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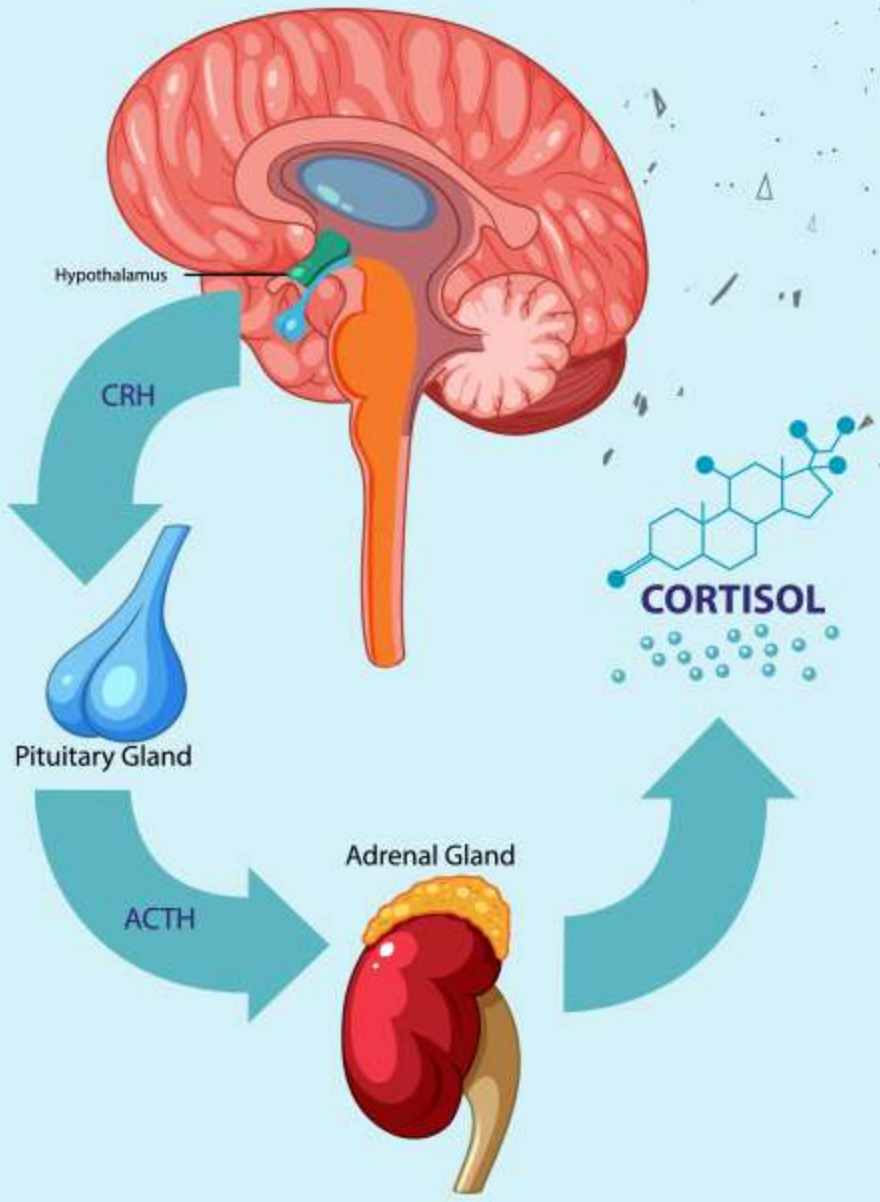
Trauma & the Brain



Neurobiological Impact
of Psychological Trauma

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How Trauma Activates the Brain

Trauma activates the **Hypothalamic–Pituitary–Adrenal (HPA) axis**, triggering the release of **cortisol and adrenaline** to prepare the body for **fight, flight, or freeze**.
This response is adaptive in immediate danger, increasing alertness, energy, and survival readiness.

When trauma is chronic, the HPA axis stays overactive. Prolonged stress hormone exposure becomes neurotoxic, impairing brain plasticity and emotional regulation, leading to anxiety, heightened reactivity, and difficulty returning to a calm state.

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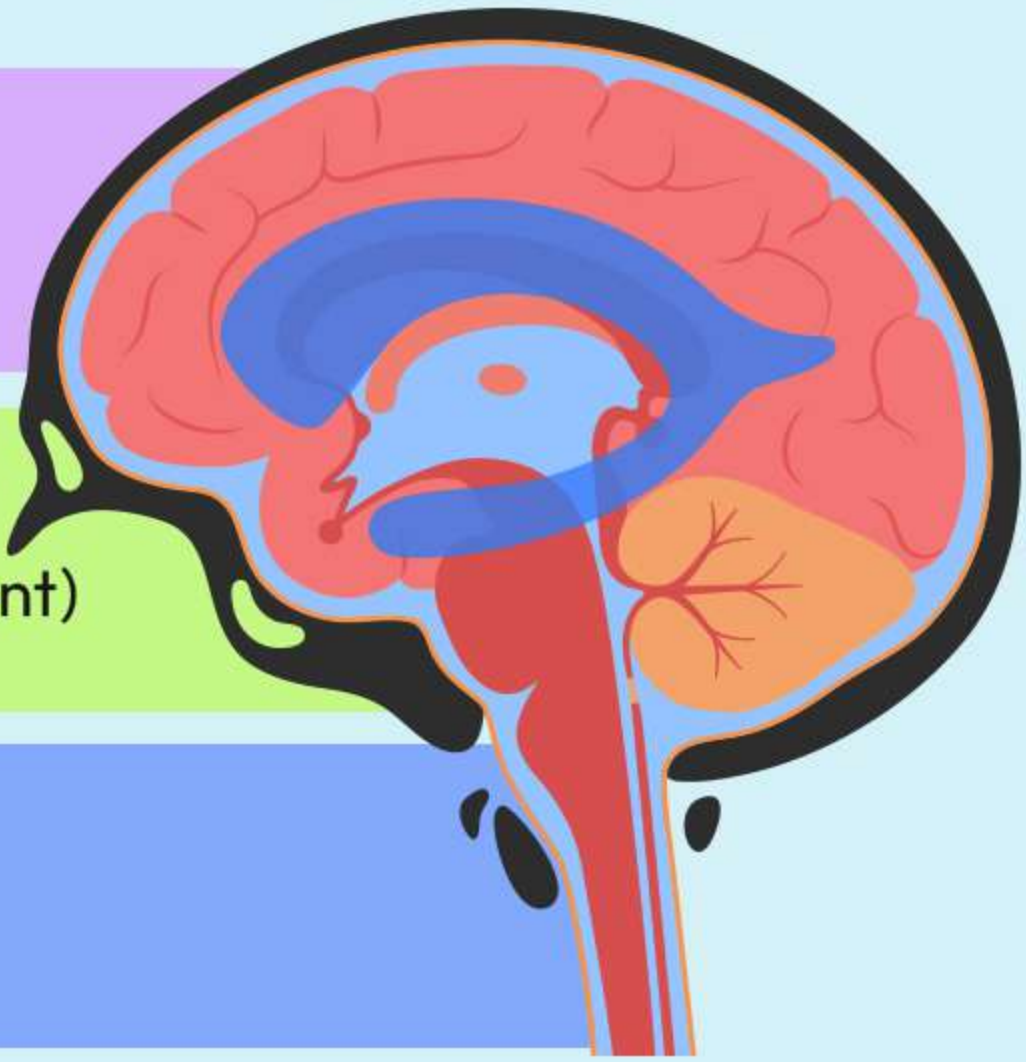
Role of the Hippocampus

The hippocampus is responsible for:

Formation of **declarative (explicit) memory**

Contextualising experiences (past vs present)

Inhibiting excessive stress responses



It helps the brain recognise that a traumatic event is over, preventing constant reactivation of fear.

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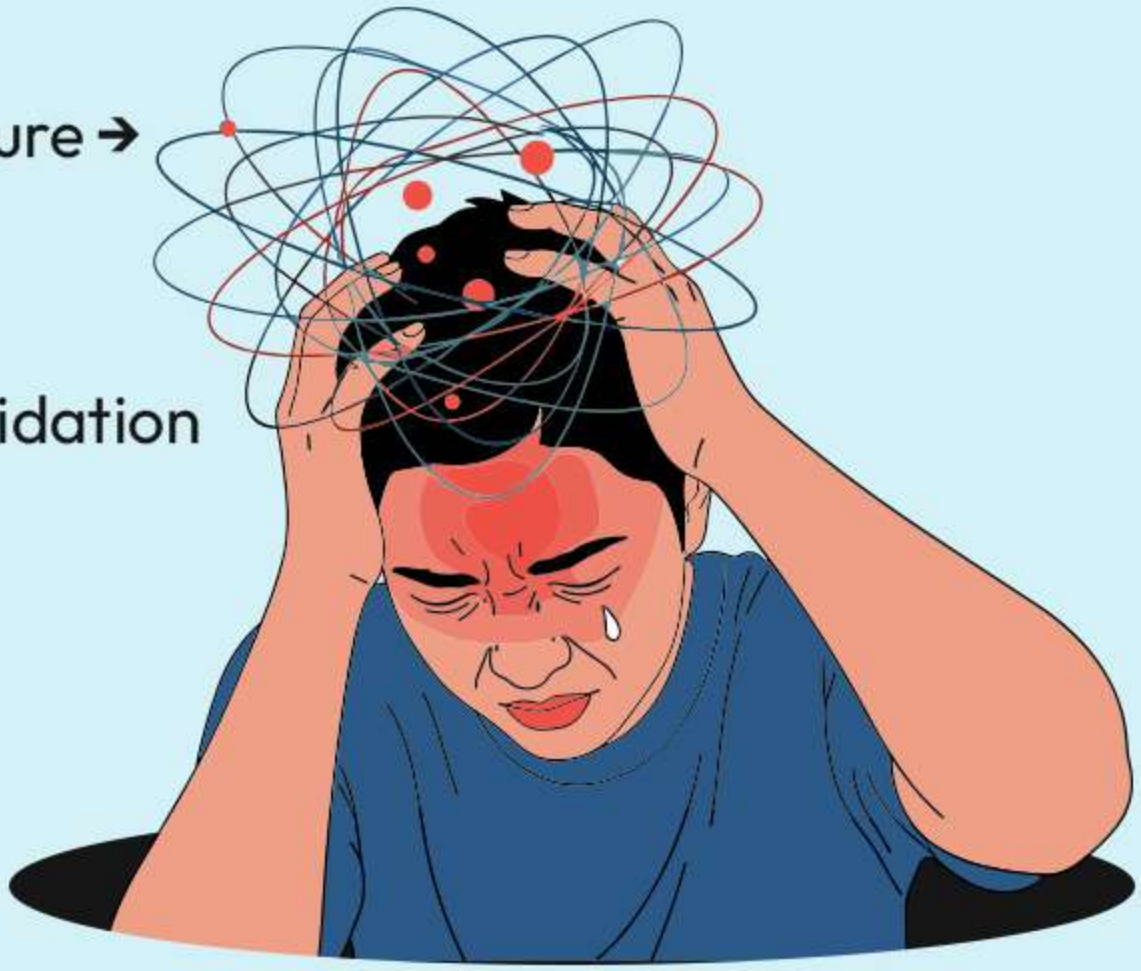
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Effects of Chronic Stress

Research shows that individuals with PTSD often display **reduced hippocampal volume.**

Mechanisms involved:

- Prolonged cortisol exposure → **neuron atrophy**
- Reduced neurogenesis
- Impaired memory consolidation



Psychological outcome:

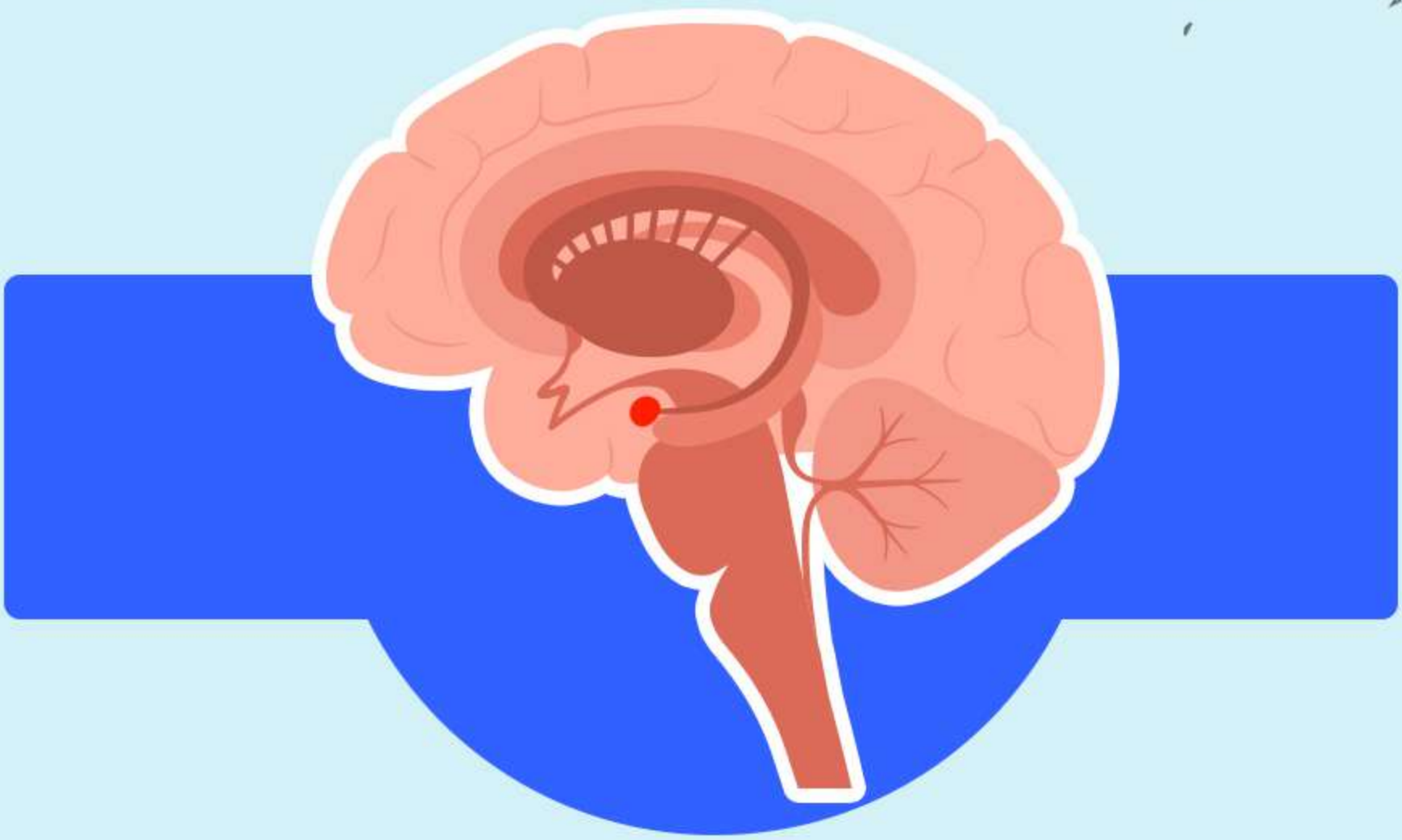
- Fragmented memories
- Difficulty recalling details
- Poor distinction between past trauma and present safety

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Role of the Amygdala

The amygdala:



- Detects threat and danger
- Stores emotional memory, especially fear-based memories
- Triggers fear, anger, and survival responses

It operates rapidly and unconsciously, prioritising survival over rational thought.

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Amygdala Hyperactivity in Trauma

Trauma leads to **amygdala hyperactivation**, causing:

- Heightened fear responses
- Hypervigilance
- Emotional overreaction to neutral stimuli

Psychological symptoms:



Anxiety



Flashbacks



Irritability



Startle response

The brain behaves as if a threat is always present, even in safe environments.

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Integration & Clinical Significance

Trauma as a Brain-Based Condition

Hippocampal shrinkage + amygdala hyperactivity explain why trauma survivors:

- Relive memories instead of recalling them
- Struggle with emotional regulation
- Remain “stuck” in survival mode

Trauma is not a weakness, but a neurobiological adaptation. Effective therapy (e.g., trauma-focused CBT, EMDR) works by helping the brain reprocess and integrate traumatic memories.

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