Persisting Problems with Attention, Speed of Processing, Memory and Executive Functions *LIUNA 28/09/21*

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FACULTY/PRESENTER DISCLOSURE

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Overview

1. Attention, speed of processing, memory, executive function

- What are they?
- What do problems in these areas look in everyday life?

2. Causes and perpetuators of thinking problems

Direct effects of concussion

Indirect causes (sleep, anxiety, other)

- The vicious cycle of symptoms
- The special role of attention
- The “good old days” bias

3. Treatment/Management

- Managing indirect causes, symptom by symptom
- Changing the brain: interventions associated with neuroplastic change
- Cognitive strategies/cognitive interventions

1. Attention, speed of processing, memory and executive functions: What are they? How do problems with them look in everyday life?

Common Cognitive Symptoms after Concussion

Symptoms (and some sub-categories)	Everyday life examples
Attention and Concentration focusing, dividing, sustaining, shifting, selecting	• Zoning out; forgetful • Distractible • Trouble following conversations • Repeating questions; difficulty learning new things
Processing Speed Verbal processing, visual processing, scanning	• More time to do things

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Executive functions Multi-tasking; Problem-solving; Working Memory Planning Organizing Impulsivity Disinhibition Controlling emotions Judgement	Interrupting Impatience Can't get going Not completing tasks Not following advice Lashing out Losing temper Cursing Getting into fights

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Implications for: *safety (e.g., driving/cycling/sport), school, work, social situations, personal relationships, other*	

2. Causes and perpetuators of cognitive problems after concussion

Causes of Cognitive symptoms
Direct organic effects of Concussion

- (refer to Dr. Gold's presentation 2 weeks ago)
- *Prior concussions makes things worse*

Causes of Cognitive Symptoms
Indirect causes or exacerbators

Examples

- Sleep disturbance/fatigue
- Headache pain
- Other pain
- Mood/anxiety
- Medications/substances with impact on thinking (e.g., sleeping pills; THC)
- Attention Deficit Hyperactivity Disorder
- Neuroendocrine problems
- Attention problems

Causes of Cognitive Symptoms
(ii) Indirect causes or exacerbators

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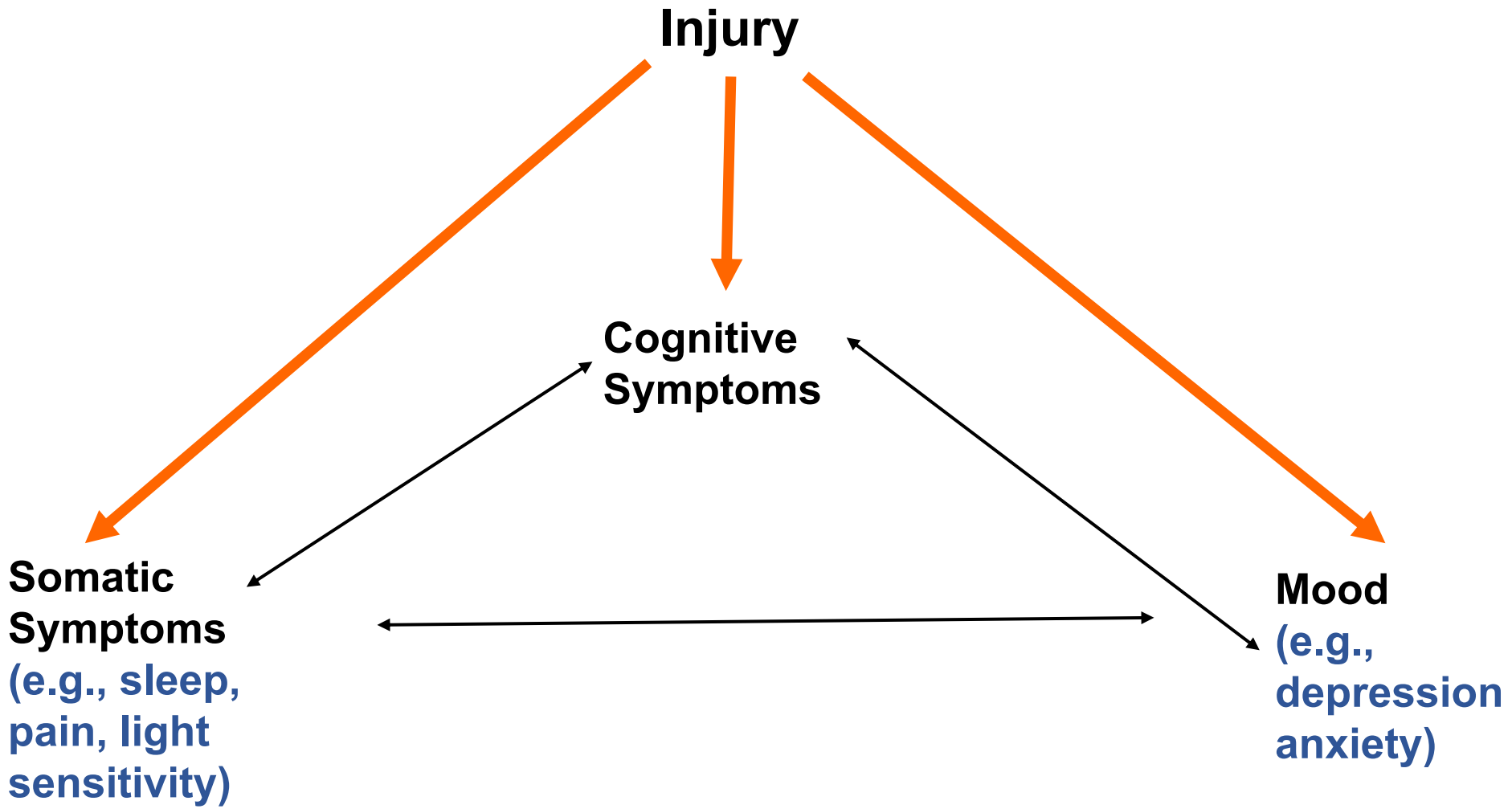
These may have been present prior to concussion or may have emerged since the concussion

The Vicious Cycle of Concussion



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- **Attention problems - As a Primary Driver of Other Cognitive Problems**

Attentional Processes

There are many types of attention

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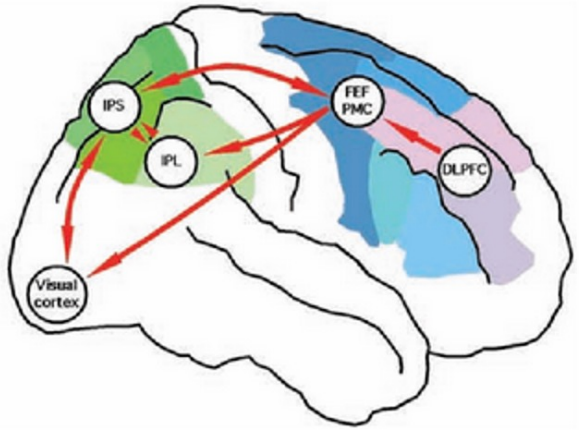
Attention is special – it underlies all other cognitive processes

Attention is all over the Brain!

Controlled by neural networks **distributed** across the brain

Distributed/spread out = more vulnerable



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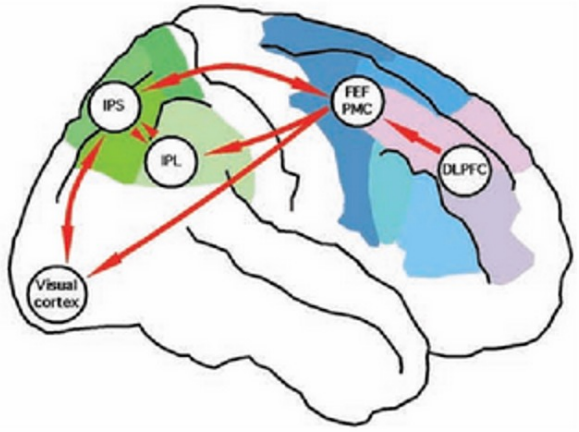

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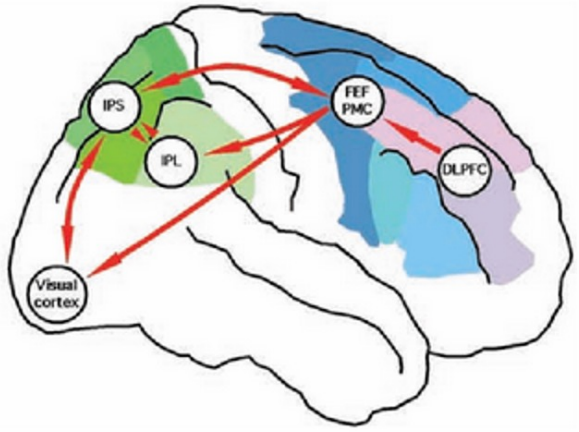

Because attentional networks are spread throughout the brain (i.e., not localized), more susceptible to fluctuations in our physical and mental state

i.e., anything that might decrease the brain's processing efficiency

(e.g., poor sleep, fatigue, cold/flu, hunger, thirst, anxiety, depression, stress, pain, etc.)

Attention's role in other cognitive processes…

Memory

We have to maintain attentional focus to "take in" and learn new information.

Language

Holding info/ideas in conscious mind is essential to read and follow conversation

Executive functions (E.g., plan, multi-task, complete a goal)

We need to pay attention and hold information in mind's eye

An attention take away…

Improving attention by maintaining physical health; treating other factors that can affect attention (e.g., sleep, mood, pain)

…can improve overall cognitive functioning

Misinterpreting Cognitive Symptoms

The Good Old Days Bias Voormolen et al, 2020; Lange et al, 2012

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Overestimating our capacities before the concussion = "misattribution" errors

Before my concussion I never:

-forgot where I left my keys
-had trouble remembering someone's name / my own PIN number
-had a word on the tip of my tongue I couldn't remember
-had difficulty trouble-shooting a complex problem
-didn't feel like finishing my homework

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Why does this matter? *Overattributing causes of errors to concussion can be demoralizing, increase anxiety/stress, and lower mood*

– In fact, hard to know cause of error in any given situation, but we know prolonged effects of concussion may cause some/most/all

3. Management/Treatments for Cognition

Cognition Management/Treatments

1. Treating Indirect Causes of Cognitive Symptoms – Trying to Break the Vicious Cycle

Focus on treatable targets contributing to vicious cycle: Headache/Pain; Sleep/Fatigue; Mood

How?

Step 1: Gain Self-Awareness

- (self) evaluate: sleep, fatigue, pain, stress/anxiety, mood (depression). (Living guidelines offer tools)

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Step 2: Address Symptom by Symptom

Examples

- **Sleep**: Insomnia CBT, sleep hygiene practices, talk to GP re: medications and/or sleep study.
- **Pain**: Talk to GP re medications / try over the counter medications; Mindfulness*; Pacing*
- **Stress/mood**: Cognitive Behaviour Therapy; Mindfulness*; Psychotherapy; talk to GP re Medication.
- **Fatigue**: Energy conservation*

Cognition Management/Treatments

….Treating Indirect Causes of Cognitive Symptoms – continued

Fatigue

Some recommended general strategies:

- Energy Conservation (coming up…)*
- Stress management
- Exercise
- Mindfulness
- Cognitive Behaviour Therapy
- Set priorities
- Be aware of medication effects
- Manage sleep

Cognition Management/Treatments

1. **Treating Indirect Causes of Cognitive Symptoms – Trying to Break the Vicious Cycle cont.**

Fatigue: Energy conservation… and the 4 Ps

An approach used to manage your energy to help your brain/body rest

Conserving physical and mental energy to complete daily activities successfully and enhance cognitive functioning

PRIORITIZE	**PACE**
PLAN	**POSITION**

Cognition Management/Treatments

4 P's – PRIORITIZE

PRIORITIZE – What is most important?

Is the activity:

- **Urgent** (must be done today)
- **Important** (must be done in the next few days)
- **Somewhat delayable** (must be done this week or month)
- **Something that can wait** (don't need to/can't do)
- **Something someone can do for you?**

Cognition Management/Treatments

4 P's – Plan

PLAN – What are you going to do?

- **When are you going to do the activity?**
- **How are you going to organize your activities?**
  - When do you feel best throughout the day?
  - What else do you need to do today?

  N.b., Make rest breaks part of your routine

Cognition Management/Treatments

4 P's – Pace

PACE – How are you going to do it?

Try to:

- **Take breaks** when necessary
- Remember it make take **more time** to complete tasks
- **Break down tasks** into smaller stages
- **Spread out tasks** throughout the day

Cognition Management/Treatments

4 P's – Position

POSITION – Where are you going to do it?

Consider:

- **Environment** (will there be distractions?)
- **Body position** (consider your posture and body position while completing tasks)

Cognition Management/Treatments

2. Treating Cognitive Symptoms: Approaches with evidence of efficacy

(i) Mindfulness Meditation

As a type of meditation: entails focusing on being highly aware of what you are feeling and sensing in the moment - without interpretation or judgment

- E.g., Mindfulness Based Stress Reduction
- E.g., Mindfulness Based Cognitive Therapy

Demonstrated benefits for…

- Sustained attention
- Indirect consequences of concussion that affect cognition e.g., mood, sleep
- Functional re-organization of brain; increased cortical thickness

(Economical Apps, including guided meditations: Calm, Insight Timer, Headspace)

Cognition Management/Treatments

2. Treating Cognitive Symptoms: Approaches with evidence of efficacy

(iii) Goal Management Training (GMT)

GMT is an interactive program for improving participants' planning, organization and follow through to improve ability to achieve goals

- A fundamental goal management problem is failing to stop and assess task elements and to know what we are doing in a given moment
  - GMT provides strategies, such as the "STOP! Technique to tackle this

- Another goal management problem is not having control over attention, being absentminded (slipping into autopilot) and resultant forgetfulness.
  - GMT provides interventions and strategies to help stay on track with tasks to be more productive day to day.
  - More techniques: basic mindfulness skills; goal definition; task splitting; and monitoring

Cognition Management/Treatments

2. Treating Cognitive Symptoms: Approaches with evidence of efficacy

(iv) Some general, evidenced-based concepts and associated strategies

Neuroplasticity is the capacity of the brain to change and rewire itself based on an individual's experience

Environmental enrichment (like use it or lose it) promotes neuroplastic change and healthier aging

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Physical: Physical exercise ("Exercise as medicine") – Animal studies: New neurons!

- Aim for daily aerobic physical exercise. Demonstrated benefits for brain health; growing evidence for concussion symptom resolution; benefits on mood and thinking abilities.
- Track your activity and try to gradually increase.

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Cognitive: Mentally effortful activity (novel, challenging, effortful, engaging, intensive) – Animal studies: survival and integration of new neurons

- Learn something new. Do thinking activities and change these up often (e.g., read, play a musical instrument, learn a new language, build something, etc.)

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Social: Social interactions (Isolation associated with depression, which is associated with reduced cognitive function)

- Try to engage with people on a daily basis – whether they are family, friends or strangers. Get out and have fun!

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Navigating through space using “allocentric” (non-self-referential) coordinates instead of “egocentric”

Stimulates hippocampi (memory structures of brain); associated with enhanced hippocampal structure and function

Tips:

- *Turn off your GPS when you can*
- *Try to make a map of your mental space*

Some Take Aways

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- Management approaches (no magic bullet)
  - Address indirect causes (headache/pain/sleep)
  - Consider interventions and practice strategies: GMT, mindfulness meditation, allocentric spatial navigation
  -Enhance brain health through mental, physical and social stimulation!

THANK YOU

Other Resources

Here are some educational materials:

Guideline for Concussion & Prolonged Symptoms
for Adults 18 years of Age or Older

https://braininjuryguidelines.org/concussion/index.php?id=154