Proactive Concussion Care for Injured Workers

Julie Griffen, PhD, ABPP
Board Certified in Clinical Neuropsychology

1

Experience

- Clinical psychologist for 10+ years with fellowship training in rehabilitation and neuropsychology
- Board certification in clinical neuropsychology
- Work in rehabilitation and neuropsychology for traumatic brain injury (mild to severe) in inpatient and outpatient setting
- Provide both neuropsychological/psychological assessments and psychotherapy treatment

2

Disclosures

Employed by Hope Network Neuro Rehabilitation

No conflicts of interests to disclose

3

Objectives

- Define diagnostic characteristics of concussion and acute symptoms.
- Identify factors associated with persistent symptoms.
- Describe treatment strategies and clinical approaches to promote recovery.

4

TBI/Concussion Statistics

- 3 million Americans have mTBI in a year
  - 1/5 have symptoms lasting longer than 1 month
- Almost half of Americans have at least one TBI in their lifetime
- Most common age: under age 24 and over age 74
- Most common in young males
- Most common etiologies: falls, motor vehicle crash, sports, assaults
- Risk increased by substance abuse
- 80-90% of TBIs are mild

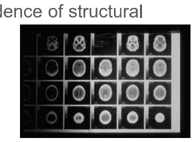
McCrea 2008; Silverberg et al 2020

5

What is a Concussion?

ACRM Definition
- Biomechanically plausible mechanism of injury
- 1 more clinical sign (e.g., LOC, altered mental status, PTA/PTC, etc)
- 2(+) acute symptoms (e.g., headache, nausea, confusion, vision change)
- 1(+) clinical/lab finding (e.g,. Clinical exam signs)
- If neuroimaging is positive "with neuroimaging evidence of structural intracranial injury"

- Mild TBI = concussion, if neuroimaging is negative



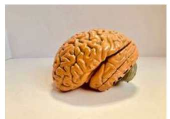
Silverberg et al., 2023

6

Injury Severity

CLASSIFICATION	GCS	LOC	PTC
Mild	13-15	<30 min	<24 hours
Moderate	9-12	30 min – 24 hours	1-7 days
Severe	<8	>24 hours	>7 days

GCS = Glascow Coma Scale
LOC = Loss of Consciousness
PTC = Post-Traumatic Confusion



7

Acute Signs and Symptoms

Observed Signs	Reported Symptoms
Appears dazed or confused	Headache
Poor balance, unsteady	Nausea
Answers questions slowly	Balance problems
Personality/behavior change	Visual changes (double vision, photosensitivity)
Retrograde amnesia (no memory for earlier events)	Cognitive changes
Anterograde amnesia (short-term memory issues)	Feels sluggish, foggy
Loss of consciousness	Sleep disturbance

8

Acute Cognitive Symptoms

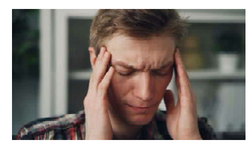
- Measurable impairments in cognitive functioning are evident acutely, even in the absence of LOC, amnesia, and focal neurological deficits
- Most common deficits: **memory, attention, processing speed**
- Most severe symptoms are evident within minutes of injury
- Measurable improvement in symptoms within hours of injury

McCrea 2008

9

Frequency of Top Ten Symptoms in Days 1-7

1. Headache 75%
2. Difficulty concentrating 57%
3. Fatigue 52%
4. Drowsiness 51%
5. Dizziness 49%
6. Fogginess 47%
7. Feeling slowed down 46%
8. Photosensitivity 45%
9. Balance problems 39%
10. Memory dysfunction 38%



Kontos et al 2012

10

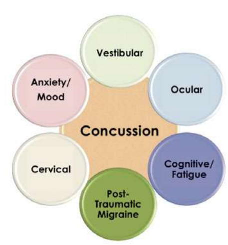
Typical Concussion Recovery Pattern

- Gradual over days to weeks, but sometimes lasts 3-12 months
- No measurable cognitive deficits after 3 months in vast majority of cases
- Delayed symptom onset is relatively rare

McCrea 2008

11

Persistent Symptoms for some
(Post-Concussion Syndrome)



12

Long-Term Outcome

- Uncomplicated concussion is NOT associated with persistent deficits in vast majority of cases, especially in absence of pre/comorbid issues.
- 80-95% of patients with mTBI return to work within 3-6 months
- Symptoms that persist beyond expected recovery course are typically nonspecific to mTBI.
- Nonetheless, persistent symptoms can be very challenging for this minority.

13

Factors Related to Persistent Symptoms

- Demographic variables
- Pre-injury psychosocial issues
- Psychological history and comorbidities
- Injury variables
- Post-injury stressors
- Litigation
- Iatrogenic treatment

Fordal et al, 2022, McCrea 2008, Scott et al 2016, Silverberg et al 2015

14

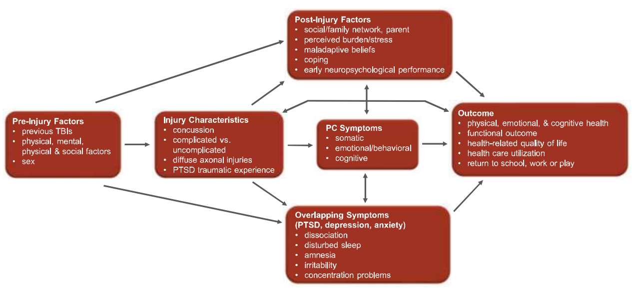


FIGURE 1 | A model for the study of Post-Concussion Symptoms after mTBI. Permissions has been obtained to model our figure based on Yeates (13). ©The International Neuropsychological society 2010, published by Cambridge University Press.

In Polinder 2018

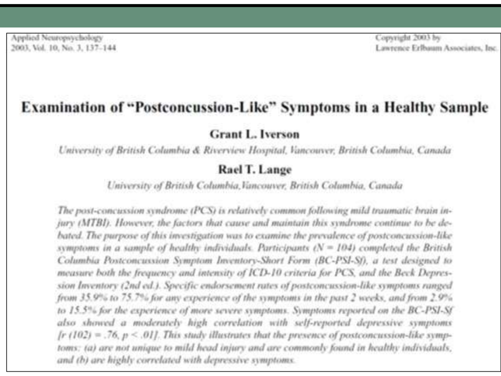
15

Does History of Concussion Matter?

- History of 3 or more concussions may put someone at increased risk for recurrent concussion (3x), lengthier recovery time, and potentially long-term risks later in life.
- Greatest risk of repeat concussion is during acute recovery phase (1-10 days).
- There does NOT appear to be a significant cumulative effect on cognitive functioning for prior 1-2 concussions.

Bolanger 2010, McCrea 2008, Preszler 2024

16



Applied Neuropsychology
2003, Vol. 10, No. 3, 137–144

Copyright 2003 by
Lawrence Erlbaum Associates, Inc.

Examination of "Postconcussion-Like" Symptoms in a Healthy Sample

Grant L. Iverson
University of British Columbia & Riverview Hospital, Vancouver, British Columbia, Canada

Rael T. Lange
University of British Columbia, Vancouver, British Columbia, Canada

The post-concussion syndrome (PCS) is relatively common following mild traumatic brain injury (MTBI). However, the factors that cause and maintain this syndrome continue to be debated. The purpose of this investigation was to examine the prevalence of postconcussion-like symptoms in a sample of healthy individuals. Participants (N = 104) completed the British Columbia Postconcussion Symptom Inventory-Short Form (BC-PSI-Sf), a test designed to measure both the frequency and intensity of ICD-10 criteria for PCS, and the Beck Depression Inventory (2nd ed.). Specific endorsement rates of postconcussion-like symptoms ranged from 35.9% to 75.7% for any experience of the symptoms in the past 2 weeks, and from 2.9% to 15.5% for the experience of more severe symptoms. Symptoms reported on the BC-PSI-Sf also showed a moderately high correlation with self-reported depressive symptoms [r (102) = .76, p < .01]. This study illustrates that the presence of postconcussion-like symptoms: (a) are not unique to mild head injury and are commonly found in healthy individuals, and (b) are highly correlated with depressive symptoms.

17

RESEARCH PAPER

When a minor head injury results in enduring symptoms: a prospective investigation of risk factors for postconcussional syndrome after mild traumatic brain injury

Ruihua Hou,[1] Rona Moss-Morris,[2] Robert Peveler,[1] Karin Mogg,[3] Brendan P Bradley,[3] Antonio Belli[1]

ABSTRACT
Objective A significant proportion (15–30%) of patients with mild traumatic brain injury (MTBI) are at risk of developing postconcussional syndrome (PCS). The aim of this study was to investigate the contributions of cognitive, emotional, behavioural and social factors to the development of PCS and identify early predictors.
Methods A prospective cohort design was employed. 126 MTBI patients completed baseline questionnaire assessments within 2 weeks of the injury and 107 completed follow-up questionnaire assessments at 3 and 6 months. A series of self-report measures were used to assess cognitive, behavioural and emotional responses to MTBI. The primary outcome was the ICD-10 diagnosis for PCS. Demographic and clinical characteristic variables were compared between PCS cases and non-cases using independent sample t tests and χ^2 tests. Individual and multivariate logistic regression analyses were used to detect predictors of PCS.
Results Of 107 MTBI patients, 24 (22%) met the criteria for PCS at 3 months and 22 (21%) at 6 months. Individual logistic regression analysis indicated that negative MTBI perceptions, stress, anxiety, depression and all-or-nothing behaviour were associated with the risk of PCS. Multivariate analysis revealed that all-or-nothing behaviour was the key predictor for the onset of PCS at 3 months while negative MTBI perceptions predicted PCS at 6 months.
Conclusions The study provides good support for the proposed cognitive behavioural model. Patients' perceptions of their head injury and their behavioural responses play important roles in the development of PCS, indicating that cognitive and behavioural factors may be potential targets for early preventive interventions.

ongoing disability and distress for patients, and high healthcare costs, identifying individuals who are at risk for developing long term sequelae post MTBI is important to both patients and healthcare professionals.[3] There has been substantial interest in prognosis after MTBI but due to misclassification of MTBI, lack of control for confounding factors, non-representative samples and cross sectional study designs, identification of prognostic factors remains a priority for research. A call for better research in this area has been made by the WHO Collaborating Centre for Neurotrauma Task Force.[5 6]

Despite the research limitations, there is increasing recognition that PCS is best understood in terms of an interaction between biological, psychological and social factors.[3 7 8] The evidence to date regarding psychosocial factors in the development of PCS suggests that premorbid psychopathology, comorbidity of anxiety and depression,[7 9] negative illness perceptions,[10] expectation[11] and compensation/litigation[12] are all potential risk factors. However, previous research is limited in that it has investigated either an individual risk factor in isolation or at best a limited subset of risk factors.

To provide theoretical guidance for our prospective design, we developed a model for PCS (illustrated in figure 1) which subsumes and integrates risk factors identified in previous studies and models of PCS.[9 13–15] In accordance with models of other functional somatic syndromes such as chronic fatigue syndrome and irritable bowel syndrome,[16 17] risk factors are characterised as (1) predisposing factors for example, people who have

18

Mood and Acute Recovery Time

Higher PHQ-9 and GAD-7 scores may be predictive of longer recovery time

GAD-7

Over the last 2 weeks, how often have you been bothered by the following problems? (Use "✔" to indicate your answer)	Not at all	Several days	More than half the days	Nearly every day
1. Feeling nervous, anxious or on edge	0	1	2	3
2. Not being able to stop or control worrying	0	1	2	3
3. Worrying too much about different things	0	1	2	3
4. Trouble relaxing	0	1	2	3
5. Being so restless that it is hard to sit still	0	1	2	3
6. Becoming easily annoyed or irritable	0	1	2	3
7. Feeling afraid as if something awful might happen	0	1	2	3

(For office coding: Total Score T___ = ___ + ___ + ___)

PATIENT HEALTH QUESTIONNAIRE-9 (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems? (Use "✔" to indicate your answer)	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING 0 + ___ + ___ + ___
=Total Score: ___

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

Not difficult at all ☐ Somewhat difficult ☐ Very difficult ☐ Extremely difficult ☐

Developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues, with an educational grant from Pfizer Inc. No permission required to reproduce, translate, display or distribute.

Narducci et al., 2021

19

Psychological Factors

- Expectations/Nocebo Effect
- Misattribution
- Good Old Days bias
- Memory perfectionism
- Diathesis-stress model /Biospsychosocial
- All or nothing thinking
- Pessimism
- Decreased resiliency
- Anxiousness

McCrea 2008, Fordal 2021, Hou 2012, Picon 2022

20

General Intervention & Strategy

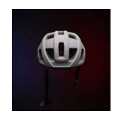
- Psychoeducation (early is best) with realistic expectations of improvement
- Early (e.g., 24-48 hours) but NOT prolonged Rest:
  - Prolonged rest > 2-3 days to a week may be related to prolonged symptoms
  - Limit screen time

Ettenhofer 2020, Kirkwood, 2016, Kontos 2020, Kontos 2023, Macnow 2021, McCrea 2008, Mittenberg, 1993, Polinder 2018, Silverberg & Iverson 2013

21

General Intervention & Strategy

- Gradual resumption of activity
  - NOT cocooning or overly restrictive
  - Activity pacing
  - Graded exposure
  - Modify tasks/environment as needed; ease back in
- Subthreshold exercise
- Avoid reinjury
- Avoid substance use



Ettenhofer 2020, Kirkwood, 2016, Kontos 2020, Kontos 2023, Macnow 2021, Mittenberg, 1993, Polinder 2018, Silverberg & Iverson 2013

22

CDC

Start your recovery by taking it easy. As symptoms improve, you may gradually return to regular activities.

Recovery from a concussion means you can do your regular activities without experiencing concussion symptoms. Recovery from a concussion may be slower among older adults, young children, and teens. People who have had a concussion in the past may also find that it takes longer to recover.

The First Few Days
- Take it easy the first few days after a concussion when symptoms are more severe.
- You may need to take a short time off from work or school, although usually no more than 2 to 3 days.
- Ask your doctor for written instructions about when you can safely return to work, school, or other activities, such as driving a car.

As You Start to Feel Better
- As you start to feel better after the first few days of your injury, you can gradually return to regular (non-strenuous) activities, such as taking a short walk.
- Avoid activities that make your symptoms come back or get worse.

When Symptoms Are Nearly Gone
- When your symptoms are mild and nearly gone, you can return to most of your regular activities.
- If your symptoms do not get worse during an activity, then that activity is OK for you. If your symptoms get worse, you should cut back on that activity.

23

Concussion Clinic: Intervention & Strategy

- Start narrow and early
- Personalized interdisciplinary approach with consistent message
- Address headaches and sleep
- Brief rehab psychotherapy/psychoeducation
- **GOAL: functional progress and prevention of prolonged symptoms**

24

Concussion Clinic: Rehab Psychology

Clinical interview
Assess symptoms and risk factors for prolonged symptoms

Psychoeducation
Evidence based outcomes for concussion recovery and treatment strategies

Brief rehab focused care
Focus on activity pacing, sleep hygiene, compensatory strategies, mitigating anxiety, setting expectations, avoiding misattribution, rebuilding confidence, etc.
Address anxiety and PTSD components if indicated

Neuropsychological testing
For persistent cognitive and emotional symptoms or diagnostic clarification

Refer out to community supports
For preinjury stress or unrelated current stress and mood symptoms

25

"I wish I had that!"


ACRM
AMERICAN CONGRESS OF REHABILITATION MEDICINE
Archives of Physical Medicine and Rehabilitation
journal homepage: www.archives-pmr.org
Archives of Physical Medicine and Rehabilitation 2024;105: 1268−74

ORIGINAL RESEARCH

"I Wish I Had That!": A Qualitative Analysis of Psychosocial Treatment Preferences Among Young Adults With Recent Concussion and Anxiety

Check for updates

Heena R. Manglani, PhD,[a,b] Brenda C. Lovette, MS,[a,c] Victoria A. Grunberg, PhD,[a,b,d] Jesse Frieder, MEd,[e] Ana-Maria Vranceanu, PhD,[a,b] Jonathan Greenberg, PhD[a,b]

26

Return to Work

- Most people return within 3-6 months
- Restrictions/accommodations
  - Physical, environmental, graded
  - Safety issues/repeat risk
  - Functional capacity evaluation
  - Neuropsychological assessment
- Practice work tasks in rehab
- Complex cases may need more supports (e.g., vocational rehab)
- Benefits of supportive, cooperative process versus adversarial

  - *Cancelliere et al. 2014, Theadom et al. 2017, Waljas et al 2014*

27

References

- Belanger, HG, Speigel, E. & Vanderploeg, RD. (2010). Neuropsychological performance following a history of multiple self-reported concussions: a meta-analysis. *J Int Neurol Soc, 16(2*), 262-267.
- Binder, LM, Rohling, ML, & Larrabee, GJ. (1997). A review of mild head trauma. Part 1: meta-analytic review of neuropsychological studies. *J Clin Exp Neuropsychol, 19,* 421-431.
- Cancelliere, C., et al. (2014). Systematic review of return to work after mild traumatic brain injury: results of the International Collaboration on Mild Traumatic Brain Injury Prognosis. *Arch Phys Med & Rehab, 95,* 201-209.
- Carroll, L.J., et al. (2004). Prognosis for mild traumatic brain injury: results of the WHO Collaborating Centre Task Force on mild brain injury. *J Rehabil Med, 43*, 84-105.
- Dikmen, S., et al. (1995). Neuropsychological outcome at one-year post head injury. *Neuropsychology, 9,* 80-90.
- Ettenhofer, M.L., et al. (2020). Best Practices for Progressive Return to Activity after Concussion: Lessons Learned from a Prospective Study of U.S. Military Service Members. *Neurotrauma Reports, 1*(1), 137-145.
- Fordal, L. (2022). Trajectories of persistent postconcussion symptoms and factors associated with symptom reporting after mild traumatic brain injury. *Arch Phys Med & Rehab, 103,* 313-322.
- Hou R., et al (2012). When a minor head injury results in enduring sy. *J Neurol, Neurosurg, & Psych, 83*mptoms: a prospective investigation of risk factors for postconcussional syndrome after mild traumatic brain injury, 217-223.
- Howell, D.R., et al. (2021). Postconcussion exercise volume associations with depression, anxiety, and dizziness symptoms, and postural stability: preliminary findings. *J Head Trauma Rehabil, 37*(4), 249-257.
- Iverson, G.L., et al. (2006). *Brain Injury Medicine: Principles and Practice.* Demos Medical Publishing, New York.
- Iverson, G.L. & Lange, R.T. (2003). Examination of "post-concussion-like" symptoms in a health sample. *Appl Neuropsychol, 10*(3), 137-144.
- Kirkwood, M.W., et al. (2016). A pilot study investigating neuropsychological consultation as an intervention for persistent postconcussive symptoms in a pediatric sample. *J Pediatr, 169*, 244-249.

28

References

- Kontos et al. (2012). A revised factor structure for the post-concussion symptom scale: baseline and postconcussion factors. *Am J Sports Med, 40*(10), 2375-2384.
- Kontos, et al. (2020). Association of time since injury to the first clinic visit with recovery following concussion. JAMA Neuro., 77(4), 435-440.
- Kontos, A.P. et al. (2023). The effects of rest on concussion symptom resolution and recovery time. *Am J of Sp Med, 51*(14), 3893-3903.
- Leddy, J. et al. (2021). Early targeted heart rate aerobic exercise versus placebo stretching for sport-related concussion in adolescents: a randomised controlled trial. *Lancet Child Adolesc Health, 5*(11), 792-799.
- Leddy, J., Wilber, C., & Willer, B. (2018). Active Recovery from Concussion. *Curr Opin Neurol, 31*(6), 681-686.
- Losoi, H.et al., (2016). Recovery from mild traumatic brain injury in previously healthy adults. *J of Neurotrauma*, 33: 766-776.
- Macnow, T., et al (2021). Effect of screen time on recovery from concussion: a randomized clinical trial. *JAMA Pediatr, 175(11*), 1124-1131.
- McCrea, M. (2008). *Mild Traumatic Brain Injury and Postconcussion Syndrome: The New Evidence Base for Diagnosis and Treatment.* Oxford University Press, New York.
- Mittenberg, W., et al. (1993). Recovery from mild head injury: a treatment manual for patients. Psychotherapy in Private Practice, 12, 37-52.
- Mittenberg, W., et al. (2001). Treatment of post-concussion syndrome following mild head injury. *J Clin Exp Neuropsychol, 23(*6), 829-836.
- Manglani, H.R. (2024). "I wish I had that!": A qualitative analysis of psychosocial treatment preferences among young adults with recent concussion and anxiety. *Arch Phys Med & Rehab, 105(7),* 1268-1274.
- Narducci, D.M., et al. (2021). Predicting concussion recovery with PHQ-9 and GAD-7. *South Med J., 114*(12), 760-765.
- Picon, E.L., et al. (2022). Memory perfectionism is associated with persistent memory complaints after concussion. *Arch Clin Neurophys, 37,* 1177-1184.

29

References

- Polinder, S., et al. (2018). A Multidimensional Approach to Post-concussion Symptoms in Mild Traumatic Brain Injury. *Front. Neurol., 9*, 1113.
- Preszler, J., et al. (2024). Evaluating recovery after two and three repeated concussions using growth curves. *J Neurotruma, 41*(11-12), 1409-1416.
- Remigio-Baker, R.A., et al. (2021). Impact of prior brain injury on concussion recovery in military personnel: evaluation of timing between concussions. *J Head Trauma Rehabil., 36*(6), 456-465.
- Schretlen, D.J., & Shapiro, A.M. (2003). A quantitative review of the effects of traumatic brain injury on cognitive functioning. *Int Rev Psychiatry, 15,* 341-349.
- Scott, K., et al. (2016). Predictors of post-concussion rehabilitation outcomes at three-month follow-up. *TCN, 30*(1), 66-81.
- Silverberg, N, & Iverson, G. (2013). Is rest after concussion "the best medicine?": recommendations for activity resumption following concussion in athletes, civilians, and military service members. *J Head Trauma Rehabil, 28*, 250–259.
- Silverberg, N., et al. (2015). Systematic review of multivariate prognostic models for mild traumatic brain injury. *J Neurotruma, 32*(8), 517-526.
- Silverberg, N., et al. (2020). Management of concussion and mild traumatic brain injury: a synthesis of practice guidelines. *Arch Phys Med & Rehab, 101,* 382-393.
- Silverberg, N., et al. (2023). The American congress of rehabilitation medicine diagnostic criteria for mild traumatic brain injury. *Arch Phys Med & Rehab, 104,* 1343-1355.
- Theadom, A., et al. (2017). Work limitations 4 years after mild traumatic brain injury: a cohort study. *Arch Phys Med & Rehab, 98,* 1560-1566.
- Vaughan, C.G., et al., (2023). Association between early return to school following acute concussion and symptom burden at 2 weeks postinjury. *JAMA Netw Open, 6*(1).
- Waljas, M., et al (2014). Return to work following mild traumatic brain injury. *J Head Trauma Rehabil*, 29(5), 443-450.

30

Q & A ???

HOPE NETWORK
NEURO REHABILITATION

31