



UNIVERSITY OF TORONTO
FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

CENTRE FOR SPORT-RELATED CONCUSSION RESEARCH, INNOVATION, AND KNOWLEDGE

Extra-Departmental Unit (EDU): D

Prof. Michael G. Hutchison

EDU Director



1. Background and rationale

There are an estimated 4M new cases of sport-related concussions reported in North America every year (~435K in Canada and ~3.6M in the United States) [1, 2]; the true incidence rate is likely greater due to unreported or self-treated cases. While the incidence of concussion may vary by context and age, concussions are considered a major public health concern with the lifetime costs to a patient including financial strains, disruptions to work, and negative consequences to both physical and mental health.

Concussion is complex, and its pathophysiology is not well-defined in humans. There have been numerous important contributions to our understanding of concussion from various disciplines including basic science, epidemiology, biomechanics, culture of risk, neuropsychology and medicine. However, accurate diagnosis, prognosis, and effective treatment are still hindered by an imprecise classification system, a dearth of high-quality clinical trials, and a lack of a shared, evidence-based working model of concussion pathophysiology and recovery within the clinical and scientific communities [3].

The clinical management of concussion includes a progression of activities and subsequent evaluation of the individual response, with recent research supporting a paradigm shift towards active rehabilitation rather than rest. Furthermore, education is an integral component throughout the recovery process alongside changes to behaviour that can reduce the risk of re-injury and prevalence. Concussion is a problem that requires multi-disciplinary collaborative efforts utilizing a bio-psychosocial approach. The Faculty of Kinesiology of Physical Education (FKPE) at the University of Toronto's guiding principles consist of a multidisciplinary approach to research and pedagogy, recognizing leaders who draw upon knowledge from the physical and life sciences, social sciences and humanities.

Our faculty recognizes and promotes the tremendous benefits of participating in physical activity (including sport and exercise), offering an expansive and diverse set of opportunities within curricular and co-curricular programming. However, we also carry the responsibility of providing avenues to healthy and safe physical activity and sport participation while integrating knowledge translation, facilitating future inquiry, and applying research. The Faculty of Kinesiology and Physical Education was one of the first – initiated in 1999 - comprehensive programs in the country dedicated to concussions among student athletes. By drawing on the resources and research excellence and leadership within our faculty in sport-related concussion, combined with the exceptional collegial network within the University of Toronto, we propose expanding the opportunity to translate new knowledge into public policy, community and healthcare settings, and sport organizations. Together, these factors have informed the proposed establishment of a ***Centre for Sport-Related Concussion Research, Innovation, and Knowledge***.



Vision:

To be the leading interdisciplinary centre for functional assessments and interventions promoting physical and psychological well-being following sport-related concussion.

Mission:

To create and develop research by fostering institutional and community collaborations, training top undergraduate and graduate students, postdoctoral fellows, as well as promoting advocacy and knowledge translation to improve outcomes and well-being following sport-related concussion.

Goals:

We will focus on collaborative models that integrate education, research, and key professional and community stakeholders, fostering a productive and enriching environment that will allow us to achieve our specific goals:

- I. To better understand the risk factors of protracted recovery following sport-related concussion.
- II. To identify and examine the utility of functional assessments that prognosticate injury and/or inform targeted interventions.
- III. To identify and examine the utility of activity-related interventions that assist individuals with sport-related concussion.
- IV. To evaluate the physiological, psychological, and social mechanisms that explain the benefit of exercise-related interventions following sport-related concussion.
- V. To build feasible, effective, and sustainable interventions that improve the clinical management and experience of sport-related concussion recovery.

Given the specific goals above, the main outcomes of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will focus on mechanisms, intervention design and evaluation, advocacy, and knowledge translation.

The Centre for Sport-Related Concussion Research, Innovation, and Knowledge will be hosted within the Faculty of Kinesiology and Physical Education (FKPE) and benefit from established infrastructure including the David L. MacIntosh Sport Medicine Clinic, Concussion Lab Space hosted within the Goldring Centre of High-Performance Sport, the Mental Health and Physical Activity Research Centre, alongside numerous co-curricular activities. Overall, the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will be a hub aimed at increasing the visibility of interdisciplinary research and collaborations, as well as a forum to advocate for policy changes that support delivering healthy, safe physical activity and sport participation. Lastly, the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will promote the availability, accessibility and uptake of interventions designed to improve outcomes following sport-related concussion.



2. History and Legacy

The University of Toronto Concussion Programme began in 1999 through the collaboration and leadership of Lynda Mainwaring, Ph.D., C. Psych. (rehabilitation and sport/performance psychology and FPEH/FKPE faculty member), Doug Richards, M.D., (Director of the David L. MacIntosh Clinic and FPEH/FKPE faculty member), and Paul Comper, Ph.D., C.Psych. (Neuropsychology, and adjunct professor FPEH and Rehabilitation Sciences, UofT). The large-scale multifaceted clinical research initiative was soon recognized internationally for the scientific integrity and comprehensive approach to the study and management of and education about concussion in varsity athletes. The nexus for teaching and research at the U of T facilitated the research, clinical and educational programme and the collaboration of the multidisciplinary team. From the beginning, the programme and its founders conducted research, clinical assessments, and educational seminars related to sport-related concussion in varsity athletes. The Concussion Programme has produced numerous noteworthy and original contributions to the sport-related concussion field since 2000, including numerous peer-reviewed publications, undergraduate and graduate training and mentorship, policy and management recommendations, and community engagement. The success of the concussion research, clinical care and education of athletes was also based upon numerous collaborations and support among a diverse research team of faculty and students, support from various U of T and community scientists, FPEH/FKPE administration, student athletes and coaches; David McIntosh Clinic staff, physicians and student-athletic therapists.

3. Governance and Structure

The Centre for Sport-Related Concussion Research, Innovation, and Knowledge will be established as a Level D, Extra-Departmental Unit (i.e. EDU:D) in accordance with the University of Toronto Guidelines for Administrative Functions and Protocols of Extra-Departmental Units.

Proposed Inaugural Membership

EDU Director: Dr. Michael Hutchison

The Centre for Sport-Related Concussion Research, Innovation, and Knowledge Director (inaugural 3-year term, renewable pending performance evaluation and/or strategic considerations) will be appointed by the Dean of the FKPE. The Centre's Director will be responsible for the administrative and financial operations of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge. Specifically, the Centre's Director will report to Faculty Council, develop and oversee training programs, hire and train research and technical personnel, and mentor trainees. The Centre's Director will also be expected to represent the centre externally within national and international organizations, government agencies, and funding agencies.

Dr. Michael Hutchison is an Associate Professor in the FKPE at the University of Toronto. He holds a PhD in Rehabilitation Science and is a Registered Kinesiologist. Dr. Hutchison specializes in concussion



UNIVERSITY OF TORONTO FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

research in various populations ranging from adolescent and university level students to professional athletes. Dr. Hutchison's research productivity is internationally recognized with over 70 peer-reviewed publications in the field, and includes numerous international presentations. Dr. Hutchison also holds appointments as a Research Scientist with the National Hockey League (NHL) Players' Association, as a Research Scientist with the Neuroscience Program, Keenan Research Centre for Biomedical Science of St. Michael's Hospital. Finally, Dr. Hutchison oversees the Concussion Program within the David L. MacIntosh Sport Medicine, University of Toronto; a multidisciplinary team of health professionals for sport or physical activity related concussion. Dr. Hutchison has secured over \$6 million in funding, including principal investigator grants across all Tri-Council Funding bodies (CIHR, NSERC, SSHRC), from the Canadian Institute For Military & Veteran Health Research (CIMVHR), University of Toronto Connaught Innovation Grant and Award, interdisciplinary University of Toronto grants (XSeed), and philanthropic funds to support his research program.

Education and Outreach Coordinator: Dr. Nick Reed

This role will organize and oversee advocacy and knowledge translation activities. This may include, but are not limited to, workshop and conference organization, engaging community partnerships, and representing Centre for Sport-Related Concussion Research, Innovation, and Knowledge externally to municipal, provincial, and national organizations related to concussion advocacy and knowledge translation activities.

Dr. Nick Reed is an Associate Professor in the Department of Occupational Science and Occupational Therapy and the Rehabilitation Sciences Institute at the University of Toronto an Adjunct Scientist at Holland Bloorview Kids Rehabilitation Hospital. Dr. Reed is a Tier 2 Canada Research Chair in Pediatric Concussion, and previously a Senior Clinician Scientist within the Bloorview Research Institute. Dr. Reed's work focuses on developing, delivering and evaluating research, educational and clinical programming specific to youth and concussion. Dr. Reed is the Director of the OAK Concussion Lab (Outcomes, Advocacy and Knowledge), and his research program has demonstrated success in funding: \$20.02 million in total research grant funding; \$4.18 million awarded as the Principal or Co-Principal Investigator. Dr. Reed has 53 published peer-reviewed manuscripts, 143 invited presentations, 49 contributions to popular media stories, and numerous awards (12 personal; 31 trainees).

Executive Committee:

An Executive Committee will be founded within the first year of the establishment of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge and will consist of leader representatives in clinical, research, and education initiatives, with an overarching focus on mechanisms, intervention design and evaluation, and/or policy and education in concussion. The Executive Committee will include **at least:**

- one Centre Director (Dr. Michael Hutchison)
- one Education and Outreach Coordinator (Dr. Nick Reed)
- one core members within FKPE
- two extra-departmental members



UNIVERSITY OF TORONTO FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

- two community partner members
- two key stakeholders (e.g., graduate student, lived experience)

The Executive Committee will meet once per year and will be responsible for evaluating whether the progress of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge is aligned with the mission and vision, as well as overseeing educational and research initiatives.

Additional Members:

Members will include researchers, clinicians, practitioners, and key stakeholders working in key areas of concussion and representing various disciplines including Rehabilitation Sciences, Life Sciences, Psychology, Medicine, Epidemiology, Neurology, Public Health, Sociology, and Economics. Members will align with and support the mission of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge by participating in research, practice, education, and/or public outreach focused on concussion.

A network analysis by Eagle and colleagues [4] of sport-related concussion research during the past decade identified the University of Toronto was one of the main hubs of sport-related concussion research in the world; thus we have a strong list of members to be associated with Centre for Sport-Related Concussion Research, Innovation, and Knowledge. Please see **Appendix A** for a list of confirmed inaugural members representing more than twelve departments, faculties, and institutions within the university who have been invited because their scholarly research aligns with the vision, mission, and goals of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge.

It is expected that members will provide ideation, research and/or clinical expertise, and technical skills contributing to the outlined vision and objectives of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge. There is an expectation that active members will contribute on an annual basis through mentorship, workshops, seminars, as well as collaborative research opportunities via protocol developments, participant recruitment, and outreach. Members will benefit from collaborative research spaces, a pool of high quality undergraduate and graduate students, a network of collaborative opportunities, shared equipment for larger, collaborative studies, and increasing opportunities to secure research funds.

4. ACTIVITIES

The Centre for Sport-Related Concussion Research, Innovation, and Knowledge will serve as a collaborative and interdisciplinary research and training environment envisioned to support functional assessments and interventions promoting physical and psychological well-being following concussion. Also, members will participate in a number of knowledge synthesis and translation activities that will serve to heighten awareness and educate the community. Finally, the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will be able to act as a conduit by which research translation occurs (e.g., research-to industry or research-to-community).



UNIVERSITY OF TORONTO FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

To achieve its goals and purpose, the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will establish and build a multidisciplinary research platform for data collection, as well as host various knowledge creation and translation activities. In conjunction with providing research and education activities, the centre will also act as a funding hub that will include large-scale research infrastructure, operation, and training grant applications. There are a number of systematic/meta-analyses planned to identify key knowledge gaps in the field. A complete list of short and long-term objectives is presented below.

Short-term (Years 1 & 2):

1. Establish the formal governance (e.g., executive committee and any working groups).
2. Develop a five-year strategic plan.
3. Host a concussion conference at the University of Toronto.
4. Build and deliver a sustainable concussion educational initiative for co-curricular programs.
5. Explore funding opportunities to support short-term goals (e.g., philanthropic, Ontario Brain Institute), tri-council (e.g., CIHR Project Grants) and infrastructure (e.g., CFI).
6. Explore commercialization opportunities with the Innovations and Partnerships Office (IPO) at UofT.

Longer-term goals (Years 3-5):

1. Develop a co-curricular collaboration for program design, implementation, and evaluation (e.g., Rowan's Law education evaluation).
1. Develop and implement placement opportunities for undergraduate students.
2. Submit a SSHRC Partnership Grant (or equivalent) to focus on sustaining community partnerships focused on concussion education and support (partnerships with non-profit organizations, TDSB, etc.).
3. Submit a CIHR Project Grant to support a collaborative, multi-site intervention study.
4. Submit a NSERC Alliance Grant to support a collaborative grant with partner organizations (e.g., private, public or not-for-profit partners).
5. Develop, pilot and deliver a web-based online course in concussion.

5. ALIGNMENT WITH STRATEGIC PLAN

The Centre for Sport-Related Concussion Research, Innovation, and Knowledge is well aligned with the strategic plans of the FKPE. First, creating a collaborative network of productive researchers and clinicians will educate and train a diverse group of students to become productive contributors and leaders in the field of concussion. Second, the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will build and support research collaborations locally within the university, as well as provincially, nationally, and internationally. This will strengthen our recognition and productivity in concussion research, scholarship, and innovation. Third, improving outcomes and well-



UNIVERSITY OF TORONTO
FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

being following concussion will contribute to increased opportunities for safe and healthy physical activity across the continuum of co-curricular physical activity and sport programs.

At the university level, the Centre for Sport-Related Concussion Research, Innovation, and Knowledge is situated within the strategic research theme “PROMOTE: Healthy People, Healthy Communities, and a Healthy World’. The core mission of the Centre for Sport-Related Concussion Research, Innovation, and Knowledge is to improve outcomes and well-being following concussion, and, as noted in the most recent University of Toronto’s Strategic plan, “there is still much we can do to alleviate suffering and improve quality of life for all people and their communities”.

Centre for Sport-Related Concussion Research, Innovation, and Knowledge is aligned with the University of Toronto’s commitment to equity and diversity. Our teaching, scholarship and co-curricular activities take place in the context of a highly diverse society. Reflecting this diversity in the Centre for Sport-Related Concussion Research, Innovation, and Knowledge will be valuable as it will contribute to the diversification of ideas and perspectives, thereby enriching our scholarship, teaching and other activities.



References

1. Langer, L., C. Levy, and M. Bayley, *Increasing Incidence of Concussion: True Epidemic or Better Recognition?* J Head Trauma Rehabil, 2020. **35**(1): p. E60-e66.
2. Langlois, J., Rutland-Brown, W. & Wald, MA. , *The Epidemiology and Impact of Traumatic Brain Injury: A Brief Overview.* Journal of Head Trauma Rehabilitation, 2006. **21**(5): p. 375-378.
3. Kenzie, E.S., et al., *Concussion As a Multi-Scale Complex System: An Interdisciplinary Synthesis of Current Knowledge.* Frontiers in Neurology, 2017. **8**.
4. Eagle, S.R., et al., *Network Analysis of Sport-related Concussion Research During the Past Decade (2010-2019).* J Athl Train, 2020.



UNIVERSITY OF TORONTO
FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

Appendix A

Full name	Appointment & Affiliation	Invited	Committed
Baker, Andrew	Professor, Department of Anesthesiology & Pain Medicine	✓	
Bayley, Mark	Professor, Division of Physical Medicine and Rehabilitation	✓	
Biddiss, Elaine	Associate Professor, Institute of Biomedical Engineering		✓
Burkhart, Tim	Assistant Professor, Faculty of Kinesiology & Physical Education		✓
Chan, Tim	Professor, Faculty of Applied Science & Engineering		✓
Churchill, Nathan	Senior Research Associate, St. Michael's Hospital		✓
Colantonio, Angela	Professor, Department of Occupational Science and Occupational Therapy		✓
Comper, Paul	University Health Network – Toronto Rehab		✓
Di Battista, Alex	Faculty of Kinesiology & Physical Education		✓
Dunkley, Ben	Sick Kids	✓	
Frost, David	Assistant Professor, Faculty of Kinesiology & Physical Education	✓	
Anne Hunt	Assistant Professor, Department of Occupational Science and Occupational Therapy		✓
Lawrence, David	Faculty of Medicine		✓
Mainwaring, Lynda	Associate Professor, Faculty of Kinesiology & Physical Education		✓
Mikilus, David	Professor, Institute of Medical Sciences		✓
Richards, Doug	Associate Professor, Faculty of Kinesiology & Physical Education		✓
Scratch, Shannon	Assistant Professor, Rehabilitation Sciences Institute		✓
Schweizer, Tom	Assistant Professor, Department of Surgery		✓



UNIVERSITY OF TORONTO
FACULTY OF KINESIOLOGY & PHYSICAL EDUCATION

Tamminen, Katherine	Associate Professor, Faculty of Kinesiology & Physical Education		✓
Tartaglia, Carmela	Associate Professor, Tanz Centre for Research in Neurodegenerative Diseases, University of Toronto		✓
Tator, Charles	Professor, Department of Surgery		✓
Wheeler, Anne	Sick Kids	✓	
Zabjek, Karl	Associate Professor, Department of Physical Therapy		✓