



Law Society
of Ontario

Barreau
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Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

CHAIR

Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon
Director, Canadian Concussion Centre

May 30, 2024



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Law Society of Ontario

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Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024



Presented by: [Canadian Concussion Centre](#), Toronto Western Hospital, in partnership with the Law Society of Ontario

CHAIR: Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon
Director, *Canadian Concussion Centre*

May 30, 2024

9:00 a.m. to 5:00 p.m.

Total CPD Hours = 6 h 15 m Substantive + 45 m Professionalism 

Law Society of Ontario


SKU CLE24-00509

Agenda

9:00 a.m. – 9:15 a.m. Welcome & Update

Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon
Director, *Canadian Concussion Centre*

9:15 a.m. – 9:55 a.m.	<p>Update on Diagnostic Biomarkers in Concussion (The Good, The Bad, and The Ugly) (10 m </p> <p><i>Update on biomarkers as evidence (medical perspective/reliability, and legal insight into biomarkers)</i></p> <p>Dr. Andrea Para, MD, Neuroradiologist, <i>Toronto Western Hospital</i></p> <p>Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist, <i>Canadian Concussion Centre, Toronto Western Hospital</i></p> <p>Lindsay Charles, <i>McLeish Orlando LLP</i></p>
9:55 a.m. – 10:35 a.m.	<p>Neuropsychological Assessments - Cognitive Testing, Validity Testing, and the Impact of Symptoms</p> <ul style="list-style-type: none"> ▪ Neuropsychological Assessment in Concussion: Utility and Limitations <p>Dr. Robin Green, PhD, C.Psych., Clinical Neuropsychologist, <i>University Health Network</i></p> <ul style="list-style-type: none"> ▪ Symptom and Performance Validity <p>Dr. Eliyas Jeffay, Ph.D., C.Psych., Clinical Neuropsychologist, <i>University Health Network</i></p>
10:35 a.m. – 10:45 a.m.	Question and Answer Session
10:45 a.m. – 11:05 a.m.	Break
11:05 a.m. – 11:40 a.m.	<p>Advances in Treatment of Concussion</p> <p>Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist, <i>Canadian Concussion Centre, Toronto Western Hospital</i></p> <p>Role of Occupational Therapy in Concussion Recovery</p> <p>Anoli Shah, Occupational Therapist, OT Reg. (Ont.), <i>Altum Health, University Health Network</i></p>

11:40 a.m. – 12:25 p.m.	Viewpoint From the Bench and Bar on Damages (15 m )
Moderator:	The Honourable Karen Weiler, <i>Court of Appeal for Ontario (Retired)</i>
Panelists:	The Honourable Justice Mark Edwards, <i>Superior Court of Justice, Regional Senior Justice (Central East Region)</i>
	The Honourable Justice Grant Dow, <i>Superior Court of Justice</i>
	Patrick Brown, C.S., <i>McLeish Orlando LLP</i>
	James Tomlinson, Retired Partner, <i>McCague Borlack LLP</i>
12:25 p.m. – 12:40 p.m.	Question and Answer Session
12:40 p.m. – 1:40 p.m.	Lunch
1:40 p.m. – 2:20 p.m.	Pre-Injury and Post-Injury Factors and Their Interplay in People with Concussion
	Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist, <i>Canadian Concussion Centre, Toronto Western Hospital</i>
	Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon Director, <i>Canadian Concussion Centre</i>
2:20 p.m. – 2:55 p.m.	Implications of <i>Rowan's Law</i>
	The Honourable Neil Lumsden, Minister of Tourism, Culture and Sport
	Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon Director, <i>Canadian Concussion Centre</i>
	Jim Davidson, C.S., <i>Davidson Cahill Morrison LLP</i>
2: 55 p.m. – 3:10 p.m.	Question and Answer Session
3:10 p.m. – 3:30 p.m.	Break

3:30 p.m. – 4:10 p.m.

Concussion and the Workplace

Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist, *Canadian Concussion Centre, Toronto Western Hospital*

Michelle Friedman, *Aviva Trial Lawyers*

Jennifer Heath, *Piccolo Heath LLP*

Anoli Shah, Occupational Therapist, OT Reg. (Ont.), *Altum Health, University Health Network*

4:10 p.m. – 4:45 p.m.

Tips From the Bench: Preparing a Concussion Case and Oral Advocacy (20 m^P)

Moderator:

The Honourable Karen Weiler, *Court of Appeal for Ontario (Retired)*

Panelists:

The Honourable Justice Darla Wilson, *Court of Appeal for Ontario*

D. Keith Smockum, *Smockum Zarnett LLP*

4:45 p.m. – 5:00 p.m.

Question and Answer Session

5:00 p.m.

Program Ends



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Whom do I contact for more information?

Contact practicePRO by e-mail: practicepro@lawpro.ca or call 416-598-5899 or 1-800-410-1013.

*One Homewood Health e-learning course is eligible for the credit on a yearly basis.



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Presentation By:

The Honourable Justice Darla Wilson, *Court of Appeal for Ontario*

D. Keith Smockum, *Smockum Zarnett LLP*

Written By:

Antonio Meringolo, *Lemieux Law*

For Reference Only. Provided with the permission of author Antonio Meringolo,
Ontario Trial Lawyers Association Blog Case Summary, *Girao v. Cunningham,*
2020 ONCA 260, June 05, 2020.



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TAB 1

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Welcome and Update: "Concussion Diagnosis and Treatment". (PPT)

Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon, Director,
Canadian Concussion Centre

May 30, 2024



CONCUSSION SYMPOSIUM FOR LEGAL PRACTITIONERS, INSURERS,
JUDGES, AND CLINICIANS 2024

WELCOME AND UPDATE: “CONCUSSION
DIAGNOSIS AND TREATMENT”.

*Charles Tator,
Canadian Concussion Centre,
Toronto Western Hospital,
University Health Network (UHN),
Brain Research Institute and
University of Toronto*



**Law Society
Of Ontario
and
Canadian
Concussion
Centre**

May 30, 2024

MY AFFILIATIONS

- Professor of Neurosurgery, University of Toronto
- **DIRECTOR, CANADIAN CONCUSSION CENTRE**, Toronto
Western Hospital and Krembil Brain Institute
- Founder, **Parachute Canada**: Canada's National Injury Prevention Charity.

OUR TEAM of Clinicians and Researchers at the Canadian Concussion Centre (CCC).



Dr. Charles Tator - Leads a team of top medical science experts to form the CCC Clinical and Research Team.

**Mozhgan Khodadadi-
CCC Clinical
Research Manager**



**Dr. Karen D. Davis, PhD
Neuroscientist and
brain
imaging expert
Krembil
Neuroscience Centre,
UHN**

**Dr. Gabor Kovacs
Neuropathologist**



**Dr. Robin Green, PhD,
CPsych
Neuropsychologist and
Specialist in traumatic
brain injury. Also at
Toronto Rehabilitation
Institute**

**Dr. Lesley Ruttan,
Neuropsychologist**



**Dr. Carmela Tartaglia
MD, FRCPC,
Neurologist
Krembil Neuroscience
Centre, UHN
Clinician scientist,
Tanz
Centre for Research
and
Neurodegenerative
Diseases**



**Dr. Richard Wennberg,
MD, FRCPC,
Neurologist
Krembil Neuroscience
Centre, UHN
Co-director UHN
Epilepsy Program
Director, Mitchell
Goldhar MEG Unit**



**Dr. David Mikulis, MD,
FRCPC
Neuroradiologist
Krembil Neuroscience
Centre, UHN
Senior Scientist, Toronto
Western Research
Institute**

**NEW RECRUIT:
Dr. Andrea Para.
Neuroradiologist**

canadianconcussioncentrehn.ca

OUR EXPANDED TEAM FOR MULTIDISCIPLINARY TREATMENT(MANY OFF_SITE).

- Neuropsychiatry- Dr. Abraham Snaiderman (UHN TRI)
- Psychiatry-Several Psychiatrists (UHN TGH)
- Neurology Headaches- Dr. Marie Slegre and Dr. Ginette Moores
- Neurotology-and Dizziness –Dr. John Rutka (UHN TGH)
- Vestibular Therapy- TGH Vestibular Group –Shaleen Sulway and Team (UHN TGH)
- Neuroophthalmology- Dr. Paul Ranalli and others
- Nurse Practitioner-Artee Srivastava
- Social Worker-Robyn Beron (VIRTUAL)
- Neuropsychologists-Drs. David Gold, Devon Anderson and Brenda Colella
- ALTUM Staff at Krembil Discovery Tower UHN
- (We also Do Concussion Research and have Graduate students, postdocs, research assistants, **Coordinator of Brain Donation Program-Nusrat Sadia**, and a Patient Research Committee).

OUR TEAM'S GOALS INCLUDING FOR TODAY'S LSO EVENT –
TO HELP CONCUSSED PEOPLE GET BETTER!
WE REGARD LAWYERS AND INSURERS AS PART OF THE TREATMENT TEAM!

How does our Team Help People get Better from Concussion? In person in our offices, virtual sessions and webinars.

Help People Prevent Another Concussion. (Parachute Canada.ca).

We Educate Patients, Practitioners and the Public about Concussions.

We Do Research to 1.Discover Answers to the Many mysteries and Unknowns about Concussions: 2.How to Detect, Treat and Prevent the consequences of concussion such as persisting concussion symptoms and cognitive decline leading to CTE/other types of brain degeneration.

We include **All Causes of Concussion**: 1.Sports and Recreation, 2.Motor Vehicle Crashes, 3.Work Related Concussions, 4.School Concussions, 4.Intimate Partner Violence, and 5. Falls especially in the elderly!

THANK YOU TO THE MAJOR SPONSORS OF THIS EVENT

- **Soloway, Goldhar and Fidani Families who Fund much of our research.**
- **LIUNA Laborers International Union of North America (Ontario Division) for Funding our bimonthly Webinar Series watched by thousands in 23 countries.**
- **Hundreds of other Donors who contributed to the University Health Network and directed their donations to the CCC, including the members of our team for their talks today!**
- **SPONSORS OF TODAY’S EVENT: McKellar Structured Settlements
BridgePoint Financial**

THANK YOU TO THE PEOPLE WHO WORKED HARD TO MAKE TODAY'S LSO EVENT HAPPEN

Dr. Carmela Tartaglia and Dr. Robin Green.

Mozhgan Khodadadi – Clinical Research Manager

Eve Halpern – Legal LSO Coordinator

Michelle Ryan and LSO Team – LSO Coordinators

PLANNING COMMITTEE: Eve Halpern, Patrick Brown (McLeish Orlando), Jim Tomlinson (McCague Borlack), Gordon Jermaine (Manulife), Judge Karen Weiler, Dr. Carmela Tartaglia, Dr. Robin Green and Dr. Charles Tator

WHY DO WE DO ALL THIS WORK ON CONCUSSIONS??

- **400,000 per year in Canada, and more in women than men**
- **1% of the population per year**
- **Concussions affect all ages: sports and rec in young people, motor vehicle crashes, work in mid-life, falls in the elderly, and intimate partner violence at all ages.**
- **NOT EVERYONE RECOVERS.** Recovery is often incomplete, and therefore, concussions cause a lot of suffering!



WHY ARE CONCUSSION IN SPORTS IMPORTANT???

- Concussions in sports are especially common –about 1/3 of all concussions
- Athletes often get repetitive concussions
- Repetitive concussions can have major consequences, such as SECOND IMPACT SYNDROME, PERSISTING CONCUSSION SYMPTOMS AND BRAIN DEGENERATION (CTE)

What is the appropriate Age for Body Checking in Youth Hockey????
Currently, it is age 13-14 in Hockey Canada and USA Hockey Rules.
Our study shows many Concussions in hockey would be eliminated if the permissible age for Body Checking was raised to 18 (now it is age 13-14).

THE CONCUSSION CONSEQUENCES ARE IMPORTANT – ACUTE, SUBACUTE AND CHRONIC

ACUTE–Second Impact Syndrome (SIS) THIS IS WHY ROWAN STRINGER DIED

SUBACUTE– Persisting Concussion Symptoms (PCS) including Depression, Anxiety, PTSD, Behaviour Change.

**CHRONIC–Cognitive Deficits, Dementia, Movement Disorders
→Chronic Traumatic Encephalopathy (CTE).
Suicide!**

CONSEQUENCES OF CONCUSSION = CONCUSSION SPECTRUM OF DISORDERS

- Acute Concussion **SYMPTOMS SHOULD BE GONE IN 30 DAYS**
- Second Impact Syndrome (SIS) **FEWER DOUBTERS after Rowan Stringer's Death**
- Postconcussion Syndrome (PCS) **NOW KNOWN AS PERSISTING CONCUSSION SYMPTOMS**
- Psychological Consequences – Mental Health Disorders: Depression/Anxiety, Panic Attacks, PTSD.
Affects 35% of PCS patients
- Brain Degeneration - Chronic Traumatic Encephalopathy (CTE), Movement Disorders, Etc. **Can be purely CTE, but more often a mixture of brain degenerative conditions. Fortunately, these are RARE.**

MANAGEMENT

All concussion guidelines until now have stated that Medical Doctors and Nurses are the appropriate Health Care Professionals to DIAGNOSE a concussion in Canada and other countries where health care is advanced. Exceptions; Quebec now allows physiotherapists to diagnose concussion.

(Reason: they say not enough doctors in Quebec to do the job)

It is now accepted that TREATMENT of Concussion must be Individualized and Multidisciplinary.

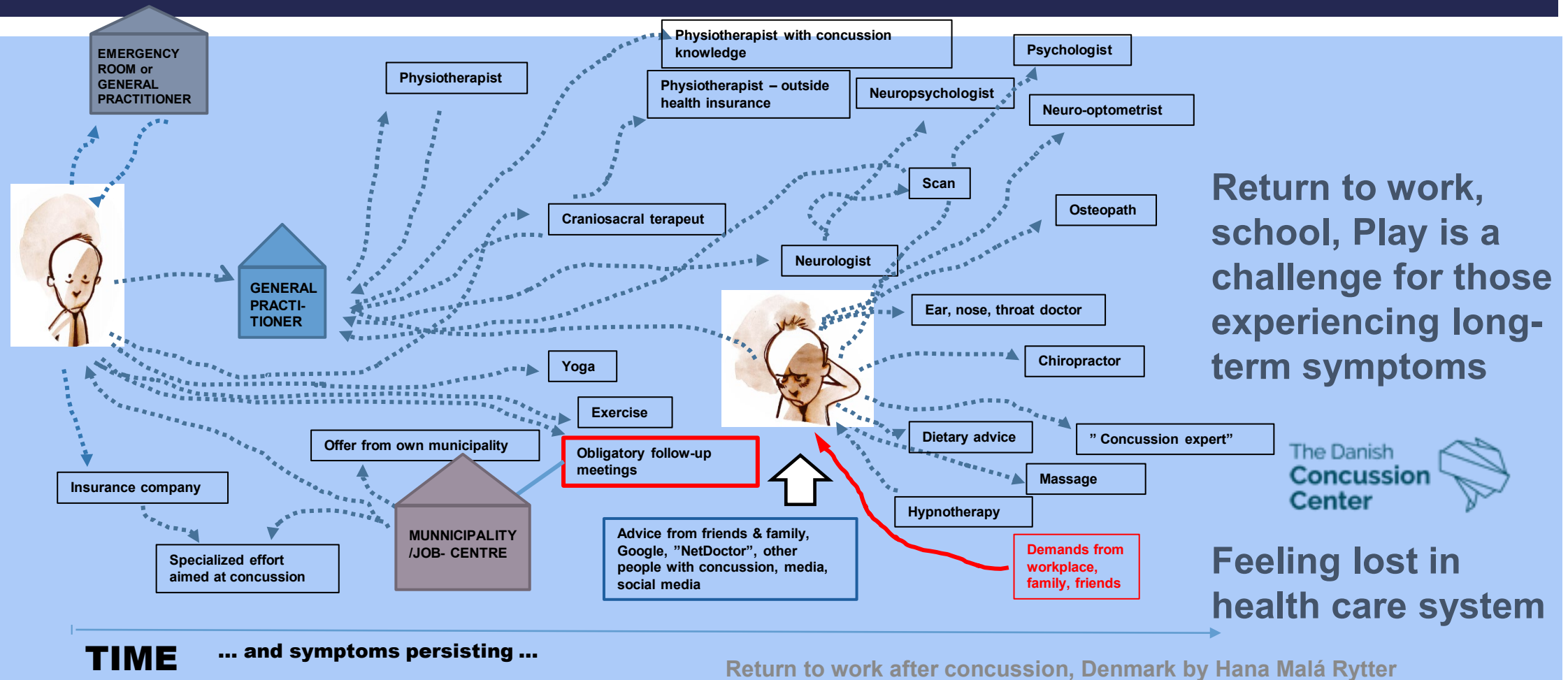
WHY IS THIS LSO COURSE ON CONCUSSIONS FOR LAWYERS, INSURERS, AND JUDGES NEEDED??

For Concussions Occurring In:

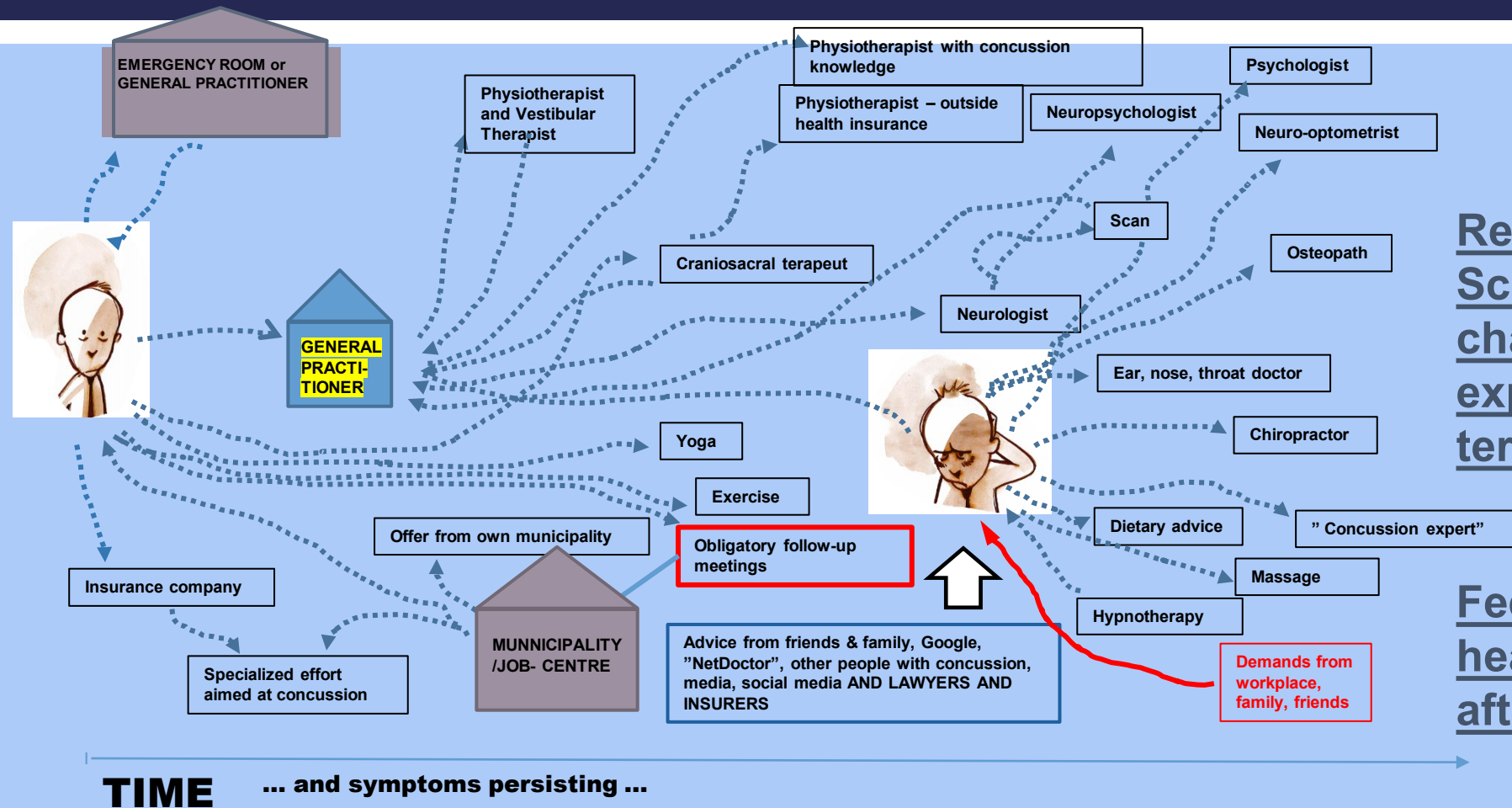
1. Motor Vehicle Crashes - **Major reason for needing a lawyer**
2. Falls at Home or Outside, especially among the elderly- **Sometimes need a lawyer**
3. Work Related Injuries - **Lawyers often involved**
4. Sports and Recreation – e.g. football, hockey, rugby, soccer, lacrosse, etc.,
-Class Action or individual Lawsuits, Equipment suits, e.g. Helmets
5. Military Action especially Blasts – **Sometimes need a lawyer**
6. School-Based - **Lawyers often involved now because of Concussion Laws**
7. Partner Violence and Domestic Violence- **Huge problem –1/4 to 1/3 of women!!!!, Usually need a lawyer.**
8. Other Criminal Activities including Assault - **Usually need a lawyer.**

THUS, Today's Program for Lawyers, Insurers, and Judges is an important public service for many patients suffering concussions in many contexts.

THE CHALLENGES OF CONCUSSED PERSON WITH PERSISTING SYMPTOMS- IMPROVEMENTS NEEDED ESPECIALLY IN PATHWAYS TO CARE AND ACCESS!!!



CHALLENGES OF THE CONCUSSED PERSON WITH PERSISTING SYMPTOMS- THE PATHWAYS TO DIAGNOSIS AND TREATMENT!!!



Return to Work, School, Play is a challenge for those experiencing long-term symptoms.

Feeling lost in the health care system after Concussion!!!

WE CAN DO BETTER!!

Important Themes for this UPDATE : Let's Improve the PATHWAYS and ACCESS to CARE so that Concussed People can Get Better!!

Thank You, for Participating!!



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TAB 2A

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Update on Diagnostic Biomarkers in Concussion
(The Good, The Bad, and The Ugly)

Imaging in Concussion (PPT)

Dr. Andrea Para, MD, Neuroradiologist
Toronto Western Hospital

May 30, 2024



Imaging in Concussion



Andrea Para MSc MD FRCPC
Joint Department of Medical Imaging, Division of Neuroradiology
Assistant Professor, University of Toronto



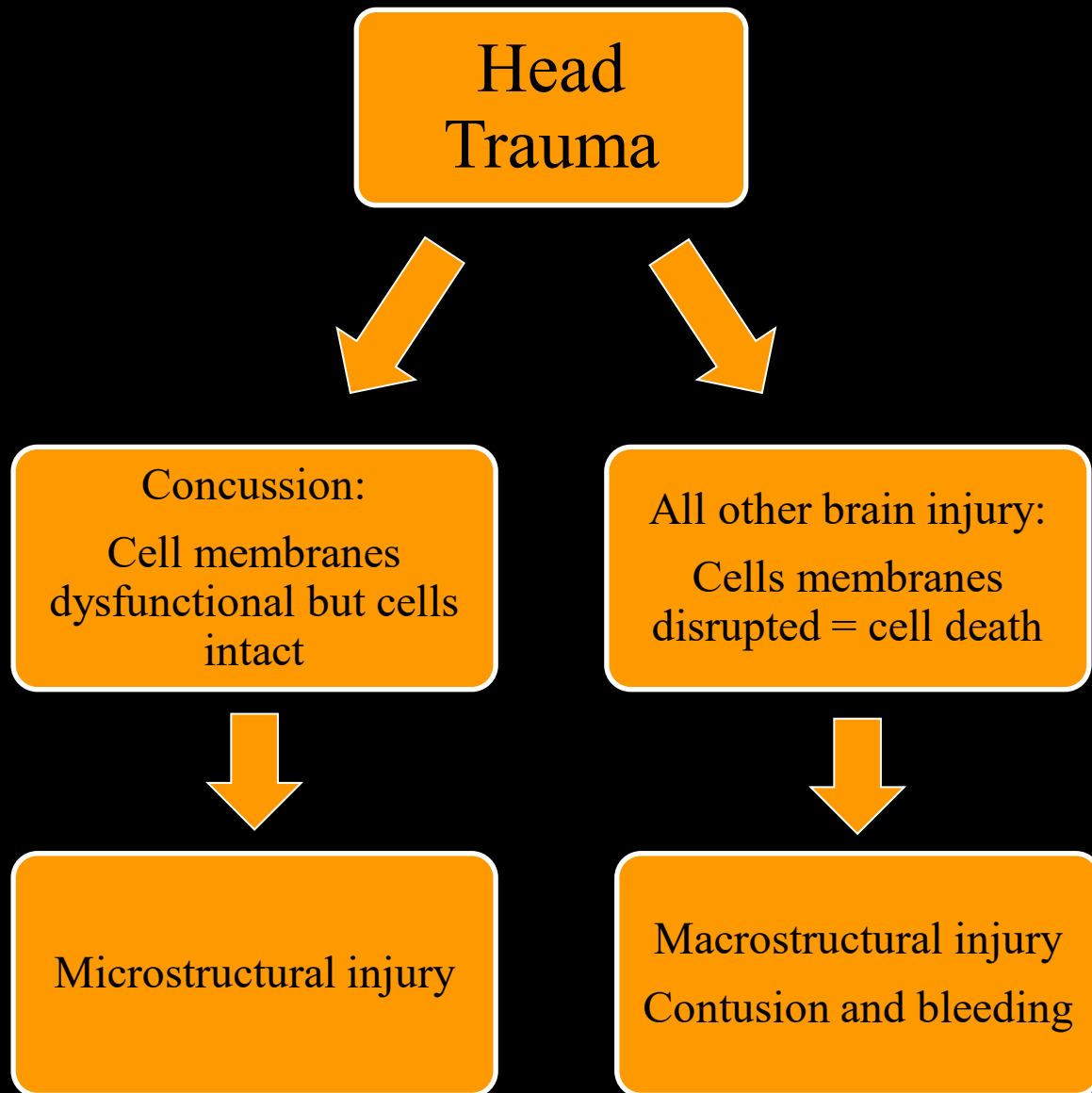
Disclosures

- None

Outline

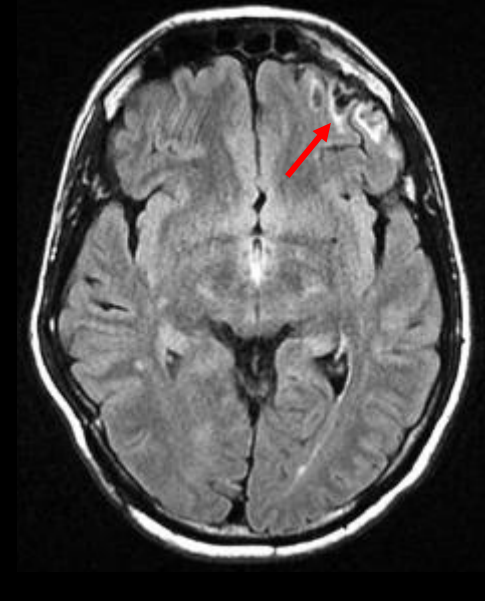
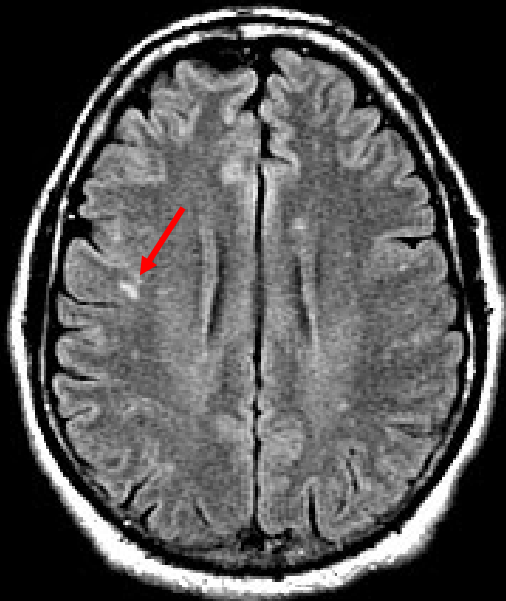
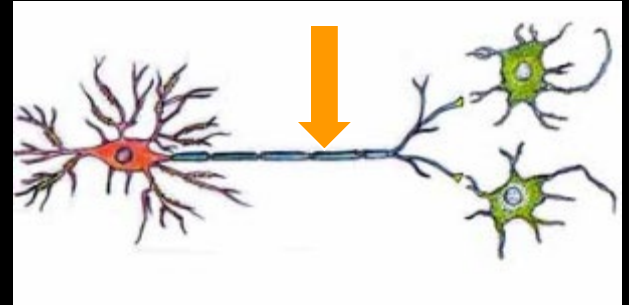
- Concussion injury
- Imaging tools
 - CT
 - MRI
 - SPECT
 - Advanced imaging
- Limitations

Immediate Events After Head Injury



Imaging of Traumatic Brain Injury

- Shear and pressure forces
 - Diffuse axonal injury (DAI)
 - Microbleeds
 - Contusions
- Hemorrhages (subarachnoid, subdural, epidural)



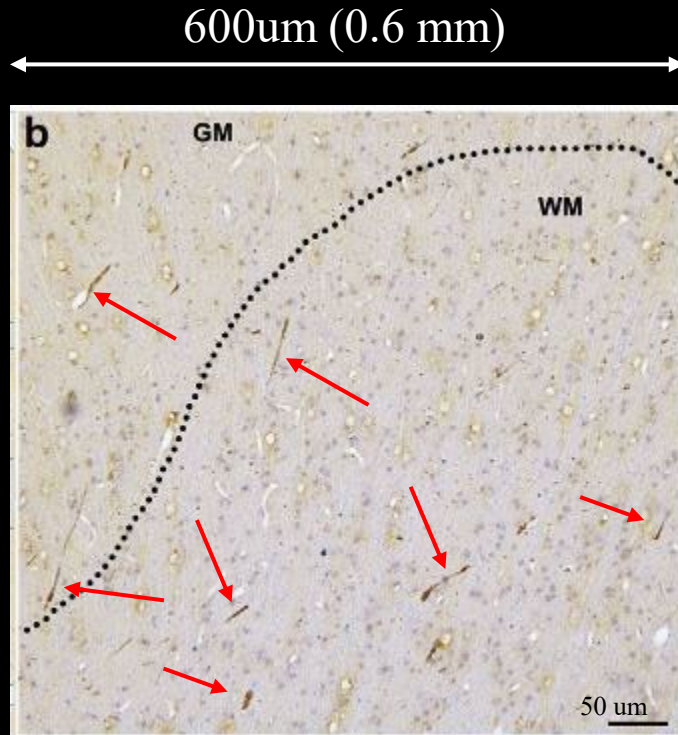
CT and MRI

- CT and MRI scans should be normal in concussed individuals
 - CT Performed to rule out more severe injury, particularly in the acute setting (ER)
- 3-30% of patients with mTBI have a positive MRI

Yuh EL, Mukherjee P, Lingsma HF, Yue JK, Ferguson AR, Gordon WA, Valadka AB, Schnyer DM, Okonkwo DO, Maas AI, Manley GT; TRACK-TBI Investigators. Magnetic resonance imaging improves 3-month outcome prediction in mild traumatic brain injury. *Ann Neurol*. 2013 Feb;73(2):224-35. PMID: 23224915.

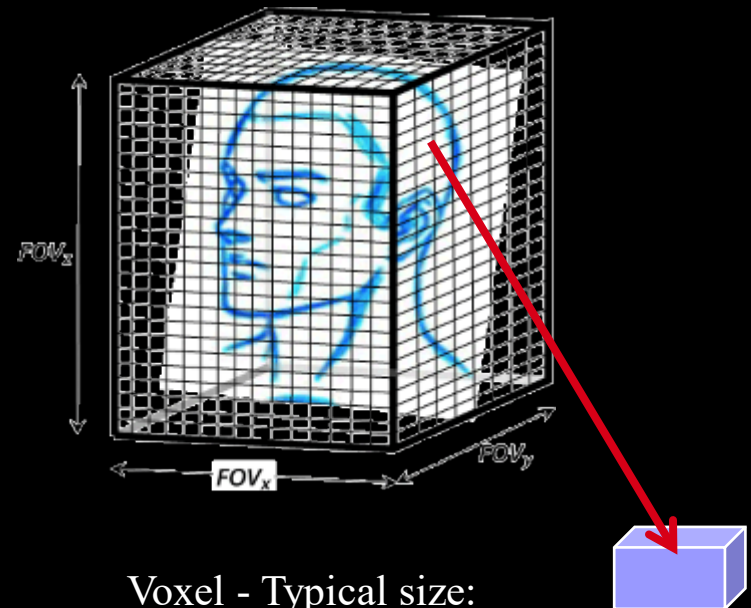
Panwar J et al. Magnetic Resonance Imaging Criteria for Post-Concussion Syndrome: A Study of 127 Post-Concussion Syndrome Patients. *J Neurotrauma*. 2020 May 15;37(10):1190-1196. doi: 10.1089/neu.2019.6809. Epub 2020 Jan 31. PMID: 31822164.

Concussion Imaging Problem



Antibody staining for amyloid precursor protein in axonal injury

Conventional MRI averages all the different signals coming from everything in a voxel



Voxel - Typical size:
1-3 mm on a side

Table 1 Summary of widely used metabolic or functional imaging modalities for mTBI. A brief summary of general findings are represented in the table. Although there have been numerous papers showing the use of each of these modalities in TBI, they are limited by the differences in protocols resulting in variable results as well as the limitation in understanding of how these techniques work

Modality	Physiological Change detected	Timecourse of findings	Advantages	Disadvantages	Clinical considerations
PET (FDG)	Glucose metabolism	Acute – Increased metabolism Chronic – Reduced metabolism	Less motion sensitive than MRI	Lower spatial resolution/ more expensive than MRI	Requires injection of radioisotope
SPECT	Cerebral blood flow	Acute and chronic – Reductions in CBF in clinically relevant areas	Relatively inexpensive compared to PET	Lengthy protocols	Requires injection of radioisotope
fMRI	Oxygen consumption	Acute/subacute – Decreased DMN connectivity, increased frontal/parietal activation with demanding task Chronic – DMN hypoconnectivity persists, hyper/hypoconnectivity in other networks	Virtually no risks, fully noninvasive	More expensive than MRI; Requires patient to tolerate MRI; extremely motion sensitive	Cannot use in patients with metal implants
EEG - Conventional	Electrical potential change by neuronal current	Acute – Alterations in underlying EEG in first 24 h associated with worse functional outcome in mild TBI Chronic – Unclear if any utility beyond patients with suspected seizure activity clinically	Can be used for longer timeframe than other modalities (several days); Well characterized methods of interpretation; Inexpensive compared to MRI; high temporal resolution	Limited evidence of how it can be applied clinically; Low spatial resolution	EEG is widely used in clinical setting
EEG - Quantitative	Electrical potential change by neuronal current	Acute and chronic – Can detect alterations in alpha and theta wave patterns not apparent on conventional EEG.	More sensitive than conventional EEG; Inexpensive compared to MRI; High temporal resolution; Portable	Inexpensive compared to MRI; Low spatial resolution	EEG is widely used in clinical setting
MEG	Magnetic field change by neuronal current	Chronic – Low frequency wave in injured patients	High temporal resolution	Expensive and time intensive; Requires use of MRI in conjunction	Requires a dedicated shielded room and MEG set up

DMN default mode network, *CBF* cerebral blood flow

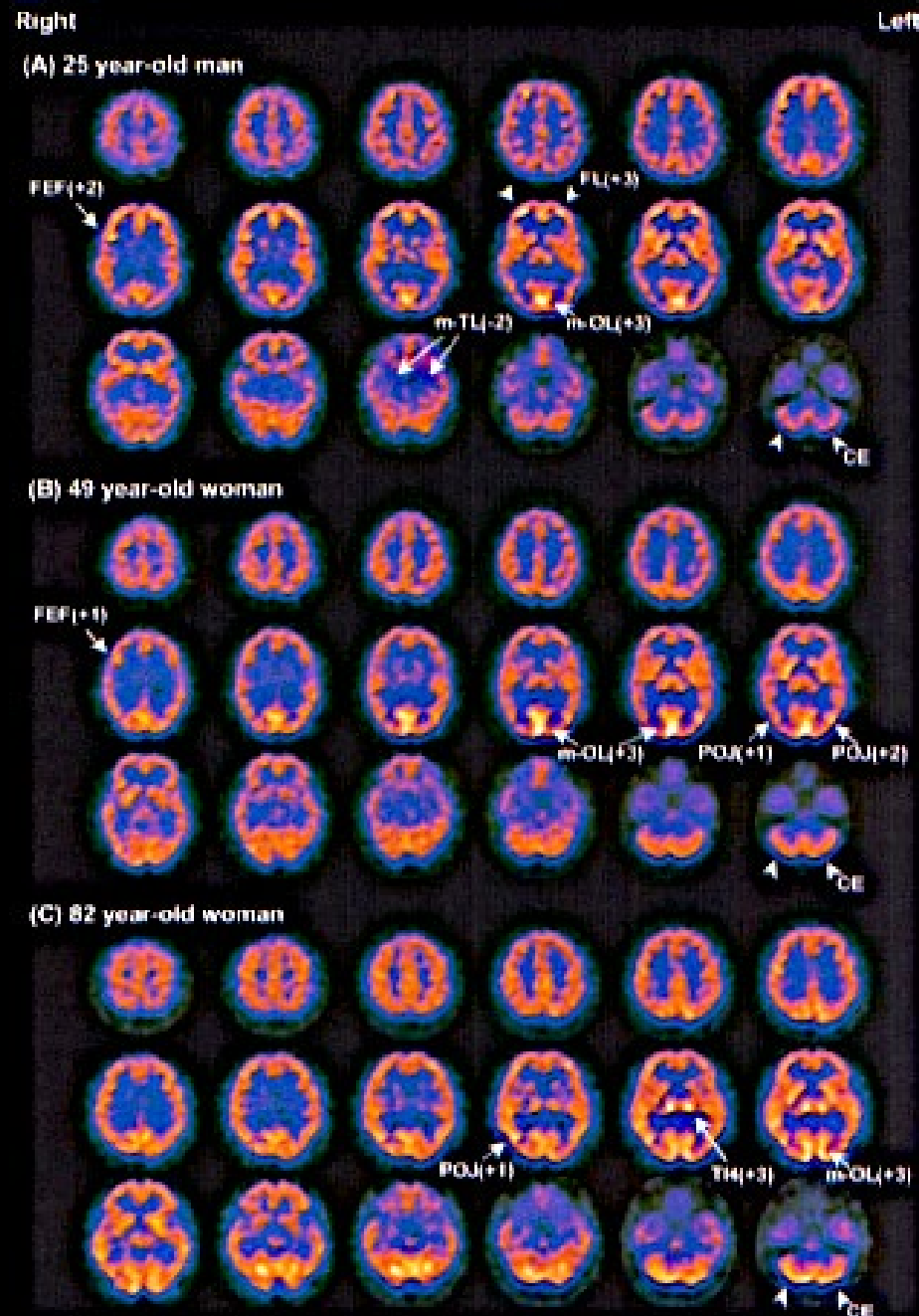
SPECT

(Single photon emission computed tomography)



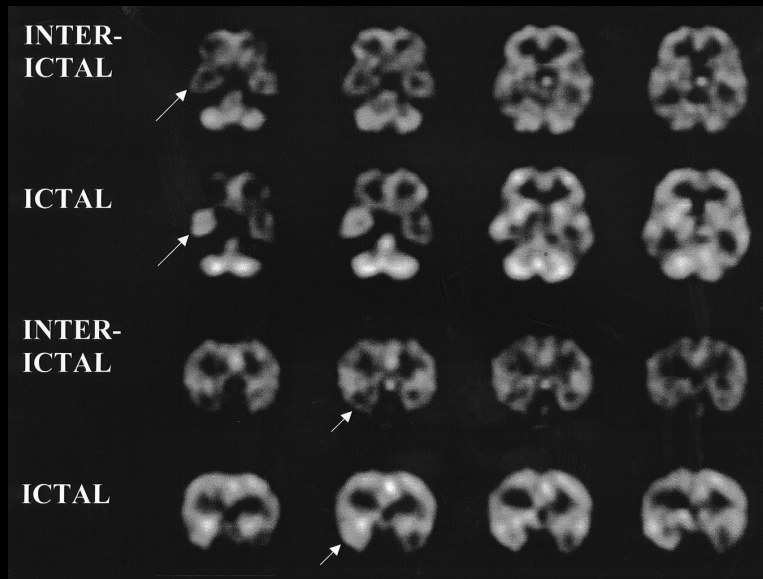
Injection of a radioactive tracer to measure cerebral blood flow

- SPECT studies in healthy adults show small but significant regional variation in tracer uptake
- Cerebral blood flow (CBF) decreases with age, while cerebellar CBF increases
- Difficulty distinguishing normal variation from variations caused by pathology



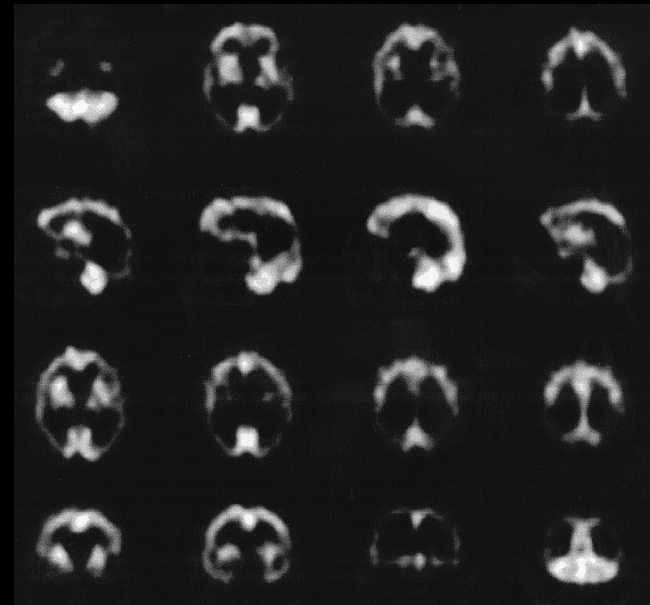
Clinical Applications of Brain SPECT

Epilepsy



Right temporal lobe shows hypo-perfusion between seizures and hyper-perfusion during seizures

MCI/dementia



Marked bilateral, symmetric temporal and parieto-occipital hypoperfusion, extending to frontal lobes. The basal ganglia, primary visual cortex, and cerebellum are spared.

Brain SPECT in TBI

- In a study of 43 mTBI patients, imaging showed abnormal results in:
 - CT 4.6%
 - MRI 9%
 - SPECT 53% -> 47% had a normal study
- Changes in blood flow (hypoperfusion) have been identified using SPECT imaging at as early as 24h after injury, and up to 5 years after injury
- "Lesions" in frontal and temporal lobes

Kant R, Smith-Seemiller L, Isaac G, Duffy J. Te-HMPAO SPECT in persistent post-concussion syndrome after mild head injury: comparison with MRI/CT. Brain Inj. 1997 Feb;11(2):115-24. PMID: 9012944.

Shin SS, Bales JW, Edward Dixon C, Hwang M. Structural imaging of mild traumatic brain injury may not be enough: overview of functional and metabolic imaging of mild traumatic brain injury. Brain Imaging Behav. 2017 Apr;11(2):591-610. PMID: 28194558.

Clinical utility of SPECT neuroimaging in the diagnosis and treatment of TBI: a systematic review

- 19 longitudinal and 52 cross-sectional studies from the last 30 years reviewed
- Definitions for mild/moderate/severe TBI are variable
 - Mild – 10%
 - Moderate – 21%
 - Severe – 37%
 - All severities – 16%
 - Not defined – 16%
- No standard evaluation
 - Visual evaluation - 47%
 - Quantitative - 26%
 - Combination - 27%
- Positive Predictive Value of negative SPECT scan within 4 weeks of mild TBI for resolution of symptoms at 3 months = 84% (25 patients)
 - Of the 16 patients with a negative initial SPECT – 100% had symptoms resolved by 3 months
 - Of the 9 patients with a positive initial SPECT – only 36% had symptoms resolve by 3 months
 - Follow up study of mTBI up to a year - PPV of initial negative SPECT for symptom resolution = 83% (136 patients)

SPECT Issues

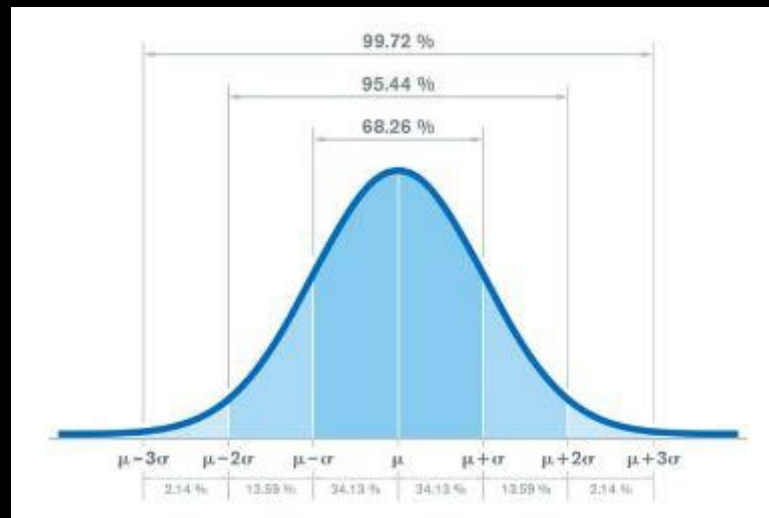
- Comorbidities associated with TBI can make interpretation of SPECT difficult
 - Migraine, depression, or post-traumatic stress disorder
 - Medications (eg benzodiazepines) or toxins (alcohol, substance abuse, inhalational fumes, CO)
 - Other medical conditions: Hypothyroidism, anemia
- Abnormal cerebral perfusion detected by SPECT could be falsely attributed to TBI

SPECT Issues

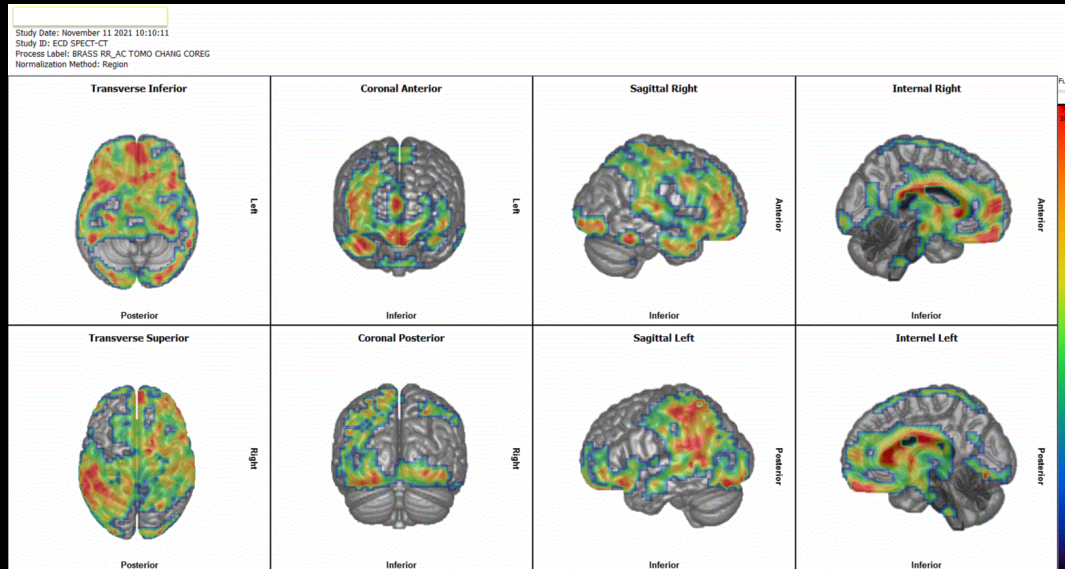
- Largely a subjective assessment requiring trained observers, inter and intra rater variability
- Needs standardization:
 - Data acquisition
 - Quantitative analysis -> enables objective assessment

SPECT scan Z-scoring

- Build an atlas of healthy controls consisting of a map showing mean tracer uptake and standard deviation
- Consider two standard deviations as threshold for abnormal findings



GE SPECT scan post processing software

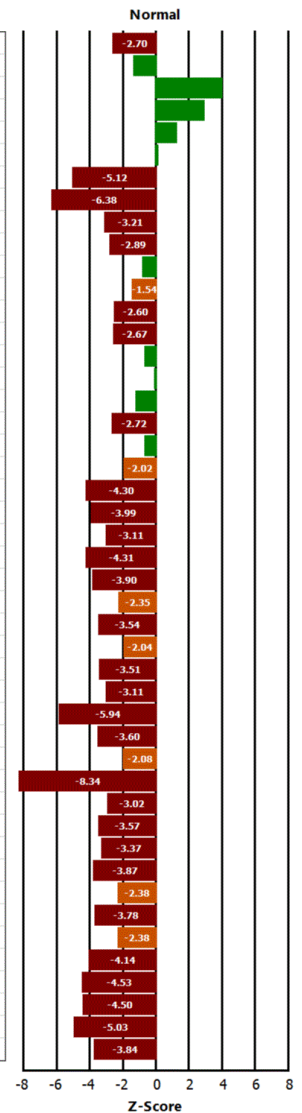


BRASS Report - Z-Score Plot

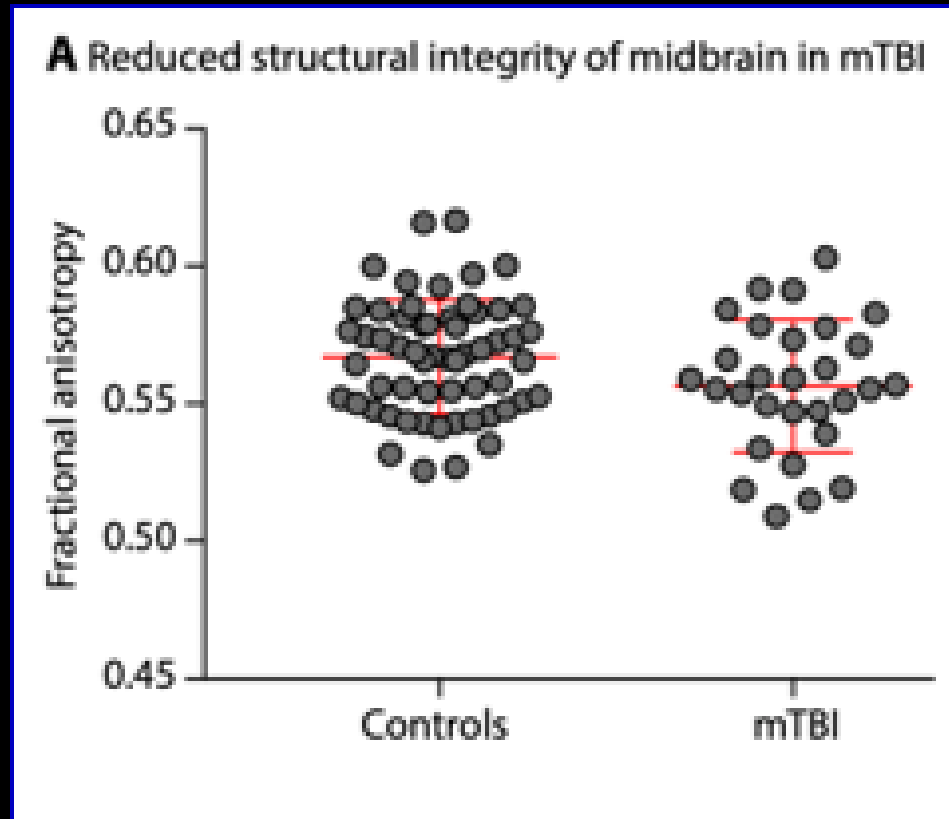
Study Date: November 11 2021 10:10:11
Study ID: ECD SPECT-CT
Process Label: BRASS RR_AC TOMO CHANG COREG
Normalization Method: Region

Counts Per Voxel

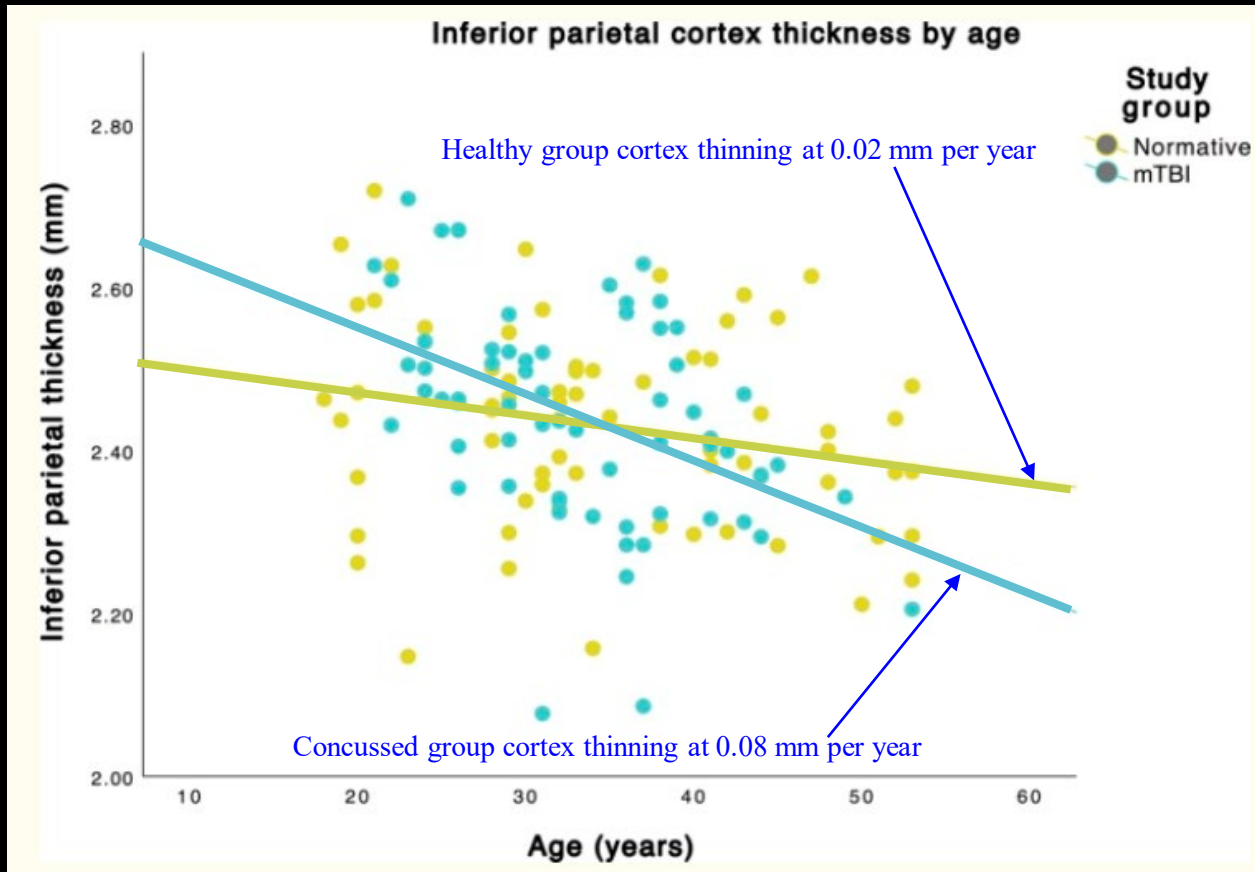
Region Name	Mean	Z Score
L cerebellar ctx	686.30	-2.70
R cerebellar ctx	689.48	-1.42
L cerebellar white matter	855.84	4.09
R cerebellar white matter	831.13	3.00
L nucleus lentiformis	816.15	1.35
R nucleus lentiformis	766.99	0.21
L nucleus caudatus	296.11	-5.12
R nucleus caudatus	290.45	-6.38
L thalamus	485.58	-3.21
R thalamus	504.06	-2.89
L sensorimotor ctx	598.24	-0.92
R sensorimotor ctx	565.74	-1.54
L occipital ctx	574.12	-2.60
R occipital ctx	590.68	-2.67
L sup parietal lobule	599.09	-0.77
R sup parietal lobule	646.04	-0.18
L ant dorsal frontal ctx	549.68	-1.32
R ant dorsal frontal ctx	466.72	-2.72
L post dorsal frontal ctx	601.26	-0.77
R post dorsal frontal ctx	536.10	-2.02
L ant orbital frontal ctx	455.54	-4.30
R ant orbital frontal ctx	421.54	-3.99
L post orbital ctx	531.94	-3.11
R post orbital ctx	468.65	-4.31
L parieto-temporal ctx	492.65	-3.90
R parieto-temporal ctx	547.50	-2.35
L medial temporal lobe	441.46	-3.54
R medial temporal lobe	488.68	-2.04
L lateral temporal lobe	540.35	-3.51
R lateral temporal lobe	565.37	-3.11
L post temporal lobe	516.95	-5.94
R post temporal lobe	567.00	-3.60
L temporal pole	497.55	-2.08
R temporal pole	372.68	-8.34
L insular ctx	594.86	-3.02
R insular ctx	578.43	-3.57
L ant gyrus cinguli	460.20	-3.37
R ant gyrus cinguli	475.39	-3.87
L post gyrus cinguli	541.15	-2.38
R post gyrus cinguli	400.95	-3.78
Pons and midbrain	462.52	-2.38
L ant subcortical	398.61	-4.14
R ant subcortical	387.92	-4.53
L post subcortical	464.89	-4.50
R post subcortical	426.51	-5.03
Other subcortical	463.69	-3.84



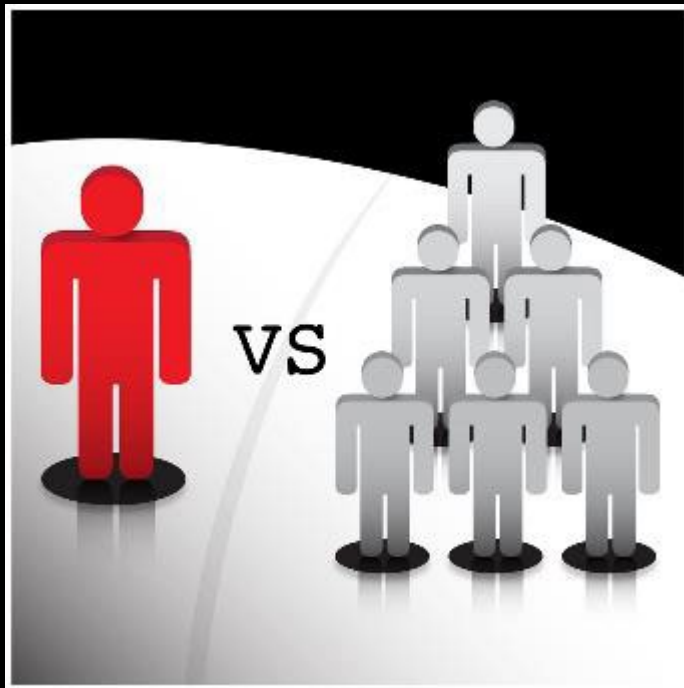
Population vs Individual Differences



Population vs Individual Differences



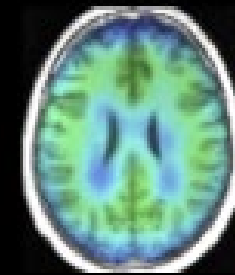
Advanced Neuroimaging Status:



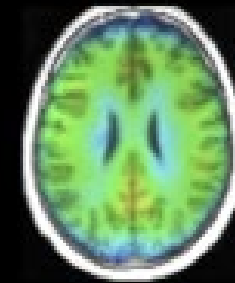
- Despite highly advanced imaging and sophisticated image analysis:
 - Group level diagnosis possible
 - Single individual diagnosis not possible

Novel SPECT tracers

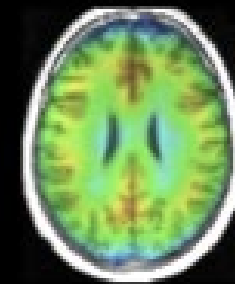
- Radioactive tracers can have very high sensitivity to tissue abnormalities
- SPECT imaging using ^{123}I -CLINDE identifies *increased microglial activity* after mild TBI:
 - Binds translocator protein that is upregulated in active microglia (neuroinflammation)
 - Neuroinflammation was present in mTBI at 1–2 weeks post-injury and persisted at 3–4 months post-injury with a tendency to be most pronounced in patients with PCS.



12 controls



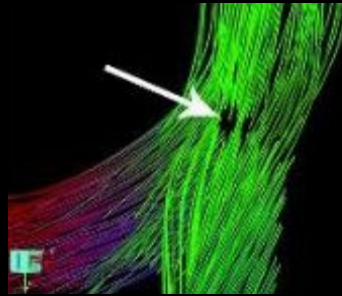
7 patients 1-2 weeks post injury



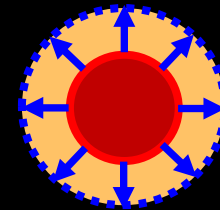
6 patients with PCS 3-4 months post injury

Advanced MRI Methods

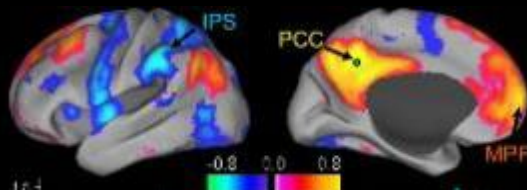
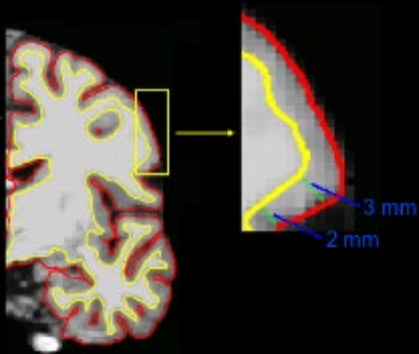
Diffusion Tensor
Imaging (DTI)



Cerebrovascular Vascular
Reactivity (CVR)



Cortical thickness
(Quantitative MRI)



Resting State
Connectivity (fMRI)



Magnetoencephalography
(MEG)

Concussion Imaging Problem

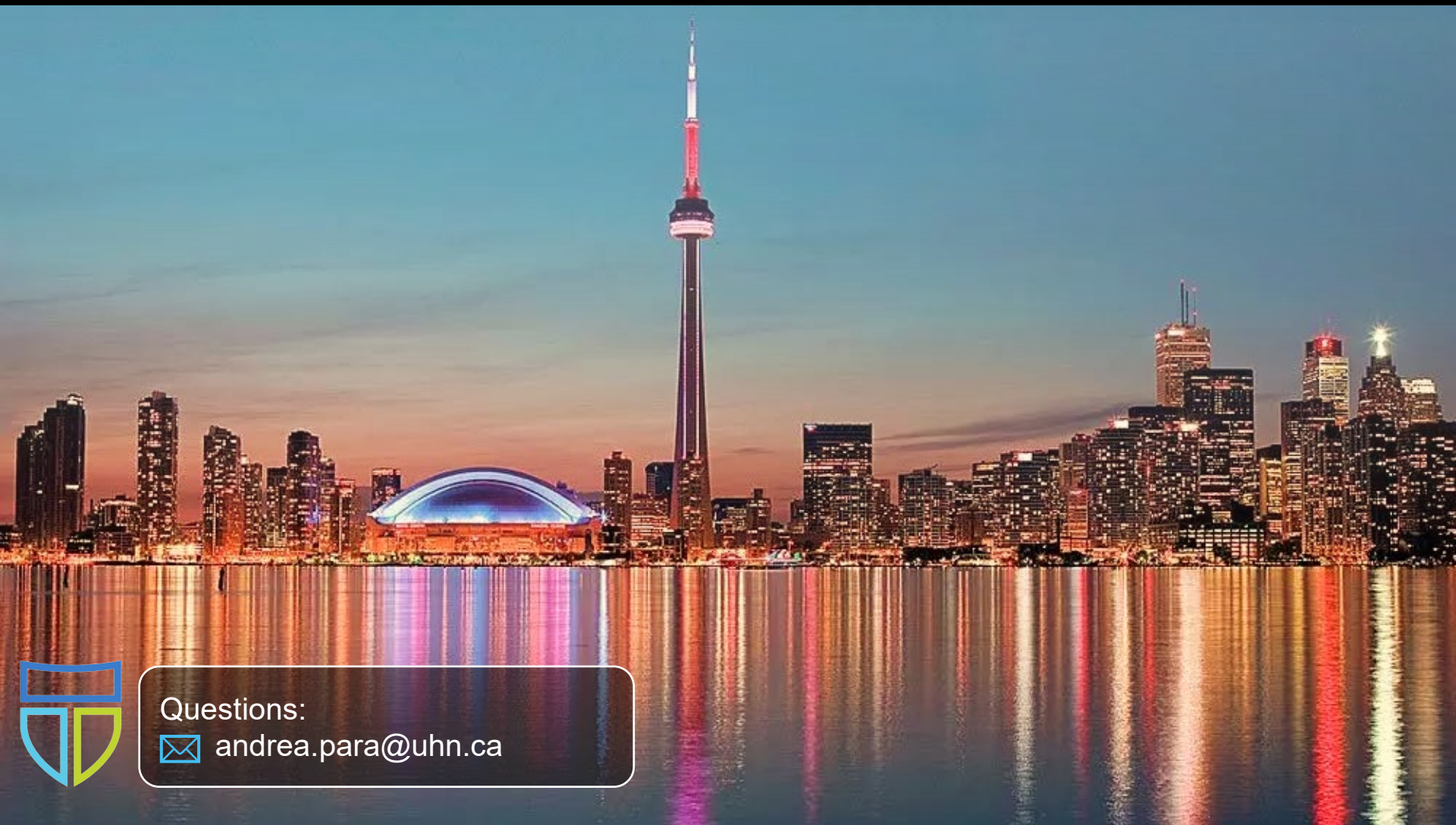
- Structural concussive injury is microscopic and sparse



- Better “pictures”, biomarkers, and super-computing are making this task possible

Imaging and Concussion Summary

1. The brain is complex and delicate.
2. In concussion, conventional imaging with CT and MRI should be normal in these patients who despite the absence of findings can have severe and persistent symptoms.
3. Advanced neuroimaging can “see” findings but only when comparing a group of concussed against a group of controls. It is not yet diagnostic in individual patients.
4. AI and advanced imaging could change this.



Questions:

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Law Society
of Ontario

Barreau
de l'Ontario

TAB 2B

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Update on Diagnostic Biomarkers in Concussion
(The Good, The Bad, and The Ugly)

Biomarkers in Concussion (PPT)

Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist
Canadian Concussion Centre, Toronto Western Hospital

May 30, 2024



BIOMARKERS IN CONCUSSION

Carmela Tartaglia, MD
Memory Clinic, Krembil Brain Institute
Tanz Centre for Research in
Neurodegenerative Diseases

DISCLOSURES

- CIHR, NIH, Weston Brain Foundation, WSIB, Tanenbaum Institute of SCIENCE IN SPORT
- Clinical Trials: Biogen, Roche, anAvex, UCB, NOVO NORDISK, Janssen, Passage BIO, GSK
- Consultation: Eisai, Lilly



OBJECTIVES

- Review of fluid biomarkers in concussion (focus on sports related concussion)
- Review of electrophysiology biomarkers
- Understand role of biomarkers in diagnosis, prognosis of concussion

BIOMARKER -DEFINITION

- Molecular, biological, or physical characteristic that indicates a specific physiologic state
- Is used in clinical practice to identify risk for disease, diagnose disease and its severity, guide intervention, and monitor patients' response to therapy



BIOMARKER

- Diagnostic
 - Prognostic
 - Pharmacodynamic
 - Surrogate
-
- PERSONALIZED MEDICINE

DISEASE (PRESENCE/ABSENCE)

- Presents or absence of symptom, sign, disease
- Comparison with a gold standard
 - Biopsy, surgery, autopsy, consensus
- Many are invasive or costly
- Result: yes/no, value, cut-off point

BIOMARKER-IDEAL CHARACTERISTICS

- Easy access
- Standardized
- Highly sensitive: few false negative results/fewer cases of disease missed
- Highly specific: few false positive/ability too designate an individual without disease as negative
- Easy interpretability
- Cost-effective
- Added value

SYSTEMATIC REVIEW FLUID BIOMARKERS -2017

16 articles
RISK OF BIAS
RATING: mod-high
(limited external validity and poor generalisability in terms of gender (M only), age (college) and sport (football or ice hockey), small sample sizes, no control subjects and lack of preseason assessment)

LEVEL OF EVIDENCE
FOR USE OF FLUID
BIOMARKERS IN
CLINICAL
ASSESSMENT OF
SRC LOW

Table 3 Data extraction tool for studies using fluid biomarkers

Study design		Participants					Review of evidence	
First author, year	Study type	Modality	Sport	Age/level (mean \pm SD, range)	Gender (M/F)	n (control description)	Time from injury to examination	Risk of bias
Daminova SA, 2013 ⁷⁰	PCS	AMPA	RB, SCR, LX, OT	Control: 21.0 \pm 3.3 years; concussed: 21.0 \pm 3.0 years	M/F	33 C+, 91 C-	BL and two follow-up time points within 6 months	High
Kiechle K, 2014 ⁷¹	PCS	S100B	FB, SCR, OT	25.4 \pm 5.5 years	M/F	17 C+, 46 C- (at BL)	BL, \leq 3 hours, 2 days, 3 days and 7 days postinjury	Moderate
Shahim P, 2014 ⁷²	PCS	S100B, tau, NSE	IH	28 years, 19–38 years	M	28 C+, 47 C- at BL (preseason)	BL, 1 hour, 12 hours, 36 hours, 144 hours postinjury, and day of return to play	Moderate
Oliver J, 2015 ⁷⁵	PCS	MBG	FB	Col	M	6 C+, 110 C- at BL (preseason)	BL, 24 hours, 48 hours, 72 hours, 96 hours and 2 weeks postinjury	High
Pham N, 2015 ⁷⁶	PCS	PrPC, GFAP	IH, FB, SCR, WR, OT	21.2 \pm 2.9 years, 18–30 years	M/F	6 C+, 27 C- non-athletes, 76 C- athletes at BL	BL and 1–7 days postinjury	Moderate
Schulte S, 2015 ⁷⁷	PCS	S100B, NSE	FB	21 years, 18–26 years	M	11 C+	BL, 1 day, return-to-play, end-of-play	High
Shahim P, 2015 ⁷⁴	PCS	VILIP-1, tau, S100B, NSE	IH	Preseason: 27.6 years; concussed: 27.2 years	M	28 C+, 45 C- at BL (preseason)	BL, 1 hour, 12 hours, 36 hours, 144 hours postinjury, and day of return to play	Moderate
Siman R, 2015 ⁷⁸	PCS	SNTF	IH	Preseason: 27.6 years; concussed: 27.2 years	M	28 C+, 45 C- at BL (preseason)	BL, 1 hour, 12 hours, 36 hours, 144 hours postinjury, and day of return to play	Moderate
Singh R, 2016 ⁸³	PCS	QUIN, 3HK, KYNA	FB	Control: 20.4 \pm 1.5 years; concussed: 20.3 \pm 1.1 years	M	18 C+, 18 C- (FB teammates)	1 day, 1 week and 1 month postinjury	Moderate
Bouvier D, 2016 ⁷³	PCS	S100B	RB	28.6 \pm 3.98 years	M	5 C+, 27 C-	Before competition, immediately postmatch and 36 hours postmatch	Moderate
Daley M, 2016 ⁸⁰	PCS	Multiple metabolites	IH	Control: 12.9 \pm 1.0 years; concussed: 13.4 \pm 2.3 years	M	12 C+, 17 C- (age, sex and sport matched controls)	2.3 \pm 0.7 days postinjury	High
Hutchison MG, 2016 ⁸²	PCS	Cortisol	FB, SCR, IH, LX, OT	21.0 \pm 2.5 years	M/F	26 C+, 26 C- (age, sex and sport matched controls)	Within 1 week, after symptom resolution and 1 week after return to play	Moderate
La Fountaine MF, 2016 ⁸⁴	CS	PRL	Any	20 \pm 1 years	M	4 C+	Within 48 hours, 7 days and 14 days postinjury	High
Meier TB, 2016 ⁶¹	PCS	Tau	FB, SCR, OT	Control: 20.3 \pm 1.5 years; concussed: 20.1 \pm 1.4 years	M/F	40 C+, 46 C- (collegiate contact-sport controls)	1 day, 1 week and 1 month postinjury	High
Shahim P, 2016 ⁷⁹	PCS	Tau	IH	P	M	28 C+	BL, 1 hour, 12 hours, 36 hours, 144 hours postinjury and the day the athlete returned to play	Moderate
Shahim P, 2016 ⁸¹	PCS	Tau, NF-L, GFAP, amyloid β , NG	IH	Control: median 25 years; concussed: median 31 years	M	16 C+, 15 C-	Median time from injury to examination was 4 months	Moderate

Tabor JB, et al. *Br J Sports Med* 2023;**57**:789–

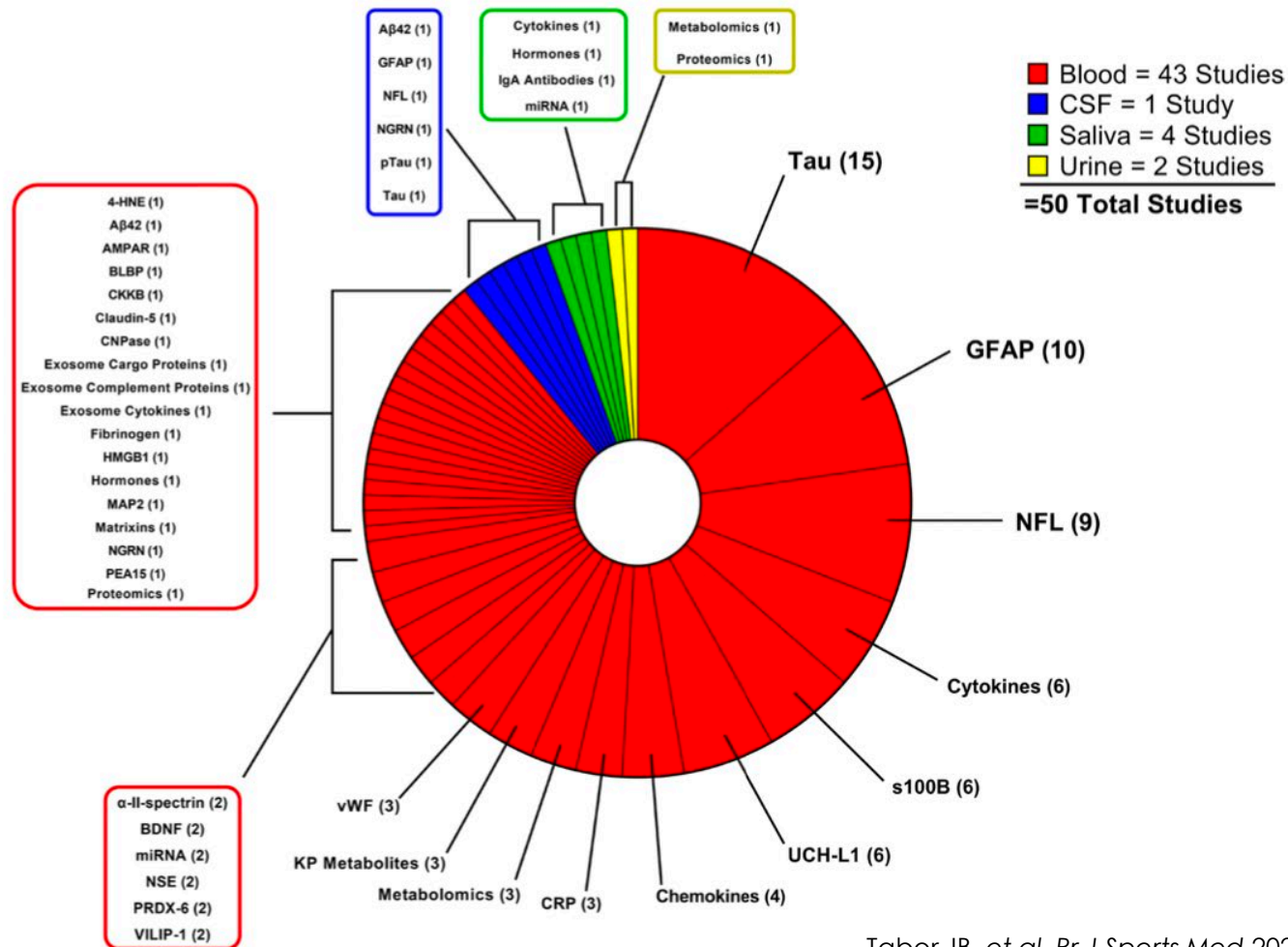
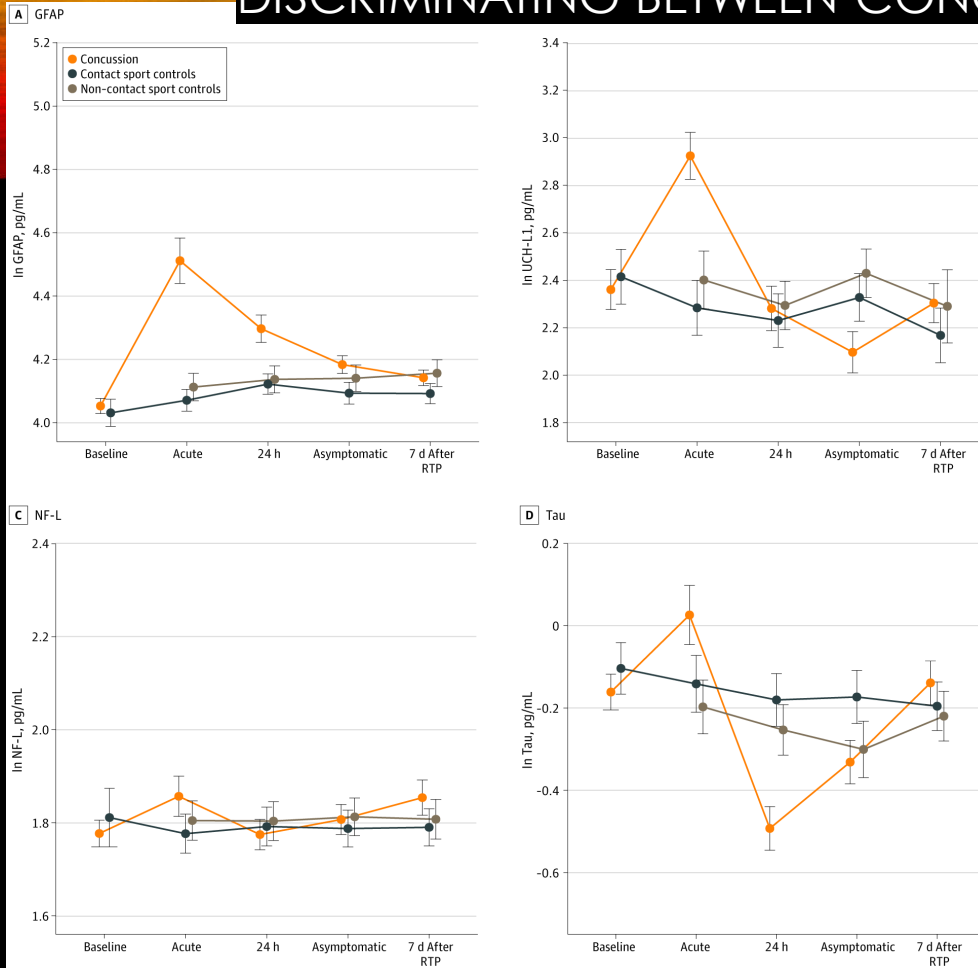


Table 1 Fluid biomarkers to detect and monitor recovery

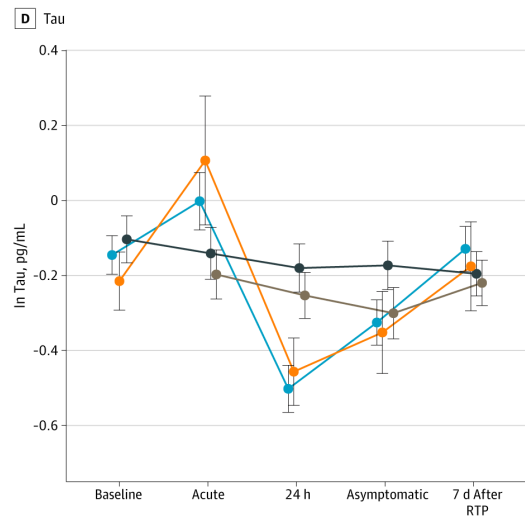
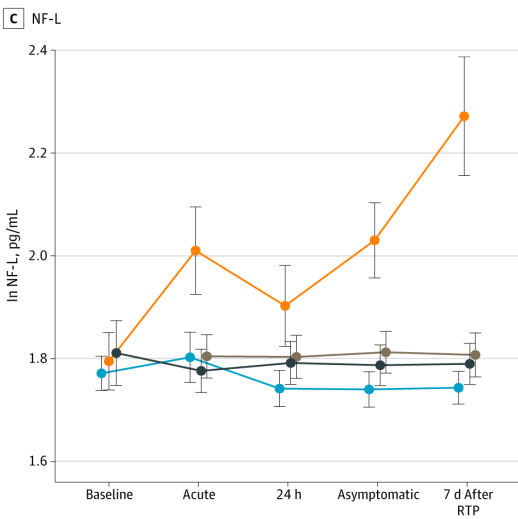
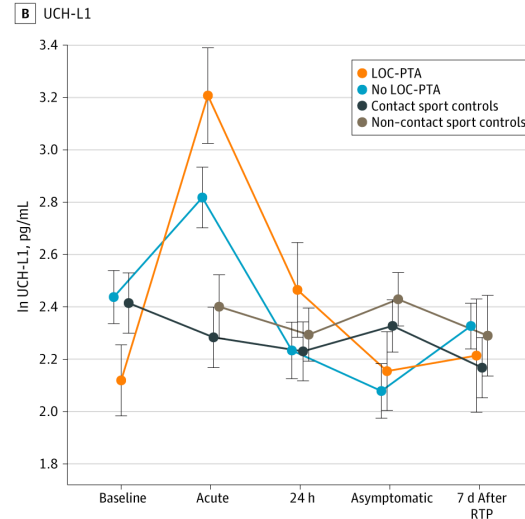
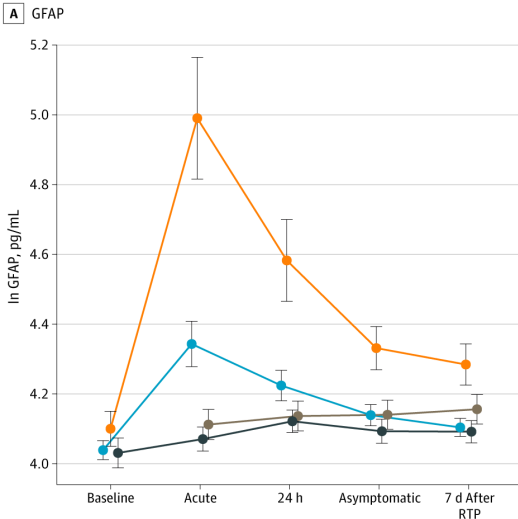
Biomarkers demonstrating ability to discriminate between SRC and controls	<ul style="list-style-type: none"> ▶ AMPAR¹⁹ ▶ Aβ-42^{20 21} ▶ BLBP²² ▶ C-proteins²³ ▶ Extracellular-vesicle associated and depleted cytokines³² ▶ GFAP²⁴⁻²⁷ ▶ IgA autoantibodies⁴⁹ ▶ Inflammatory chemokines MCP-4^{28 29}, MIP-1β²⁹ ▶ Inflammatory cytokines IL-6^{21 30 31}, IL-1RA^{30 31} ▶ Matrix metalloproteinases MMP-2 and MMP-3³³ ▶ Metabolomic^{34-36 51} and proteomic^{37 52} panels ▶ miRNAs^{38 39 50} ▶ Neuron-derived and astrocyte-derived exosome cargo proteins²¹ ▶ NF-L^(24 25 27 40 53 54) ▶ PRDX-6^{28 41} ▶ QUIN and KYNA⁴²⁻⁴⁴ ▶ s100B^{20 31 40 45} ▶ SNTF^{18 31} ▶ I-tau^{20 24-28 41 45-47} and tau-C⁴⁸ ▶ UCH-L1^{21 26 31 40}
Biomarkers failing to discriminate SRC from controls	<ul style="list-style-type: none"> ▶ Cortisol⁵⁹ ▶ CRP³¹ ▶ Fibrinogen²² ▶ GFAP^{27 31 40 55} ▶ HMGB1²² ▶ Inflammatory cytokines IL-6⁵⁶, IL-18⁵⁸ ▶ NFL^{27 47 57} ▶ NSE⁴⁵ ▶ PEA15⁴² ▶ T-tau^{27 57} and tau-A⁴⁸ ▶ VILIP-1⁶⁰ ▶ vWF²²
Biomarkers trajectories post-SRC resolved by symptom resolution/return to play/return to sport	<ul style="list-style-type: none"> ▶ C-proteins²³ ▶ Inflammatory chemokines MCP-1, MCP-4, MIP-1B²⁹ ▶ Matrix metalloproteinases MMP-2 and MMP-3³³ ▶ NFL⁶¹ ▶ s100B⁴⁵ ▶ T-tau⁴⁵
Biomarkers associated with prolonged recovery post-SRC	<ul style="list-style-type: none"> ▶ GFAP⁶² ▶ Inflammatory cytokines IL-1RA³¹, IL-6^{30 32} ▶ NFL^{53 54} ▶ QUIN and KYNA⁴² ▶ SNTF¹⁸ ▶ T-tau⁶²⁻⁶⁴ and tau-A⁴⁸

DISCRIMINATING BETWEEN CONCUSSION & NON-CONCUSSION



Baseline and Postinjury Biomarker Levels in the Concussion, Contact Sport Control, and Non-Contact Sport Control Groups

64 athletes (19.08+/-1.24 years; 21M [79.9%] male) sustained a concussion
138 matched contact sport controls (19.03 +/- 1.27]years; 107M (77.5%)
102 matched non-contact sport controls (19.39 +/- 1.25 years); 82M [80.4%] male).



57 athletes (21.6%) had PTA or LOC,

PROGNOSTICATION MARKER IN SRC

	Level, mean (SE), by RTS group, pg/mL			
Biomarker	<14 d N=65	≥14 dN=62	P value	Mean difference (95% CI)
Total tau				
Participants, No.	31	24	NA	NA
Postinjury	-0.06 (0.13)	0.24 (0.14)	.12	-0.29 (-0.68 to 0.08)
24-48 h postinjury	-0.65 (0.12)	-0.14 (0.14)	.008	-0.51 (-0.88 to -0.14)
Time of symptom resolution	-0.54 (0.12)	0.17 (0.14)	<.001	-0.71 (-1.09 to -0.34)
7 d after unrestricted RTS	-0.30 (0.11)	-0.13 (0.12)	.31	-0.17 (-0.50 to 0.16)
GFAP				
Participants, No.	37	42	NA	NA
Postinjury	4.72 (0.12)	4.39 (0.11)	.04	0.33 (0.01 to 0.65)
24-48 h postinjury	4.37 (0.09)	4.28 (0.08)	.45	0.09 (-0.15 to 0.32)
Time of symptom resolution	4.26 (0.06)	4.21 (0.06)	.59	0.04 (-0.12 to 0.21)
7 d after unrestricted RTS	4.27 (0.07)	4.16 (0.06)	.23	0.11 (-0.07 to 0.29)
Nf-L				
Participants, No.	36	42	NA	NA
Postinjury	1.97 (0.07)	1.92 (0.07)	.59	0.05 (-0.14 to 0.25)
24-48 h postinjury	1.89 (0.07)	1.87 (0.06)	.81	0.02 (-0.16 to 0.21)
Time of symptom resolution	1.98 (0.08)	1.83 (0.07)	.17	0.15 (-0.07 to 0.37)
7 d after unrestricted RTS	2.05 (0.09)	1.85 (0.08)	.09	0.20 (-0.03 to 0.44)

miR-27a and miR221-3p levels were inversely correlated with SRC symptom severity

N

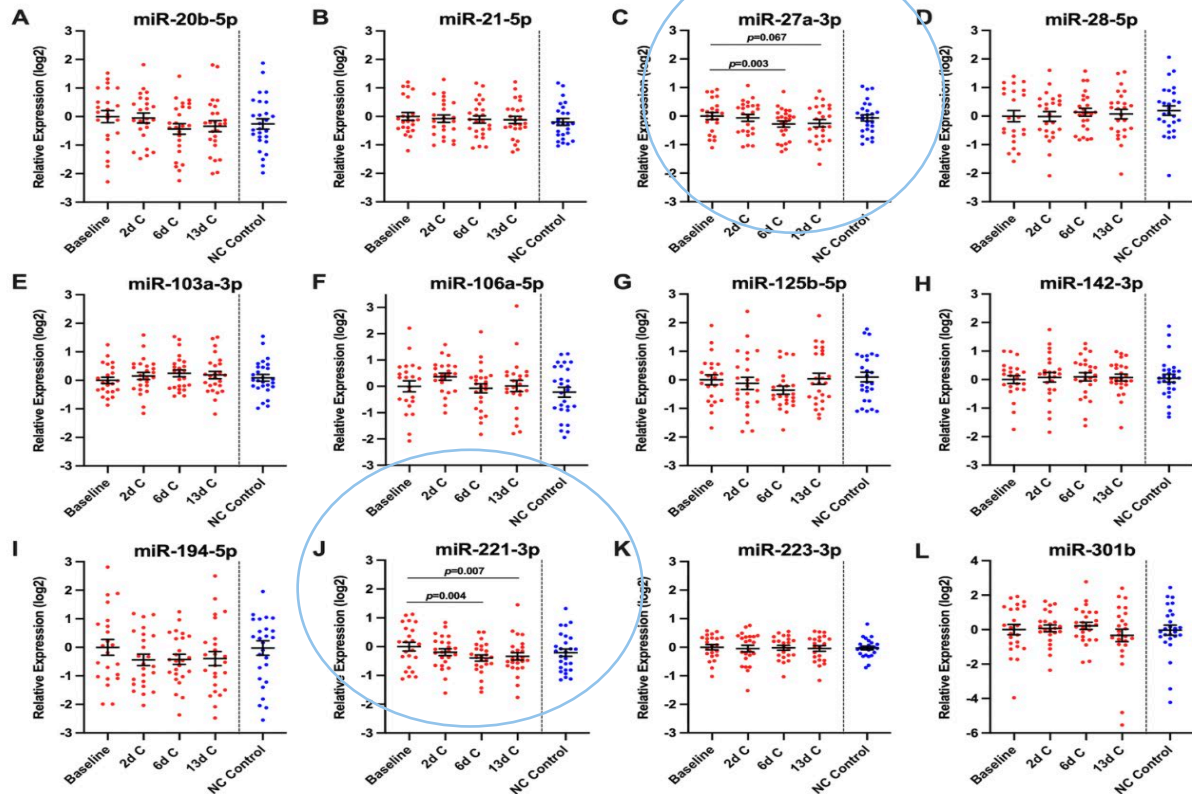
Age

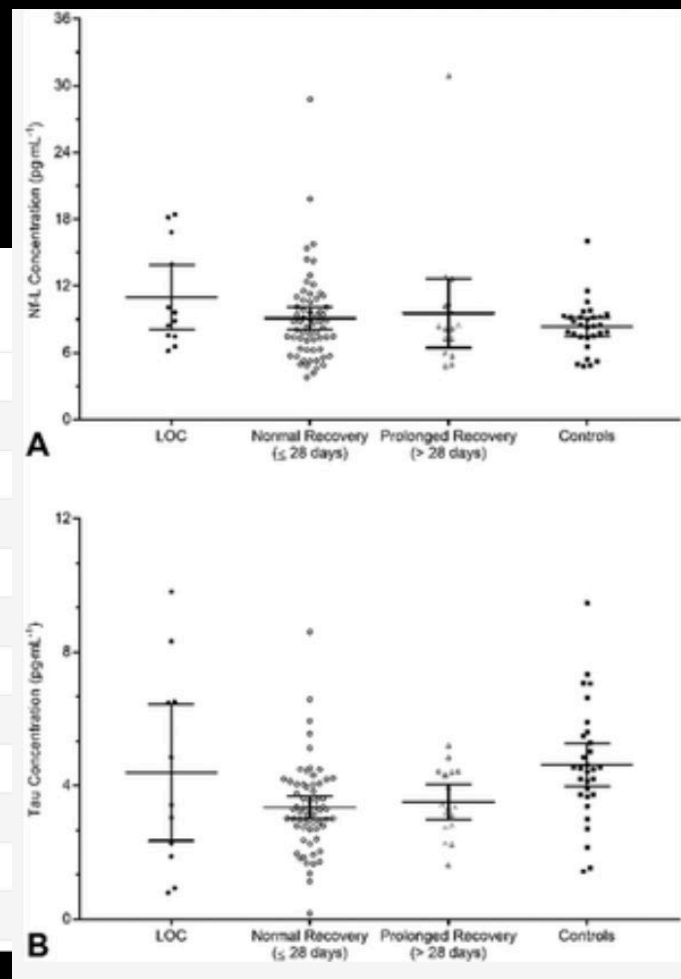
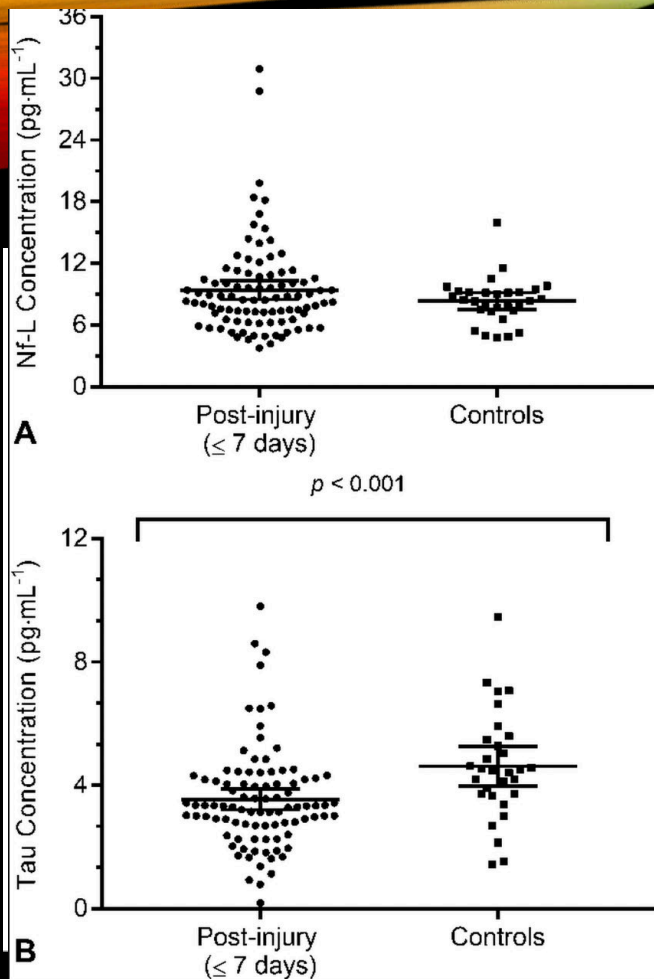
Years of education

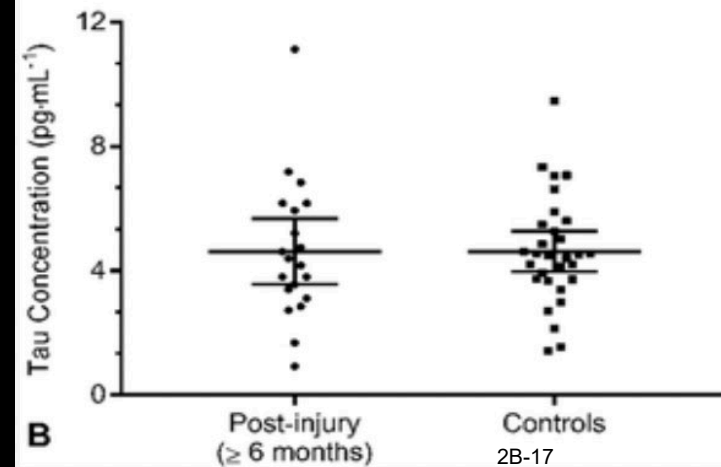
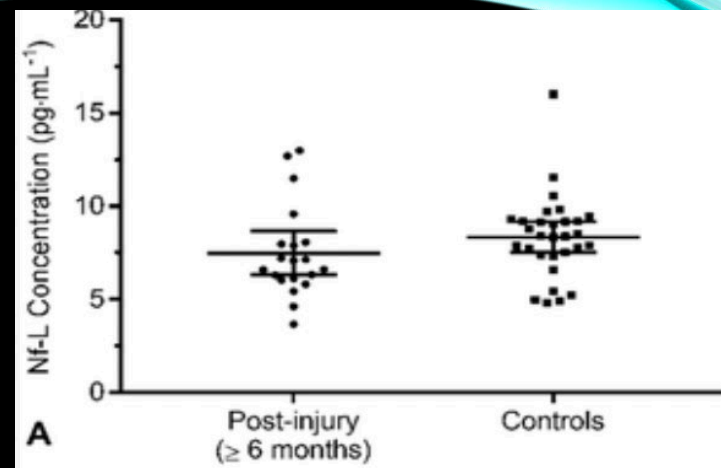
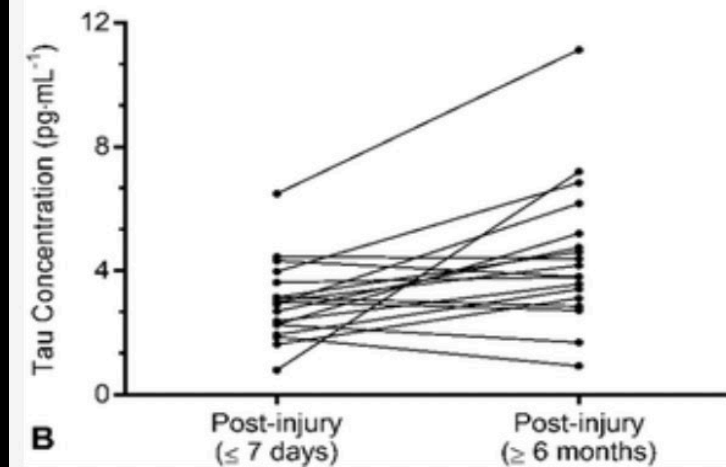
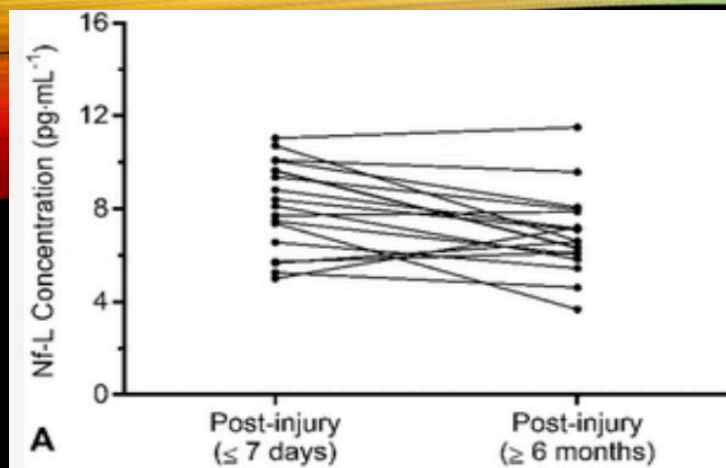
Years of sport

Years of collision sport

No. of previous concussions

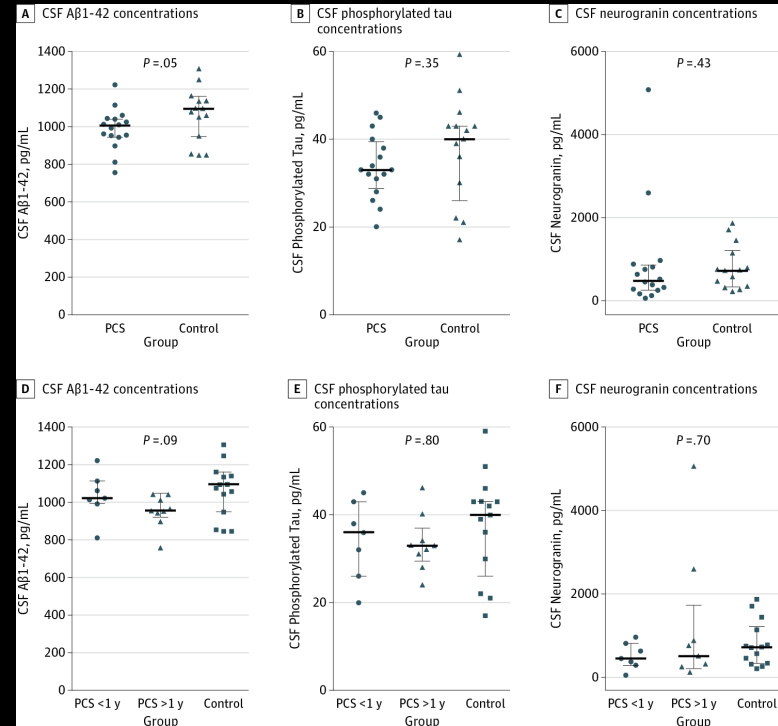
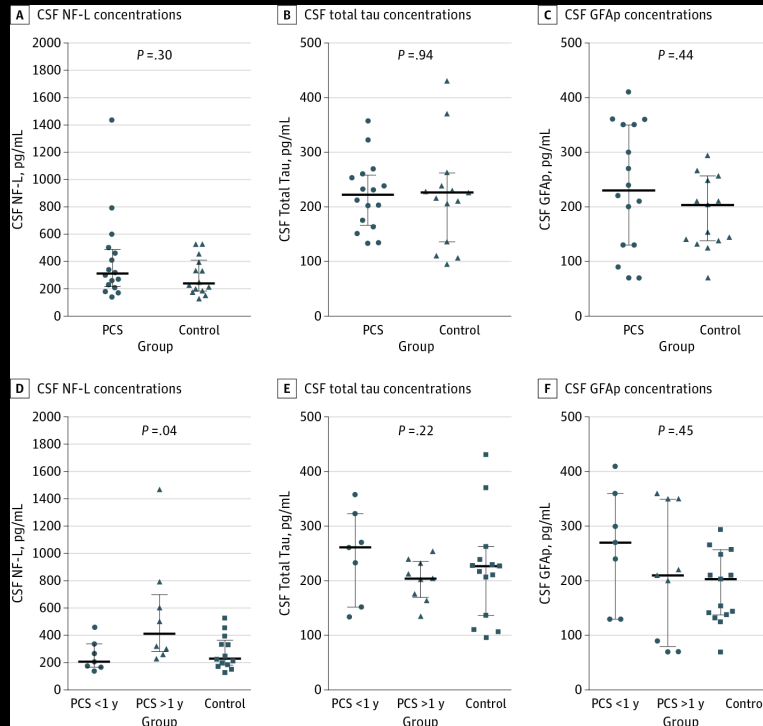




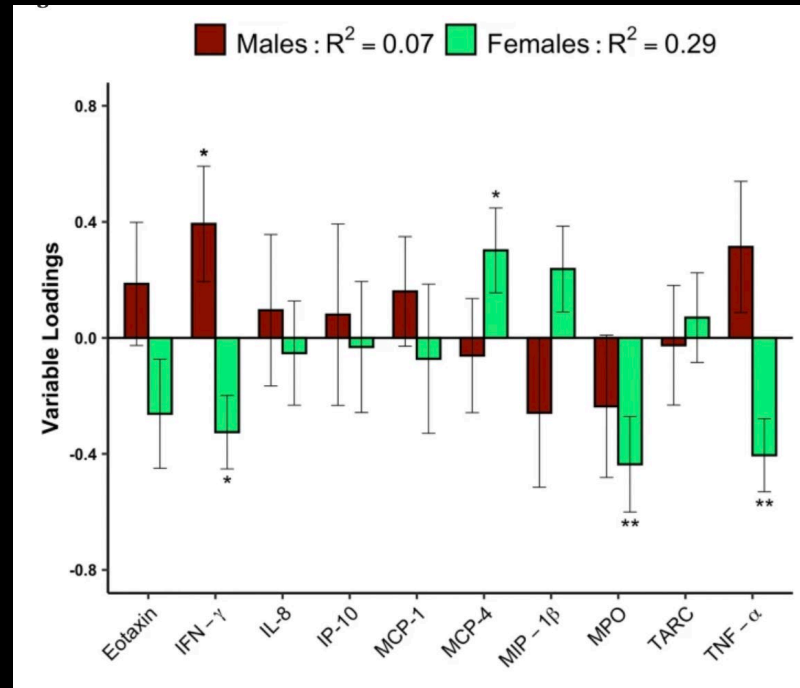


Long-term prognostication

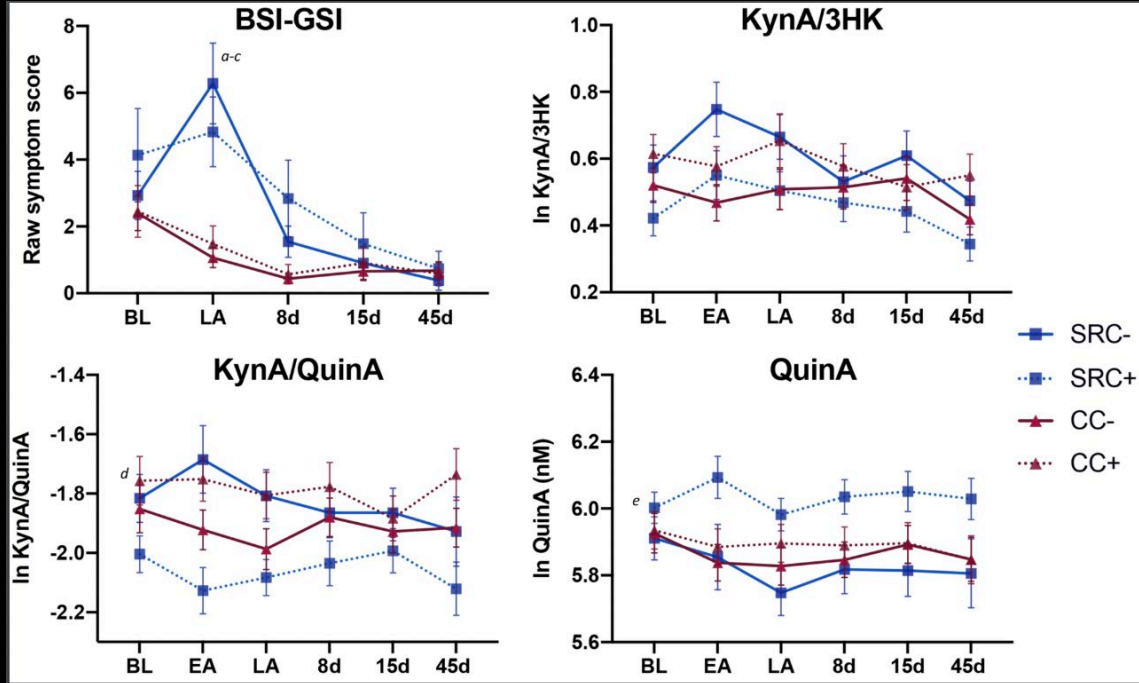
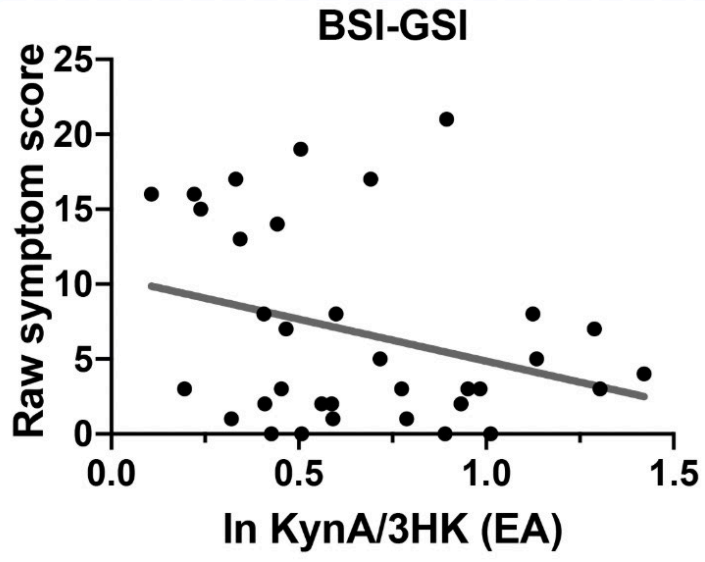
16 male professional ice hockey players (& 15 controls) with prolonged postconcussive symptoms for more than 3 months



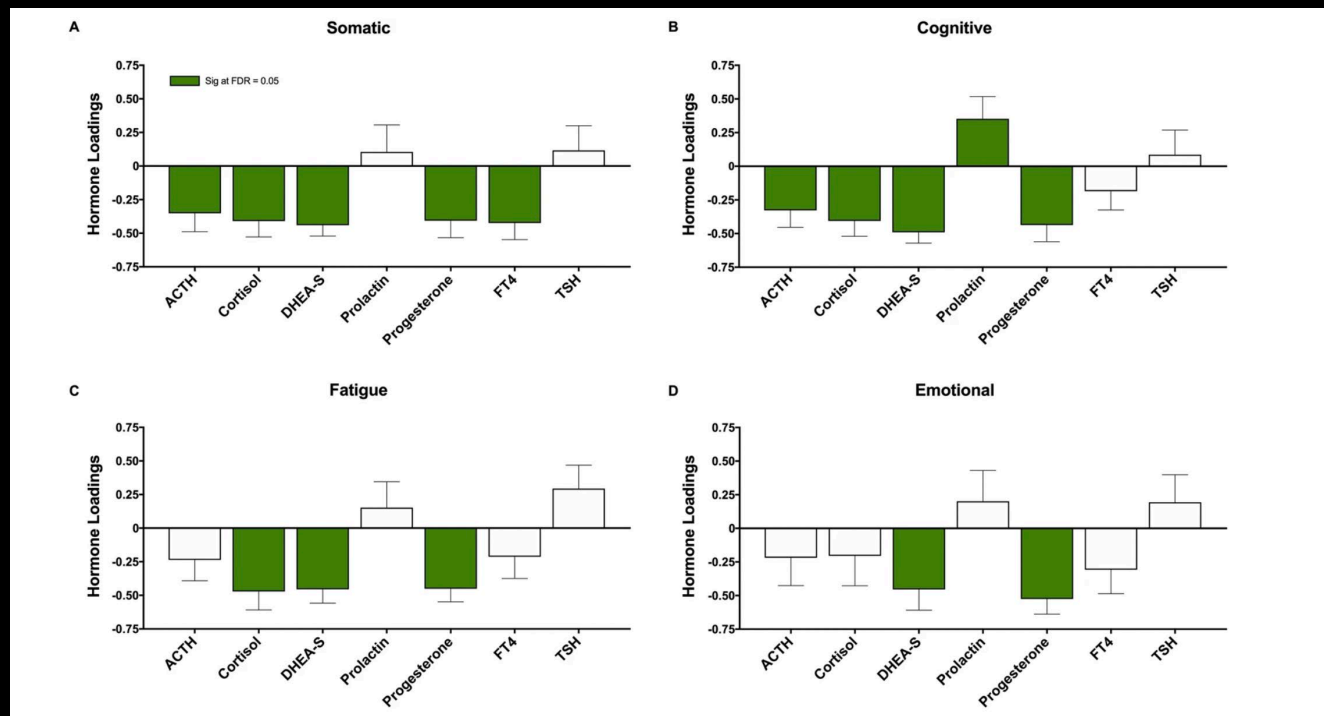
CORRELATION BETWEEN INFLAMMATORY MARKERS & SYMPTOM SEVERITY IN MALES & FEMALES IS DIVERGENT



SYMPTOMS & BIOMARKERS IN SRC



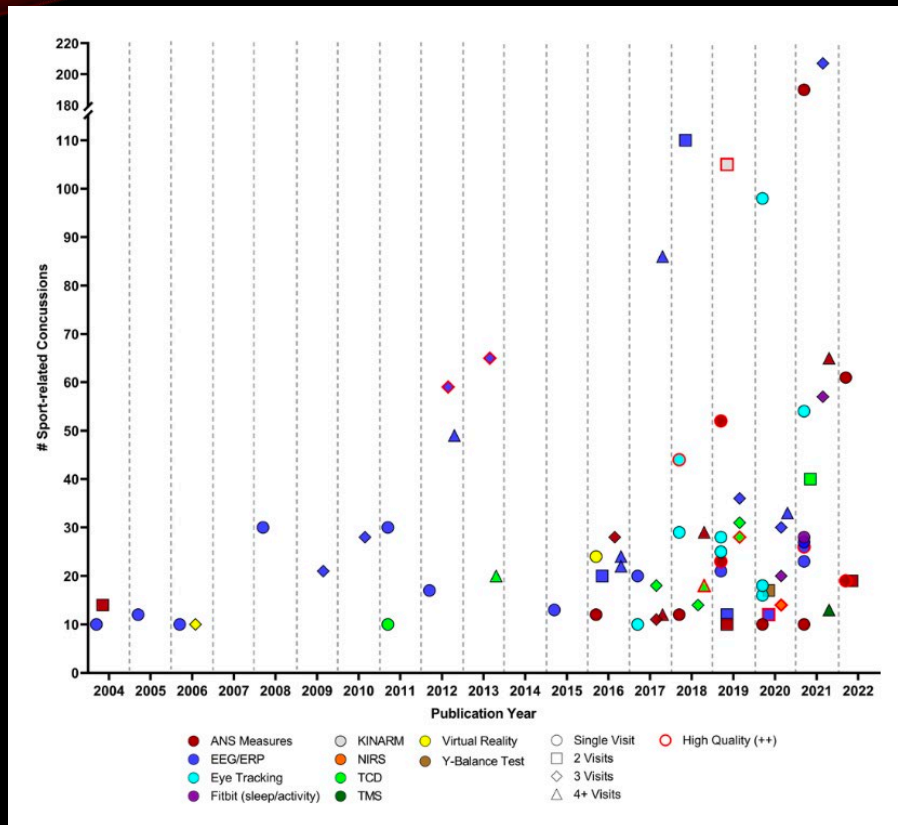
SYMPTOMS & BIOMARKERS



SUMMARY OF FLUID BIOMARKERS

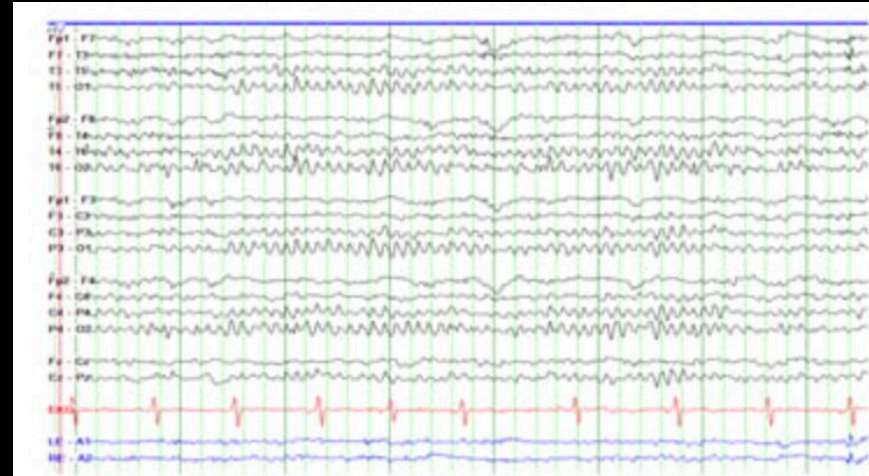
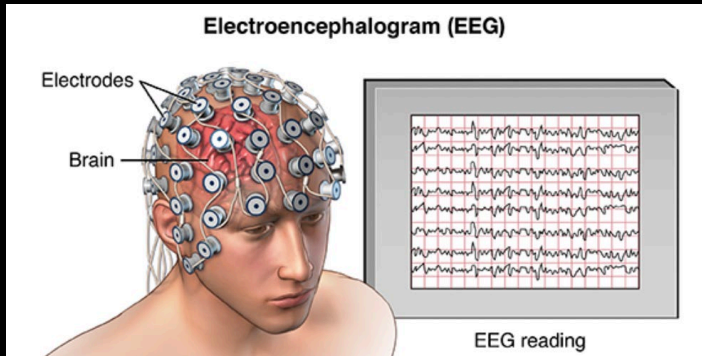
- promising sensitivity to SRC
- numerous studies demonstrate ability of these biomarkers to discriminate athletes with and without SRC
- results at the group level, as opposed to diagnostic or prognostic accuracy at the level of the individual athlete
- consistent patterns have emerged but there exists conflicting evidence likely due to inconsistent sample compositions and study methods layered onto an already heterogenous injury

ADVANCED TECHNOLOGIES STUDY ACTIVITY AND SAMPLE SIZES (2001–2022)



ELECTROENCEPHALOGRAPH (EEG)

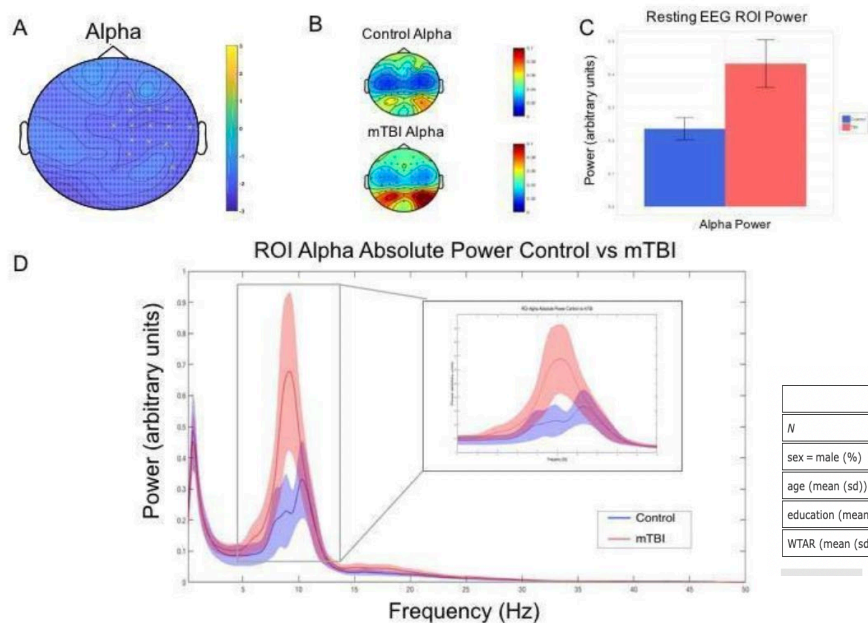
- Used to assess electrical activity of the brain
- Measures electrical activity of the brain through electrodes placed on the scalp
- Electrical signals captured by EEG are generated by the synchronous activity of mainly cortical neurons
- Primarily used to detect seizure, slowing of brain



ELECTROENCEPHALOGRAPH (EEG)

Studies consistently found lower resting EEG power in one or more frequency bands post-SRC

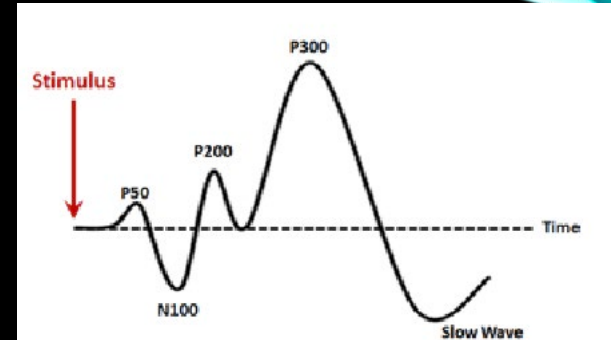
Thompson J, et al *Neurosci Lett* 2005;377:158–63.
Slobounov S, et al *Clin Neurophysiol* 2012;123:1755–61.
Munia TTK, et al 2017 *Seogwipo*.2017:3212–5



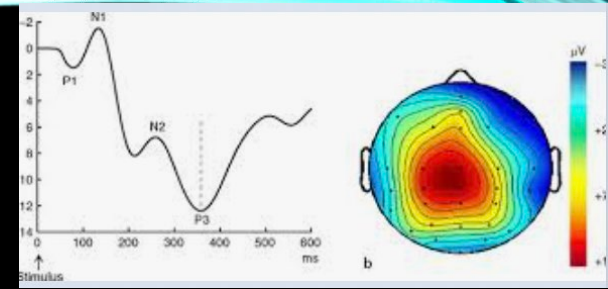
	Control	mTBI		p	d
N	26	30			
sex = male (%)	18 (69.2)	23 (76.7)	$\chi^2 = .11$	0.746	0.087
age (mean (sd))	31.65 (9.06)	35.43 (10.31)	$t = -1.46$	0.154	0.389
education (mean (sd))	16.94 (2.59)	15.25 (3.19)	$t = 2.19$	0.035*	0.582
WTAR (mean (sd))	41.76 (5.63)	38.00 (7.86)	$t = 1.91$	0.053	0.506

EVENT RELATED POTENTIAL (ERP)

- measurable brain responses that are directly related to specific cognitive, sensory, or motor events
- derived from EEG by averaging the brain's electrical activity time-locked to the occurrence of these events
- **Basic Concepts of ERPs:**
 1. Recorded using EEG
 2. Time-locked to specific events, such as the presentation of a stimulus (e.g., a sound or image) or the execution of a response (e.g., pressing a button).
 3. Time-locking allows for the isolation of brain activity associated with the specific event from the ongoing EEG activity.
 4. Segmented into epochs and then averaged



COMPONENTS OF ERPS



1. Early Components:

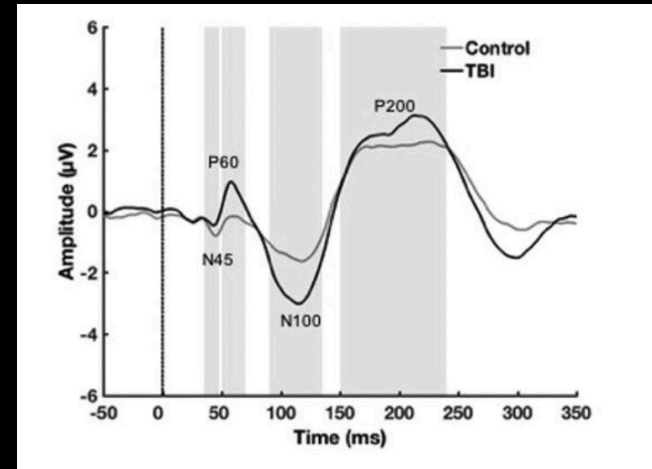
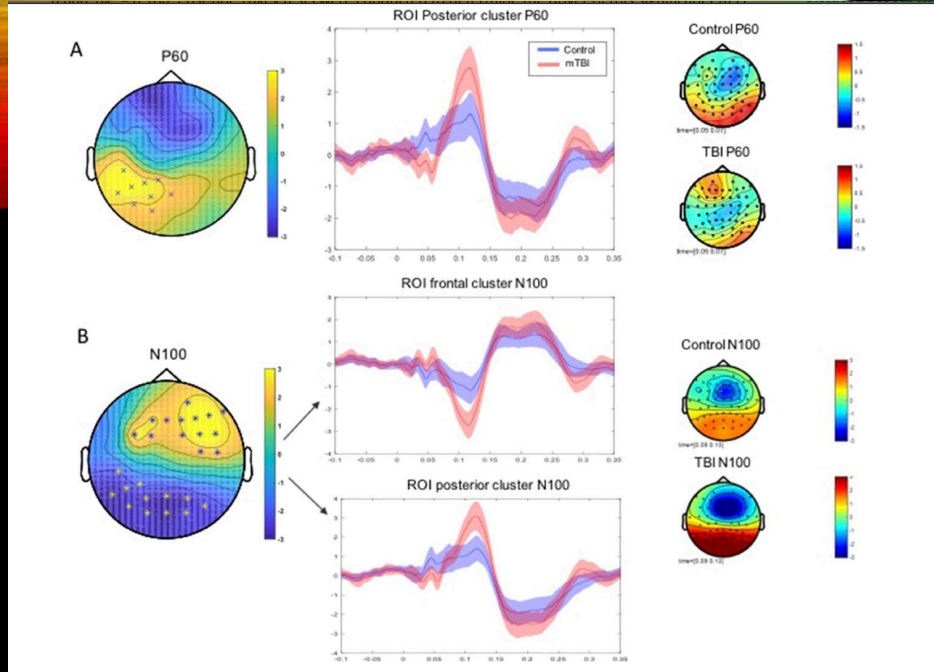
1. **P1/N1:** early sensory components, occurring within the first 100 milliseconds after the stimulus.
2. **P2/N2:** appear around 150-250 milliseconds post-stimulus and are linked to higher-order perceptual and cognitive processes, such as attention and stimulus discrimination.

2. Late Components:

1. **P3 (P300):** Occurs around 300 milliseconds after the stimulus. It is often divided into P3a (related to attention and novelty detection) and P3b (related to memory and decision-making processes).
2. **N400:** Appears around 400 milliseconds post-stimulus and is associated with language processing and semantic understanding.
3. **Late Positive Complex (LPC):** This component occurs later (500-800 milliseconds) and is linked to memory and complex cognitive functions.

ERPS

- Studies found altered amplitudes of numerous ERPs to auditory & visual stimuli after SRC, usually *lower* amplitude in SRC (vs non-SRC) groups and concussed athletes with more severe symptoms
- P3/P300 was the most commonly studied ERP
- N1, P2, N4 and a brainstem potential to speech sounds (frequency following response (FFR))
- Studies have been mixed in whether or not ERP latency was associated with SRC
- Functional connectivity using various indices extracted from the proprietary brain network algorithm (BNA), all of which reported either significant SRC versus control group differences or different trajectories of BNA scores across groups



Significant Results:

The mTBI group showed greater scores on measures of anxiety, depression, fatigue and post-concussion symptoms ($p < 0.05$).

The mTBI group recalled fewer words on the first trial of the RAVLT ($FDR-p = 0.0467$).

The mTBI group showed greater alpha power in the right fronto-central region during eyes closed resting ($FDR-p = 0.0431$).

The mTBI group showed an increase in the left parieto-occipital P60 TMS evoked potential ($FDR-p = 0.042$).

The mTBI group showed an increase in the right fronto-central N100 and left parieto-occipital N100 TMS evoked potentials ($FDR-p = 0.0289$).

OTHER BIOMARKERS

- Portable quantitative EEG (QEEG) systems that might become feasible to implement at the time of suspected injury
- BrainScope's QEEG system were reviewed
- Autonomic nervous system: heart-rate variability
- Cold Pressure Test found group differences in cerebrovascular reactivity, HR and BP
- Transcranial doppler ultrasound to assess cerebral autoregulation or neurovascular coupling during a task
- Oculomotor and vestibular functioning – eye-tracking, pupillary light reflex
- Novel technologies: Robotic devices, virtual reality

SUMMARY OF ELECTROPHYSIOLOGICAL, PHYSIOLOGICAL AND ANS DISRUPTIONS

- Growing number of studies
- Many non-invasive, some cost-effective, some mobile
- Most of acceptable quality BUT NOT HIGH QUALITY
- Most not generalizable
- Most in small numbers
- Many studies done individuals involved in their development and who hold commercial interests in them
- Need replication and larger numbers and evidence at individual level

SUMMARY OF BIOMARKERS

- Advancements have resulted in valuable research tools: neurobiology of diagnosis, prognosis and recovery
- Potential for eventual clinical use BUT translation limited by methodological inconsistencies and a lack of generalizability
- FUTURE: large, multisite, prospective longitudinal studies implementing standardized operating procedures, common data elements, consistent data collection time points and more sophisticated biostatistical approaches to data analysis
- CONCUSSION REMAINS A CLINICAL DIAGNOSIS



THANK YOU FOR YOUR
ATTENTION



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TAB 2C

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Update on Diagnostic Biomarkers in Concussion
(The Good, The Bad, and The Ugly)

The SPECT Scan in Personal Injury Litigation

Lindsay Charles

McLeish Orlando LLP

Mandeep Tamber

McLeish Orlando LLP

May 30, 2024



The SPECT Scan in Personal Injury Litigation

Lindsay Charles and Mandeep Tamber

The Single Photon Emission Computed Tomography (“SPECT”) scan is increasingly being utilized in personal injury cases, particularly for assessing traumatic brain injuries. There are contradictory decisions as to whether the SPECT scan is considered a valid tool to assess brain injury at both The Superior Court of Justice, and The Licence Appeal Tribunal (“LAT”).

The Ontario Superior Court of Justice

At The Superior Court of Justice, there are varying interpretations as to the admissibility of SPECT scan results in determining issues relating to brain injury. Below is a summary of a few decisions weighing in on the use of the SPECT scan, and the ways in which it can be used to assist in determining issues relating to brain injury.

- In a motion by the Defendant to exclude all evidence referring to a brain SPECT scan administered by the Plaintiff¹, S.T. Bale J, found that Dr. Siow’s brain SPECT evidence was inadmissible as it failed to satisfy the reliable foundation test for novel scientific evidence set out in the Supreme Court of Canada decision of *R. c. J. (J.)*². Therefore, the proposed brain SPECT evidence was excluded from the evidence admissible at trial.
- P.W. Sutherland J. in *Wabie v. Wilson* (2022)³ did not agree with the Defendant’s contention that the SPECT scan evidence should be disregarded in its entirety. His Honour allowed the use of the SPECT scan to assist the Court in the determination of the issues. Importantly, in allowing the use of the SPECT scans results, it was found that the SPECT scan cannot be used as a primary diagnostic tool, instead as a secondary diagnostic tool to support a traumatic brain injury diagnosis. His Honour opined that the SPECT scan should be used in concert with other medical techniques and observational tools.

¹ *Meade v. Hussein* 2021 ONSC 7850 Ontario Superior Court of Justice

² *R. c. J. (J.)* 2000 SCC 51

³ *Wabie v. Wilson* 2022 ONSC 4296 Ontario Superior Court of Justice

- P. Tamara Sugunasiri J. in *Kolapully v. Myles et al.* (2022)⁴ dismissed the Defendant's motion to exclude a SPECT scan as evidence. Her Honour allowed SPECT scan evidence to be used because it was one of the many diagnostic tools used to conclude that the Plaintiff suffered from the ongoing effects of a mild traumatic brain injury. Her Honour agreed with the Defendants, only with respect to the idea that if a SPECT scan was used on its own to diagnose a traumatic brain injury, it would be considered a novel use of the scan, and its "prejudicial effect would vastly outweigh its probative value". However, since the Applicant's brain injury was supported by way of multiple tools, the use of the SPECT scan as evidence was not only acceptable, but the correct way to proceed.

The Ontario Court of Appeal

Recently, the Court of Appeal, in *Kolapully v. Myles* (2024)⁵, weighed in on whether the Trial Judge erred in admitting the results of a SPECT scan into evidence. In determining the Trial Judge did not err in admitting the results, the Court opined as follows.

I would make three observations about these more recent cases. First, the science appears to still be contestable and each case will turn on the evidence considered by the trial judge. A party must put its best foot forward. Here the TTC did not do so. Second, the cases turn on their own facts and evidence. Later cases that address a common factual or evidentiary issue are of no assistance on appeal. Third, the TTC's reliance on para. 74 of *Gutfriend* was an improper attempt to influence this court against Dr. Mehdiratta. The TTC was entitled to challenge the impartiality of the CANM guidelines at Dr. Mehdiratta's *voir dire*, or to attempt to bring a motion to adduce fresh evidence on appeal. It did not do so. Without the benefit of the evidence that the trial judge in *Gutfriend* relied on, this court has no basis to assess, let alone accept, the concern that he raised.

The Licence Appeal Tribunal

Adjudicators at the LAT have also weighed in on the validity of using the SPECT scan as a tool to measure brain injury. The decisions lack consistency on whether the SPECT scan will always be considered a valid tool. Below are a few decisions highlighting the

⁴ *Kolapully v. Myles et al.* 2022 ONSC 6674 Ontario Superior Court of Justice

⁵ *Kolapully v. Myles*, 2024 ONCA 350

analysis LAT Adjudicators took when the SPECT was tendered to support an Applicant's brain injury.

- In *Cruz v. Belair Direct*⁶, Vice Chair Chloe Lester, found that the Applicant was not entitled to a SPECT scan being funded by the insurer. Vice Chair Chloe Lester found there was a lack of medical evidence in the acute phase of her injuries, that she had any concussive symptoms, or was diagnosed with a traumatic brain injury. Further, the SPECT scan did not give any conclusive evidence of a mild traumatic brain injury. While the scan showed some abnormalities, it was only on a balance of probabilities, that a doctor determined that the Applicant might have a traumatic brain injury. Because a doctor could not determine whether the Applicant had a traumatic brain injury, a SPECT scan was not found to be conclusive.
- In *Panchoo v. Aviva Insurance Company of Canada (2023)*⁷, Vice Chair Tyler Moore found that the completed SPECT scan objectively supported the Applicant as having suffered a traumatic brain injury, as a result of an accident. Therefore, he found the proposed treatment, being a neuropsychological assessment, to be reasonable and necessary. In determining that the treatment plan was reasonable and necessary, it was noted that two other physicians agreed that the Applicant continued to suffer from cognitive impairments. This decision is one of the few where a member of the LAT endorsed the idea of a SPECT scan being capable of diagnosing a traumatic brain injury, albeit in concert with a psychologist's finding that the Applicant suffered from a major cognitive disorder. Further, the Applicant's family physician specifically noted that the SPECT scan revealed brain perfusion defects, consistent with a traumatic brain injury.
- In *Kalk v. Intact Insurance Company (2022)*⁸, a SPECT scan formed a part of the evidence that conveyed that the Applicant suffered a concussion. Vice chair Jeffrey Shapiro did not agree with Dr. Yahmad, who stated that using a SPECT scan to diagnose a concussion is "essentially reverse engineering a diagnosis when there

⁶ *Cruz v. Belair Direct* 2022 CarswellOnt 12252 Ontario Licence Appeal Tribunal

⁷ *Panchoo v. Aviva Insurance Company of Canada* 2023 CarswellOnt 14859 Ontario Licence Appeal Tribunal

⁸ *Kalk v. Intact Insurance Company* 2022 CarswellOnt 7554 Ontario Licence Appeal Tribunal

is no loss of consciousness and intact GCS scores”. In accepting Dr. Basile’s evidence, it was highlighted that the Applicant suffered cognitive symptoms, and that a concussion was also diagnosed by several other providers, including the acquired brain injury clinic at The Toronto Rehabilitation Institute.

- In *Foster v. Aviva General Insurance* (2021) ⁹, a SPECT scan assisted Adjudicator Nathan Ferguson in finding that, on a balance of probabilities, the Applicant did suffer trauma to his brain, and a concussion, as a result of the accident in question.

Takeaways

There is little consistency on how the SPECT scans results will be viewed at the LAT and The Superior Court of Justice. That said, it is apparent that if Plaintiff or Applicant’s counsel intends to rely on a SPECT scan, she should have corresponding evidence of a traumatic brain injury. If defence counsel wants to challenge the validity of the SPECT scan, and its admissibility, she ought to tender evidence from an expert who is qualified to address the SPECT scan’s merits.

⁹ *Foster v. Aviva General Insurance* 2021 CarswellOnt 12979 Ontario Licence Appeal Tribunal



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TAB 3A

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Neuropsychological Assessments - Cognitive Testing, Validity Testing, and the Impact of Symptoms

Neuropsychological Assessment in Concussion: Utility and Limitations (PPT)

Dr. Robin Green, PhD, C.Psych., Clinical Neuropsychologist
University Health Network

May 30, 2024



Neuropsychological Assessment in Concussion: Utility and Limitations

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Robin Green, Ph.D., C.Psych.

Practice In Clinical Neuropsychology

Saunderson Family Chair in Acquired Brain Injury, UHN

Professor, Department of Psychiatry, Temerty Faculty of Medicine

University of Toronto

Disclosures

Relationships with financial sponsors:

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Speakers Bureau/Honoraria: N/A

Consulting Fees: N/A

Patents: N/A

Donor: Walter & Maria Schroeder Institute for Brain Innovation & Recovery; Saunderson Family Foundation; Joseph and Antoinette Sorbara Foundation

No Conflicts of Interest

Objectives

To provide general background to neuropsychological assessment in concussion:

- How is NP assessment conducted?
- What is its utility in concussion?

To clarify limitations of neuropsychological assessment in concussion

PART 1

General Background

Neuropsychological Assessment in Concussion

What is it?

An in-depth assessment of cognitive skills and abilities, mood, personality linked to brain function

Some Key Purposes in Concussion

Diagnose (new ACRM) and characterize impaired and preserved capacities

- Cognitive/psychological/neurological diagnosis - tied to an etiology
- Characterization - description of cognitive strengths/weaknesses; personality
- Co-Morbid disorders in need of treatment (e.g., ADHD; psychiatric; substance use)

Treatment planning (e.g., rehabilitation goals; return-to-learn/sport; safety decisions)

Insurance / Medical-Legal

Prior to Testing

1. Referral question

Diagnosis/Characterization of cognitive/psychological impairments/symptoms

- Types and severities

Etiology of symptoms

- Is overall diagnosis organic, “psychogenic”, factitious, malingering?
- Can individual symptoms be stratified by concussion vs. non-concussion (e.g., pre-morbid?)

Clinical Questions

- What are functional impacts of symptoms?
- Can patient safely return to work, school, sport, driving?
- What should therapy focus on?

Prior to Testing

1. Referral question

2. Review of relevant records

Pre-injury records

- Medical, psychological, school, employment, criminal

Post-injury

- Ambulance/ER, neuroimaging, hospital, assessments/treatments

Prior to Testing

1. Referral source/question

2. Review of clinical/medical records

3. Clinical interview (~ 1-2 hours duration)

Pre-injury questions

- Personal/Relationships/Family
- Language/Culture/Ethnicity
- Developmental/Educational
- Occupational/Volunteerism
- Social/Recreational
- Medical/Psychiatric/Psychological history of patient and family

Post-injury questions

- Symptoms: Cognitive, Emotional/Behavioural, Physical
- Treatments: Types, Frequency, Duration, Efficacy
- Medications: particularly psychoactive
- Functioning: across life domains
- WSIB/Insurance/Criminal/Legal involvement

Prior to Testing

1. Referral source/question
2. Review of clinical/medical records
3. Clinical interview (~ 1-2 hour duration)
4. Collateral clinical interview (family/caregiver)

Neuropsychological Testing

Duration:

Variable (2-8 hours; 1 or multiple sessions)

Outcome measures:

Test types: Performance-Based Measures

Patient Reported Outcomes (self-report measures)

Materials: Digital; paper and pencil

Behavioural Observations

Comprehension of instructions, cooperation, appearance, pain behaviours, affect, interruptions during testing, attention to testing, engagement, etc.

Neuropsychological Testing

Key Domains Assessed	Sub-Types
Sensory, perceptual, manual motor	Verbal
Intellectual functioning (including estimated pre-morbid)	Visuospatial
Language, visuospatial processing	Timed
Attention, concentration, speed of processing	Untimed
Learning and memory (verbal and visuospatial)	Oral
Executive functioning	Written
Motivation/performance validity	
Mood and personality	
Functional	

After Testing

Scoring: normative data

- Findings compared to normative sample; quality of norms matters
- Age-stratified; sometimes education and sex (“apples to apples”)

Interpretation

- Integration of: Test scores, interpretation science, referral question(s), validity (patient factors/quality of tests/norms/testing conditions), contextual information (present/past)

Report: lay summary, full report, medical-legal/third party

Clinical Feedback: Patient; Family; Clinical Team; Legal Team

PART 2

Limitations and Utility of Testing

Limitations

Challenges of “Patient Reported Outcomes (aka Self-Report Measures or surveys)”

Acute and persisting symptoms of concussion are non-specific

“Symptoms” (concentration problems, brain fog) endorsed even in healthy adults

~~OLD: “Post-concussion syndrome”~~ NEW: *“Prolonged Symptoms after Concussion.”*

Why?

We can't know underlying etiology of a given symptom in a given individual

Factors unrelated to concussion contribute to symptom endorsement

- Pre-injury factors, e.g., mental health, resiliency
- Post-injury factors, e.g., acute distress; “Good old days” bias; “Cogniphobia”
- Interplay between symptoms

Limitations

Challenges of “Performance-Based Measures”

Origins: Developed for more severe symptoms/diseases; many validated against imaging/neurosurgical findings

- Absence of baseline testing against which to compare current performance
- In high-functioning patient (e.g., 75th percentile or higher) a decline of 50 percentile points is still within average range – low specificity
- Impairments may manifest only under particular conditions (e.g., tired; long period of activity) - but patient “rises to occasion” during assessment
- Normative data – dependent on size, stratifications, sampling
- Subject/pre-injury factors that reduce sensitivity/specificity
 - always stellar at math so can’t detect decline from baseline on computations
 - always had concentration problems so cannot discern if new or old symptom

Limitations

Inaccurate diagnosis consequences

False negative (missed diagnosis):

- Missed opportunity for early intervention
- Appropriate claims/compensation not received

False positive (diagnosis of impairments when there are none):

- Inappropriate use of resources (e.g., rehab; compensation)
- Reinforcement of “sick role”
- Missed contribution of non-concussion factors in need of treatment

Utility

Diagnosis/Characterization of Cognitive/Mood/Personality Impairments

- Comprehensive picture of etiology, discriminating new vs. pre-existing (e.g., “hold” measures/disparity between measures), and relative impairments (declines from pre-injury not within impaired range)
- Contributions of collateral factors to current functioning – mood, personality, pre-morbid, co-morbidities, psychosocial factors
- Use of normative data, continually updated for increased precision/validity (e.g., larger data sets; more stratifications)
- Advancing field with improving methodologies for increased testing sensitivity and validity (e.g., dual tasking; ecological momentary assessment) and reach (i.e., validated remote assessment)

Utility

Insurance/Medical Legal

- Provision of a diagnostic report
- Methods for distinguishing concussion from pre-existing/collateral diagnoses
- Estimation of impact on functional/everyday manifestations, restrictions to participation/role
- Capacity assessment
- Evidence-based techniques for establishing validity

Utility

Clinical Recommendations/Management

- Guiding of rehabilitation process with treatment recommendations
e.g., setting goals for treatment; readiness for return to school, work; information on independent functioning
- Diagnose and clinical recommendations re: non-cognitive factors
e.g., cogniphobia, pain, sleep, mood
- Collaboration with clinical team to generate optimal management strategies
- Provision of feedback, education to patient, family, school, employer
- Including recommendations for accommodations needed

Thank you



<https://www.cognitiveneurorehablab.ca/>



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TAB 3B

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Neuropsychological Assessments - Cognitive Testing, Validity Testing, and the Impact of Symptoms

Neuropsychological Assessment of Mild Traumatic Brain Injury
Symptom and Performance Validity (PPT)

Dr. Elias Jeffay, Ph.D., C.Psych., Clinical Neuropsychologist
University Health Network

May 30, 2024



Neuropsychological Assessment of Mild Traumatic Brain Injury

Symptom and Performance Validity

Eliyas Jeffay, Ph.D., C.Psych.

Practice in Clinical Neuropsychology

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(SPARC)

Canadian Concussion Centre

KITE | Toronto Rehab | University Health Network

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SPARC

Schroeder Pain Assessment
and Rehabilitation Research Centre

kiteclinics UHN



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3B-1

Disclosure(s)

- Fee for service work
 - Staff Psychologist at SPARC chronic pain rehabilitation clinic at UHN
 - Private practice
- No other conflicts of interest to disclose

Objectives

1. Introduce validity testing in neuropsychological assessments for concussion, highlighting its significance and application
2. Outline the benefits and challenges of symptom and performance validity testing in this context
3. Examine common post-concussion factors that may affect neuropsychological performance, including validity testing

Typical Scenario

- Neuropsychologist is retained to complete a neuropsychological evaluation
- Patient incurred a mild traumatic brain injury (mTBI)
- Results of performance validity testing were below cutoff scores and interpretation of objective test results were forgone or interpreted with caution

Are you saying my client was lying?

- The M-word
- Multiple definitions
 - **DSM-5**
 - “Intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives such as avoiding military duty, avoiding work, obtaining financial compensation, evading criminal prosecution, or obtaining drugs”
 - **Slick et al., 1999 (and updated Sherman et al., 2020)**
 - “Volitional feigning or exaggeration of neurocognitive, somatic, or psychiatric symptoms for the purpose of obtaining material gain and services or avoiding formal duty, responsibility, or undesirable outcome”
 - Largely endorsed by AACN position paper (see Sweet et al., 2021)
 - Multidimensional malingering criteria
- Implies (degree of) intentionality of deception

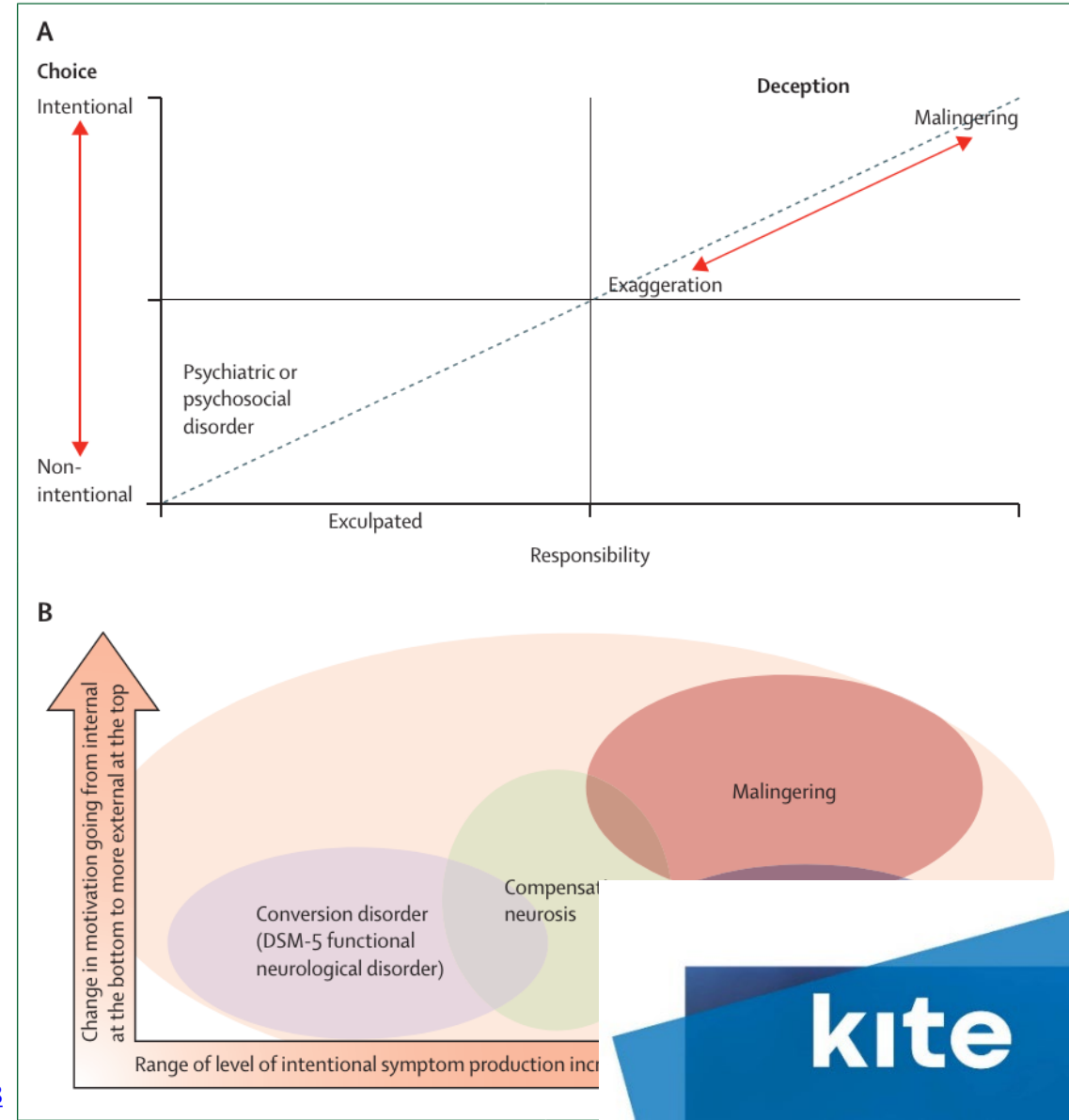
Multidimensional Criteria for Neurocognitive, Somatic, and Psychiatric Malingering.

- A** Presence of external incentive
- B** Invalid presentation on examination indicative of feigning or exaggeration
- C** Marked discrepancies
- D** Behaviours in Criterion B not fully accounted for by another developmental, medical, or psychiatric condition

Sherman et al., 2020

Are you saying my client was lying?

- Intention is difficult, if not impossible, to ascertain
- Continuum between
 - Intentional to unconscious
 - internal vs external motivation
 - Range and severity of symptoms
- Neuropsychological tests are not validated for intentionality



How are you determining this?

- Neuropsychologists have sophisticated, evidence-based, tools to determine performance validity
 - Multiple tests in battery
 - Objective psychometrically validated criteria
 - Classification accuracy data
 - Professional judgement mindful of social, cultural, and legal contexts
- Performance Validity Tests (PVT)
 - Validity for measures that assess cognitive, motor, sensory, or some behavioural task or ability that requires actual performance of the task
 - Stand alone vs embedded
 - Both often used
- Symptom Validity Tests (SVT)
 - Validity for symptom endorsement
 - Eg: medically implausible or impossible, clinically infrequent, along with inconsistent, extreme defensiveness/negative response bias
- Many types of PVTs and SVTs available
- No consensus on cutoff and multiple 'algorithms' proposed
 - Common conservative approach equates to 2 to 3 failed PVTs (Larrabee 2014; Bilder, 2014)



SPARC

Schroeder Pain Assessment
and Rehabilitation Research Centre

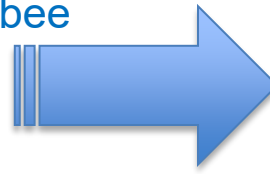
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3B-7

How reliable are these tests?

- Neuropsychologists need to be familiar with the classification accuracy of the tests they employ
- Sensitivity
 - Those correctly identified by the test noncredible
- Specificity
 - Those correctly identified by the test as credible
 - Usually set at 0.90 (90% credible clients score above cutoff)
- Standalone > embedded PVTs
- 4-9 administered over the course of testing
- Multiple 'algorithms' proposed and continues to be an area of active discussion
- Probability improves with multiple administration
 - 2 to 3 failed PVTs across 5 or more PVTs administered yield an acceptable <5% false positive rate (Larrabee 2014; Bilder, 2014)
- In addition, incorporate multiple sources of data outside of PVTs



		Criterion: Number of failed PVTs to judge battery invalid					
Number of PVTs Given	Source	>=1	>=2	>=3	>=4	>=5	>=6
5 PVTs							
	Ind Binom	41.0	8.2	0.9	0	0	0
	Corr Binom	33.8	11.5	3.6	0.9	0.2	0
	Neg Binom-14	26.7	7.1	1.9	0.5	0.1	0.0
	Neg Binom-12	33.8	11.4	3.8	1.3	0.4	0.1
	ACS-Data	25.0	6.0	1.0	0	0	0
	DM-Data	40.0	40.0	0	0	0	0
	Larrabee-Data	41.6	5.6	0	0	0	0
6 PVTs							
	Ind Binom	46.9	11.4	1.6	0.1	0	0
	Corr Binom	33.8	11.5	3.6	0.9	0.2	0
	Neg Binom-14	30.4	9.3	2.8	0.9	0.3	0.1
	Neg Binom-12	38.0	14.4	5.5	2.1	0.8	0.3
	DM-Data	26.9	3.9	0	0	0	0
7 PVTs							
	Ind Binom	52.2	15.0	2.6	0.3	0	0
	Corr Binom	41.1	17.5	7.3	2.9	1	0.3
	Neg Binom-14	34.4	11.9	4.1	1.4	0.5	0.2
	Neg Binom-12	42.4	17.9	7.6	3.2	1.4	0.6
	DM-Data	33.3	15.2	3.0	0	0	0
	Larrabee-Data	48.0	11.0	4.0	0	0	0
8 PVTs							
	Ind Binom	57.0	18.7	3.8			
	Corr Binom	44.0	20.2	9.3			
	Neg Binom-14	38.7	15.0	5.8			
	Neg Binom-12	46.9	22.0	10.3			
	DM-Data	40.0	15.0	15.0			

Table 2 from Bilder et al., (2014)
doi:10.1080/13854046.2014.969774

Isn't the brain injury causing failures?

- Important to review expected recovery after mTBI

0 - 5 days	5 - 30 days	30 + days	90 + days
<p>Acute Period</p> <p>Symptoms and cognitive impairments that were severe enough to disrupt normal daily functioning</p>	<p>Subacute Period</p> <p>Gradual resolution of symptoms and cognitive and functional impairments.</p> <p>The majority of patients with mTBI achieve full recovery within this period</p>	<p>Chronic Period</p> <p>Physiologically, the brain will return to a normal state of function.</p> <p>Some will continue to report persistent symptoms and cognitive complaints.</p>	<p>Post-Acute Period</p> <p>Estimates of 5-20% patients continue to exhibit persistent difficulties.</p> <p>Termed miserable minority (Rohling et al., 2011)</p>

McCrea et al., 2009 | Rohling et al., 2011 | Belanger et al., 2005

Not just PVT results

- Symptoms make sense with injury?
- History of symptom onset?
- Evolution of symptoms follow expected trajectory?
- Any pre-existing conditions that may affect cognitive performance (directly or indirectly)
- Support from other findings/reports/consultations?
- Results of the validity tests?
- Behavioural observations?
- Medications?
- Situational factors?
- Cultural or language barriers?
- Current cognitive results align with expected profile?
- Variability within domains?
- Consistent reports from patient, collaterals, or caregivers?
- Other alternate explanations or diagnoses that can account for performance?

What else could it be?

- Well established that involvement in litigation after concussion increases likelihood of invalid symptom reporting (French et al., 2018)
- Binder and Rohling (1996) found that external incentives (litigation) in mTBI potentially lowered test scores on average nearly one-half standard deviation ($d = 0.47$), which is more than the decrement associated mTBI.
 - Litigation is not the 'cause'
 - Protracted litigation lowers morale, reduces effectiveness of treatment, accounts for drift of symptoms, and fosters iatrogenic conditions, which lowers test performance
- Overlapping factors
 - Post-injury depression (Mooney 2005)
 - Occurs nearly 4x the rate in health population
 - Low motivation, decreased attention, slowed cognitive processing speed
 - Posttraumatic stress disorder
 - Irritability, emotional dysregulation, which leads to lowered cognitive efficiency
 - Pain and Somatic symptom disorder
 - Subjective, difficult to measure reliably (neuropsych tests were not designed to measure pain)
 - Naturally distracting which can fluctuate rapidly in time and severity
 - affects all areas of cognition, especially attention and processing speed
- Other factors
 - Culture, ethnicity, language (Zakzanis et al., 2011; Fujii, 2018; Salazar et al., 2021)

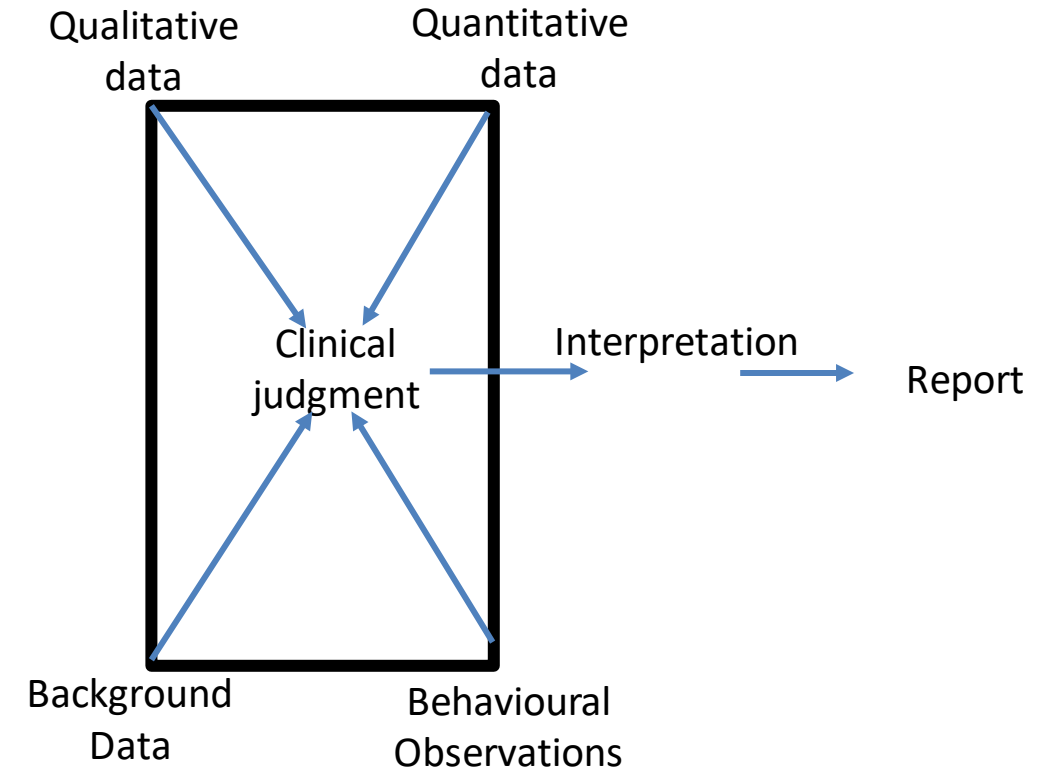
What about psychological condition?

- While there may be overlapping factors that affect test performance, multiple failures across PVTs are not observed
 - Even when there is cognitive impairment (Critchfield et al., 2019)
- Specific clinical populations have been evaluated and again, although there may be cognitive effects of these psychological conditions, multiple PVT failures not common
 - Depression (Guilmette et al., 1994; Green et al., 2013)
 - Anxiety (Marshall et al., 2021)
 - Pain (Gervais et al., 2004; Greve et al., 2018)
 - Fatigue (Dorociak et al., 2018; Kalfon et al., 2016)
 - PTSD (Demakis et al., 2008)
 - Medication effects (Schroeder et al., 2021)
- SVTs should be used to validate self-reported symptoms
 - SVT results are evaluated in terms of discrepancy from normal expectations: mild, moderate, or extreme over-reporting
- Failure on PVTs do not predict failure on SVTs and vice versa (Zakzanis, Gammada, Jeffay, 2012; Van Dyke et al., 2013)
- Neuropsychologists consider the totality of the client's presentation



Why couldn't you interpret the findings?

- Interpretation is based on accuracy of information
- Failures on PVTs limits confidence of test results reflecting their true ability
- If interpretation is proceeded, then it risks
 - If this, then that: overgeneralizing
 - Psychometric metrics like sensitivity and specificity are no longer valid and risk of false positive and false negative increases
 - Confirmatory bias
 - Misuse of salient data: over- and under-interpretation
 - Underutilization and misutilization of base rates
 - Effort effects
- All risks empirically informed neuropsychological opinion

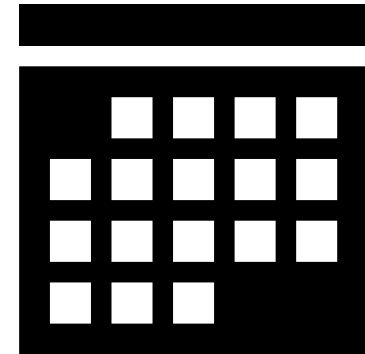


I want to look at the data

- Some attorneys argue that access is necessary to cross-examine opposing neuropsychological expert witnesses and protecting their clients
- As per PHIPA (2004), a client, or legal guardian, the right of access to, or the right to consent to the disclosure of, his/her personal health information. Except:
 - Raw test data from standardized psychological tests [PHIPA 51.(1)]
 - Information that could pose a risk of harm and confidential third-party information
- However, as per the CPO Standards of Professional Conduct (10.8):
 - Raw data can be provided to non-members when the request is reasonable and appropriate, and with proper authorization
 - PHIPA (2004, section 52) exceptions related to the expectation of serious risk associated with the disclosure
- Difference between raw test data and standardized psychological tests and materials
- Risks misuse, misinterpretation, and naivety of tests
 - Coaching occurs
 - Essig et al., 2001; Victor et al., 2004; Spengler, 2020)
 - Attorneys have no formal training or expertise in analyzing test data
 - Neuropsychologists have ethical and professional responsibility to safeguard protected test materials
- Multiple Position Papers on test security
 - National Academy of Neuropsychology (NAN) (2000; 2003)
 - American Academy of Clinical Neuropsychology (2007; 2022)
 - Interorganizational Position Paper on Protection of Psychological Test Information (2024)
- Bound to test security, copyright laws, and tests are considered trade secrets
- Competing interests when released to non-psychologists
- Solution: Release of data (transcribed) to psychologists retained by opposing counsel to maintain tes

When can they go back for testing?

- Documenting performance over repeated evaluations is recommended by AACN Practice Guidelines (2007)
- No clinical guidelines regarding minimum test–retest intervals in clinical or forensic settings
- Practice effects
 - Improvement in performance due to previous exposure
 - Confounds performance
 - Vary in duration by test, based on scientific literature
- Alternate versions can be administered if applicable
- Can use statistical methods to estimate change (e.g., Reliable Change Index; RCI)



How can I prepare my client next time?

- ☐ Tell them to earnestly try their best
 - Our job is to test their cognitive limits
- ☐ Prepare by having a good night's sleep
- ☐ Take regular medications and caffeine intake
- ☐ Bring food and snacks
- ☐ Know their fatigue thresholds
 - Better to take frequent breaks than to overdo themselves
- ☐ Encouraged to ask for clarification
- ☐ Minimize stress for patient
 - E.g., arrange transportation, arrange babysitting, discuss test anxiety (if applicable)



“To understand the neurocognitive effects of brain injury, valid neuropsychological test findings are paramount”

- Erin D. Bigler, 2014

Thank you



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TAB 4

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Treatment of Post-Concussion Symptoms (PPT)

Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist
Canadian Concussion Centre, Toronto Western Hospital

May 30, 2024



TREATMENT OF POST- CONCUSSION SYMPTOMS

CARMELA TARTAGLIA, MD

MEMORY CLINIC, KREMBIL BRAIN INSTITUTE

TANZ CENTRE FOR RESEARCH IN NEURODEGENERATIVE DISEASES



DISCLOSURE

- CIHR, NIH, WESTON BRAIN FOUNDATION, TANENBAUM INSTITUTE OF SCIENCE IN SPORT
- CLINICAL TRIALS: BIOGEN, ROCHE, ANAVEX,UCB, NOVO NORDISK, JANSSEN, PASSAGE BIO, GSK
- CONSULTATION: EISAI, LILLY

OBJECTIVES

At the end of this presentation, the learner will be able to:

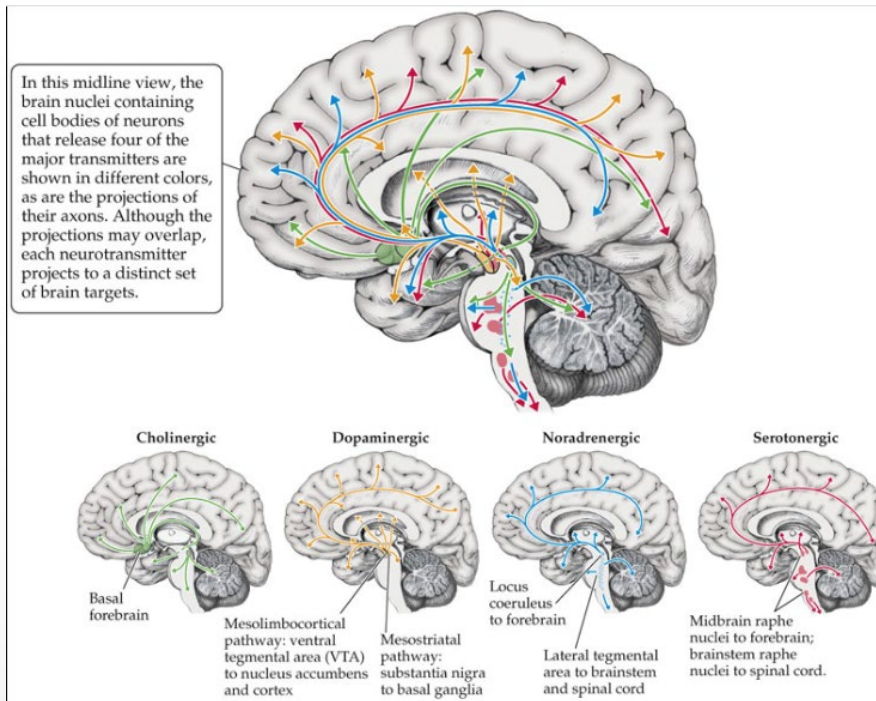
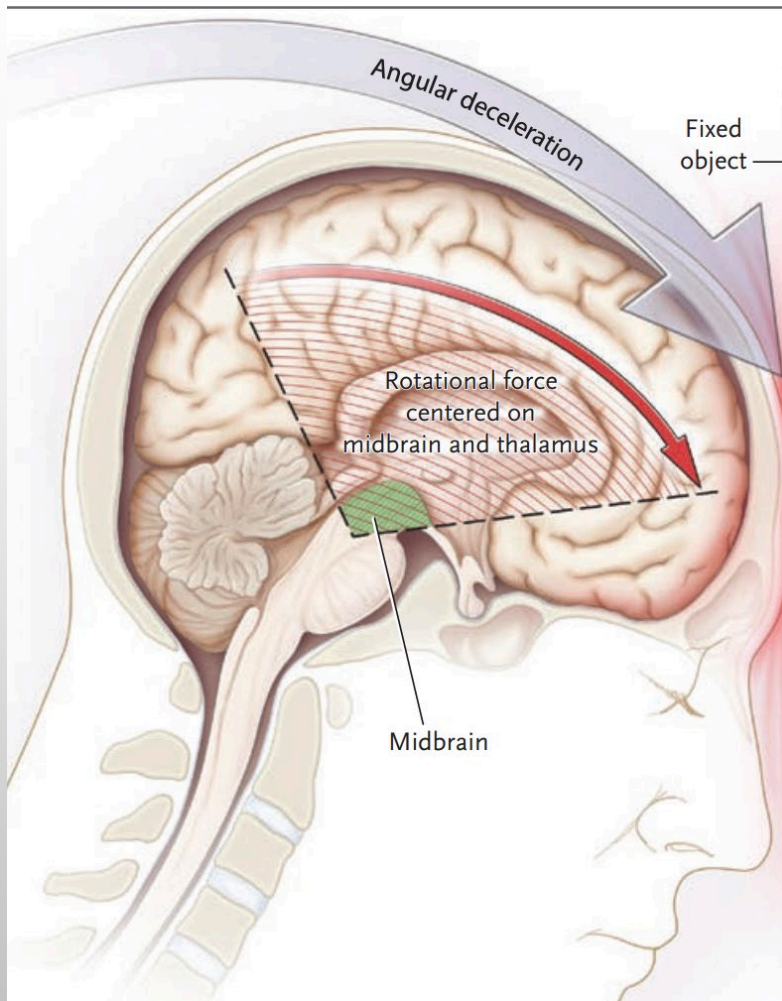
- Learn about the treatment of various concussion spectrum disorders

TYPES OF BRAIN INJURIES

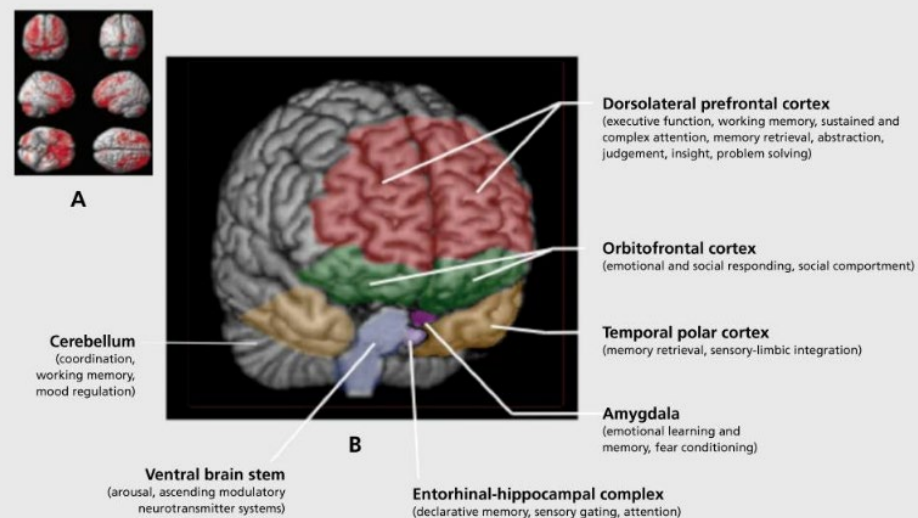
- **CONCUSSION/MILD TRAUMATIC BRAIN INJURY (MTBI)**
 - often used interchangeably
 - mTBI glasgow coma scale 13-15 at 30min post-injury +
 - <30min LOC
 - <24hr post-traumatic amnesia
 - Impaired mental status at time of accident (confusion, disorientation etc)
 - Transient neurological deficit
- **Moderate-severe TBI:** bruising or contusion, tearing/laceration, bleeding

CONCUSSION

- Acute neurophysiological effect of blunt impact or other mechanical energy applied to the head or other body part such as from sudden acceleration, deceleration or rotational forces.
 - trauma does not have to be directly to head, can be from whiplash effect on the brain or trauma elsewhere on the body
 - immediate and temporary alteration of mental functioning due to trauma



Brain regions vulnerable to TBI and relationship to neurobehavioral sequelae



SYMPTOM HETEROGENEITY AMONG PATIENTS

COGNITIVE SYMPTOMS

Difficulty thinking-confusion

Slowed processing

Difficulty remembering

Unable to concentrate



PERSONALITY/MOOD

Irritable

Depression

Anxiety

Lability

Impulsivity

Sleep changes

PHYSICAL

Headache

Vision abnormalities

Dizziness/Vertigo

Sensitivity to light or noise

Balance problems

Fatigue



PERSISTENT SYMPTOMS OF CONCUSSION

AKA POST-CONCUSSION SYNDROME

- *Heterogeneous concept with different definitions (**DSM-IV, ICD-10**)*
- *'PERSISTENT SYMPTOMS' FOLLOWING SPORT RELATED CONCUSSION SHOULD REFLECT FAILURE OF NORMAL CLINICAL RECOVERY—THAT IS, SYMPTOMS THAT PERSIST BEYOND EXPECTED TIME FRAMES (IE, >10–14 DAYS IN ADULTS AND >4 WEEKS IN CHILDREN).*
- Concussions can lead to serious somatic, affective, & cognitive sequelae
- Persist for months, years or permanently following injury
- Can occur after 1 but more common after repeated concussions

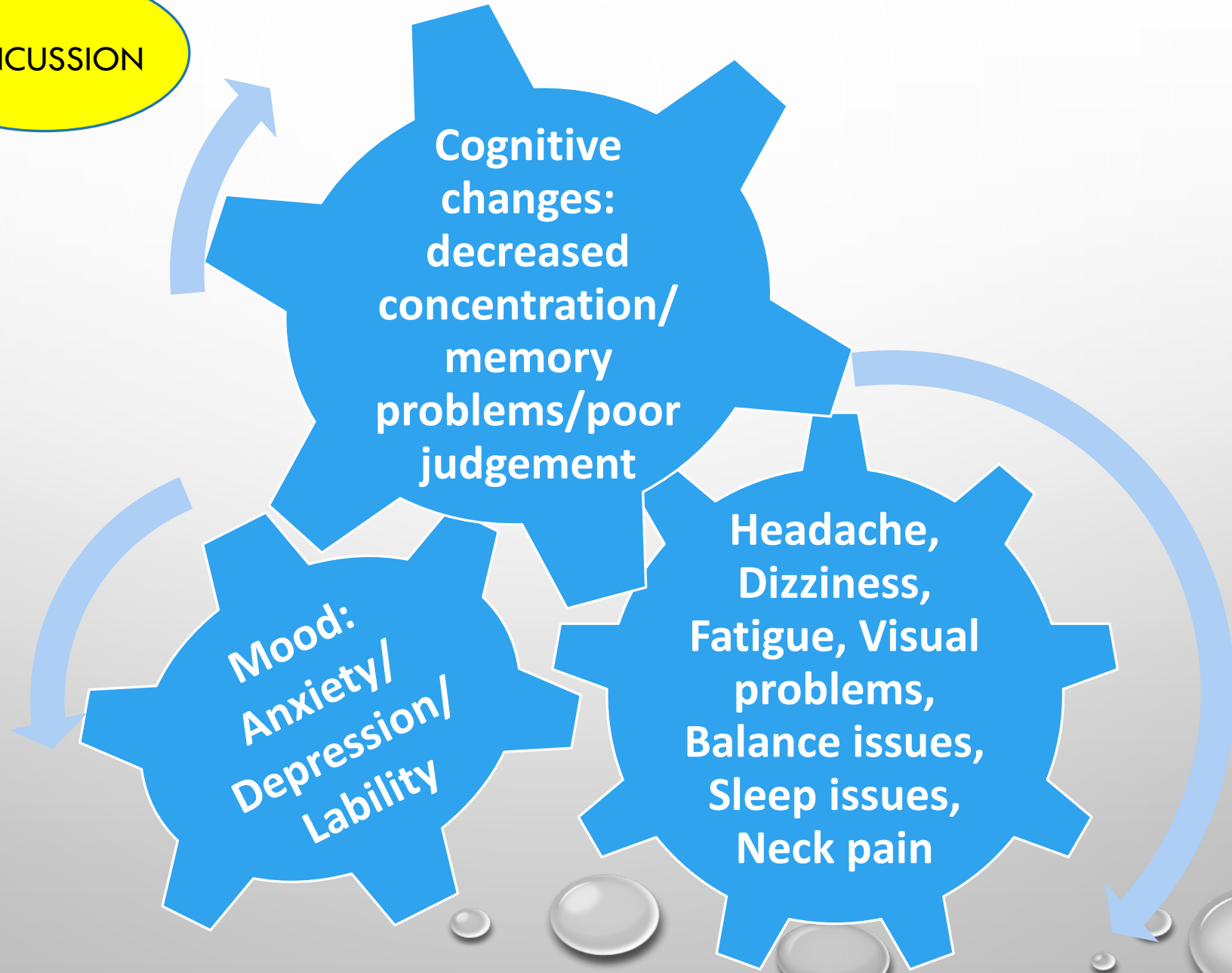


PROLONGED/PERSISTING SYMPTOMS OF CONCUSSION

- 10% (-58%) of people do not recover from concussion/mTBI within 3 months
- *Heterogeneous concept with different definitions*
- > 15% experience prolonged symptoms (150000)
- ~23,000 Ontarians/year endure prolonged symptoms



CONCUSSION



POST-TRAUMATIC HEADACHE (PTH)

- Headache within 7 days of the injury or after regaining consciousness
- Most common symptom after concussion: prevalence of 30-90%
 - MANY DON'T REPORT AS UNAWARE IT'S A PCS SYMPTOM
- Mean age 31.7-39.5 yrs
- F>M
- associated with a high degree of disability
- Acute vs chronic
 - Acute PTH:
 - Headache develops within 7 days after head trauma
 - One or other of the following:
 1. Headache resolves within 3 months after head trauma
 2. Headache persists < 3 months since head trauma
 - Chronic headache develops within 7 days & persists for > 3 months after head trauma

POST-TRAUMATIC HEADACHE

Does not refer to one specific headache:

- Tension 6.9-85.7% (33.6)
 - Migraine-like 1.9-40.7% (28.6)
 - Mixed type
 - 60% mild-moderate headache
 - Sensitivity to light 1 / 3
 - Sensitivity to sound 1 / 3
 - 71% aggravated by physical activities
-
- Compounded by medication overuse headache because excessive use of analgesics

POST-TRAUMATIC HEADACHE TREATMENT

- Based upon clinical experience and expert opinion
- No class 1 studies (highest evidence)
- BUT evidence shows that PTH is treatable

Step 1: lifestyle modification: avoid triggers, sleep hygiene, exercise etc

Step 2: acute headache medications Over-the-counter <15d/ Triptans (max 6-10): Many with medication overuse headache

Step 3: Non-pharmacological: massage, acupuncture, physical therapy, chiropractor, spine manipulation

- **Headache Prevention: Gabapentin, Topiramate, Amitriptyline, Beta-blocker, Candesartan**
- Nerve blocks; Botox; Avoid narcotics; Referral to headache specialist

WHIPLASH INJURY

- is a neck injury (strain or sprain) due to forceful, rapid back-and-forth movement of the neck
- symptoms include:
 - Pain, including neck pain, back pain and shoulder pain
 - Stiff neck that's difficult to turn
 - Muscle spasms
 - Headaches
 - Fatigue

TREATMENT OF WHIPLASH

- Physical therapy
- Massage therapy
- Some gentle stretches and exercises
- Steroid injections or lidocaine injections
- Chiropractic techniques
- Meds: non-steroidal anti-inflammatory, ibuprofen, short course muscle relaxants

SLEEP DISORDER

- Under-recognized by both physicians and patients
- 30-70% of mTBI patients experience sleep problems
- Sleep apnea (23-70% of mTBI pts)
- Hypersomnia/Excessive daytime sleepiness
- Insomnia
- Parasomnias; Periodic Limb Movements of Sleep; Narcolepsy; REM Behavior Disorder
- Presence & persistence of sleep disturbances - associated with more symptoms of concussion and greater psychological distress
- Poor sleep predictive of memory disturbance MILITARY MEDICINE, 177, 11:1293,2012
- Persistent sleep disturbances significantly predicted poorer functional/social outcome at the end of 1 year J Head trauma rehabil, 2015
- Resolution of sleep disturbances = greater improvements in other postconcussive symptoms

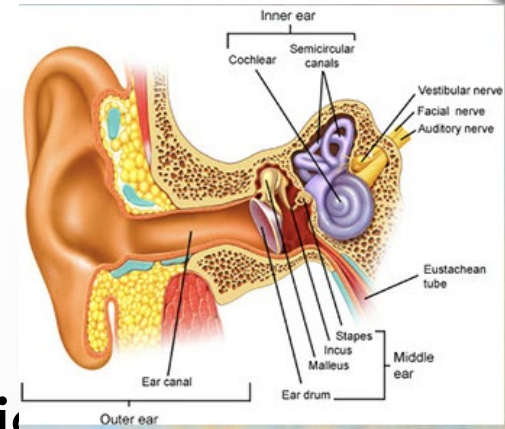
SLEEP DISORDER MANAGEMENT

- Screen for sleep disturbance
- Refer for sleep specialist consultation & sleep study
- Treating sleep/wake disturbances may positively affect other persistent symptoms (e.g., mood, anxiety, pain, fatigue, cognitive problems, headache)

SLEEP DISORDER MANAGEMENT

1. Sleep education: sleep hygiene, stimulus control, use of caffeine/tobacco/alcohol and other stimulants
2. Non-pharmacologic interventions such as cognitive behavioral therapy specific for insomnia, dietary modification, physical activity, relaxation and modification of the sleep environment
 - Cognitive-behavioural therapy for insomnia Arch Phys Med Rehabil 2007;88:1581-92.
3. Pharmacologic interventions as appropriate to aid in sleep initiation and sleep maintenance, e.g.: melatonin, magnesium
 - Eg. Trazodone, Mirtazapine, Amitriptyline
 - Orexin antagonists
 - Avoid benzodiazepines
4. CPAP for sleep apnea

VESTIBULAR (INNER EAR) & TREATMENT



- Common complaints: unsteadiness, double vision, ~~craziness~~, tinnitus
- Most common cause of post-traumatic peripheral vestibular dysfunction is benign positional vertigo
 - Treatment: epley maneuver
- Referral to ear nose throat/otolaryngologist
- Balance testing
 - Vestibular rehabilitation

VISION DISTURBANCE

Symptom	Possible Visual Deficit
Blurry vision	Accommodative dysfunction
Reading comprehension or efficiency problems	Version eye movement deficits or visual perceptual processing deficits
Diplopia	Vergence eye movement deficits
Eyestrain/headaches	Accommodative or vergence dysfunction
Sensitivity to light/glare	Abnormal light-dark adaptation, photosensitivity
Dizziness	Impaired vestibular-ocular reflex and motion perception
Spatial deficits	Impaired visual field or visual processing deficits

Computer intolerance

- Referral to optometrist & ophthalmologist
- Prisms
- Blue filter; shades, f.lux
- Evidence for vision therapy lacking

COGNITIVE SYMPTOMS

- Common symptoms: impairment of attention/concentration, speed of information processing, memory, executive
- Patients should get assessed
- Usually cognition improves within 6 months
- Unclear whether persistent cognitive symptoms result from:
 1. Effects of injury
 2. Related to other factors influencing cognition: pain, fatigue, medications, sleep, psychological factors and emotional disturbance (i.e., anxiety and depression)
- Cognitive symptoms usually don't worsen over time-investigate mood, sleep etc

COGNITIVE SYMPTOMS MANAGEMENT

- Referral for neuropsychological assessment
- Early education intervention associated with significant reduction in persistence & misattribution of symptoms
- Educate that all other post-concussion symptoms affect cognition i.e pseudo-dementia
- Occupational therapy for interventions to reintegrate into work, school, etc- early management strategies that include graduated reintegration
- Reassurance
- Understanding that symptoms should typically resolve within a 3-6 month time frame
- Cognitive rehabilitation strategies: compensatory strategies and remediation approaches help J head trauma rehabil, 2016
- If cognitive deficits recognized and persisting need accommodations so as to minimize anxiety

RATES OF NEUROPSYCHIATRIC SYMPTOMS FOLLOWING CONCUSSIONS

- Prevalence of psychiatric disorder in PCS extremely high: depression 14-61% & anxiety 18-60%
- More concussions = higher risk
- Can have >1 psychiatric disorder
- Post-traumatic stress disorder symptoms overlap
- Comorbid conditions i.e. substance abuse
- Worsening of pre-morbid psychiatric condition

DEPRESSION

- Most frequent psychiatric symptom in those with a history of concussion
 - 60% of patients will meet criteria for a diagnosis of depression at some point following their injury
 - 3X more likely if 3+ concussion: 10 vs 20% in 2552 retired football players;
 - Need to address PTSD if present
 - Need to address substance abuse
 - Coexists with anxiety
 - **Predictors: younger age, premorbid psychiatric illness, female, increased # of previous concussions**

DEPRESSION TREATMENT: PSYCHOTHERAPY & MEDICATIONS

- Cognitive behavioral therapy
- Mindfulness
- Goal management therapy
- Support groups
- Social networks/family involvement
- Antidepressants: SSRI (Sertraline -1st choice if anxiety also present; Citalopram-can also help with sleep); Duloxetine (if headache present)
 - All take 4-6 weeks before effect seen
 - Well-tolerated

ANXIETY DISORDER

- Prevalence of anxiety disorders in PCS ranges from 18 - 60%
 - Generalized anxiety disorder
 - Panic disorder
 - Agoraphobia
 - Post-traumatic stress disorder
 - Social anxiety disorder
 - Simple phobia
 - Obsessive compulsive disorder
- **Predictors: older age, female sex, premorbid psychiatric illness**

ANXIETY DISORDERS TREATMENT

- 1st line: Psychotherapies
 - CBT, mindfulness, exposure therapy
- Exercise
- Education
- Medications: antidepressants

SOMATIC SYMPTOM DISORDER

- Focus on physical symptoms i.e. Pain, weakness, dizziness = major distress or problems functioning
- May or may not be related to medical cause (i.e. Concussion)
- Ongoing high level anxiety about symptoms & health
- Ongoing thoughts that are out of proportion to seriousness of symptoms

TREATMENT- GAINING ACCEPTANCE OF FUNCTION

- Education on symptoms
- Validation of problems
- Acceptance of symptoms
- Regaining control
- Reintegration

AGGRESSION/IRRITABILITY & TREATMENT

- Posttraumatic irritability (+ annoyance, impatience): common during acute phase of concussion - resolve over time
- PCS: irritable behavior persists, triggered by trivial causes
- Irritability often co-occurs with aggressive behavior
- Sudden waves of explosive rage in short outbursts that they are not always able to control.
- Change in personality - attacks from minutes to hour
- Aggression and irritability have been widely documented in PCS & in patients discovered to have CTE upon death
- Treatment:
 - Psychotherapy
 - Anger management
 - Treatment of co-morbid psychiatric disorders

NEUROPSYCHIATRIC TREATMENT

- Exercise for neuropsychiatric symptoms
 - Data for efficacy in mood, sleep, energy
 - Daily-frequency is the most important factor
 - More evidence for aerobic
- Evidence in PCS

STANDARDS FOR CARE OF PERSISTENT SYMPTOMS

1. Assessment by a qualified practitioner
2. Direct access to a **physician with experience in concussion management**
3. Specified time points, according to an outlined pathway.
4. Information: About concussion, trajectory of recovery; Additional resources and information; Healthcare provider experience; Services offered; Types of referrals available
5. Follow-up (usually from his/her PCP) within 1-2 weeks.
6. Treating team: regulated, licensed; trained (direct patient care/contact ; knowledge of traumatic brain injury); experience in concussion management; practices up-to-date, evidence-based guidelines; practices within defined scope of practice; KNOWS when to refer.
7. Utilize an interdisciplinary team with =>3 different disciplines.
8. Clearly outline whether it is able to provide the full spectrum of care: initial- PCS.
9. Core functions/services: Diagnosis and medical treatment decisions; Physical treatment; Cognitive, functional, emotional support; Coordination of care function; Education
10. Delineate each other's roles and professional scopes of practice.
11. Follow practices and use treatments that are evidence- based or recommended by provincial, national or international guidance or consensus statements.
12. Follow referral indicators to refer patients to appropriate specialists, services and allied professionals.
13. If network of providers: respond to individual patient needs; qualified/experienced interdisciplinary providers including a physician; clear care pathway with comprehensive follow-up practices; not unduly inconvenience patients, use a model of collaborative, shared care (aware of the treatment, etc of the others)
14. Clear internal and external communication mechanisms
15. Track timely access to service, use suggested reporting and common data elements, and collect patient-level clinical data, demographic data and administrative data.

PERSISTENT SYMPTOMS OF CONCUSSION TREATMENT

- Personalized treatment/TREATMENT

- Get a good history - target

1. Anti-depressants for
2. Headache prevention - e.g. propranolol, nifedipine, candesartan etc
3. Neck physiotherapy
4. Zolpidem or zopiclone for difficulty getting to sleep
5. Vestibular rehabilitation therapy for balance
6. Light aerobic exercise
7. Modified return to work/school/play: OT

REASSES EFFICACY – PHARMACOLOGICAL & NON-PHARMACOLOGICAL TREATMENTS

APPROACH TO *POSSIBLE* CTE/NEURODEGENERATIVE PATIENT


1. Good history
 - a. Symptoms: cognitive, mood, motor
 - b. History of concussions, TBI: types of injuries
 - c. Comorbid conditions: vascular risk factors, OSA, thyroid, B12, other metabolic factors
 - d. Pain
 - e. Med profile: opioid use
 - f. Substance abuse
2. Cognitive assessment: cognitive (MOCA), longer assessment likely required in some
3. Physical exam – joints, parkinsonism
4. Imaging/blood to rule out usual culprits

TREATMENT OF *POSSIBLE* CTE/NEURODEGENERATIVE PATIENT

1. Reversible metabolic conditions ie B12, thyroid etc
2. Treat pain
3. Treat mood
4. Treat addiction
5. Treat OSA
6. Counsel about control of vascular risk factors
7. Advocate lifestyle modifications (exercise, diet, cognitive activity)
8. If possible AD (biomarkers) try acetylcholinesterase inhibitors, ?DMT
9. If possible PD (biomarkers) try Sinemet
10. FUTURE: possible tau imaging/biofluids for diagnosis of CTE

SUMMARY

- Concussion are the result of brain trauma
- Symptoms varied and include memory problems, headache, dizziness, sleep issues, psychiatric
- Persisting symptoms can occur
- Treat the persisting symptoms while we look for a cure

The background of the slide is a light gray gradient. It is decorated with numerous realistic water droplets of various sizes. Some droplets are clustered in the top left corner, while others are scattered across the bottom right. The droplets have highlights and shadows, giving them a three-dimensional appearance.

THANK YOU FOR YOUR ATTENTION

Carmela.Tartaglia@uhn.ca



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TAB 5

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

The Role of Occupational Therapy in the Treatment of Concussions (PPT)

Anoli Shah, Occupational Therapist, OT Reg. (Ont.)
Altum Health, University Health Network

May 30, 2024



The Role of Occupational Therapy in the Treatment of Concussions

Anoli Shah, OT Reg. (Ont.)

Occupational Therapist

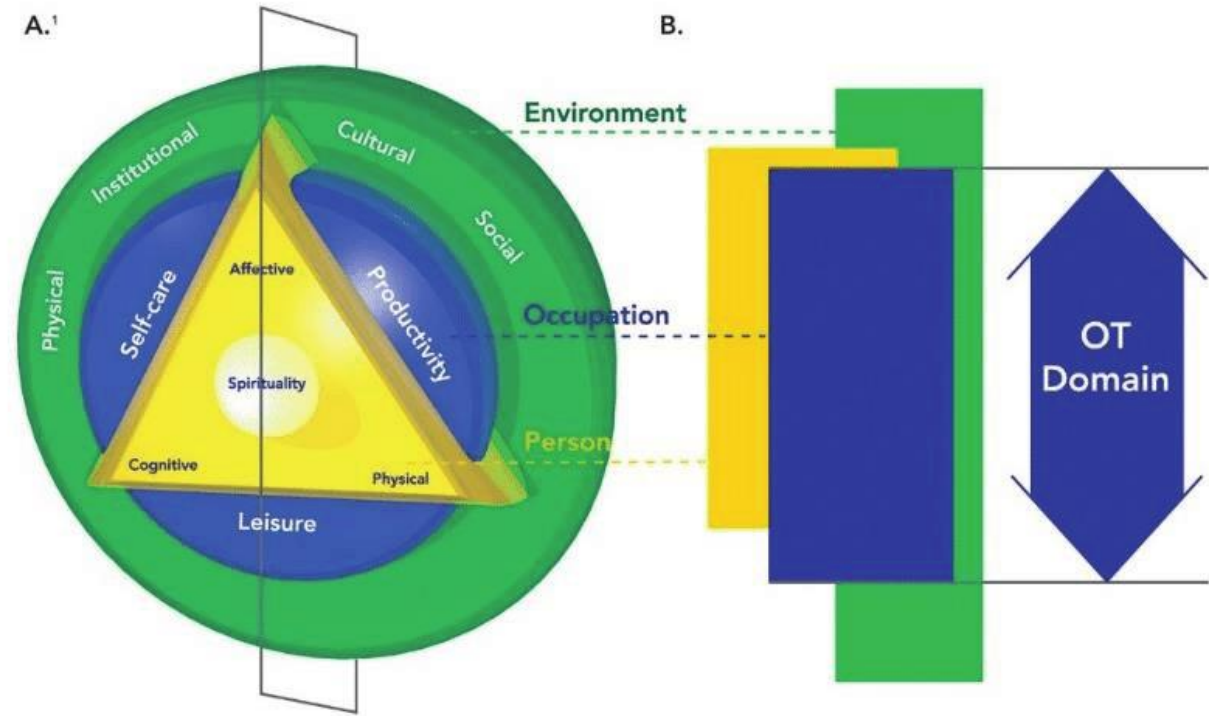
Altum Health, University Health Network

Occupational Therapy – A Key Stakeholder

- Prolonged rest after a concussion is no longer indicated, and individuals are recommended to gradually **return to pre-injury activities** as soon as tolerated.
- Interdisciplinary approach to concussion rehabilitation
- Occupational Therapists (OTs) promote health and well-being by enabling **participation in meaningful activities of daily life**

A Key Stakeholder

OTs use a holistic approach to consider the physical, cognitive, emotional, and spiritual components of the individual and their health, and are thus, uniquely situated to provide concussion treatment.



A.¹ Referred to as the CMOP in *Enabling Occupation* (1997a, 2002) and CMOP-E as of this edition
B. Trans-sectional view

Polatajko, H. J., Townsend, E. A., Craik, J. (2007). *Canadian Model of Occupational Performance and Engagement (CMOP-E)*. In E. A. Townsend and H. J. Polatajko, *Enabling Occupation II: Advancing an Occupational Therapy Vision of Health, Well-being, & Justice through Occupation*. p.23 Ottawa, ON: CAOT Publications ACE.

Common Symptoms in Clinical Practice

Physical	Cognitive	Emotional/Behavioural
Headaches	Attention/Concentration	Low mood and motivation
Dizziness and balance	Memory	Symptoms of anxiety
Light and noise sensitivity	Processing speed	Frustration
Sleep	Executive functioning	Anger and irritability
Fatigue	Mental fatigue	Withdrawal

OT Interventions Related to Concussion Management

- Education to clients, families, and communities on concussions
- Non-pharmacological pain management
- Sleep hygiene and Cognitive Behavioural Therapy for Insomnia (CBT-i)
- Fatigue management and relaxation
- Return to instrumental activities of daily living such as meal preparation, home maintenance, shopping, managing finances
- Return to driving
- Return to school, work, play, leisure, and other social activities
- Improving visual and vestibular skills

OT Interventions Related to Concussion Management

- Home and workplace assessments to adapt the physical environment to the individual
- Prescribing assistive devices
- Cognitive compensatory strategies
- Cognitive rehabilitation exercises to build tolerance to demanding activities
- Job demands analysis and functional abilities evaluations
- Psychosocial and mental health interventions such as Behavioural Activation, Psychotherapies, and lifestyle management to cope with stress, improve mood, and quality of life.
- Collaborate with interdisciplinary team to achieve clients' functional goals

Funding for OT

- Government funding
- **Some** extended health insurance plans
- Worker's compensation
- Auto Insurance plans
- Long term disability insurance
- Veteran Affairs
- Private practice

When do OTs become involved?

- OTs are often not part of the care team until clients have already developed persistent post-concussive symptoms
- Importance of strategy coaching, reassurance, and return to activities to prevent the prolonged rest which can lead to activity intolerance and avoidance
- Early intervention plans for concussion rehabilitation should consider Occupational Therapy as a key stakeholder
- At Altum Health, we prescribe a comprehensive program with an interdisciplinary team including Occupational Therapy to work towards client's recovery and goals

Who we are

OUR MISSION

**The Right
Care, Always.**

350 staff

and 300 medical consultants

Generate giveback to UHN

**Leaders in medical assessment and
multidisciplinary return to work
focused rehabilitation care.**



Best in the world:
Toronto General named
one of the world's five
best hospitals by
Newsweek.

Best in Canada:
Toronto Western named
one of Canada's top 15
hospitals.

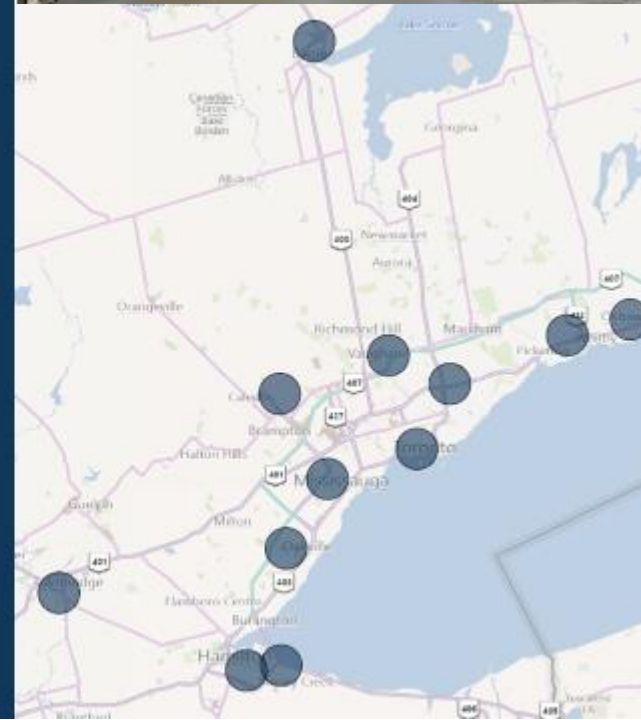
**Canada's top
research hospital:**
UHN tops RESEARCH
InfoSource list for eight
years in a row.

**Canada's hospital
patent leader:**
UHN tops list from
RESEARCH InfoSource.



12 Locations Across Ontario

Ajax
Barrie
Brampton
Cambridge
Hamilton
Mississauga
Oakville
Oshawa
Scarborough
Toronto
Vaughan



References

Polatajko, K. J., Townsend, E. A., Craik, J. (2007). *Canadian Model of Occupational Performance and Engagement (CMOP-E)*. In E. A., Townsend and H. J. Polatajko, *Enabling Occupation II: Advancing an Occupational Therapy Vision of Health, Well-being, & Justice through Occupation*. P.23 Ottawa, ON: CAOT Publications ACE

Thank you



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TAB 6A

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Viewpoint From the Bench and Bar on Damages

Recent TBI/Concussion Caselaw and Reference

Patrick Brown, C.S.
McLeish Orlando LLP

Jamie Davison
McLeish Orlando LLP

May 30, 2024



Recent TBI/Concussion Caselaw

Patrick Brown and Jamie Davison

Case Name	Nature of the TBI	General Damages Award	Adjusted to 2024 Dollars
<i>Foniciello v Bendall</i> 2016 ONSC 1119	<ul style="list-style-type: none"> Severe TBI with positive findings Diffuse axonal injury to the frontal and temporal lobe Surgery to insert a shunt into his head to relieve pressure on the brain In a semi-conscious state in hospital for five months 	\$275,000	\$343,600
<i>Kwok v Abecassis</i> 2017 ONSC 164	<ul style="list-style-type: none"> Moderate to severe TBI with positive findings Diffuse axonal injury Cerebral haematoma 	\$290,000	\$355,100
<i>Akeelah v Clow</i> 2018 ONSC 3410	<ul style="list-style-type: none"> Mild concussion No positive findings 	\$100,000	\$119,800
<i>Abdulhussein v Barbeau</i> 2019 ONSC 966	<ul style="list-style-type: none"> Mild TBI Post-Concussive Syndrome No positive findings 	\$65,000	\$76,700

<i>Rolley v MacDonell</i> 2020 ONCA 642	<ul style="list-style-type: none"> • Mild TBI • No positive findings 	\$142,500	\$164,700
<i>Casterton v MacIsaac</i> 2020 ONSC 190	<ul style="list-style-type: none"> • Concussion • No positive findings 	\$100,000	\$115,600
<i>Haji v Infinity Health Centre</i> 2021 ONSC 5077	<ul style="list-style-type: none"> • Concussion-like symptoms • No positive findings 	\$100,000	\$114,300
<i>Legree v Origlieri</i> 2021 ONSC 7650	<ul style="list-style-type: none"> • Concussion • Post-concussion syndrome • Normal CT scan and MRI • Positive SPECT 	\$100,000	\$114,300
<i>Higashi v Chiarot</i> 2021 ONSC 8201	<ul style="list-style-type: none"> • Mild TBI • Post-concussion syndrome • No positive findings 	\$225,000	\$257,200
<i>Braks v Dundee Canada (GP) Inc.</i> 2022 ONSC 3978	<ul style="list-style-type: none"> • Mild TBI/Concussion • No positive findings • Normal CT scan and MRI 	\$115,000	\$124,400

<i>Graul v Kansal</i> 2022 ONSC 1958	<ul style="list-style-type: none"> • Mild TBI • Post-concussion syndrome • No positive findings 	\$225,000	\$243,400
<i>Wabie v Wilson</i> 2022 ONSC 4296	<ul style="list-style-type: none"> • Mild TBI • Post-concussion syndrome • Normal MRI • Positive SPECT 	\$200,000	\$216,300
<i>Addy v Goulet et al</i> 2023 ONSC 1265	<ul style="list-style-type: none"> • Mild TBI • No positive findings 	\$125,000	\$128,500
<i>Sanson v Paterson</i> 2023 ONCA 798	<ul style="list-style-type: none"> • Mild TBI • Post-concussion syndrome • No positive findings 	\$250,000	\$257,000
<i>Taylor v Zents</i> 2024 ONSC 166	<ul style="list-style-type: none"> • Mild TBI • Post-concussion syndrome • No positive findings 	\$250,000	\$250,000

Concussion Caselaw Reference

Taylor v. Zents, 2024 ONSC 166 (CanLII)

Date: 2024-01-08

File number: CV-16-95-00

CanLii link: <https://canlii.ca/t/k26pm>



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TAB 6B

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Viewpoint From the Bench and Bar on Damages

Concussions and Causation

James Tomlinson, Retired Partner

McCague Borlack LLP

Maxwell Gill, Articling Student

McCague Borlack LLP

May 30, 2024



Concussions and Causation

Jim Tomlinson and Maxwell Gill

McCague Borlack LLP

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Rolley v. MacDonell, 2018 ONSC 6517.....	1
Akeelah v. Clow, 2018 ONSC 3410	3
Caron v. Omers Realty Corporation et al., 2019 ONSC 1374.....	5
Higashi v. Chiarot, 2021 ONSC 8201.....	6
Alison Braks v. Dundee Canada (GP) Inc, 2022 ONSC 3978	7
Fraser v. Persaud, 2023 ONSC 1449	9

Introduction

Concussions pose unique challenges in both their medical and legal contexts due to their complex and often subtle nature. Determining causation in a concussion case is crucial, as it directly impacts the assessment of damages. Trial Judges are at the nexus of this delicate balance, tasked with the responsibility of evaluating the often conflicting expert testimony and medical evidence provided by the parties. This article aims to summarize some recent cases discussing concussions and causation while highlighting the individual judicial approaches to this complex issue.

Rolley v. MacDonell, 2018 ONSC 6517 ([Link](#))

Trial Judge: Madam Justice S. Corthorn.

Date of Loss: January 10, 2012.

Date of Trial: November 20, 2017, to March 8, 2018.

Non-Pecuniary General Damages: Assessed at \$190,000 (\$228,457.49 in 2024); reduced to \$142,500 (\$171,343.12 in 2024).

Income Loss: Not claimed.

Future Care Costs: \$1,720,390, (\$2,068,610.40 in 2024).

Summary of Facts: The Plaintiff brought this action after he was struck by a motor vehicle while crossing a street in January 2012. However, prior to the January 2012 accident, the Plaintiff had received 13 different diagnoses, including fibromyalgia, sarcoidosis, and hypothyroidism and was on long-term disability and CPP disability benefits on the date of loss. His pre-existing condition was described by the Trial Judge as “one of the most complex medical histories ever seen by the litigation experts who testified at trial.” The Defendant was found wholly liable for the collision.

The Plaintiff contended that he suffered a mTBI and was in a materially different condition following the collision. While he had been in a disabling condition before the 2012 collision, he was still capable of “contribut[ing] to family life and the physical household.” The Plaintiff claimed damages based on his diminished capabilities following the accident. The Plaintiff claimed in excess of \$5,215,000, of which the future care cost claim was \$4,160,000. The Defendant’s position on damages was that the Plaintiff’s post-accident condition did not differ substantially from his pre-accident condition. Any injuries the Plaintiff suffered had resolved.

Summary of Causation Analysis: Justice Corthorn relied on the decision *Clements v Clements*, noting that the Plaintiff must demonstrate that, but for the negligence of the Defendant, the Plaintiff would not have suffered the losses alleged. The Trial Judge then considered each of the injuries and complaints alleged by the Plaintiff in turn, to determine if the Plaintiff did suffer from them. The Trial Judge then considered if they were the result of the collision, materially contributed to by the collision, or pre-existing. The Defendant relied on the Plaintiff pre-loss application for CPP benefits. The Plaintiff suggested that these documents only provided a snapshot of each point in time, and they must be considered in their context. The Trial Judge considered the CPP documentation, medical records, and reports prior to the date of loss, and noted that the Plaintiff had developed a lifestyle that accommodated his condition while maintaining some stability. However, after the collision, the Plaintiff was unable to maintain that same level of function, causing a recurrence of the Plaintiff’s major depression that was in remission at the date of loss.

On that basis, the Trial Judge determined that the majority of injuries were caused, or materially contributed to, by the 2012 collision. On the basis of these injuries, the Plaintiff’s non-pecuniary

general damages were assessed at \$190,000.00 and the future care costs to be \$2,281,000. The Plaintiff did not assert a future income loss claim, as he had not worked since 2007.

Justice Corthorn then reviewed whether the thin skull rule or crumbling skull principle were applicable. Due to the Plaintiff's limited capabilities and extensive pre-existing conditions, Justice Corthorn found that the crumbling skull principle applied. As a result, the Plaintiff's global damages award was subject to a 25% reduction.

Akeelah v. Clow, 2018 ONSC 3410 ([Link](#))

Trial Judge: Justice R. J. Nightingale.

Date of Loss: November 18, 2013.

Date of Trial: October 2017 to January 2018.

Non-Pecuniary General Damages: \$100,000 (\$120,240.78 in 2024).

Income Loss: \$6,749 (\$8,115.05 in 2024).

Future Care Costs: \$43,965 (\$52,863.86 in 2024).

Summary of Facts: The Plaintiff brought this action after a motor vehicle accident in November 2013. Following this collision, the Plaintiff was involved in a second motor vehicle accident in February 2014, for which he was at fault. He did not bring an action as a result of the second motor vehicle accident. He then suffered a stroke in October 2015.

In the 2013 accident, the Plaintiff sustained a concussion, headaches, dizziness, neck pain, and low back pain. There was some dispute as to whether the 2014 accident exacerbated the Plaintiff's injuries and, if so, for how long. The Plaintiff's stroke was most debilitating, causing the Plaintiff to suffer a substantial decline in his capabilities. At the start of the trial, the Defendant conceded that the Plaintiff's medical condition, at that time, resulted in an inability for the Plaintiff to work and would likely require a significant amount of therapy, care and assistance. The Defendant admitted liability for the November 2013 motor vehicle accident.

The Plaintiff took the position that the 2014 motor vehicle accident was minor. The Plaintiff contended that the 2015 stroke was caused by the 2013 motor vehicle accident. The Defendant, by contrast, argued that the stroke was unrelated to the 2013 motor vehicle accident and did not

meet the but-for test. They argued, therefore, that the Plaintiff was only entitled to damages for the injuries he received following the first accident, which were minor.

Summary of Causation Analysis: In determining causation, the Trial Judge noted that the Plaintiff was required to prove, but for the Defendant's negligence, the Plaintiff's injuries *from the stroke* would not have occurred. He considered the evidence of the Plaintiff's expert, who suggested that the 2013 accident was the cause of the stroke. However, Justice Nightingale preferred the evidence of the Defence expert, who testified that the Plaintiff suffered a stroke of unknown origin and that there was "no clear causal relationship between the stroke and the motor vehicle accident."

In awarding damages, the Trial Judge sorted through the evidence provided in support of the cause of each injury. He found that

the Plaintiff's stroke that he suffered in October 2015 is quite distinct and divisible from the injuries he sustained as a result of the November 2013 car accident. It represents an intervening event that needs to be considered when assessing the damages the Plaintiff is entitled to in this action when trying to place the Plaintiff in the position he would have been absent the Defendant's negligence.

The Trial Judge concluded that the Plaintiff sustained neck and back pain, as well as mild to moderate chronic pain that fluctuated in intensity before the stroke. After the stroke, the Plaintiff was fully disabled. The Trial Judge awarded \$100,000 in non-pecuniary general damages.

The Trial Judge concluded that the Plaintiff suffered a loss of competitive advantage as a result of the 2013 accident. He quantified this loss in the amount of \$200,000.00. However, since the collision did not cause the Plaintiff's stroke, it was an intervening act. The stroke would have occurred with or without the 2013 collision. The stroke entirely prevented him from returning to work. This fully eliminated his loss of competitive advantage claim. However, the past loss of income claim between the collision and the Plaintiff's stroke was compensable. The parties had already agreed on a quantification for this loss, which the Trial Judge approved. The Plaintiff advanced a future care cost claim in excess of \$8 million, but Justice Nightingale awarded the sum of \$43,965 on the basis that the future care costs claimed arose from the stroke and not from the 2013 collision.

Caron v. Omers Realty Corporation et al., 2019 ONSC 1374 ([Link](#))

Trial Judge: Justice P. E. Roger.

Date of Loss: January 18, 2008.

Date of Trial: November 26, 2018, to January 15, 2019.

Non-Pecuniary General Damages: \$0.00 BUT \$80,000 if liable (\$94,416.54 in 2024).

Income Loss: \$0.00 BUT \$290,562 if liable (\$342,923.25 in 2024).

Future Care Costs: Not claimed.

Summary of Facts: The Plaintiff brought this action after she fell at work in January 2008. The Plaintiff's fall resulted in a concussion which was complicated by the Plaintiff's long pre-existing history of anxiety disorder with episodes of panic attacks and depression. The Plaintiff worked for some time following the accident, before she completely stopped working in 2011. Liability was contested.

Justice Roger found the Defendants had met their positive duty of care and therefore dismissed the action. Despite dismissing the action, the Trial Judge stated if he had found the Defendants liable, he would have made certain findings concerning both causation and damages. These are discussed below.

The Plaintiff's position was that her present injuries were the result of her concussion. The Defendant's position was that the Plaintiff's current injuries were the result of her pre-existing psychiatric condition and that her concussion-related injuries had resolved. On that basis, the Defendants asserted that the Plaintiff was not entitled to damages.

Summary of Causation Analysis: Justice Roger noted that the central question was whether but for the fall the Plaintiff would not have suffered from the deficits she presented with at the time of the trial. This was described as "a complicated factual question given the facts and the medical evidence presented."

In this case, the Court found that the Plaintiff's pre-existing anxiety disorder was severe and was interfering with her work prior to the collision. Justice Roger, after assessing all of the evidence, found that the Plaintiff had not proved that her complaints resulted from the concussion she

sustained as a result of her fall. The Trial Judge also found that the Plaintiff had not proven that her inability to return to work after 2011 was caused by her 2008 fall.

Justice Roger did note that the Plaintiff suffered a concussion which resolved within two years. During these two years, however, her ability to work was limited. As a result, Justice Roger stated, if he had found differently on liability, he would have awarded the Plaintiff past loss of income for the two years following her fall.

The Trial Judge also noted that, had he found differently on causation and thus found the Plaintiff's future loss of income to have been caused by her concussion, he would have applied a specific contingency of at least 20% on the Plaintiff's loss of future income claim. The Trial Judge observed that the Plaintiff was likely to retire earlier than 65 years old due to, in part, her pre-existing psychiatric condition. As the Plaintiff's accounting expert had not applied any specific contingencies, the Trial Judge would have done so.

Higashi v. Chiarot, 2021 ONSC 8201 ([Link](#))

Trial Judge: Justice M. Smith

Date of Loss: September 13, 2012

Date of Trial: March 15 to June 25, 2021.

Non-Pecuniary General Damages: \$225,000 (\$257,557.31 in 2024).

Income Loss: \$328,402.20 (\$375,921.72 in 2024).

Future Care Costs: \$489,300 (\$560,101.29 in 2024).

Summary of Facts: The Plaintiff brought this action following a motor vehicle accident in September 2012. The Plaintiff was a "hard worker" prior to the accident, but suffered from migraines, for which she took medication, as well as an inability to get pregnant and irregular periods. Following the accident, the Plaintiff was diagnosed with a mild traumatic brain injury, post-concussion syndrome, PTSD, adjustment disorder, and chronic pain. The Plaintiff appeared to improve for a few years following the collision, but then drastically deteriorated around 2016 to 2017. The Defendants were found liable for the accident.

The Plaintiff's position was that the Plaintiff never recovered from the accident. She alleged that she remained physically, psychologically, and cognitively impaired. The Defendants' position

was that the Plaintiff's catastrophic regression several years after the accident was not connected to the injuries the Plaintiff sustained in the accident. The Defendants also asserted that the Plaintiff's injuries were exaggerated, and her regression was the result of her melodramatic nature, connected to issues with her Accident Benefits insurer, and not connected to the accident.

Summary of Causation Analysis: the Trial Judge noted that she did not find the Plaintiff's pre-accident physical health issues were "of any significance." This was based on the fact that these ailments "did not impact [the Plaintiff's] ability to function and perform daily." Justice Smith disagreed with the Defendants' position that the Plaintiff's regression was not in keeping with the typical recovery of someone who sustained a mild TBI. The Plaintiff's testimony regarding her injuries correlated with contemporary medical records lay witness testimony, and the testimony of her participant experts. As a result, the Trial Judge found the Plaintiff's medical condition at trial was caused by the 2012 collision.

Justice Smith awarded non-pecuniary general damages in the amount of \$225,000. He also awarded \$47,359.20 in past loss of income, \$281,043 in future income loss, and \$489,300 in future care costs. Due to his conclusion on causation, the Trial Judge did not apply any across the board percentage reduction to these amounts.

Alison Braks v. Dundee Canada (GP) Inc, 2022 ONSC 3978 ([Link](#))

Trial Judge: Justice A. P. Ramsay.

Date of Loss: May 25, 2012.

Date of Trial: September 28 to November 1, 2021.

Non-Pecuniary General Damages: \$115,000.00 (\$123,418.40 in 2024).

Income Loss: \$599,675 (\$643,573.30 in 2024).

Future Care Costs: Not claimed.

Summary of Facts: This action arose as a result of a slip and fall at the office building where the plaintiff worked. In May of 2012, the Plaintiff slipped and fell after exiting from her office elevator. The parties disputed whether she hit her head when she fell. The Plaintiff alleged that she suffered from a minor TBI, severe headaches, blurred vision, neck pain and nausea as a result of the slip and fall.

The Plaintiff had a serious pre-accident medical history, including injuries from two motor vehicle accidents when she was a teenager, an incident when her head came in contact with a horse's head and a snowmobiling accident. After the Plaintiff's 2012 fall, she suffered from a mild TBI, severe headaches, migraines, blurred vision, neck pain, and nausea. Liability was disputed. The Trial Judge found that the Defendants fell below the applicable standard of care.

The Plaintiff took the position that she hit her head when she fell to the ground, resulting in her injuries. The defence took the position that the Plaintiff did not hit her head in the slip and fall accident, and if she did suffer any injuries, they had long since resolved. If the Plaintiff had any ongoing complaints, they were not related to the slip and fall.

Summary of Causation Analysis: The Trial Judge rejected the Defendants' claim that the Plaintiff's injuries were the result of her pre-date of loss accidents. A participant expert with a focus on sports medicine, whom the Plaintiff was referred to by her family doctor, diagnosed the Plaintiff with post-concussive symptoms. The sports medicine doctor opined that it was not necessary for the Plaintiff's head to have made contact during her fall in order for her to have sustained these injuries. The Plaintiff's neurological expert witness agreed that a person did not have to hit their head to sustain a concussion, a shaking of their head would suffice. Justice Ramsay stated that on a balance of probabilities, the prior accidents did not have anything to do with her current symptoms. Even the defence neurological expert stated that the Plaintiff's pre-accident health was not a factor contributing to her current symptoms. Accordingly, there was no need for the Trial Judge to apply a reduction to the damages for causation related reasons.

Justice Ramsay then considered the Plaintiff's individual injuries to determine which were the result of her fall. She noted that the majority of the Plaintiff's injuries were either caused or contributed to by the fall. Considering the injuries caused by her fall, the Trial Judge awarded the Plaintiff \$115,000 in non-pecuniary general damages.

Justice Ramsay awarded \$173,400 for past income loss and \$501,500 for loss of earning capacity. In doing so, the Trial Judge rejected the defence contention that the Plaintiff's loss of earning capacity was impacted by her pre-date of loss medical condition. The Trial Judge did not apply any specific contingencies. However, Justice Ramsay did apply a 15% general contingency to reflect the lack of job security at Plaintiff's place of employment at the time of the accident.

Fraser v. Persaud, 2023 ONSC 1449 ([Link](#))

Trial Judge: Justice L. Shaw.

Date of Loss: January 15, 2015.

Date of Trial: January 13 to May 2, 2022.

Non-Pecuniary General Damages: \$175,000 (\$180,070.83 in 2024).

Income Loss: \$491,972 (\$506,227.47 in 2024).

Future Care Costs: \$342,278 (minus the cost of a CPAP machine), (\$352,195.91 in 2024).

Summary of Facts: The Plaintiff commenced this action after a motor vehicle accident in January 2015. The Plaintiff was also involved in a September 2012 accident for which she was at fault. No action was commenced by her as a result of that accident. Following the September 2012 accident, the Plaintiff suffered from sleep issues, a bruised chest, and pain in her neck, arm, back, and knee. Following the January 2015 accident, the Plaintiff suffered from a mild head injury, headaches, and pain in her shoulders and back. The Plaintiff also sustained a major depressive episode and PTSD in 2004-05. At the time of the trial, the Plaintiff suffered from a mild head injury, major depressive disorder, post-traumatic stress disorder, somatic symptom disorder, chronic pain, and fibromyalgia. Liability for the January 2015 accident was conceded during trial.

The Plaintiff's position on damages was that she was 70% to 80% recovered from the 2012 accident when the 2015 accident occurred. At trial, the Plaintiff asserted that she incurred permanent physical, psychological, and cognitive impairments which prevented her from living on her own or working since 2018. The Defendant's position on damages was that the Plaintiff suffered minor injuries in the 2015 accident from which the Plaintiff recovered. At trial, the Defendant asserted that the Plaintiff's physical and psychological impairments were unrelated to the 2015 accident. The Defendant alleged that these injuries were the result of the Plaintiff's pre-existing health issues and her injuries from the 2012 accident.

Summary of Causation Analysis: Justice Shaw first evaluated the Plaintiff's damages at each of the relevant times. The Trial Judge noted that the uncontroverted evidence was that, prior to the 2012 accident, the Plaintiff was fully functioning and was not being treated for any significant complaints. The Trial Judge then found that the Plaintiff had not fully recovered from

the 2012 accident at the time the 2015 accident occurred. She noted that the Plaintiff's recovery appeared to be between 75% and 90%. Justice Shaw found that she had recovered prior to the 2015 accident, as she had resumed her work and activities with her family, friends, and church.

Justice Shaw then considered the issue of causation. She applied the but-for test in *Clements v. Clements*. The Trial Judge specifically noted that the Defendant's negligence needs not be the sole cause of the Plaintiff's injury, only a cause. Justice Shaw determined that, but for the 2015 accident, the Plaintiff would not have suffered the injuries she was experiencing at the time of trial.

Once causation was established, the Trial Judge went on to assess the extent of the damages. The crumbling skull principle applies where the Defendant's act causes the premature or accelerated degeneration of the Plaintiff's pre-existing condition. The Ontario Court of Appeal in *M.B. v. 2014052 Ontario Ltd. (Deluxe Windows of Canada)*, 2012 ONCA 135, described the crumbling skull principle as:

If there is a "measurable risk" that the condition suffered by the plaintiff would have affected the plaintiff in the future regardless of the defendant's tortious act, the defendant will be liable for the effect of his act on the degenerative process. However, the defendant need not compensate the plaintiff for any debilitating effects of the pre-existing condition that would have occurred in any event.

The Trial Judge stated that, she did "not find Ms. Fraser's condition to have been deteriorating prior to the 2015 accident. There is no evidence that [she] accept[ed] in th[e] trial which suggests that [the Plaintiff's] condition would have deteriorated had the 2015 accident not occurred."

Once Justice Shaw made this determination, she awarded damages in line with the Plaintiff's limitations and impairments. Noting the Plaintiff had a full life prior to the accident, and a limited and confined life following the accident, the Trial Judge awarded \$175,000.00 for non-pecuniary general damages. Justice Shaw was satisfied that the Plaintiff would not return to work. The Defendants did not take issue with the Plaintiff's claimed past income loss, 70% of which equalled \$116,382. The Trial Judge found that the Plaintiff would have worked full-time until she was 65 years old, and then she would have worked part-time for the following five years to supplement her CPP and Old Age Security benefits. The five years of part-time work took into account the Plaintiff's pre-existing non-accident related medical issues. Future income loss was found to be \$375,590. With respect to future care costs, the Trial Judge noted the

Plaintiff was only entitled to the cost of what was medically necessary based on the injuries resulting from the 2015 accident. As a result, Justice Shaw awarded the Plaintiff \$342,278 in future care costs, minus the cost of a CPAP machine and mask, as sleep apnea was not caused by the Plaintiff's 2015 accident.



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TAB 7A

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Pre-Injury and Post-Injury Factors and Their Interplay in People with Concussion

Pre-Injury and Post-Injury Factors and Their Interplay in People with Concussion (PPT)

Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist
Canadian Concussion Centre, Toronto Western Hospital

May 30, 2024



PRE-INJURY AND POST-INJURY FACTORS AND THEIR INTERPLAY IN PEOPLE WITH CONCUSSION

Carmela Tartaglia, MD
Memory Clinic, Krembil Brain Institute
Tanz Centre for Research in
Neurodegenerative Diseases

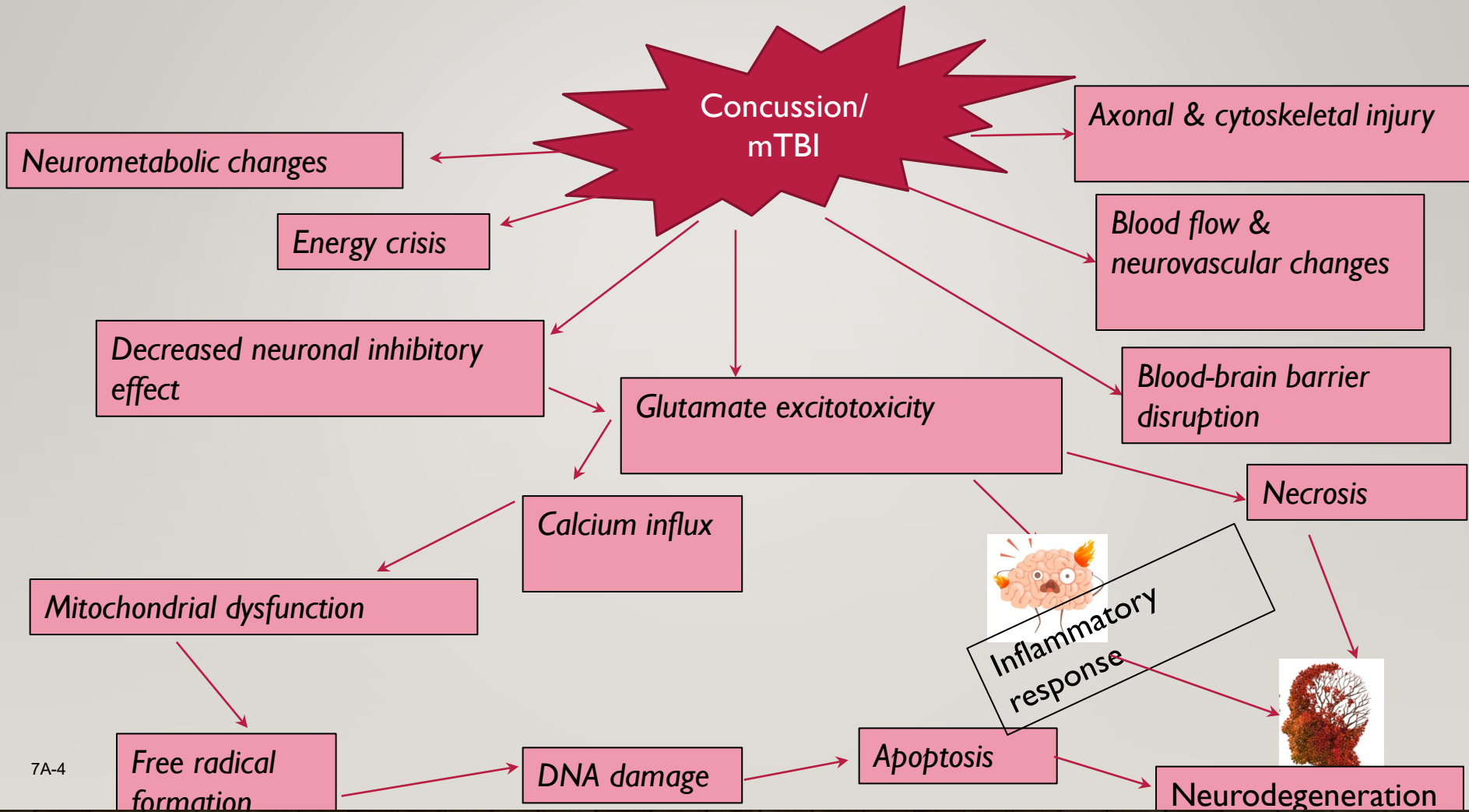
DISCLOSURES

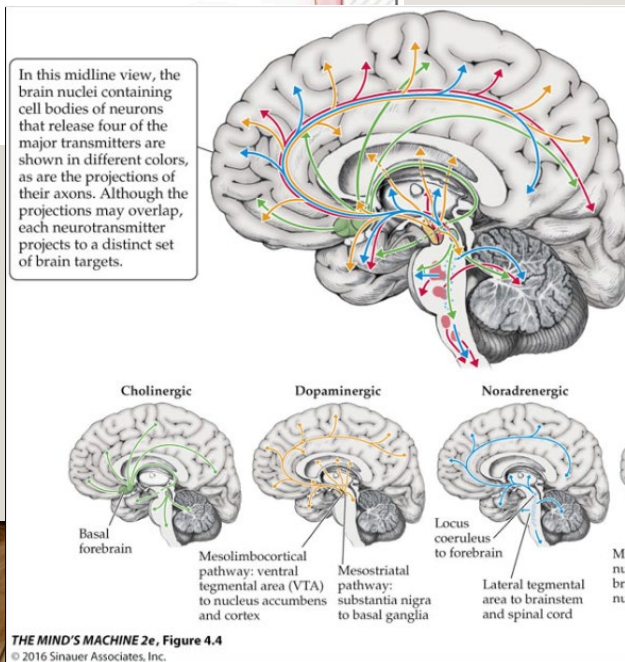
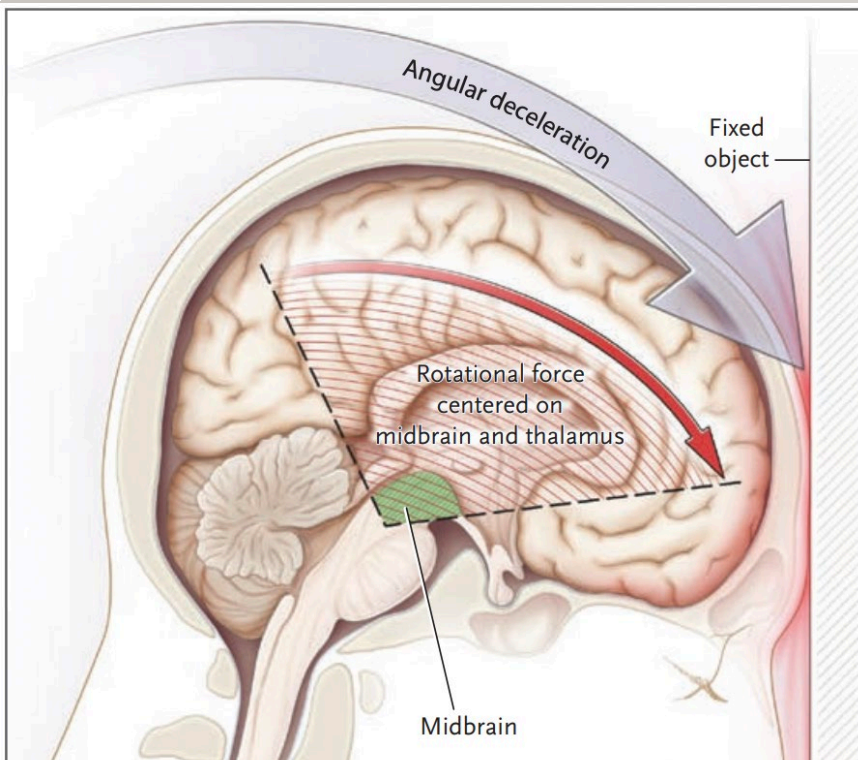
- CIHR, NIH, Weston Brain Foundation, Tanenbaum Institute of Science In Sport, WSIB
- Clinical Trials: Biogen, Roche, Anavex, UCB, NOVO NORDISK, Janssen, Passage BIO, GSK
- Consultation: Eisai, Lilly

OBJECTIVES

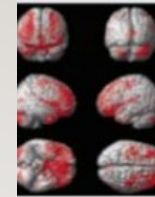
- Overview of pre-injury & post-injury factors in concussion and its recovery

PATHOPHYSIOLOGY OF CONCUSSION/MTBI

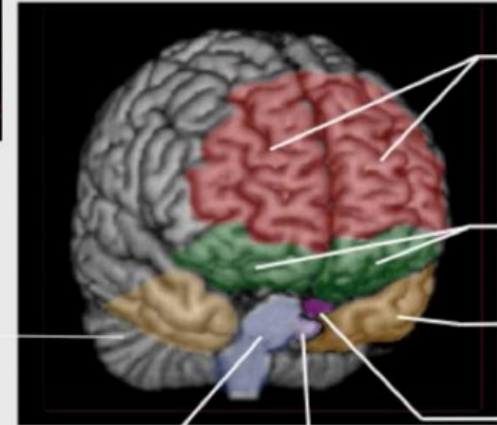




Brain regions vulnerable to TBI and relationship to neurobehavioral sequelae



Cerebellum
(coordination, working memory, mood regulation)



Dorsolateral prefrontal cortex
(executive function, working memory, complex attention, judgment, insight, planning)

Orbitofrontal cortex
(emotional and social behavior)

Temporal polar region
(memory retrieval, social behavior)

Amygdala
(emotional learning, memory, fear conditioning)

Ventral brain stem
(arousal, ascending modulatory neurotransmitter systems)

Entorhinal-hippocampal complex
(declarative memory, sensory gating, attention)

CONCUSSION SYMPTOMS VARY AMONG PATIENTS

COGNITIVE SYMPTOMS

Difficulty thinking-confusion

Slowed processing

Difficulty remembering

Unable to concentrate

PERSONALITY/MOOD

Irritable

Depression

Nervous/anxious

More emotional

Sleeping more/less than usual

Insomnia

PHYSICAL

Headache

Tinnitus

Fuzzy or blurry vision

Dizziness/Vertigo

Sensitivity to light or noise

Balance problems

Fatigue

Nausea

7A-6



PERSISTING/PROLONGED SYMPTOMS OF CONCUSSION

- “...Failure of normal clinical recovery—that is, symptoms that persist beyond expected time frames (ie, >10–14 days in adults and >4 weeks in children).”
- Some guidelines suggest 1 or 3 months
- Doesn't presume an underlying cause
- Focus on symptoms, regardless of cause

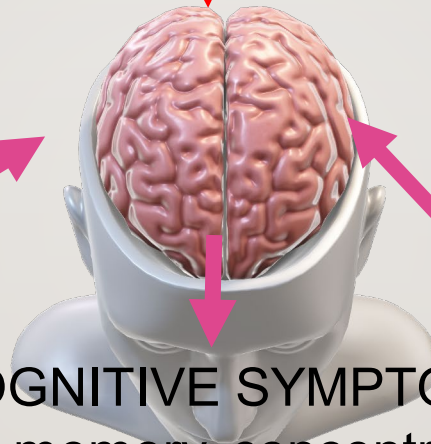
PROLONGED/PERSISTING SYMPTOMS OF CONCUSSION

- 10% (-58%) of people do not recover from mTBI within 3 months
- *Heterogeneous concept with different definitions*
- > 15% experience prolonged symptoms (150000)
- ~23,000 Ontarians/year endure prolonged symptoms



VICIOUS CYCLE OF CONCUSSION

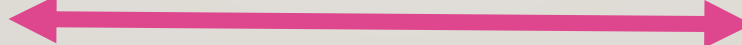
INJURY



COGNITIVE SYMPTOMS
i.e. memory, concentration etc

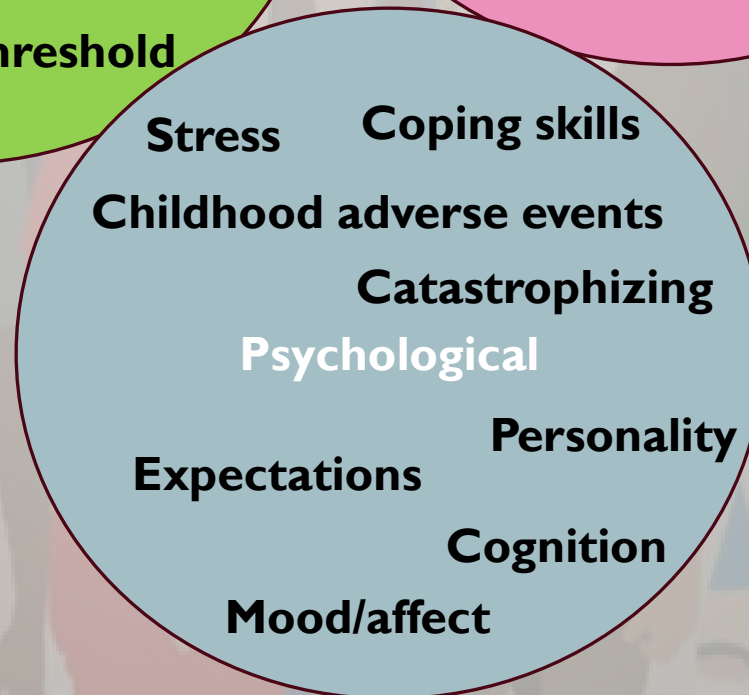
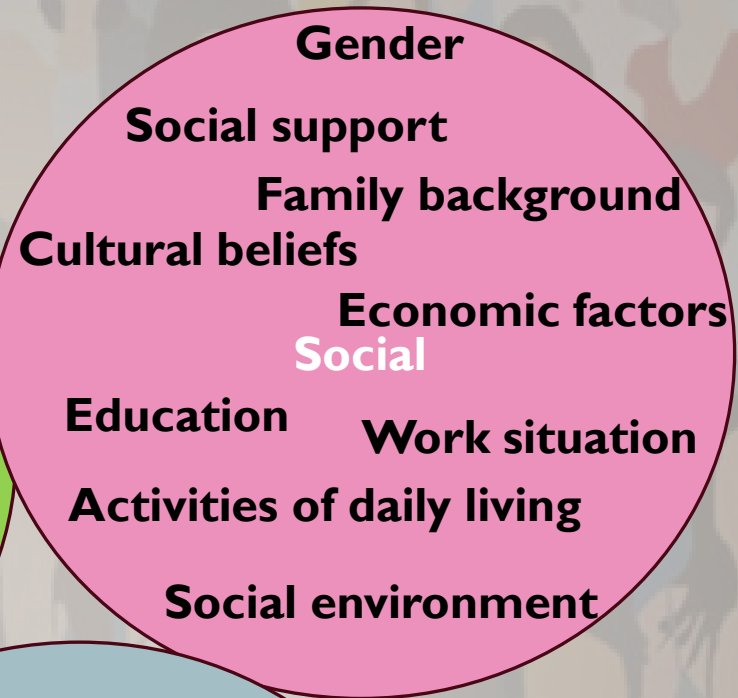
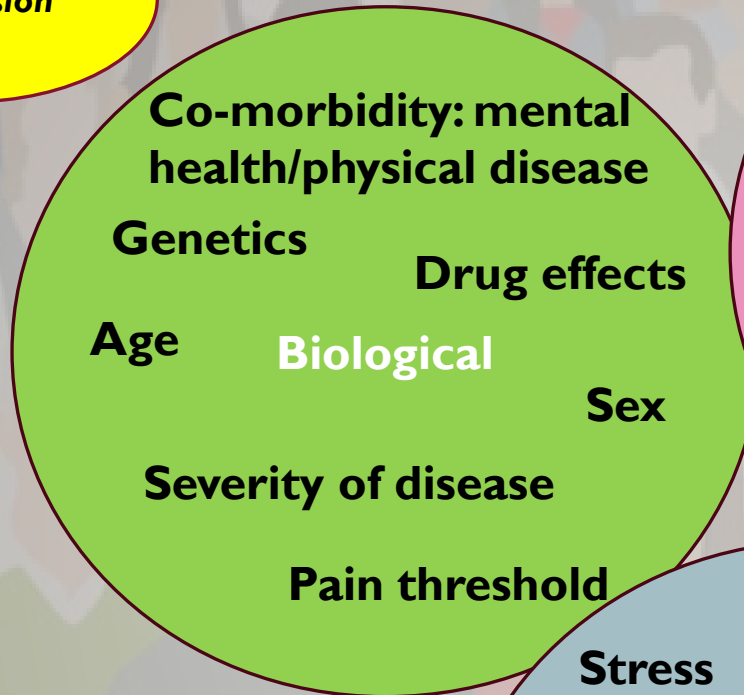
SOMATIC
SYMPTOMS
(i.e. sleep, pain,
headache, dizziness)

MOOD
(i.e. depression,
anxiety)



BIOPSYCHOSOCIAL MODEL OF HEALTH

Concussion

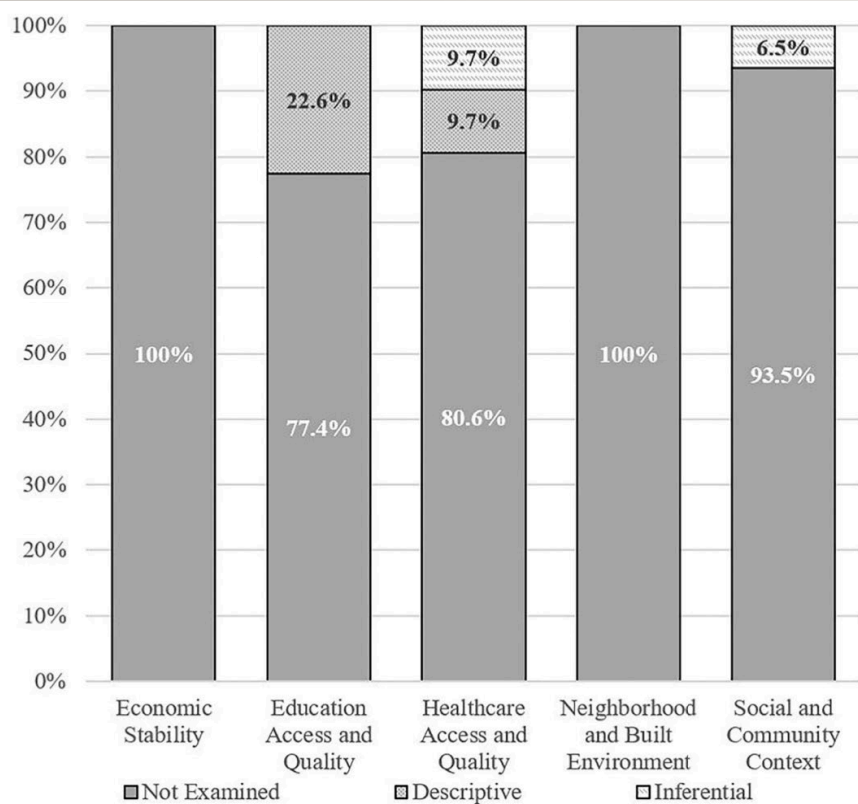


SOCIAL DETERMINANTS OF HEALTH & OUTCOME

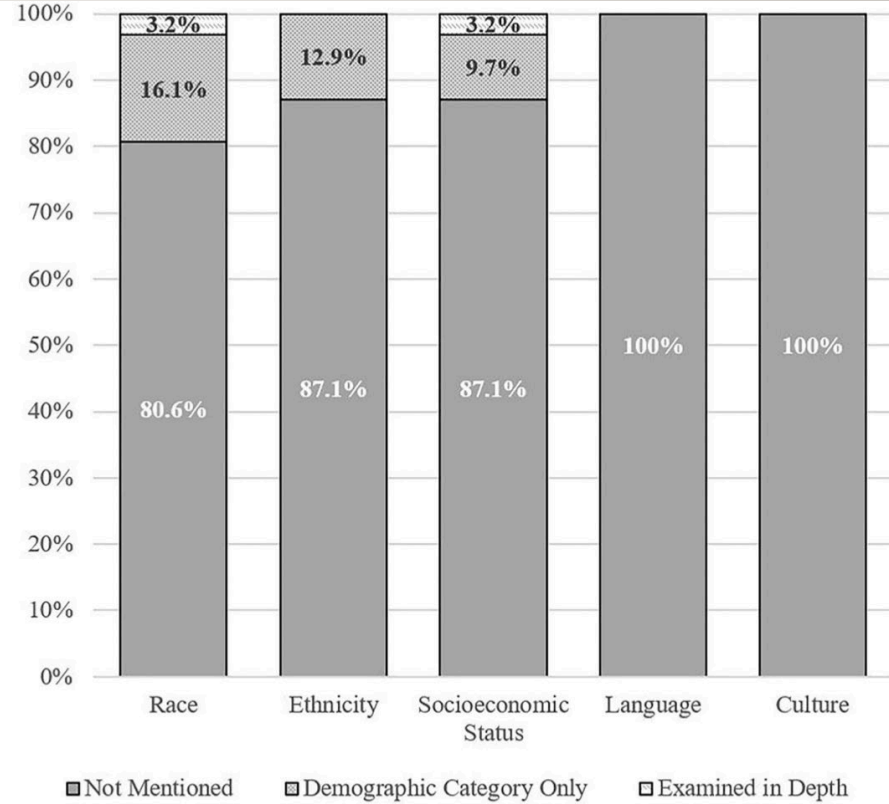
Domains	Dimensions ^a
Economic stability	Health insurance, zip code, income, financial resource, employment, basic needs, SES, cost of living percentile, and median income percentile, percentage of college graduates, percentage of homeowners, country type, and insurance type
Neighborhood and built environment	Transportation, neighborhood, environmental conditions, healthy food and clean water access, living arrangements, and impact of crime
Health care access and quality	Behavioral health, mental health, health insurance coverage, and health literacy
Education access and quality	Education, school type, language, and early childhood education and development
Social and community context	Race/ethnicity, social connections, sense of belonging to a community, discrimination, and adverse childhood experiences

PRE/POST-INJURY FACTORS :

Social determinants of Health



Health Equity



Why care?

- Prolonged symptoms of concussion i.e mood, sleep, fatigue, concentration etc are often non-specific
- Factors other than concussion can lead to 'concussion- like' symptoms
- Such factors may be related to the initial concussive event, but may also pre-date or follow it: pre-morbid
- Diagnostic challenges: vicious circle
- Symptoms secondary to concussion may include:
 - (i) psychological sequelae of traumatic experience (e.g., Depression, anxiety, PTSD)
 - (ii) pain sequelae, including headache, caused by orthopedic injury or whiplash
 - Injuries
- Medication side effects

MEDICAL FACTORS

(PRE-EXISTING, CONCURRENT OR POST-INJURY SYMPTOMS ASSOCIATED WITH MORE PERSISTENT SYMPTOMS)

- History of TBI
- History of past physical limitations
- History of past neurological/psychiatric illness
- Skull fracture
- Early onset pain (headache w/n 24h)
- Confounding effects of other health issues, e.g pain meds, associated injuries, emotional distress
- Anxiety
- High number of symptoms post-concussion:
 - Vestibular/Vestibular-ocular abnormalities
 - Pre-injury sleep issues or post-injury changes
 - Reduced balance or dizziness
 - Nausea after injury
 - Memory problems after injury
 - Post-traumatic amnesia

CONTEXTUAL FACTORS

(PERSONAL, PSYCHOSOCIAL, ENVIRONMENTAL ASSOCIATED WITH MORE PERSISTENT SYMPTOMS)

- Injury sustained in a MVA
- Potential influence of secondary gain ie litigation/compensation
- Not returning to work or delays In returning to work
- Presence of life stressors at time of injury
- Higher levels of symptom reporting associated with mood symptoms & heightened self-awareness of deficits
- Being a student
- Older age
- Lack of social supports
- Lower education
- Lower SES
- Female sex
- Lower resilience
- Returning to a contact/risk of contact sport activity

Predictor	Coding*	Univariable OR (95% CI)	Emergency department model OR (95% CI)	Emergency department-plus model OR (95% CI)
Baseline data				
Age*	33-51	0.67 (0.55-0.83)	0.77 (0.60-1.00)	..
Age*	51-64	1.09 (0.90-1.32)	1.19 (0.96-1.47)	..
Gender	Male-Female	0.62 (0.45-0.85)	0.74 (0.52-1.04)	..
Education*	4-6	1.79 (1.36-2.36)	1.47 (0.92-2.34)	2.06 (1.49-2.86)
Mental health†	No-Yes	0.30 (0.17-0.53)	0.31 (0.17-0.56)	0.39 (0.20-0.75)
Alcohol‡	No-Yes	2.18 (1.54-3.10)	2.17 (1.47-3.22)	2.14 (1.41-3.24)
Previous TBI	No-Yes	0.48 (0.20-1.18)	..	..
CT abnormalities	No-Yes	0.71 (0.47-1.07)	..	..
GCS*	13-15	1.78 (1.10-2.88)	4.20 (2.17-8.12)	3.26 (1.61-6.58)
PTA	<1h-≥1h	1.21 (0.86-1.70)	1.67 (1.06-2.63)	1.94 (1.20-3.15)
Headache	No-Yes	0.99 (0.73-1.35)	..	..
Nausea	No-Yes	0.86 (0.62-1.19)	..	..
Dizziness	No-Yes	0.83 (0.54-1.26)	..	..
Neck pain	No-Yes	0.41 (0.26-0.62)	0.40 (0.25-0.63)	0.42 (0.26-0.68)
2-week data				
Anxiety*	1-6	0.51 (0.41-0.64)	..	1.54 (1.07-2.22)
Depression*	1-5	0.40 (0.32-0.49)	..	0.44 (0.33-0.59)
PTS*	5-25	0.58 (0.47-0.71)	..	..
Complaints*	2-9	0.37 (0.28-0.48)	..	0.57 (0.40-0.81)
UCL-active*	3-4	1.12 (0.94-1.33)	..	..
UCL-passive*	2-4	0.56 (0.41-0.75)	..	0.65 (0.42-1.02)
UCL-avoidant*	3-4	1.09 (0.90-1.29)	..	1.29 (1.02-1.63)

*The values in this column indicate the 25th and 75th percentile of the continuous predictors, since OR are scaled to correspond to a change from the lower to the upper percentile. For age, values are scaled to changes from the 25th to 50th percentiles, and then from the 50th to the 75th percentile to reflect the non-linear association. An OR <1 favours the first presented condition, whereas an OR >1 favours the second presented condition of a given row. †Pre-injury mental health problems. ‡Alcohol consumed on the day of injury. GCS=Glasgow Coma Scale, PTA=post-traumatic amnesia, PTS=post-traumatic stress. TBI=traumatic brain injury. UCL=Utrecht coping list.

7A-16

Table 2: Potential associations between predictors in three models and outcomes

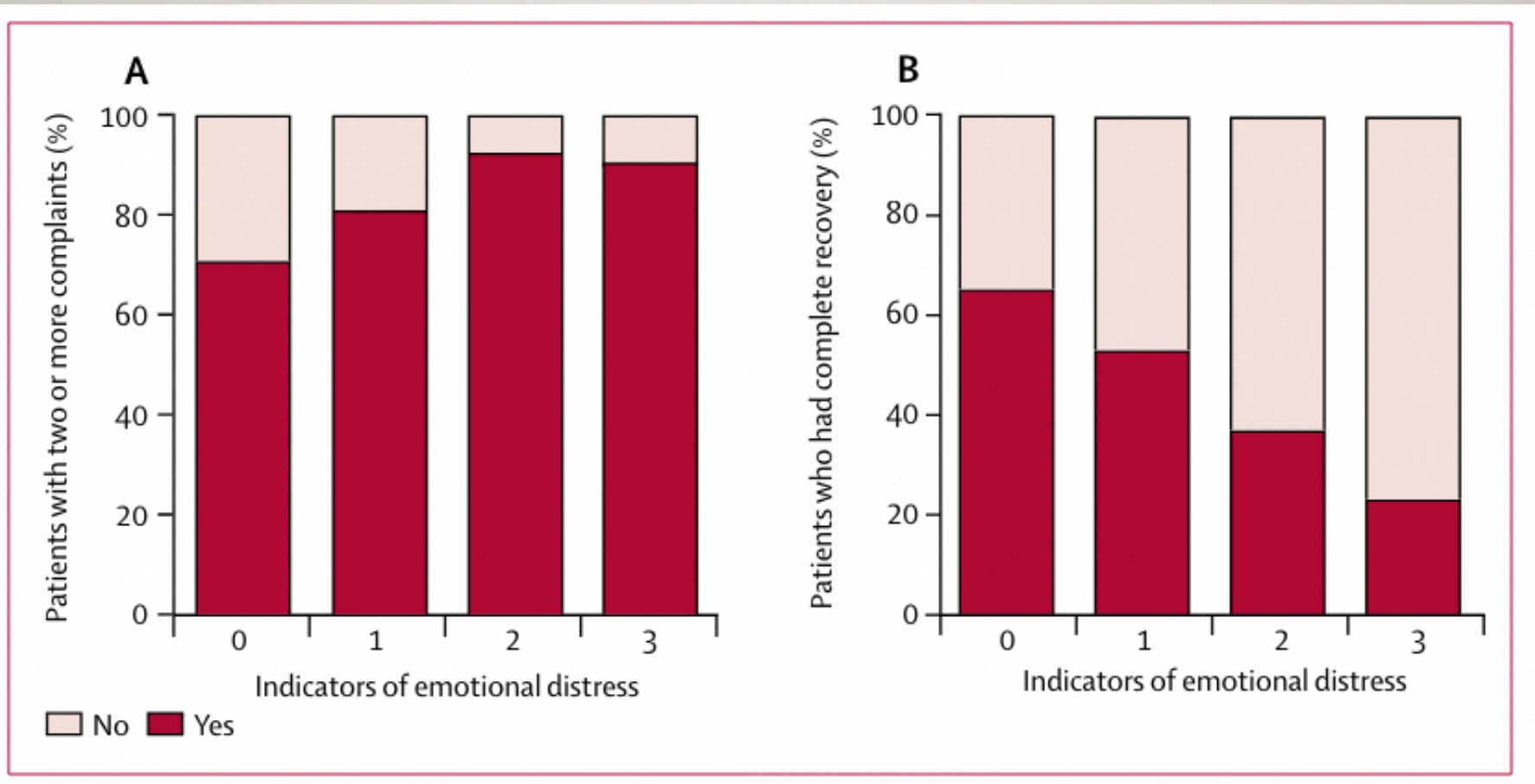
N=671

ER & 2-week f/u for questionnaires

ER: higher education, MALE sex, absence of mental health problems, presence of alcohol intoxication, absence of neck pain, higher GCS score, longer duration of post-traumatic amnesia contributed positively to **prediction of complete recovery**.

ER-plus model: higher depression score, a higher number of post-traumatic complaints, higher use of passive coping style significant predictors of an **incomplete recovery**; higher score anxiety score & higher avoidant coping style predictive for a better outcome

EMOTIONAL DISTRESS POST-CONCUSSION & RECOVERY



N=671; complete recovery in 373 (56%)

7A-17

A retrospective cohort study of 154 high school athletes with complete documentation of post-concussion symptom resolution or persistence at 6 weeks

TABLE 2. Bivariate regression of PCS comparing FPH/PPH, FPH only, and control groups

	B	SE	Wald	p Value	Adjusted p Value*	OR	95% CI	
							Lower Bound	Upper Bound
FPH/PPH & controls†	1.62	0.55	8.58	<0.01	0.018	5.06	1.71	14.99
FPH only & controls‡	0.92	0.38	5.92	0.02	0.03	2.52	1.20	5.30
FPH/PPH & FPH only§	0.70	0.55	1.60	0.21	0.247	2.01	0.68	5.94

1) positive family psychiatric history & personal psychiatric history (FPH/ PPH) = 5 TIMES RISK OF PERSISTENCE OF SYMPTOMS

2) positive FPH only = 2.5 TIMES RISK OF PERSISTENCE OF SYMPTOMS i.e. anxiety and bipolar disorder

PREDICTING PROLONGED SYMPTOMS: CLINICAL SAMPLE

- acute concussion (≤ 14 days) vs. prolonged post-concussion symptoms (PPCS) (≥ 90 days) on four factors of interest: sex, history of mental health disorders, history of headaches/migraines, and past concussions.
- 110 patients with acute concussion & 96 patients with PPCS
- **groups did not differ on sex, history of mental health disorders, history of headaches/migraines, and past concussions**
- both groups had greater proportions of females (acute concussion: 61.1% F; PPCS: 66.3% F)
- PPCS were significantly **older, more symptomatic**, more likely to have been injured in a **transportation-related incident**, and more likely to **live outside a Metropolitan city**.

RATES OF NEUROPSYCHIATRIC SYMPTOMS FOLLOWING CONCUSSIONS

- Prevalence of psychiatric disorder in PCS extremely high: depression 14-61% & anxiety 18-60%
- More concussions = higher risk
- Can have >1 psychiatric disorder
- Post-traumatic stress disorder symptoms overlap
- Comorbid conditions i.e. substance abuse
- Worsening of pre-morbid psychiatric condition

PSYCHIATRIC DISEASE IN GENERAL POPULATION:

WHO: 1 in every 8 people in the world live with a mental disorder

- 2019: 970 million people living with a mental disorder, with anxiety and depressive disorders the most common
- 2020, anxiety and depressive disorders rose significantly because of the COVID-19 pandemic. (26% and 28% increase respectively in 1 year)

7A-20

COGNITIVE SYMPTOMS

- Common symptoms: impairment of attention/concentration, speed of information processing, memory, executive
- Unclear whether persistent cognitive symptoms result from:
 1. Effects of injury
 2. Related to other factors influencing cognition: pain, fatigue, medications, sleep, psychological factors and emotional disturbance (i.e., anxiety and depression)
- Cognitive symptoms usually don't worsen over time-
investigate mood, sleep but can uncover something else

CONCUSSION

**Cognitive
changes:
decreased
concentration/
memory
problems/poor
judgement**

**Mood:
Anxiety/
Depression/
Lability**

**Headache,
Dizziness,
Fatigue, Visual
problems,
balance, sleep
issues**

DELAYED EFFECTS OF TBI



Source: Livingston et al. A, et al. Dementia prevention, intervention, and care: 2020 report of the Lancet Commission

www.alz.co.uk

DELAYED EFFECTS OF CONCUSSION/MTBI

- TBI (all severities) associated with increased risk of dementia
- Lancet Report: TBI is a modifiable risk factor for dementia
 - Single mTBI increased risk of dementia (OR 1.6, 95% CI 1.6–1.7)
 - Multiple TBIs increased risk of dementia OR 2.8, 2.5–3.2
 - Study of 178779 veterans with TBI with propensity matched veterans without TBI found dementia risk was associated with TBI severity (**HR 2.4, 95% CI 2.1–2.7 for mild TBI without loss of consciousness; 2.5, 2.3–2.8 for mild TBI with loss of consciousness;**
 - A cohort study of 28815 older adults with concussion, found the risk of dementia doubled, with 1 in 6 developing dementia over a mean follow-up of 3.9 years

MTBI/CONCUSSION & DEMENTIA

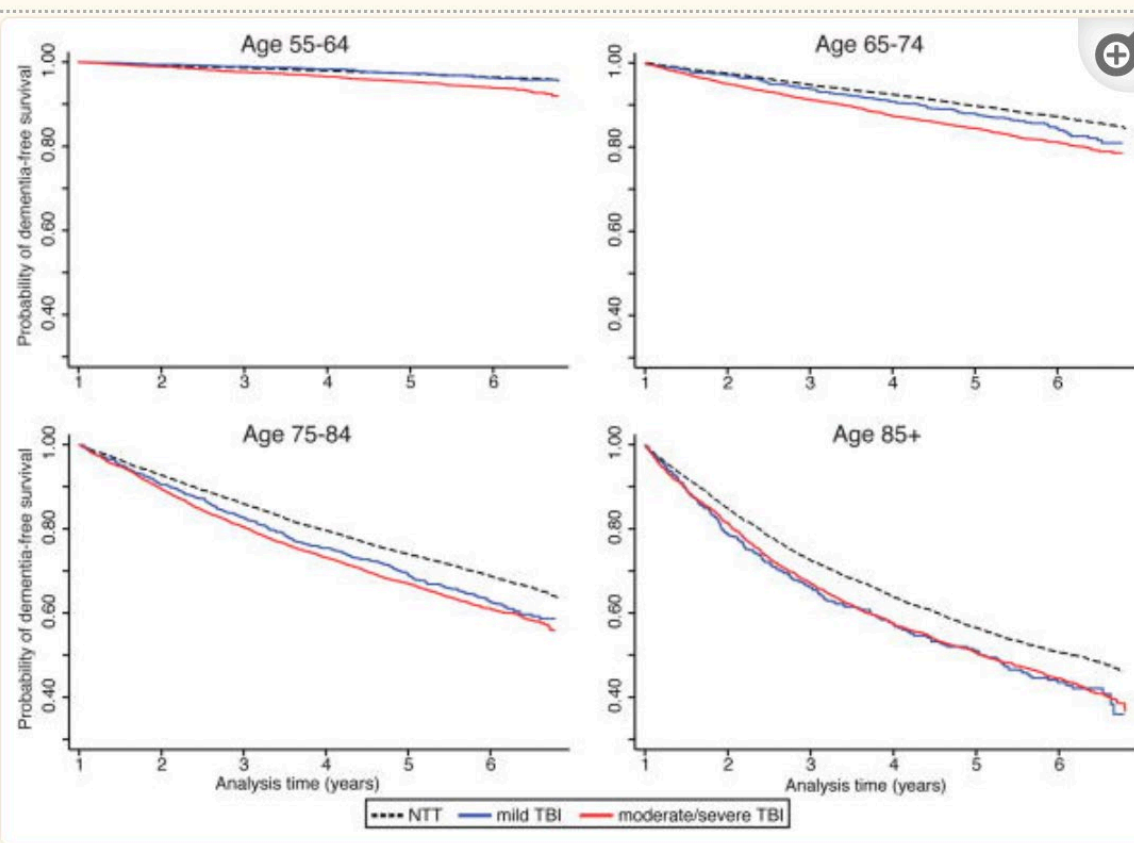
- Increasing evidence that mTBI can increase risk of Dementia
 - retrospective population-based case-controlled 25 yr retrospective study using province-wide (Man) medical health data collected 1 Apr-31 Mar 1990–1991 to 2014–2015
 - 28021M (mean age \pm sd, 25 \pm 18yrs) & 19462W (30 \pm 21 years) in concussion group; 81871M (25 \pm 18 years) & 57159W (30 \pm 21yrs) in the matched control group
 - Outcomes: **Dementia**, ADHD, PD, Mood disorder

Table 4 Hazard ratios for risk of dementia diagnosis

Age of diagnosis

	Mean±SD		
Control	73.8±19.3		
Concussion	71.0±19.6	Corrected for SEF and CMI	
Model 1a		Model 1b	
HR (95% CI)	P value	HR (95% CI)	P value
1.75 (1.63 to 1.87)	<0.001	1.72 (1.61 to 1.84)	<0.001
Model 2a Sex interaction		Model 2b	
0.95 (0.83 to 1.09) Multiple concussion	0.49	0.93 (0.82 to 1.07)	0.33
Model 3a		Model 3b	
1.70 (1.59 to 1.82)	<.001*	1.67 (1.56 to 1.79)	<.001*
1.63 (1.26 to 2.11)	<0.001†	1.62 (1.25 to 2.10)	<0.001†
1.19 (0.62 to 2.28) Controlling for other conditions of interest	0.60‡	1.20 (0.63 to 2.30)	0.60‡
Model 4a Proportionality model		Model 4b	
1.55 (1.45 to 1.67)	<0.001	1.54 (1.43 to 1.65)	<0.001
Model 5a		Model 5b	
0.97 (0.97 to 0.98)	<0.001	0.97 (0.97 to 0.98)	<0.001

MILD TBI/CONCUSSION IN OLDER POPULATIONS



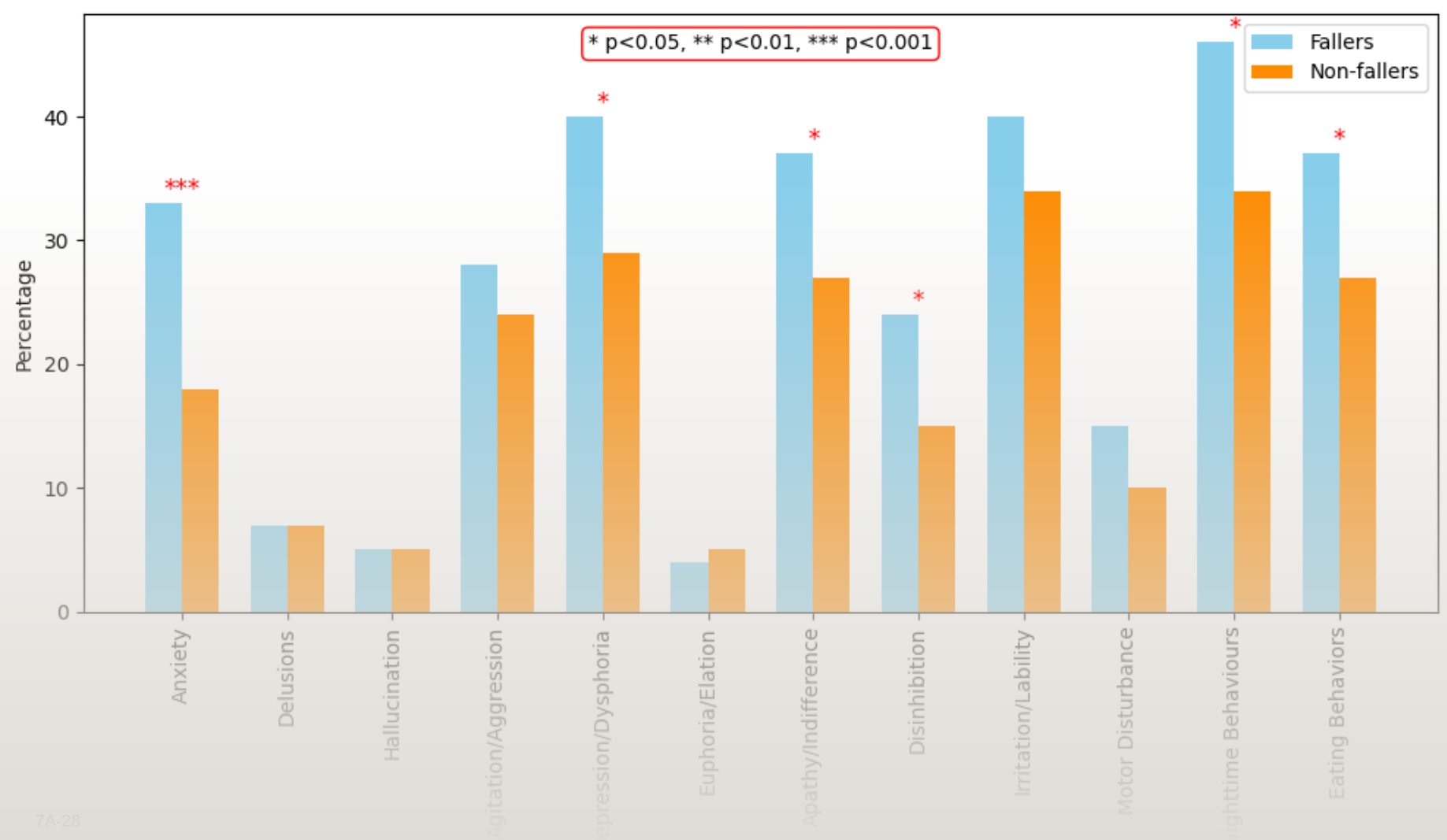
	HR (95% CI)	p-value
55–64 years, reference NTT (n=10,281)		
mild TBI (n=1,226)	1.08 (.77–1.49)	.665
moderate/severe TBI (n=2,769)	1.65 (1.35–2.02)	<.001
65–74 years, reference NTT (n=8,607)		
mild TBI (n=850)	1.22 (1.02–1.47)	<.05
moderate/severe TBI (n=2,750)	1.50 (1.33–1.68)	<.001
75–84 years, reference NTT (n=10,025)		
mild TBI (n=938)	1.26 (1.13–1.42)	<.001
moderate/severe TBI (n=4,347)	1.38 (1.29–1.47)	<.001
85+ years, reference NTT (n=4,218)		
mild TBI (n=422)	1.25 (1.09–1.44)	<.005
moderate/severe TBI (n=2,278)	1.31 (1.21–1.41)	<.001

Cognitive Test comparison between fallers and non-fallers with neurodegenerative disease after 1 year

- 482 patients :
111 Alzheimer's, 37 ALS, 50 frontotemporal dementia, 137 Parkinson's disease, 147 Vascular Cognitive Impairment

Cognitive domain	Mean score (fallers)	Mean score (non-fallers)	P value	Effect size Cohen'd
Attention & Working Memory	-0.1086	0.0548	<.001	0.717
Executive	-0.1320	0.0666	<.001	0.693
Language	0.0253	-0.0128	<.001	0.524
Memory	-0.0591	0.0298	.209	0.750
Visuospatial	-0.0860	0.0434	.035	0.337

Neuropsychiatric symptoms comparison between fallers and non-fallers with neurodegenerative disease after 1 year



CONCLUSION

- Concussion/mTBI happens to a person with medical/psychological and contextual factors (as all illnesses)
- Short-term and long-term effects concussion/mTBI
- Concussion/mTBI can worsen symptoms and can accelerate cognitive and neuropsychiatric symptoms
- Social determinants of health need assessment for impact on recovery

THANK YOU FOR YOUR ATTENTION



Law Society
of Ontario

Barreau
de l'Ontario

TAB 7B

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Pre-Injury and Post-Injury Factors and Their Interplay in People with Concussion

Pre-Injury and Post-Injury Factors and Their Interplay In People With Concussion (With Dr. Carmela Tartaglia) (PPT)

Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon, Director
Canadian Concussion Centre

May 30, 2024



CONCUSSION SYMPOSIUM FOR LEGAL PRACTITIONERS, INSURERS,
JUDGES, AND CLINICIANS 2024:

**PRE-INJURY AND POST-INJURY FACTORS AND
THEIR INTERPLAY IN PEOPLE WITH CONCUSSION
(WITH DR. CARMELA TARTAGLIA)**

*Charles Tator,
Canadian Concussion Centre,
Toronto Western Hospital,
University Health Network (UHN),
Brain Research Institute and
University of Toronto*



**Law Society
Of Ontario
and
Canadian
Concussion
Centre**

May 30, 2024



CONCUSSION TOPICS FOR THIS TALK

- 1. The Concussion Spectrum of Disorders are the Consequences of Concussion**
- 2. Recognition, Diagnosis and Treatment of Concussion.**
- 3. Discussion of Specific Mechanisms of Concussion such as Motor Vehicle Crashes**
- 4. Consequences of Concussions**

WHAT IS RECOGNITION OF CONCUSSION?

- There is now an expectation that most Ontarians should know something about concussion.
- This includes many types of health care professionals: medical doctors and nurses, chiropractors to therapists of all types, but especially physiotherapists, O.T.'s, etc
- Canadians in specific roles should **RECOGNISE** concussion: teachers, coaches, referees
- Virtually all school-based personnel should **RECOGNISE** concussion
- Insurance industry, and most government departments should **RECOGNISE** concussion
- Parents, athletes, bicyclists, camp owners, etc. should **RECOGNISE** concussion

EVERYONE IN THESE CATEGORIES SHOULD BE ABLE TO **RECOGNISE** WHEN A CONCUSSION MAY HAVE OCCURRED. BUT only doctors and nurses are trained and expected to be able to **Diagnose** a concussion

WHERE DOES CONCUSSION FIT IN THE OVERALL PICTURE OF BRAIN INJURIES?

- Concussion is the most frequent brain injury: **about 150,000 per year in ONTARIO**, 25% of players on a Junior B hockey team, average age 18, are concussed each season
Echlin et al 2010 Neurosurgery Focus
- In football, probably 50% of players each season



WHO DIAGNOSES CONCUSSIONS?

WHO TREATS CONCUSSIONS?

All concussion guidelines until now have stated that Medical Doctors and Nurses, especially NURSE PRACTITIONERS are the appropriate “Health Care Professionals” to DIAGNOSE a concussion in Canada and other countries where health care is advanced. Quebec now allows physiotherapists to diagnose concussion because there are not enough doctors in Quebec to do the job.

It is now accepted that TREATMENT of Concussion should be Individualized and Multidisciplinary, and often “Requires a Village”.

TYPES OF BRAIN INJURIES

- CONCUSSION IS THE MOST COMMON TYPE OF BRAIN INJURY!! 400,000/Year in Canada.
- Other brain injuries are Bruising or Contusion of the brain, Tearing or Laceration of the brain, and Bleeding and Blood Clots in the brain or around the brain including intracerebral, subdural and extradural haematomas.

THE CONCUSSION CONSEQUENCES – ACUTE, SUBACUTE AND CHRONIC

ACUTE--Second Impact Syndrome (SIS) can cause major disability or death

**SUBACUTE– Persisting Concussion Symptoms (PCS)
including Depression, Anxiety, PTSD Behaviour Change.**

**CHRONIC--Cognitive Deficits, Dementia, Movement Disorders
→Chronic Traumatic Encephalopathy (CTE) and
Suicide**

THESE CONSEQUENCIES ARE WHY WE SHOULD ALL WORRY ABOUT CONCUSSIONS!!!

CONSEQUENCES OF CONCUSSION = CONCUSSION SPECTRUM OF DISORDERS

- Acute Concussion SYMPTOMS SHOULD BE GONE IN 30 DAYS
- Second Impact Syndrome (SIS) FEWER DOUBTERS after Rowan Stringer's Death
- Postconcussion Syndrome (PCS) NOW KNOWN AS PERSISTING CONCUSSION SYMPTOMS
- Psychological Consequences – Mental Health Disorders: Depression/Anxiety, Panic Attacks, PTSD 35% of PCS patients!!!
- Brain Degeneration - Chronic Traumatic Encephalopathy (CTE), Movement Disorders, Etc. Can be purely CTE, but more often a mixture of brain degenerative conditions, such as AD, PD, etc

WHAT ABOUT “MILD TRAUMATIC BRAIN INJURY”?

- Is Similar to Concussion, but Concussion is a better term.
- mTBI- includes a mixture of more severe injuries and focal injuries such as bruises, haemorrhages and contusions of the brain. PM&R docs prefer mTBI.
- HOWEVER, there is nothing “mild” about concussions which can produce permanent consequences. (therefore is mTBI an oxymoron?)
- Large numbers of the public now understands what a concussion is. In *contrast*, not all health care professionals agree on what mTBI is. Thus, it is a confusing term describing a heterogeneous mixture of brain injuries. **CONCUSSION IS A BETTER TERM!!!**

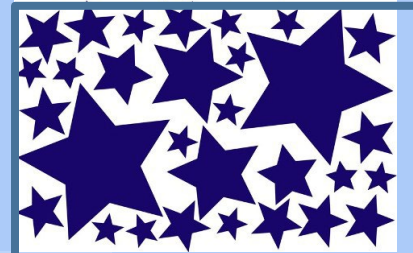
TRAUMATIC BRAIN INJURY (TBI) TYPES- INCREASING SEVERITY

Increasing Severity of Injury

	CONCUSSION (HOMOGENEOUS)	MILD TBI (HETEROGENEOUS)	Moderate TBI	Severe TBI
GCS (Glasgow Coma Scale)	15	13-15	9-12	3-8
Structural NON-Specific Changes on Imaging	There may be some, but no bleeding	There may be some lesions such as bleeding	Always	Always
Clinical Neurological Deficits	NONE	There may be some	Always	Always

DEFINITION OF CONCUSSION

- Immediate and temporary alteration of mental functioning due to trauma
- The trauma does not have to be directly to the head, and can be due to a whiplash effect on the brain from a blow elsewhere on the body!!!



(OLD Terms:
“Bell Ringer”,
“Ding”, “Seeing
stars” were all
concussions)

CONCUSSION IS DUE TO JIGGLE OF THE BRAIN

Rotational or Linear Acceleration are the Mechanisms that cause Jiggle of the Brain and Concussion



FEATURES OF CONCUSSIONS

1. Mild injury –in about 75%, complete recovery in **one month**
2. Diffuse injury. No focal neurological deficits
3. Subtle deficits- eg dizziness, nausea, photophobia, about **65 possible symptoms**
4. Unconsciousness is rare (5%)
5. **Major cumulative effects** from repetitive injury
6. There is no evidence-based grading system.
7. Concussion is still a **Clinical Diagnosis**

WHAT IS THE MECHANISM OF CONCUSSION?

- Exact cellular/metabolic mechanism is unknown!!
- **Rotational acceleration or jiggle of the brain** is a more frequent cause of concussion than **linear acceleration**
- The “jiggle” of the brain within the skull causes concussion. In MVC the “Bobble-Head Effect”.
- Axonal injury may occur
- Probably, the first concussion is a biochemical injury
- NOT DUE TO Bleeding, in most cases
- NOT DUE TO Tearing or Bruising of the brain

Science of concussion is improving.

Concussion may be an example of Network Damage. Networks connect regions of the brain, and allow brain regions to work together to create a thought or a movement. Networks involve both white matter tracts and collections of neurons in grey matter that work together. Networks can be studied by MRI, for example.

CAUSES OF CONCUSSION

1. **Motor Vehicle Crashes:** type of crash, sex of occupant are important
- 2 **Falls, especially among the elderly**
3. **Work Related Injuries and RTW**
4. **Sports and Recreation and RTP** – e.g.
football, hockey, rugby,
soccer, lacrosse, etc.
5. **Military Action** many causes including Blasts
6. **School-Based-** students and staff
- 7 **Intimate Partner Violence**, domestic violence: huge problem – **1/4 to 1/3 of all women!!!!**
8. **Other Assaults-Criminal Activities**

Although the signs and symptoms and recovery potential show some similarities among the causes, there are many important differences!!

CAUSES OF CONCUSSION THAT INVOLVE LAWYERS

1. Motor Vehicle Crashes - Major reason for needing a **Lawyer**
2. Falls especially among the elderly- sometimes need a **Lawyer**
3. Work Related Injuries - **Lawyers** often involved
4. Sports and Recreation – e.g. football, hockey, rugby, soccer, lacrosse, etc.,
-Class Action or individual Lawsuits **LAWYERS**
5. Military Action and Blast – Sometimes need a **Lawyer**
6. School-Based- **Lawyers** more often involved now because of Concussion Laws
7. Partner Violence and Domestic Violence- Huge problem –1/4 to 1/3 of women!!!!,
usually need a **Lawyer**
8. Criminal Activities such as Assault - Usually need a **Lawyer**
(Unfortunately, CONFIDENTIAL SETTLEMENTS IMPEDE OUR RESEARCH!!)



Who we are:

We are a provincial, registered, charitable organization. Our mission is to enhance the lives of Ontarians living with the effects of acquired brain injury (ABI) through education, awareness and support.

OBIA's FREE services include:

- Helpline: 1-800-263-5404
 - Provide support, education and advocacy with concerns relating to legal, financial assistance, housing, employment, transportation issues.
 - Provide listening and emotional support to discuss the difficulties and frustrations associated with brain injuries.
 - Assists with access to services
- Peer Support Program
- Online Concussion Support Groups
- Online Caregiver Support Groups



TIPS FOR SELECTING A QUALIFIED TRAUMA LAWYER

Selecting an experienced and qualified trauma lawyer is one of the most important decisions you need to make following a motor vehicle collision. The tips below will help you identify leading trauma lawyers in Ontario best suited to help you and your family.

Qualification, competence and credentials matter.

THE LAWYER	THE LAW FIRM	THE PITFALLS	THE COST
<p>Hire a lawyer with <u>objective credentials</u> validating their status as a leader in personal injury law.</p> <p><u>Ask the lawyer*:</u></p> <p>Are you Certified by the Law Society of Ontario as a Specialist in Civil Litigation?</p> <p>The Certified Specialist designation is awarded by the Law Society of Ontario to <u>select</u> lawyers who have maintained exemplary standards of professionalism in his or her field of law.</p> <p>Are you recognized as an expert in personal injury law?</p> <p>An experienced personal injury lawyer should be listed in the following peer-reviewed publications:</p> <ul style="list-style-type: none"> • Lexpert • Best Lawyers in Canada • Martindale-Hubbell (the highest rating is AV Preeminent) 	<p>Hire a lawyer that works at an established law firm known for its expertise in personal injury law.</p> <p><u>Ask the lawyer*:</u></p> <p>How long has the law firm been in business?</p> <p>A well-established law firm with a history of success is more likely to have the resources and access to highly regarded health care professionals and other experts needed to help you with your case.</p> <p>Is the law firm a leader in Plaintiff's personal injury law?</p> <p>You should talk to more than one law firm. Ask others that work with people with brain injury for suggestions to determine if the law firm is widely regarded or recognized as a leader in personal injury law.</p>	<p>Consider the following when selecting a lawyer and law firm to assist you and your family.</p> <p><u>Ask the lawyer*:</u></p> <p>Have you handled similar cases and successfully taken cases to trial?</p> <p>A lawyer and law firm with a reputation and history of taking cases to trial is better equipped to favourably resolve your case. Ask to speak to former clients with similar cases.</p> <p>Will you remain involved with my case?</p> <p>Make sure that the lawyer you are hiring will be the one involved in your case and will be accessible to your questions.</p>	<p>People often worry about the cost of hiring a lawyer. However, qualified trauma lawyers typically:</p> <ul style="list-style-type: none"> • Offer a <u>free</u> no obligation consult; • Will meet you at the hospital and/or at your home; • Will <u>only</u> get paid if and when the case is successfully resolved; and, • Will charge you an industry standard fee that should not exceed one-third of the damages recovered (plus HST on fees and plus reimbursement for disbursements).

Download from
OBIA Website:
obia.ca

WHY ARE CONCUSSION IN SPORTS IMPORTANT???

- Concussions in sports are especially common – about 1/3 of all concussions, and effect many youngsters
- Athletes often get repetitive concussions
- Repetitive concussions can have major consequences, such as second impact syndrome, postconcussion syndrome and brain degeneration (CTE)

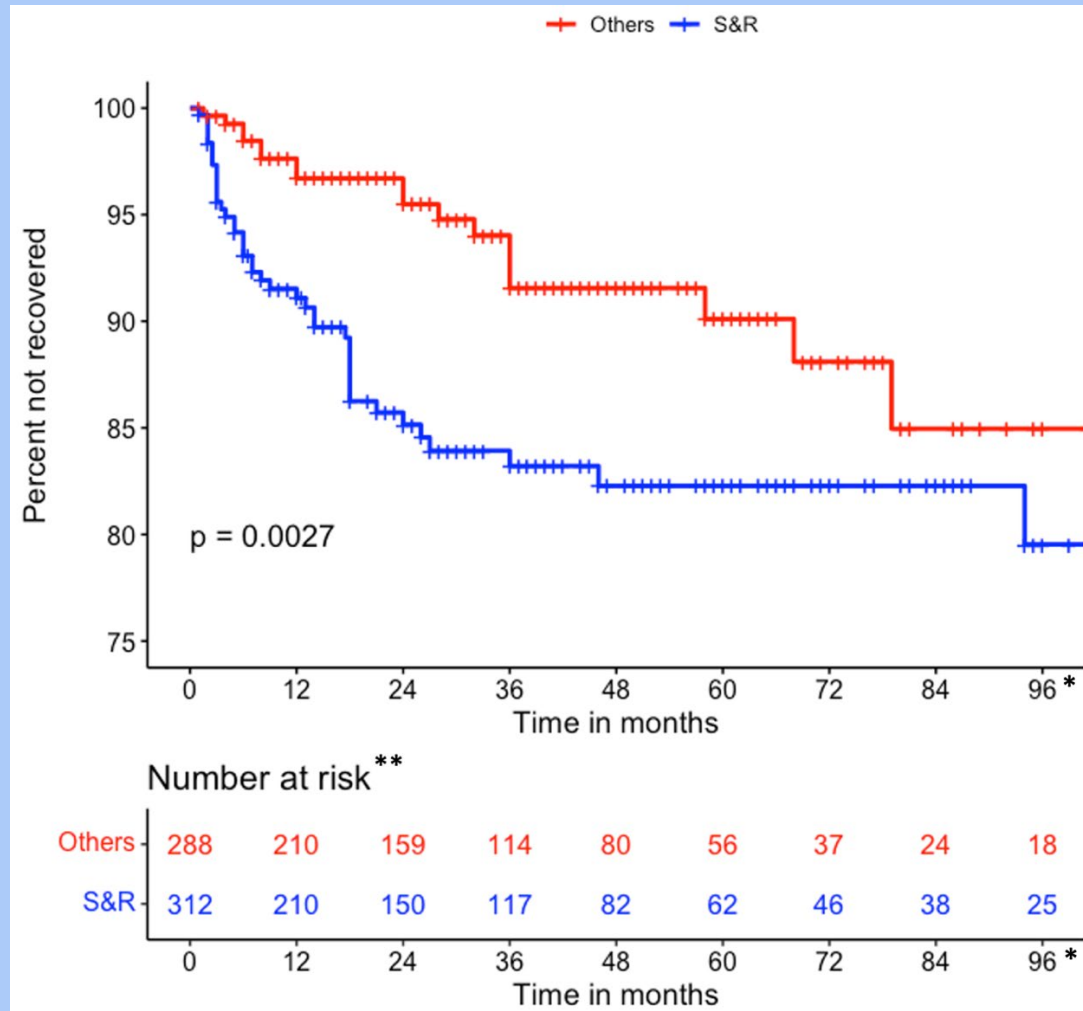
What is the Approved Age for Body Checking in Youth Hockey?
Currently, it is age 13-14 in Hockey Canada and USA Hockey Rules. Our study shows many cases of Concussion and PCS would be eliminated if the AGE for permissible Body Checking was raised to 18. What do you think??????

WHY ARE CONCUSSIONS IN MOTOR VEHICLE CRASHES IMPORTANT??

- VERY COMMON AMONG MVC OCCUPANTS.
- MORE FREQUENT IN WOMEN!
- LESS RECOVERY THAN OTHER CAUSES.
- MORE SYMPTOMS THAN OTHER CAUSES.
- VERY COMMON, ESPECIALLY AFTER REAR-END COLLISIONS.
- BOBBLE-HEAD EFFECT DUE TO WEAKER NECK MUSCLES IN WOMEN.
- OFTEN OCCURS WITH WHIPLASH, AND IN A PREVIOUS ERA WAS LUMPED WITH WHIPLASH AND OVERLOOKED!
- ONBOARD SAFETY MECHANISMS INCLUDING AIRBAGS, SEATBELTS AND HEAD RESTRAINTS ARE INSUFFICIENT, ESPECIALLY IN WOMEN

(Manuscript on 136 MVC Patients Submitted, 2024)

Figure 3. Kaplan-Meier Curves for Complete Recovery Between S&R and the Other 3 Causes over 96-month follow-up (N=600).



RECOVERY IS FASTER AFTER CONCUSSIONS IN SPORTS AND RECREATION THAN THE OTHER CAUSES (600 patients)

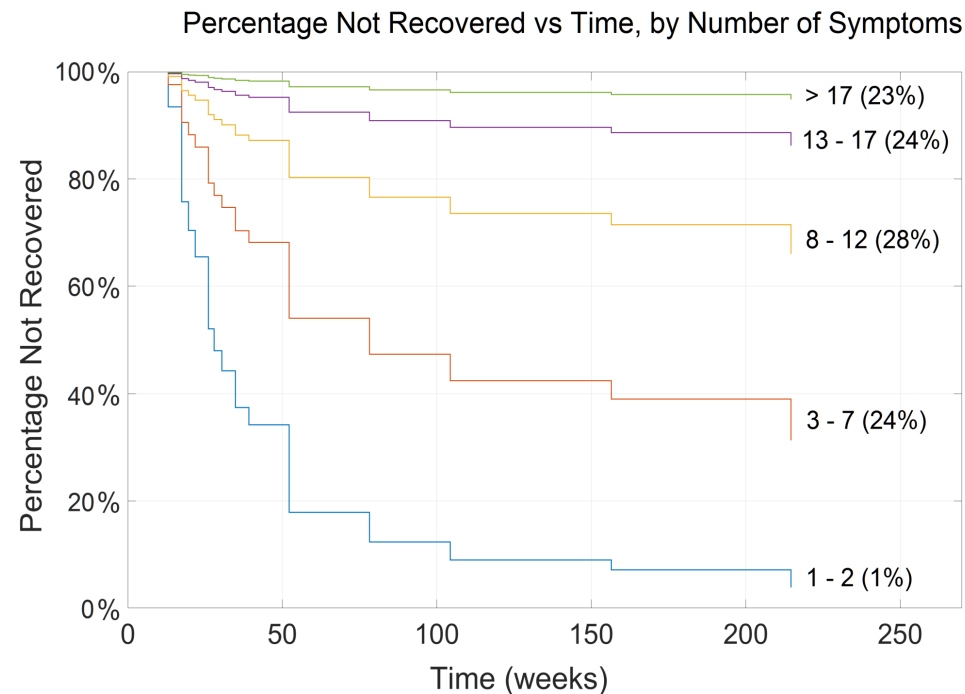
(J. Neurotrauma, 2024)

S&R, sports and recreation; Others defined as: MVC, motor vehicle collision; SBOV, struck by object including violence; or falls.

*Maximum length of follow up was 250 months, all events happened prior to 96 months.

** Number at risk refers to patients not yet recovered or not yet censored

RECOVERY CURVES FOR PATIENTS BASED ON NUMBER OF SYMPTOMS (N=110)



The numbers of symptoms associated with each curve are shown to the right of the figure at the end of each curve, with the percentage of patients closest to this number of symptoms shown in parentheses. **Based on Cox Modeling (similar to Kaplan-Meier Curves).** (HIPLOYLEE et al J. Neurotrauma, 2017)

THE INCIDENCE OF CONCUSSION AND RECOVERY FROM CONCUSSION DEPEND ON MANY FACTORS

1. **ACTIVITY-** hockey, football, specific occupations
2. **AGE-** especially adolescents (sports) and older people (falls)
3. **SEX-** women have higher incidence of concussions e.g. hockey, partner violence, **MVC!**
4. **NUMBER OF PREVIOUS CONCUSSIONS.**
5. **GENETIC EFFECTS** - some families are more susceptible
6. **PRE-EXISTING CONDITIONS** - migraine, ADD, ADHD, Depression

CONCUSSION - FOR MORE INFORMATION

Useful Concussion Websites for Concussion Guidelines and
other Concussion Resources:

parachute.ca

cdc.gov

onf.ca

obia.ca

ontario.ca/concussions

canadianconcussioncentreuhn.ca SESSIONS FOR
PATIENTS with persisting symptoms

THANK YOU.



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TAB 8A

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Implications of Rowan's Law

Implications of Rowan's Law (PPT)

Dr. Charles H. Tator, OC, MD, PhD, FRCSC, Neurosurgeon, Director
Canadian Concussion Centre

Neil Lumsden, Minister of Tourism, Culture and Sport

Jim Davidson, C.S.
Davidson, Cahill, Morrison LLP

May 30, 2024



CONCUSSION SYMPOSIUM FOR LEGAL PRACTITIONERS, INSURERS, JUDGES,
AND CLINICIANS 2024:

IMPLICATIONS OF ROWAN'S LAW

Charles Tator,

*Neil Lumsden, Minister of Tourism,
Culture and Sport,*

*Jim Davidson (Davidson, Cahill,
Morrison, LLP)*

**Law Society
Of Ontario
and
Canadian
Concussion
Centre**

May 30, 2024

THE CONCUSSION CONSEQUENCES – ACUTE, SUBACUTE AND CHRONIC

ACUTE--Second Impact Syndrome (SIS)

SUBACUTE– Persisting Concussion Symptoms (PCS)
including Depression, Anxiety, PTSD Behaviour Change.

CHRONIC--Cognitive Deficits, Dementia, Movement Disorders
→Chronic Traumatic Encephalopathy (CTE) and
Suicide

SECOND IMPACT SYNDROME OR MALIGNANT BRAIN SWELLING

- Results from a second concussion hours or days later when there has not been full recovery from the first concussion.
- **CAN BE CATASTROPHIC, AND EVEN FATAL.**
- Exact mechanism unknown (?loss of autoregulation leading to cerebrovascular congestion, brain swelling, increased intracranial pressure, and brain herniation. Treatment is poor.
- **COMPLETELY PREVENTABLE** by preventing the second concussion. Only occurs in teenagers and young adults.
- Can occur without an identifiable first injury.

ROWAN STRINGER DIED AFTER REPEATED CONCUSSIONS IN RUGBY, AGE 17

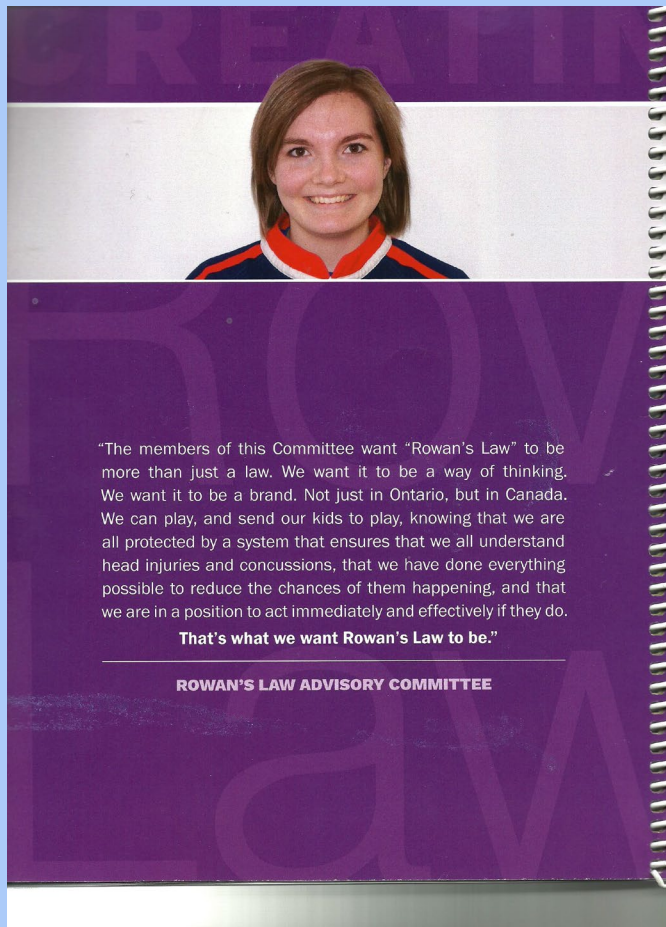
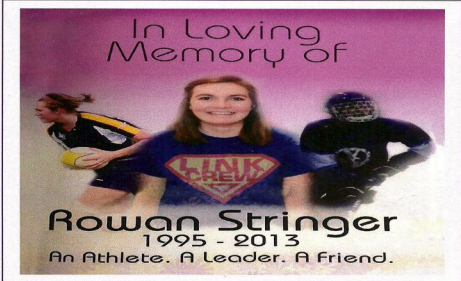


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WHY are Concussions Important Enough to Merit Public Policies? BECAUSE THEY CAN BE FATAL OR DISABLING!!!

Concussions in Children & Youth ≤ 18 . Large increase incidence in sport in the USA, and in Ontario- almost 5-fold increase 2003-2013. Concussion can significantly impact student health and academic success.

Concussions in Adults very common in MVC, IPV and Falls in elderly and can be very debilitating.

Return to sports, learning and work are big problems for all age groups.
Currently in Canada: 1%/Year are concussed = 400,000 Canadians concussed annually!!

Thus, Concussions Merit Public Policies.

Definition of Public Policy: (Wikipedia)

Action taken by a **government or non-government body** to address a problem experienced by its constituents through **legislation and policy program memoranda, guidelines, regulations, rules, etc.**

Year	Concussion Policies, Laws, and Guidelines in Canada and USA 1998-2024
1998	Karen Johnston started Canadian Academy of Sports Medicine Concussion Committee, a committee of the Canadian Academy of Sports Medicine (CASM). Charles Tator a member.
2000	Canada's First Concussion Guideline "Guidelines for Assessment and Management of Sport-Related Concussion." (Clin. J. Sports Med.2000) Canadian Academy of Sport Medicine Concussion Committee
2003 - 2022	Concussion In Sport Group-International with meetings in Vienna, Zurich, Berlin and Amsterdam. Many Canadian clinicians and researchers involved.
2006	Zachary Lystedt major brain injury in Seattle, Washington during high school football game. Returned to play after concussion. Probable Second Impact Syndrome.
2009	First Concussion Law in the world. State of Washington, "the Lystedt Law".
2013	Rowan Stringer died after rugby high school game, Ottawa
2015	Rowan Stringer Inquest. Her death due to Second Impact Syndrome. Jury makes 49 recommendations for prevention of concussion.
2015	Ontario Ministry of Education establishes PPM158 Concussion Program for Elementary and High Schools. All students and staff are to be taught about concussion prevention and management
2017	All 50 USA states have passed Concussion Laws
2017	Parachute Canada publishes Canadian Sport Concussion Guidelines supported by the Public Health Agency of Canada
2017	Ontario Neurotrauma Foundation Publishes Its Guidelines for Practitioners
2018	Rowan's Law announced by the Government of Ontario. Lead Ministry was Travel, Culture and Sport
2019 to- 2023	Regulations attached to the laws announced by Government of Ontario included Codes of Conduct and Laws Apply to College and University students and Non-school Leagues for participants less than 26 years old.

CONCUSSION DIAGNOSIS

- The diagnosis of concussion is made **CLINICALLY**
- **THE DIAGNOSIS DEPENDS ON A KNOWLEDGEABLE DOCTOR/NURSE AND A COMPLIANT PATIENT. Still PROBLEMS!!!!** because of uninformed docs and nurses and non-compliant patients.



We must teach kids to tell!

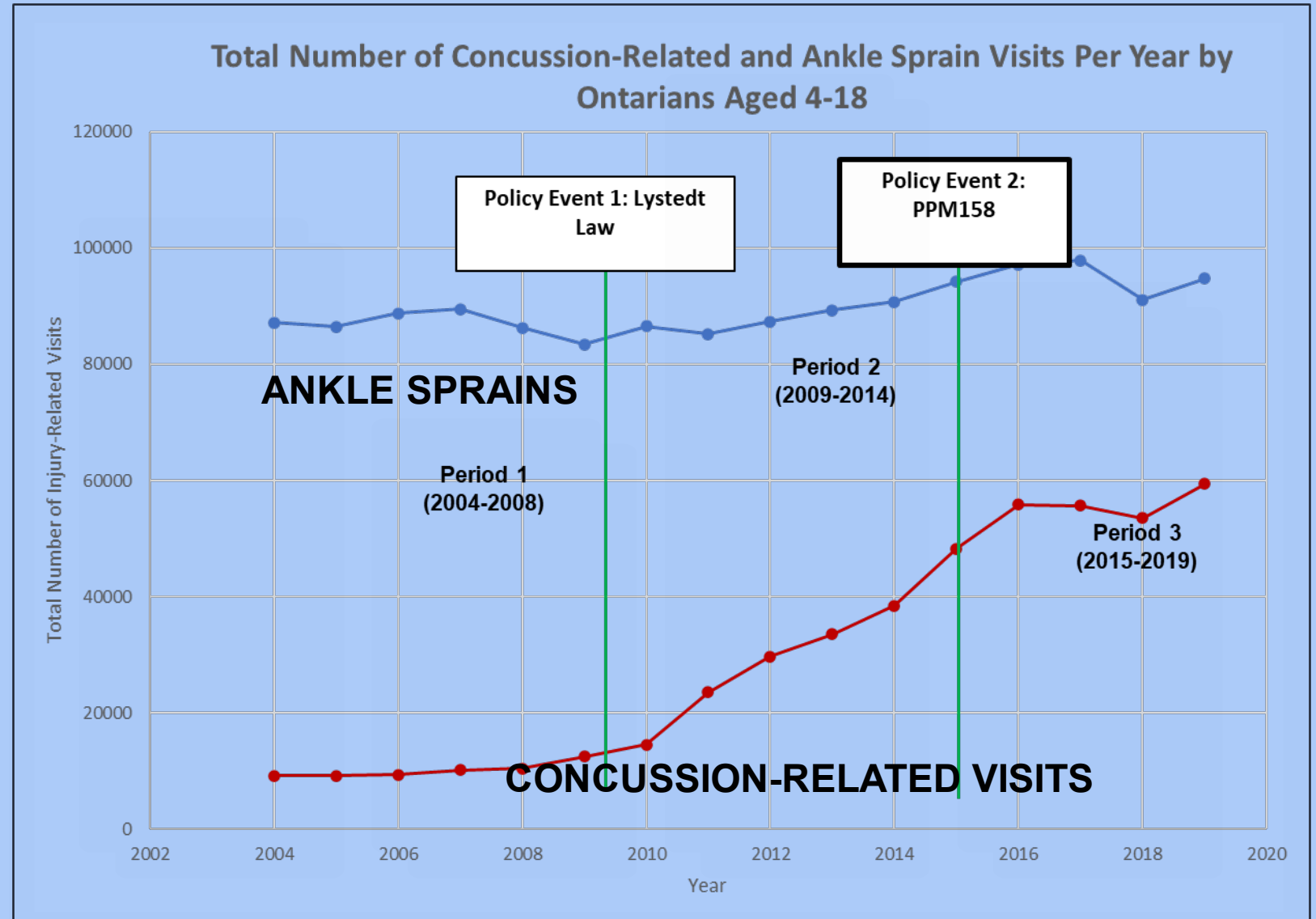
We are Still looking for Better Biomarkers than Symptoms, such as Biofluids and Imaging.

ROWAN'S LAW IN ONTARIO

- Introduced in 2018. Regulations continue to be announced since then.
- Lead Ministry-Tourism Culture and Sport.
- Chaired by Tyler Currie of the Ministry and Dr. Dan Cass VP of Sunnybrook.
- 25 members including me.
- Purpose: prevent concussions in school and league sports, and manage expertly those that still occur.

RESULTS

- 473,244 total records of concussion-related visits between 2004 and 2019
- The post-policy/pre-policy rate ratio for PPM158 was 2.2
- There was a significant trend over time in concussions ($p < 0.0001$) but not ankle sprains ($p > 0.05$)



MINISTER NEIL LUMSDEN



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TAB 8B

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Implications of Rowan's Law

Rowan's Law

What are the Legal Implications? (PPT)

Jim Davidson, C.S.

Davidson, Cahill, Morrison LLP

May 30, 2024



Rowan's Law

What are the Legal Implications?

By Jim Davidson – DAVIDSON CAHILL MORRISON LLP

BACKGROUND

- The goal of Rowan's Law is to protect amateur athletes and improve concussion safety on the field of play by creating certain legal requirements and obligations for sport organizations and their members and participants

The Legal Sources

Rowan's Law (Concussion
Safety), 2018

Ontario Regulation
161/19

No case law to date

Basic Requirements

The Legislation includes a number of requirements including:

- 1. Annual mandatory concussion education for athletes, parents/guardians, coaches, team trainers and officials through the availability of Concussion Awareness Resources;*
- 2. The development and annual review of Concussion Codes of Conduct for sports organizations;*
- 3. Removal-from-sport protocols for sports organizations; and*
- 4. Return-to-sport protocols for sports organizations*

Definition of a Sport Organization

- A sport organization is a person or entity, that for profit or otherwise, trains athletes, conducts practices among athletes, or organizes or holds one or more tournaments, contests, or other competition among athletes, in connection with any of the 65 amateur competitive sports listed in the regulation or their parasport equivalent.

Sport Organizations Include

- Municipalities
- Post secondary institutions, such as a university or college
- Community center
- Private sport club or gym
- Other person or entity if it has at least one individual under 26 years old who is participating in the sport competitions/tournaments/contests, practices or training

Exceptions

- A school or private school is not a sport organization for the purposes of the Act or regulation
- Certain other organizations may also be excluded under regulation s.2(4) primarily because they involve activities that are informal and not competitive

Who is impacted

- Coaches and assistant coaches
- An official such as an umpire, a referee or a judge, but only if the official presides over the field of play
- Team Trainers
- A “designated person” in relation to the removal-from-sport and return-to-sport protocols
- Athletes or their parents/guardians

Does Rowan's Law Create Legal Liability

- While *Rowan's Law* creates certain requirements and obligations on coaches and other sport organization members, a failure to comply with the requirements of the *Act* does not automatically give rise to legal liability - see *The Queen v. Saskatchewan Wheat Pool* [1983] 1 SCR 205
- It is also noteworthy that there are no enforcement or monitoring provisions in *Rowan's Law*. Rather the legislation is intended to promote culture change and make participation in amateur sport safer.

Evidence of Breach of Standard of Care (*The Queen v. Saskatchewan Wheat Pool*)

- A breach of statutory obligations may be some evidence of negligence, but the breach alone will not suffice to prove negligence
- Similarly, compliance with the statute is not necessarily a complete civil defence
- The statutory formulation of the obligations do afford a useful standard of reasonable conduct
- A plaintiff still bears the burden of proving a breach of the common law standard of care based on traditional principles of negligence

Protecting your sport organization

- Ministry's "Requirements & Frequently Asked Questions" – a guide for *Rowan's Law*
- Government of Ontario – sample Concussion Awareness Resource
- Sample Concussion Codes of Conduct
- Sport Organizations and Governing Bodies Resources



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TAB 9A

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Concussion and the Workplace

Concussion & Return to Work (PPT)

Dr. Carmela Tartaglia, MD, FRCPC, Cognitive Neurologist
Canadian Concussion Centre, Toronto Western Hospital

May 30, 2024



CONCUSSION & RETURN TO WORK

Carmela Tartaglia, MD
Memory Clinic, Krembil Brain Institute
Tanz Centre for Research in
Neurodegenerative Diseases

Disclosures

- CIHR, NIH, Weston Brain Foundation, Tanenbaum Institute of Science In Sport, WSIB
- Clinical Trials: Biogen, Roche, Anavex, UCB, NOVO NORDISK, Janssen, Passage BIO, GSK
- Consultation: Eisai, Lilly

MILD TRAUMATIC BRAIN INJURY/ CONCUSSION

- Growing epidemic (sports, military, falls, abuse etc)
- **About 150,000 concussions in Ontario/year**
- Under-reported-most stats from hospitals



CONCUSSION SYMPTOMS VARY AMONG PATIENTS

COGNITIVE SYMPTOMS

Difficulty thinking-confusion

Slowed processing

Difficulty remembering

Unable to concentrate

PERSONALITY/MOOD

Irritable

Depression

Nervous/anxious

More emotional

Sleeping more/less than usual

Insomnia

PHYSICAL

Headache

Tinnitus

Fuzzy or blurry vision

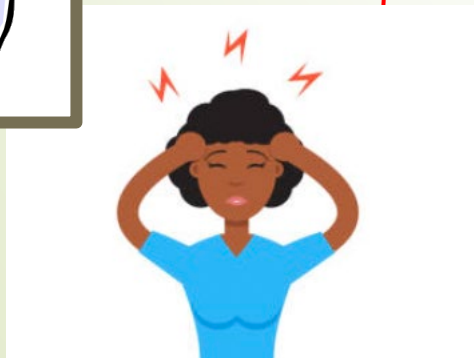
Dizziness/Vertigo

Sensitivity to light or noise

Balance problems

Fatigue

Nausea

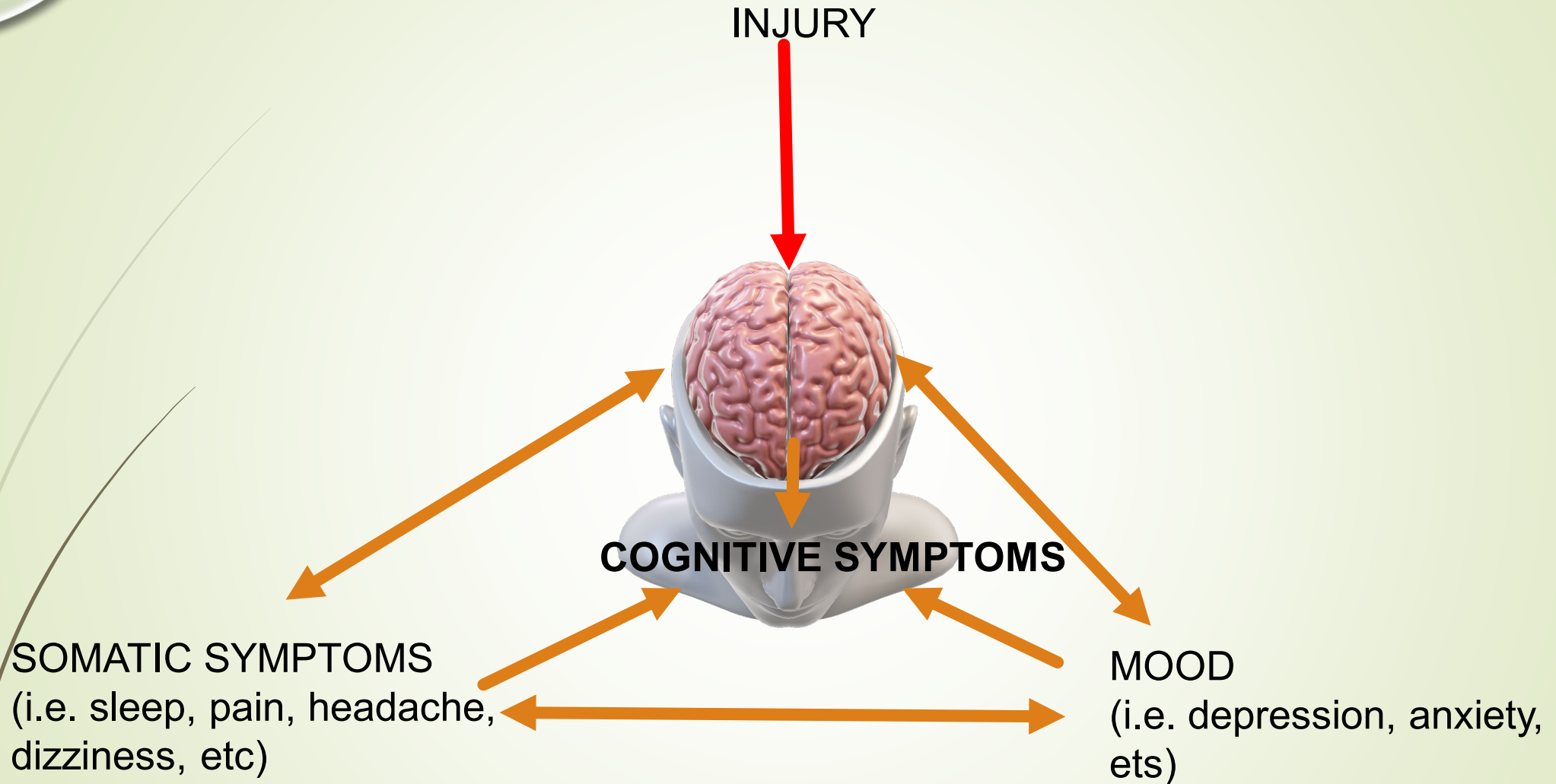


PERSISTING/PROLONGED SYMPTOMS OF CONCUSSION

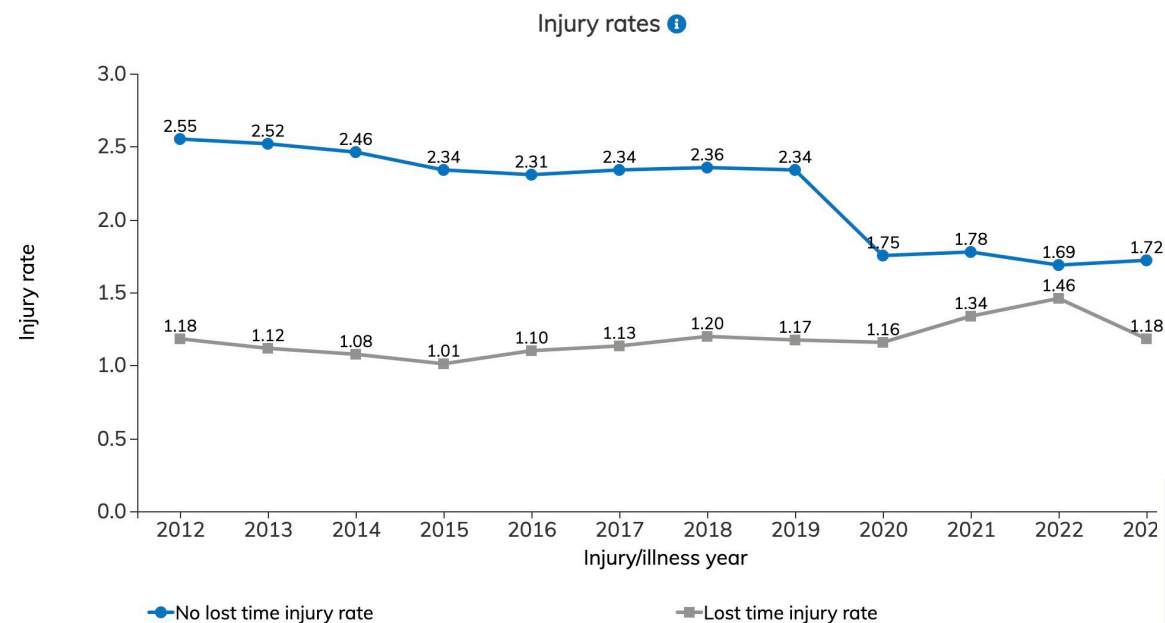
- Mild injury – complete recovery in about 85-90%
 - Usually 10-14 days in adults; 4 weeks in children
- “...Failure of normal clinical recovery—that is, symptoms that persist beyond expected time frames: 10% (-58%) of people do not recover from mTBI within 3 months
 - > 15% experience prolonged symptoms ~23,000 Ontarians/year endure prolonged symptoms
- Impact on individual, their family, **work** and the health-care system
- Can result in long-term effects including poorer health, increased healthcare cost, unemployment



VICIOUS CYCLE OF CONCUSSION



WORKPLACE SAFETY & INSURANCE BOARD STATS- 2024



- TBI among work-related injury claims have increased in Canada

Time range

Start year

2023

End year

2024

Drivers

Characteristics

Nature of injury

Sort by

Count

Apply

Nature of injury Category	Claim count	Average days lost per claim	Leading age group
Sprains and strains	30,816	17	30-34
Bruises, contusions	8,054	10	25-29
COVID-19 novel coronavirus	6,192	5	50-54
Not coded	6,129	6	25-29
Concussion	5,551	30	20-24
Fractures	5,454	46	30-34
Cuts, lacerations, punctures	5,206	10	20-24
Traumatic injuries, disorders, complications, unspecified, NEC	4,243	17	30-34
Mental disorders or syndromes	2,849	103	40-44
Abrasions, scratches and other superficial injuries	1,497	4	20-24

	Workplace Safety and Insurance Board Commission de la sécurité professionnelle et de l'assurance contre les accidents du travail												
	Injury/illness year												
Characteristics category	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Fractures	4,648	5,087	5,057	5,022	4,931	4,263	4,980	4,733	4,047	4,509	5,182	4,863	591
Sprains and strains	25,500	23,606	22,781	21,619	23,199	27,385	31,553	29,124	20,107	24,510	26,619	27,588	3,228
Cuts, lacerations, punctures	3,753	3,601	3,760	3,719	4,001	4,401	4,667	4,458	3,158	3,972	4,445	4,674	532
Soreness, pain, hurt, except the back	851	1,754	1,180	823	936	546	10	80	95	23	27	17	< 5
Intracranial injuries excluding concussions	364	479	527	529	522	314	774	1,054	481	515	590	620	78
Mental disorders or syndromes	682	667	860	960	1,304	1,803	2,366	2,286	2,003	2,472	2,448	2,557	292
Disorders of ear including deafness	40	35	70	54	59	51	54	43	40	48	54	45	< 5
Traumatic injuries, disorders, complications, unspecified, NEC	3,762	3,343	3,573	3,688	5,853	3,556	1,496	3,389	3,514	3,372	3,343	3,779	464
Bruises, contusions	3,995	3,916	3,844	3,798	4,025	6,460	7,496	6,022	3,534	4,513	6,067	7,184	870
Back pain, hurt back	478	813	976	622	816	493	12	78	80	44	64	42	6
Concussion	1,307	1,670	2,145	2,433	3,139	3,513	4,314	4,931	3,301	3,779	4,538	4,933	618
COVID-19 novel coronavirus	0	0	0	0	0	0	0	0	13,080	17,967	22,670	5,734	458
^{9A-8} Total	57,723	56,463	55,749	53,631	59,103	61,894	67,327	67,173	62,054	74,311	86,007	72,027	14,041

RETURN TO WORK (RTW) & Concussion

- Systematic review showed that **most workers RTW within 3-6 months** after concussion
- **5-20% continue to experience work limitations, even for years**
- **COSTLY** to the healthcare system and industry (By the numbers: 2018 WSIB statistical report) 2019
- Workers with PCS may have **a multitude of symptoms including headaches, irritability, cognitive deficits in attention and/or memory, fatigue, sleep disturbance, dizziness, and mental health disorders**

Toccalino D, et al. Occup Environ Med 2021;78:769–776; Maas et al, Lancet Neurol 2017; Ilie G Plos One 2014; Whiteneck et al, J Head Trauma Rehabil 2016; Hwang et al, CMAJ 2008; Sveen et al, Disabil Rehabil 2016

META-ANALYSIS: work-related traumatic brain injury

- Studies included in quantitative synthesis (meta-analysis) (n = 55)
- most common industries **WORK-RELATED TBI: construction, education, healthcare and social assistance, and transportation**
- 17.9% of TBIs were work-related
- 6.3% of work-related injuries resulted in TBI
- Falls, being struck by an object or person, motor vehicle collisions, & assaults were the most commonly reported mechanisms of wr-TBI.

Table 1 Results from pooled proportions and pooled mean meta-analyses

Variable of interest	# of Studies	Pooled estimate	95% CIs	tau ²	I ²
Average age of workers with wrTBI	8	40.44 years	39.62 to 41.26	0.83	85.1%
Proportion of wrTBI that occur in males	19	0.762	0.657 to 0.843	1.27	99.7%
Proportion of TBI that are work-related	8	0.179	0.073 to 0.376	2.12	99.6%
Proportion of work-related injuries that are TBI	32	0.063	0.045 to 0.089	1.01	99.9%
Proportion of wrTBI that are fatal	5	0.036	0.016 to 0.077	0.77	93.6%

TBI, traumatic brain injury; wrTBI, work-related TBI.

WORK vs NON-WORK INJURIES

- comparable post-concussion symptom burden
- **PTSD** more frequent amongst workplace injuries
- **NO workplace/non-workplace mTBI differences in RTW outcome at 6–7 months post injury**
- entire sample: 42.5% of patients had full RTW; 18.4% had partial RTW, and 39.1% had no RTW
- Greater post-concussion symptom burden was most predictive of no RTW at follow-up (6-months)

	Follow-up Sample (n = 87)	Work Injury (n = 38)	Non-work Injury (n = 49)
Follow-up Characteristics			
Lost to follow-up, n (%)	15 (14.7%)	8 (17.4%)	7 (12.5%)
Weeks from Injury to Follow-Up, M (SD)	31.6 (6.1)	31.2 (6.2)	31.8 (6.0)
Compensation status at follow-up, n (%)			
No compensation	40 (46.0%)	24 (63.2%)	16 (32.7%)
Seeking/receiving administrative benefits	23 (26.4%)	14 (34.8%)	9 (18.4%)
Litigating	33 (26.4%)	0 (0%)	23 (46.9%)
Claim Settled	1 (1.1%)	0 (0%)	1 (2.0%)
<i>Primary Outcome</i>			
Return to work status, n (%)			
Full return to work	37 (42.5%)	17 (44.7%)	20 (40.8%)
Partial return to work	16 (18.4%)	7 (18.4%)	9 (18.4%)
No return to work	34 (39.1%)	14 (36.8%)	20 (40.8%)
<i>Secondary Outcomes</i>			
Post-Concussion Symptoms; BC-PSI, M (SD)	20.1 (13.2)	20.2 (13.0)	19.9 (13.5)
Brief Pain Questionnaire (BPQ), M (SD)	4.5 (3.7)	4.7 (3.4)	4.4 (4.0)
ICD-10 Postconcussional Syndrome, n (%)			
Based on Mild+ Symptoms	73 (83.7%)	31 (81.6%)	41 (85.4%)
Based on Moderate+ Symptoms	55 (64.9%)	23 (60.5%)	32 (66.7%)
WHODAS 2.0 Total Score, M (SD)	25.8 (9.6)	25.2 (8.7)	26.3 (10.3)
Return to work status (alternate definition)			
Full RTW with LEAPS = 0–5	20 (23.0%)	9 (23.7%)	11 (22.4%)
No RTW/Partial RTW/Full RTW with LEAPS ≥ 6	67 (77.0%)	29 (76.3%)	38 (77.6%)
Abbreviations: BC-PSI = British Columbia Postconcussion Symptom Inventory; ICD-10 = International Statistical Classification of Diseases and Related Health Problems, 10 th Revision; M = mean; RTW = Return to work; SD = standard deviation; WHODAS = World Health Organization Disability Assessment Schedule, 2.0			
https://doi.org/10.1371/journal.pone.0198128.t002			

	Full Sample (n = 102)	Work Injury (n = 46)	Non-work Injury (n = 56)
Demographics			
Age, M (SD)	41.2 (11.7)	39.0 (11.8)	43.0 (11.4)
Sex, n (% female)	55 (53.9%)	18 (39.1%)	37 (66.1%)
Education level, n (%)			
Did not complete high school	8 (7.9%)	4 (8.7%)	4 (7.1%)
High School	23 (22.6%)	16 (34.8%)	7 (12.5%)
Some College	17 (16.7%)	8 (17.4%)	9 (16.1%)
Diploma	17 (16.7%)	8 (17.4%)	9 (16.1%)
Bachelor's Degree	27 (26.5%)	8 (17.4%)	19 (33.9%)
Graduate Degree	10 (9.8%)	2 (4.3%)	8 (14.3%)
Occupation			
Manual Labor	20 (19.6%)	13 (28.3%)	7 (12.5%)
Skilled craft or trade	13 (12.7%)	9 (19.6%)	4 (7.1%)
Transport	4 (3.9%)	1 (2.2%)	3 (5.4%)
Sales and service	14 (13.7%)	7 (15.2%)	7 (12.5%)
Clerical	6 (5.9%)	0 (0%)	6 (10.7%)
Management or professional	23 (22.5%)	4 (8.7%)	19 (33.9%)
Other	22 (21.6%)	12 (26.1%)	10 (17.9%)
Pre-injury Mental Health Treatment	53 (52.0%)	27 (58.6%)	26 (46.4%)
Injury Characteristics			
Mechanism of Injury, n (%)			
Struck by object	30 (29.4%)	20 (43.5%)	10 (17.9%)
Motor vehicle crash	29 (28.4%)	3 (6.5%)	26 (46.4%)
Fall	28 (27.5%)	14 (30.4%)	14 (25.0%)
Sport	5 (4.9%)	0 (0%)	5 (8.9%)
Assault	5 (4.9%)	5 (10.9%)	0 (0%)
Other	5 (4.9%)	4 (8.7%)	1 (1.8%)
Loss of Consciousness, n (%)			
Witnessed LOC	18 (17.7%)	5 (10.9%)	13 (23.2%)
Unwitnessed LOC	23 (22.5%)	11 (23.9%)	12 (21.4%)
Unknown	12 (11.8%)	5 (10.9%)	7 (12.5%)
Denied	49 (48.0%)	25 (54.3%)	24 (42.9%)
Post-traumatic amnesia, n (%)	67 (65.7%)	33 (71.7%)	34 (60.7%)
Acute confusion/disorientation, n (%)	90 (88.2%)	42 (91.3%)	48 (85.7%)
Co-occurring orthopedic injury, n (%)	63 (61.8%)	21 (45.7%)	38 (67.9%)
Initial Assessment Characteristics			
Weeks to initial assessment, M (SD)	12.05 (6.3)	10.1 (5.5)	13.7 (6.4)
Primary care visits since injury, M (SD)	6.4 (4.4)	5.9 (3.9)	6.8 (4.7)
Self-Reported Treatment Utilization Since Injury, n (%)			
Emergency Department	78 (76.4%)	32 (68.6%)	46 (82.1%)
Specialist (e.g., neurologist)	39 (38.2%)	24 (52.2%)	15 (26.8%)
Physiotherapist	47 (46.1%)	19 (41.3%)	28 (50.0%)
Occupational Therapist	12 (11.8%)	4 (8.7%)	8 (14.3%)
Psychological therapy/counseling	10 (9.8%)	2 (4.3%)	8 (14.3%)
Massage Therapy	31 (30.4%)	7 (15.2%)	24 (52.2%)
Chiropractic treatments	12 (11.8%)	3 (13.0%)	9 (16.1%)
Acupuncture treatment	10 (9.8%)	3 (6.5%)	7 (12.5%)
Compensation status at initial assessment, n (%)			
No compensation	13 (12.7%)	1 (2.2%)	12 (21.4%)
Seeking/receiving administrative benefits	71 (69.6%)	45 (97.8%)	26 (46.4%)
Litigating	18 (17.6%)	0 (0%)	18 (32.1%)
Return to work status, n (%)			
Full return to work	11 (10.8%)	1 (2.2%)	10 (17.9%)
Partial return to work	16 (15.7%)	4 (8.7%)	12 (21.4%)
On leave	73 (71.6%)	40 (87.0%)	33 (58.9%)
Other	2 (2.0%)	1 (2.2%)	1 (1.8%)
Perceived Injustice; IEQ Total, M (SD)	20.8 (10.9)	22.7 (10.5)	19.2 (11.3)
Traumatic Stress; PCL-5, M (SD)	29.2 (17.0)	32.7 (17.9)	26.2 (15.9)
Brief Pain Questionnaire (BPQ), M (SD)	4.9 (3.3)	5.6 (3.5)	4.3 (3.0)
Post-Concussion Symptoms; BC-PSI, M (SD)	25.4 (12.8)	27.0 (13.4)	24.1 (12.2)
Performance Validity; MSVT Failures, n (%)	23 (22.5%)	9 (19.6%)	14 (25.0%)
Self-Prognosis Rating, n (%) (Note: n = 3 missing)			
Get better soon	14 (14.3%)	7 (16.3%)	7 (12.7%)
Get better slowly	60 (61.2%)	29 (66.4%)	31 (56.4%)
I don't know	24 (24.5%)	7 (16.3%)	17 (30.9%)

The information in this table was collected between 2 and 26 weeks following injury (M = 12.06, SD = 6.3). Abbreviations: BC-PSI = British Columbia Postconcussion Symptom Inventory; IEQ = Injustice Experience Questionnaire; FABQ = Fear Avoidance Beliefs Questionnaire; M = mean; PCL-5 = PTSD Checklist for DSM-5; SD = standard deviation.

HEALTHCARE UTILIZATION AFTER MTBI

- Health-care utilization of workers (N=728) who made an incident claim involving mTBI to the Ontario WSIB 1997 - 1998
- Linked workers' compensation and Ontario Health Insurance Plan files and collected all health care services accrued during year before & 2 years after claim was initiated
- 65.8% of claims filed by men; 28.3% filed by those aged between 25 and 34 years
- Cumulative rate of health care utilization was stable (mean 67.6 visits/ 1000 claimants per day) throughout the year before claim initiation
- Health care utilization peaked during first 4 weeks following claim (mean=274.3 visits/1000 claimants d) & remained **182% higher** than baseline from 5th to 12th week postclaim.
- **2 years after initiation of claim, utilization remained 9.5% higher than preclaim level**

- workers' compensatio
claim involv
MTBI is
associated w
long-term
increase in
health care u

Table 4 Cumulative rate of health care utilization per 1000 workers per day in the first year postclaim stratified by diagnostic category

Diagnostic Category	Baseline Average (95% CI)	% of All Services During Baseline	Year 1 Average (95% CI)	% of All Year 1 Services	% Change From Baseline*
Infectious and parasitic disease	1.14 (1.02–1.25)	1.80	1.09 (0.85–1.33)	1.00	–4.38
Neoplasms	0.34 (0.28–0.40)	0.54	0.52 (0.35–0.70)	0.48	52.94
Endocrine, nutritional, and metabolic diseases and immunity disorders	1.02 (0.91–1.13)	1.61	0.95 (0.75–1.15)	0.87	–6.86
Diseases of blood and blood-forming organs	0.08 (0.05–0.10)	0.12	0.11 (0.00–0.27)	0.10	37.50
Mental disorders	2.62 (2.45–2.80)	4.16	8.97 (7.91–10.03)	8.23	242.4
Diseases of the nervous system and sense organs	2.93 (2.72–3.14)	4.63	8.85 (7.63–10.08)	8.12	202.0
Diseases of the circulatory system	1.96 (1.81–2.11)	3.09	3.98 (3.47–4.49)	3.65	103.1
Diseases of the respiratory system	3.48 (3.29–3.66)	5.48	3.88 (3.41–4.36)	3.56	11.49
Diseases of the digestive system	2.13 (1.98–2.28)	3.36	2.09 (1.78–2.41)	1.92	–1.88
Diseases of the genitourinary system	1.65 (1.52–1.79)	2.61	2.02 (1.72–2.32)	1.85	22.42
Complications of pregnancy, childbirth, and the perineum	0.29 (0.22–0.36)	0.46	0.44 (0.20–0.67)	0.40	51.72
Diseases of the skin and subcutaneous system	1.14 (1.04–1.25)	1.80	1.32 (1.10–1.54)	1.21	15.79
Diseases of the musculoskeletal system and connective tissue	4.02 (3.82–4.22)	6.35	8.15 (7.11–9.19)	7.48	102.7
Congenital anomalies	0.03 (0.02–0.05)	0.05	0.03 (0.00–0.17)	0.03	0
Perinatal morbidity and mortality	0	0	0.01 (0.00–0.23)	0.01	0
Symptoms, signs, and ill-defined conditions	0.52 (0.46–0.59)	0.82	0.89 (0.66–1.11)	0.81	71.15
Accident, poisoning, and violence	5.13 (4.89–5.37)	8.10	19.11 (13.25– 24.97)	17.53	272.5
Supplementary classification	0.90 (0.81–1.00)	1.43	0.89 (0.68–1.11)	0.82	–1.11
Without diagnosis†	33.96 (32.41–35.52)	53.59	45.68 (42.50– 48.87)	41.91	34.51

Predictors of six-month inability to return to work in previously employed subjects after mild traumatic brain injury: A TRACK-TBI pilot study

John K Yue^{1,2,*}, Ryan RL Phelps^{1,2,*}, Debra D Hemmerle^{1,2}, Pavan S Upadhyayula³, Ethan A Winkler^{1,2}, Hansen Deng⁴, Diana Chang^{1,2}, Mary J Vassar^{1,2}, Sabrina R Taylor^{1,2}, David M Schnyer⁵, Hester F Lingsma⁶, Ava M Puccio³, Esther L Yuh^{2,7}, Pratik Mukherjee^{2,7}, Michael C Huang^{1,2}, Laura B Ngwenya⁸, Alex B Valadka⁹, Amy J Markowitz², David O Okonkwo⁴, Geoffrey T Manley^{1,2}, TRACK-TBI Investigators[‡]

152 subjects; Mean age: 40; 73%M; 81%Caucasian
72% employed at baseline

RTW was 77.6% at 3 months and 78.9% at 6 months
At 3 months, the proportion of subjects scoring positive for ACE physical (59%), sleep (47%), cognitive (46%), and emotional (32%) symptoms

ACE emotional (three months)- PREDICTED NO RTW at 6mo

61.2% had no intracranial abnormalities on CT.

HEADS UP
CLINICIANS

ACUTE CONCUSSION EVALUATION (ACE)
PHYSICIAN/CLINICIAN OFFICE VERSION
Gerard Gioia, PhD¹ & Micky Collins, PhD²
¹Children's National Medical Center
²University of Pittsburgh Medical Center

Patient Name: _____
DOB: _____ Age: _____
Date: _____ ID/MR# _____

A. Injury Characteristics
Date/Time of Injury _____ Reporter: __Patient__Parent__Spouse__Other__
1. Injury Description _____
1a. Is there evidence of a forcible blow to the head (direct or indirect)? __Yes__No__Unknown
1b. Is there evidence of intracranial injury or skull fracture? __Yes__No__Unknown
1c. Location of Impact: __Frontal__Lft Temporal__Rt Temporal__Lft Parietal__Occipital__Neck__Indirect Force
2. Cause: __MVC__Pedestrian-MVC__Fall__Assault__Sports (specify) _____Other _____
3. Amnesia Before (Retrograde) Are there any events just BEFORE the injury that you/ person has no memory of (even brief)? __Yes__No Duration _____
4. Amnesia After (Anterograde) Are there any events just AFTER the injury that you/ person has no memory of (even brief)? __Yes__No Duration _____
5. Loss of Consciousness: Did you/ person lose consciousness? __Yes__No Duration _____
6. EARLY SIGNS: __Appears dazed or stunned__Is confused about events__Answers questions slowly__Repeats Questions__Forgetful (recent info) _____
7. Seizures: Were seizures observed? No__Yes__Detail _____

B. Symptom Check List* Since the injury, has the person experienced any of these symptoms any more than usual today or in the past day?
Indicate presence of each symptom (0=No, 1=Yes).
**Lovell & Collins, 1998 JHTR*

PHYSICAL (10)		COGNITIVE (4)		SLEEP (4)	
Headache	0 1	Feeling mentally foggy	0 1	Drowsiness	0 1
Nausea	0 1	Feeling slowed down	0 1	Sleeping less than usual	0 1 N/A
Vomiting	0 1	Difficulty concentrating	0 1	Sleeping more than usual	0 1 N/A
Balance problems	0 1	Difficulty remembering	0 1	Trouble falling asleep	0 1 N/A
Dizziness	0 1	COGNITIVE Total (0-4) _____		SLEEP Total (0-4) _____	
Visual problems	0 1	EMOTIONAL (4)		Exertion: Do these symptoms <u>worsen</u> with: Physical Activity __Yes__No__N/A Cognitive Activity __Yes__No__N/A Overall Rating: How <u>different</u> is the person acting compared to his/her usual self? (circle) Normal 0 1 2 3 4 5 6 Very Different	
Fatigue	0 1	Irritability	0 1		
Sensitivity to light	0 1	Sadness	0 1		
Sensitivity to noise	0 1	More emotional	0 1		
Numbness/Tingling	0 1	Nervousness	0 1		
PHYSICAL Total (0-10) _____		EMOTIONAL Total (0-4) _____			
(Add Physical, Cognitive, Emotion, Sleep totals)		Total Symptom Score (0-22) _____			

C. Risk Factors for Protracted Recovery (check all that apply)

Concussion History? Y__N__	Headache History? Y__N__	Developmental History	Psychiatric History
Previous # 1 2 3 4 5 6+	Prior treatment for headache	Learning disabilities	Anxiety
Longest symptom duration Days__Weeks__Months__Years__	History of migraine headache __Personal__Family	Attention-Deficit/ Hyperactivity Disorder	Depression
If multiple concussions, less force		Other developmental	Other psychiatric disorder

PREDICTORS OF RETURN TO WORK

➤ Mixed results:

- Lower level of education, nausea or vomiting on hospital admission, extracranial injuries, severe pain early after injury, and limited job independence and decision-making latitude predict delayed RTW (Cancelliere, Arch Phys Med Rehabil. (2014) 95:S201–9)
- Age, multiple bodily injuries, intracranial abnormality, and fatigue (Wäljas J Head Trauma Rehabil. (2014) 29:443–50.)
- Psychological distress, global functioning post-injury, and being sick-listed 2 months after and the last year before mTBI (Vikane Behav Neurol. (2016) 2016:1–10.)
- Residual symptoms and comorbid psychiatric conditions (Silverberg, Arch Phys Med Rehabil. (2018) 99:250–6.)
- Cognitive complaints at 1 month post-injury (Theadom, Arch Phys Med Rehabil. (2017) 98:1560–6.)
- Cognitive complaints (Mani et al, Work (2017) 58:51–62.)

INTERVENTIONS

➤ MIXED:

- Information about concussion, reassurance of likely recovery, early management plan (Arbabi et al., 2020; Heslot et al., 2022; Sullivan et al., 2020; Teo et al., 2020; Tracey et al., 2023)
- Psychological treatments (i.e. psychotherapy or neuropsychological training - help with emotion regulation; cognitive behaviour therapy, problem solving therapy, and counselling are effective for reducing concussion symptoms) (Arbabi et al., 2020; Cooper et al., 2015; Little et al., 2021; Möller et al., 2021; Rytter et al., 2021; Sullivan et al., 2020; Teo et al., 2020; Thomas et al., 2017)
- Neuropsychological training in reducing symptoms Rehabilitative interventions, i.e. vestibular, vision, and physical exercise (subthreshold aerobic) training; compensatory cognitive strategies or cognitive training (Galeno et al., 2022; Kinne et al., 2015; Rytter et al., 2021; Schlemmer & Nicholson, 2022; Heslot et al., 2022; Rytter et al., 2021; Carter et al., 2021; Rytter et al., 2021; Vuu et al., 2022)
- Compensatory cognitive strategies/cognitive training also tend to produce symptom improvement (Arbabi et al., 2020; Cooper et al., 2015; Heslot et al., 2022; Teo et al., 2020; Tracey et al., 2023)

INTERVENTIONS

➤ Vocational rehabilitation –tailored approach

(Dornoville de la Cour et al. 2019)

➤ Inter-disciplinary (Rytter et, 2023)

Table 1. Overview of the structure of the S-REHAB programme.

	Module 1	Module 2
Duration	12 wks	10 wks
Content	<ul style="list-style-type: none"> • 12–14 individual consultation sessions (1–2 h/wk) with a neuropsychologist • 24 h in a group therapy (2 h/wk) combining psychoeducation, small exercises and group conversations • 33 h (2–3 h/wk) of individual exercise training and coaching by a physiotherapist 	<ul style="list-style-type: none"> • 10 individual consultation sessions (1 h/wk) with a neuropsychologist • 16 h of group work (1.5 h/wk) combining group exercises and conversations • 10.5 h (1 h/wk) of individual exercise training and coaching with a physiotherapist • 1 meeting with a case manager in participant's municipality • 2 meetings with an existing or potential employer

RTW

Table 4. Results at 6-month follow-up.

Measure	STAND Mean (SD)	S-REHAB Mean (SD)	F	p	ES
Primary outcome measure					
RPSQ Total score	35.30 (7,57)	29.69 (12.92)	8.17	0.005*	0.26
Secondary outcome measure					
HIT-6 Total score	61.77 (6.89)	57.11 (8.99)	8.94	0.004*	0.68
MDI Total score	18.52 (10.29)	13.07 (9.27)	7.29	0.008	0.40
MFI-20					
- General fatigue ^b	75.57 (16.71)	71.11 (19.83)	4.01	0.048	0.56
- Physical fatigue	69.55 (20.17)	61.89 (21.033)	2.19	0.143	0.19
- Reduced activities ^b	68.86 (17.58)	57.11 (23.32)	9.88	0.002	0.74
- Reduced motivation ^b	49.89 (13.18)	44.00 (15.76)	2.39	0.126	0.11
- Mental fatigue	69.89 (13.75)	62.00 (19.32)	6.02	0.016	0.50
SF-36					
- Physical functioning ^a	67.96 (20,15)	76.33 (20.15)	0.04	0.838	0.004
- Role functioning/ physical	13.07 (26.68)	22.78 (31.00)	1.66	0.201	0.07
- Role functioning/ emotional ^a	55.30 (47.66)	76.30 (38.68)	2.20	0.142	0.12
- Energy/fatigue	36.25 (17.49)	40.44 (21.10)	1.77	0.187	0.24
- Emotional well-being ^a	60.64 (17.66)	68.36 (15.44)	2.45	0.12	0.23
- Social functioning	46.31 (24.94)	55.83 (28.03)	2.21	0.14	0.25
- Pain ^a	43.35 (20.67)	54.72 (27.25)	3.91	0.051	0.25
- General health	47.16 (14.56)	56.33 (20.15)	7.84	0.006	0.42
- Health change ^a	55.68 (20.79)	63.89 (27.98)	2.60	0.111	0.28
General questionnaire					
Problems related to:					
- Muscle strength	5.00 (1.98)	3.31 (2.44)	8.23	0.005*	0.24
- Balance	4.34 (2.56)	3.31 (2.64)	4.23	0.043	0.35
- Vertigo ^b	4.68 (2.51)	3.51 (2.79)	4.51	0.037	0.38
- Pain	6.43 (2.32)	5.02 (3.15)	5.59	0.020	0.45
- Quality of sleep ^b	5.52 (2.76)	4.04 (2.94)	4.71	0.033	0.28
General questionnaire					
Satisfaction with:					
- Current working conditions	1.84 (1.10)	2.47 (1.40)	9.18	0.003*	0.68
- Leisure life	2.52 (1.02)	3.33 (1.19)	11.18	0.001*	0.56

mTBI/Concussion & Return to work

- RTW as a surrogate marker for functional recovery
- RTW is a good prognostic sign for recovery
- WHO recognizes RTW as a critical outcome measure in the context of injury & disability
- Delayed RTW = significant psychosocial & economic consequences
- Lost income = worsening of outcome bc increases barriers to rehab
- RTW encompasses ability to resume prior duties, equal quality, efficiency, and stamina as pre-injury performance
- Different therapies available: full spectrum from TIME to comprehensive, multi/inter-disciplinary (*Expensive & may not be required by most*)

Exploring the cost–utility of stratified primary care management for low back pain compared with current best practice within risk-defined subgroups

David G T Whitehurst,^{1,2,3} Stirling Bryan,^{1,2} Martyn Lewis,³ Jonathan Hill,³ Elaine M Hay³

The Keele STarT Back Screening Tool

Patient name: _____ Date: _____

Thinking about the last 2 weeks tick your response to the following questions:

	Disagree 0	Agree 1
1 My back pain has spread down my leg(s) at some time in the last 2 weeks	<input type="checkbox"/>	<input type="checkbox"/>
2 I have had pain in the shoulder or neck at some time in the last 2 weeks	<input type="checkbox"/>	<input type="checkbox"/>
3 I have only walked short distances because of my back pain	<input type="checkbox"/>	<input type="checkbox"/>
4 In the last 2 weeks, I have dressed more slowly than usual because of back pain	<input type="checkbox"/>	<input type="checkbox"/>
5 It's not really safe for a person with a condition like mine to be physically active	<input type="checkbox"/>	<input type="checkbox"/>
6 Worrying thoughts have been going through my mind a lot of the time	<input type="checkbox"/>	<input type="checkbox"/>
7 I feel that my back pain is terrible and it's never going to get any better	<input type="checkbox"/>	<input type="checkbox"/>
8 In general I have not enjoyed all the things I used to enjoy	<input type="checkbox"/>	<input type="checkbox"/>

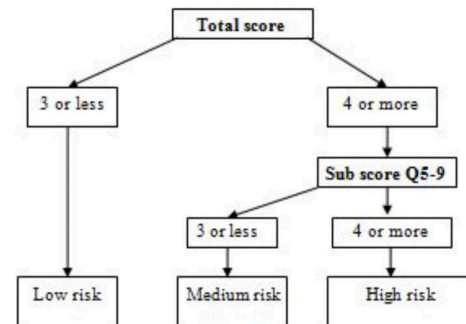
9. Overall, how bothersome has your back pain been in the last 2 weeks?

Not at all Slightly Moderately Very much Extremely
☐ ☐ ☐ ☐ ☐
0 1 2 3 4

Total score (all 9): _____ Sub Score (Q5-9): _____

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Funded by Arthritis Research UK

The STarT Back Tool Scoring System



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Funded by Arthritis Research UK

Conclusions Compared with current best practice, stratified primary care management for low back pain provides a highly cost-effective use of resources across all risk-defined subgroups.

Post-concussion Symptom Risk Stratification Tool for PREDICTing RETURN TO WORK

- Development of PCS Risk Stratification Tool (PCS RST) based on retrospective cohorts groups
 - These groups of retrospectively documented PCS patients used to identify patients at low or high risk of persistent symptoms and failure to RTW
- **MISSION: Get the right therapy to the right patient at the right time**

Risk Stratification Tool-INTAKE FORM

REVIEW LITERATURE & EXPERT PANEL REVIEW



UPDATE LIST & SEND SURVEY TO EXPERT PANEL



CHART REVIEW TO GATHER VARIABLES IDENTIFIED
(Questionnaire sent)



DATA FOR DEVELOPING MODEL for PCS RST



Validate PCS RST in clinic patients with mTBI & not
RTW



CANADIAN
CONCUSSION
CENTRE

Age: (last) concussion (dd/mm/yyyy):

Date of visit (dd/mm/yyyy):

Time of visit:



Risk Stratification Tool

Medical History

Before the concussion, did you have headaches or migraines? ☐ Yes ☐ No

Before the concussion, did you have a mental health disorder? E.g. depression, anxiety, bipolar disorder, schizophrenia, post-traumatic stress disorder (PTSD) ☐ Yes ☐ No

Injury Information

How did the most recent Concussion Happen?

- ☐ Motor Vehicle Collision (not including pedestrians or cyclists)
- ☐ Fall
- ☐ Striking Object/Falling Object
- ☐ Other

Did you lose consciousness/"blackout" when you sustained your concussion? ☐ Yes ☐ No

Are there any events just before OR after the event that you have no memory of? ☐ Yes ☐ No

Symptoms

Indicate "Yes" for ANY symptoms that developed within 1 month of the concussion, and that persisted beyond that first month, whether or not you are experiencing these symptoms now

Where multiple symptoms are listed together in one box, indicate "Yes" if you have experienced/are experiencing *any* of the symptoms in that given box.

Headache, pressure in head ☐ Yes ☐ No

Neck pain ☐ Yes ☐ No

Dizziness, imbalance, lightheadedness, incoordination, vertigo ☐ Yes ☐ No

Vision problems (blurred vision, double vision, sensitivity to light) ☐ Yes ☐ No

Sensitivity to noise ☐ Yes ☐ No

Fatigue, tiring more easily, drowsiness, hypersomnial/daytime somnolence ☐ Yes ☐ No

Memory problems such as poor memory, forgetfulness, difficulty remembering ☐ Yes ☐ No

VALIDATION of the PCS Risk Stratification Tool in Prospective Cohort:

- 75 patients with persistent symptoms of concussion recruited from the CCC concussion clinics and Altum.
- PCS Risk Stratification Tool administered and based on responses each patient assigned to the Low, Medium or High-Risk category
- Participants assessed at five time points: initial clinic visit, and subsequently at 3, 6, 9 and 12 months following their initial study visit.
- INCL: Age 18-60; PCS 1-12mo; 3+ symptoms, FTE/PTE at injury, Eng speaking, Pass TOMM
- EXCL: MRI abnormalities, history of neurological conditions or major psychiatric diseases

	N	Sex (M/F)	Age	Number of Concussions	Cause of the Injury
Baseline	83	63/20	46.27±10.51	2.18±1.57	MVC:7 Fall:13 Striking Object:58 Other:5
3-month follow-up	71	54/17	46.63±10.73	2.26±1.60	MVC:5 Fall:11 Striking Object:50 Other:5
6-month follow-up	47	34/13	46.70±11.19	2.04±1.47	MVC:3 Fall:9 Striking Object:33 Other:2
9-month follow-up	28	19/9	46.03±11.63	2.07±1.53	MVC:1 Fall:2 Striking Object:23 Other:2
12-month follow-up	22	15/7	46.22±11.04	2.09±1.54	MVC:1 Fall:0 Striking Object:20 Other:1

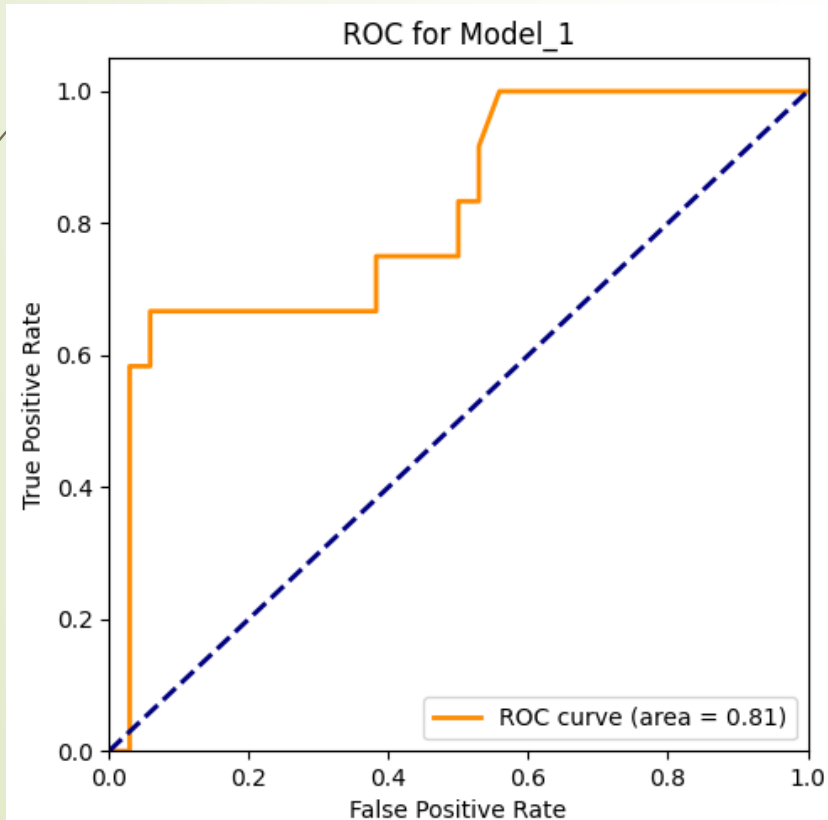
RST results for all patients enrolled as of April 30, 2024

Classification of failure to Return to Work	Number
Low Risk	16
High Risk	67
TOTAL	83

ONGOING STUDY

3 months (N=71)			6 months (N=47)			9 months (N=28)			12 months (N=22)		
RTW (Y/N)	modified (Y/N)	Baseline (Y/N)	RTW (Y/N)	modified (Y/N)	Baseline (Y/N)	RTW (Y/N)	modified (Y/N)	Baseline (Y/N)	RTW (Y/N)	modified (Y/N)	Baseline (Y/N)
48/23	37/34	11/60	36/11	24/23	12/35	24/4	14/13	11/16	20/2	8/14	12/10

6-month



Model	Accuracy	Precision	Recall	F1-Score	ROC AUC
Model_1	0.85	0.82	0.76	0.78	0.814951

CONCLUSION



- WHO recognizes RTW as a critical outcome measure in the context of injury & disability
- Concussion associated with a variety of symptoms that interfere with work
- Facilitating early identification of those at high risk of failing to RTW can help with getting the Right Treatment to the Right Person at the Right Time =
PRECISION/PERSONALIZED MEDICINE

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Law Society
of Ontario

Barreau
de l'Ontario

TAB 9B

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Concussion and the Workplace

“SABS and Sustainability: Why and How an Insurer Supports a Claimant's Return to Function” (PPT)

Michelle Friedman, AVP/Managing Counsel for Accident Benefits
Aviva Trial Lawyers

Noella Thompson, Senior Counsel
Aviva Trial Lawyers

May 30, 2024





AVIVA TRIAL LAWYERS

“SABS and Sustainability: Why and How An Insurer Supports a Claimant's Return to Function”
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DID YOU KNOW?

Insurers do not simply want to report a better COR ratio to its shareholders or to take your hard-earned premium dollars.

Insurers want to work together with insureds to restore their position.

Litigation should be a last resort.

INSURERS WANT TO RESTORE CLAIMANTS TO WORK/FUNCTION BECAUSE:

- 1. Insurers do not want to be mere administrators of benefits.**
- 2. Insurers want to provide care and treatment to claimants to restore their functionality in society.**
- 3. Returning claimants to function is part of the sustainability goal of insurers.**

Corporate sustainability is a way of doing business that creates sustainable and long-term shareholder, employee, consumer and societal value by pursuing ESG strategies.

(1) THE ENVIRONMENTAL PILLAR

Examples: (i) Reducing carbon footprint; (ii) reducing wasteful practices; (iii) dealing with environmentally conscious suppliers/investors etc.

(2) THE SOCIALLY RESPONSIBLE PILLAR

Practices that benefit company employees, consumers and the community at large.

(3) THE ECONOMIC PILLAR (OR GOVERNANCE PRACTICES)

Honest and transparent accounting/regulatory compliance

Together these 3 pillars support sustainable goals.

DID YOU KNOW?

Practices that restore a claimant's return to work or return to function are **socially responsible practices**. They are an example of the second pillar of corporate sustainability.

DID YOU KNOW?

There has been a significant rise in mild traumatic brain injury claims and all decision makers want to provide the best **pathways to recovery**.



KEY WAYS INSURERS SUPPORT RETURN TO FUNCTION:

- 1. Considering whether a claimant has met their onus to prove an inability to work (s.58(2) SABS).**
- 2. Approving those reasonable and necessary expenses which aid in recovery/return to function (s.15-18 SABS).**
- 3. Carefully reviewing the medical evidence provided with an open mind.**
- 4. Referring a claimant for insurer assessments, not more than is reasonably necessary (s.44 SABS), to understand what is wrong and what care is needed. The type and nature of these assessments is covered in other presentations today.**
- 5. Considering whether a claimant is participating in their own recovery by continuing to seek treatment and making reasonable efforts to return to work or other suitable employment (s.57-58 SABS).**

1. HAS AN INABILITY TO WORK BEEN PROVEN?

The legal test for whether a claimant should return to work is fundamentally similar across various benefit regimes. It centers around the ability to perform the tasks of one's **own occupation vs. any occupation**.

The tests for income continuation benefits across various regimes are complex. This presentation is intended to give a high-level overview only from the *Statutory Accident Benefits Schedule* perspective.

s.5(1)1.i. SABS – Legal Test for Income Replacement Benefit Pre-104:

Whether the insured is **substantially unable** to perform the **essential tasks** of their pre-accident employment **as a result of** an **accident-related impairment**.

s.6(2)(b) SABS – Legal Test for Income Replacement Benefit Post-104

Whether the insured person suffers a **complete inability** to engage in **any employment/self-employment** for which they are **reasonably suited by education, training or experience**.

THE ONUS IS ALWAYS ON THE CLAIMANT TO PROVE ON A BALANCE OF PROBABILITIES THAT THEY ARE UNABLE TO WORK.

Elisha v. Aviva Insurance Company, 2024 CanLII 20678 (ON LAT)

Failing to meet the pre or post 104 test means the insurer will expect the claimant to return to work or find alternative suitable employment!

THE ONUS IS CREATED BY STATUTE (SABS S.58(2)):

The insured person shall make reasonable efforts to,

- (a) Return to the employment or self-employment in which they were engaged at the time of accident
- (b) Obtain employment for which they are reasonably suited by education, training or experience

17-004229 v. The Guarantee Company of North America, 2018 CanLII 12115 (ON LAT)

Treatment considerations:

- The **sustainability goal** of insurers includes accountability for **safeguarding an insured's benefits limits** and not approving unnecessary or irrelevant treatment.
- Application of **socially responsible practices** ensuring an insured receives effective and directed treatment tailored specifically to **support the insured's return to function**.

Examples of Reasonable & Necessary expenses pertaining to concussion:

- Assistive devices – memory aids
- Cognitive treatment
- Counselling and stress management
- Skills training/re-training
- Job reintegration programs

Knight v Aviva General Insurance, 2024 CanLII 30720 (ON LAT)

Hall v Unifund Assurance Company, 2023 CanLII 58499 (ON LAT)

3. WHAT TYPE OF MEDICAL EVIDENCE DOES THE INSURER LOOK FOR?

What type of medical evidence is a SABS insurer looking for in considering how to restore a claimant to work and/or function?

- Mandatory Disability Certificate indicating need for benefits.
- Clinical notes and records of the insured's family doctor and **treating practitioners** that support the reason and recommendation for the treatment.
- Treatment plans with **clear and measurable outcomes**.
- Evidence of benefit or improvement from treatment provided.
- Diagnostic tests

3. CT'D. WHAT TYPE OF NON-MEDICAL EVIDENCE DOES THE INSURER LOOK FOR?

Non-medical evidence an insurer is looking for

- Vocational assessments.
- Transferrable Skills Assessment/Labour Market Analysis.

16-000874 v Certas Home and Auto Insurance Company

- A description of the essential tasks of the insured's employment (job description).
- A description of the insured's education, training and experience.

Berkoh v Scottish & York, 2021 CanLII 110991 (ON LAT)

5. CLAIMANTS MUST BE ACTIVE PARTNERS IN THEIR OWN RECOVERY

There are **reciprocal obligations** in the SABS both on the insurer and the insured.

An insurer must, for example:

- Act in good faith
- Determine entitlement based on all information available;
- Reassess entitlement upon receipt of new material information;
- Pay for all reasonable and necessary benefits for which an insured is entitled under the SABS
- Respond within timelines and in the method prescribed (compliance with notice and “medical reasons” requirements”) (ss.36(4); 36(7)-(8); 37(5)-(6); s.38; 42(3) and (13); s.44 to name just a few!)

Failure to adhere to its obligations will cost the insurer possible s.51 interest, special award, deemed incurred items etc.

An insured person must, for example:

- Provide requested information to the insurer to assist in determining entitlement to a benefit (s.33).
- Be an active partner in their recovery:
- Section 57 (2) An insured person who is entitled to an income replacement, non-earner or caregiver benefit shall obtain such treatment and participate in such rehabilitation as is reasonable, available and necessary to,
 - (a) permit the insured person to engage in employment or self-employment in accordance with the criteria set out in subsection (3), in the case of an insured person entitled to an income replacement benefit;

Gamble v Allstate Insurance Company of Canada, 2022 CanLII 68295 (ON LAT)

58 (2) The insured person shall make reasonable efforts to,

- (a) return to the employment or self-employment in which he or she was engaged at the time of the accident;
- (b) obtain employment for which he or she is reasonably suited by education, training or experience; or
- (c) engage in self-employment for which he or she is reasonably suited by education, training or experience.

11. A person receiving an income replacement benefit may return to or start employment or self-employment at any time during the first 104 weeks for which he or she is receiving the benefit without affecting his or her entitlement to resume receiving any benefits to which he or she is entitled under this Part if, as a result of the accident, he or she is unable to continue the employment or self-employment.

WHO ARE THE DECISION MAKERS ?

Where a claim has been made:

- Adjuster
- Manager
- Internal Review

When a dispute resolution process is initiated:

- Adjudicator
- Court on appeal or review



**SOCIAL
RESPONSIBILITY**

**RETURN TO
WORK**

Insurers and insureds working together to support
return to function

**RETURN TO
FUNCTION**

**WORKING
TOGETHER**

SUSTAINABILITY

... Thank you



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TAB 9C

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Concussion and the Workplace

Concussion and the Workplace: *The Post-Return Accommodation Process* (PPT)

Jennifer Heath
Piccolo Heath LLP

May 30, 2024



Concussion and the Workplace: *The Post-Return Accommodation Process*

**Jennifer Heath
Piccolo Heath LLP**

Law Society of Ontario
Concussion Symposium for Legal Practitioners, Insurers,
Judges, and Clinicians 2024
May 30, 2024

Employer's Duty to Accommodate

- Required by human rights and workplace safety and insurance legislation
- Must accommodate those who fall within protected grounds to the point of undue hardship
- *“The duty to accommodate means that the terms and conditions of the workplace, or the functions of a job, may have to be changed.”*

(OHRC Policy and Guidelines on Disability and the Duty to Accommodate)



Employer's Obligations

- Be alert to need for accommodation
- Accept request for accommodation in good faith
- Ensure that alternatives and possible accommodation solutions are investigated and assessed
- Obtain expert opinion or advice when required – pay for medical where required
- Limit requests for medical to what is reasonable
- Implement accommodations in a timely manner
- Maintain a record of accommodation request and action taken
- Maintain confidentiality

Employee's Obligations

- Advise employer of existence of disability
- Make needs known to best of their ability
- Provide information concerning restrictions
- Assist in the search for accommodation and accept reasonable alternatives
- Cooperate with experts if information is unavailable to employee
- Meet agreed-upon performance standards once accommodation is provided



Case Law Regarding Post-Concussion Accommodation

- *Berti v. Complex Services Inc.*, 2013 HRTO 1304
- Employer accommodated employee's post-concussion syndrome for 7 years by permitting:
 - employee to not work more than two consecutive shifts and more than four shifts per week;
 - employee to work evening shifts, as employee's symptoms were less severe in the evening;
 - employee to take additional breaks;
 - scheduling another employee to work with employee to avoid employee working alone.
- Employee met with employer's occupational physician, who determined that further accommodation was not required.
- Employer scheduled employee to work alone one evening and after employee's shift went very poorly, their employment was terminated.

Case Law Regarding Post-Concussion Accommodation

- Employee filed an Application, alleging failure to accommodate him, leading to the termination of his employment
- HRTO dismissed Application as it had no reasonable prospect of success, finding:
 - Employee did not demonstrate that difficulties he faced during the shift he worked alone were *caused* by his disability, and working alone was never a *required* accommodation, though Employer provided this
 - Employee acknowledged that Employer continued to accommodate his needs for modified shifts throughout his employment
 - Employer engaging an occupational physician to gather information regarding the Employee's ongoing need for accommodation was permitted and did not amount to a violation of the *Code*.



Challenges For Employers and Employees Post-Concussion

- HR or manager relying on stereotypes/anecdotes re: recovery
- Lack of central, informed feedback mechanism about employee needs, job-based demands
- Assumption of a linear recovery/accommodation process
- Employees lacking awareness/understanding of their own recovery and the impact on their work product
- Distinguishing between performance/effort issue and a problem requiring accommodation
- Mistrust on both sides
- Maintaining confidentiality

Keep in Touch!

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TAB 9D

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Concussion and the Workplace

Return to work Post Concussion (An Occupational Therapy Perspective) (PPT)

Anoli Shah, Occupational Therapist, OT Reg. (Ont.)
Altum Health, University Health Network

May 30, 2024



RETURN TO WORK POST CONCUSSION (An Occupational Therapy Perspective)

Anoli Shah, OT Reg. (Ont.)

Occupational Therapist

Altum Health, University Health Network

HOW CAN OCCUPATIONAL THERAPISTS HELP WITH RTW?

Education on
the importance
of RTW

Assess RTW
readiness

Prescribe
assistive and
ergonomic
devices

Develop
personalized
RTW plans

Job demands
analysis

Graduated
RTW
monitoring

Functional
abilities
evaluations

Accommodations
and limitations

Symptom
management

On-site and
off-site
coaching

HOW DO WE DETERMINE A CLIENT IS FIT TO RTW?

- Subjective report and client's perceived barriers
- Consideration of medical, psychosocial, and workplace related barriers
 - Medical/clinical: (e.g. high symptom severity, poor sleep, risk of falls, driving considerations)
 - Psychosocial: (e.g. extreme symptom reporting, pain catastrophizing, avoidance of activities, poor coping strategies, low self-efficacy, symptoms of anxiety, depression, or trauma)
 - Workplace factors: (e.g. heavy physical demands, perception of unsafe work, lack of job satisfaction, lack of offered accommodations, negative interactions with colleagues)

HOW DO WE DETERMINE A CLIENT IS FIT TO RTW?

- Favourable factors (e.g. long history of employment, motivation, good health prior to injury, strong participation rehabilitation, good relationship with employer)
- Safety considerations (e.g. responsibility for safety of others, operating machinery, working at heights, driving, taking public transportation)
- Consider potential symptom triggers (e.g. computer work, visual tasks, lighting, noise, interaction with others, sudden movements, physical exertion, shift work)

FUNCTIONAL ABILITIES

Physical Functional Abilities

- Walking
- Standing
- Sitting
- Lifting
- Stair climbing
- Ladder climbing
- Bending/twisting/repetitive movement
- Pushing/pulling

Cognitive Functional Abilities

- Ability to pay attention and concentrate
- Memory
- Judgement and responsibility
- Planning and organizing
- Working quickly or under time pressure
- Ability to work independently
- Flexibility and adaptability
- Problem solving

ACCOMMODATIONS

- Personalized based on the limitations identified for each individual

Light/Noise sensitivity —————> Allow use of light and noise accommodations as needed and as appropriate (earplugs/noise canceling headphones, alternative light sources, sunglasses, dimmers for overhead lights, etc.). However, these are encouraged to be weaned off.

Fatigue and activity tolerance —————> Frequent micro-breaks, task rotation, and positional changes

Cognitive inefficiencies —————> Limit multi-tasking and interruptions from tasks, limit time pressured tasks, no tasks in which increased error rate is unacceptable or poses safety risk

Sleep difficulties —————> Maintain consistent start time to support sleep hygiene strategies

Restriction

Involves risk of harm to worker or others if there is a performance error whether physical or cognitive

VS

Limitation

May not result in harm however physical, cognitive, or emotional factors interfere with client's ability to perform their duties

JOB SITE VISITS

- Analyzing the physical and cognitive demands of a job is a key component of work rehabilitation.
- A functional abilities evaluation allows to assess an injured worker's current abilities and capacity for work
- In conjunction, a job analysis and a functional abilities evaluation can be a more effective and objective method to determine a client's suitability to work

(Joss, 2007)

REFERENCES

Joss, M. (2007). The importance of Job Analysis in Occupational Therapy. *British Journal of Occupational Therapy*, 70(7), 301–303.
<https://doi.org/10.1177/030802260707000705>



TAB 10

Concussion Symposium for Legal Practitioners, Insurers, Judges, and Clinicians 2024

Tips from the Bench: Preparing a Concussion Case and Oral Advocacy

Ontario Trial Lawyers Association Blog
Editorials, Case Summaries and Association News
Girao v. Cunningham, 2020 ONCA 260

Presentation By:
The Honourable Justice Darla Wilson
Court of Appeal for Ontario

D. Keith Smockum
Smockum Zarnett LLP

Written By:
Antonio Meringolo
Lemieux Law

For Reference Only. Provided with the permission of author Antonio Meringolo
Ontario Trial Lawyers Association Blog Case Summary, Girao v. Cunningham,
2020 ONCA 260, June 05, 2020.

May 30, 2024



Ontario Trial Lawyers Association Blog
EDITORIALS, CASE SUMMARIES AND ASSOCIATION NEWS

Girao v. Cunningham, 2020 ONCA 260

Written by **Antonio Meringolo** / **Summaries** / June 05, 2020

For Reference Only. Provided with the permission of author Antonio Meringolo, Ontario Trial Lawyers Association Blog Case Summary, *Girao v. Cunningham, 2020 ONCA 260*, June 05, 2020.

Full Decision

Court of Appeal sets aside trial decision favouring defendants, orders new trial, and awards costs against defendants for trial and appeal

MATERIAL FACTS

This was a motor vehicle accident which initially proceeded to a 20 day Jury Trial reported at 2017 ONSC 2452 and a Costs Order reported at 2017 ONSC 4102. The Appeal was heard September 26, 2019, and reported on April 21, 2020. At Trial the Jury found the Defendant liable for the subject collision, and awarded \$45,000 in general damages and \$30,000 in special damages.

Prior to Trial, the Plaintiff settled her Accident Benefits claim with Allstate for an all-inclusive sum of \$82,300 including \$890.64 for transportation, \$6,252 for housekeeping, \$91,246.24 for IRB, \$28,360.43 for medical expenses, and \$32,667.32 for medical rehab.

Ms. Cunningham refused to accept even 1% of liability for the subject collision and required the Plaintiff to sue her insurer, Allstate, pursuant to the unidentified motorist provision; however there was no evidence in support of this Defense. Allstate was driven to considerable involvement on the basis of Ms. Cunningham's meritless Defence. Lauwers J.A., at [11] indicated that Allstate's participation as a party '*added significantly to the complexity and the costs of the trial for no good purpose*'. Cavanagh J., made a *Sanderson Order* respecting costs in favour of Allstate in the amount of \$98,813.06 as against Ms. Cunningham at the end of the Trial.

Once the Trial was completed, the Defendants brought a Threshold Motion where they were wholly successful in reducing General Damages to zero, and the offsets of the combined accident Benefits settlement reduced special damages equally to zero. The outcome was that

the Plaintiff was required to pay \$311,845.34 in adverse costs and disbursements. The Appellant appealed both the Trial Decision and the Threshold Decision.

The Plaintiff was a self-represented Spanish speaking claimant utilizing an interpreter throughout the Trial. The Defendants were represented by Counsel, David Zuber and Michael Best. Trial proceeded by way of a Jury and with The Honourable Cavanagh J. The Court of Appeal decision was written by The Honourable Lauwers J.A with the Court concurring.

The Defence strategy at trial to convince the Jury that the Plaintiff was a ‘Malingerer’ consisted firstly of the Defense relying upon the *truth* of a treating psychiatrist’s pre-accident letter concerning the Plaintiff’s pre-accident state, but the Defence did not call the Psychiatrist as a witness at trial. Second, the Defense promoted a ‘secondary gain theory’ utilizing the accident benefits settlement. Third, the Defense worked to exclude from the Jury and the Trial the substantive evidence of the Plaintiff’s experts. The Defense portrayed the accident benefits settlement as an undeserved windfall, while the Court denied the Plaintiff the ability to justify the settlement by the exclusion of her expert evidence.

ISSUES

1. *Whether the Appellant suffered substantial trial unfairness, requiring the Trial Decision, to be set aside and a new Trial ordered contextualized as follows:*

- *the preparation, content, delivery and use of the so-called “Joint Trial Brief”;*
- *the Defense’s treatment of expert evidence;*
- *the Defences use of information about the Plaintiff’s accident benefits settlement; and*
- *the role of the Trial Judge and counsel where one party is self-represented.*

2. *Whether the refusal to strike the Jury amounted to Trial unfairness; and*

3. *Whether the Threshold Decision should be set aside under the circumstances.*

BRIEF ANSWER

Yes. A new trial is ordered as the ‘*interests of justice plainly require that to be done*’: **Brochu v. Pond (2002), 62 O.R. (3d) 722 (C.A.)** at [68]. Moreover, the Appellant has shown that a ‘*substantial wrong/miscarriage of justice has occurred*’: s. 134(6) of the *Courts of Justice Act*, R.S.O. 1990, c. C.43 and **Vokes Estate v. Palmer, 2012 ONCA 510, 294 O.A.C. 342**, at [7].

- A selectively redacted document dump on the eve of Trial by the Defendants became the basis of a trial record in an unfair way that was inconsistent with trial practice directions;
- The Trial Judge refused to allow one of the Plaintiff’s expert witness to testify, Dr. Becker, and permitted the Defendants to rely upon the truth of the contents of a medical record where the corresponding doctor was not called by them at Trial;

- Evidence from the settlement of the Plaintiff's accident benefits claim was not properly admitted into evidence before the Jury;
- As a self-represented litigant, the Plaintiff was entitled to, but did not get active assistance from the Trial Judge to ensure fairness of the proceeding, or get basic fairness from trial Defence Counsel as Officers of the Court;
- The Self-represented status, use of an interpreter, and length at which the trial was proceeding coupled with much frustration for all involved was unfair to the Plaintiff. However, the new Trial Judge will decide whether they will strike the Jury, not this Court.
- The skewed orientation in the evidence that went to the jury permeated into the trial judge's threshold decision, causing unfairness and required setting aside the threshold decision.

ANALYSIS

"Joint Trial Brief"

On the eve of Trial, the Defense document dumped a selectively redacted 16 volume Joint Trial Brief upon the Plaintiff, who requires the assistance of a Spanish/English interpreter. The Defense was well aware of the Plaintiff's language barriers. Lauwers J.A., cited *1162740 Ontario Ltd., v. Pingue*, 2017 ONCA 52, 135 O.R. (3d) 792 at [14] noting that *'The goal of a trial judge in supervising the assembly of a trial record is completeness and accuracy, so that the panel of this court sitting on the appeal can discern without difficulty exactly what was before [the trial judge] at any moment in the course of the trial'*.

The "Joint Document Brief" was prepared by the Defense without input from the Plaintiff. The late delivery also put the Plaintiff at a disadvantage. Moreover, the volumes in the "Joint Document Brief" were marked as numbered exhibits. Numbered exhibits as opposed to lettered exhibits, go in with the Jury during its deliberations: see *Pingue* at [17].

Initially, the Plaintiff's expert report from Dr. Becker was included in the numbered exhibits. Subsequently, it was struck by the Defense and then not marked as a lettered exhibit and filed with the Court. The record would not otherwise have included it for an appeal, but for the Plaintiff's inclusion within the Appeal Record.

Medical reports and records favouring the Plaintiff's claim were included within the "Joint Document Brief" however they were redacted by the Defense and thus excised from the Jury. Lauwers J.A., considered *Blake v. Dominion of Canada General Insurance Company*, 2015 ONCA 165, 331 O.A.C. 48, at [54]:

When a document brief is tendered at trial, the record should reflect clearly the use the parties may make of it. Such use may range from the binder's acting merely as a convenient repository of documents, each of which must be proved in the ordinary way, through an agreement about the authenticity of the documents, all the way to an agreement that the documents can be taken as proof of the truth of their contents.

Absent an agreement by the parties on the permitted use of a document brief, the trial judge should make an early ruling about its use.

While these flaws in the management of the Trial Record cause unfairness, they are not fatal in and of themselves under the circumstances. However, they did unfairly enable the Defense strategy of keeping evidence favourable to the Plaintiff, from the Jury and the Trial Record. Lauwers J.A., goes on at [33-35] with insightful commentary on how the court should have addressed the issues at the outset.

The Use of Expert Evidence

Lauwers J.A., identified two issues of concern in the use of expert evidence at Trial. The first relates to the refusal to allow Dr. Becker to testify as to the Plaintiff's injuries and the second relates to the use of the treating psychiatrists pre-accident opinion letter [truth of the contents] while the defence did not call him at trial as a witness.

The admissibility of expert opinion and then the use of expert opinion without the need to call the doctor who prepared the opinion are outlined by Lauwers J.A. at [39]:

Four elements are required to meet the threshold for admission of expert evidence:

1. the evidence must be relevant;
2. it must be necessary in assisting the trier of fact;
3. no other evidentiary rule should apply to exclude it; and
4. the expert must be properly qualified.

Then the Trial Judge must execute the *gatekeeper function*: *White Burgess Langille Inman v. Abbott and Haliburton Co.*, 2015 SCC 23, [2015] 2 S.C.R. 182 at [19]; *R. v. Abbey*, 2017 ONCA 640, 140 O.R. (3d) 40 at [47-48].

Lastly, the elements give rise to a proviso: *whether a person who has expertise, but who is not qualified as an expert witness under Rule 53.03 of the Rules of Civil Procedure, R.R.O. 1990, Reg. 194, still provide expert opinion?*

In short, yes. see *Westerhof v. Gee Estate*, 2015 ONCA 206, 124 O.R. (3d) 721, leave refused, [2015] S.C.C.A. No. 198. The two examples are *participant experts* who form opinions based on their participation in the underlying events, such as treating physicians, and *non-party experts* who are retained by a non-party to the litigation and who form opinions based on personal observations or examinations that relate to the subject matter of the case. For example, a medical examiner for an accident benefits claim.

However in reviewing the pre-accident psychiatrists letter relied upon by the Defense, as to the truth of its contents, Lauwers J.A., concluded that in doing so made it *hearsay evidence*. This type of evidence *'is presumptively inadmissible because – in the absence of the opportunity to cross examine the declarant at the time the statement is made – it is often difficult for the trier*

of fact to assess its truth': *R. v. Bradshaw*, 2017 SCC 35, [2017] 1 S.C.R. 865, at [1].

Exceptions to the *hearsay evidence* rule are contained within s. 35 and s. 52 of the *Evidence Act*. First, if the record is a business record, made '*in the ordinary course of any business and if it was in the usual and ordinary of such business to make such writing or record at the time of such act.*' That evidence is admissible: s. 35(2). Section 35 relates to medical reports. '*it permits the court to allow the report to be admitted into evidence without the need to call the practitioner. Then the opinion can be accepted for the truth of its contents.*'

However, Lauwers J.A., points out at [45] that the Trial Judge must allow a request by a party to cross-examine the medical practitioner: *Kapulica v. Dumancic*, [1968] 2 O.R. 438 (C.A.); *Reimer v. Thivierge*, [1999] 46 O.R. (3d) 309 at [12-15].

There are limitations: *Westerhof v. Gee Estate*, at [103]:

Because these reports were tendered under s. 35 of the Evidence Act, the opinions concerning causation were not admissible for the truth of their contents, [citing: Robb Estate v. Canadian Red Cross Society, (2001) 152 O.A.C. 60 (Ont. C.A.) at [152]] Further, the appeal record contains no indication that notice was served for the admission of these reports under s. 52 of the Evidence Act [emphasis added].

The difference between s. 52 and s. 35 is that within s. 52 it is permitted to admit evidence of opinion as to diagnosis contained in medical reports signed and prepared by qualified practitioners as an alternative to oral testimony.

As such, the evidence of Dr. Becker ought to have been admissible and put to the Jury. It contained substantive commentary from other medical experts, such as Dr. Rosenblatt (Psyche) which supported the Plaintiff's claim. Lauwers J.A. at [57] concluded that there was no reasonable legal basis on which the evidence of Dr. Becker could be excluded in light of s. 52 of the *Evidence Act*. Dr. Becker provided a summative report attaching the individual reports of multiple specialized assessors, which is not unusual in the context of a claim for accident benefits. It was an error not to allow Dr. Becker to testify and an error to exclude his report from the Trial Record, given that the Plaintiff served a notice under s. 52 of the *Evidence Act*.

'It should be remembered that any time a court excludes relevant evidence the Court's ability to reach a just verdict is compromised': Hunter v. Ellenberger, (1988), 25 C.P.C. (2d) 14 (Ont. H.C.). Lauwers J.A., at [60] concluded that allowing the defence experts to testify and offer opinions contrary to Dr. Becker and Dr. Rosenblatt presented a skewed picture to the Jury and was grossly unfair to the Plaintiff.

Lauwers J.A. concluded at [75] that the Plaintiff properly served a notice under s. 52 of the *Evidence Act* and was entitled to refer to and rely upon Dr. Becker's report and the reports that it summarized. The Plaintiff was entitled to call Dr. Becker as a witness and was entitled to have Dr. Becker explain his opinion to the Jury. If the Defense wished to dispute Dr. Becker's report, counsel could have cross-examined him.

Dr. Sanchez Opinion – pre-accident psychiatrist letter

The Defense asserted and relied upon the truth of the contents of Dr. Sanchez letter opining as to the Plaintiff's pre-accident psychological state, but did not call Dr. Sanchez at trial as a witness. This opinion was placed within the Defense's statement of its position that the Trial Judge included within the *Jury Charge*.

By including Dr. Sanchez letter within the "Joint Document Brief" and making that brief a numbered exhibit, it was *easy* for Defense counsel to use this evidence for its hearsay purposes. This report was a substantive tool used by Defense counsel in the cross-examination of the Plaintiff, other medical witnesses, in closing argument and the Jury Charge.

In reviewing the Jury Charge at [68] Lauwers J.A., noted that the commentary about hearsay evidence was not cautioned with respect to Dr. Sanchez opinion. This '*ratified the Defenses abuse of the opinion for hearsay purposes*'.

Lauwers J.A., concluded at [74] that s. 35 of the *Evidence Act* is not a proper way to get medical opinion evidence admissible for the truth of its contents. Section 35 relates to business records and the ordinary notations made in such records. The case law is clear, where the report is that of a medical practitioner s. 52 is applicable. Once the Plaintiff objected, as she did, the Trial Judge was required to refuse to admit Dr. Sanchez report for the truth of its contents unless he was presented for cross-examination. this error of law was procedurally and substantially unfair to the Plaintiff.

The Use of Insurance Settlement Information

The accident benefits settlement was utilized as a means to the Defense strategy. It was used as an attack on her credibility, her reliability, and the credibility and reliability of her witnesses and experts. Lauwers J.A., at [79-80] summarizes the traditional and current view of discharging the Jury on mention of a reasonable inference that the Defendant was insured. In short, the mention of insurance no longer necessarily results in the Jury's automatic discharge '*because the court understands that Juries share the general public awareness that motor vehicles are insured*'.: *Hamstra v. British Columbia Rugby Union*, [1997] 1 S.C.R. 1092.

Lauwers J.A., at [87] discussed the *hybrid system* of Ontario's compensation of injured people in motor vehicle accidents. Citing *Meyer v. Bright*, (1993), 15 O.R. (3d) 129, [1993] O.J. No. 2446 (C.A.) at [6]: The Plaintiff's access to the at-fault tort system is limited, but the Plaintiff is given access to no-fault accident benefits for income loss, and medical and rehabilitation expenses. The system is based on '*an exchange of rights wherein the accident victim loses the right to sue unless coming within the statutory exemptions, but receives more generous first-party benefits, regardless of fault, from his or her own insurer*'. the system is '*designed to control the cost of automobile insurance premiums to the consumer by eliminating some tort claims*'.

While separate (Tort and accident benefits claims), they do overlap when reconciled with awards of damages. Section 267.8 of the *Insurance Act* is intended to prevent double recovery by the Plaintiff. the functioning of the system is explained in *Cadieux v. Cloutier*, 2018 ONCA 903, 143 O.R. (3d) 545 at [10-11, 22-24, 85-86], leave to appeal refused [2019] S.C.C.A. No. 63.

Three *Silo's* of benefits categories from accident benefits claims must be taken into account as possible reductions of Tort awards as follows: (see *Basandra v. Sforza*, 2016 ONCA 251, 130 O.R. (3d) 466 affirmed in *Cadieux*).

1. past income loss and loss of earning capacity;
2. health care expenses including attendant care costs; and
3. pecuniary losses such as housekeeping costs.

Lauwers J.A., explains at [90] that the Trial Judge reconciles the no-fault benefits **received** by the Plaintiff with the award of tort damages after the Jury's damages verdict by reducing the tort award. The instruction to the Jury is that they are to '*make their award, if any, on a gross basis with no deduction for any collateral benefits*' on the basis that the Judge will make any adjustment: *Malfara v. Vukojevic*, 2014 ONSC 6640.

The Law of Evidence

Evidence is admissible if it is relevant to a fact in issue and not subject to an exclusionary rule. The Trial Judge has discretion to refuse to admit evidence where its prejudicial effect would exceed its probative value: *Draper v. Jacklyn* (1969), [1970] S.C.R. 92. Spence J., at [98] stated:

The occasions are frequent upon which a Judge trying a case with the assistance of a jury is called upon to determine whether or not a piece of evidence technically admissible may be so prejudicial to the opposite side that any probative value is overcome by the possible prejudice and that therefore he should exclude the production of the particular piece of evidence.

That principle, cited at [91] by Lauwers J.A., also applies generally beyond physical evidence along with the Trial Judges residual Discretion to exclude evidence: *R. v. Lyttle*, 2004 SCC 5, [2004] 1 S.C.R. 193 at [44].

Relevance – accident benefits settlement disclosure

Citing *R. v. Truscott*, (2006) 216 O.A.C. 217 (C.A.), at [22], the first question is whether evidence of the details or existence of the accident benefits settlement is relevant to a fact in issue in the tort action. '*evidence is relevant is, as a matter of logic and human experience, it renders the existence or absence of a material fact in issue more or less likely*'.

Two Defensive avenues exist where Counsel seek to have the accident benefits settlement revealed to the Jury:

First, alleging that the Plaintiff's failure to use the settlement proceeds to mitigate future losses as depicted in *Farrugia v. Ahmadi*, 2019 ONSC 4261 and *Peloso v. 778561 Ontario Inc.*, (2005),

28 C.C.L.I. (4th) 10 (Ont. S.C.).

Second, to claim that the benefits settlement eroded the Plaintiff's motivation to work, thereby increasing the future income losses the Defendant will be required to pay through the Tort award. However, this avenue has been rejected as not relevant: *Ismail v. Flemming*, 2018 ONSC 5979, or excessively prejudicial: see *Farrugia*.

Lauwers J.A., explains at [100] that the derivative decision which supports cases like *Ismail* is that of *Kitchenham v. AXA Insurance*, 23 C.C.L.I. (4th) 76 (Ont. S.C.) rev'd on other grounds, 229 O.A.C. 249 (Div. Ct), rev'd on other grounds, 2008 ONCA 877, 94 O.R. (3d) 276. The principle is summed up by Lauwers J.A. at [102] citing *Kitchenham* at [52]:

The best that [the defendant insurer] could do was to suggest that the quantum of settlement might affect the Plaintiff's motivation to return to work. However, the issue to be determined at trial is whether or not the Plaintiff is disabled from working, not whether the Plaintiff has a financial incentive to work. A wealthy person might have no incentive to work at all, yet would still be entitled to loss of income benefits if he were disabled from doing so. [Emphasis added.]

Kitchenham applies in principle whether the Tort settlement comes first, or the accident benefits settlement: *Ismail* at [32]. Doherty J.A., in *Kitchenham* concluded that '*The issue in the benefits action is whether the Plaintiff is disabled and unable to work*'. That is a substantive issue in Tort claims. Motivation to work however, is relevant to credibility, which is a collateral issue. The Defense argued that *McLean v. Knox*, 2013 ONCA 357, 306 O.A.C. 203 would instead apply to effectively elevate the Plaintiff's credibility to the equivalent of a fact in issue or substantive relevance in an attempt to enliven this Defensive avenue.

Lauwers J.A., concluded at [110] that this interpretation of *McLean* overstated the principle. At [112] Lauwers states that in this courts view, a Plaintiff's motivation to work is a collateral issue related to the credibility of the assertion that she or he is unable to work. '*How much evidence will be permitted on the issue of the plaintiff's alleged malingering or motivation to work is a matter for the trial judge's discretion in considering the balance of prejudicial effect and probative value*'.

Prejudicial Effect v. Probative Value – accident benefits settlement disclosure

Citing *Farrugia* Lauwers J.A., at [115] summarizes the prejudicial effect of disclosure of the accident benefits settlement by way of questions to the Plaintiff in front of the Jury. '*...permitting a question about the totality of accident benefits settlement received and any related question would expose Ms. Farrugia to double jeopardy. She would be subject to the impact of both the prejudicial effect of that question, as well as the fact that the very same accident benefits will be deducted under the Insurance Act, where applicable, from any award the Jury makes.*'

Credibility Issues

The central question posed by Lauwers J.A. at [122] is whether evidence in the form of the details of the accident benefits settlement be used in the plaintiff's cross examination. Cross examination is afforded broad scope to cross-examine a witness on their credibility: *R. v. Krause*, [1986] 2 S.C.R. 466, [1986] S.C.J. No. 65, at [17].

However, there are limits as pointed out by Lauwers J.A. Evidence excluded by the Trial Judge is a forbidden road. The *collateral fact rule* for example is another limitation on cross-examination, or cross-examinations done in bad faith or to abuse a witness.

For such a Defensive tactic to be available [see *Farrugia*] at Trial, a two fold proviso is required to be met according to Lauwers J.A. at [134]. First the pleadings must have plead the issue with appropriate particularity. Second, there must be an air of reality to the issue supported by the evidence and admissible expert evidence. The same would apply to an argument that the Plaintiff is malingering or lacks motivation to work. This issue could be addressed during a *Voir Dire*.

However, allegations of malingering are easy to make and difficult to defuse according to Lauwers J.A. An accusation of malingering adds to the Plaintiff's burden to prove his/her inability to work for chronic pain cases particularly as the use of the word *sows suspicion* in the minds of the Jury. Using the accusation can form the basis of a cross-examination to allow counsel to repeat the accusation in direct examination and cross examination. This repetition can resonate with the Jury and remind them of the Defense theory.

Lauwers J.A. states at [137] that should the evidence of an accident benefits settlement be admitted, or is in the record, '*the jury instructions should carefully explain how the motor vehicle accident compensation system in Ontario functions, including the entitlement to accident benefits, and the distinct roles of the Trial Judge and the Jury in setting the damages and accounting for benefits received*'. The Jury should be instructed not to reduce the award of damages because it believes that the benefits have compensated the plaintiff adequately for the accident.

In the within case, the thrust of the Defense cross-examination focused on the Plaintiff receiving an unearned windfall by not working and yet earning more per year from her accident benefits settlement at [145]. Lauwers J.A., concludes that given the pleadings and the material facts at issue, there was minimal probative value, if any, in what was characterized as *mocking and belittling* during the cross-examination on the accident benefits settlement.

The Role of the Trial Judge – self represented parties

Lauwers J.A. begins the analysis with a simple statement at [148]: '*The overarching principle is that the trial judge is responsible for controlling proceedings to ensure trial fairness.*' In *Pintea v. Johns*, 2017 SCC 23, [2017] 1 S.C.R. 470 at [4] the Supreme Court endorsed the *Statement of Principles on Self-Represented Litigants and Accused Persons*. Those Principles are enumerated

at [149].

Of note, Lauwers J.A., cites *Morwald-Benevides v. Benevides*, 2019 ONCA 1023, 148 O.R. (3d) 305 citing some of the responsibilities of Trial Judges:

It is no longer sufficient for a judge to simply swear a party in and then leave it to the party to explain the case, letting the party flounder and then subside into unhelpful silence. As this court has noted, “it is well accepted that trial judges have special duties to self represented litigants, in terms of acquainting them with courtroom procedure and the rules of evidence”: Dujardin v. Dujardin, 2018 ONCA 597, 423 D.L.R. (4th) 731, at para. 37, repeated in Gionet v. Pingue, 2018 ONCA 1040, 22 R.F.L. (8th) 55, at para. 30. The court added, at para. 31 of Gionet: “In ensuring that a self-represented litigant has a fair trial, the trial judge must treat the litigant fairly and attempt to accommodate their unfamiliarity with the trial process, in order to permit them to present their case”, citing Davids v. Davids (1999), 125 O.A.C. 375, at para. 36.

Turning to Counsel’s duties as Officers of the Court, Lauwers J.A. noted the professional ethical obligations of a lawyer toward a self-represented litigant. In this case the Defense advanced evidentiary positions that were problematic on legally complex topics. The Defense ought to have assisted the Judge as officers of the court with the legal issues embedded in their positions. The limited trial record leaves an impression that the Trial Judge allowed himself to be lead at trial by counsel’s arguments. The self-represented Plaintiff who struggles with the English language was left to her own devices. Fairness required more as stated by Lauwers J.A. at [156].

Striking the Jury

The Plaintiff moved to strike the Jury under s. 108 (3) of the *Courts of Justice Act* and Rule 47.02 of the *Rules of Civil Procedure*. The principles governing discharge of the Jury were considered by Lauwers J.A. at [159] in citing *Kempf v. Nguyen*, 2015 ONCA 114, 124 O.R. (3d) 241 at [43] and [118]; *Cowles v. Balac*, (2006), 83 O.R. (3d) 660, leave to appeal refused, [2006] S.C.C.A. No. 496.

The Trial Judge erred in his decision not to revisit the refusal to strike the Jury. While the Defense relied upon the principle that Juries are fundamental to civil actions: *McDonald-Wright v. O’Herlihy*, 2007 ONCA 89, 220 O.A.C. 110 at [13], however the principles enumerated in *Kempf* would require fairness to the Plaintiff and the Defense in the eyes of the Jury. As concluded by Lauwers J.A. at [170] *self-represented litigant status is a factor that might unduly complicate or lengthen a trial, leading the trial judge to conclude that prudence suggests the Jury be discharged.*

However as noted in *Kempf* a ‘wait and see approach’ is most prudent as the trial unfolds the trial judge becomes better able to assess the capacity of the self-represented party to present the case. Lauwers J.A. listed the factors relevant to discharging the jury at [169]. In short, the use of an interpreter, coupled with the Plaintiff’s complete lack of substantive and procedural knowledge of the law, faced with constant objections by Defense Counsel lead to a very lengthy

trial, frustrations to all involved, and likely to the Plaintiff's detriment.

Threshold Decision

Lauwers J.A., concluded at [174] that the skewed orientation of the evidence that went to the Jury made it's way into the Trial Judges decision on the Threshold Motion. Because of the basic unfairness with regard to Dr. Sanchez opinion influencing the basic approach of the matter, refusal to admit Dr. Becker's report or allow him to testify, and the procedural unfairness as referenced, there was little to oppose the Defense evidence. Therefore the Threshold Motion ruling is set-aside.

CONCLUSION

A new trial was ordered, and costs of the Trial and the Appeal were Ordered as against the Defendants.

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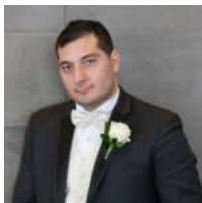
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