Toronto Rehab Research Day

23.01.2018

www.ResearchDay.ca

@TRI_UHN

UHN Toronto Rehabilitation Institute

We would like to thank Steve Pong for designing the cover page.

Message from Geoff Fernie, CM, PhD, PEng, CEng, FCAHS

Our theme for Research Day this year is IMPACT

What do we mean by impact?

Research scientists traditionally build their reputations and careers through publication of their results in peer-reviewed journals. At TRI we understand and support publications as a measure of academic productivity and we do rather well at it. Our publication rates are extraordinarily high, but for us, publication is just the beginning.

Our mission is to solve problems and bring those solutions to benefit people who have disabilities and to their caregivers. We do not want our parents and grandparents to sit in a wheelchair in a care facility waiting for someone to take them to the toilet. We want to help prevent them from suffering an accident, illness or injury and if they acquire a disability through stroke – for example – they can benefit from non-invasive neuromodulation therapy to restore voluntary upper limb function so that they can return to their former activities. We want them to live in their own homes and community with a good quality of life for as long as possible!

We do this by:

- **Helping change policies, regulations, guidelines and safety standards.** Examples include leadership in the WHO of standards for rehabilitation services worldwide, contributions to best practice guidelines for spinal cord and stroke, standards for food preparation for dysphagia, safer methods for homecare workers to provide care in the bathroom, a patient manual for cardiac rehabilitation, evidence used to upgrade building codes to reduce the risks of falling and the publication of information to help the public select safer winter footwear.

- **Making new treatments available beyond the walls of TRI.** Examples include functional electrical therapy (MyndMove®) and robotics to rehabilitate paralyzed limbs, web-delivered therapies for aphasia and head injury. Our treatments maximize the potential of individuals so that they can return to enjoying their lives.

- **Commercializing our inventions** so that individuals and institutions can acquire them and use them to support prevention, diagnosis and treatment and to enable greater independence while they age at home without stressing family. Examples include products to support safe mobility (www.hartvision.com), home diagnosis of sleep apnea (www.bresotec.com), intelligent wheelchair guidance (www.brazemobility.com) and restoring upper limb function (www.myndtec.com).

We encourage and support this emphasis on IMPACT by having progressive policies that foster teamwork and excellence, and we promote a supportive culture that encourages intelligent entrepreneurship:

- Our promotion policy gives equal weight to 4 criteria – academic achievement (publications and grants), mentorship (teaching and supervision), 'citizenship' at TRI and in the community (committee work and volunteer activities), and IMPACT (e.g. support of clinical application and commercialization). Our scientists are encouraged and expected to be well-rounded and community-oriented in addition to having strong academic achievements in their area of expertise.

- We encourage commercialization by supporting startups through awards, mentorship, training and nurturing incubation. The first of our Power Play Pitch events was a great success in 2017 with $60,000 in prizes given to the winners selected from 12 entrants in three categories. We look forward to continuing this tradition.

On January 8th of this year we celebrated the appointment of Dr. Milos Popovic as Institute Director. TRI Research has an exciting future under Dr. Popovic's bold and enterprising leadership. My biggest hope for the future is that we continue to increase our IMPACT by intensifying our current research efforts, maintaining our position as the top rehabilitation research centre, and expanding our reach. We take great pride in serving our communities!

Together with Dr. Milos Popovic, let us enthusiastically welcome the future, collaboratively embrace challenges, and courageously overcome all obstacles to create the most IMPACT for those we serve.

Wishing you all the best!

Geoff

Message from Institute Director
Milos Popovic, PhD, PEng

With the outstanding visionary leadership of Dr. Fernie over the last 15 years, TRI has evolved into a world-class institution that unquestionably leads the rehabilitation field internationally. This is an outstanding achievement.

From this solid platform of excellence, we will continue the momentum and push our achievements to extraordinary heights. Together, we will establish key strategic partnerships, enable processes and implement effective policies to ensure that our Institute continues to be the number one rehabilitation research institution in the world and evolves into a global centre for the development of innovative rehabilitation therapies, methods, processes and products. We will focus our efforts on developing long-term strategies to address our key infrastructure and operational needs to allow continued growth in the areas of Innovative Research, Knowledge Translation, Collaborations, Industrial Partnerships and Commercialization. Success in these growth areas will be highly dependent on enhanced and stable Funding, effective Human Resource management, Institutional Support and on thoughtful and energetic Leadership.

Our mission will continue to focus on improving and maintaining the quality of life through prevention, improved participation and restored function for all people as they age or when they have been challenged with a disability. Over the coming years, we will further intensify our research programs and improve our utilization of already existing and planned infrastructure. Our work will have an even greater focus on actual impact that ultimately benefits our patients, their caregivers, their families and society at large.

With pride and excitement, I welcome you to 2018 Research Day, and I hope that you will learn something new at the event as well as make new friends and meet future collaborators.

Cheers!

Milos

Message from the Chair, Research Day Planning Committee
Associate Academic Director of Research
Susan Jaglal, PhD, FCAHS

The theme of this year's Research Day is "IMPACT" which aligns with our mission to solve problems and bring those solutions to benefit people living with disabilities and their caregivers. It is something we pride ourselves on at TRI and it is what brings us together.

As an organization we are committed to providing an excellent environment for the academic and professional development of our trainees and scientists. This means creating a culture where fully integrative teams with expertise in engineering, computer science, epidemiology, kinesiology, gerontology, medicine, nursing, psychology, rehabilitation, and business can flourish. Research at TRI is conducted by 110 scientists and ~150 post-doctoral fellows and graduate students; all our students and scientists belong to at least one of TRI's 11 research teams.

A key determinant of success of an academic organization is career development. At TRI that includes understanding and being able to articulate the IMPACT of their research. We are committed to mentorship and have programming to support our junior scientists and trainees. The goals are to advise, provide resources and opportunities to enable our scientists and trainees to be integrative thinkers, innovative, productive, collegial, responsive and socially responsible. It is our expectation that our trainees and scientists will have impact in a number of ways including affecting policy changes, making new rehabilitation treatments available and through commercialization of our inventions.

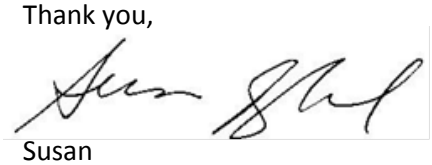
We have a number of mentorship events throughout the year in addition to our signature event, Research Day. In October we held a "speed mentoring" event for junior scientists and post-doctoral fellows. This provided mentees the opportunity to meet mentors outside of their existing research teams. Each mentee met with each mentor for about 5 minutes. We then matched mentees and mentors based on their preferences. The initial feedback was extremely positive and we look forward to evaluating this initiative. In February we are also planning a Project Management workshop to introduce our trainees to some new tools and skills.

TRI Research Day is one of the highlights of the year as it is our opportunity to showcase our excellence in research and the impact we are having on our community and health system. We are pleased to support a number of events at Research Day. Our trainees play an active role by participating in the "Minute Madness" sessions. This experience hones their communication skills and gives them an opportunity to explain why their research is important. The Trainee Committee is also organizing a mentorship breakfast with TRI scientists. We also recognize the excellence and commitment of our trainees with various awards. These include Impact Awards to trainees with strong leadership qualities, commitment to community service and academic excellence, Best Poster and Minute Madness Presentations, Top Peer-Reviewed Publications, Joel Verwegen Award for a student who possesses a deep interest in research and potential as a future scientist in brain health and the TechnoVation Award to support the transformation of student projects into market innovations.

I would also like to take this opportunity to thank the staff and the many trainees and scientists at Toronto Rehab who volunteer to make Research Day and our other Mentorship activities such a success. Their engagement and commitment to research excellence promotes a truly inspiring research culture.

TRI Research Day is a wonderful opportunity to showcase our research IMPACT, spark new ideas and collaboration in our quest to develop solutions to prevent injury and illness, restore function and enable independence. On behalf of the Research Day Planning Committee we hope you enjoy the day and look forward to seeing you.

Thank you,



Susan

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PROGRAM OF EVENTS

7:30 – 8:45 am	Registration, 2nd floor, 89 Chestnut Street, Toronto ON M5G 1R1
8:00 – 8:45 am	Trainee Breakfast (invitees only)
	Introduction
8:50 – 9:00 am	**Geoff Fernie,** The Creaghan Family Chair in Prevention and Healthcare Technologies *Welcome and thoughts on Impact*
9:00 – 9:10 am	**Milos Popovic,** Institute Director, TRI-UHN *Future directions of TRI Research*
9:10 – 9:15 am	**Brad Wouters,** Executive Vice President, Science & Research UHN *UHN – Canada's top research hospital*
9:15 – 9:35 am	**John Wright**, CEO – Dart Insight and Communication Keynote Speaker: *The Impact of the Impending Silver Tsunami*
9:35 am – 9:40 am	*Mindfulness Meditation*
9:45 – 10:25 am	**Introduction & Minute Madness – Prevent Injury & Illness Theme** Theme Lead: **Geoff Fernie**
10:25 – 10:45 a.m.	*Refreshment and Networking Break*
10:45 – 11:35 am	**Introduction & Minute Madness – Restore Function Theme** Theme Lead: **Milos Popovic**
11:35 – 11:40 a.m.	*Fit Break*
11:40 am – 12:05 pm	**Introduction & Minute Madness – Enable Independence Theme** Theme Lead: **Susan Jaglal**
12:05 – 12:20 pm	**Student Scholarship & Award Presentations** • Geoff Fernie Impact Awards (3 Awards) • Joel Verwegen Award (1 Award) • Best Publication Awards (2 Awards) • TD Awards (3 Awards)
12:20 pm – 1:30 pm	*Lunch*
1:30 – 3:00 pm	**Poster & Interactive Display Sessions** (Colony Ballroom, 2nd floor foyer, Giovanni Room) • Odd #s (1:30–2:15 pm) • Even #s (2:15–3:00 pm)
3:15 – 3:30 pm	**Research Day Awards - presentations / Close of Research Day** • Best Posters (Undergraduate, Master's, Doctoral and Postdoctoral) • Best Interactive Display • People's Choice Award (Best Minute Madness) • TechnoVation Award

GUEST SPEAKER – JOHN WRIGHT

CEO, DART Insight and Communication

Opinion/Market Research, Demographics & Ideation

John Wright is one of Canada's most renowned pollsters with expertise in Canadian and Global opinions, demographics, issues, and strategic communications. An author of three Canadian bestselling books on what Canadians think about everything, he was the Senior Vice President of the Public Affairs Opinion Research Division of Ipsos and Spokesperson of the company for 26 years before opening his own consulting company in 2016. There is literally not an industry or issue he has not dealt with and his specialty area of study is the growing and aging population in Canada and abroad.

John is an experienced, dynamic, entertaining, provocative, and engaging speaker. His passion is to deliver the "so what?" answers to the topics he addresses and takes great care in constructing his presentation takeaways. With a unique perspective on world issues and trends, John brings forward real-life examples on how to deal with pressing issues of our time and zeros in on the issues affecting people. He shows how one can start addressing critical challenges and opportunities right now.

John is a Founder and Lifetime member for each of the Public Affairs Association of Canada, the Canada Institute at the Woodrow Wilson Centre for Scholars, and the Canadian Forces College Foundation. A Senior Fellow at the Angus Reid Institute and a Fellow of the Royal Canadian Geographic Society, he's an Honorary Colonel for the Royal Canadian Air Force with three Commendations, has been awarded the Queens Diamond Jubilee Medal for Military History and Education, the Ontario Lieutenant Governor's Award for Community Volunteerism, and the Arbor Award from the University of Toronto.

POSTERS & INTERACTIVE DISPLAYS: TITLES & AUTHORS

PREVENT INJURY AND ILLNESS (1-28)

Research on this topic is about preventing the injury or illness from happening, and preventing episodes from recurring, following treatment.

1. Assault Independently Predicts Time Away from Work after a Work-Related Mild Traumatic Brain Injury – Analysis of Workers' Compensation Claims in Victoria, Australia
R Shafi, P Smith, A Colantonio

2. A Systematic Review on the Course and Prognostic Factors of Cognitive Status in Traumatic Brain Injury
T Mollayeva, N Pacheco, A D'Souza, S Mollayeva, A Colantonio

3. Passive Physiological Monitoring of Older Adults with Heart Failure via Ambient Sensors Embedded in a Home Environment
IS Chang, AQ Javaid, N Armanfard, J Boger, SL Grace, S Mak, C Chessex, A Mihailidis

4. Psychosis Secondary to Traumatic Brain Injury: Examining a Novel Neurodegenerative Hypothesis
MJC Bray, J Cottrelle, B Colella, M Bayley, REA Green

5. Cardiac Rehabilitation in Low- and Middle-Income Countries
E Pesah, K Turk-Adawi, M Supervia, F Lopez-Jimenez, SL Grace

6. Evaluating Slip-Resistant Footwear for Personal Support Workers to Use Outdoors in Winter
P Ahmadian, ZS Bagheri, S Hulec, Y Li, N Patel, K Rizzi, KYG Lui, P Holyoke, G Fernie, L Dutta

7. Improving Slip Resistance on Ice: Optimizing the Design of a Hybrid Composite Footwear Outsole Material
ZS Bagheri, AA Anwer, G Fernie, HE Naguib, T Dutta

8. A Week in the Life of a Home Care Personal Support Worker
EC King, T Kajaks, J Voth, P Holyoke, R Hurst, J Del Sole, K Hutchinson, T Dutta, SB Jaglal

9. Preventing Back Pain Using Real-time Feedback
M Owlia, M Kamachi, K Ledda, C Ng, A Longfield, T Dutta

10. Development of a Best Practice Model in Acute Concussion Care: The Hull-Ellis Concussion and Research Clinic at the Toronto Rehabilitation Institute
T Chandra, P Comper, C Saverino, E Inness, L Ruttan, L Langer, E Foster, M Bayley, C Wiseman-Hakes

11. Cognitive Tasks Induced Hemodynamic Changes in Prefrontal Cortex
SA Hassan, LV Bonetti, S Lau, LT Melo, T Tanaka, KK Patterson, WD Reid

12. Brake and Loading Impulse Characteristics when Responding to a Forward Loss of Balance in People with Stroke
AH Huntley, EL Inness, A Aqui, G Mochizuki, A Mansfield

13. Providing Urgent Medical Diagnostic Services at Home: A System Level Snapshot of Current Challenges and Motivations
V Young, V Boscart, G Heckman, S McKay, G Naglie, P Trbovich, S Jaglal

14. Measuring the Level of Interprofessional Collaboration in ECHO Ontario Chronic Pain / Opioid Stewardship: Assessment and Development of a Tool
S Vyravanathan, J Zhao, E Hanna, J Babineau, R Dubin, A Furlan

15. A Hold on Joint Degradation: Cerebral Palsy Caregiver Biomechanics Education Intervention
MO Ehioghae

16. Coordination Between the Upper and the Lower Body During Standing for Individuals with SCI
JW Lee, K Chan, JE Unger, J Yoo, K Musselman, K Masani

17. Clinical Assessment of Mobility in Dementia: A Scoping Review
K Van Ooteghem, A Iaboni

18. Computed Tomography Imaging of the Pharyngeal Airway as a Predictor of the Effectiveness of Maxillomandibular Advancement: A Meta-Analysis
G Gruenspan, S Saha, T Meisami, A Yadollahi

19. Detecting Drowsiness from Electroencephalogram
AR Hassan, M Kabir, S Saha, K Zhu, B Keshavarz, A Yadollahi

20. Change in Heart Sound Intensity during Respiratory Event is Positively Correlated with Magnitude of the Hypoxia
M Kabir, S Saha, B Gavrilovic, K Zhu, A Yadollahi

21. Sleep Apnea Diagnosis using Respiratory Sounds and Pulse Oximetry
S Saha, M Kabir, B Gavrilovic, K Zhu, A Yadollahi

22. Vision Based Estimation of Cardiopulmonary Rates during Sleep
K Zhu, M Li, A Yadollahi, B Taati

23. Developing an Acoustic Algorithm for Respiratory Flow Estimation without Subject-Specific Calibration
N Montazeri, S Saha, K Zhu, B Taati, A Yadollahi

24. Creating and Validating an Improved Bioimpedance Model for the Estimation of Body Composition in Healthy Adults
T Cole, FE Nemeth, MP Popovic, A Yadollahi

25. Effects of Physical Exercise Training on Nocturnal Symptoms in Adults with Asthma: A Systematic Review
CO Francisco, SA Bhatawadekar, J Babineau, WD Reid, A Yadollahi

26. Pathophysiology of Swallowing in Oculopharyngeal Muscular Dystrophy
AA Waito, CM Steele, M Peladeau-Pigeon, A Genge, Z Argov

27. Time-Dependent Variations in the Flow of Matched Starch- and Gum-Thickened Liquids
CEA Barbon, M Peladeau-Pigeon, CM Steele

28. Respiratory Stability During Swallowing: Effect of Liquid Consistency on Respiratory Pattern and Pause Duration
TJ Valenzano, M Peladeau-Pigeon, BT Guida, CM Steele

RESTORE FUNCTION (29- 61)

Research on this topic is about restoring function to those who have had an injury or illness. New techniques are showing promise with both acute and chronic injuries. One important aim is to develop ways of treating more people in their own homes and reducing time spent in hospital.

29. Long-Term Arthritis and Musculoskeletal Complaints Following Traumatic Brain Injury
M Biscardi, A Colantonio

30. Battered and Brain Injured: Identifying and Supporting Brain Injured Women Survivors of Intimate Partner Violence
HL Haag, N MacGregor, V Green, D Jones, T Joseph, S Sokoloff, N Cullen, S Broekstra, A Colantonio

31. Predictors of Discharge to Rehabilitation Facilities from Acute Care in Patients with Traumatic Brain Injury: A Systematic Review
S Zarshenas, L Tam, A Colantonio, SM Alavinia, S Jaglal, N Cullen

32. Improving Mood, Adjustment and Coping in People with Acquired Brain Injury: An RCT to Examine the Efficacy of a Remotely Deliverable Cognitive Behaviour Therapy Protocol Adapted for Brain Injury
B Budisin and A Changoor, L Miguel, L Ruttan, D Kwan, B Colella, R Green

33. The How Much is Too Much Questionnaire: A New Patient Reported Outcome for Measuring Symptom Burden from Cognitive Interventions
A Chan, B Sharma, J Tomaszczyk, B Colella, J Mok, D Beaton, B Christensen, RE Green

34. A Pilot Study on the Effects of Intermittent Fasting on Cognition and Mood in Healthy Individuals Observing the Ramadan Fast
A Changoor, B Colella, C Makowski, J Palmer, S Shoker, H Alshaer, J Fung, R Green

35. Video-Based Face Tracking in the Assessment of Orofacial Impairment in Stroke
A Bandini, Y Yunusova

36. Discourse Coherence Analysis Provides New Insights into Cognitive Decline in aMCI
B Seixas Lima, K Murphy, A Troyer, B Levine, NL Graham, C Leonard, E Rochon

37. Is Executive Control a Predictor of Aphasia Therapy Success?
T Simic, L Laird, D Goldberg, T Bitan, C Chambers, G Turner, C Leonard, E Rochon

38. Reliability of Force Plate Balance Measures in the Sub-Acute Stage of Stroke Recovery
R Aryan, AH Huntley, EL Inness, KK Patterson, G Mochizuki, A Mansfield

39. Determining Safe Participation in Exercise Early After Stroke Through a Graded Submaximal Exercise Test
EL Inness, A Aqui, L Biasin, K Brunton, C Danells, E Foster, J Fraser, V Poon, B Rudy-Froese, D Brooks, A Mansfield, S Marzolini, P Oh, A Tang, M Bayley

40. Characterizing Velocity-Dependent and Velocity-Independent Features of Resistance to Passive Stretch Using Robotic Assessment Methods
MF Resnick, A Centen, CR Lowrey, SH Scott, G Mochizuki

41. Lower Limb Muscle Activity Underlying Temporal Gait Asymmetry Post-Stroke
GM Rozanski, AH Huntley, LD Crosby, JS Wong, A Schinkel-Ivy, A Mansfield, KK Patterson

42. Characterizing Balance Impairment Following Acute Concussion in the General Population: A Cross-Sectional Analysis
M Sweeny, O Habib Perez, E Inness, M Bayley, P Comper, C Danells, G Mochiszuki

43. Suppression of Bladder Activity Following Saphenous Nerve Stimulation in a Continuous Urodynamic Model: A Study in Anesthetized Rats
Z Moazzam, PB Yoo

44. Effects of Hypogastric Nerve Transection on the Bladder-Inhibitory Reflex Evoked by Saphenous Nerve Stimulation in Anesthetized Rats
KS Franz, PB Yoo

45. Bladder Parameter Estimation During Continuous-Fill Cystometry in Urethane-Anesthetized Rats Treated with Tibial Nerve Stimulation
JP Paquette, PB Yoo

46. Development of a Therapeutic Tool for Standing Balance Using FES
EP Grabke, K Chow, JW Lee, J Yoo, K Musselman, K Masani

47. A Case Report on Improving Upper-Limb Function Following Severe Stroke Using BCI-Controlled FEST
L Jovanovic, N Desai, L Lo, V Zivanovic, MP Popovic, C Marquez-Chin

48. Spike-Level Classification of *In Vivo* Peripheral Nerve Recordings
RGL Koh, AI Nachman, J Zariffa

49. Closed-Loop Control of the Knee with Wearable Stimulation Technology
B Moineau, JP Galvan, C Marquez-Chin, MR Popovic

50. Recording Low-Noise Bi-Directional Nerve Activity with a Novel Tetrapolar Nerve Cuff Electrode
P Sabetian, R Koh, J Zariffa, P Yoo

51. Intensive Balance Training for Adults with Non-Traumatic Incomplete Spinal Cord Injuries
J Unger, K Chan, K Masani, BC Craven, A Mansfield, KE Musselman

52. Torque and Discomfort During Three Types of Electrical Stimulation
MJ Wiest, AJ Bergquist, DF Collins

53. Impact Through Scale: Implementation and Optimization of the Centralized Recruitment Process Across All Clinical Units
J Rybkina, SA Jones, LM Brisbois, N Parmar, A Brown, BC Craven

54. If You Build It, They Will Come: Adoption of a Research Volunteer Pool (RVP) for Contact and Recruitment of Outpatient Rehabilitation Research Participants
N Parmar, SA Jones, L Brisbois, BC Craven

55. Identifying Sensory Impairment in Long-Term Care Residents with Dementia: An Environmental Scan and Qualitative Analysis
F Hobler, KS McGilton, J Jarry, X Argueta-Warden, AE Pinol, MR Monforte, W Wittich

56. Perception of Emotion in Music by Hearing-Impaired and Hearing-Aided Listeners
D Fanelli, A Good, F Russo

57. Emotional and Physiological Responses to Music in Hearing Impaired and Hearing Aided Listeners
EV Scholey, FA Russo

58. iWalk App to Improve Use of Timed Walk Tests Post-Stroke
S Raj, M Bayley, D Brooks, J Howe, L Kelloway, M MacKay-Lyons, A McDonald, A Mihailidis, P Solomon, S Veitch, NM Salbach

59. Cognitive Deficits Post Concussion: A Discrepancy Between Patient Reported Outcomes and Performance Based Measures
C Saverino, P Comper, L Ruttan, R Green, E Foster, T Chandra, D Tang, EL Inness, L Langer, M Bayley

60. Fatigue and Discomfort During Sequential Stimulation of Tibialis Anterior
MG Heffernan, AJ Bergquist, MJ Wiest, T Yamashita, MR Popovic, K Masani

61. FLOW Trial: Fluoxetine to Open the Critical Period Time Window to Improve Motor Recovery After Stroke – A Preview

E Foster, F Leibovitch, J Eng, M Bayley

ENABLE INDEPENDENCE (62–78)

Advances in medicine have been extending the average life span into the 80s. As we continue to increase longevity, it is important to also maintain and improve the quality of that life. People like to live at home and we work towards enabling that goal by providing innovations to support aging-in-place without placing undue financial, time, psychological and physical stress on family caregivers.

62. Investigating the Acceptability of Autonomous Cars among Older Adults
S Haghzare, A Mihailidis

63. Non-Invasive Fall Detection using Deep Convolutional Autoencoders
S Khan, J Nogas, A Mihailidis

64. Knowledge Engineering to Develop the Control System of a Novel Stoke Rehabilitation Hybrid Device
A Rich, A Mihailidis

65. HERO: Hand Extension Robot
A Yurkewich, L MacLeod, D Hebert, R Wang, A Mihailidis

66. Homelessness and the Neuropsychiatric Sequelae of Traumatic Brain Injury: A Scoping Review
MJC Bray, EA Barany, A Colantonio, S Hwang, M Bayley, REA Green

67. Talk2Me: Language-Based Assessment of Cognitive Function
C Pou-Prom, F Rudzicz

68. Life After Personalized Adaptive Locomotor Training: A Qualitative Follow-Up Study
H Singh, J Sam, HM Flett, BC Craven, MC Verrier, KE Musselman

69. Virtual Support Platform for Individuals with Spinal Cord Injury Requires an Evaluation Framework Re-Think
BC Chan, M Weist, S Howe, BC Craven

70. An Outcome Measure for Functional Hand Use Based on Egocentric Video
J Likitlersuang, J Zariffa

71. Validation of Stroke-Specific Protocols to Enhance the Clinical Utility of the 10-Metre Walk Test and 6-Minute Walk Test in People with Acute and Subacute Stroke
DK Cheng, M Nelson, D Brooks, NM Salbach

72. 'We're In It Together': Using Animation to Foster the Collaboration of Researchers and Older Adults in the Research and Development of Technologies
R Colobong, P Kontos, S Kirkland, J Sixsmith, K O'Doherty, T Crawford, J Diep, I Panek, K Stroud, O Vaccarino

73. Transdisciplinary Game Night: An Innovative Knowledge Dissemination Strategy to Support Transdisciplinary Research
A Grigorovich, P Kontos, J Sixsmith, ML Fang, M Wada

74. A Qualitative Study Exploring the Barriers and Facilitators to Optimal Physical Therapy Management of Knee Osteoarthritis Symptoms
C MacKay, G Hawker, SB Jaglal

75. Developing a Family-Centered Care Model for Alzheimer's Disease: A Scoping Review of Family-Centered Care Models
KM Kokorelias, G Naglie, MAM Gignac, JI Cameron

76. SCI&U: Participatory Design of an Online Self-Management Tool
S Allin, J Shepherd, S Farrugia, E Wan, S Hossain, SEP Munce, SB Jaglal

77. Needs Analysis of Advanced Multiple Sclerosis Patients
T Bruno, A Srivastava, L Langer, M Bayley

78. Measuring Practice Gaps in Wheelchair Assessment for Persons With Spinal Cord Injury
L Lo, D Hebert, H Colquhoun

79. Towards Closed-Loop Transcranial Alternating Brain Stimulation
F Mansouri, J Downar , J Zariffa

TEAMS

Toronto Rehabilitation Institute's 11 research teams include 110 scientists with appointments at the University of Toronto, McMaster, Guelph, York, Ryerson, Waterloo, Wilfrid Laurier and other leading academic institutions. Our investigators bring a rich and diverse mix of academic, technical and clinical experience. They collaborate in a multidisciplinary environment where engineers, clinicians, social scientists and psychologists work closely together.

Our 150+ graduate students and postdoctoral fellows are members of at least one of these 11 teams that provide them with mentorship, networking and collaboration opportunities. Alums of Toronto Rehab credit our multidisciplinary environment for their success when they graduate.

ACQUIRED BRAIN INJURY & SOCIETY

Team Leader: Dr. Angela Colantonio

The Acquired Brain Injury (ABI) & Society team is a global leader in interdisciplinary research and knowledge exchange that addresses the intersection of brain injury and social variables, such as gender, socioeconomic status, workplace cultures, and exposure to violence. Much of their research explores the impact of brain injury on marginalized populations. They are developing innovative strategies to improve outcomes beyond health indicators, such as employment and social participation, which integrate personal and systemic factors with the latest scientific evidence.

ARTIFICIAL INTELLIGENCE & ROBOTICS IN REHAB (AIRR)

Team Leader: Dr. Alex Mihailidis

The objective of the AI & Robotics in Rehab (AIRR) team is to develop tools that can support the roles and practices of caregivers and clinicians to deliver safe and effective patient care using cutting-edge technologies. The team has particular expertise in selecting, developing and deploying technologies that allow delivery of this care anywhere and at any time, whether in a hospital, clinic, or in the home. Applying techniques and algorithms from the fields of artificial intelligence, robotics, computer vision, and pervasive computing, the AIRR team helps older adults and individuals with disabilities live more independently.

BRAIN DISCOVERY & RECOVERY

Team Leader: Dr. Robin Green

The Brain Discovery & Recovery (BDR) team focuses on the >36,000 Canadians with enduring effects of traumatic brain injury, effects that can be debilitating and life-long. This team has been at the forefront of research that re-conceptualizes moderate-severe TBI as a chronic and progressive disease process rather than a one-time event.

Restoring Function: The BDR team has been translating their basic research findings (new brain biomarkers and novel causes of brain decline) into evidence-based treatments designed to restore brain structure and function, and to ameliorate cognitive and emotional functioning.

Enable independence: By improving the brain and behaviour, these treatments are designed to help people to get back to more independent lives - back to school, work and an enjoyable social life.

Optimize the Rehabilitation System: The BDR team has created a provincial research centre for chronic traumatic brain injury in order to speed up scientific discovery, while scaling up delivery of care province-wide. The centre's dual-purpose approach allows for delivery of treatment to patients through their participation in research, and it fills critical gaps in research and care in chronic TBI. The centre employs teletherapies developed by the team that can be delivered remotely to patients in their own homes, helping to maximize reach and scaleability.

CARDIORESPIRATORY FITNESS

Team Leader: Dr. Paul Oh

The Cardiorespiratory Team is a cohesive blend of scientists and trainees from multiple disciplines who are focused on the primary goal of prevention and better management of cardiovascular disease. Our three pillars of research are:

1. Optimization of exercise and health behavioural models: This area includes the investigation of rehabilitation programs for people with cardiovascular disease, but also for several chronic disease populations (e.g., stroke, diabetes and cancer) that have become increasingly more complex and pervasive. Building on our long tradition of research into exercise models, we are examining innovative higher intensity exercise for vulnerable populations and the effects of exercise on fitness, function and physiology. The team also addresses access and barriers to cardiac rehabilitation, with particular emphasis on sex-related differences. Novel behavioural supports including use of financial health incentives, peer support, technology and music to promote long term adherence are being explored. The brain-heart connection is another important focus with respect to cognitive function, mood, stress and sleep in chronic disease populations.
2. Patient education with the goal of behaviour change: We have developed a systematic process for the assessment of patient knowledge, design and delivery of therapeutic education, and quantification of subsequent behavior change and health outcomes. An important aspect of this theme addresses needs in multicultural communities close to home and around the world.
3. Impact into global communities: Our program has been providing leadership with the international cardiac rehab community, especially sharing resources and spearheading collaborative research with low and middle income countries around the world. Measurement of our impact on patient outcomes and cardiovascular health services utilization is another important focus.

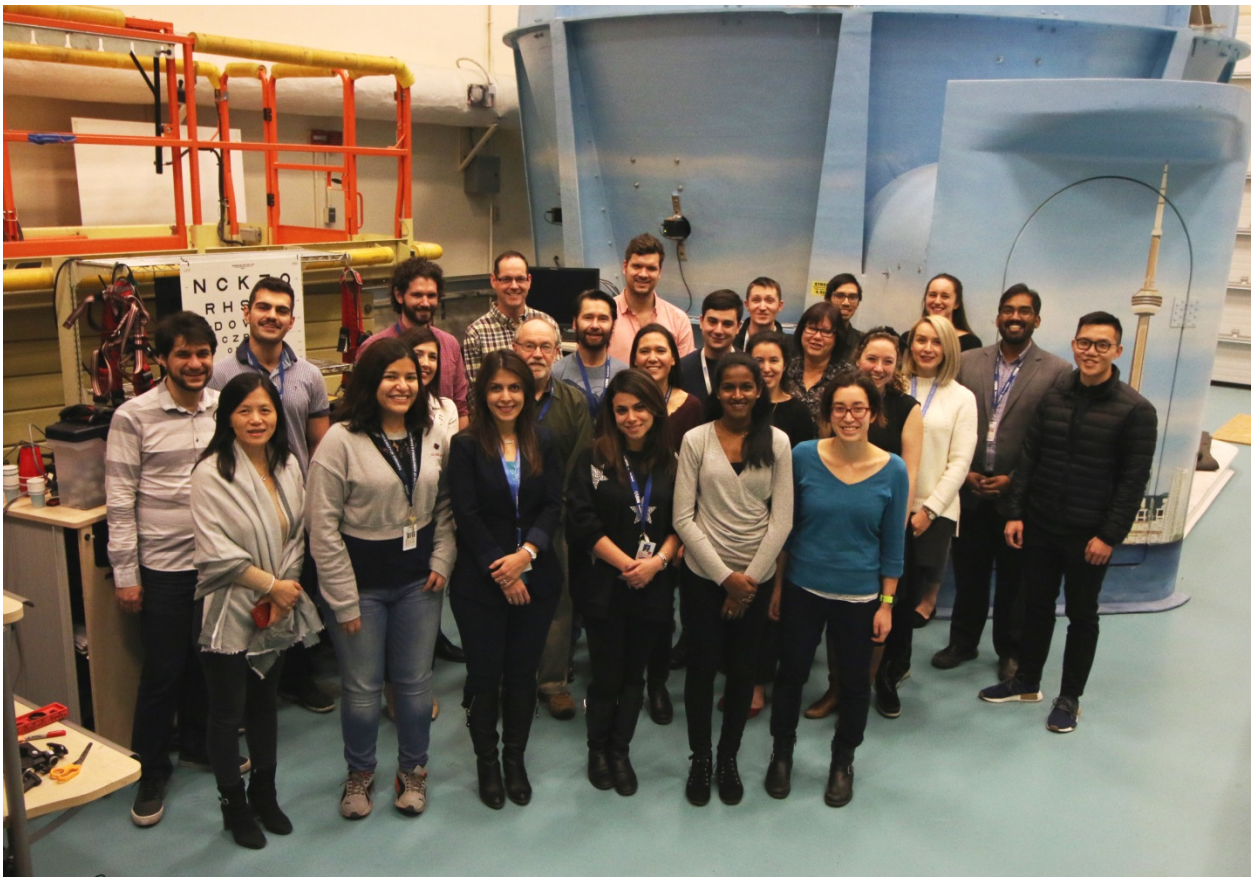
COMMUNICATION

Team Leader: Dr. Yana Yunusova

The Communication Team undertakes research to restore speech, language and cognitive abilities and enable independence through improved communication in individuals living with dementia, stroke, traumatic brain injury, and Parkinson's disease. The team members are developing novel therapies to improve naming in those with aphasia, and speech articulation skills and emotional communication in those with Parkinson's disease. They are developing means to maximize communication between individuals with dementia and their caregivers (human and robotic). The team members also enable independent living for those with age-related hearing loss by improving the design of hearing aids and their acceptability. The members of the team improve our rehabilitation system by participating in large country and province-wide initiatives focused on successful aging and quality of life through improved communication.

HOME, COMMUNITY & INSTITUTIONAL ENVIRONMENTS

Team Leader: Dr. Tilak Dutta



The Home, Community and Institutional Environments Team develops technologies to help older adults and individuals with disabilities live more safely and independently by preventing falls and ensuring safe mobility. They also develop technologies to prevent the spread of infection and to help caregivers avoid back injuries. The team implements their goals by bringing successful new products to the market, making important changes to policy and introducing new therapies to clinical practice.

MOBILITY

Team Leader: Dr. Mark Bayley

This team strives to optimize mobility using a two-pronged approach:

- preventing loss of mobility with exercise and innovative interventions; and
- restoring mobility to those who have experienced a decrease, whether gradually due to aging, or rapidly after a stroke, brain injury, fall, or other life-altering event.

Team members have expertise in the study and treatment of human movement (kinesiologists and physiotherapists), structure and design (engineers), and medicine (physicians and nurses). They are a talented and caring unit of transdisciplinary researchers, learning the skills and perspectives of team members outside their primary discipline to become uniquely capable forces within the health care system. To achieve their goals they are developing predictive models to identify those at most risk of falls. They then develop and evaluate interventions to target fall prevention and thus ensure people avoid the need to enter a rehab hospital. They also research, design and test novel therapies and rehab paradigms to boost rate of recovery through intensified exercises. They also provide strategies to ensure people with mobility impairments continue to maintain their physical activity after discharge, enabling their independence from formal rehab and reducing the burden on the health care system. They are interested in using new technology to measure mobility in the community as well to ensure sustainability of benefits. Their research has broad importance in geriatric, neuro-, and pulmonary rehabilitation.

NEURAL ENGINEERING & THERAPEUTICS

Team Leader: Dr. Cathy Craven

The Neural Engineering and Therapeutics (NET) Team's mandate is to advance our understanding of neurological recovery, and the therapeutic benefits of neurorehabilitation, for individuals living with spinal cord injury (SCI) through the conduct of translational research. Since its inception, the team has been developing neuroprosthetic systems and assistive technologies, neurorehabilitation interventions (drug, physical therapy, nutraceuticals), and clinical outcome assessment tools for individuals with SCI. Many of NET Team's clinical interventions have potential for clinical deployment prior to 2020. The NET team is comprised of 9 Scientists, 6 postdoctoral fellows, 26 graduate students, and 19 staff with expertise in Engineering, Rehabilitation, Physiotherapy, Epidemiology, Kinesiology, Biology, Neurology and Health Systems Innovation. NET team senior scientists are international leaders in the field driving device, therapy and health systems transformation. The team hosts a National SCI conference every two years (www.sci2017.com) and has recently founded a new organization, CSCI-RA (Canadian Spinal Cord Injury – Rehabilitation Association) to assist with clinical implementation and dissemination of the team's products and advance the health and wellness of patients living with spinal cord injury.

OPTIMIZE

Team Leader: Dr. Kathy McGilton

The goal of Team Optimize research is to prevent cognitive and functional decline of persons requiring rehabilitation by focusing on restoring function and enabling independence for adults through the optimization of the health care system and the home environment. The results of their research will lead to 1) maintaining or improving the ability of patients to function independently, 2) improving health-related quality of life, and, 3) reduce unnecessary service utilization and associated costs.

The researchers within this team understand that individuals with these complex conditions require an interdisciplinary solution to their care and deserve access to rehabilitation care; they create solutions to improve outcomes such as: a clinic for older adults with complex conditions who have genitourinary cancer, increasing exercise among hemodialysis patients and their caregivers, patient centred rehabilitation models for persons with cognitive impairment, drama-based interventions to address the stigma of dementia and interprofessional clinics using telemedicine focused on chronic pain management. Their research strives to create the most effective health care systems, programs and approaches to caring for patients with complex (i.e. mental, physical, cognitive and social) conditions.

SLEEP SCIENCE

Team Leader: Dr. Owen Lyons

The Sleep Science Team aims to enhance management of sleep disordered breathing by increasing access to diagnosis, improving our understanding of the causes of airway narrowing during sleep, and developing new therapies. Early diagnosis of a breathing disorder during sleep (such as sleep apnea) allows for treatment in a timely manner, improving sleep quality, and **preventing poor health outcomes** associated with untreated sleep apnea. BresoDx is a home sleep apnea testing device that removes barriers to diagnosis; it has received Health Canada Approval and European Commission CE Mark as a medical device. Future generations of the device are in development.

The team has developed a new laboratory at Toronto Rehab: Sleep*dB* is a sound-proof laboratory that is now supporting our full spectrum of research, from basic science to prototype development. This basic science research has already made novel observations on the pathogenesis of airway narrowing during sleep. This will lead to new treatments for sleep disordered breathing and help to **restore function** in patients with comorbidities by reducing fluid shift and its pernicious effects.

The team's clinical research has led to a greater understanding of the pathogenesis of sleep apnea in various at-risk patient populations such as heart disease, renal disease and stroke. This is facilitating the development of innovative clinical pathways and novel therapies for sleep apnea in these at-risk patients with a view to reducing **morbidity and improving quality of life**.

SWALLOWING SCIENCE

Team Leader: Dr. Catriona Steele

The Swallowing Science Team consists of a multidisciplinary group of researchers including speech-language pathologists and engineers whose goal is to optimize outcomes for individuals with swallowing impairment. They study methods to restore optimal swallowing function by tailoring interventions to the specific mechanisms underlying swallowing impairment. There are several foci of research for this team: tongue function; viscosity and texture modification; swallowing accelerometry; treatment studies; and nutrition.


Awards

GEOFF FERNIE IMPACT AWARDS

The Geoff Fernie Impact Awards have been created to honour three TRI stars whose work and presence have impact internally at TRI, and whose research has impact externally in the world. The bar was very high and it was extremely difficult for the adjudication committee to select the recipients of these Impact Awards. Our winners truly deserve this award which comes with a cash prize of $1,000 each as well as a listing on a newly minted "Honour Board"! The other 10 nominees were of an incredibly high calibre and have earned an "Honourable Mention".

Bastien Moineau, Post-Doctoral Fellow

Dr. Bastien Moineau has been with TRI almost 2 years. In last 12+ months Bastien has exhibited leadership skills at multiple levels, which make him an ideal candidate for the Impact award.

Collaboration with company Myant: Since August/September 2016 Bastien worked intensively and collaboratively with the head of Myant's R&D team, Milad Alizadeh-Megrazi. He established a strong collaboration between the REL laboratory and Myant which resulted in the first garment-based system for delivering functional electrical stimulation (FES) to individuals with various neurological deficits. The key feature of this technology is that the stimulation electrodes are woven into garments and in a minimally intrusive manner deliver FES therapy. This is a revolutionary technology that will enable faster and easier adoption of FES therapies and it will revolutionize the FES field. Video of the product prototype can be found at: https://www.youtube.com/watch?v=zn3cr8Vgzos

- **Student mentoring:** Bastien directly supervised 5 undergrad students during their 4 months long internship, and another engineering student who was completing his engineering thesis project that lasted 6 months. Besides undergraduate students Bastien also assisted in supervising 2 MASc students, and he regularly advised other MASc and PhD students in the laboratory. His mentorship approach differs considerably from other PDFs in the way he manages and cares for the students. Unlike other people at his stage of career who are usually focused only on their direct mentees and people who contribute to their body of research, Bastien mentored all students in the laboratory and took ownership of their work and their challenges and successes. He truly impressed everyone with this attitude as he demonstrated maturity and caring for students. His attitude that every student matters and should be assisted regardless of the project s/he is working on, is something that makes Bastien stand out. As part of this effort Bastien also organized a Journal Club to further assist students with their reasoning and presentation skills. He made sure that all students in the laboratory attend the journal club and contribute to the effort.

GEOFF FERNIE IMPACT AWARDS

- **Upgraded laboratory:** Bastien identified a deficiency in the way our motion analysis system and its space were used. He dedicated considerable time and effort to transform our motion analysis space and make it truly accessible and safer for study participants. He essentially designed the fixtures and platforms that increased ease of use of the equipment as well as its safety.

- **Accessible poster initiative:** Bastien also noticed that our posters, which are displayed in the corridors of Lyndhurst Centre, are often not accessible to our patients, their families and our staff due to their complexity. Therefore, he introduced a template that addresses this problem and makes our research more accessible to the general public. Over the past year Bastien has been working with the REL team to produce posters for display at Lyndhurst that are accessible to all audiences.

Kramay Patel, MD/PhD candidate

Kramay spent three summers at REL as an undergraduate summer student. He came to our lab with the Engineering Science Research Opportunity Award from the University of Toronto in the summer of 2013, and the NSERC Undergraduate Student Research Award in summers of 2014 and 2015. During that time, we worked closely on various projects that investigated the physiological control of human balance during sitting and on projects for improving trunk stability in individual with SCI.

In his 1st year at REL, Kramay worked on developing a clinical tool for assessing sitting balance and for providing video-game based rehabilitation exercises for patients with sitting instability after spinal cord injuries (SCIs). During his 2nd summer research, Kramay worked on a study in which he investigated how the trunk muscles respond to anticipated and unanticipated perturbations. He performed extensive analysis to detect robust muscle onsets and calculated detailed body kinematics. Kramay co-authored a paper for this study that was published in Journal of Electromyography Kinesiology. During the same summer, Kramay also started working on his own project at the lab which focused on developing a novel, wheelchair-based neuroprosthesis for improving dynamic trunk stability in individuals with SCI. He carried forward this work into his 3rd summer by the end of which, Kramay had executed this project from start to finish. He was responsible for everything for this project, including filing for a regional ethics approval, developing a novel experimental setup, designing the experimental protocol, recruiting subjects, collecting data, analyzing data and formulating conclusions. This study has been published in IEEE Trans Neural Sys Rehabil Eng, where he is the first-author. This level of research contribution is way beyond what one expects from undergraduate students.

Since starting his graduate studies in the REL lab this September, Kramay has continued having a strong impact on the lab and on his peers. He completely redesigned our lab's website to dramatically improve our online

presence (www.reltoronto.ca). He also started social initiatives to increase the sense of community amongst the trainees in our lab. Furthermore, he has used his passion for undergraduate research to improve the process through which we recruit summer students. To do this, he has created a standardized summer-student recruitment template which PIs, post-docs and graduate students in our laboratory can use to develop appropriate projects for summer students which have tangible learning and research outcomes. He also created a centralized recruitment portal on our website where these projects will be posted, and is actively investigating new channels through which talented summer students can be recruited to the lab. Kramay understands the value that an undergraduate summer student can add to the laboratory environment, and the importance that rigorous undergraduate research can have on the education of undergraduate students, and is very passionate about making the experience mutually beneficial for the laboratory and for the summer students.

Apart from Kramay's extensive and excellent technical skillset, what really makes him a successful researcher is his ability to communicate his research, not only to experts in the field, but also to those who know nothing about the field. He is able to translate difficult, quantitative concepts into easy to understand presentations. As an example, he gave a guest lecture about Inertial Measurement Units that involves complex mathematics but he successfully taught the topic to undergrad students with great clarity. He has also won several presentation awards as part of each one of his research internships in our lab, including several awards at the annual Undergraduate Engineering Research Day at U of T (1st place twice), and at the annual IBBME Undergraduate Research Symposium (1st place three times). Most notably, he was awarded the national Sunnybrook Research Prize in 2015, which is an extremely competitive national level research competition organized by the Sunnybrook Research Institute. His work has also been featured in several news articles and has also been recognized internationally at the 6th Advanced Institute on Global Healthcare Challenges, where he was invited to present his work as a Junior Speaker. Kramay is also one of U of T's only students to have been awarded a NSERC Vanier Canada Graduate Scholarship straight out of his undergrad, and is the only MD/PhD student in the country to hold a Vanier CGS from NSERC.

Kramay has served as the President of the Sustainable Engineers Association at U of T, an organization dedicated to promoting sustainability and sustainable engineering practices across the City of Toronto. He also founded a space-robotics team at U of T (Robotics for Space Exploration) and led it to several international robotics competitions. Kramay is also very entrepreneurial, and established a design engineering company (while an undergraduate student) that designed the world's first smart showerhead which provides users with intelligent feedback on their showering habits to help reduce water consumption. This product is currently patent pending in US and Canada.

GEOFF FERNIE IMPACT AWARDS

Sin Tung Lau, MSc candidate

Sin Tung Lau worked with her supervisor, Dr Campos as an undergraduate research student completing a fourth year independent project (Sept. 2011 – May 2012) and since then as a Research Analyst and Project Manager working on a study evaluating the effects of dual-tasking on older adults with and without hearing loss (May 2012 – Aug 2014). Currently, she is a second-year Masters student co-supervised by Dr Jenny Campos and Dr. Michael Cinelli (Wilfrid Laurier University).

As part of her undergraduate independent research project, Sin Tung investigated questions related to the interactions between hearing and balance in older adults. This work is motivated by the fact that *older adults with hearing loss are three times more likely to fall* and they demonstrate more mobility-related problems than their normal-hearing peers. Specifically, she has used (and continues to use) Toronto Rehab's StreetLab (Virtual Reality lab) to investigate dual-task performance costs during a realistic "listening while walking" task. Because this was the inaugural study conducted within this new, high-tech laboratory, there were unique challenges that Sin Tung successfully overcame, her enthusiasm never waning. Sin Tung recently submitted a manuscript as first author for publication in the Journal of the American Acoustical Association (following some very positive peer reviews), with several other papers in the pipeline. This is quite an achievement given that this research was peripheral to her thesis work. For the work she completed during her undergrad, which she presented at the Canadian Acoustical Association conference in 2012, she was awarded the Raymond Hétu Prize in Acoustics and last year she was also awarded the CAA prize for best student presentation. She also presented her research at the International Society for Gait and Posture conference (Spain, 2015), the Falls and Mobility meeting in Toronto ("Watch your Step"), the Lake Ontario Visionary Establishment conference in Niagara Falls (2015, 2016) and she presented a talk at an invited Symposium series at the American Psychological Association's international congress in Washington DC in August of 2014. She also was a co-organizer of this year's Canadian Acoustics Week in Canada Symposium on "Acoustics in Virtual Reality". For all of her academic accomplishments, she was awarded the Team Excellence Award for her research contributions as a member of Toronto Rehab's Communication Team in 2014. She was also the 2015 recipient of the prestigious Mark Rochon Leadership award, which is awarded to a student who exemplifies leadership, academic excellence and community contributions at the graduate student level.

In addition to her research contributions, Sin Tung has also been a keen contributor to our iDAPT Young Innovator's program; particularly in the capacity of reaching out to underrepresented youth and children with disabilities. She has been instrumental in helping to develop activities that can be conducted with children across a range of abilities, with accessibility and program appropriateness top of mind. To achieve this, she has drawn from her rich experiences working very closely with special needs children in the community and their families. She has also dedicated her time and efforts to older adults within the community through her roles as a volunteer at the E.W. Bickle long-term care facility and the Aphasia Institute.

GEOFF FERNIE IMPACT AWARDS

Honourable Mention

Post-Doctoral Fellows:	**PhD candidates:**
Zahra Bagheri	Rabea Aryan
Swati Bhatawadekar	Daniel Vena
Cristina de Oliveira Franco	Stephanie Yung
Gabriela Ghisi	Aaron Yurkewich
Tatyana Mollayeva	
Sarah Munce	

JOEL VERWEGEN AWARD

JOEL VERWEGEN AWARD

The **Joel Verwegen Award** is given by the *Cognitive Neurorehabilitation Sciences Lab* of the Brain Discovery and Recovery Team in memory of Joel Verwegen. Joel was an undergraduate student researcher in the *Cognitive Neurorehabilitation Sciences Lab* at Toronto Rehab in 2007 and 2008. He had a passion for learning, with a particular interest in cognitive neurosciences as well as evolutionary biology. Joel had an aptitude for research, and in the short time he worked at Toronto Rehab, he made substantive contributions. Joel possessed an intellect that was not only exceptionally sharp and rigorous, but also creative. He was meticulous and thoughtful in his actions, and he was immeasurably generous and supportive. The purpose of the award is to honour Joel and to inspire other undergraduate students to aim high.

Alana Changoor

Ms. Alana Changoor, an exceptionally meritorious winner, was a work-study student for the *Cognitive Neurorehabilitation Sciences Lab* for over two years while a University of Toronto undergraduate student. When she gained acceptance to the Masters of Science Program in Global Health at McMaster University, her first choice of programs, she continued to volunteer with us, despite the heavy demands of her program. Alana has been involved in many projects with our team, including the development of a remotely delivered cognitive intervention designed to offset hippocampal degeneration and creation of remotely delivered clinical education materials for patients with traumatic brain injury. She has materially advanced our lab's research, through the development and testing of methodology and materials, data analysis, presentation of findings, and the preparation of manuscripts. Alana's contributions have been so substantive that she is a co-author on three manuscripts in progress. Her work is meticulous, analytical and often original; even as a young undergraduate student, Alana operated like a senior graduate student. There has been no task too challenging or onerous for Alana, and her perseverance and work ethic are outstanding. No matter how many tasks she is juggling, her work is punctual and impeccable. In addition to Alana's intellect, academic accomplishments and research accomplishments, is the wonderful bonus of Alana's kindness, humility and warmth. It is exciting to watch Alana's professional growth, and we will enjoy watching the contributions she makes to science and humanity as she moves forward in her career.

Honourable Mention

This year we had our largest number of nominees for the Joel Verwegen award. The calibre of the nominees was so high that we wanted to give honourable mention to the three runners up who have also displayed attributes that defined Joel – scientific ability, a passion for scientific inquiry, and a positive attitude towards their work.

Alborz Noorani
Annie (Si Cong) Li
Sebastian Acost

BEST PUBLICATION AWARDS

TRI BEST PUBLICATION AWARDS

Alex Terpstra, MSc

Alex Terpstra completed his MSc supervised by Dr. Robin Green at the Toronto Rehabilitation Institute and the University of Toronto's Rehabilitation Sciences Institute. Alex's research, supported by a Toronto Rehabilitation Institute Student Scholarship and Margaret & Howard Gamble Research Grant, focused on how anxiety symptoms relate to ongoing brain changes after a moderate-to-severe traumatic brain injury. He has presented his research at several local and national conferences and received one oral and two poster presentation awards focused on this research. He remains a collaborative member of the Brain Discovery & Recovery Team.

Terpstra AR, Girard TA, Colella B, Green REA. Higher Anxiety Symptoms Predict Progressive Hippocampal Atrophy in the Chronic Stages of Moderate to Severe Traumatic Brain Injury. Neurorehabil Neural Repair. 2017 Nov 1:1545968317736817. doi: 0.1177/1545968317736817

This research uncovers anxiety symptoms as a contributor to hippocampal neurodegeneration in the chronic stages of moderate to severe traumatic brain injury (TBI). In addition to the acute damage to the brain observed in the days and weeks following a moderate to severe injury, TBI may also cause progressive neurodegeneration months and years post-injury. The hippocampi – essential for memory, emotional processing and stress regulation - are one of the most vulnerable structures to neurodegeneration.

We were interested in identifying modifiable "post-injury" mechanisms contributing to hippocampal neurodegeneration. Considering recent research demonstrating that higher anxiety was associated with persistent damage to the medial temporal lobes in mild cognitive impairment and Alzheimer's disease, we were interested in anxiety as a candidate mechanism underlying the chronic hippocampal neurodegeneration seen in moderate to severe TBI. In our study, we found that anxiety symptoms measured at 5 and 12 months predicted volume loss from 5 to 12 and 12 to 30 months post injury (respectively) in the right hippocampus. Thus, our results suggest that the right hippocampus is structurally vulnerable to elevated anxiety symptoms in the chronic stages of moderate to severe TBI. Critically, this research identifies a modifiable, post-injury factor as a target for mitigating ongoing hippocampal atrophy in the chronic stages of moderate to severe TBI. Implications of the research are that tried-and-true strategies for anxiety, such as psychological treatment, mindfulness meditation, physical exercise and pharmacological treatments, should serve to offset hippocampal atrophy in the chronic stages of moderate-severe TBI.

BEST PUBLICATION AWARDS

Shehroz Khan, Post-Doctoral Fellow

Dr Shehroz Khan started his post-doctoral fellowship in 2016 supervised by Dr Babak Taati and funded by AGE-WELL. Dr Khan completed his PhD in machine learning in 2016 at the David R Cheriton School of Computer Science, University of Waterloo. Prior to this, he completed his Masters at the National University of Ireland, Department of Information Technology. His current research interests are developing machine learning algorithms for solving health and aging problems, and supporting assistive technologies. Dr Khan is member of the AIRR team.

Shehroz S. Khan, Babak Taati. Detecting unseen falls from wearable devices using channel-wise ensemble of autoencoders. Expert Systems with Applications. 2017 Nov 87:280-290
https://doi.org/10.1016/j.eswa.2017.06.011

Falls are a major health hazard in elderly people. Most of the fall detection solutions build classification models using normal activities of daily living and falls that are either simulated or collected by actors. There are two problems with this strategy (i) Simulated falls are not representative of real falls (as supported by many recent studies) and they can over fit classification models, and (ii) a fall is a rare event; therefore, collecting real falls is very difficult and classification models will still suffer from huge data skew problems. To solve these issues, we proposed a novel fall detection method that trains a deep learning based classification model on only the normal activities, which are available in abundance. This method does not explicitly train the classification model on falls. However, it can identify a fall as an abnormal activity during testing, if it deviates from the model of normal activities. To demonstrate the idea, we used several datasets that collect motion data from wearable devices. A new technique is proposed to train deep autoencoders on raw data from each channel of the wearable device individually. This creates an ensemble of wearable device data; their outcomes are fused to take a robust decision about the occurrence of falls. We also developed new methods to compute dynamic thresholds from the data for each channel of the wearable device that improves the generalization of our proposed method. We showed better model performance than traditional methods in differentiating normal activities from falls.

TECHNOVATION AWARD

This is the 5th year that the Center on Knowledge Translation for Technology Transfer, University at Buffalo (SUNY), USA, is sponsoring this competition to promote the thoughtful consideration and planning necessary to transform student projects into market innovations with beneficial impacts. US$1,000 is awarded to the successful grad student/post-doctoral fellow. This cash award is provided through the National Institute on Disability, Independent Living and Rehabilitation Research (NIDILRR), US Department of Health and Human Services.

This year the award is co-sponsored by the Ontario government (the Ministry of Research, Innovation and Science and the Accessibility Directorate of Ontario). The TechnoVation winner is guaranteed one of 35 exhibit spaces within the Accessibility Innovation Showcase (AIS) at the Discovery 2018 conference taking place in Toronto April 30-May 1, along with two full conference passes. AIS exhibitors may apply to be part of a Tech Pitch Competition* where five finalists compete for a $20,000 award to further their business development.

A winner from the following entries will be selected and announced on Research Day:

9. Preventing Back Pain Using Realtime Feedback, M Owlia, M Kamachi, K Ledda, C Ng, A Longfield, T Dutta
21. Sleep Apnea Diagnosis using Respiratory Sounds and Pulse Oximetry. S Saha, M Kabir, B Gavrilovic, K Zhu, A Yadollahi
23. Developing an Acoustic Algorithm for Respiratory Flow Estimation without Subject-Specific Calibration. N Montazeri, S Saha, K Zhu, B Taati, A Yadollahi
48. Closed-Loop Control of the Knee with Wearable Stimulation Technology. B Moineau, JP Galvan, C Marquez-Chin, MR Popovic
57. iWalk App to Improve Use of Timed Walk Tests Post-Stroke. S Raj, M Bayley, D Brooks, J Howe, L Kelloway, M MacKay-Lyons, A McDonald, A Mihailidis, P Solomon, S Veitch, NM Salbach
65. HERO: Hand Extension Robot. A Yurkewich, L MacLeod, D Hebert, R Wang, A Mihailidis

*Competitors must have a tangible product that is already in market or is at minimum market-ready

TD GRADUATE SCHOLARSHIP FOR PEOPLE WITH DISABILITIES

TD GRADUATE SCHOLARSHIPS

TD reaffirmed its commitment to accessibility by pledging $1 million to support Toronto Rehab's vision of assisting exemplary Masters and PhD students with disabilities in becoming world-class scientists in rehabilitation-related research. Scientists with disabilities understand both the needs and opportunities that exist in science and technology. Their unique knowledge and perspectives enrich research. The scholarships of up to $20,000 each, help to level the playing field for students with disabilities.

Pictured here at the 2016 Research Day, past award recipients celebrate the announcement.

Jirapat Likitlersuang, PhD candidate

A previous recipient of this scholarship, Jirapat is a PhD candidate at the Institute of Biomaterials and Biomedical Engineering, University of Toronto (UofT) with a BASc in Engineering Science from UofT.

His strong fascination in the research area of rehabilitative treatments and devices for people with disabilities primarily stems from his experience living with a language expression difficulty, having seen how assistive devices have made a significant difference to his life.

He is particularly interested in the development of novel assistive devices and the evaluation of treatments for children and adults living with a disability.

TD GRADUATE SCHOLARSHIP FOR PEOPLE WITH DISABILITIES

As an undergrad he worked on an automatic rehab assessment system for upper limbs, as well as educational tools that teach high-functioning children with autism spectrum disorder how to safely cross the road. In collaboration with scientists at the Bloorview Kids Rehabilitation Hospital, he helped to develop a portable pressure sensor device that can be used to examine the biomechanics of mobility assistive devices. Currently, he is working to develop a wearable system capable of monitoring hand function for adults with upper limb dysfunction at the TRI-UHN.

Stefania Moro, PhD candidate

Stefania studies auditory and visual processing in a rare group of patients who have had one eye surgically removed early in life due to cancer of the retina. Her research addresses crossmodal plasticity (how people with one eye adapt to the loss of binocularity). She has found that those experiencing the loss of an eye in early life may be able to compensate for their visual loss by using their remaining eye with other senses. She believes that the brains of people with a sensory deficit can adapt resulting in rich perceptual experiences.

Stefania suffered a traumatic injury to an eye as a child and appreciates firsthand the importance of achieving a normal sensory experience throughout life.

Stefania is doing her PhD in Psychology at York University after completing her Master's degree. She has several

An "alum" of the Toronto Rehab Scholarships, **Andrea Kusec, MSc,** is in the UK as a Gates Cambridge Scholar. In her own words ….

"I have nothing but great things to say about the Toronto Rehab Scholarship, made possible by TD's generous donation. Throughout my undergraduate career, I constantly wondered whether I was good enough to be a graduate student because I had always struggled academically due to my disability. This scholarship not only recognized my potential, but enabled me to pursue my Master's degree in Rehabilitation Science; it allowed me to focus on my thesis without being overwhelmed by other responsibilities. As a result, I have recently published a manuscript from my Master's thesis and have submitted another.

In October 2017, I began my PhD at the MRC Cognition and Brain Sciences Unit at the University of Cambridge as a Gates Cambridge Scholar, a competitive scholarship awarded to roughly 1% of international applicants. I will be investigating novel treatments for mood disorders in acquired brain injury, and in the future, aim to translate cognitive neuroscience research into clinical practice for those with brain injuries.

Rehabilitation research is highly personal to me – most of my life has been shaped by my concussion and subsequent diagnosis of epilepsy; my epilepsy provides me with insight into the experiences of people living with a permanent disability, who – like me – are working to make their lives meaningful.

publications and has co-authored a book chapter in *Plasticity in Sensory Systems*. She has also presented at over 25 scientific meetings including the prestigious Vision Sciences Society, the International Multisensory Research Forum and the Society for Neuroscience.

John Shepherd, MSc candidate

John Shepherd studies health services and policy research related to people living with spinal cord injury (SCI). He is examining ways of using data from novel sources such as electronic medical records to study the epidemiology of chronic SCI, providing information on the long-term experience of people who live with SCI in the community. John's research will provide a better picture of the health status and healthcare use of this population, and will suggest opportunities for improvement via research and policy. John, who has been living with a spinal cord injury for 14 years, appreciates the impact of a well-informed and responsive health care system.

John is completing his Master's degree at the University of Toronto's Rehabilitation Sciences Institute. He has published in the Journal of Spinal Cord Medicine, and presented his work at the National Spinal Cord Injury Conference, where he gave a Consumer Keynote address and was awarded best poster presentation in the Patient Education category. He has been active as a community volunteer, and has served on the boards of Toronto Rehab Foundation and Spinal Cord Injury Ontario.

ACKNOWLEDGEMENTS

We gratefully acknowledge the support of our sponsors:

University at Buffalo The State University of New York KT4TT	The **Center on Knowledge Translation for Technology Transfer** (KT4TT) is a program of the Center of Assistive Technology at the **University at Buffalo**, sponsored by the National Institute on Disability, Independent Living and Rehabilitation Research Agency (NIDILRR). http://sphhp.buffalo.edu/cat/kt4tt.html
Ontario	The **Ontario Ministry of Research, Innovation and Science** supports world-class research, commercialization and innovation taking place across Ontario through a range of programs and services like the Ontario Research Fund, Innovation Demonstration Fund and Ontario Venture Capital Fund. https://www.ontario.ca/page/ministry-research-innovation-and-science Ontario is a world leader in ensuring a more accessible place for all, where every resident or visitor can participate fully. Since 2005, the **Accessibility Directorate of Ontario (ADO)** has been working with the disability, private and public sectors to develop and enforce accessibility standards, and promote greater accessibility awareness throughout the province.
Dr. Geoff Fernie	Dr Fernie's sponsorship of the Impact Awards recognizes the leadership qualities of our trainees, their academic excellence and outstanding contributions to the community at TRI and beyond.
Professional Engineers Ontario West Toronto Chapter	Professional Engineers Ontario (PEO) is the licensing and regulating body for professional engineering in the province. PEO operates under the authority of the *Professional Engineers Act* to serve and protect the public interest by setting and upholding high academic, experience and professional practice standards for the engineering profession. The core values for professional engineers include: Accountability, Respect, Integrity, Professionalism and Teamwork. **Professional Engineers Ontario, West Toronto Chapter (WTPEO)** is one of the 36 chapters in Ontario. It promotes the value of engineering to local communities, universities, colleges, schools and

	offers a forum for its members to discuss issues of concern for engineers and society. WTPEO engages the youth in discovering the joys of math, science and engineering through education outreach programs and local events, including those associated with National Engineering Month. WTPEO encourages innovations and the development of impactful solutions to advance and safeguard the wellbeing and safety of our communities and society. http://westtorontopeo.com/
BlueSky INVESTMENT COUNSEL	**BlueSky Investment Counsel Inc**. is an independent, discretionary portfolio management firm that caters to the needs of individual investors, institutions and not-for-profit organizations. BlueSky Investment Counsel deems most of its portfolios Socially Responsible Investments. https://www.blueskyic.com/about-2/
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Klick Health	**Klick Health** (established in 1997) is the world's largest independent health marketing and commercialization agency. Recognized as Agency of the Year five times over the last six years by the industry's leading publications, Klick is focused on creating solutions that engage and educate healthcare providers about life-saving treatments and help inform and empower patients to manage their health and play a central role in their own care. Every solution hinges on Klick's in-house expertise across the commercial universe—strategy, creative, analytics, instructional design, user experience, relationship marketing, social and mobile. Klick's digital innovation lab, Klick Labs, helps life science organizations advance healthcare through the application of emerging concepts and technologies. Follow Klick Health on Twitter @KlickHealth. https://www.klick.com
HandyMetrics CORPORATION	HandyMetrics is a health software services and technologies company that develops innovative infection control, hand hygiene and patient safety auditing technologies for healthcare settings. The company was started to commercialize technology from Toronto Rehab, and spun out of TRI's Home Community and Institutional Environments Team. https://www.handymetrics.com

TRI Research Leadership

Geoff Fernie	**The Creaghan Family Chair in Prevention Research and Healthcare Technologies**
Milos Popovic	**Institute Director, Research**
Susan Jaglal	**Associate Academic Director**
Catharine Hancharek	**Director of TRI Research Operations and Business Development**

TRI Research Team Leaders

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Alex Mihailidis	Artificial Intelligence & Robotics for Rehabilitation (AIRR)
Robin Green	Brain Discovery & Recovery
Paul Oh	Cardiorespiratory Fitness
Yana Yunusova	Communication
Tilak Dutta	Home, Community & Institutional Environments
Mark Bayley	Mobility
Cathy Craven	Neural Engineering & Therapeutics
Owen Lyons	Sleep Science
Catriona Steele	Swallowing Science
Kathy McGilton	Optimization of the Rehabilitation System

Research Day Chair

Susan Jaglal

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(We appreciate the help of all volunteers whose names were not available when we went to print)

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Please join me in welcoming Milos as the new Institute Director of our research enterprise. We look forward with great excitement to cheering on his ambitious goals and bold vision for TRI Research.

Geoff Fernie

I look forward to leading our Research Institute and working together with our scientists, clinicians, staff, trainees, and collaborators in creating even more impactful solutions for our patients, their caregivers, their families and our communities.

Milos Popovic