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Head Injury in Sport: Approach to Delayed Recovery from Concussion



**KUTCHER
CLINIC**

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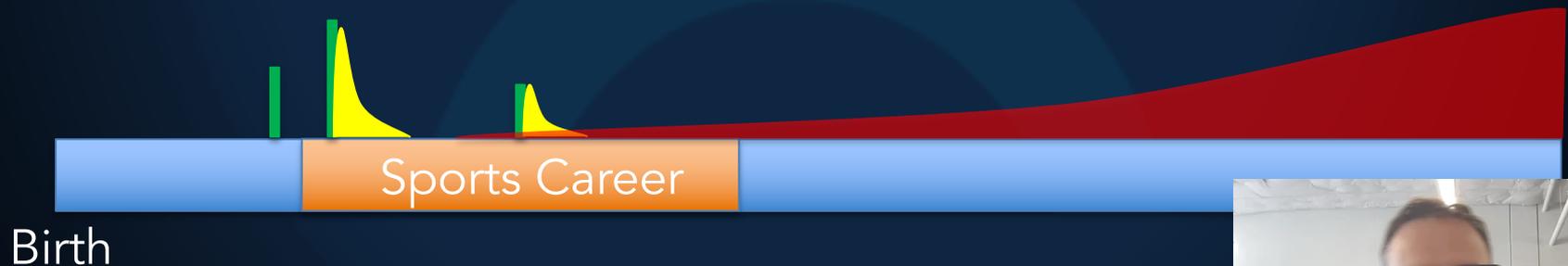
Disclosures

- Director, The Sports Neurology Clinic
- Team Neurologist, US Ski & Snowboard
- Director, NBA Concussion Program
- Medical Director, Woodward Park City
- Neurology Consultant, NHLPA
- Neurology Consultant, NFLPA
- Neurology Consultant, MLSPA
- Medical Advisory Board, SyncThink
- Medical Advisory Board, Cognivue
- Book royalties: Oxford University Press



Diagnostic Clarity

1. **Concussion:** transient physiologic state
2. **PSAC:** multiple secondary pathologies
3. **Long-term:** structural changes



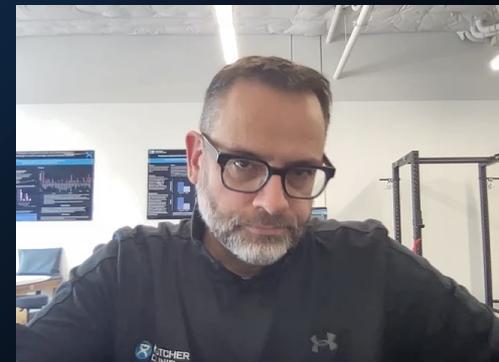
What is Concussion?

- Force-created physiologic injury of brain function
- Temporary
- Does not require loss of consciousness
- Can affect a wide array of brain functions

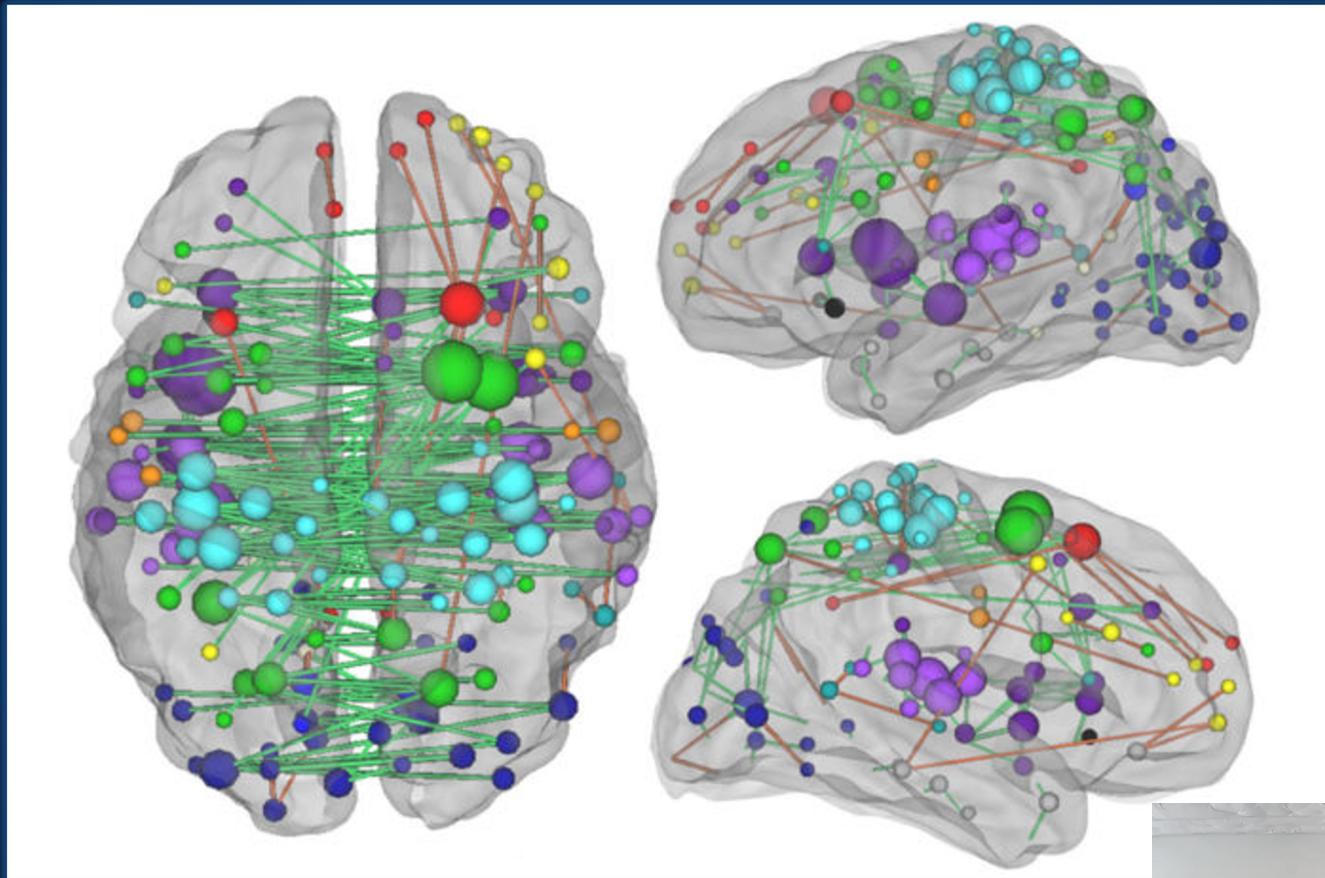


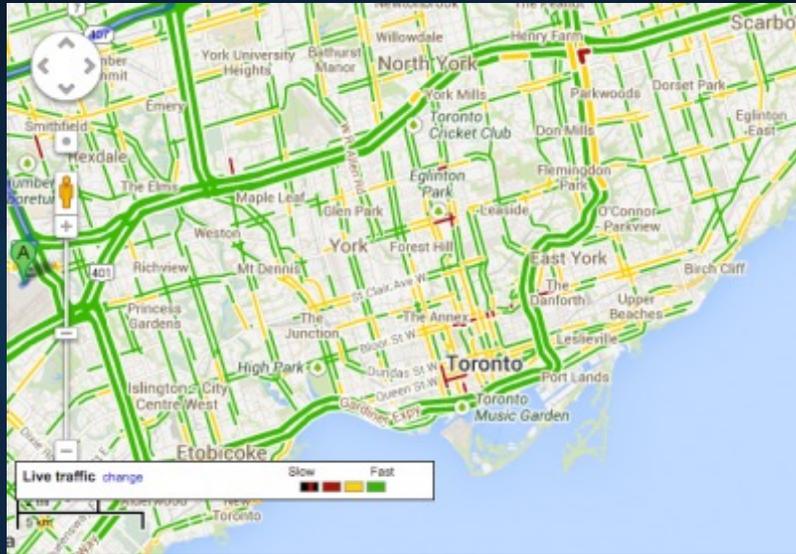
What Concussion ISN'T:

- The force itself, the hit, the mechanism of injury...
- Tissue level structural change
- An injury that “adds up”
- An injury that occurs in isolation



Concussion: a "Network Injury"

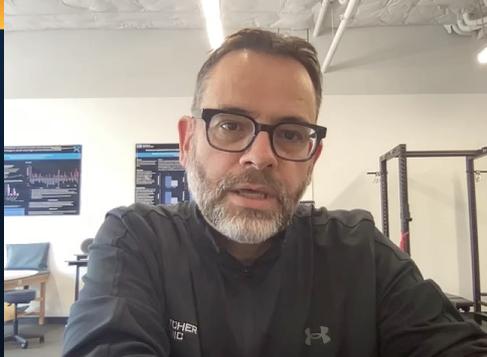
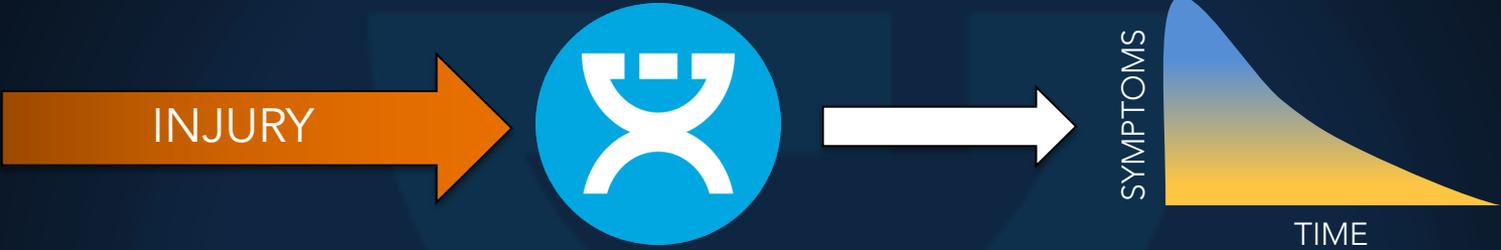




A Tale of Two Thresholds



Concussion as a Projection...



Concussion Differential Diagnosis

CONCUSSION SYMPTOM CHECKLIST

Headache
Pressure in head
Neck pain
Nausea/vomiting
Dizziness
Blurred vision
Balance problems
Sensitivity to light
Sensitivity to noise
Feeling slowed down
Feeling like "in a fog"
"Don't feel right"
Diff. concentrating
Diff. remembering
Fatigue or low energy
Confusion
Drowsiness
More emotional
Irritability
Sadness
Nervous or Anxious
Trouble falling asleep

MIGRAINE SYMPTOM CHECKLIST

Headache
Pressure in head
Neck pain
Nausea/vomiting
Dizziness
Blurred vision
Balance problems
Sensitivity to light
Sensitivity to noise
Feeling slowed down
Feeling like "in a fog"
"Don't feel right"
Diff. concentrating
Diff. remembering
Fatigue or low energy
Confusion
Drowsiness
More emotional
Irritability
Sadness
Nervous or Anxious
Trouble falling asleep

CERVICAL SYMPTOM CHECKLIST

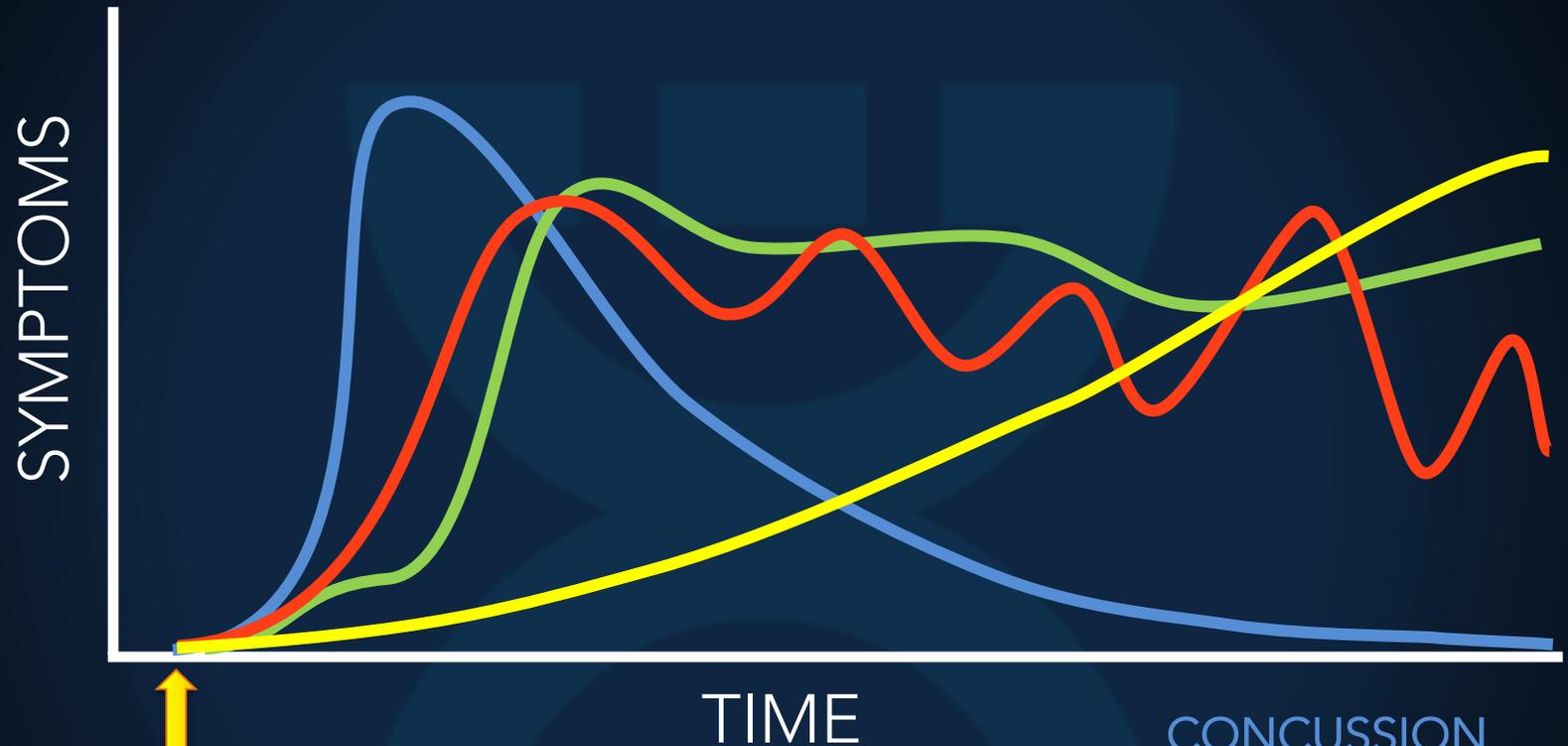
Headache
Pressure in head
Neck pain
Nausea/vomiting
Dizziness
Blurred vision
Balance problems
Sensitivity to light
Sensitivity to noise
Feeling slowed down
Feeling like "in a fog"
"Don't feel right"
Diff. concentrating
Diff. remembering
Fatigue or low energy
Confusion
Drowsiness
More emotional
Irritability
Sadness
Nervous or Anxious
Trouble falling asleep

CRANIAL NERVE SYMPTOM CHECKLIST

Headache
Pressure in head
Neck pain
Nausea/vomiting
Dizziness
Blurred vision
Balance problems
Sensitivity to light
Sensitivity to noise
Feeling slowed down
Feeling like "in a fog"
"Don't feel right"
Diff. concentrating
Diff. remembering
Fatigue or low energy
Confusion
Drowsiness
More emotional
Irritability
Sadness
Nervous or Anxious
Trouble falling asleep



Concussion Symptom Differential



↑
IMPACT

CONCUSSION

NECK

MIGRAINE

SLEEP



“Baseline Testing”

- Great concept to measure brain function prior to an injury and...easy to do
- However, results should be useful to the provider managing the concussion
- Testing should augment the neurologic history and exam



ORIGINAL RESEARCH ARTICLE

Test-Retest Reliability and Interpretation of Common Concussion Assessment Tools: Findings from the NCAA-DoD CARE Consortium

Steven P. Broglio¹ · Barry P. Katz² · Shi Zhao² · Michael McCrea³ · Thomas McAllister⁴ · CARE Consortium Investigators

What did the study find?

Commonly used and emerging concussion assessment tools — such as ImPACT, the Standardized Assessment of Concussion, and the Balance Error Scoring System — do not meet the accepted reliability thresholds for clinical interpretation. This finding suggests that more testing (that is, repeated annual baseline concussion testing) may not yield more diagnoses, as each subsequent test may not provide useful information beyond evaluation.



Athlete Brain Health Assessment

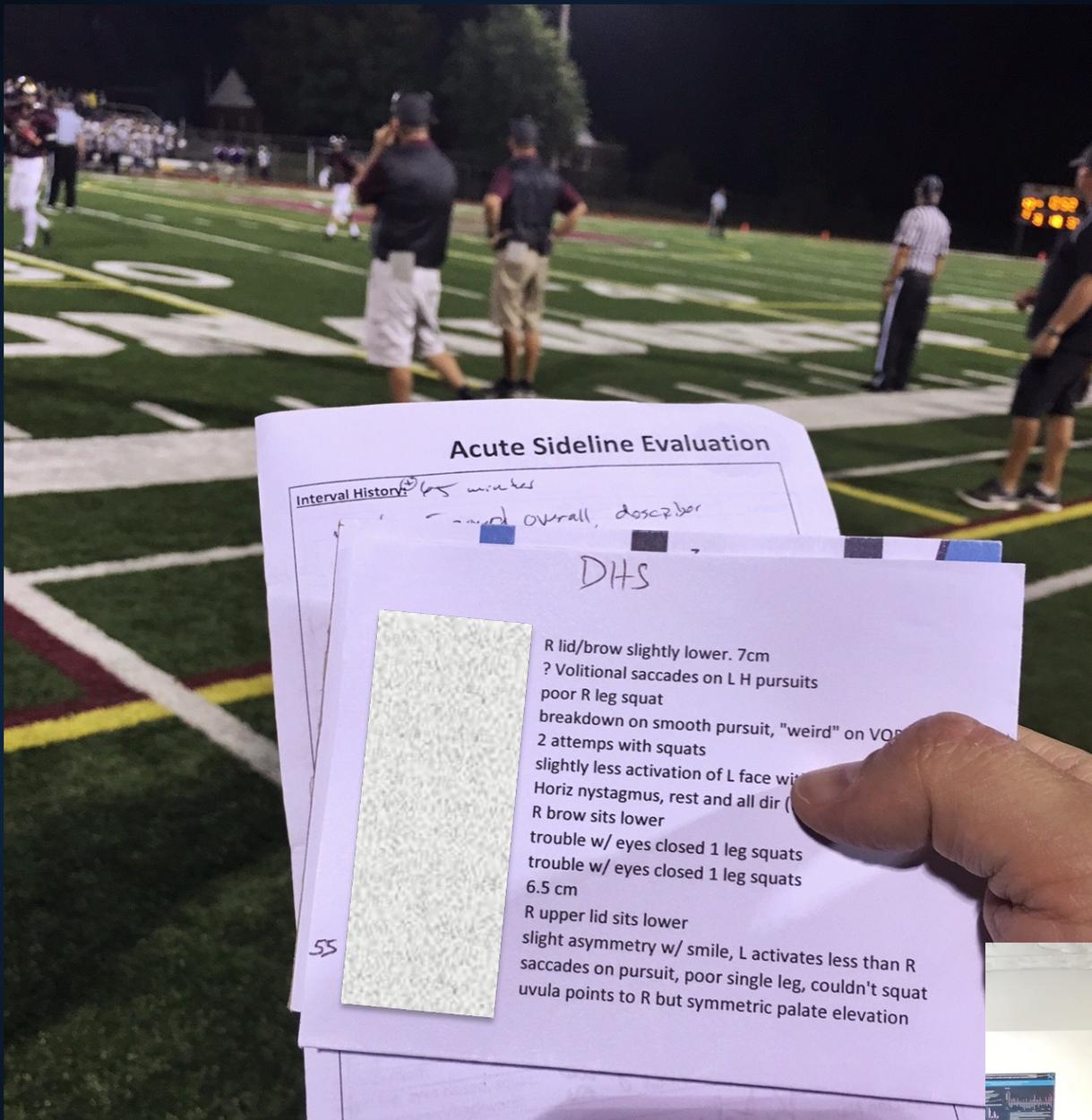
Neurologic history:

- Recurrent symptoms
- Relevant comorbidities
- Brain trauma history
- Family history

Neurologic physical exam:

- Screening neurologic exam
- Focused concussion exam
- Supplementary tests



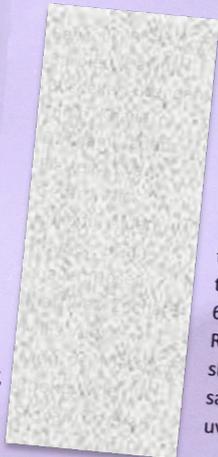


Acute Sideline Evaluation

Interval History

65 minutes
normal overall, describe

DHS

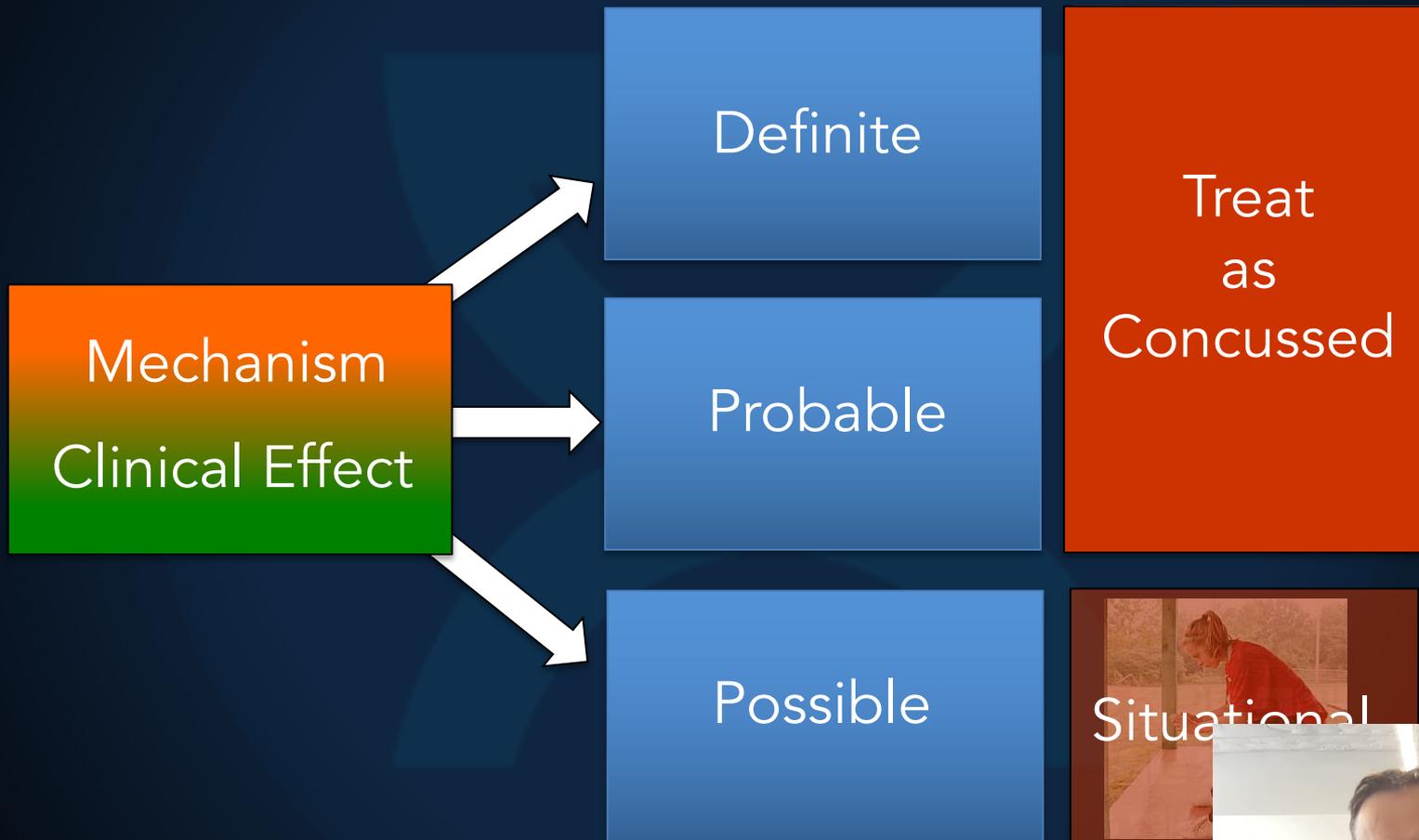


R lid/brow slightly lower. 7cm
? Volitional saccades on L H pursuits
poor R leg squat
breakdown on smooth pursuit, "weird" on VOF
2 attempts with squats
slightly less activation of L face with
Horiz nystagmus, rest and all dir ()
R brow sits lower
trouble w/ eyes closed 1 leg squats
trouble w/ eyes closed 1 leg squats
6.5 cm
R upper lid sits lower
slight asymmetry w/ smile, L activates less than R
saccades on pursuit, poor single leg, couldn't squat
uvula points to R but symmetric palate elevation

55



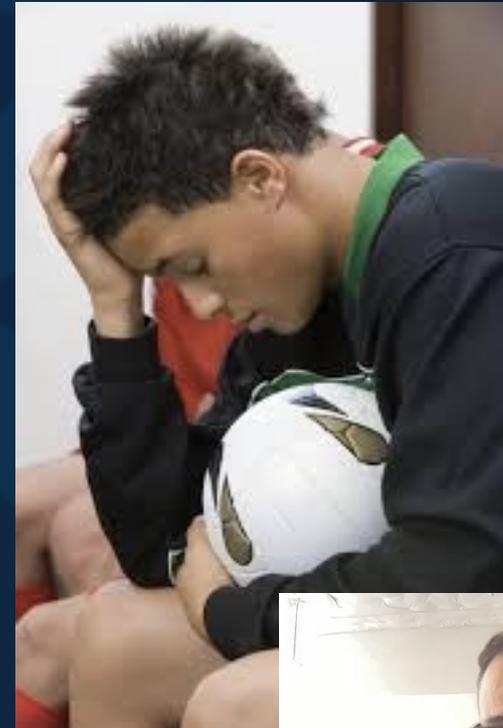
Certainty of Concussion Diagnosis



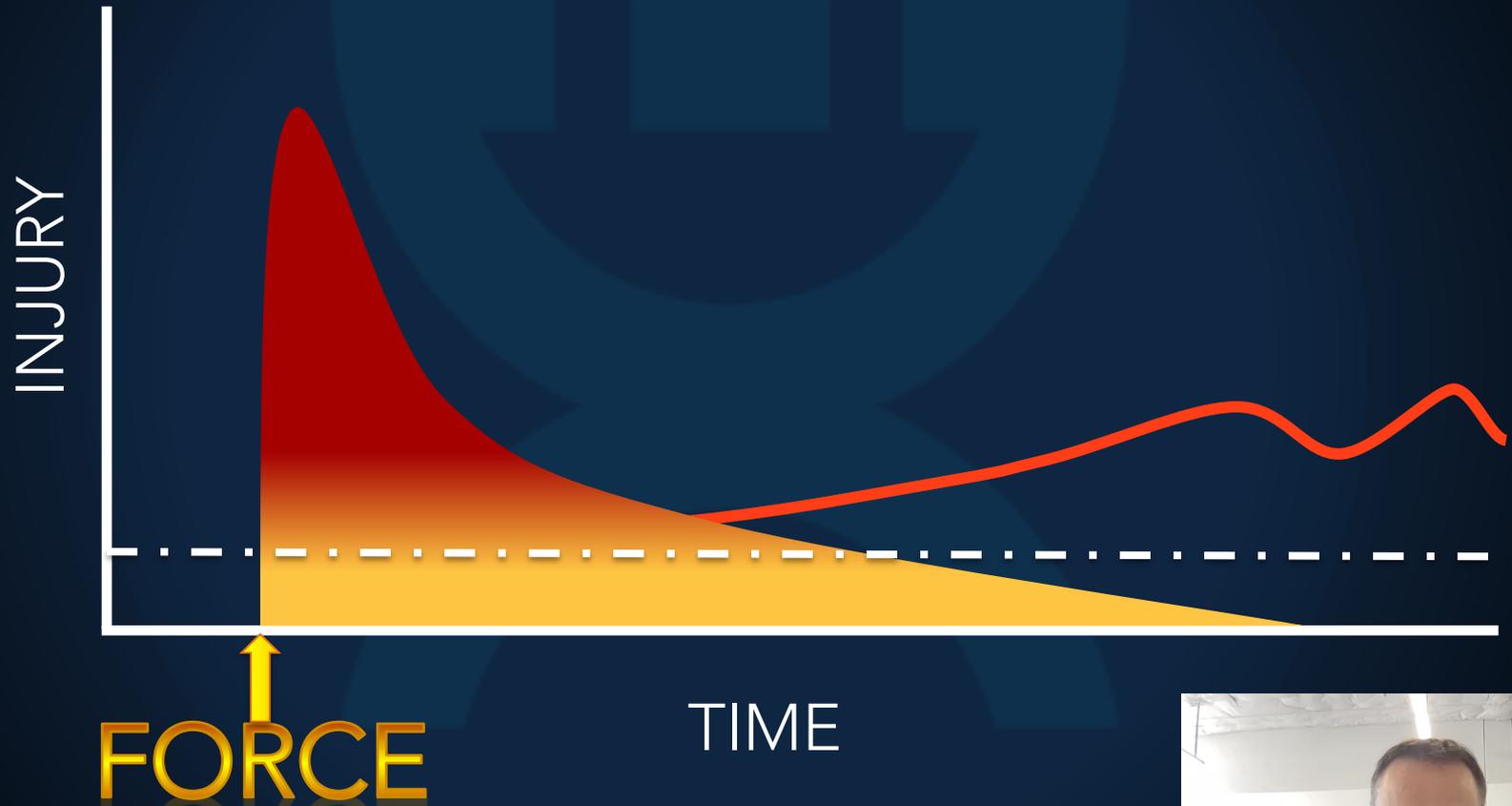
Persistent Symptoms After Concussion (PSAC)

Take a history, make a list...

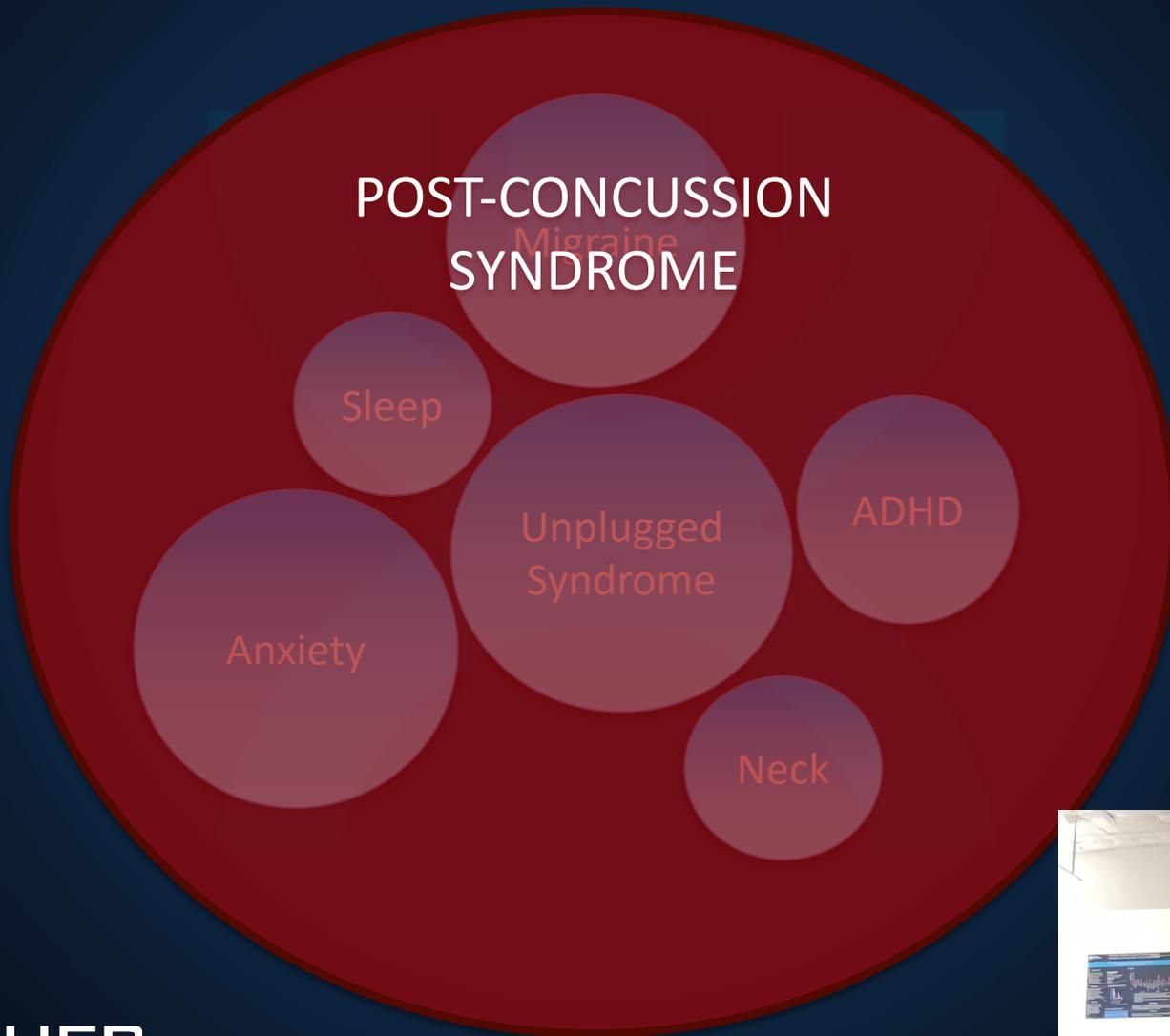
- Unplugged Syndrome
- Migraine
- Dysautonomia
- Mood
- Sleep
- Neck
- ADHD
- etc...



Concussion vs. PSAC



Evaluating PCAS



Treating PCAS

-
- Physical exertion
 - Cognitive exertion
 - Environmental exposure
 - Medication
 - Accommodations
- POST-CONCUSSION SYNDROME**
- Sleep
 - Psycho-therapy
 - Medication
 - Medication
 - CPAP
 - Sleep hygiene
- Migraine**
- ADHD**
- Unplugged Syndrome**
- Anxiety**
- Magnesium/Riboflavin
 - Medication
 - Neck therapy
 - Headache hygiene
 - Cranio-sacral
 - Traditional PT
 - Electro stim
 - Accupuncture
- Neck**



Sample Patient Plan: ----- July 13, 2016

Pathologic Variable:

1. Neck: PT for cervical endurance and strengthening, range of motion, proprioceptive training, and scapular/upper thoracic strengthening.
2. Jaw: continue work on TMJ with emphasis on stabilization over mobilization.
3. Spine: continue myofascial release of cervical and thoracic spine.
4. Sleep/migraine: start nortriptyline 25 mg nightly
5. Exertion Rehabilitation/Return to Sport:

FOUNDATION To be done together as a unit

<u>CARDIO</u>	<u>MOVEMENT</u>	<u>EYE TRACKING</u>
<ul style="list-style-type: none">▪ Simple skating drills▪ 4-5 days/wk.▪ 30-45 mins▪ Average HR = 140-160▪ No stationary bike	<ul style="list-style-type: none">• Agility drills that stress head movement• 6 days/wk• 10 mins/day on days with skating• 20 mins/day on days without skating	<ul style="list-style-type: none">• Agility drills that stress eye tracking• 6 days/wk• 10 mins/day on days with skating• 20 mins/day on days without skating

HOCKEY ENVIRONMENT

- Gradually add complexity on the ice
- Two-person simple passing drills
- Add live goalie
- Add players and increase game play scenarios

CONTACT

- Short battle drills
- Anticipated half-speed checking
- ¾ speed patient initiated contact
- Anticipated

→ RTP



When at estimated 80% fitness

When tolerating no





Thank you!



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