



# TBI-BH ECHO

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

# Persisting Symptoms after Concussion

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# Speaker disclosures

No conflicts of interest

The following series planners have no conflicts of interest:

- ✓ Jennifer Erickson DO
- ✓ Jess Fann MD
- ✓ Cherry Junn MD
- ✓ Chuck Bombardier PhD
- ✓ Cara Towle MSN RN MA



# 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



## 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

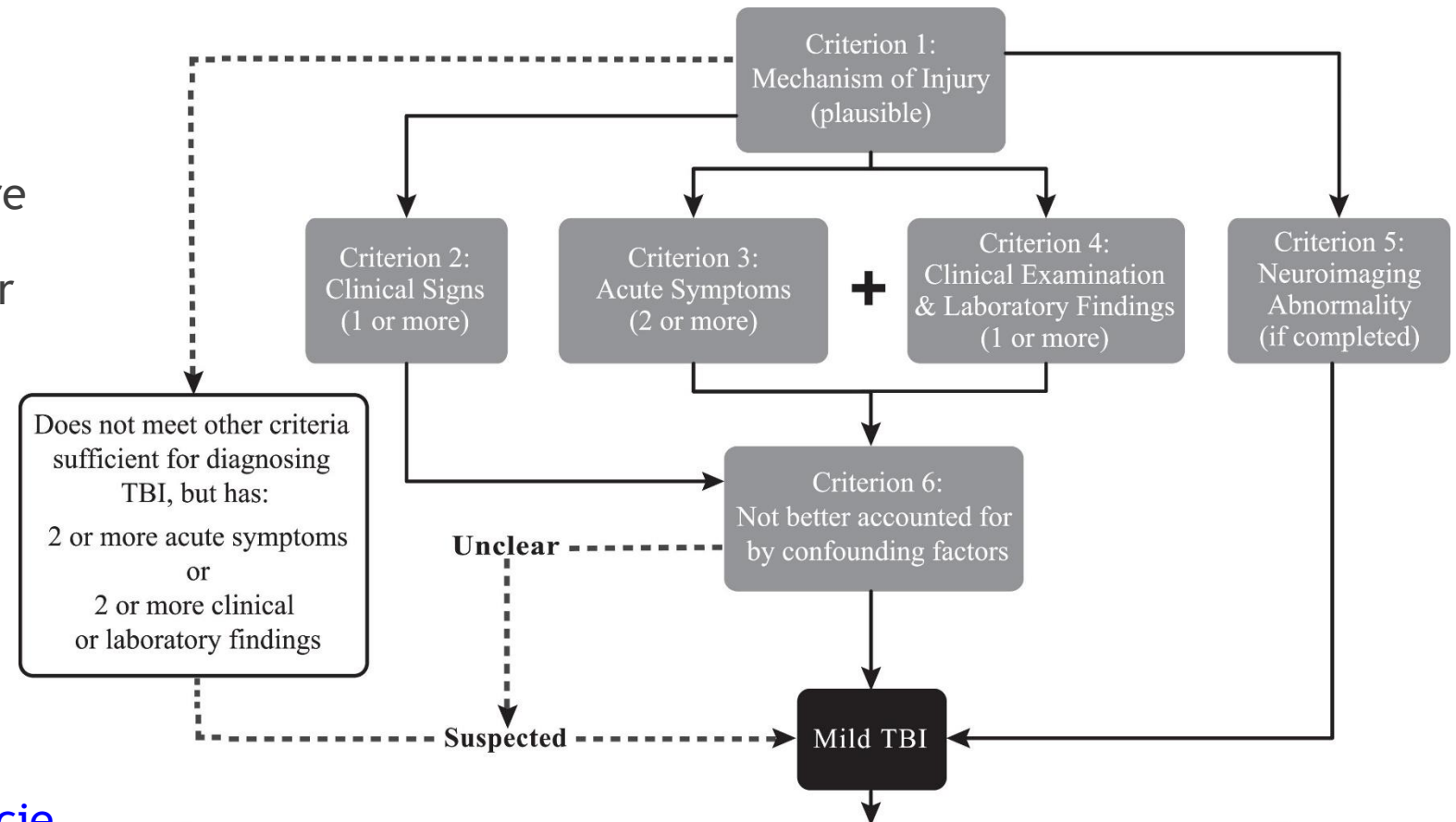
# Did the patient have a concussion?

► 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

► Concussion Diagnosis criteria (ACRM):

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



The 'Mild' qualifier is not used if any of the injury severity indicators listed below are present.

- Loss of consciousness duration greater than 30 minutes.
- After 30 minutes, a Glasgow Coma Scale (GCS) score of less than 13.
- Post traumatic amnesia greater than 24 hours.

# “Post-Concussion Syndrome”



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



# “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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## DSM V

~~PCS~~



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## 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

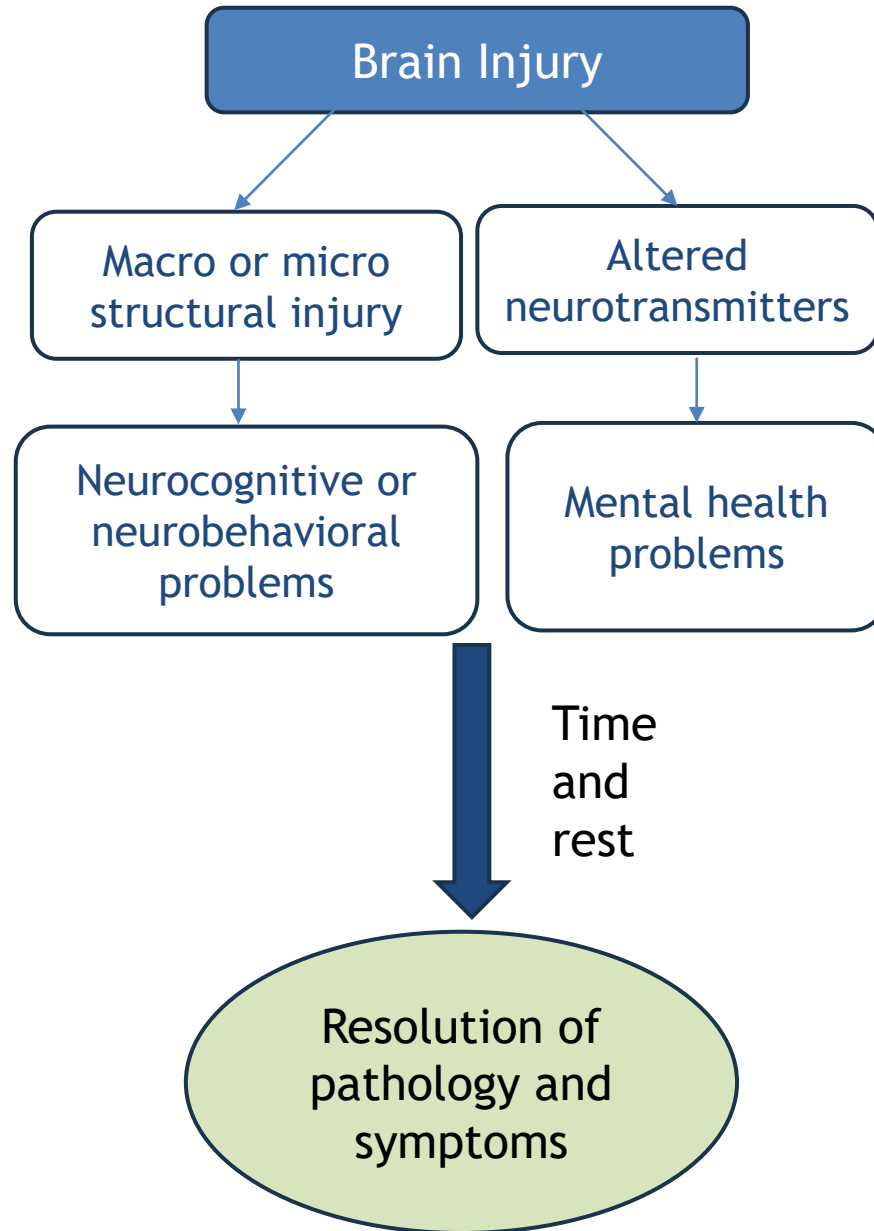
15-20% of patients will have symptoms beyond one month post-injury

No singular pathophysiological cause

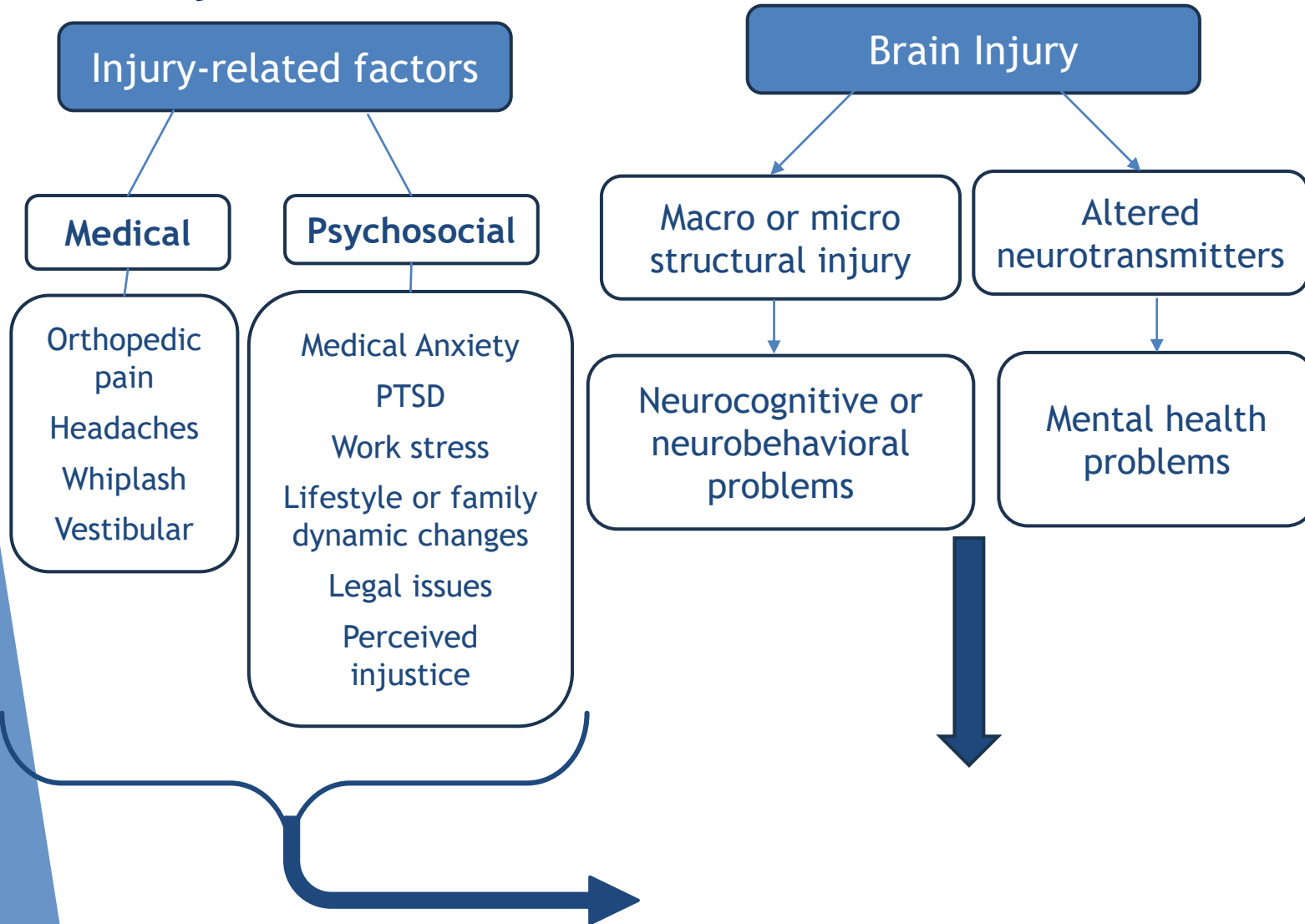
Theory - Psychosocial model



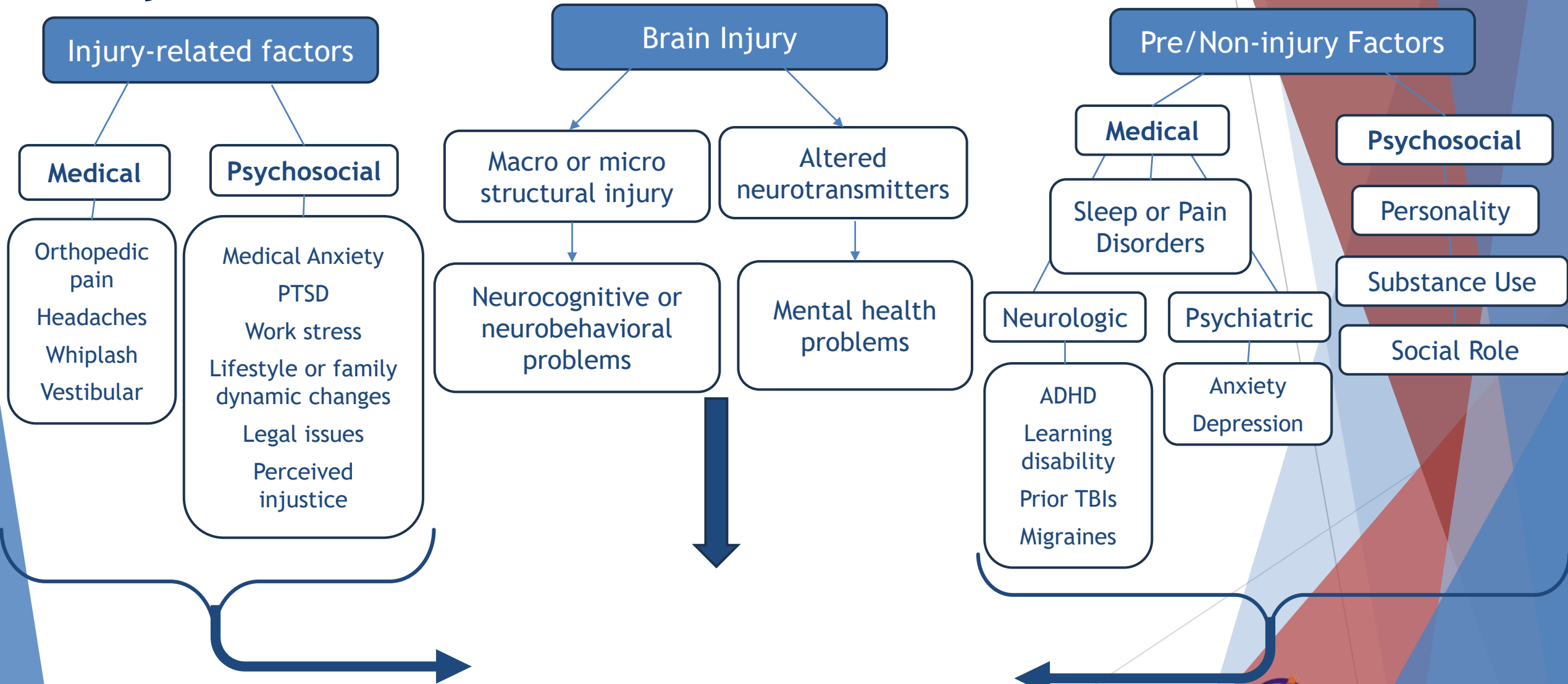
# Psychosocial Model



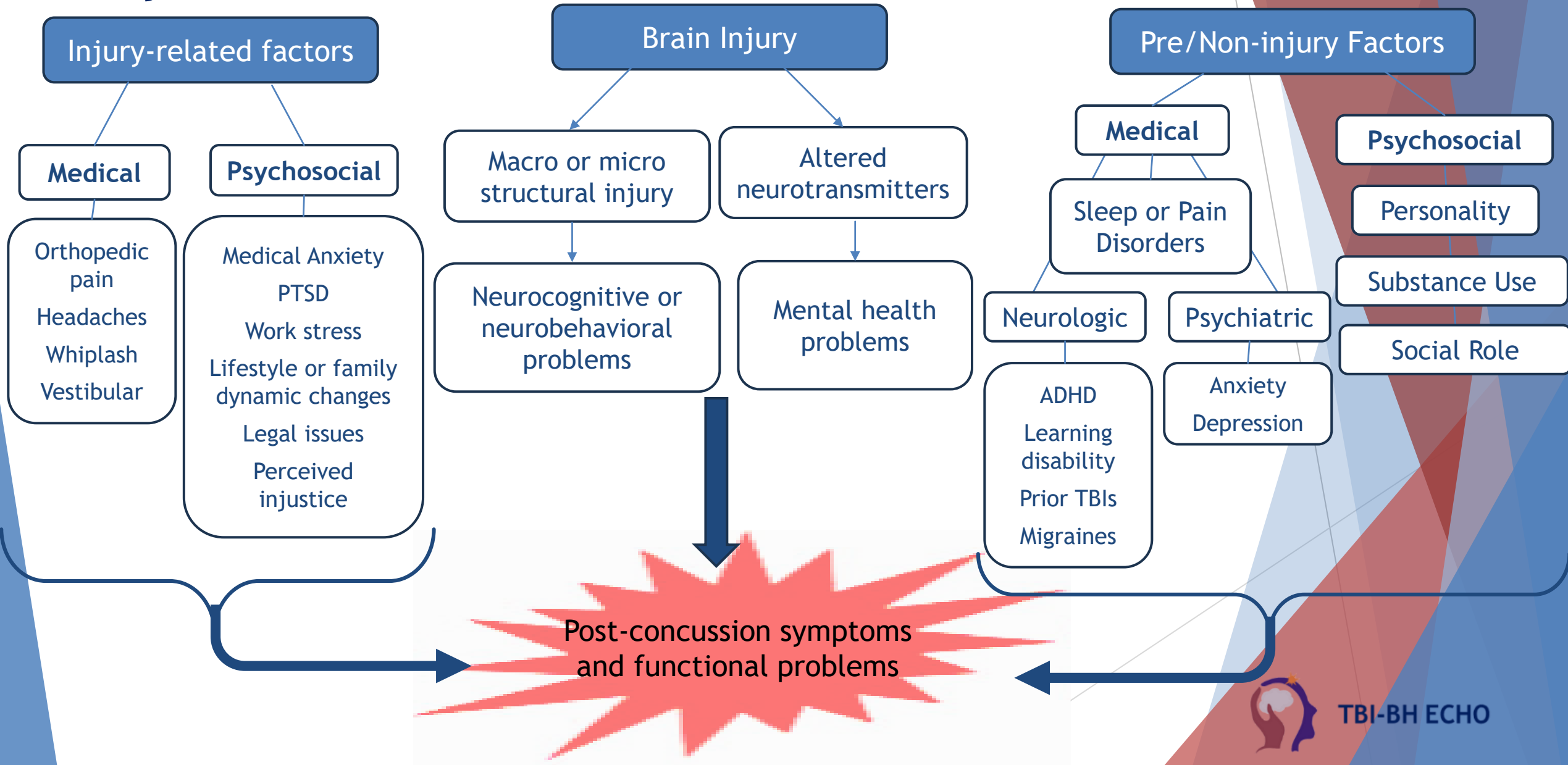
# Psychosocial Model



# Psychosocial Model



# Psychosocial Model



# Management Strategies for Overall Recovery

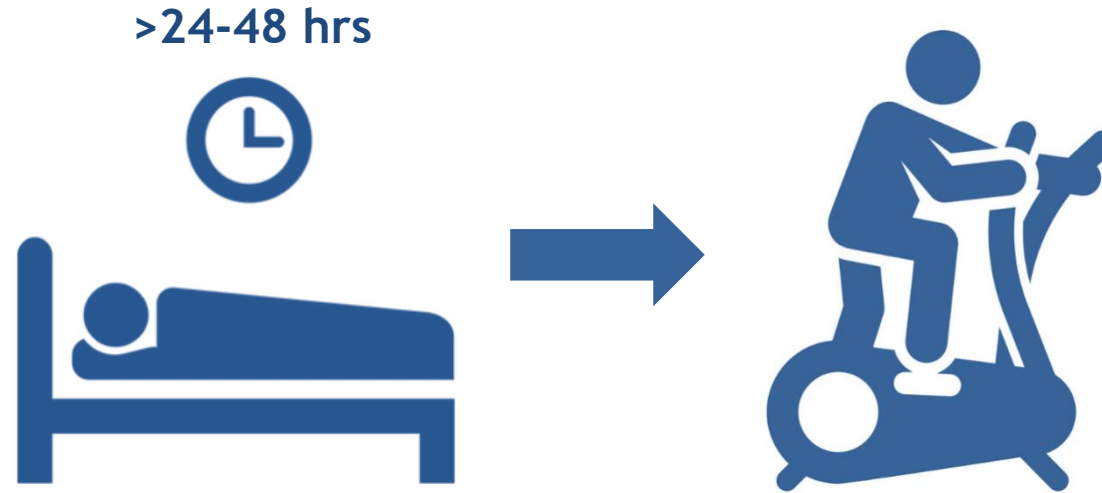


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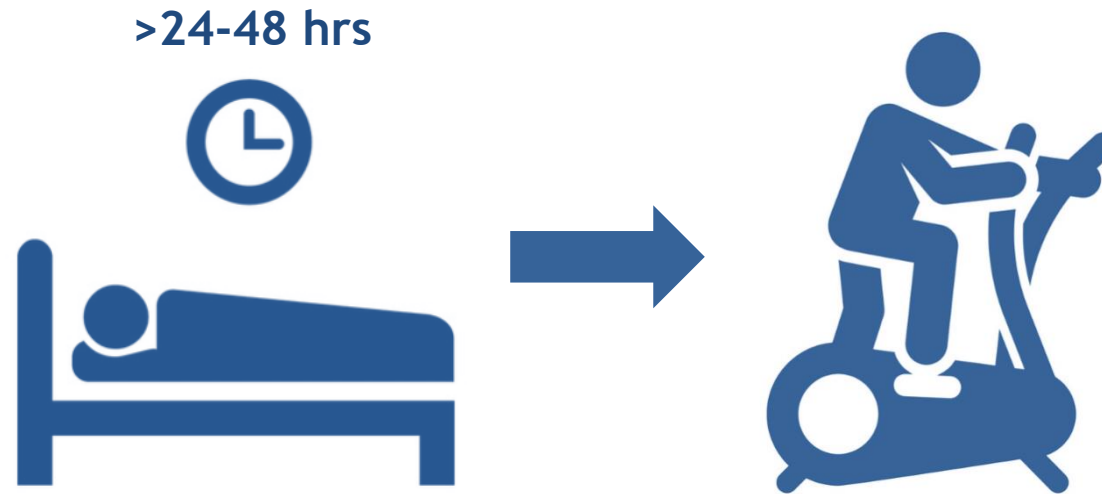
# Early Management

- ▶ **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

## Repetitive Transcranial Magnetic Stimulation (rTMS)

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

Parr NJ, Anderson J, Veazie S. Evidence Brief: Hyperbaric Oxygen Therapy for Traumatic Brain Injury and/or Post-traumatic Stress Disorder. Washington (DC): Department of Veterans Affairs (US); 2021 Jul

Mollica A, Safavifar F, Fralick M, Giacobbe P, Lipsman N, Burke MJ. Transcranial Magnetic Stimulation for the Treatment of Concussion: A Systematic Review. *Neuromodulation*. 2021 Jul;24(5):803-812. doi: 10.1111/ner.13319. Epub 2020 Nov 12. PMID: 33184973.



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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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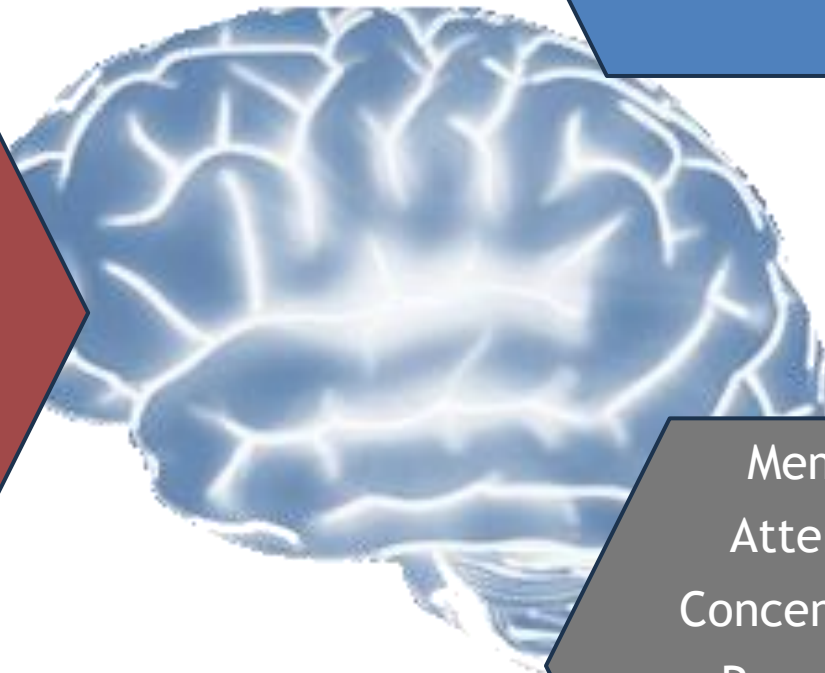
# Persisting Symptoms

## Affective

Depression  
Anxiety  
PTSD  
Irritability

## Somatic

Headaches  
Neck pain  
Sleep  
Vestibular  
Visual  
Fatigue

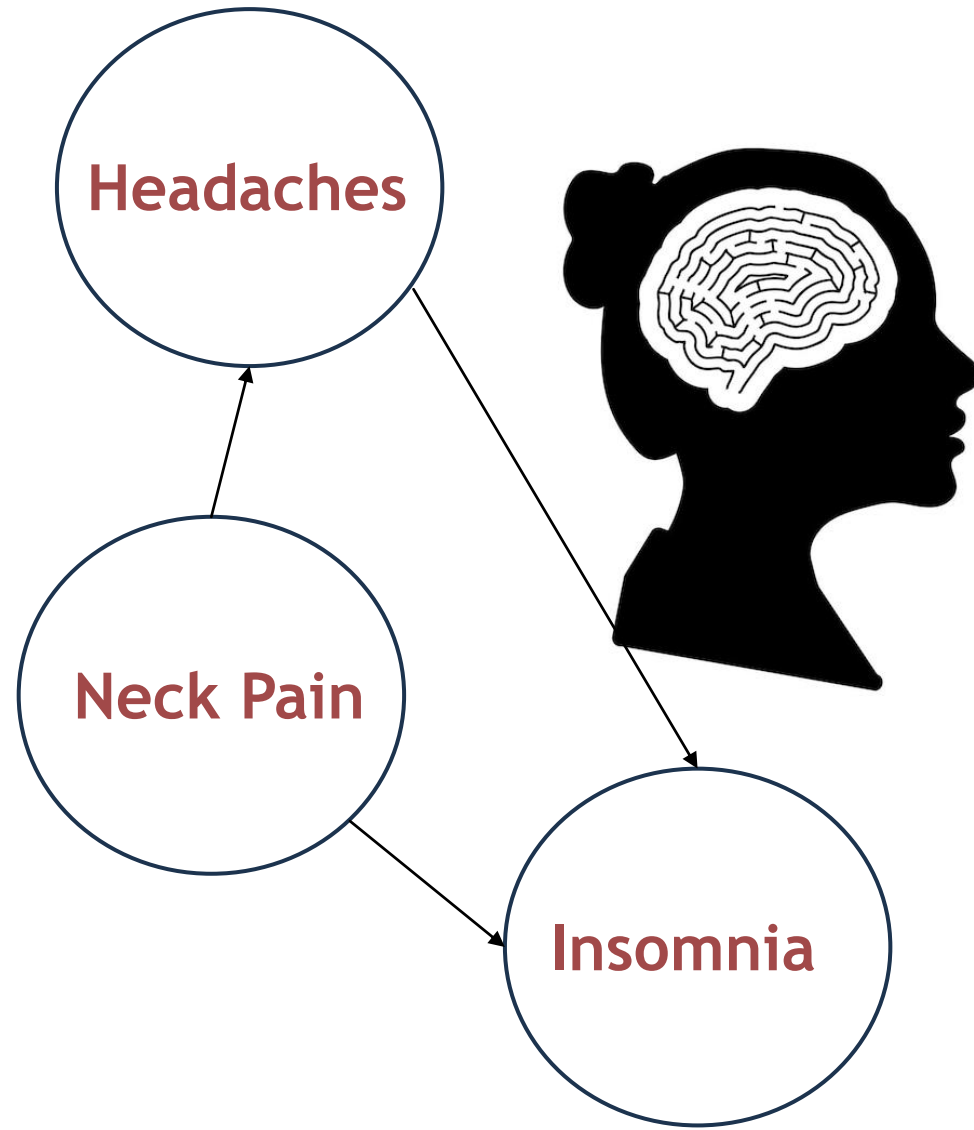


## Cognitive

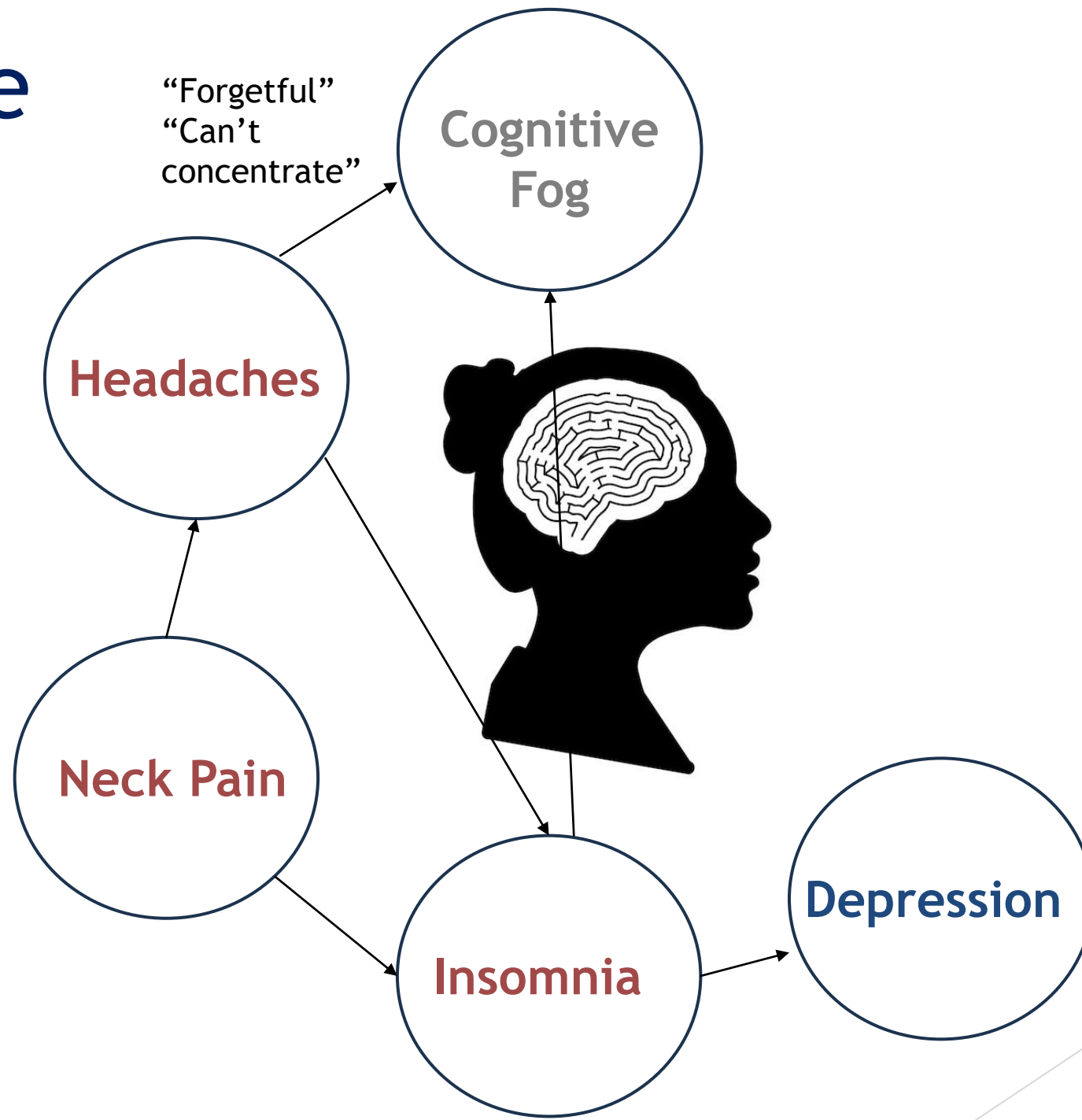
Memory  
Attention  
Concentration  
Processing speed  
Executive function



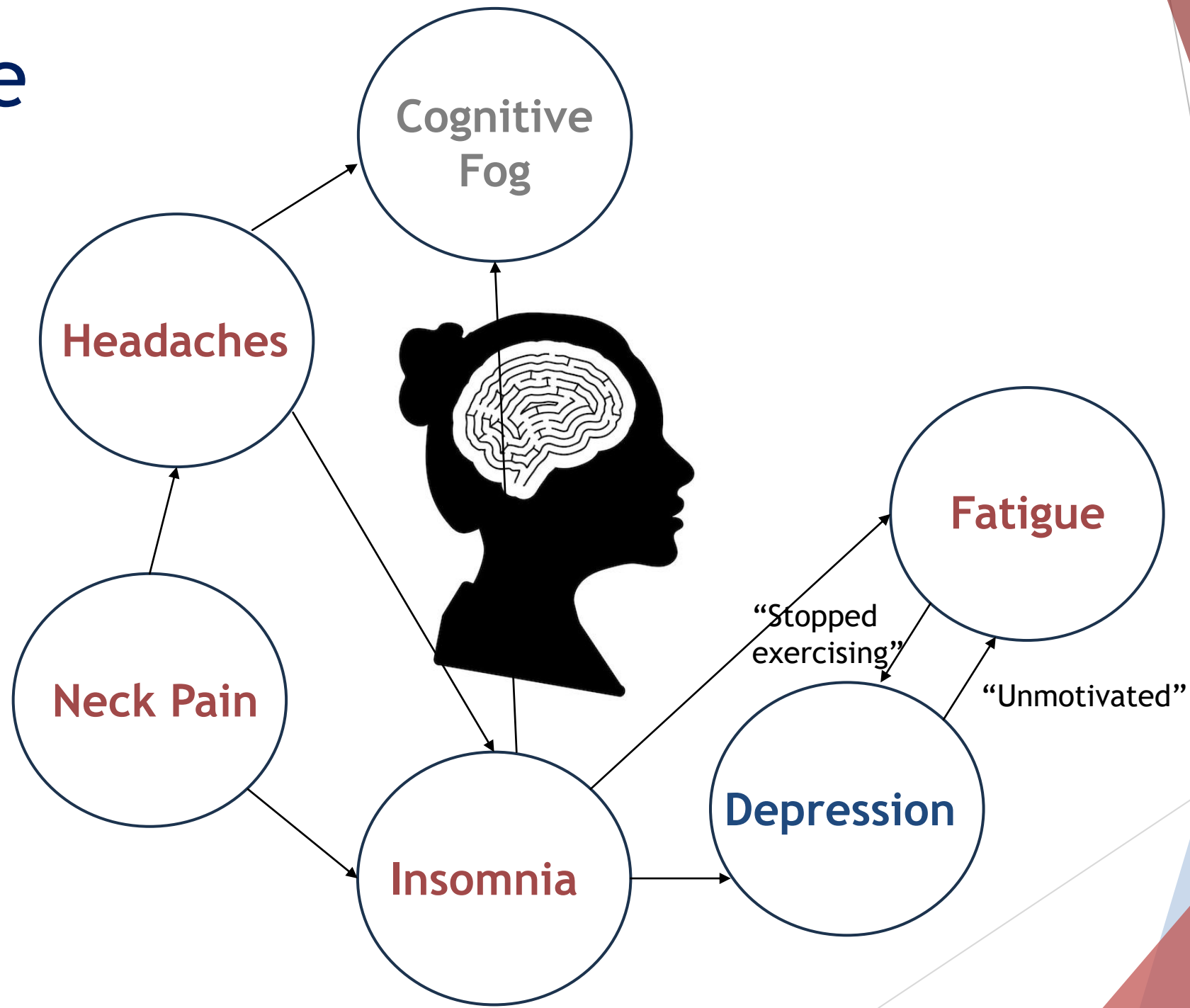
# Case - Ms S



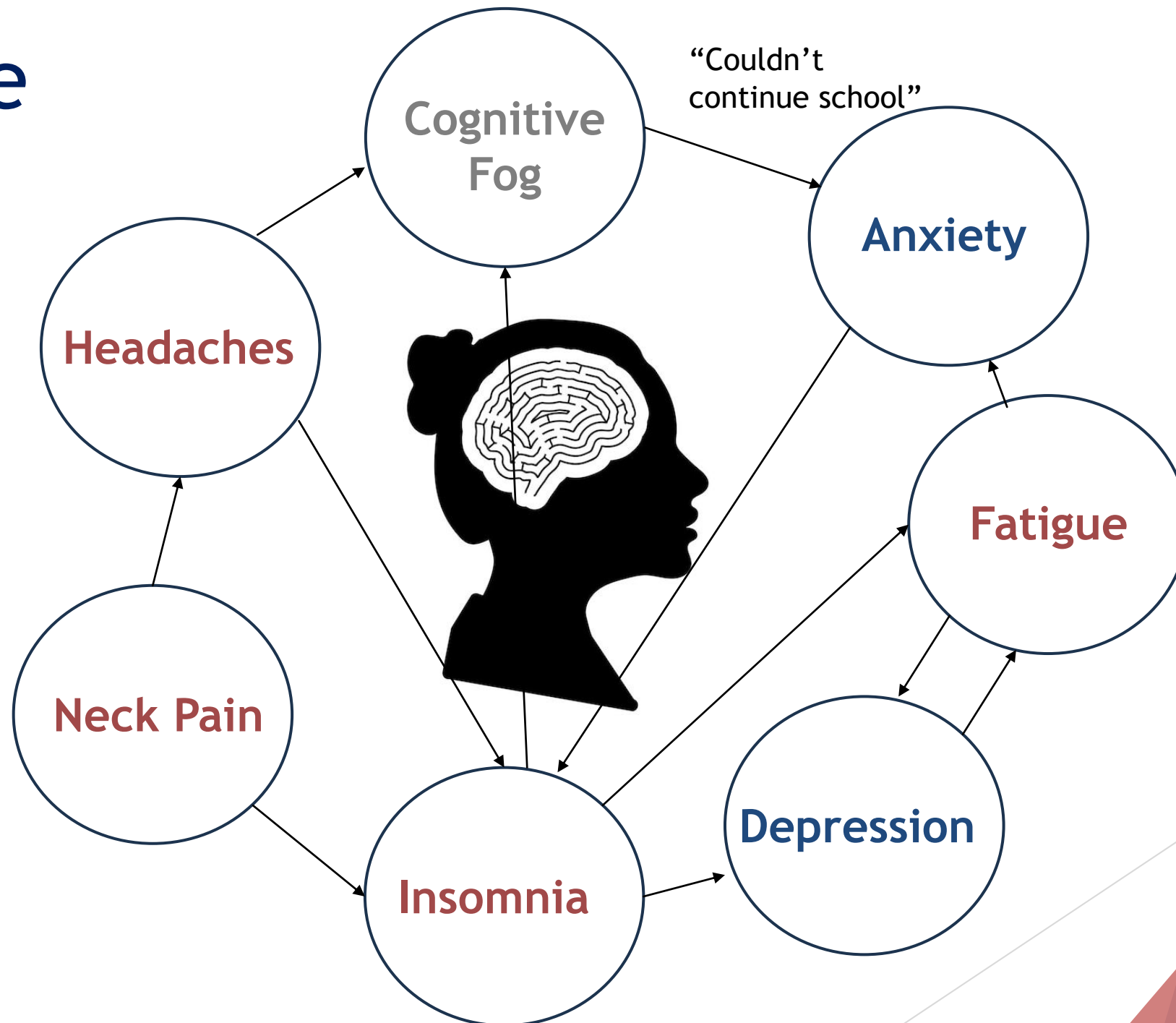
# Case



# Case



# Case



# Somatic



Headaches



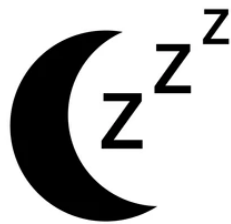
Fatigue



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



Supplements  
NSAIDs  
Beta-blockers  
TCAs  
SNRIs  
Anticonvulsants



If Neck Pain:  
Physical Therapy  
Massage  
Modalities





# Vestibular/Visual



## CAUSES

Benign Paroxysmal Positional Vertigo (BPPV)

Central vertigo

Eye movement problems (convergence, vergence, version deficits)

## TREATMENTS

Epley maneuver (may need to do many times)

Vestibular Physical Therapy

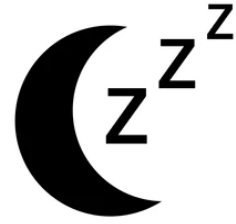
- Desensitize the vestibular system
- Coordinate eye and head movements
- Improve functional balance and mobility

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

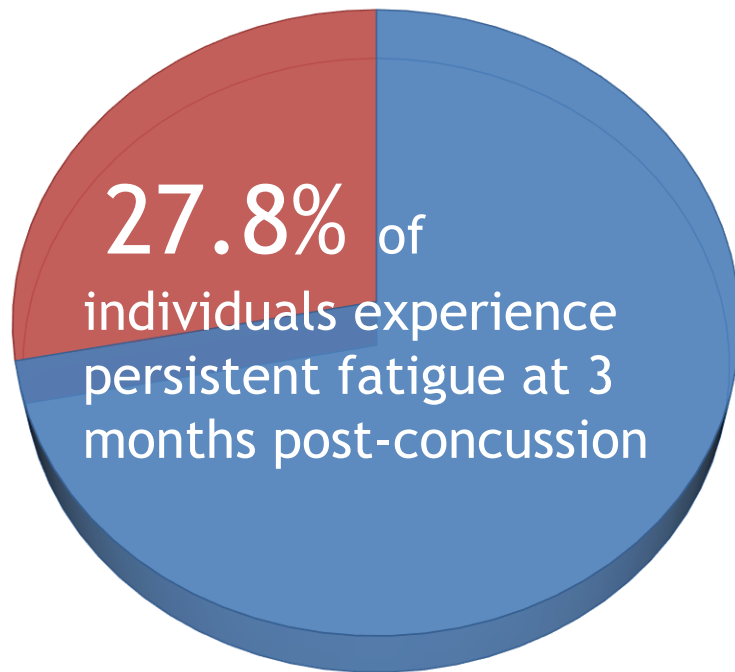
Insomnia -> CBTi

Medications: melatonin and trazodone (or other antidepressant)

Referral to Sleep Disorder specialist if suspect sleep disorder



# 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



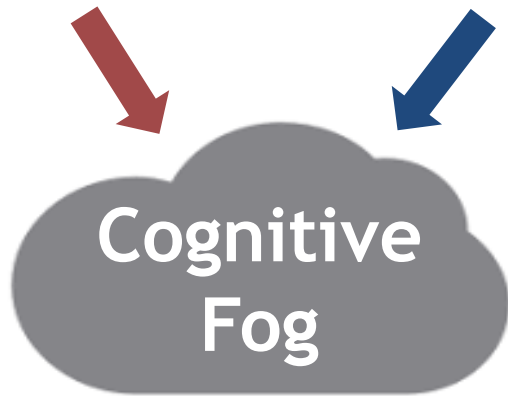
# Cognitive



## CAUSES

**Somatic  
Symptoms**

**Affective  
Symptoms**



## TREATMENTS

Education - pacing cognitive activities, focus on one task at a time

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

Medications - Methylphenidate

Lee H, Kim SW, Kim JM, Shin IS, Yang SJ, Yoon JS. Comparing effects of methylphenidate, sertraline and placebo on neuropsychiatric sequelae in patients with traumatic brain injury. Hum Psychopharmacol. 2005 Mar;20(2):97-104. doi: 10.1002/hup.668. PMID: 15641125



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# Cognitive - Neuropsychological Testing



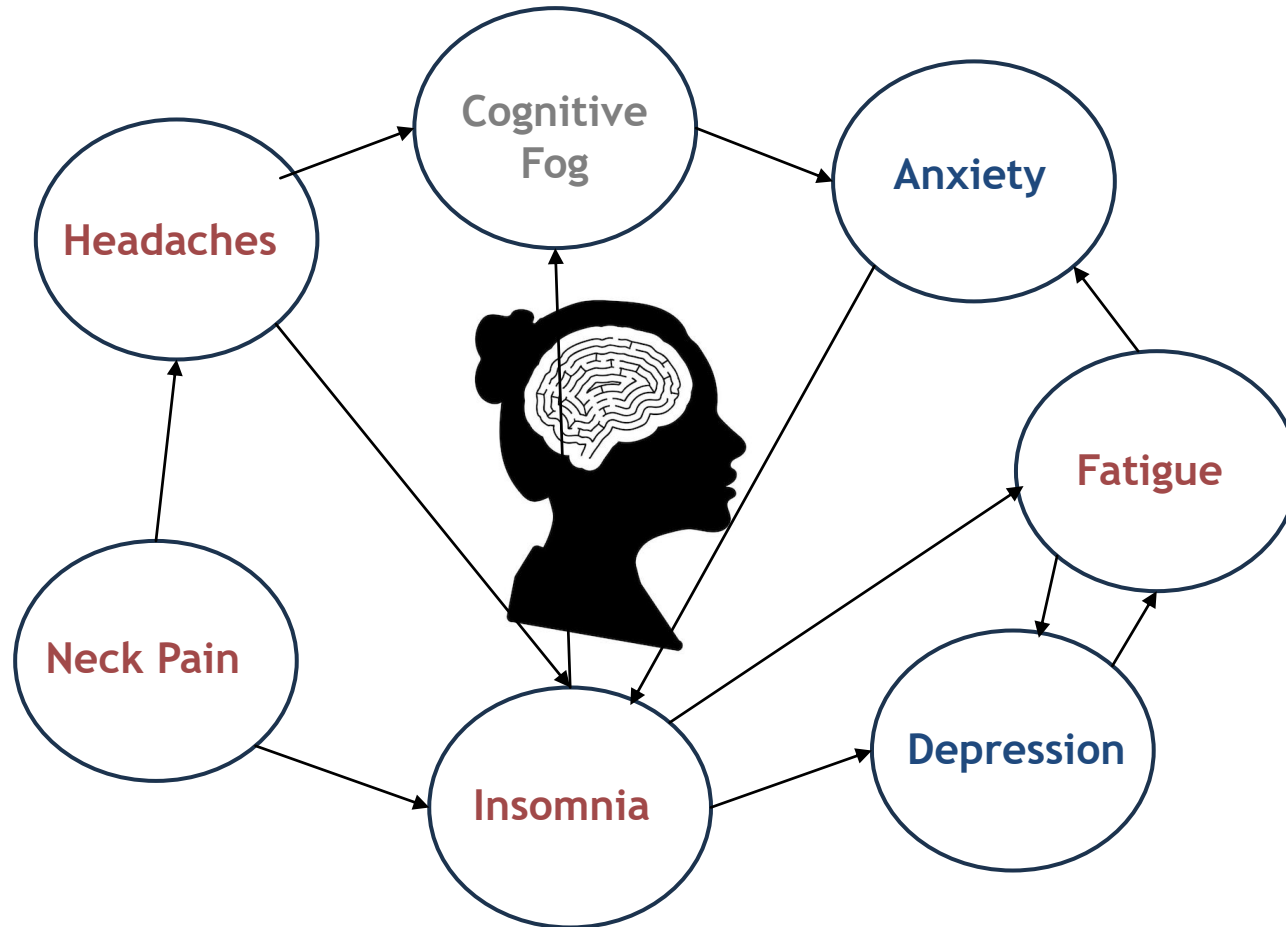
When: Cognitive difficulties persist despite treatment of other problems.  
Different sources recommend between 30-90 day after the injury

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)





# Case - Ms S

## Education

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

## Meds

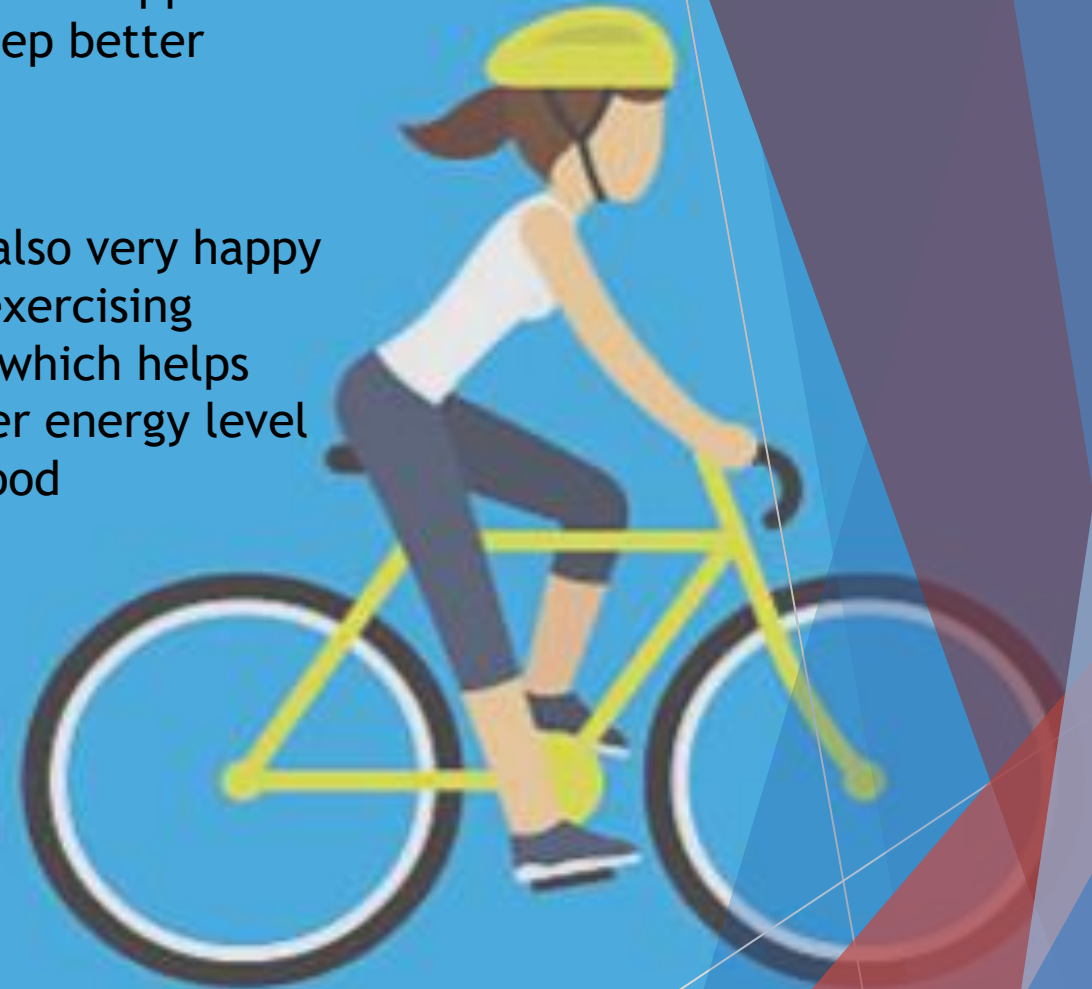
- NSAIDs for headache w/o overuse
- Preventative headache medication

## 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

- ▶ Concussion symptoms are not a “syndrome” and will get better 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/>

For Patients:

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



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<https://concussionsontario.org/home-|-living-concussion-guidelines>

Broshek DK, Pardini JE, Herring SA. Persisting symptoms after concussion: Time for a paradigm shift. *PM R*. 2022 Dec;14(12):1509-1513. doi: 10.1002/pmrj.12884. Epub 2022 Sep 24. PMID: 36152344; PMCID: PMC10087676.

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