



TBI-BH ECHO

Traumatic Brain Injury - Behavioral Health ECHO
UW Medicine | Psychiatry and Behavioral Sciences

Persisting Symptoms after Concussion

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2/6/26



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Speaker disclosures

No conflicts of interest

The following series planners have no conflicts of interest:

- ✓ Jennifer Erickson DO
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- ✓ Chuck Bombardier PhD
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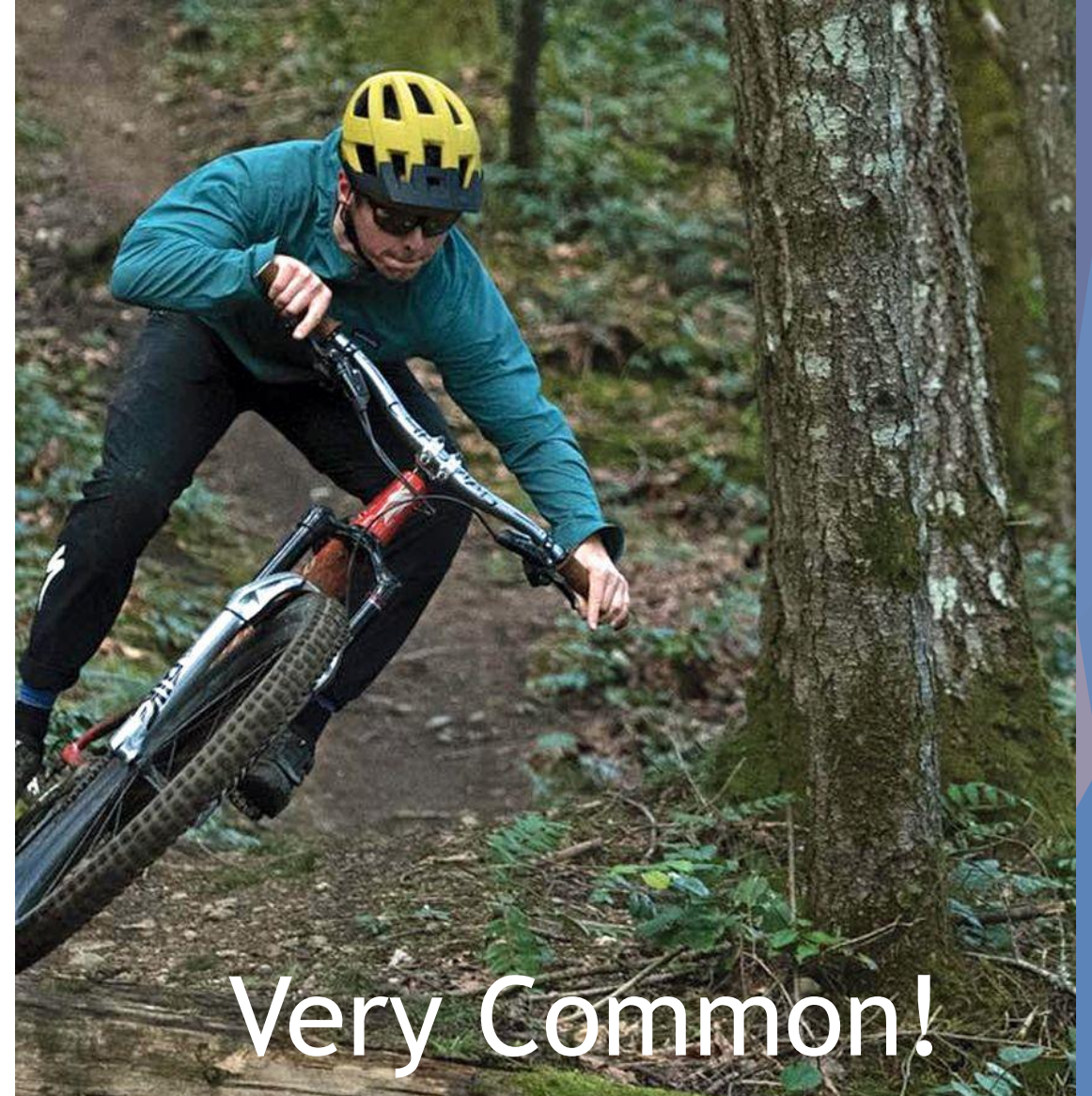
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Objectives

1. Identify patients who have persisting symptoms after concussion and possible contributing factors
2. Shift mindset from “post-concussion syndrome” to persisting symptoms
3. Apply strategies to encourage overall concussion recovery
4. Target symptoms with evidence-based treatments



Concussion...



Very Common!



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Concussion...

- Difficult to diagnose and many patients do not present to care
- Data likely counts 1 out of 9 concussions
- CDC estimates that 1.4-3.8 million concussions occur each year in the United States

Very Common!



Outcomes?



2 weeks post-concussion



2 years post-concussion

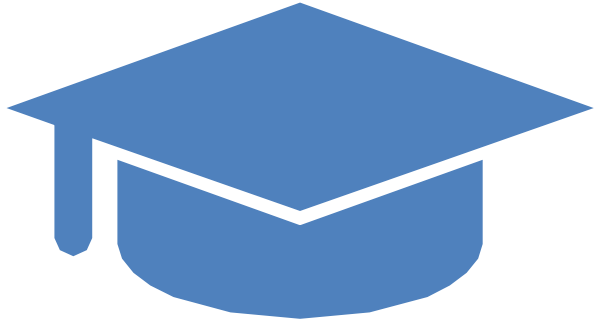


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Case - Ms S

- ▶ A 31 yo female comes to clinic 3 months after a helmeted bike crash
- ▶ She hit her head and did not lose consciousness, but felt dazed and doesn't remember the few minutes after the injury
- ▶ She went to the ED right after and head CT had no acute findings





Case - Ms S

- ▶ She is a grad student and took one week off before returning to school because she did not want to fall behind.
- ▶ However, she has had new severe headaches almost every day. She has trouble looking at screens to do her work. She now has accommodations to stop attending classes in person.
- ▶ She also reports brain fog. She is taking much longer than usual to complete assignments. She cannot pay attention to follow conversations.

Case - Ms S

Why aren't my
symptoms
getting better?

What is wrong
with me?

Do I have PCS?



Diagnosing Concussion and Persisting Symptoms



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Concussions and mild TBIs

If neuroimaging negative:
Concussion = mild TBI



If neuroimaging positive:
Complicated mild TBI



Did the patient have a concussion?

- ▶ Symptoms of mTBI/concussion are vague. Heavily overlap with other diagnoses like depression, PTSD, or whiplash from the injury

- ▶ Diagnosis may help patient education and reassurance, explaining need for other work up

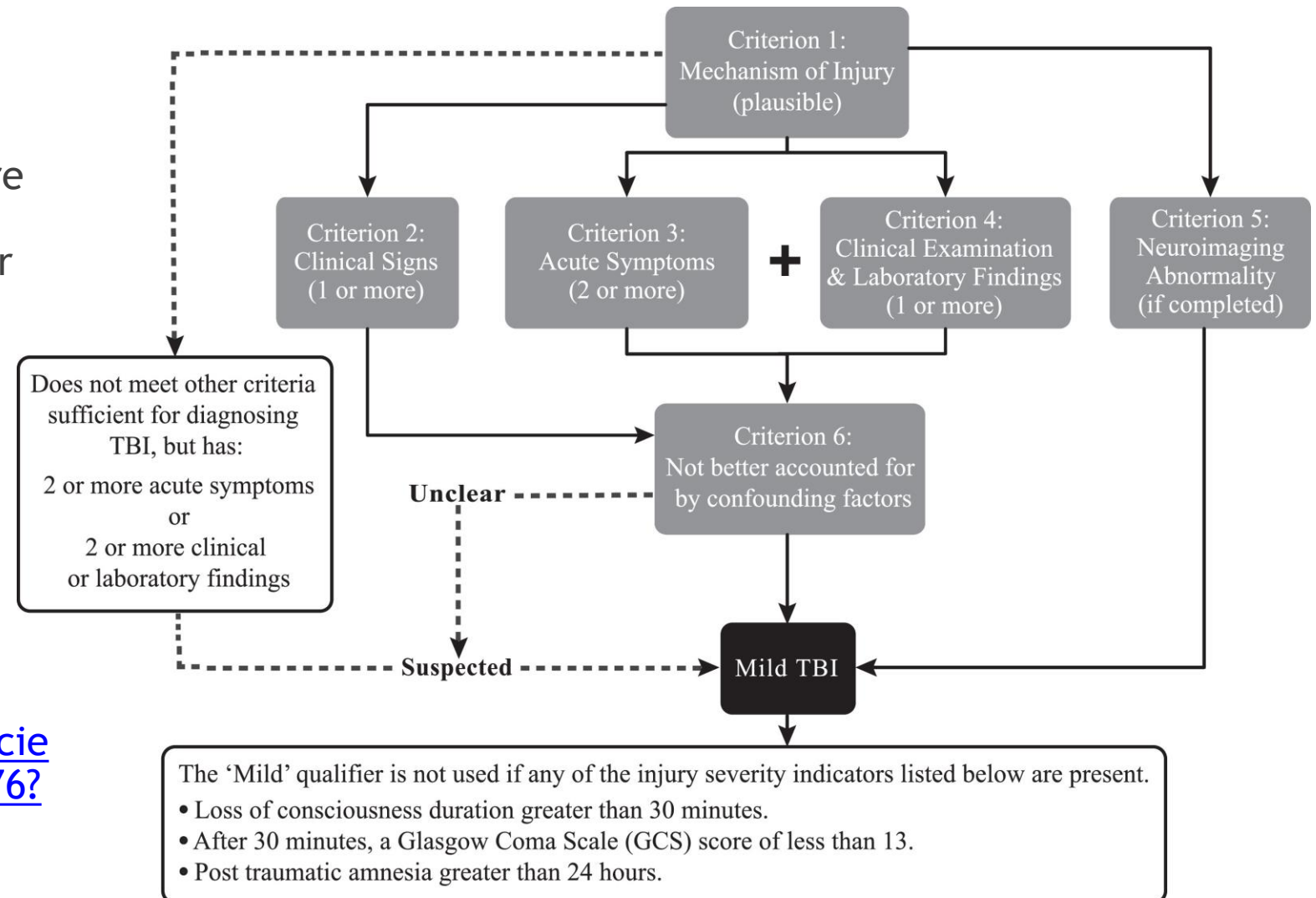
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► Symptoms of mTBI/concussion are vague. Heavily overlap with other diagnoses like depression, PTSD, or whiplash from the injury

► Diagnosis may help patient education and reassurance, explaining need for other work up

► Concussion Diagnosis criteria (ACRM):

<https://www.sciencedirect.com/science/article/pii/S0003999323002976?via%3Dihub#fig0002>



“Post-Concussion Syndrome”



"Oh, that... that's the GP's motto."



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“Post-Concussion Syndrome”

Definitions...conflicting

DSM IV

Concussion

Cognitive Deficits on
Neuropsych Testing

>3 symptoms
>3 months

- Fatigue
- Sleep Disorder
- Headache
- Vertigo/Dizziness
- Irritability
- Depression
- Personality Changes
- Apathy

Decline in function



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Decline in function

Need Neuropsych
testing to diagnose

Waiting 3 months to
intervene would be
too long!



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Decline in function

DSM V

~~PCS~~



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- Fatigue
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- Irritability
- Depression
- Personality Changes
- Apathy

Decline in function

DSM V

~~PCS~~

ICD-10

Head Trauma w/ LOC

Disorder caused by
brain injury with no
other cause

>3 symptoms
> 4 weeks

- Sleep Disorder
- Headache/Pain/Dizziness
- Cognitive Complaints
- Emotional Changes
- Reduced alcohol tolerance
- Hypochondriacal over-valued ideas



~~“Post-Concussion Syndrome”~~

Persisting Symptoms after Concussion

2022 - “Time for a Paradigm Shift”

- Definitions are not clinically useful
- Implies that all symptoms are solely due to the concussion
- Defeatist mindset that recovery will not happen
- Persisting -> Symptoms are present now, but we have the power to resolve them



Persisting Symptoms after Concussion

Normal non-persisting symptoms:

- Concussion symptoms improve significantly within 1 month for most healthy individuals



Persisting Symptoms after Concussion

Persisting Symptoms

- The same or worsening in number and severity days to weeks after injury
- May be related to premorbid, comorbid, or resulting factors from the injury
- Cause distress or disability more than half the days
- Prevent return to normal activities (work, school, social)



Why do symptoms persist?

Still a mystery

20-59% of patients will have symptoms beyond one-month post-injury

No singular pathophysiological cause

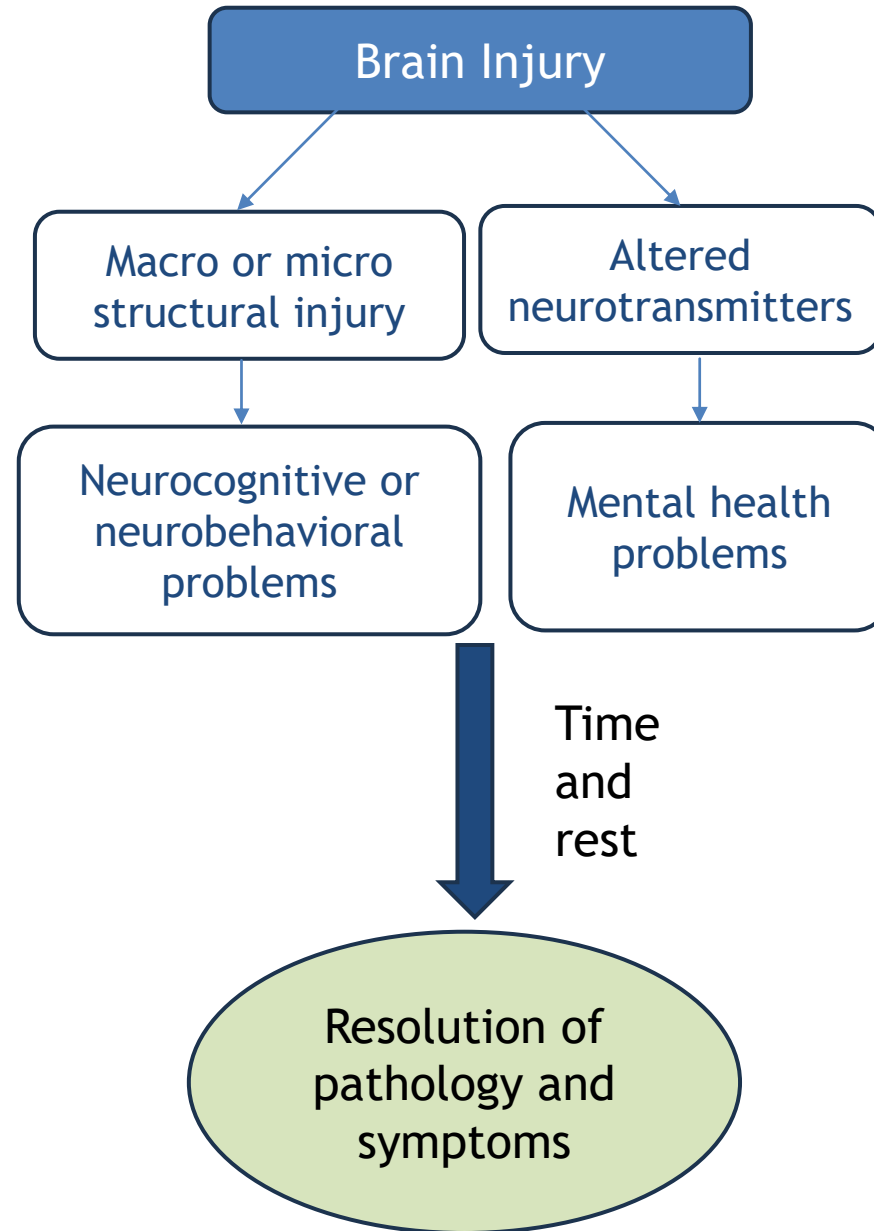
Theory - Psychosocial model

Theadom A, Parag V, Dowell T, McPherson K, Starkey N, Barker-Collo S, et al. Persistent problems 1 year after mild traumatic brain injury: a longitudinal population study in New Zealand. *Br J Gen Pract J R Coll Gen Pract.* 2016;66(642):e16-23. 24.
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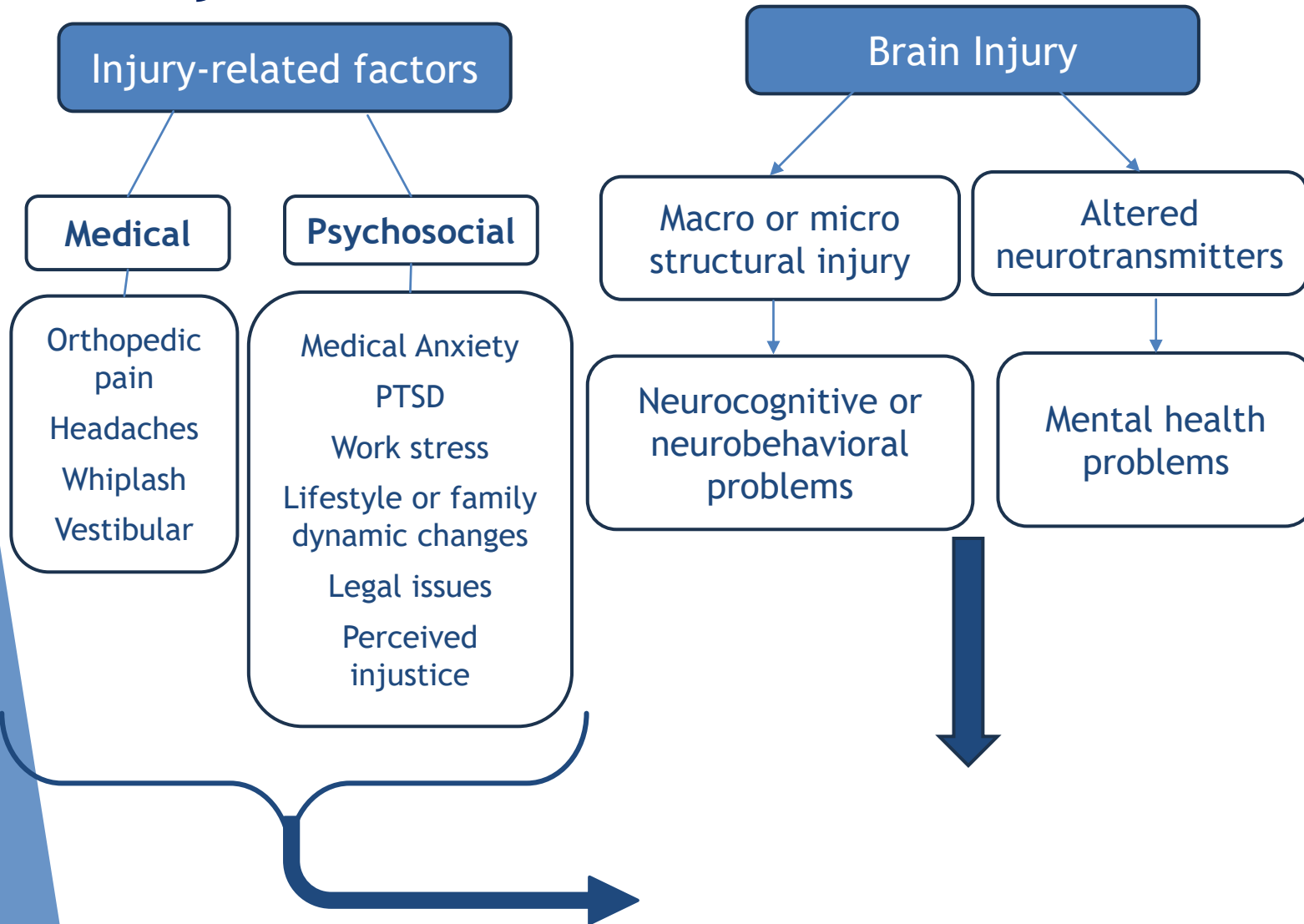


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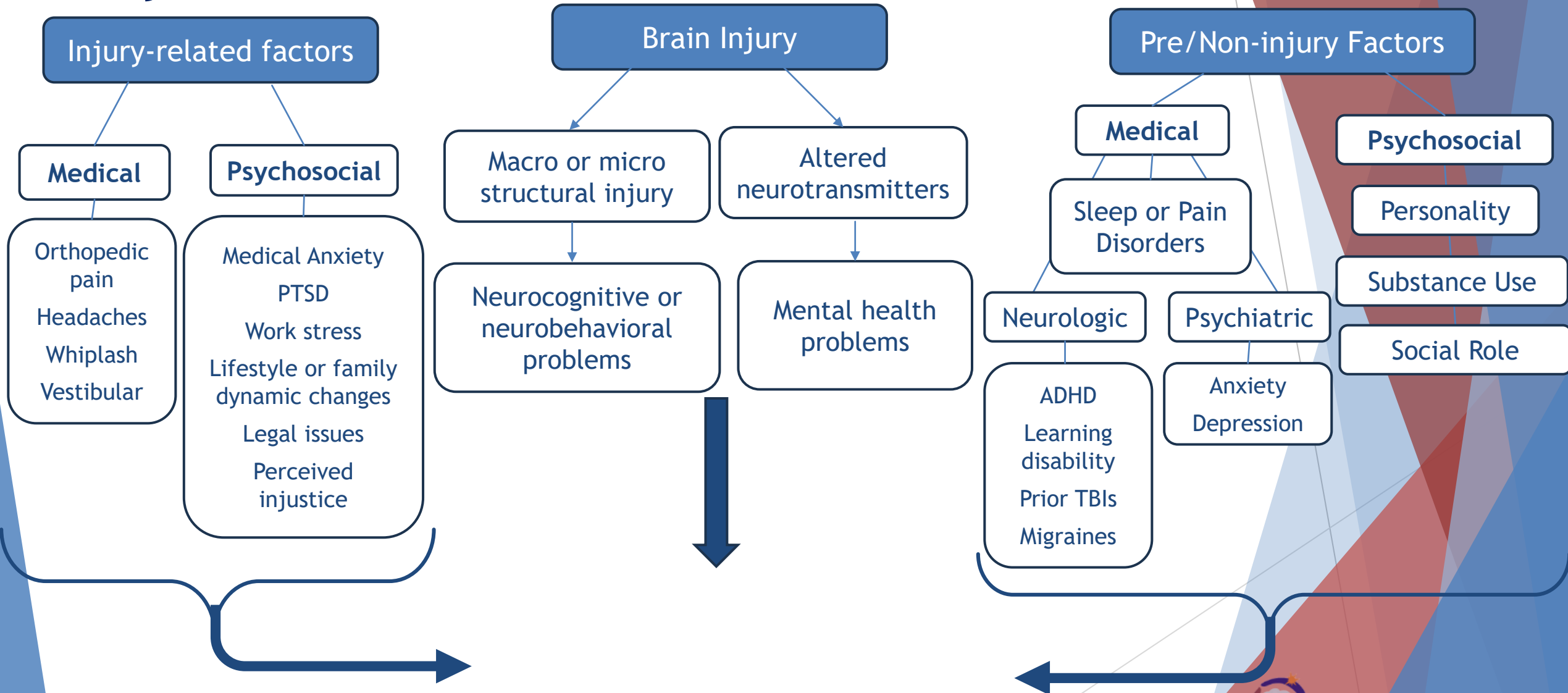
Psychosocial Model



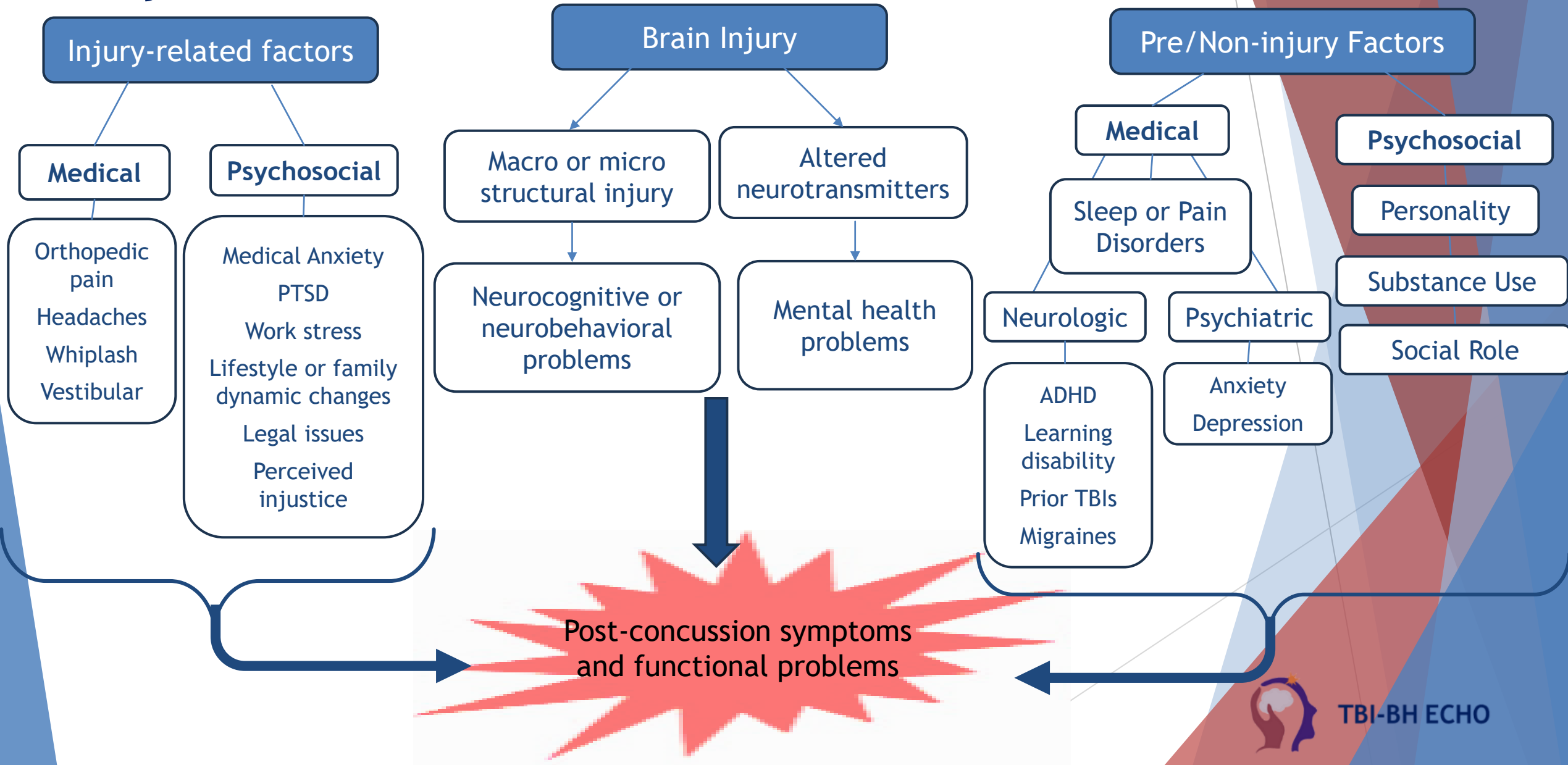
Psychosocial Model



Psychosocial Model



Psychosocial Model



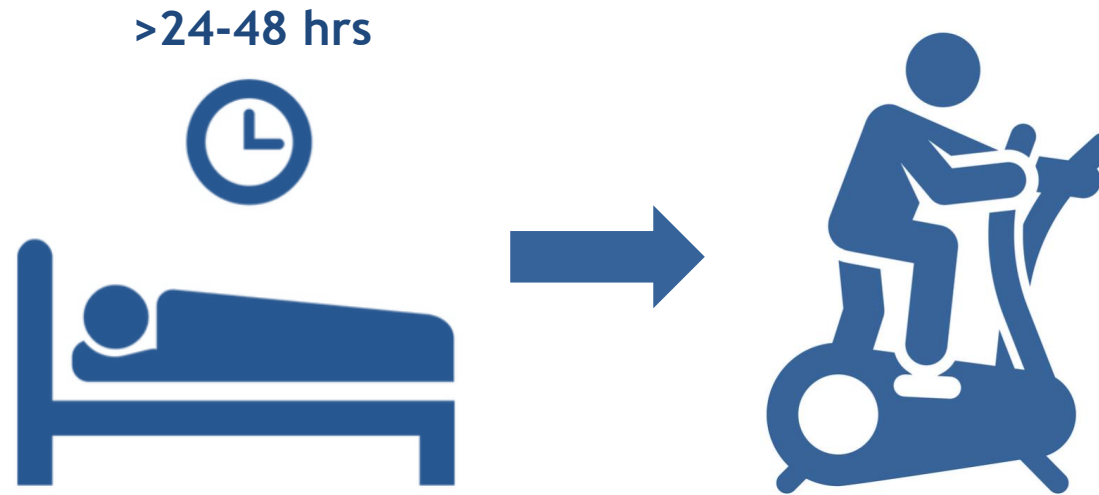
Management Strategies for Overall Recovery



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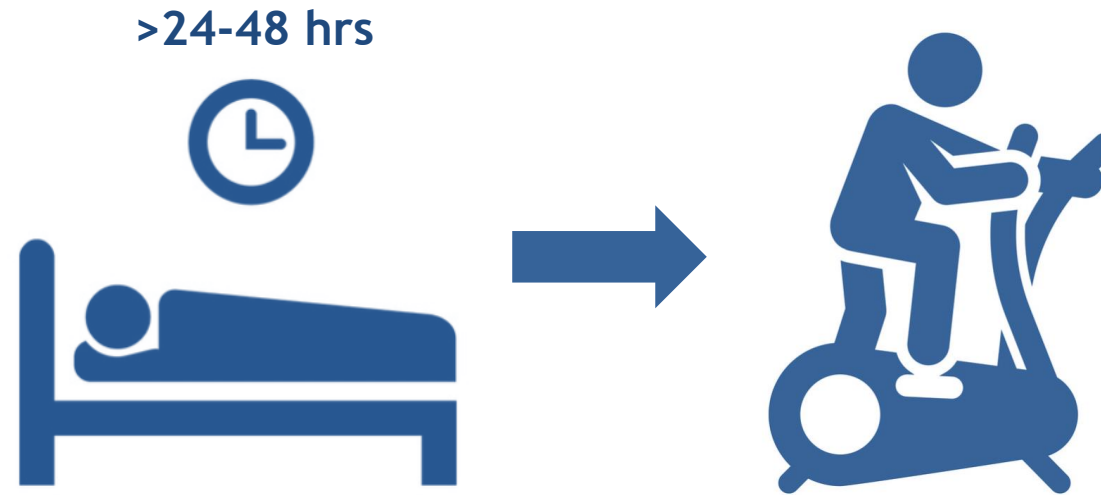
Early Management

- ▶ **Brief** period of relative rest during acute phase (24-48 hours)
- ▶ Gradual/progressive resumption of usual activities **within limits of symptoms**



Early Management

- ▶ Brief period of relative rest during acute phase (24-48 hours)
- ▶ Gradual/progressive resumption of usual activities within limits of symptoms
- ▶ No cocooning (complete rest > 48hrs)



“Cocooning” will prolong symptoms!



Early Management - Physicians



- Early education and reassurance



- Screen for risk factors for prolonged recovery



Case - Ms S

Symptoms persist for many patients for various reasons, but they WILL resolve with treatment and return to normal activity



I really want to get back to the exercise, but it causes headaches, which are scary. I don't want to hurt my brain more.

Persisting Symptoms - Education for All

- ▶ Assure that symptoms are a normal part of recovery
- ▶ Symptoms are not a sign of permanent or ongoing brain damage/dysfunction
- ▶ Encourage safe exercise and recreational activities within limits of symptoms
- ▶ Encourage good sleep hygiene
- ▶ Resume usual occupational, educational, and social responsibilities in a graded fashion

Persisting Symptoms - Education for All

Cognitive Behavioral Therapy

- ▶ Reduces anxiety
- ▶ Reduces misattribution of symptoms
- ▶ Encourages resumption of normal activities

Exercise for All

- ▶ Exercise associated with faster symptom resolution
- ▶ Sub-symptom Threshold Exercise:
 - ▶ Any low-risk non-contact exercise (cardio, weights)
 - ▶ Determine heart rate that provokes symptoms and exercise at 80% of that
 - ▶ 20-30 min/day



Potential therapies patients ask about

Hyperbaric Oxygen Therapy

- No evidence for improving concussion recovery over sham
- Mostly well-tolerated but can cause barotrauma
- Expensive!!!

Prebiotics and Probiotics

- No evidence for concussion, but inexpensive and may have GI benefits



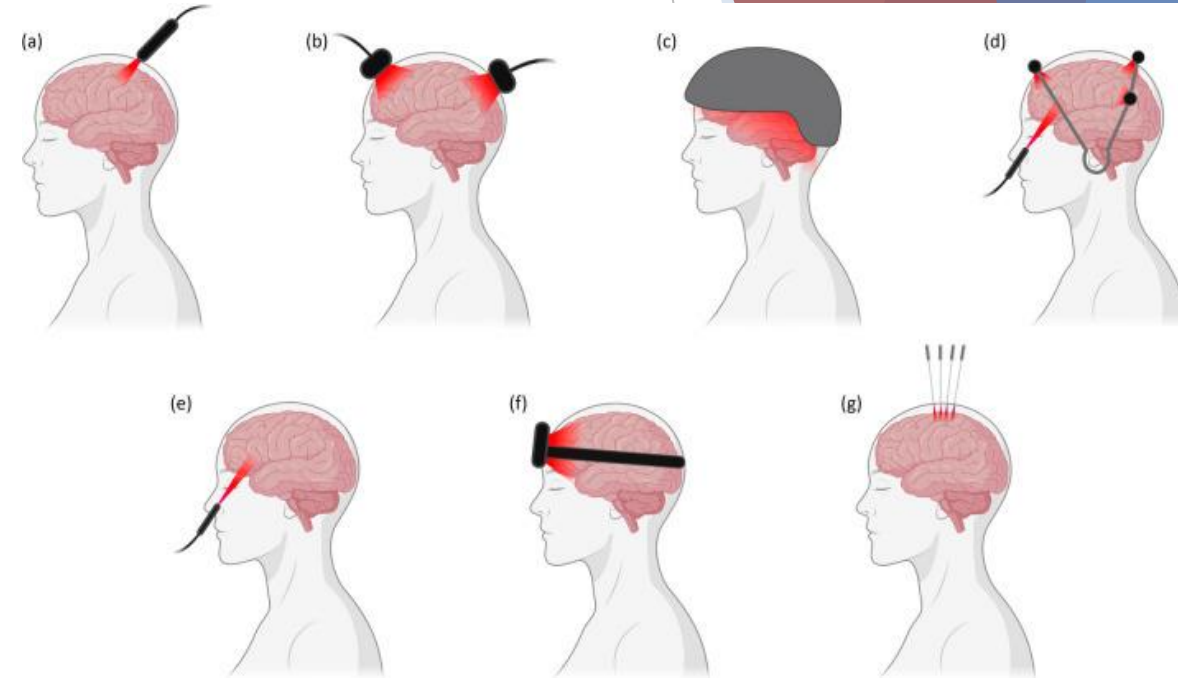
Potential therapies patients ask about

Repetitive Transcranial Magnetic Stimulation (rTMS)

- Evidence is evolving
- A few studies showing improvement over sham in depression and headaches

Red Light Therapy (transcranial photobiomodulation)

- Randomized controlled trial in 2025 showed improvement in cognitive performance and symptoms over sham with red light helmet
- Commercially available devices are variable and expensive



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Symptom Targeted Treatment

A Brief Overview*

*Refer to past TBI-ECHO presentations for more in-depth discussions!



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Persisting Symptoms

Affective

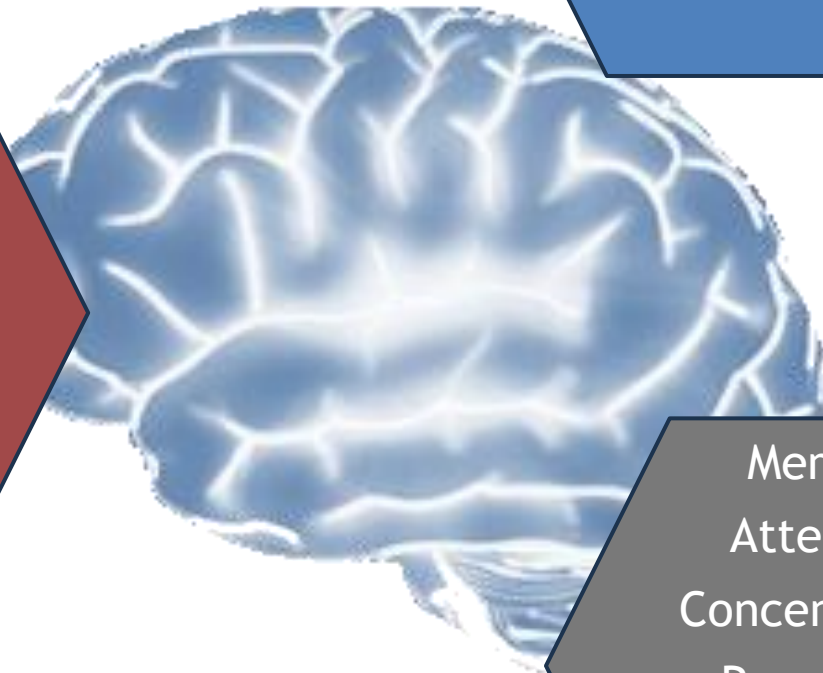
Depression
Anxiety
PTSD
Irritability

Cognitive

Memory
Attention
Concentration
Processing speed
Executive function

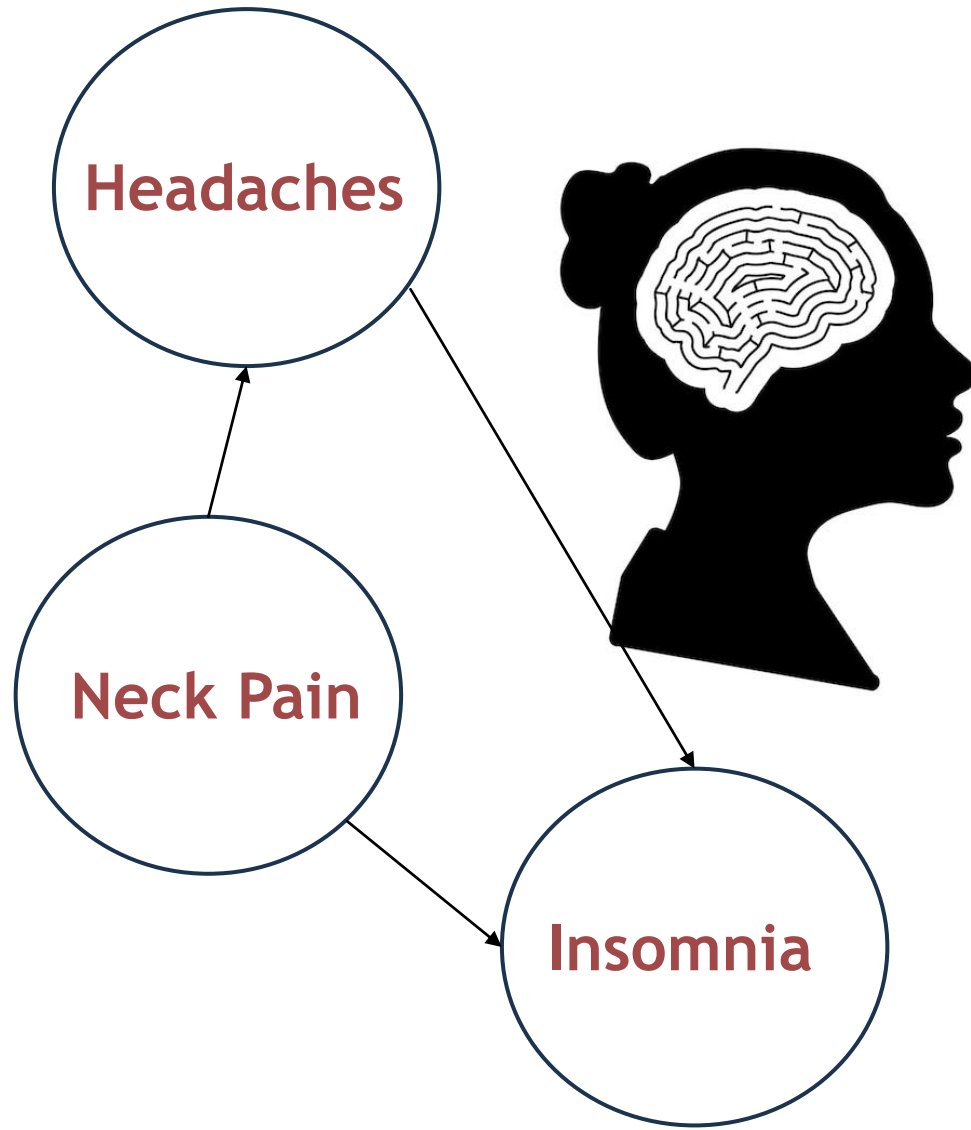
Somatic

Headaches
Neck pain
Sleep
Vestibular
Visual
Fatigue

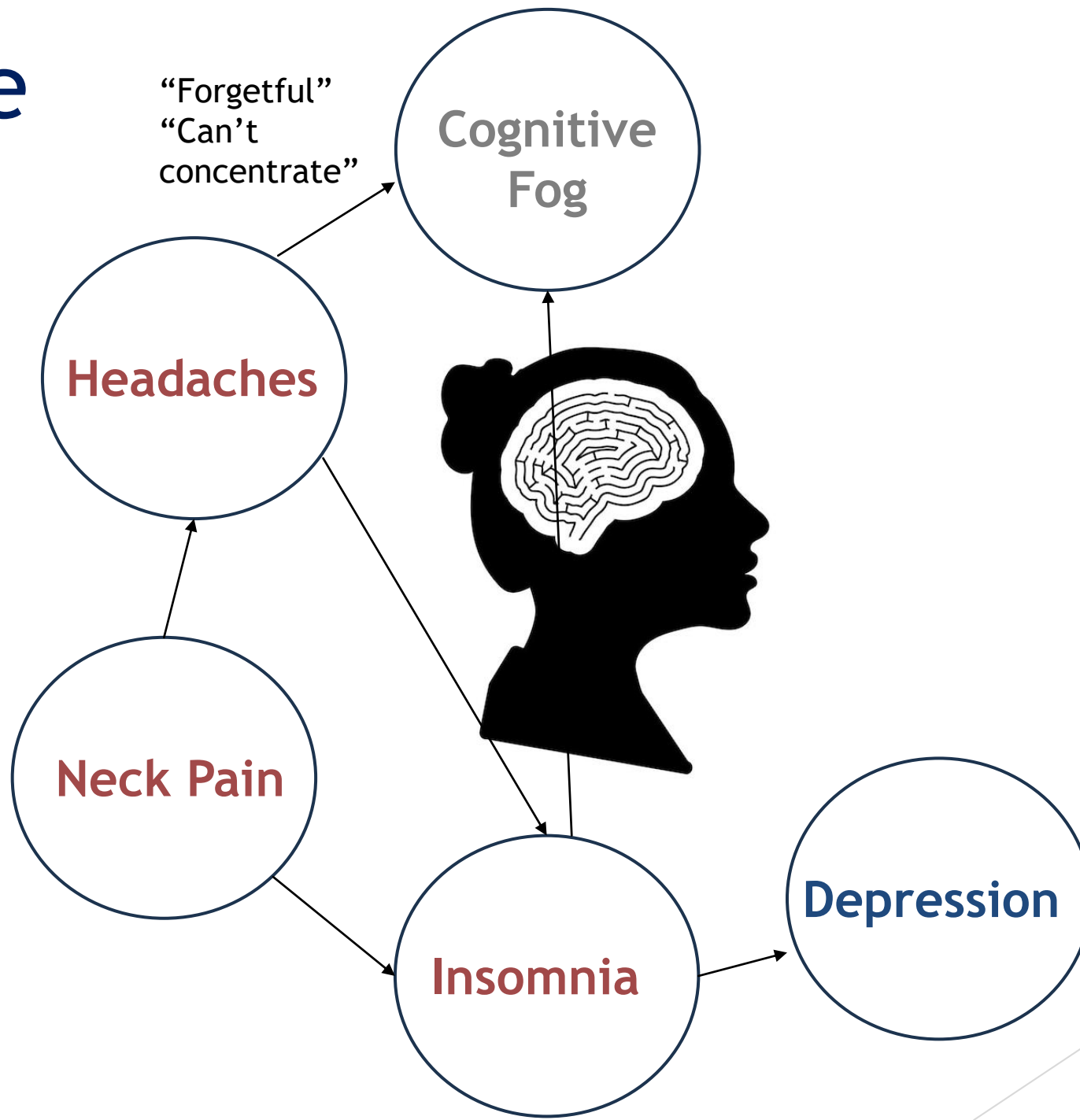


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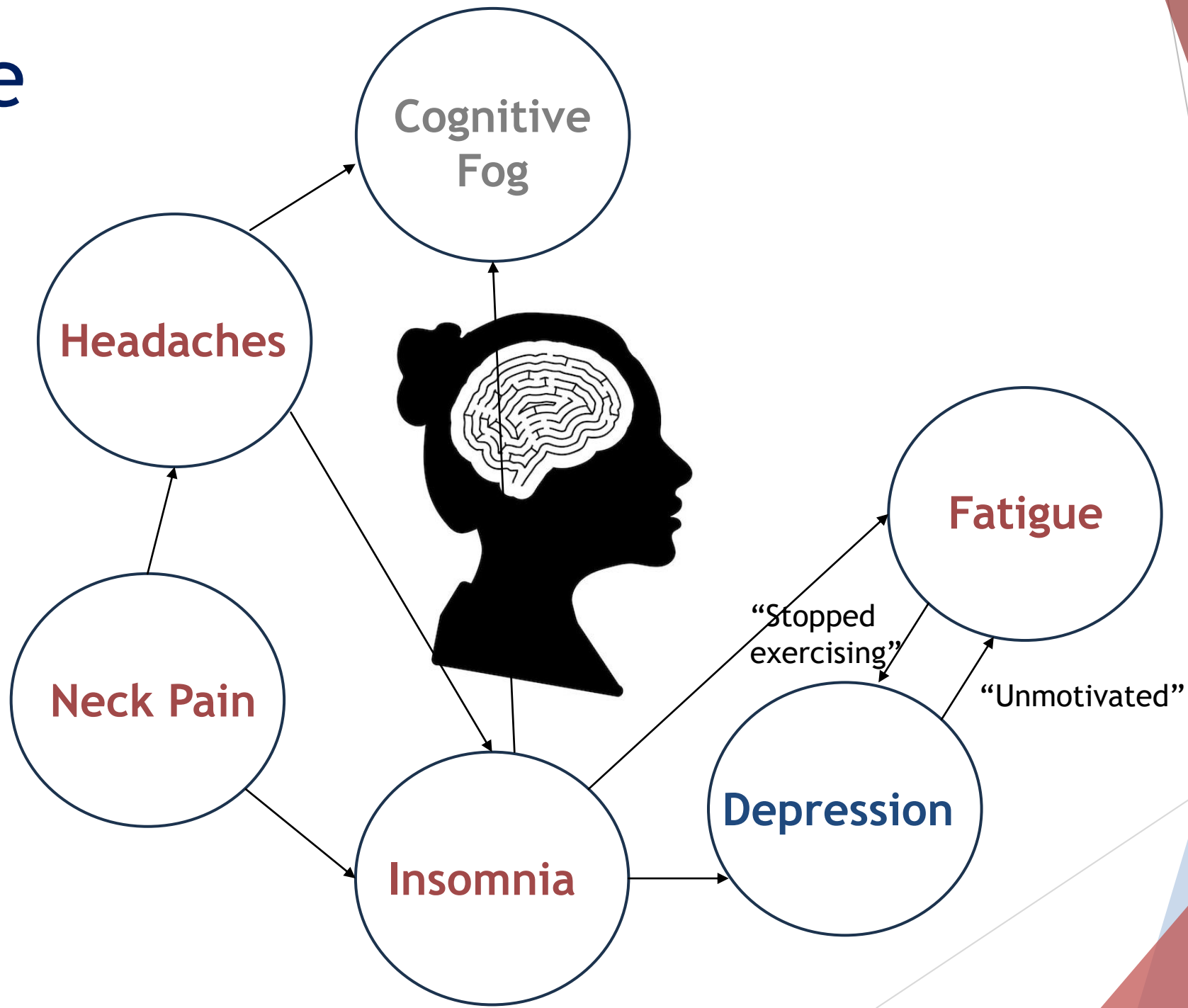
Case - Ms S



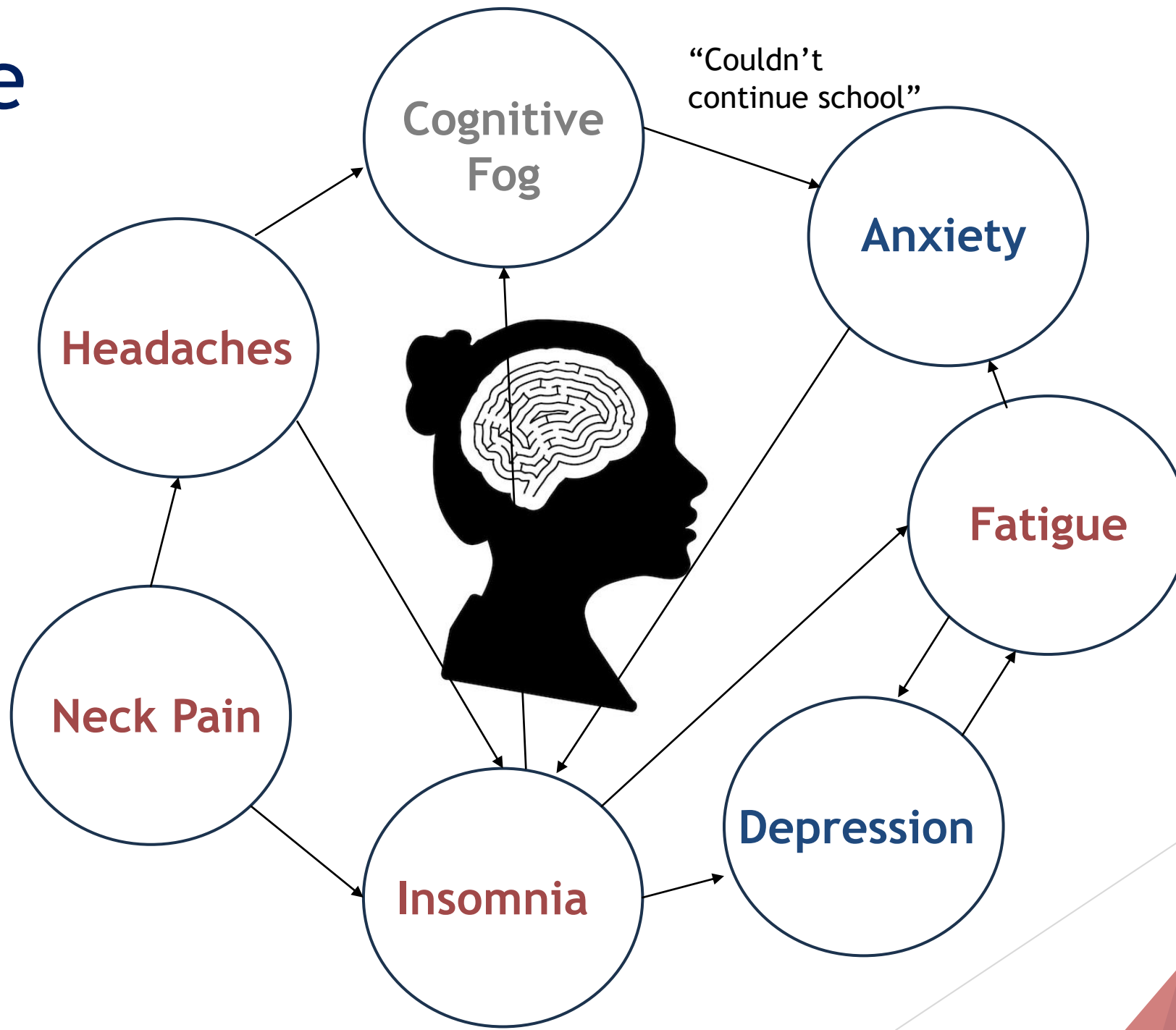
Case



Case



Case



Somatic



Headaches



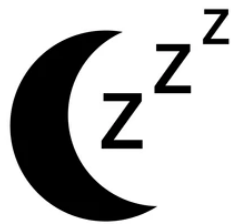
Fatigue



Vestibular



Neck pain



Sleep



Visual



Headaches ± Neck Pain



Post-traumatic headache: new, worse, or different headaches that start within 7 days of injury

Similar to primary headache management:

Type of Headache

**Cervicogenic (Common
due to neck injury)**

**Occipital
Tension
Migraine**



Hydration/Diet
Sleep
Exercise
Relaxation



Abortive (1-2x/week)
NSAIDs
Triptans
Preventative (>15
days/month)
Beta-blockers
TCAs
SNRIs
Anticonvulsants



If Neck Pain:
Physical Therapy
Massage
Modalities



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Vestibular/Visual



CAUSES

Benign Paroxysmal Positional Vertigo (BPPV)

Eye movement problems (convergence, vergence, version deficits)

TREATMENTS

Epley maneuver (may need to do many times)

Vestibular Physical Therapy

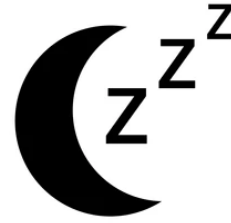
- Desensitize the vestibular system
- Coordinate eye and head movements
- Improve functional balance and mobility

Neuro-Opto or Vision Therapy

Avoid medications that suppress the vestibular system (meclizine)



Sleep Disturbance



CAUSES

Sleep Disorders after TBI

- Insomnia
- Circadian Rhythm Disorders
- Hypersomnia
- Sleep-disordered breathing
- Narcolepsy

Mood and pain problems

TREATMENTS

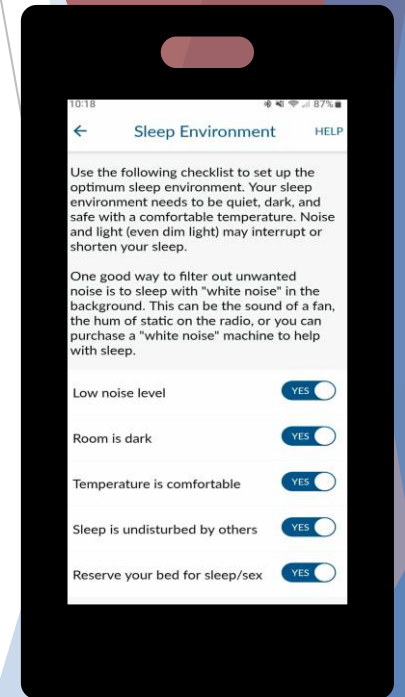
Sleep hygiene

Insomnia -> CBTi

***Cognitive Behavioral Therapy is first-line treatment for insomnia**

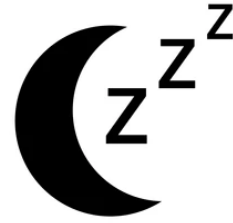
Free(!) Mobile/web apps

- CBTi Coach
- Insomnia Coach
- SleepEZ
- Sleepio



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Sleep Disturbance



CAUSES

Sleep Disorders after TBI

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- Sleep-disordered breathing
- Narcolepsy

Mood and pain problems

TREATMENTS

Sleep hygiene

Insomnia -> CBTi

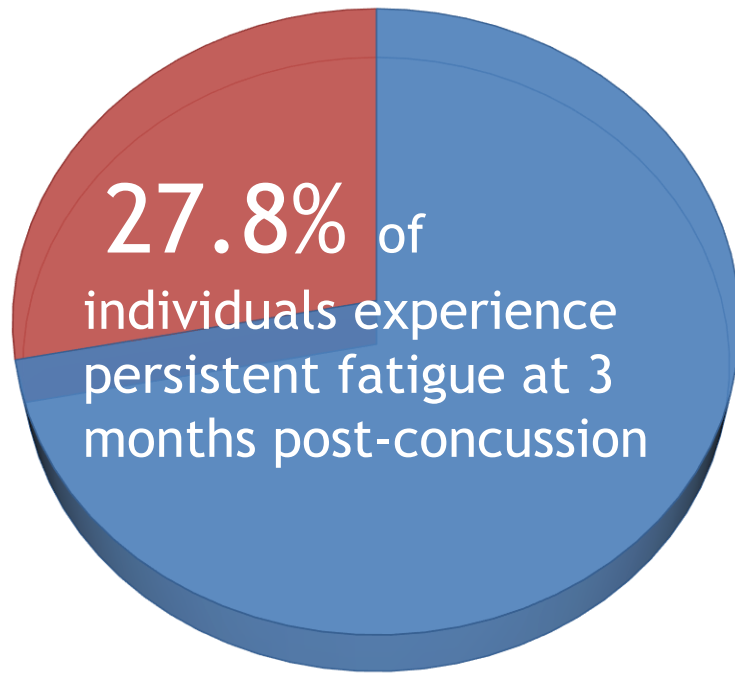
Medications: melatonin and trazodone
(or other antidepressant)

Referral to Sleep Disorder specialist if
suspect sleep disorder



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Fatigue



TREATMENTS

Pacing strategies (cognitive and physical)

Exercise to build endurance

Blue-light therapy

Neuro-endocrine workup if persistent despite treating other problems



Affective Causes



Brain Pathology



Life Stress



Depression
Anxiety
PTSD



Pain



Insomnia



Affective Treatment



Address pain, sleep, metabolic disturbances



Psychological counseling and CBT (restructuring thinking and reattributing symptoms)



Pharmacologic: same as primary mood disorder*

- antidepressants
- anxiolytics
- mood stabilizers

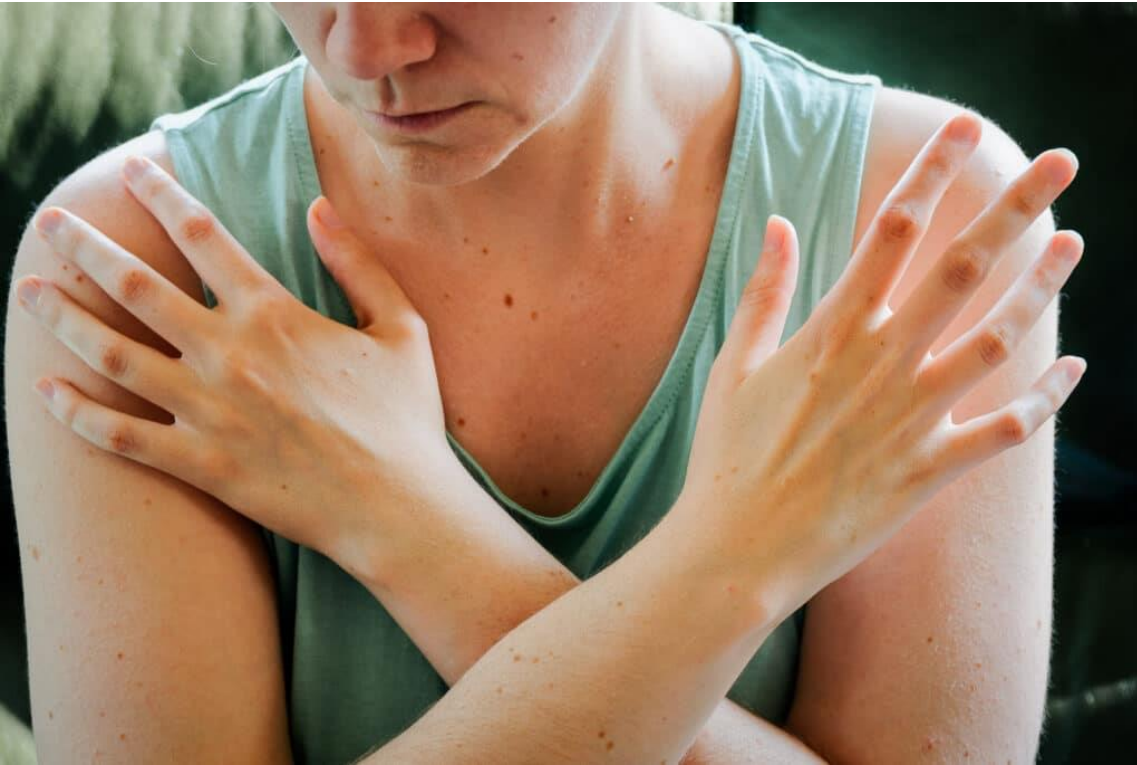
*TBI recovery: avoid sedating or anticholinergic meds

*Goal for medications that target multiple symptoms



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Affective - Stress Response



- ▶ Hyperactivation of the sympathetic nervous system after trauma
- ▶ Overactive "fight or flight" response
- ▶ Management
 - Breathing techniques
 - Meditation
 - Bilateral stimulation music or tapping
 - Vagus nerve activation via humming, singing, chanting
 - Vagus nerve stimulation devices



Cognitive

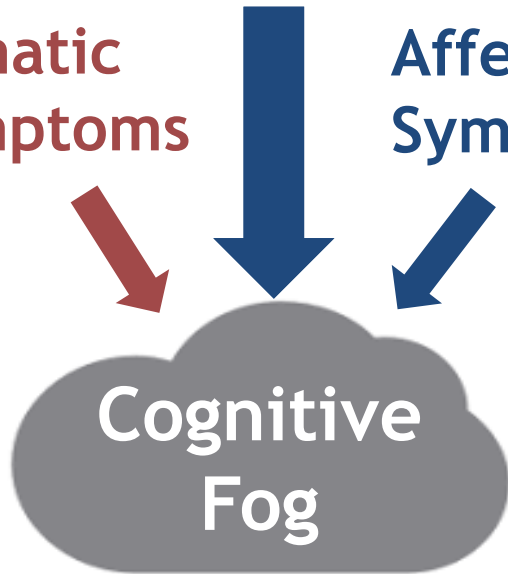


CAUSES

TBI Pathology

**Somatic
Symptoms**

**Affective
Symptoms**



TREATMENTS

Pacing cognitive activities

- focus on one task at a time
- take brain breaks
- build up cognitive endurance

Speech Therapy - Compensatory strategies (reminders, note taking, calendar)

Medications - Methylphenidate

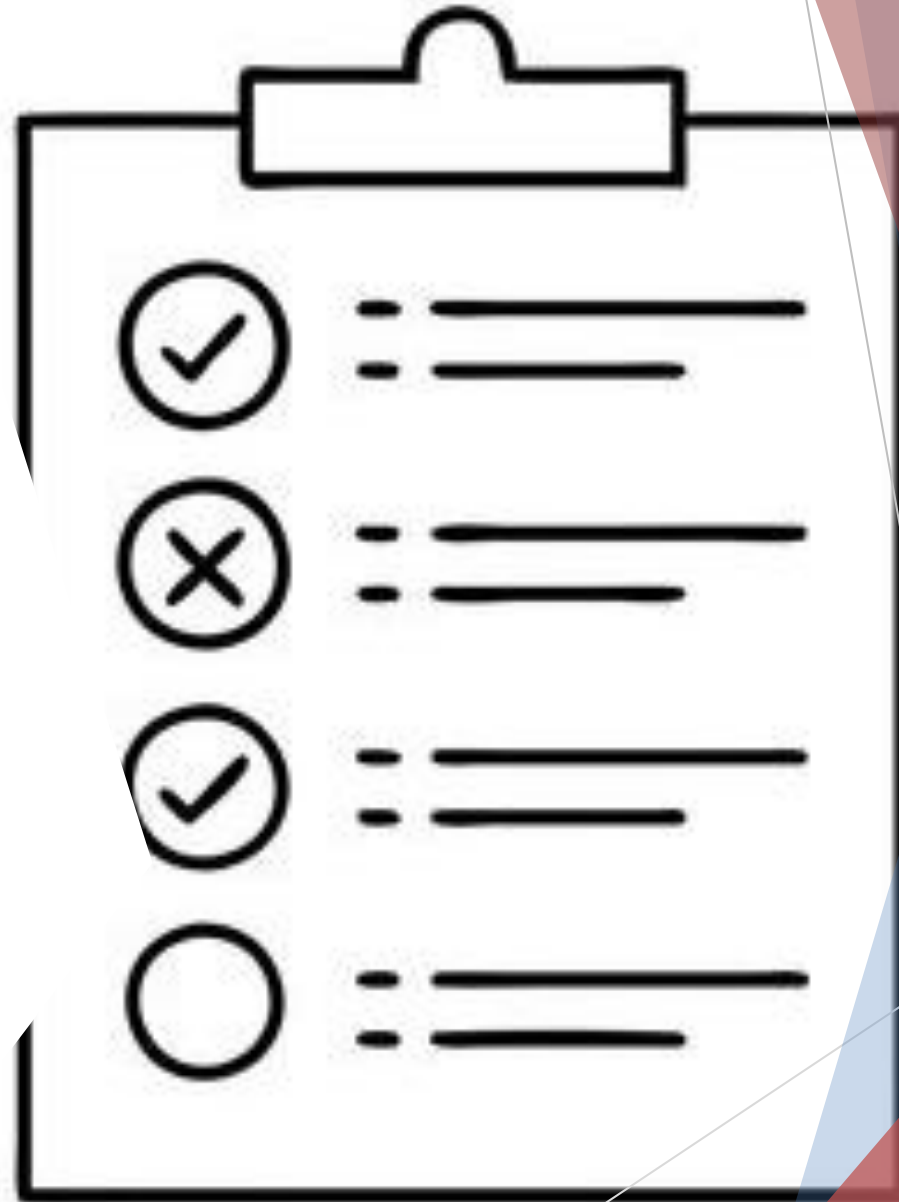
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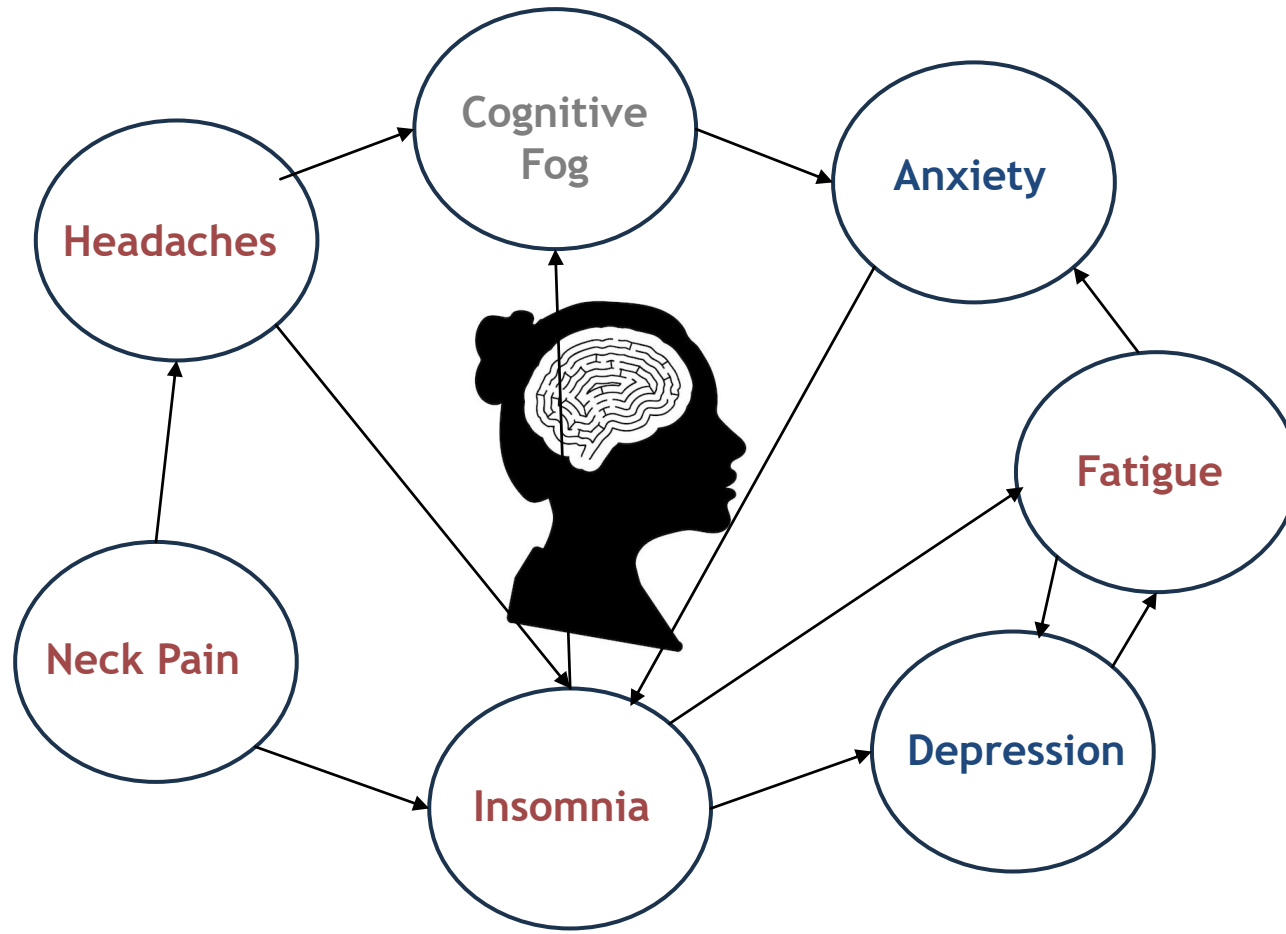
Cognitive - Neuropsychological Testing

- ▶ When: Cognitive difficulties persist despite treatment of other problems. Different sources recommend between 30-90 day after the injury
- ▶ Why: Identify strengths and weaknesses, guide return to school/work, guide specific rehab strategies



Symptoms-Based Treatments

Disentangle symptoms: What are the biggest symptom(s) to prioritize most/first?



Specific symptom is severe or does not improve with treatment of others -> specialty work-up (e.g. sleep study, endocrine labs, neuropsych testing)



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Return to Work or School

- ▶ ~20% of people continue to have RTW difficulties 6 months after mTBI
- ▶ Systematic review showing efficacy of psychotherapy, vestibular, vision, cognitive, and physical therapy
- ▶ Accommodations depend on type of job
 - ❑ Work with Vocational Rehab!
 - ❑ Gradual increase in shifts and/or responsibilities
 - ❑ Physical accommodations for balance or pain



Case - Ms S

Education

- Return to exercise (sub-symptom threshold)
- Sleep hygiene + melatonin
- Gradual return to school

Meds

- NSAIDs for headache w/o overuse
- Preventative headache medication

Referrals

- Physical Therapy for neck pain
- If she still has trouble with return to school, later plan for Neuropsych testing

Headaches slowly improve, she feels happier and is able to sleep better

She is also very happy to be exercising again, which helps with her energy level and mood



Drops to 1 class for the rest of the quarter, stays active reading and doing hobbies. Returns in full the next quarter

Summary

- ▶ Persisting concussion symptoms are not a “syndrome” and will improve with lifestyle changes and treatment!
- ▶ Education - Reassurance and early, gradual return to activities/exercise
- ▶ Symptom-targeted treatments
 - ▶ Ask about and address somatic, affective, and cognitive symptoms, often symptoms are interconnected
 - ▶ Watch more TBI-ECHO presentations on specific symptoms!



Additional Educational Resources

For Providers:

Ontario Neurologic Foundation Living Concussion Guidelines -
<https://concussionsontario.org/>

TBI-ECHO presentations on specific symptoms: <https://tbi-bh-echo.psychiatry.uw.edu/past-didactic-presentations/>

For Patients:

CDC Head's Up - <https://www.cdc.gov/heads-up/about/index.html>

Brainline - <https://www.brainline.org/topic/concussion-mild-tbi>

Concussion Alliance - <https://www.concussionalliance.org/>



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