mechanistic, multidisciplinary study of human sensorimotor control and learning. They combine behavioural experiments with robotics, medical imaging, and computational models to examine the function of the human sensory and motor systems. They focus on understanding how basic aspects of sensory processing contribute to human motor control and learning.

Ongoing projects in the lab focus on four topics: 1) the role of sensory feedback in the selection, planning, and control of voluntary movements, 2) basic principles of sensory processing and how they impact individual patterns of human motor behaviour, 3) probing the function of neural circuits that support motor behaviour, and 4) identifying how impairments in sensory and motor function caused by stroke and concussion influence sensorimotor control and learning. Through their basic science program and ongoing collaborations, they hope to generate tools that allow them to better assess, monitor and diagnose deficits in sensory and motor function.



### PETERS

#### Integrative Sensorimotor Neuroscience Laboratory

Dr. Ryan Peters' laboratory investigates the neural basis of human movement using a variety of physiological, behavioural and computational techniques in concert.

There are basic and applied science streams of research currently ongoing in the lab. Within the basic science stream, he studies complex interactions between sensory and motor neurons during voluntary movement. Dr. Peters specializes in microneurography: the only method for directly recording the activity of human somatosensory neurons (muscle spindles, Golgi tendon organs, skin and joint receptors). Currently, their focus is on the functional properties of the muscle spindle's fusimotor system, which remains poorly understood, particularly in humans.



In the applied research stream, the focus is on developing new vibration-emitting wearable technologies for remote neurological diagnostics and monitoring. Both healthy older adults and individuals suffering from neurological disorders (e.g., diabetic and chemotherapy-induced peripheral neuropathy) experience a decline in somatosensory function that is associated with impairments in manual dexterity and balance. Vibration-emitting wearable technologies offer a promising new alternative to standard clinical tests of neuropathy, which are both arduous for clinicians and not well controlled.

Dr. Peters is the Chief Science Officer and co-founder for a new wearable device company, Vibratus Inc., that will bring these technologies to market for the first time.

### Presentations

- New Concussion Resources for Sport Organizations — Amanda Black, Kathryn Schneider  
2021 Canadian Concussion in Sport Virtual Symposium, Virtual, February
- Assessing Vertical Jump Force-Time Asymmetries: Performance, Injury and Return to Sport Forecasting – Matt Jordan  
Sports Biometrics Conference, Virtual, February 2021
- Assessing Vertical Jump Force-Time Asymmetries: Performance, Injury and Return to Sport Forecasting – Matt Jordan  
University of Iowa Running Injury Symposium, Virtual, February 2021
- So, You Want to Build a Holacracy? Learn to Follow Before You Lead – Matt Jordan  
Art of Coaching Communication and Leadership Strategy Summit, Virtual, March 2021
- Return to rugby post COVID: opportunities for injury prevention: The SHRED concussion program – Stephen West, Isla Shill  
Coast-to-coast national rugby coaching conference, Virtual, March 2021
- Designing Concussion Education: Moving Towards changing Behaviour – Amanda Black  
Loughborough University Seminar series, Virtual, May 2021
- There's no glamour in overtraining: recovery cues and tips – Patricia Doyle-Baker  
UofC Marathon seminar series, Virtual, May 2021
- Menstrual linked asthma: what we (don't) know and where we need to go – Patricia Doyle-Baker, C. Lebrun, J. Thornton  
5TH Biennial Female Athlete Conference. Virtual, May 2021
- Re-pre-habilitating the Hamstring Muscle Group to Prevent ACL Reinjury after Hamstring Autograft – Matt Jordan  
Exercise and Sport Science Association – Research to Practice, Virtual, May 2021
- SHRed Concussions Rugby – Carolyn Emery  
Rugby Canada Annual Meeting, Virtual, May 2021
- Continuum Mechanist by Chance – Salvatore Federico  
Alberta Innovates – High School Youth Researcher Summer Programme, July 2021
- The Hamstring Conundrum: Data-Led Approach to Rehabilitation after ACL Reconstruction – Matt Jordan  
Brazilian Biomechanics Conference, Virtual, September 2021

## PUBLIC ENGAGEMENT

- Concussion prevention and management - community initiatives: The SHRed Mobile – Carolyn Emery  
SHRed Concussions Research and Community Engagement (RACE) Symposium, Virtual, September 2021
- What's new in rugby concussion prevention? – Stephen West, Isla Shill  
SHRed Concussions Research and Community Engagement (RACE) Symposium, Virtual, September 2021
- Concussion prevention in youth ice hockey – Ash Kolstad, Paul Eliason  
Research and Community Engagement (RACE) Symposium, Virtual, September 2021
- Concussion Prevention Panel: Collision Sports – Reid Strydiuk  
Oral Presentation (Panel Discussion). Research and Community Engagement (RACE) Symposium, Virtual, September 2021
- Getting Back to Health and Performance after Knee Injuries: Why Strength Matters – Matt Jordan  
The Woods Forum, Virtual, November 2021
- “Take my breath away”: Asthma in female athletes and effects of reproductive hormones and strategies for screening and management – Patricia Doyle-Baker, Connie Lebrun  
IOC World Conference on Prevention of Injury & Illness in Sport, Monaco, November 2021
- Targets for the prevention of injuries and their consequences in youth sport – Carolyn Emery  
Wood Forum 2021: Sports Injury Prevention, Virtual, November 2021
- Female athlete's health: adding the X's and O's – Patricia Doyle-Baker  
Grouse Mountain Ski Club, Virtual, December 2021
- SHRed Concussions – Carolyn Emery, Stephen West, Isla Shill  
SHRed Concussions Rugby Canada AGM, 2021
- SHRed Concussions – Stephen West, Isla Shill  
Rugby Alberta Town Hall, 2021

## PUBLIC ENGAGEMENT

### Media and Interviews

- [Virtual forum to address indirect effects of COVID-19 pandemic on Canadian children](#) – Patricia Doyle-Baker  
UToday, B. DeAngelis. January 2021
- [The Kinesiology Students' Society intent on making the student experience special](#) – Tyler Cluff  
University of Calgary website, Stacy McGuire. February 2021.
- [Calgary research group wins major grant to study motor learning after stroke](#) – Tyler Cluff  
Canadian Partnership in Stroke Recovery (CPSR) Newsletter, Heart and Stroke Canada. March 2021
- [Kinesiology researcher studies rare fractures in post-menopausal women](#) – Brent Edwards  
UCalgary News, Leanne Yohemas, March 2021
- [What can Sports Exercise Medicine learn from the International Space Station?](#) – Leigh Gabel  
British Journal of Sports Medicine Podcast. May 2021
- [Students passionate about preventing disease through physical activity](#) – Patricia Doyle-Baker  
UToday, Leanne Yohemas. May 2021
- [Wearable device developed to help diagnose brain health of boxers, MMA fighters](#) – Ryan Peters  
CTV News, Ryan White. May 2021
- [Electrifying new research on the impact of head trauma in career fighters](#) – Ryan Peters  
UCalgary Newsroom, Leanne Yohemas. May 2021
- [Dr. Ryan Peters' Faculty of Kinesiology team created a new technology that could help protect the brain health of career fighters by providing trainers, coaches, and medical staff with important information for 'return-to-ring' decisions](#) – Ryan Peters  
Facebook. May 2021
- NRK Viten program investigation into the link between artificial sweeteners and obesity – Raylene Reimer  
Norwegian Broadcasting Corporation, Chris Veloy. May 2021
- [Investigating Exercise Science, Sports Injuries, and breaking into the Movement](#)

[Science Field](#) – Brent Edwards  
BioTEC Podcast, June 2021

[Why regaining physical fitness post-COVID may improve mental health](#) – Patricia Doyle-Baker  
UToday, J. Mackenzie. August 2021

Significance of Concussion Awareness Week – Amanda Black  
Concussion Expert Radio Interview, CFRA station. Kirsty Cameron. September 2021

[SHRed mobile. U of C initiative researches concussions and sports injuries in Alberta youth](#) – Carolyn Emery  
CTV News. September 2021

[Innovative project SHReds concussions and injuries in youth across Alberta](#) – Carolyn Emery  
UCalgary news. September 2021

[Five UCalgary researchers named Killam Annual Professors](#) – Carolyn Emery  
UCalgary news. September 2021

[Wearable Tech and the Future of Health](#) – Ryan Peters  
Arch Magazine, UCalgary, Brennan Black and Jaelyn Molyneux. September 2021

We talk concussions: SHRed Moblie – Carolyn Emery  
Global News Radio, 770 CHQR. October 2021

[Continuum Mechanics of Soft Tissues](#) – Salvatore Federico  
Canadian Society for Biomechanics Podcast Series. December 2021

## Tours & Events Hosted

The Faculty of Kinesiology welcomes students into its facilities for tours and events annually. Students from Calgary high schools and programs such as Operation Minerva, IBM STEM4Girls, Shad Valley, and Heritage Youth Researchers Summer program are provided the opportunity to visit various labs in the faculty to learn about science, technology, engineering, and mathematics in a university setting. For health reasons, all events were cancelled in 2021.

## Workshops, Forums, Panels & Webinars

Anatomy of a Pandemic – Patricia Doyle-Baker, Suzanne Tough, Kelly Dean Schwartz, Gina Dimitropoulos  
Panel, Public Forum, Virtual, January 2021

The world at war with a virus: the science behind the headlines – Raylene Reimer  
Series of Four Community lectures  
What is a virus? Virtual, January 2021  
Why do I feel sick with a virus? Virtual, January 2021  
What is a vaccine? Virtual, January 2021  
What happens during quarantine? Virtual, February 2021

Concussion Education Webinar: How to recognize a suspected concussion and support management for parents and coaches – Amanda Black  
SHRed Concussions – Public online concussion education session, February 2021

Seminar on Assessing and Monitoring Interlimb Force-Time Asymmetries – Matt Jordan  
Houston, Texas, March 2021

Monitoring the Uncertain Journey Back from ACL Injury – From Case Study to Prospective Study – Matt Jordan  
Simon Fraser University Sports Analytics Meeting, Burnaby, BC, March 2021

SHRed Concussions: Surveillance in High School and Community Sport to Reduce Concussions and their Consequences in Youth – Carolyn Emery  
Quarterly Speaker Series, Michigan Concussion Center, University of Michigan, Virtual, April 2021

[Spaceflight: Bad to the Bone](#) – Leigh Gabel  
Canadian Space Health Research Network (CSHRNet), May 2021

Strategies to improve exercise performance: Exercise physiology and interval training – Martin MacInnis  
Run 21 Marathon Training Program, Virtual, May 2021

The Climb – Patricia Doyle-Baker  
Panel, Third Action Film Festival, Virtual, June 2021

SHRed Concussions Research and Community Engagement (RACE) Symposium – Carolyn Emery  
Symposium, Virtual, September 2021

RACE Seminar – Carolyn Emery  
Seminar, Virtual, September 2021

## PUBLIC ENGAGEMENT

- Coaching the Female Athlete – Patricia Doyle-Baker, Jenni Stielow, Cam Stephen, Erin Wilson, Diane Culver  
Panel, Canadian Alpine Coach Education Series, Virtual, October 2021
- Guidelines for successful implementation of best practice in a team/federation – Carolyn Emery  
Webinar, Aspetar Journal Online Forum, Virtual, October 2021
- Turf Traction Research – Darren Stefanyshyn  
2021 FieldTurf Annual Sales Meeting, Marana, Arizona, USA, November 2021
- Video teaching essentials – John Holash  
Video Webinar, Virtual via Taylor Institute
- How to make the most of what you have – John Holash  
Video Webinar, Virtual via Taylor Institute

## Other Knowledge Translation Activities, Publications and Documents

- [Concussion and Visual Impairments Resource](#) – Amanda Black  
Vision impairment specific concussion resources, online
- [Concussion Awareness Training Tool for High Performance Athletes](#) – Amanda Black  
Education resource in collaboration with U Sport for varsity programs in Canada, online. February 2021
- [SHRED injuries website](#) – Carolyn Emery  
Online resources. April 2021
- [“Pre-View” \(Sport Injury Prevention Research Centre Newsletter\)](#) – Carolyn Emery  
Newsletter, first edition, online. July 2021
- [“Pre-View” \(Sport Injury Prevention Research Centre Newsletter\)](#) – Carolyn Emery  
Newsletter, summer edition, online. August 2021
- [Prebiotics and gut microbiota: how they work together to affect metabolic health](#)  
– Raylene Reimer  
The Digest 55(4):1-5. Fall 2021
- [Coaching Female Athletes](#) – Patricia Doyle-Baker  
Blog, LinkedIn. October 2021
- [“Pre-View” \(Sport Injury Prevention Research Centre Newsletter\)](#) – Carolyn Emery  
Newsletter, fall edition, online. November 2021

## PUBLIC ENGAGEMENT

- What is Exercise physiology? How to maintain your hard-won exercise fitness through summer, aging and athletics. Exercise physiology basics – John Holash  
Presentations, Foothills Nordic
- Reimer RA, Delzenne NM. 2021. Dieting for Success: What Baseline Gut Microbiota Can Tell You About Your Chances of Losing Weight. *Gastroenterology* 160(6):1933-1935. DOI: [10.1053/j.gastro.2021.02.021](https://doi.org/10.1053/j.gastro.2021.02.021)
- MacIntosh, B.R., K.B. MacDougall, T.M. Falconer and R.J. Holash. Letter to the Editor: In [Reworking the recipe: Adding experimentation and reflection to exercise physiology laboratories](#). – Martin MacInnis, Cari Din Blog, American Physiological Society.
- Bosivert NMJ, Hayden KA, Doyle-Baker PK. 2021. Familial resemblance of bone health in maternal lineage pairs and triads: A scoping review protocol.

## PATENTS AND LICENSES

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- System and method for measuring skin sensitivity to vibration  
WIPO (PCT) Patent Appln No. CA2021/051533  
Inventors: Peters, R.M., Osman, N.M., Aburashed, R., Darici, O.



## OFFICIAL RESEARCH RELATED FUNCTIONS

### ABOODARDA

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#### Memberships

- Canadian Society for Exercise Physiology
- The American College of Sports Medicine

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### BLACK

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#### Board Member

- Canadian Athletic Therapy Association Education Committee
- Pediatric Research in Sport Medicine Society Education Committee
- Sport Information Research Centre

#### Conference Reviewer

- Conference Reviewer for CATA Conference
- Conference Reviewer for PRISM Abstracts

#### Membership

- American College of Sport Medicine
- Pediatric Research in Sports Medicine Society
- Alberta Athletic Therapy Association
- Canadian Athletic Therapy Association (CATA)
- International Society of Qualitative Research in Sport & Exercise
- National Athletic Trainer Association

### CLUFF

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#### Grant Reviewer

- NSERC Discovery Grant program, External
- NSERC CGS-M competition, University of Calgary
- University Research Grants Committee, University of Calgary
- Faculty of Graduate Studies Graduate Awards Committee, University of Calgary

#### Conference Reviewer

- Motor Learning and Motor Control (MLMC) Conference, Society for Neuroscience Satellite Meeting

#### Memberships

- Society for the Neural Control of Movement
- Society for Neuroscience

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### DOYLE-BAKER

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#### Advisory Board Member

- Annals of Applied Sport Science
- Alpine Canada True Grit Award

#### Editorial Board Member

- International Journal of Environmental Research in Public Health
- International Journal of Kinesiology and Sport Science (IJKSS)

#### Scientific Board Member

- International Congress on Sport Science in Skiing (ICSS)

#### Conference Organization

- Canadian Society for Exercise Physiologists (CSEP) for 2023 conference

#### Membership

- Alberta Fitness Leadership Associa-

## OFFICIAL RESEARCH RELATED FUNCTIONS

### tion (AFLCA)

- Alberta Children's Hospital Research Institute (ACHRI)
- American College of Sports Medicine (ACSM)
- Canadian Society of Exercise Physiology (CSEP)
- The Coaching Association of Canada (CAC)
- European College of Sport Science (ECSS)
- O'Brien Institute for Public Health

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### EDWARDS

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#### Executive Board Member

- Secretary General, International Society of Biomechanics

#### Editorial Board Member

- JBMR Plus
- BONE
- Bone Reports
- Journal of Biomechanics

#### Conference Reviewer

- Canadian Society of Biomechanics
- American Society of Biomechanics
- Orthopaedic Research Society

#### Membership

- Canadian Society of Biomechanics
- American Society of Biomechanics
- International Society of Biomechanics
- American College of Sports Medicine
- Orthopaedic Research Society
- American Society of Bone and Mineral Research

### EMERY

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#### Editor

- Associate Editor, British Journal of Sport Medicine

#### Executive Board Member

- Canadian Concussion Network Executive Committee
- Co-Lead Training and Career Development Committee, Canadian Concussion Network
- Canadian Traumatic Brain Injury Research Consortium Executive Committee
- Canadian Traumatic Brain Injury Research Consortium – Chair Training and Education Committee

#### Advisory Board Member

- Centre for Health and Injury and Illness Prevention in Sport (CHI2PS) University of Bath

#### Editorial Board Member

- Journal of Science and Medicine in Sport

#### Scientific Advisor

- Expert Group 6th International Consensus on Concussion in Sport

#### Scientific Board Member

- External Reviewer, Promotion to Associate Professor, University of South Carolina
- External Reviewer, Promotion to Full Professor, Harvard University
- External Reviewer, Promotion to Associate Clinical Professor, University of Michigan
- Concussion in Para Sport (CIPS) Expert Group
- Canadian Physiotherapy Association Strategic Research Committee

## OFFICIAL RESEARCH RELATED FUNCTIONS

### Committee Member

- Concussions Research and Community Engagement Symposium, Chair
- Canadian Concussion Network Annual meeting, Chair Conference Organizing Committee
- Canadian Traumatic Brain Injury Research Consortium national meeting, Conference Organizing Committee
- Scientific Committee World Conference on Prevention of Injury and Illness in Sport
- Injury Prevention Symposium Canadian Academy of Sport and Exercise Medicine, Co-chair
- Expert Group 6th International Consensus on Concussion in Sport
- Massive Open Online Course (MOOC) in Concussion –Leadership Committee
- O'Brien Institute for Public Health, Population Health Panel Committee (2021)

### Grant Reviewer

- Canadian Academy of Health Sciences Fellowships
- Society of Canada College of New Scholars
- Canadian Institutes of Health Research, Social & Developmental Aspects of Children's & Youth's Health Project Review

### Conference Reviewer

- World Conference on Prevention of Injury and Illness in Sport 2021
- Osteoarthritis Research Society International 2021
- Canadian Traumatic Brain Injury Research Consortium
- Canadian Concussion Network An-

### nual Meeting

#### Membership

- Strategic Research Committee of the Canadian Physiotherapy Association
- Canadian Academy of Health Sciences Fellow
- Society of Canada College of New Scholars
- Osteoarthritis Research Society International
- Hotchkiss Brain Institute, University of Calgary
- Centre for Hip Health and Mobility, University of British Columbia
- O'Brien Institute of Public Health, University of Calgary
- McCaig Institute for Bone and Joint Health, University of Calgary
- Alberta Children's Hospital Research Institute for Child Health, University of Calgary
- American College of Sport Medicine
- Society for Epidemiologic Research
- Canadian Society for Epidemiology and Biostatistics
- Alberta College of Physiotherapists
- Alberta Physiotherapy Association
- Canadian Physiotherapy Association Sport Physiotherapy Division
- Canadian Physiotherapy Association Research Division
- Canadian Physiotherapy Association Pediatric Division
- Canadian Physiotherapy Association

## OFFICIAL RESEARCH RELATED FUNCTIONS

### FEDERICO

#### Executive Board Member

- Member of the Canadian National Committee of the International Union of Theoretical and Applied Mechanics (CNC-IUTAM)

#### Editorial Board Member

- Mathematics and Mechanics of Solids
- Atti dell'Accademia Peloritana dei Pericolanti, Classe di Scienze Matematiche, Fisiche e Naturali

#### Committee Member

- Selection Committee Member, Society for Natural Philosophy
- Evaluation Group Member, Mechanical Engineering, Natural Sciences and Engineering Research Council of Canada

#### Grant Reviewer

- Evaluation Group Member, Mechanical Engineering, Natural Sciences and Engineering Research Council of Canada
- NFRF (New Frontiers in Research Fund, Canada) Exploration Grant, External
- "Ingegneri & Ingegneria a Firenze", 281 p., Firenze University Press, External

#### Membership

- International Society of Biomechanics
- Canadian Society for Biomechanics
- International Union of Theoretical and Applied Mechanics
- Italian Association of Theoretical and Applied Mechanics
- European Mechanics Society

- Society for Natural Philosophy
- Society of Engineering Science
- Cardiac Physiome Society
- M&MoCS, International Centre for Mathematics and Mechanics of Complex Systems

### GABEL

#### Editorial Board Member

- Associate Editor, British Journal of Sports Medicine

#### Membership

- Canadian Society of Exercise Physiology
- American Society for Bone and Mineral Research

### HERZOG

#### Editor

- Co-Editor in Chief, Journal of Sport and Health Science
- Associate Editor, Exercise and Sports Science Reviews
- Associate Editor, IEEE Transactions in Neural Systems and Rehabilitation Engineering

#### Editorial Board Member

- BMC Biomedical Engineering
- Chiropractic & Manual Therapies
- The Current Issues of Sport Science (CISS)
- Journal of Functional Morphology and Kinesiology
- Biomechanics and Modeling in Mechanobiology
- International Journal of Mechanical

## OFFICIAL RESEARCH RELATED FUNCTIONS

- and Materials Engineering
- Muscles, Ligaments and Tendons Journal
- Sports Orthopaedics and Sports Traumatology
- Molecular and Cellular Biomechanics
- Journal of Biomechanics
- Journal of Electromyography and Kinesiology
- Journal of Manipulative and Physiological Therapeutics
- Journal of the Canadian Chiropractic Association
- Sportverletzung Sportschaden

### Advisory Board Member

- German Journal of Exercise and Sport Research
- Nike Sport Research Advisory Board
- German Journal of Sport Sciences
- Sportwissenschaft Journal
- Sportorthopädie Sporttraumatologie

### Committee Member

- Vice-Chair, Motor Control Group, International Society of Biomechanics
- External Review Committee Member, Faculty of Movement Science, University of Leuven, Belgium

### Grant Reviewer

- Natural Sciences and Engineering Research Council of Canada
- CIHR College of Reviewers

### Conference Organization

- Scientific Chair, Active Muscle Mechanics: Bone and Soft Tissue, World Congress of Biomechanics, July 10-14, 2022, Taipei, Taiwan
- Chair, Hay Award Session, American

- Society of Biomechanics, Atlanta, Georgia, USA, Aug 10-13, 2021 (virtual)
- Chair, Dyson Lecture, International Society of Biomechanics in Sports, Canberra, Australia, Sep 3-7, 2021 (virtual)
- Co-organizer (with Drs. Paola Connessa and James Richards), International Symposium on Motor Control in Biomechanics, in conjunction with the 7th International Foot and Ankle Congress, Sao Paulo, Brazil (virtual) April 11, 2021
- Career Award Committee, Canadian Society for Biomechanics, Montreal, QC, May 2021 (postponed from August 2020)
- Scientific Committee Member, Congress of International Society of Biomechanics/Japanese Society of Biomechanics, Fukuoka, Japan, July 30-Aug 3, 2023
- International Scientific Committee Member, IUPESM World Congress on Medical Physics and Biomedical Engineering 2021 (WC2021), Singapore
- Scientific Committee Member, European Society of Biomechanics Congress, Warsaw, Poland (2019-2022)
- Scientific Advisory Board Member, International Congress on Science and Skiing (ICSS), Austria, 2022

### Conference Reviewer

- 43rd Annual International Conference of the IEEE Engineering in Medicine & Biology Society (EMBC)

### Memberships

- International Society of Electrophysiology and Kinesiology
- Brazilian Society of Biomechanics

## OFFICIAL RESEARCH RELATED FUNCTIONS

- Elected Honorary Member, Chilean Association for Human Movement Science
- Osteoarthritis Research Society International
- Fellow, Royal Society of Canada
- European College of Sport Science
- American Physiological Society,
- European Society of Biomechanics
- International Society of Biomechanics
- Orthopaedic Research Society, American Academy of Orthopaedic Surgeons
- Biophysical Society
- American Association for the Advancement of Science
- Canadian Society for Biomechanics
- American Society of Biomechanics

## HOLASH

### Membership

- Canadian Society for Exercise Physiology
- West grid
- Compute Canada
- Simga-Xi

## JORDAN

### Editor

- Review Editor, Elite Sports and Performance Enhancement, Frontiers in Sports and Active Living
- Review Editor, Biomechanics and Control of Human Movement, Frontiers in Sports and Active Living

### Advisory Board Member

- Scientific Board Member for National Return to Health & Performance Task Force

### Committee Member

- Committee Member for Conjoint Health Research Ethics Board

### Membership

- Sport Scientist Canada Professional
- European College of Sport Science (ECSS)
- Certified Strength and Conditioning Specialist (CSCS), National Strength and Conditioning Association

## MACINNIS

### Grant Reviewer

- New Frontiers in Research Fund
- NSERC Discovery Grant

## PETERS

### Committee Member

- Emma Plater, University of Guelph

### Grant Reviewer

- NSERC Idea-to-Innovation Grant

### Conference Reviewer

- 2022 IEEE Haptics Symposium (HAPTICS)

### Membership

- Society for Neuroscience

REIMER

Editor

- Associate Editor, Applied Physiology, Nutrition and Metabolism

Scientific Advisor

- General Mills Inc.

Editorial Board Member

- Frontiers in Endocrinology

Committee Member

- Canadian Nutrition Society Awards Committee
- Data Monitoring Committee: FMT in Major Depression
- Executive Committee, Canadian Obesity Network-Calgary Chapter, Recruitment/Networking Coordinator
- Canadian Nutrition Society-University of Calgary Faculty Advisor

Grant reviewer

- Fonds de la Recherche Scientifique (FNRS), Research Director
- Dairy Farmers of Canada
- Harold Hamm Diabetes Centre Team Science Grant
- Natural Sciences and Engineering Research Council Discovery Grant

Membership

- College of Dietitians of Alberta
- Canadian Nutrition Society
- American Society for Nutritional Sciences
- The Obesity Society
- Obesity Canada (formerly Canadian Obesity Network)
- Obesity Canada, Calgary Chapter

STEFANYSHYN

Editorial Board Member

- Footwear Science
- European Journal of Sport Science

Board Member

- Footwear Biomechanics Group

Committee Member

- NFL Engineering Committee



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## PEER REVIEWED JOURNAL ARTICLES

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- Wilkins AT, Reimer RA. 2021. Obesity, early life gut microbiota and antibiotics. *Microorganisms* 9(2):413. DOI: [10.3390/microorganisms9020413](https://doi.org/10.3390/microorganisms9020413)
- Williamson R, Kolstad AT, Krolkowski MR, Nadeau L, Goulet C, Hagel B, Emery CA. 2021. Incidence of Head Contacts, Penalties and Player Contact Behaviors in Youth Ice Hockey Players: Evaluating the “Zero Tolerance for Head Contact” Policy Change. *Ortho J Sports Med* 9(3). DOI: [10.1177/2F2325967121992375](https://doi.org/10.1177/2F2325967121992375)
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- Wong JD, Cluff T, Kuo AD. 2021. The energetic basis for smooth human arm movements. *eLife* 10: e68013. DOI: 10.7554/eLife.68013
- Wong MT, Wiens C, Lamothe J, Edwards WB, Schneider PS. 2021. Four-dimensional CT analysis of normal syndesmotic motion. *Foot & Ankle International*, 42, 1491-1501.
- Zhang J, Iannetta D, Alzeeby M, MacInnis MJ, Aboodarda S. 2021. Exercising muscle mass influences neuromuscular, cardiorespiratory, and perceptual responses during and following ramp incremental cycling to task failure. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*. 321(2): R238-R249.
- Zimmerman HB, Costa FE, Sakugawa R, MacIntosh BR, Diefenthaler F, Dal Pupo J. 2021. Plyometric exercise enhances twitch contractile properties but fails to improve voluntary rate of torque development in highly trained sprint athletes. *European Journal of Sport Science*. DOI: [10.1080/17461391.2021.1916083](https://doi.org/10.1080/17461391.2021.1916083)
- Zimmerman HB, Knihs D, Diefenthaler F, MacIntosh BR, Dal Pupo J. 2021. Continuous countermovement jumps enhances twitch peak torque of quadriceps muscles and sprint performance in highly-trained sprint athletes. *International Journal of Sports Physiology and Performance* 16(4): 565-572. DOI: [10.1123/ijsp.2020-0240](https://doi.org/10.1123/ijsp.2020-0240)

## BOOKS AND BOOK CHAPTERS

- Howard JJ, Herzog W. 2021. Skeletal muscle in cerebral palsy: from belly to myofibril. *Cerebral Palsy: New Developments*. (Eds.) Antigone Papvasiliou et al. *Frontiers in Neurology and Frontiers in Pediatrics*. Frontiers Media SA, Lausanne, Pg(s) 89-103. DOI: [10.3389/fneur.2021.620852](https://doi.org/10.3389/fneur.2021.620852)
- Jordan, M. 2021. Enhancing Movement Efficiency in Sport. In *High Performance Training for Sports* (2nd edition). Human Kinetics.
- Jordan M. 2021. Resistance Training for Sport Performance. In *National Academy of Sports Medicine* (2nd edition).





## TECHNICAL REPORTS

- Barrons Z, Esposito M, Smith E, Wannop JW, Stefanyshyn D. 2021. Regional Traction Requirements of Female Basketball Shoes. Technical Report for adidas Concept Excellence.
- Barrons Z, Esposito M, Wannop JW, Stefanyshyn D. 2021. Mechanical Traction of Football and Soccer Cleats. Technical Report for Under Armour.
- Clermont C, Wannop JW, Barrons Z, Esposito M, Culo M, Stefanyshyn D. 2021. 4D Shear: Phase 2 Shoe Shear, Running Mechanics and Running Performance. Technical Report for adidas Future Team.
- Hoitz F, Vienneau J, Nigg SR, Nigg BM. 2021. Developing a Virtual Coaching System for Hockey Study 3: Validation. Report to CCM, Scorched Ice.
- Hoitz F, Vienneau J, Subramaniam A, Nigg SR, Nigg BM. 2021. Developing a Virtual Coaching System for Hockey Study 2: Skill Metrics. Report to CCM, Scorched Ice.
- Honert EC, Cigoja S, Wallnoefer E, Nigg SR, Nigg BM. 2021. Quantification of the Biomechanical Benefits of Prefabricated Vulcanized Rubber Flooring. Report to Mondo.
- Matijevich E, Behling AV, Subramaniam A, Honert E, Vienneau J, Nigg SR, Nigg BM. 2021. Marketing Support for a "Hollow" Shoe Design Phase II. Report to Li Ning.
- Matijevich E, Moghadam NK, Vienneau J, Nigg SR, Nigg BM. 2021. "Rolling Bar" Concept Evaluation. Report to Li Ning.
- Stefanyshyn D, Wannop JW. 2021. Basketball Endurance. Technical Report for adidas Concept Excellence.
- Stefanyshyn DJ, Esposito M, Wannop JW. 2021. Evaluation of X22 Soccer Shoes. Technical Report for adidas Future Team.
- Vienneau J, Cigoja S, Honert E, Nigg SR, Nigg BM. 2021. ON Cloud Swift: Competitor Evaluation. Report to ON.
- Vienneau J, Honert E, Nigg SR, Nigg BM. 2021. Biomechanical Competitor Evaluation of a Prototype Activity Shoe. Report to FitFlop.
- Vienneau J, Nigg SR, Nigg BM. 2021. Reliability and repeatability evaluation of XSENSOR's foot pressure system: An executive summary. Report to XSENSOR.
- Wannop JW, Barrons Z, Esposito M, Clermont C, Culo M, Dominguez E, Stefanyshyn D. 2021. Female Forefoot Bending Stiffness. Technical Report for adidas Future Team.
- Wannop JW, Crawford R, Trauma R, Barrons Z, Clermont C, Stefanyshyn DJ. 2021. Evaluation of Techfit Prototypes. Technical Report for adidas Future Team.
- Wannop JW, Esposito M, Barrons Z, Stefanyshyn DJ. 2021. Mechanical Traction of Wet Non-infilled Artificial Surfaces. Technical Report for FieldTurf Inc.

## TECHNICAL REPORTS

- Wannop JW, Esposito M, Smith E, Kowalchuk S, Barrons Z, Stefanyshyn, D. 2021. Evaluation of Power Prototypes. Technical Report for adidas Concept Excellence.
- Wannop JW, Esposito M, Smith E, Stefanyshyn DJ. 2021. Future of Endurance: Influence of Cushioning and Geometry on Running Biomechanics and Perception. Technical Report for adidas Future Team.
- Wannop JW, Esposito M, Stefanyshyn DJ. 2021. Mechanical Traction of Fibre Sprays. Technical Report for FieldTurf.
- Wannop JW, Esposito M, Stefanyshyn DJ. 2021. Mechanical Traction of Natural and Wet Artificial Surfaces during Rugby Scrums. Technical Report for FieldTurf.
- Wannop JW, Kowalchuk S, Smith E, Culo M, Stefanyshyn D. 2021. Synthetic Turf Testing: Phase 2. Technical Report for Biocore.
- Wannop JW, Kowalchuk S, Smith E, Esposito M, Stefanyshyn D. 2021. Mechanical Traction of Artificial Surfaces During Rugby Scrums. Technical Report for FieldTurf.
- Wannop JW, Kowalchuk S, Smith E, Stefanyshyn DJ. 2021. Influence of Turf Fibers on Mechanical Traction of Artificial Turf Surfaces. Technical Report for FieldTurf.
- Wannop JW, Smith E, Esposito M, Clermont C, Stefanyshyn DJ. 2021. 4D Shear: Phase 3 Influence of Midsole Shear on Peak Braking Forces and Foot Acceleration. Technical Report for adidas Future Team.
- Wannop JW, Smith E, Stefanyshyn DJ. 2021. Foot Sensitivity and Insole Selection. Technical Report for Superfeet.



## KEYNOTE AND INVITED LECTURES

Federico S. 25th International Congress of Theoretical and Applied Mechanics. Italy, Virtual Event. August. (Keynote)

Federico S. SES Biotechnology and Allied Sciences Symposium. Lakehead University, Canada. August.

Federico S. Advanced Fibrous Material Autumn School. Amirkabir University of Technology, Iran. December.

Edwards WB. Towards the real-time monitoring of tendon strain and cumulative damage to minimize the risk of patellar tendinopathy. NBA/GE Collaboration – Strategic Advisory Board Meeting. October.

Edwards WB. Predicting the mechanical fatigue of bone and bones. Neuromechanical Performance Research Lab, University of Guelph. Virtual Event. June.

Edwards WB. Running injuries as a fatigue failure process. 3rd Annual Symposium on Sport Sciences, Aalborg University, Denmark. Virtual Event. June.

Emery CA. Concussions Prevention in Youth Team Sports: Evidence informing best practice and policy across five high risk concussion sports. IOC World Conference on Prevention of Injury & Illness in Sport. Monaco. November.

Emery CA. Injury Prevention in Youth Sport. Why are we so afraid of change? IOC World Conference on Prevention of Injury & Illness in Sport. Monaco. November. (Keynote)

Emery CA. Injury Prevention in Youth Sport: Where does the future lie? IOC World Conference on Prevention of Injury & Illness in Sport. Monaco. November.

Emery CA. Opportunities for the Prevention of Injuries and their Consequences in Youth Sport. 2021 Sport Medicine Australia Conference. Melbourne, Virtual Event. October. (Keynote)

Emery CA. Prevention of Concussion. 8th Annual Concussion Research Symposium, Canada Concussion Centre. Toronto, Virtual Event. February. (Keynote)

Emery CA. SHRed Concussions: Surveillance in High Schools and Community Sport to Reduce Concussions and their Consequences. University of Michigan Concussion Centre, Center for Education of Women. Virtual Event. April.

Emery CA. SHRed Concussions: Surveillance in High School and Community Sport to Reduce Concussions and their Consequences in Youth. 5th Annual Injury Prevention Symposium, Steadman Philippon Research Institute and the United States Olympic and Paralympic Committee. Colorado, Virtual Event. April. (Keynote)

Emery CA. Targets for the Prevention of Injuries and their Consequences in Youth Sport. Pediatric Research in Sports Medicine Society (PRISM) 8th Annual Meeting. Virtual Event. January. (Keynote)

Emery CA. Targets for the prevention of injuries and their consequences in youth sport. Wood Forum 2021: Sports Injury Prevention. Virtual Event. November.

Emery CA. Transforming Sport Experience Through Prevention. Canadian Academy of Sport and Exercise Medicine (CASEM). Virtual Event. May. (Keynote)

Emery CA. What next? Translation of surveillance data into action: Informing best practice and policy. American College of Sports Medicine (ACSM) Annual Meeting, World Congress on Exercise is Medicine, and World Congress on the Basic Science of Exercise in Regenerative Medicine. Virtual Event. June.

Herzog W. Basic muscle mechanics and selected applications in sport. International Sport Sciences Conference. Lisbon, Portugal, Virtual Event. July. (Keynote)

Herzog W. Huxley's Missing Filament. King's College. London, UK, Virtual Event. June. (Keynote)

Herzog W. Muscle mechanics: from molecules to function. University of Sao Paulo, Brazil. 2021.

Herzog W. Recent observations on the molecular mechanisms of muscle contraction. 11th International Conference on Biomedical Engineering and Technology. Tokyo, Japan, Virtual Event. March. (Keynote)

Herzog W. The distribution problem in biomechanics and motor control: how can we measure, predict and validate in vivo muscle forces? Congress of the International Society of Biomechanics. Stockholm, Sweden, Virtual. July.

Herzog W. The forgotten filament: Titin's contribution to active force production in muscle. Monday Muscle Seminar (M&MS), Médecine Sorbonne Université. Paris, France, Virtual. May.

Herzog W. The many faces of knee joint osteoarthritis. The Science and Environmental Studies Biotechnology & Allied Sciences Symposium. Thunder Bay, Canada, Virtual Event. August. (Keynote)

Herzog W. The past, present and future of biomechanics. The Science and Environmental Studies Biotechnology & Allied Sciences Symposium. Thunder Bay, Canada, Virtual Event. August.

Herzog W. The role of titin in muscle contraction and active force production. Society for Orthopedics and Traumatology in Sports Medicine. Basel, Switzerland, Virtual Event. July. (Keynote)

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- Herzog W. The three-filament sarcomere model: titin-actin-myosin interaction and force production. French Society for Biomechanics. St. Etienne, France, Virtual Event. October 2021. (Keynote)
- Herzog W. What's Titin got to do with it: evidence of Titin's contribution to force regulation in skeletal muscle. Brigham Young University. Utah, USA. February.
- MacInnis, MJ. Strategies to augment and assess skeletal muscle oxidative capacity in humans. Research Revealed, University of Alberta. March.
- MacInnis, MJ. Altitude: Physiology, Exercise, Training, and Illness. Faculty of Kinesiology, University of Calgary.
- MacInnis, MJ. Interval training: From physiology to practice. University of Calgary.
- MacInnis, MJ. Exercise physiology at altitude: Acute detriments and chronic benefits. University of Regina.
- Reimer RA. Role of prebiotics in chronic disease management. Canadian Nutrition Society Annual Conference. April. (Keynote)
- Reimer RA. Role of prebiotics in chronic disease management. Canadian Nutrition Society Annual Conference. April. (Keynote)
- MacInnis, MJ. Strategies to augment and assess skeletal muscle oxidative capacity in humans. Research Revealed, University of Alberta. March.
- MacInnis, MJ. Altitude: Physiology, Exercise, Training, and Illness. Faculty of Kinesiology, University of Calgary.
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