

THE 'UNRELIABLE  
WITNESS'

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# OVERVIEW

- Explore the role of the Forensic Physician in explaining inconsistencies in memory in the setting of a traumatic event (+/- mTBI) from a clinical perspective:
  - A brief overview of neurobiology
  - The physiology of 'trauma' (and the brain)
  - The acute effects of 'trauma' on memory
  - How the acute effects of 'trauma' manifest clinically
  - The chronic and 'secondary' effects of TBI on memory
  - How the chronic effects of TBI manifest clinically
  - What all this may explain about our patient and their ability to recall details
  - What this means for our clinical practice

# TRAUMA

Trauma is a broad but complex concept

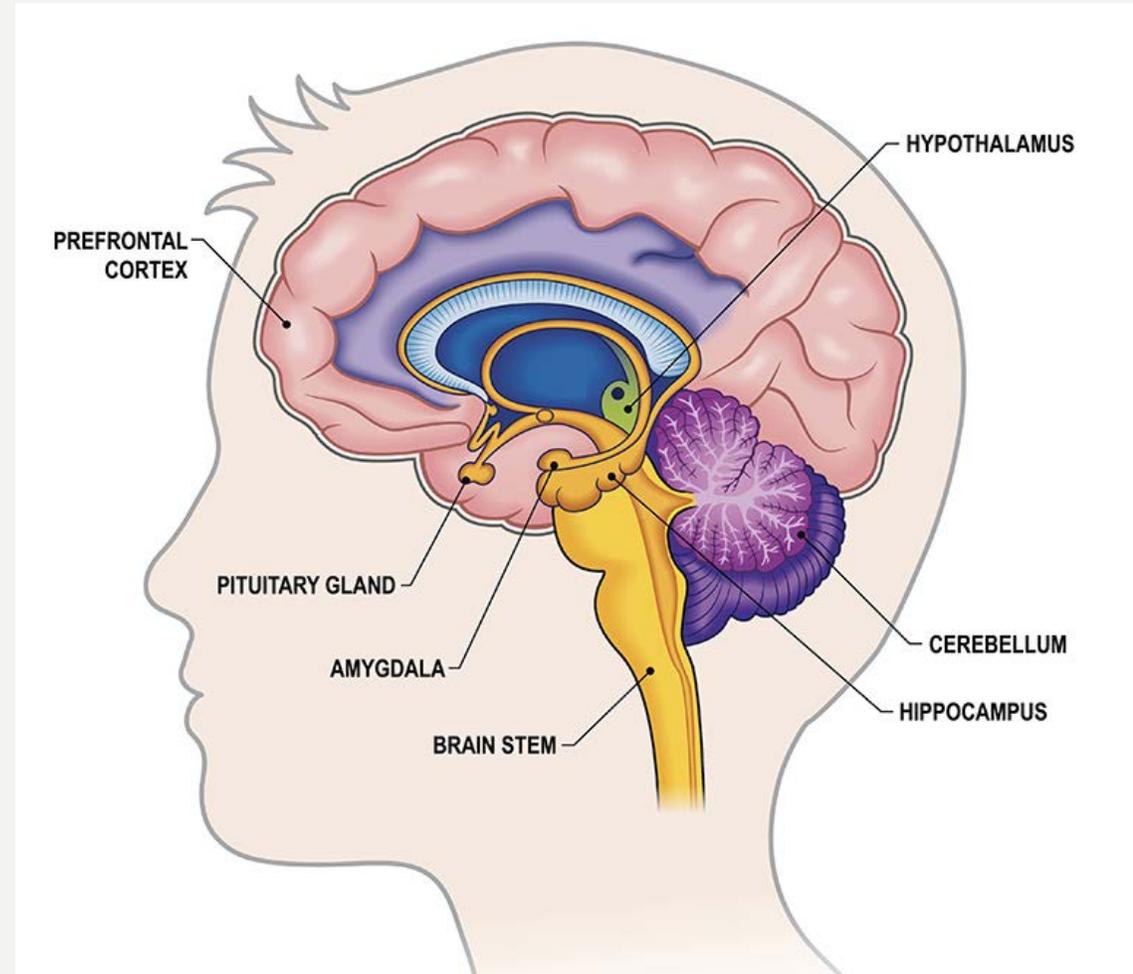
- Physical trauma
- Psychological trauma
  - *When a person is overwhelmed by something that is beyond their control*
- Usually a combination of both (not mutually exclusive concepts)



# NEUROBIOLOGY AND TRAUMA

## THE LIMBIC SYSTEM

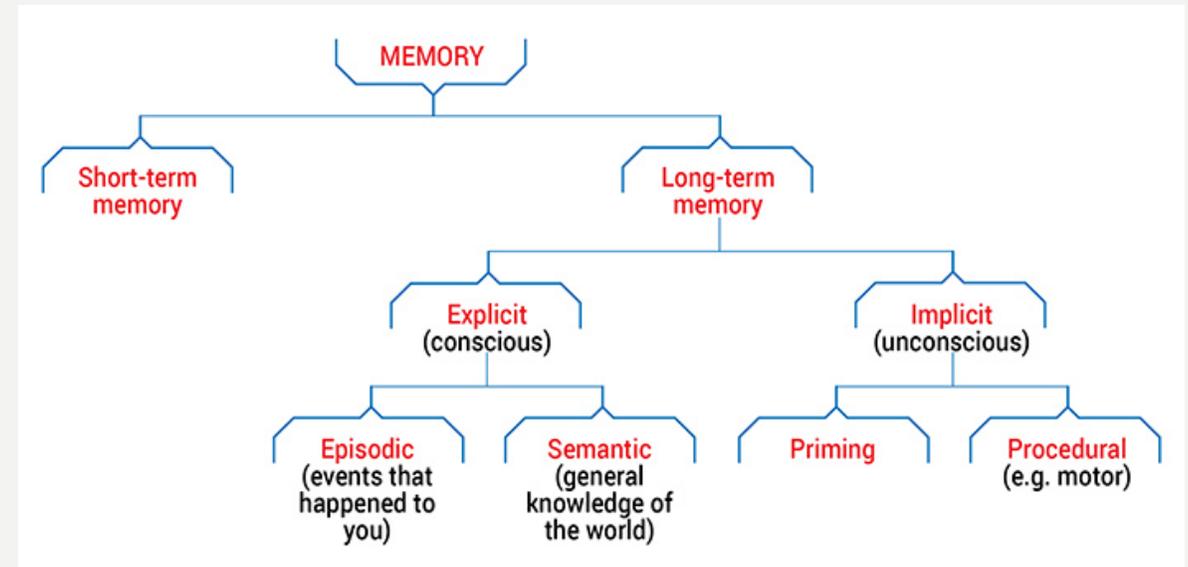
- Governs emotional and behavioural responses (survival)
  - Feeding, reproduction, caring for young, fight/flight responses
- Major structures
  - Hippocampus
  - Amygdala
  - (thalamus/hypothalamus/basal ganglia)



# NEUROBIOLOGY AND TRAUMA

## HIPPOCAMPUS

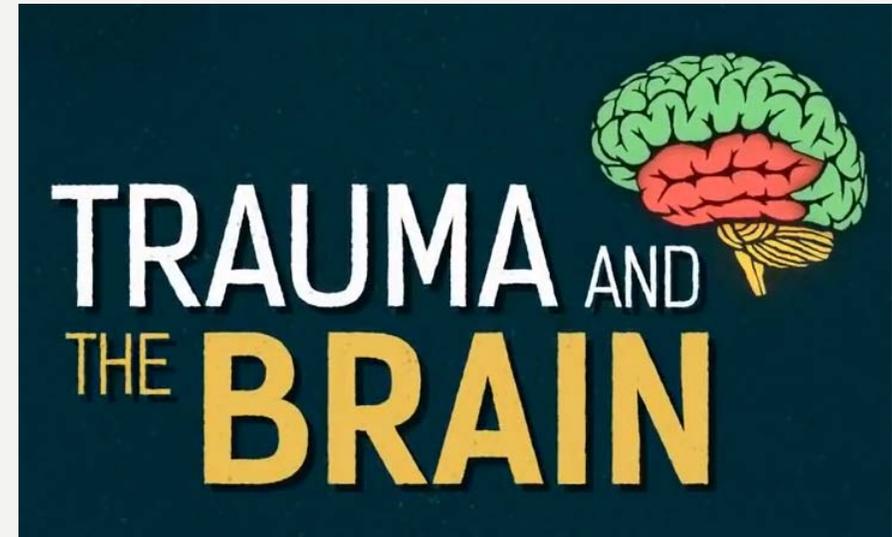
- (Paired) seahorse-shaped
- Memory centre of the brain
  - Episodic memories are formed and catalogued away in long term storage in other parts of the brain (neocortex and amygdala)
  - Connections associate memories with senses (sound/smell)
- Spatial orientation
- New neurons are made from adult stem cells (neurogenesis > brain plasticity)



# NEUROBIOLOGY AND TRAUMA

## AMYGDALA

- (Paired) almond-shaped
- Plays central role in emotional responses
- 'Feels fear'
- Attaches emotional content to our memories
  - Plays a key role in forming memories specifically related to fear
- Suppressing or stimulating activity in the amygdala can influence the body's automatic fear response (startle)
- The stability of memories relies on the interaction between the hippocampus, amygdala and neocortex.



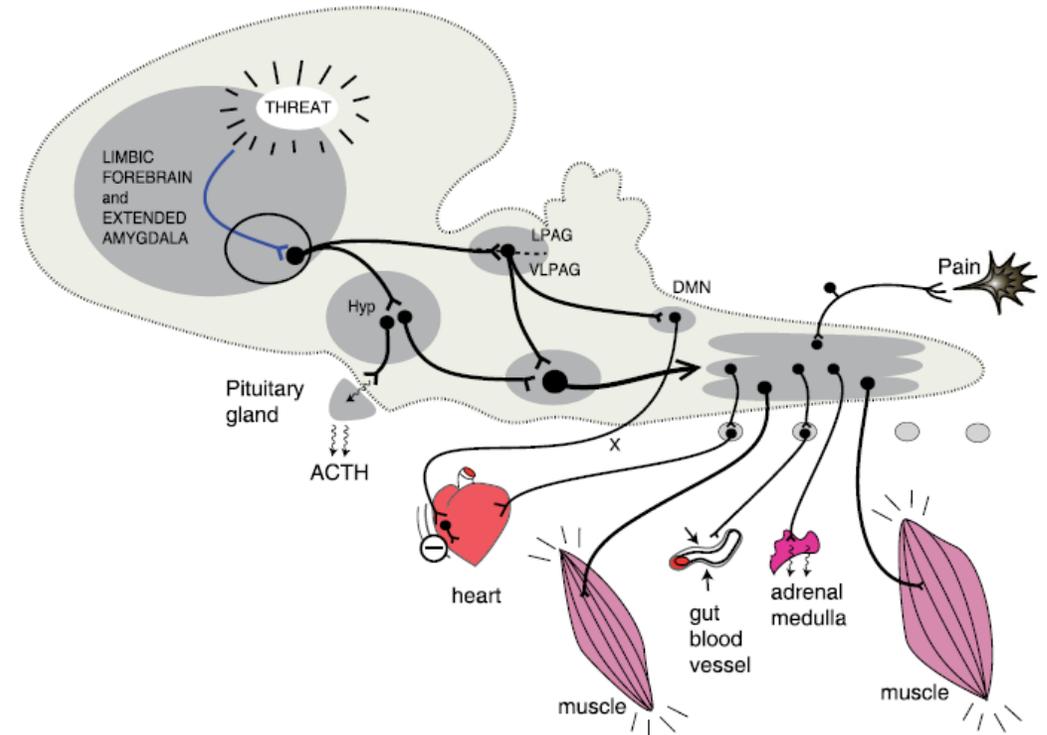
<https://www.youtube.com/watch?v=4-tcKYx24aA>

# PHYSIOLOGY OF TRAUMA

Response to fear

- **Amygdala** responsible for 'fear feeling'
- **Hypothalamus**
  - Increased heart rate
  - Increased blood pressure
  - Increased respiratory rate
  - Diversion of blood to skeletal muscle
- **Prefrontal cortex** formulates plans and guides behaviour
  - Overrides amygdala-induced responses that may be inappropriate

## THE DEFENSE CASCADE



Kozłowska et al. Fear and the Defense Cascade: Clinical Implications and Management. *Harvard Review of Psychiatry*, 2015; 23 (4): 263-287

# ACUTE EFFECTS OF TRAUMA ON MEMORY

## **1. Primitive brain responses**

- Hippocampus redirected to stimulate hormones during the 'fear' response
- Difficulty in *forming* episodic memory

## **2. Psychological responses to fear**

- PTSD
- Dissociative disorders

## **3. Traumatic brain injury in physical trauma**

- Mild traumatic brain injury (mTBI)
- Non-fatal strangulation

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# CLINICAL MANIFESTATIONS OF ACUTE TRAUMA

What our patients report to us:

- Exhausted (physically/mentally)
- Feel 'tired' all over
- Feel pain/sore 'everywhere'
- Nauseated
- Thirsty/hungry
- Can't recall/remember details

What we see in our patients:

- Emotionally labile
- Physical and mental exhaustion
- Feeling cold/shivering
- Poor recall
- Injuries that may not have been recognised by the patient
  - Defence injuries
  - Pattern injuries
- Distracting injuries

# CHRONIC EFFECTS OF REPEATED TRAUMA

Studies of women repeatedly exposed to trauma/IPV/sexual violence (+/- PTSD):

- Abnormalities in neuropsychological functioning
  - Poorer performance (matched controls) in working memory, sustained auditory attention, response inhibition and slower processing speed on tasks that required executive function.
- Reduction in volume of hippocampus (chronic child abuse) – impairment in memory formation and recall; and altered stress response.
- Higher levels of baseline circulating cortisol, dopamine and noradrenaline (child abuse).
- Increased activity in amygdala (hypervigilance)
- Alterations in immune function (chronic inflammatory responses).

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# SA/IPV AND TBI

## Traumatic Brain Injury (TBI):

- ‘A physiological disruption in brain function resulting from an external physical force, including blunt force and acceleration/deceleration’
  - Includes **NFS (unconsciousness)**
- TBI occurs commonly in IPV/FDV (some studies up to 75%)
  - (50%) multiple TBI’s
  - (50%) of IPV/FDV victims incur attempted strangulation injuries

(Campbell et al, 2003)

- 56% of IPV reported NFS

(Jackson et al, 2002)

- 25% IPV pts had been hit in head more than 20 times in 5 years
- 40% of IPV pts had reported at least one TBI resulting in LOC
- 92% reported blow to face/head

(Smith et al, 2001)

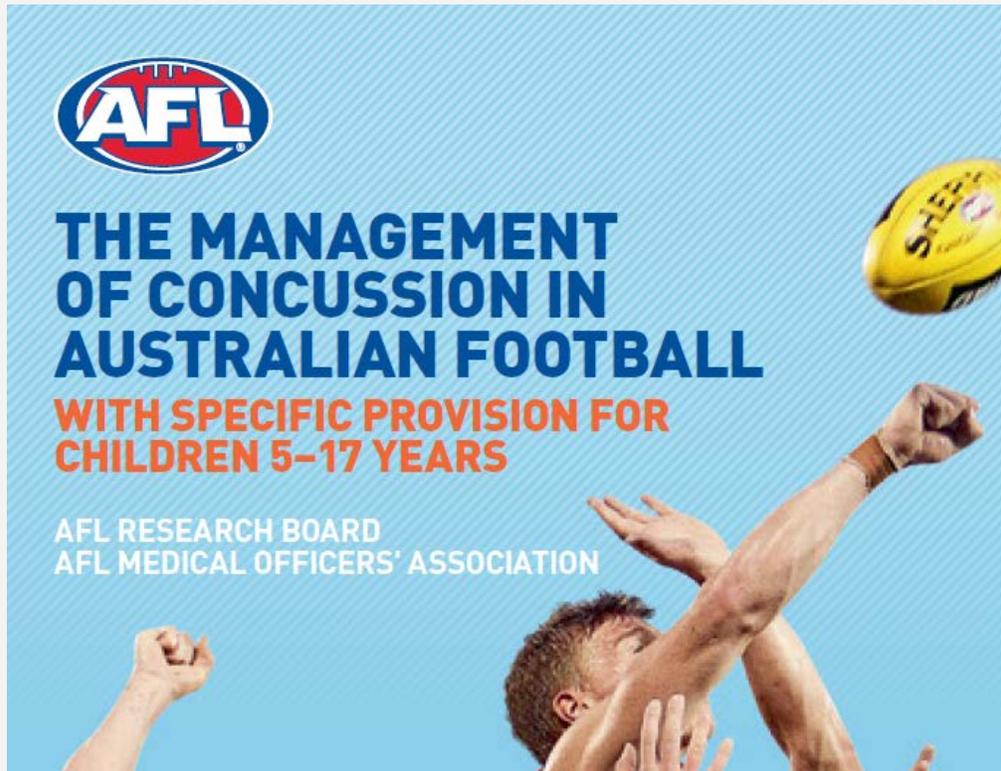
- 34% IPV/NFS victims reported being strangled 3-5 times
- 23% reported >5 times

# TBI AND SEXUAL ASSAULT/IPV

## Why link the two?

- Because they occur together
- Because of the potentially compounding effect on memory (acute and chronic)
- NFS resulting in alterations in consciousness can result in TBI
- Because the majority of TBI's are mild (GCS 13-15)
- Because mild TBI's are often overlooked by both patient and clinician
- Most women never seek medical attention for their TBI's (*Banks 2007; Valera 2003*)

# TBI AND THE AFL



## RETURN TO PLAY

- Players should not return to play until they have returned to school/ learning without worsening of symptoms.
- Players should be returned to play in a graduated fashion.
- The “concussion rehabilitation” program should be supervised by the treating medical practitioner and should follow a step-wise symptom limited progression, for example:
  1. Rest until symptoms recover (includes physical and mental rest)
  2. Light aerobic activity (e.g. walking, swimming or stationary cycling) – can be commenced 24-48 hours after symptoms have recovered
  3. Light, non-contact training drills (e.g. running, ball work)
  4. Non-contact training drills (i.e. progression to more complex training drills, may start light resistance training. Resistance training should only be added in the later stages)
  5. Full contact training – only after medical clearance
  6. Return to competition (game play)
- There should be approximately 24 hours (or longer) for each stage.
- Players should be symptom-free during their rehabilitation program. If they develop symptoms at any stage, then they should drop back to the previously symptom-free level and try to progress again after a further 24 hour period of rest.
- If the player is symptomatic for more than 10 days, then review by a medical practitioner, expert in the management of concussion, is recommended.

# Pocket CONCUSSION RECOGNITION TOOL

To help identify concussion in children, youth and adults



## RECOGNISE & REMOVE

Concussion should be suspected **if one or more** of the following visible clues, signs, symptoms or errors in memory questions are present.

### 1. Visible clues of suspected concussion

Any one or more of the following visual clues can indicate a possible concussion:

- Loss of consciousness or responsiveness
- Lying motionless on ground / Slow to get up
- Unsteady on feet / Balance problems or falling over / Incoordination
- Grabbing / Clutching of head
- Dazed, blank or vacant look
- Confused / Not aware of plays or events

### 2. Signs and symptoms of suspected concussion

Presence of any one or more of the following signs and symptoms may suggest a concussion:

- Loss of consciousness
- Balance problems
- Drowsiness
- Irritability
- Fatigue or low energy
- "Don't feel right"
- Headache
- Confusion
- "Pressure in head"
- Sensitivity to light
- Feeling like "in a fog"
- Sensitivity to noise
- Seizure or convulsion
- Nausea or vomiting
- More emotional
- Sadness
- Nervous or anxious
- Difficulty remembering
- Dizziness
- Feeling slowed down
- Blurred vision
- Amnesia
- Neck Pain
- Difficulty concentrating

### 3. Memory function

Failure to answer any of these questions correctly may suggest a concussion.

*"What venue are we at today?"*

*"Who scored last in this game?"*

*"Did your team win the last game?"*

*"Which half is it now?"*

*"What team did you play last week / game?"*

**Any athlete with a suspected concussion should be IMMEDIATELY REMOVED FROM PLAY, and should not be returned to activity until they are assessed medically. Athletes with a suspected concussion should not be left alone and should not drive a motor vehicle.**

It is recommended that, in all cases of suspected concussion, the player is referred to a medical professional for diagnosis and guidance as well as return to play decisions, even if the symptoms resolve.

## RED FLAGS

**If ANY of the following are reported then the player should be safely and immediately removed from the field. If no qualified medical professional is available, consider transporting by ambulance for urgent medical assessment:**

- ▶ Athlete complains of neck pain
- ▶ Severe or increasing headache
- ▶ Seizure or convulsion
- ▶ Deteriorating conscious state
- ▶ Repeated vomiting
- ▶ Double vision
- ▶ Increasing confusion or irritability
- ▶ Unusual behaviour change
- ▶ Weakness or tingling / burning in arms or legs

## Remember:

- In all cases, the basic principles of first aid (danger, response, airway, breathing, circulation) should be followed.
- Do not attempt to move the player (other than required for airway support) unless trained to do so.
- Do not remove helmet (if present) unless trained to do so.

from McCrory et. al, Consensus Statement on Concussion in Sport. Br J Sports Med 47 (5), 2013

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# EXPOSURE TO TBI

Following a **TBI** that is recognised, a person develops *adaptive behaviours*.

- AFL/sporting TBI/concussion injury
  - Abstinence from further contact sport
  - Period of recovery
  - Medical clearance prior to return to play
  - Headgear

The SA and/or IPV population often **doesn't recognise** the TBI and therefore cannot develop adaptive behaviours.

# EXPOSURE TO TRAUMA

Following an exposure to **trauma** (without TBI) that is recognised, a person develops *adaptive behaviours* (or they are afforded to them).

- Justifiable homicide (USA)
  - Mandated two (2) sleep/wake cycles prior to interview
- Fitness for interview
  - Considerations given for eating/sleeping/intoxication/withdrawal

There is considerable evidence and recognition surrounding the increased likelihood of a false confession when acutely exposed to stress.

That same consideration is not commonly applied to victims of SA/IPV.

# TBI AND MEMORY

## ACUTE

Post-traumatic Amnesia (PTA)

- Well recognised in head trauma
- Westmead PTA
  - Evidence-based standardised assessment tool
  - Closed head injuries
  - Not validated in hypoxia population

## CHRONIC

Post concussive syndrome (PCS)

- Controversial concept
- 29-90% of patients following TBI
  - Depends on definition and severity
- Headache
- Dizziness, nausea, vertigo
- Anxiety, depression, sleep disturbance
- Cognitive impairment (memory loss, difficulty concentrating)

# TBI AND MEMORY

- Multiple mild TBI's have been shown to cumulative effect
  - Chronic traumatic encephalopathy

In *traditional* trauma population:

- PCS symptoms are well recognised

In IPV/SA/DV population:

- PCS symptoms may be causing symptoms that would otherwise be attributed to mental illness

# WHAT MAKES AN 'UNRELIABLE WITNESS'

- Difficulty in or inability to recall events
- Poor recollection of details or intricacies
- Inconsistent recall of events
  - Though to be '*censoring*' event/s depending on audience
- '*Inappropriate*' responses to event/s
- '*Inappropriate*' behaviours linked to the event/s
- Added complexity of alcohol and/or drug intoxication

All of the above can be seen in (and is accepted as part of) **physical trauma** (in the absence of TBI) where consideration is given to the traumatic circumstances.

But in IPV/sexual assault.....

# WHAT THIS MEANS FOR CLINICAL PRACTICE

We are doctors/clinicians first.....

- Unique model of care (compared to international jurisdictions)
- Recognise TBI and acute effects of trauma/stress
- Clinical assessment of (unrecognised) TBI
- Contemporaneous collection of data
  - Role for concussion questionnaire (Rivermead Post Concussion Symptom Questionnaire)
  - Follow-up clinical assessment (with repeat Rivermead at 3 months)
- Further research to use and adapt the information we have from other fields of medicine

# CONCLUSION

- Patients exposed to traumatic events may have difficulties in recalling those traumatic events
- There are physiological considerations for why a person may have difficulty in recalling events
  - Limbic system interruption (specifically hippocampus/amygdala) due to physiological trauma response
  - Difficulty in forming memories
  - Additional acute and chronic effects on memory from traumatic brain injury (which includes non-fatal strangulation)
  - Added layer of complexity for patients who are intoxicated (alcohol/drugs)
- The potential role for the clinician in explaining disordered memory in trauma
- Further research

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<https://qbi.uq.edu.au>



QUESTIONS?