Fear Avoidance Behaviors In Concussion Management

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Objectives

▪ Conceptualize the Fear Avoidance Behavior Model as it relates to Post-Concussive Syndrome for earlier recognition and intervention
▪ Demonstrate utilization of pain neuroscience framework to include patient education and earlier patient self-care promotion based on current evidence supporting active recovery.
▪ Discuss available patient reported outcome measures to assist in identifying those at risk for fear avoidance behaviors
▪ Demonstrate language changes and “growth mindset” approach with focus on abilities and progress during patient interactions
Concussion in 2021

- Media Sensationalism
- Active Recovery Models Superior
- Cocoon Therapy
Society’s Role

Concussion PSA compares youth football dangers to smoking

Everybody seems to be having fun when the kids are playing football in the PSA, until one boy is thrown to the ground. Then, the coach starts handing out cigarettes.
Predictors of Prolonged Recovery

History of:
- Previous Concussion
- Anxiety/Depression/Mood Disorders
- Headaches/Migraines
- Learning Disabilities
- ADD/ADHD

Multiple Presenting Symptoms
Younger Athlete
Genetic predisposition (APOE e4, APOE G-219T)
Vestibular/Ocular Deficits post injury
Exercise Intolerance (ANS)
Sleep Cycle Disturbances
## Factors Associated with the Development of Chronic Pain

<table>
<thead>
<tr>
<th>Demographics Factors</th>
<th>Clinical Factors</th>
<th>Lifestyle and Behavioral Factors</th>
<th>Other Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Pain</td>
<td>Smoking</td>
<td>Attitudes and beliefs about pain</td>
</tr>
<tr>
<td>Gender</td>
<td>Multi-morbidity and mortality</td>
<td>Alcohol</td>
<td>History of violent injury, abuse or</td>
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<tr>
<td>Ethnicity and cultural</td>
<td>Mental Health</td>
<td>Physical Activity</td>
<td>interpersonal violence</td>
</tr>
<tr>
<td>background</td>
<td></td>
<td>Nutrition</td>
<td></td>
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<tr>
<td>Socio-economic background</td>
<td></td>
<td>Sunshine and Vit D</td>
<td></td>
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<tr>
<td>Employment status and</td>
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<tr>
<td>occupations factors</td>
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</tbody>
</table>

- **Lifestyle and Behavioral Factors**
  - Smoking
  - Alcohol
  - Physical Activity
  - Nutrition
  - Sunshine and Vit D

- **Clinical Factors**
  - Pain
  - Multi-morbidity and mortality
  - Mental Health
  - Surgical and medical interventions
  - Weight
  - Sleep disorders
  - Genetics

- **Other Factors**
  - Attitudes and beliefs about pain
  - History of violent injury, abuse or interpersonal violence
Factors in Adolescent LBP

Subjective Versus Objective?

Evaluation of Early Submaximal Exercise Tolerance in Adolescents with Symptomatic Sport-related Concussion

Morissette, Marc P.1,2; Cordingley, Dean M.1; Ellis, Michael J.3,4; Leiter, Jeff R. S.5

Purpose To compare the cardiorespiratory response to a graded aerobic exercise challenge between adolescents with symptomatic sport-related concussion (SSRC) and healthy control subjects.

Methods A quasi-experimental non-randomized study at a multi-disciplinary pediatric concussion program was conducted. Thirty-four adolescents with SSRC (19 males and 15 females) and 40 healthy control subjects (13 males and 27 females) completed Buffalo Concussion Treadmill testing (BCTT) until either symptom exacerbation or volitional fatigue. Main outcome measures included heart rate (HR), oxygen consumption ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$), and minute ventilation ($\dot{V}E$) at rest and at test termination, and change from rest in variables ($\Delta$HR, $\Delta$V’O2, $\Delta$V’CO2, and $\Delta$V’E) during the first 5 stages of the BCTT. Main outcomes were analyzed using three-way mixed model ANOVAs, with group status (control vs. SSRC) and sex (male vs. female) as between-subjects factors, and time (BCTT stage) as the within-subjects factor.

Results No group differences in resting HR, systolic and diastolic blood pressure (BP), $\Delta$V’O2, $\Delta$V’CO2, and $\Delta$V’E were observed. During the first 5 stages of the BCTT, no group differences in $\Delta$V’O2, $\Delta$V’CO2, and $\Delta$V’E were observed; however SSRC patients demonstrated higher ratings of perceived exertion ($p < .0005$) compared to control subjects. No sex-based differences were observed among SSRC patients on measures collected at rest and during early stages of BCTT.

Conclusions Although SSRC patients exhibited higher ratings of perceived exertion during a graded aerobic exercise challenge, no differences in cardiorespiratory response were observed compared to control subjects exercising at equivalent workloads. Further work is needed to elucidate the physiological mechanisms underlying exercise intolerance following SSRC.
Perception on HRQoL Following Return to Sport…
The Influence of Psychological Factors on the Incidence and Severity of Sports-Related Concussions: A Systematic Review.

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Abstract
BACKGROUND: An athlete's preexisting psychological factors may influence the incidence and/or severity of sports-related concussions (SRCs).

PURPOSE: To determine if emotional states, personality traits, temperament, life stressors, and explanatory styles (optimism vs pessimism) influence the incidence and severity of SRCs in athletes.

STUDY DESIGN: Systematic review.

METHODS: A systematic literature search of multiple major medical reference databases was performed following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Studies were included that evaluated the effect of preexisting psychological factors on the incidence and severity of SRCs in male and female athletes participating in all sports.

RESULTS: The initial search identified 1195 articles. Ten studies met our inclusion criteria and were included in our analysis. Factors such as meanness, aggression, and psychoticism were associated with an increased incidence of SRCs. Baseline traits of irritability, sadness, nervousness, and depressive symptoms were associated with worse symptomatology after SRCs. In young athletes, preexisting psychiatric illnesses, family history of psychiatric illness, and significant life stressors were associated with an increased risk of developing postconcussion syndrome after SRCs.

CONCLUSION: This systematic review demonstrated a potential relationship between an athlete's preexisting psychological factors and the incidence and severity of SRCs. These associations are not entirely clear owing to the heterogeneity across included studies and the low-to-moderate certainty of evidence. Future studies should attempt to evaluate men and women independently, use well-validated psychological questionnaires, and limit the usage of self-reported SRCs, when possible. Furthermore, the potential efficacy of baseline psychological factor and/or symptom reports on the prevention and management of SRCs should be explored.

KEYWORDS: psychological factors; psychology; sports injury; sports-related concussion

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Avoidance Model

Avoidance—natural response to aversive stimuli

Excessive Avoidance prevents desensitization and ability to challenge negative expectations about what may happen if stimuli is not avoided

Continued fear avoidance behaviors maintains sensory sensitivity and activity intolerance

By continually restricting activities to avoid symptoms, patients can become disabled

Avoidance Behaviors

These individuals may:

Be on the “lookout” for symptoms

Somatically hypervigilant (more likely to notice all symptoms)

Interpret all symptoms as serious, dangerous and uncontrollable

This reinforces fear avoidance and continued hypervigilance

Avoidance behaviors are linked to chronic disability in MSK injuries as well as other conditions such as headache, dizziness, and tinnitus (these overlap with mTBI symptoms)

Associated with adverse outcomes in patients with mTBI
Biopsychosocial Model in MSK

Do We Perpetuate Focus on Symptoms?
Cost
Concussion Is a COMPLEX Injury

Importance of Therapeutic Alliance

Reality....

85-90% of post concussive injuries recover in 2-4 weeks, age dependent...

How do we keep patients from falling into 10-15%
Therapeutic Relationship

Strong therapeutic relationship is key

Building trust, rapport and empathy

Frame the relationship in a POSITIVE light

Patients who were given more discharge instructions of restrictions experienced more symptoms compared with no instructions (Zuckerbraun et al., 2014)

POSITIVE FRAMEWORK!
Positive Language

“You will recover from this injury”

“There are things we can do to get you better”

“What can you do since last visit?”

Concussion has become the “boogeyman” and something feared and misunderstood.

NEED ACTIVE RECOVERY MODEL KNOWLEDGE TRANSLATION IMPLEMENTATION!
A novel clinical practice tool increases patients’ understanding of concussion care within an inter-disciplinary clinic

Shannon M Bauman1,2,3, Julie MacDonald4, Carolyn Glatt1, Iveta Doktor-Inglis1 and Jesse McLean1

Abstract

Background: Concussion patients who experience prolonged symptoms may benefit from evidence-based, physician-led, inter-disciplinary care. The success of this approach may depend on a patient's understanding and adherence to a complex, multi-modal recovery process.

Objectives: We have developed a novel clinical care guide for post-injury concussion care termed the “Treatment Passport,” intended to facilitate greater communication and understanding among patients, healthcare providers, family members, teachers, and coaches. This study aims to assess whether the Treatment Passport increases patients’ understanding of their concussion care in an inter-disciplinary setting.

Methods: Patients presenting with sports- or recreation-related concussions were randomly assigned to the intervention (n = 15) or control (n = 18) group. Subjects in the control group received physician-led, inter-disciplinary care, while subjects in the intervention group received the same care, but with the addition of the Treatment Passport. After four weeks of treatment, participants in both groups completed an 11-question survey to assess their understanding of inter-disciplinary concussion care.

Results: The median age of participants was 20 (range 10-63). Participants in the intervention group showed significant increases in their understanding of inter-disciplinary concussion care when compared to control group members. This was reflected in a 2.1-2.8-fold greater understanding of the cognitive, physical, and vestibular aspects of their care. In addition, 86.7% of control group participants indicated they believed that the Treatment Passport would have helped with their concussion recovery journey.

Conclusion: The Treatment Passport is a novel clinical tool that facilitates the delivery of standardized inter-disciplinary concussion care by increasing patient-physician communication and understanding.
Re-Assessment of Symptom Scales

Most common includes patient self-reported symptoms

Open-ended approaches elicit lower total symptom severity scores than closed-ended items “What symptoms are you currently experiencing?”

Excessive monitoring and reporting of symptoms following concussion may lead to patients dwelling on or overanalyzing their symptoms such that they report more symptoms

Recommend no more than once a week following injury!

Different schools of thoughts here..... Journals vs. positive psychology
Changing the Mindset!

Ruminate about Symptoms

Post-concussive Symptoms

Reduced Activity (Prescribed > self-imposed)
What Can We Do?
Measurement of the Fear Avoidance Construct?
# Fear Avoidance Behavior – TBI

## Table 3. Item Factor Loadings from Exploratory Factor Analysis of FAB-TBI in a Sample of mTBI Participants (N=159)

<table>
<thead>
<tr>
<th>Item</th>
<th>Factor 1 (activity avoidance)</th>
<th>Factor 2 (cognophobia)</th>
<th>Factor 3 (symptom avoidance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I have put parts of my life on hold.</td>
<td>0.77</td>
<td></td>
<td></td>
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<tr>
<td>2. I have avoided my usual activities.</td>
<td>0.77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. I cannot do activities which (might) make my symptoms worse</td>
<td>0.56</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>4. My work might harm my brain.</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. I should not do my normal work with my present symptoms.</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. My head pain is telling me that I have something dangerously wrong.</td>
<td>0.79</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. I worry that when I have to think or concentrate too hard that I will bring on a headache.</td>
<td>0.74</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. My headaches put my head and brain at risk for the rest of my life.</td>
<td>0.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I purposely avoid doing activities that might elicit a headache.</td>
<td>0.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. I’m afraid that I might make my headache pain worse by concentrating too much or being too mentally active.</td>
<td>0.68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. I wouldn’t have this much pain if there weren’t something potentially dangerous going on in my head.</td>
<td>0.83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. I avoid external reminders of a stressful experience (for example, people, places, conversations, activities, objects, or situations).</td>
<td>0.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. I stop what I am doing when my symptoms start to get worse.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. If I know that something will make my symptoms worse I don’t do it anymore.</td>
<td>0.81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Because of my symptoms most days I spend more time resting than doing activities.</td>
<td>0.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Most days my symptoms keep me from doing much at all.</td>
<td>0.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Principal component analysis with Varimax rotation and Kaiser normalization. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy 0.88. Bartlett’s test of sphericity p < 0.001: Factor loadings ≥0.45 reported. FAB-TBI, Fear Avoidance Behavior after Traumatic Brain Injury Questionnaire; mTBI, mild traumatic brain injury.
Fear Avoidance Short Form

Table 3. Items in Fear Avoidance Short Form Scale

<table>
<thead>
<tr>
<th>Scale</th>
<th>Item</th>
<th>Item composite correlation</th>
<th>Recoded M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FABQ physical activities subscale</td>
<td>I cannot do activities which (might) make my symptoms worse</td>
<td>0.571</td>
<td>2.2 (1.5)</td>
</tr>
<tr>
<td>FABQ work as cause subscale</td>
<td>My work might harm my brain</td>
<td>0.568</td>
<td>1.9 (1.6)</td>
</tr>
<tr>
<td>FABQ work readiness subscale</td>
<td>I should not do my normal work with my present symptoms</td>
<td>0.554</td>
<td>2.9 (1.4)</td>
</tr>
<tr>
<td>BRIQ limiting scale</td>
<td>I have put parts of my life on hold</td>
<td>0.509</td>
<td>2.8 (1.2)</td>
</tr>
<tr>
<td>BRIQ limiting scale</td>
<td>I have avoided my usual activities</td>
<td>0.560</td>
<td>2.6 (1.6)</td>
</tr>
<tr>
<td>Cogniphobia dangerousness subscale</td>
<td>My head pain is telling me that I have something dangerously wrong.</td>
<td>0.666</td>
<td>1.6 (1.2)</td>
</tr>
<tr>
<td>Cogniphobia dangerousness subscale</td>
<td>My headaches put my head and brain at risk for the rest of my life.</td>
<td>0.635</td>
<td>1.3 (1.2)</td>
</tr>
<tr>
<td>Cogniphobia dangerousness subscale</td>
<td>I wouldn’t have this much pain if there weren’t something potentially dangerous going on in my head</td>
<td>0.647</td>
<td>1.4 (1.2)</td>
</tr>
<tr>
<td>Cogniphobia avoidance subscale</td>
<td>I worry that when I have to think or concentrate too hard that I will bring on a headache.</td>
<td>0.578</td>
<td>2.7 (1.1)</td>
</tr>
<tr>
<td>Cogniphobia avoidance subscale</td>
<td>I purposely avoid doing activities that might elicit a headache.</td>
<td>0.622</td>
<td>2.3 (1.3)</td>
</tr>
<tr>
<td>Cogniphobia avoidance subscale</td>
<td>I’m afraid that I might make my headache pain worse by concentrating too much or being too mentally active.</td>
<td>0.624</td>
<td>2.4 (1.3)</td>
</tr>
<tr>
<td>PCL-5 avoidance subscale</td>
<td>Avoiding external reminders of the stressful experience (for example, people, places, conversations, activities, objects, or situations)</td>
<td>0.635</td>
<td>1.2 (1.2)</td>
</tr>
</tbody>
</table>

FABQ: Fear Avoidance Behavior Questionnaire; BRIQ, Behavioral Responses to Illness Questionnaire; PCL, PTSD Checklist.

Note: Original response options were "Completely disagree (0) to Completely agree (6)." Not at all (1) to Every day (5). "Strongly disagree (1) to strongly agree (4)." Not at all bothered (0) to Extremely bothered (4). Recoded responses range from 0 to 4 for all scales.
Early Identification and Proper Management is KEY!
Practical Tips from Chronic Pain Model to Break the Cycle...

- Care should be patient centered
- Screen for serious pathology/red flag conditions
- Assess psychosocial factors
- Radiological imaging is discouraged unless appropriate criteria is met
- Undertake a physical examination
- Progress should be evaluated including the use of outcome measures
- Provide patient education/info about their condition and management options
- Provide management addressing physical activity and/or exercise
- Apply manual therapy only as adjunct to other EBP treatments
- Unless specifically indicated (red flags conditions), offer evidence-informed non-surgical case prior to surgery
- Facilitate continuation or resumption of work

### Table 1: Unhelpful and Helpful Health Messages About LBP for Adolescents

<table>
<thead>
<tr>
<th>Unhelpful Health Messages About LBP</th>
<th>Helpful Health Messages About LBP</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBP means something is seriously wrong, damaged, or out of place</td>
<td>LBP is rarely associated with serious pathology or structural damage</td>
</tr>
<tr>
<td>When the spine is too mobile, it can lead to chronic LBP</td>
<td>LBP is influenced by many things, such as your activity levels, sleep patterns, mood, worries, response to stress, habitual body postures, and levels of conditioning</td>
</tr>
<tr>
<td>Scoliosis causes LBP</td>
<td>While there is no ideal posture, varying your posture is helpful</td>
</tr>
<tr>
<td>Poor posture, such as slump sitting, is the cause of LBP</td>
<td>Rest, avoidance of activity, and taking time off school are usually not helpful for LBP</td>
</tr>
<tr>
<td>Physical activity and carrying school bags should be avoided if painful</td>
<td>Regular physical activity, maintaining a positive mindset about LBP, good sleep patterns, maintaining a healthy weight, and learning to handle stress are good for LBP</td>
</tr>
<tr>
<td>With LBP, the spine should be rested and school avoided</td>
<td>If your back hurts carrying a backpack or playing sports, then get your back strong and conditioned so it will handle loads better</td>
</tr>
</tbody>
</table>

*Abbreviation: LBP, low back pain.*
Barriers to Breaking the Cycle

Consensus of 4 domains

- The culture of health care consumption
- Patient factors and experiences
- Clinician factors and experiences
- Practice environment

These domains are interrelated, interact, and influence the clinician-patient interaction. We map drivers to potential solutions to overcome overuse.

Clinical Trajectories...
In Concussion Management

Acute Assessment < 5 days includes: SCAT5, VOMs, KD Test

1. Present @ waking? Light/noise sensitivity?
   - Headache/Migraine

2. Progresses as day goes on
   - Cervical

   a. Neck pain, dizziness, limited ROM, Postural/UQ Dysfunction

   b. Difficulty reading, blurry vision, double vision, headache with visual tasks?
   - Oculomotor

   c. Dizziness, balance problems, blurry vision
   - Vestibular

   d. Tiredness, fogtness, memory deficits
   - Cognition/Fatigue

   e. Dizziness, nervousness, difficulty sleeping, emotional disturbances
   - Mood/Axiety

Physical Exam to include; Myelomes, Coordination, CN Testing if warranted

Post-traumatic migraine

Ocular/Postural/Cervical Testing

HIT-6
Headache Neurologist Referral Consistent MD follow-up

AROM/PROM, TEO ligamentous instability (SP, AL)
Cervical JPE Test, HNDT, SPNFT
Postural Assessment
Neck Disability Index
Deep Cervical Flavors/Extensor Endurance (when appropriate)

OMROM, Smaoth Pursuits, Saccades, NPC, Subjective Visual Vertical/Basket Test
Cover/Uncover/Alternate Cover Test, Near Vision Assessment, Visual Acuity
King Devick
CIZ, BIVSS

Dix Hallpike/Roll Test
VOR, Head Thrust, Head Shaking Nystagmus, DVAT
VOR Cancellation, Optokinetic Nystagmus
Modified CTSB, FSA, HMT, Y-Balance, Dual Task Assessment,
Computerized Posturography (if available)
DHI, ABC Scale, VVAS

ImpACT (or other computerized NP testing)
TOMALs-2, WMS-4, FAVRES, RBANS-update, SCAE, BRIEF-2, WAIS-R, Mount Wiza,
PCL-E, CEFL-5
Formalized Neuropsychological Assessment
Buffalo Concussion Treadmill Test/ modified Exertional Testing
Pittsburgh Sleep Quality Index®, Epworth Sleepiness Scale, Sleep Hygiene Index

State-Trait Anxiety Inventory, Profile of Moods States (POMS)
Formalized Neuropsychological Assessment
ANTIFRAGILE
ADJECTIVE

BECOMES STRONGER FACING ADVERSITY, JUST AS WIND EXTINGUISHES A CANDLE, BUT FUELS A FIRE.
CB Initial Injury

July 11, 2015 - Playing a baseball showcase and was at bat when he was hit in the back of the head, under the helmet, with a mid 80’s fastball. He dropped to the ground on all fours and was still alert, no LOC.

Immediate headache reported

Seen in ER, X-rays and observation for 4 hrs

Concussion diagnosed and protocol initiated.
- Was given Hydrocodone, 1 tablet every 4-6 hrs as needed for pain.
- Ondansetron, 8 mg, twice daily for nausea.
1 Month Later......

8/13/15 - Followed up with PCM and was told to follow the same protocol for concussion.

Symptoms include: fatigue, headache daily upon waking and fogginess
- No Activity until symptoms resolved
- Was not in school at this time
- Avoid stimulation and things that made symptoms worse
Almost 2 months post injury

9/6/15 - Neuro-optometrist Exam performed

9/7/15 - ImPACT performed and poor results

9/11/15 - Had an appt. with MD that covered high school sports, who did impact testing for High School. CB never had baseline ImPACT in High School.

High School MD

◦ Tylenol – as needed
◦ Amitriptyline – 25 mg tablet at bedtime
2.5 months...

9/25/15 - Follow up with MD from high school, with no change to how he feels.

9/31/15 - Had an MRI done
3 months since injury....

10/10/15 - Made an appt. with Sports Medicine physician at University Hospital System Sports Medicine.

ImPACT test on CB, took X-rays and was told to go ½ days at school.

Referral to Neurologist who specialized in Concussion.
10/24/15 - First appt. with Neurologist, 4 hours going over everything. Repeated ImPACT with poor below normative performance.

Referral to vestibular therapy, vision therapy and cervical manual therapy (all 3 different locations)

- Tylenol – as needed
- Amitriptyline – increased to 75 mg at bedtime
- Ritalin – 1 tablet by mouth twice a day (he took it 3 days because it made him feel worse)
10/29/15 - Had an appt. with a vestibular therapist able to make it through eval but stopped with treatment secondary to increased headache

11/8/15 - First appt. with orthopedic PT for his neck. She did an exam and talked about her thoughts and feelings on what she could do with trying to relieve pressure points and some massage.

11/15/15 - Another appt. with ortho PT and after further exam, recommended injection in cervical spine in order to perform high thrust upper cervical manipulation

Was referred to pain management
4.5 Months...

11/22/15 - Had an appt. with Neuropsychology.

CB was put through a full day of testing, which he had to stop shortly after lunch and we had to go back the following week to finish.

Patient reported total fog and had no idea what was going on during or post NP testing.
5 months...

12/6/15 - appt. with pain management MD

He was given an injection of Bupivacaine (Marcaine) 4 mL.

Another injection of Triamcinolone Acetonide (Kenalog-40) 40 mg.

12/12/15 – f/u with ortho PT, had an upper cervical manipulation and increased cervical ROM following and had repeated upper cervical manipulations

12/12/15 – saw Concussion Neurologist who ordered continued ortho/vestibular PT and vision therapy
6 months

Continued headache with no change with continued upper cervical manipulations

vestibular & vision therapy continued as well

He had good days and bad days and he seemed to be doing well but the headaches continued.

Stopped the vestibular and neck therapy at this time because they were at a loss of what to do to help him and no objective progress made.

F/u with pain management with more injections:

- Bupivacaine (Marcaine) 10 mL.
6.5 months...

F/u with neurologist with continued complaints of headache and fatigue, depression and occasional visual issues/dizziness

Was still not back in school full days

MRI c/spine ordered: multiple small central and parcentral disc protrusions resulting in minimal central spinal stenosis, most notable C5/C6

- Tylenol continued
- Amitriptyline- 75 mg BID
- Cyclobenzaprine 10mg 3x a day
2/20/16 - Spine Center Pain Procedure - wanted to do a test run and deaden or block the nerves to see if it would help with the headaches.

Medial Branch Block Cervical C2-4 Bilateral. He had 6 injections on each side of his neck and nothing changed over the course of the week.

No change in headaches
8 months

Neuro-optometrist tried prism lenses to decrease strain on vision with reading and schoolwork

No change

Saw neuro-surgeon to insure nothing had been missed, he concurred with neurologist’s POC
8.5 months...

Follow up with neurologist
- Tylenol – as needed
- Amitriptyline – 75 mg, once daily
- Topiramate (Topamax) 25 mg, twice daily
CB’s Dad did the following:

- Researched online and found a website called The Players Tribune, and read an article about a hockey player that was having concussion issues and couldn’t get relief. He found Dr. Jeff Kutcher at the Core Institute in Michigan. I found a contact number and email for Dr. Kutcher and started a conversation with him about Chase and he said he would be happy to take a look at him. We scheduled an appt. for April for 3 days in Michigan working with Dr. Kutcher.

- Drove from Kansas to Michigan for 2^nd^ opinion:
  - Testing for the whole day. They did the same thing on Tuesday and gave CB a workout program to start with to get him back to playing ball and to get over the headaches. Dr. Kutcher said you must treat it like an injury and start aggressive rehabilitation.
Now he’s your patient! What do you want to do?
Double vision makes it difficult to read and comprehend.
<table>
<thead>
<tr>
<th>Physiologic</th>
<th>Vestibulo-Ocular</th>
<th>Cervicogenic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache exacerbated by physical and cognitive activity</td>
<td>Headache exacerbated by activities that worsen vestibulo-ocular symptoms (i.e. reading)</td>
<td>Occipital headaches exacerbated by head movements and not physical or cognitive activity</td>
</tr>
<tr>
<td>Nausea, intermittent vomiting</td>
<td>Nausea</td>
<td></td>
</tr>
<tr>
<td>Photophobia, phonophobia</td>
<td>Photophobia</td>
<td></td>
</tr>
<tr>
<td>Dizziness</td>
<td>Dizziness, vertigo, lightheadedness</td>
<td>Dizziness, Lightheadedness</td>
</tr>
<tr>
<td>Fatigue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty concentrating, slowed speech</td>
<td>Blurred or double vision, difficulty tracking objects, motion sensitivity, eye strain or brow-ache</td>
<td></td>
</tr>
<tr>
<td>Gait instability and postural instability at rest</td>
<td>Postural imbalance</td>
<td>Neck pain, stiffness, and decreased range of motion</td>
</tr>
</tbody>
</table>
Evaluation Findings

Abnormal Cervical JPE Test

Abnormal cervical spine mobility

Over-activity in upper trapezius and Sub-occipitals, poor motor control with any head movements

Abnormal convergence > 6cm

Hypometric Saccades

> 3 line difference on DVAT bilaterally, below 100 degrees per second for GST scores with asymmetry

Abnormal Limits of Stability Testing (forward direction and poor reaction times)

+ right Dix Hallpike

Completed 5 mins on Buffalo Concussion Treadmill Test before Increase in Symptoms
Diagnostic Challenge

Concussion
- Headache
- Dizziness
- Sensitivity to noise, light
- Balance problems
- Fatigue
- Concentration and memory problems
- Irritable, sad, anxious

Whiplash
- Neck pain/stiffness
- Dizziness
- Headaches
- Unsteadiness
- Fatigue
- Concentration and memory problems
- PTSD
How is This All Related?

FIGURE 1. Proposed schema of cervical afferent involvement in sensorimotor control. Abbreviation: CNS, central nervous system.
Cervical Dysfunction and Treatment

Viewpoint
Sport-Related Concussion: Optimizing Treatment Through Evidence-Informed Practice
| Differential Diagnoses and Suggested Management of Sensorimotor Control Disturbances in Those With Traumatic Neck Pain |
|---|---|---|---|---|---|
| **Cervical** | **Vertebrobasilar** | **Bridging Vasa** | **Peripheral Vascular** | **Central Vascular** | **Phylogenetic** |
| Exacerbation | Unilateral weakness + light headness | Vertigo | Vertigo | Vertigo | Vertigo |
| Frequency | Episodic | Episodic | Episodic | Episodic | Episodic |
| Duration | Minutes to hours |Seconds |Seconds |Seconds |Seconds |
| Exacerbated | Increased pain + neck movement | Sustained on neck extension and/or rotation | Headache in bed + neck movement + malaise | Headaches or vision problems | Headaches or vision problems |
| Related | Decreasing rest pain + neck to neutral | Disabling if doing physical activities | Headaches + neck study | Headaches + neck study | Headaches + neck study |
| Associated Symptoms | Blurred vision | Nausea | Nausea | Nausea | Nausea |
| Suggested Causes | Abnormal cervical arborization | LEAKS | LEAKS | LEAKS | LEAKS |
| Primary Objective Findings | Cervical muscle-skeletal symptoms | Increased arm + neck tension | Positive Babinski sign | Headache + neck study | Headache + neck study |
| Suggested Treatment | Cervical muscle-skeletal and tail end sensorimotor | Related to head or neck | referral to ENT + surgery | Refer to ENT + surgery | Refer to ENT + surgery |

**Abbreviations:** BB, barbitone; BV, bridging; perianginal position; VAS, crown; scapular vessels; EMG, dynamic visual analy; ENT, ear, nose, throat. **Questions:** VH, joint position error; SPN, spine; muscle testing may reveal; TA, targeted artery; VM, vertebrobasilar occlusion; VH, vertebrobasilar occlusion; VM, vertebrobasilar occlusion. **CAUTION:** Includes: slow evolution, severe, unusual pain, and suicide.
Cervicovestibular rehabilitation in sport-related concussion: a randomised controlled trial

Kathryn J Schneider1,2, Willem H Meeuwisse1,3, Alberto Nettel-Aguirre2,3,4, Karen Barlow2, Lara Boyd5, Jian Kang1, Carolyn A Emery1,2,3

Results In the treatment group, 73% (11/15) of the participants were medically cleared within 8 weeks of initiation of treatment, compared with 7% (1/14) in the control group. Using an intention to treat analysis, individuals in the treatment group were 3.91 (95% CI 1.34 to 11.34) times more likely to be medically cleared by 8 weeks.

Conclusions A combination of cervical and vestibular physiotherapy decreased time to medical clearance to return to sport in youth and young adults with persistent symptoms of dizziness, neck pain and/or headaches following a sport-related concussion.
Are You Getting to Sport Specific Training?


