

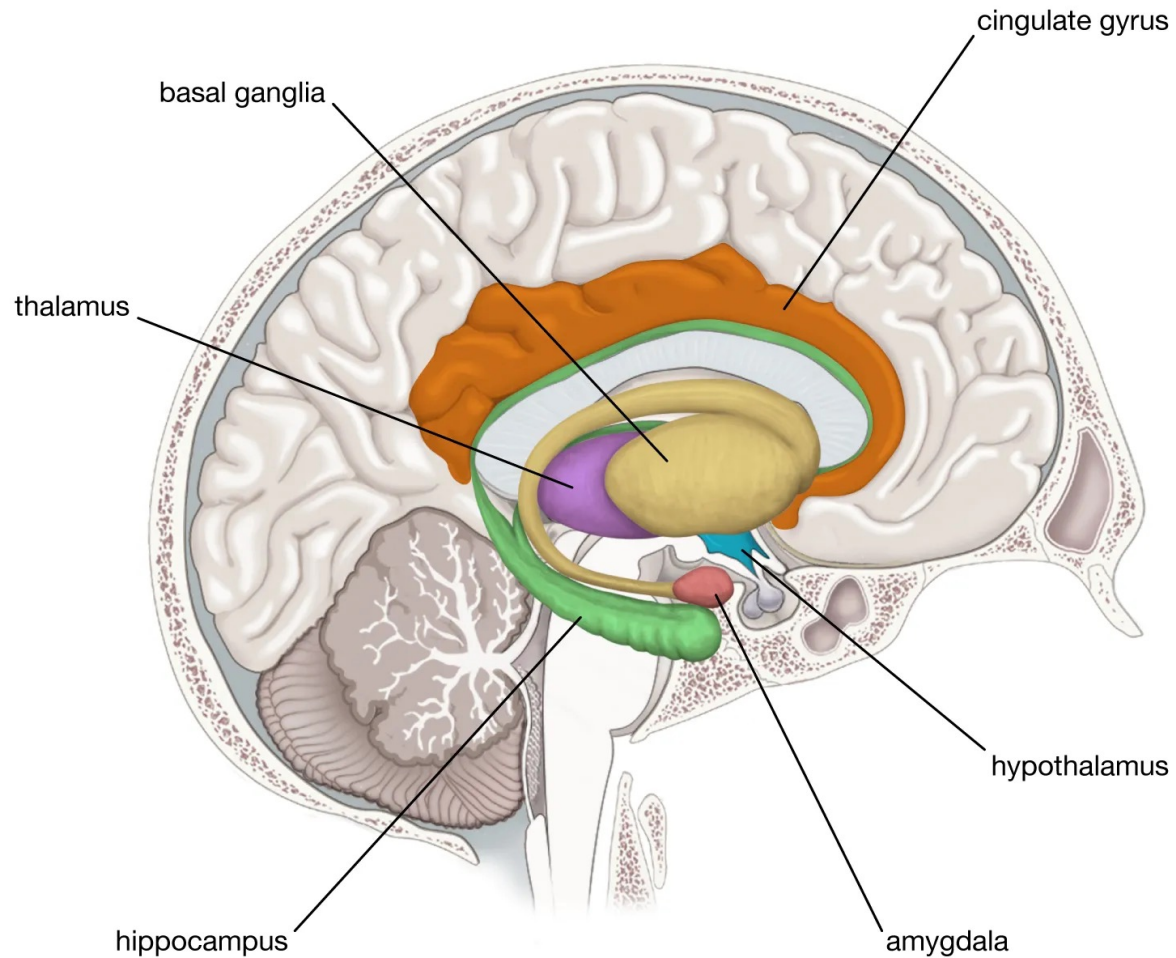
Limbic System & Higher Brain Function

By Tess Warchalowski

Limbic System

Limbic System

Primary components of the limbic system



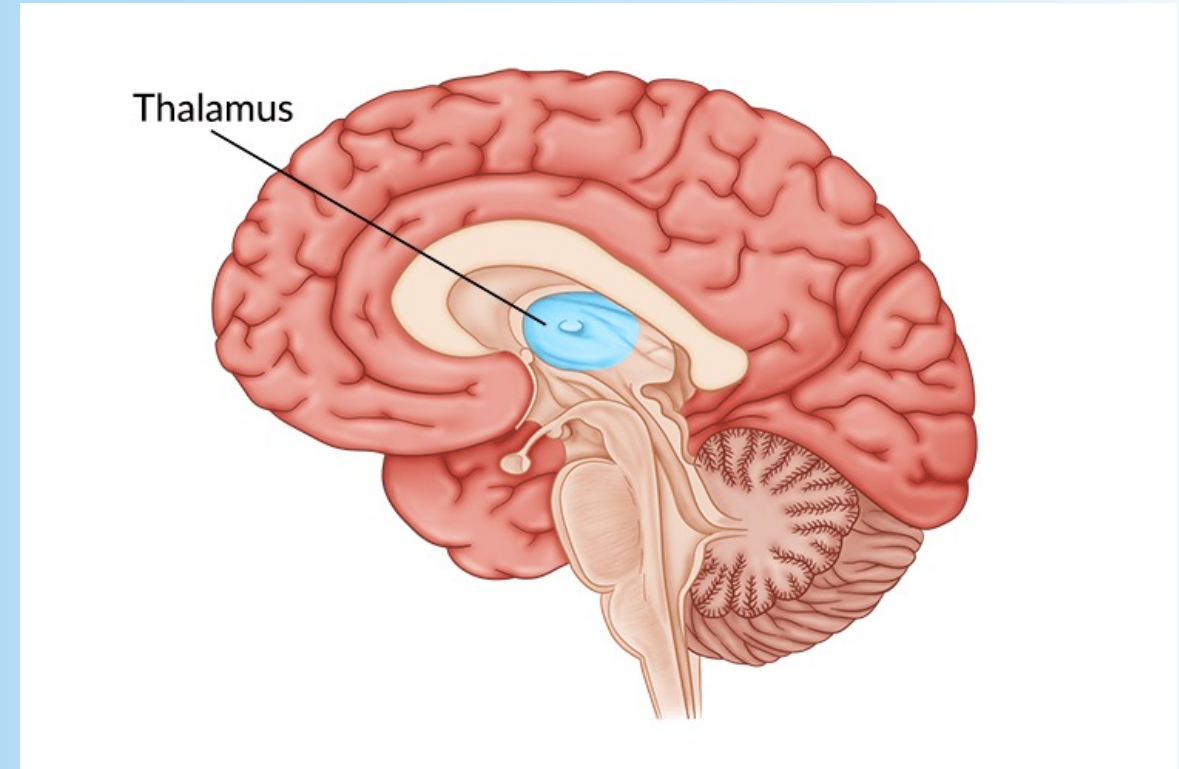
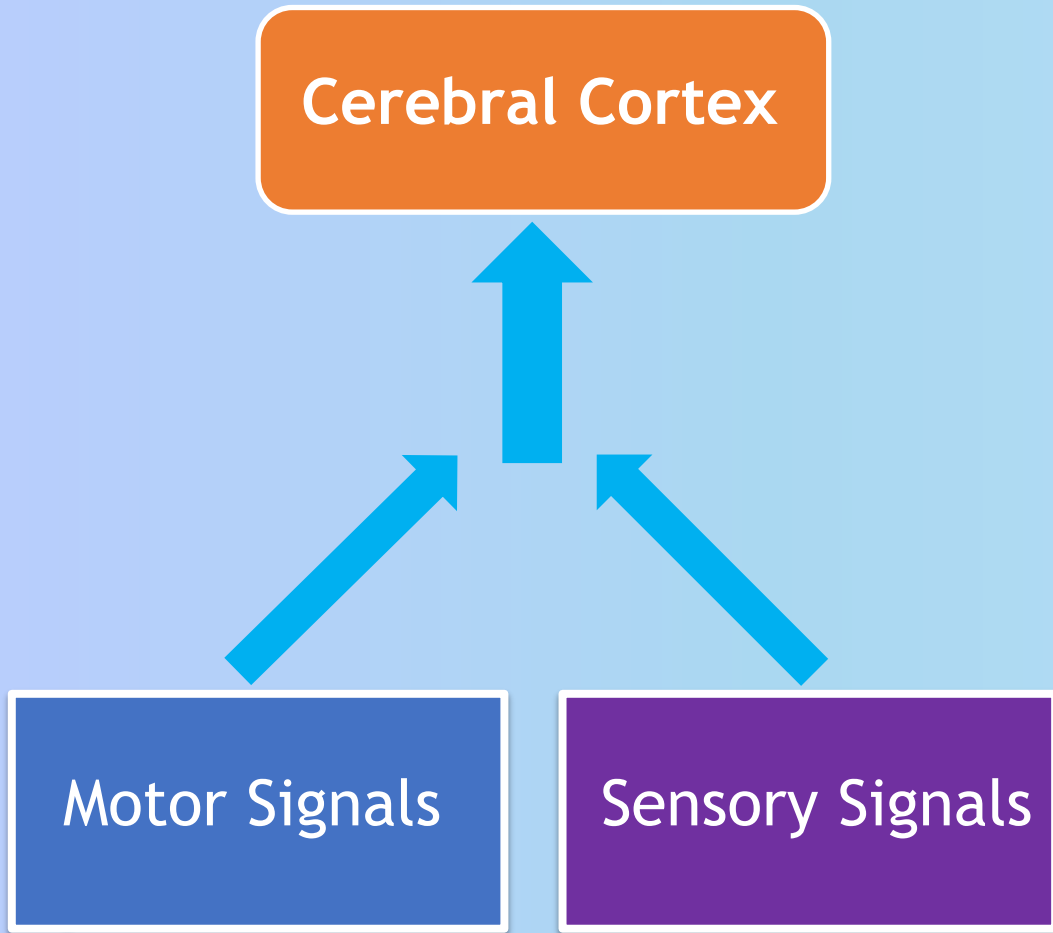
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What does it control?

5 “F’s”

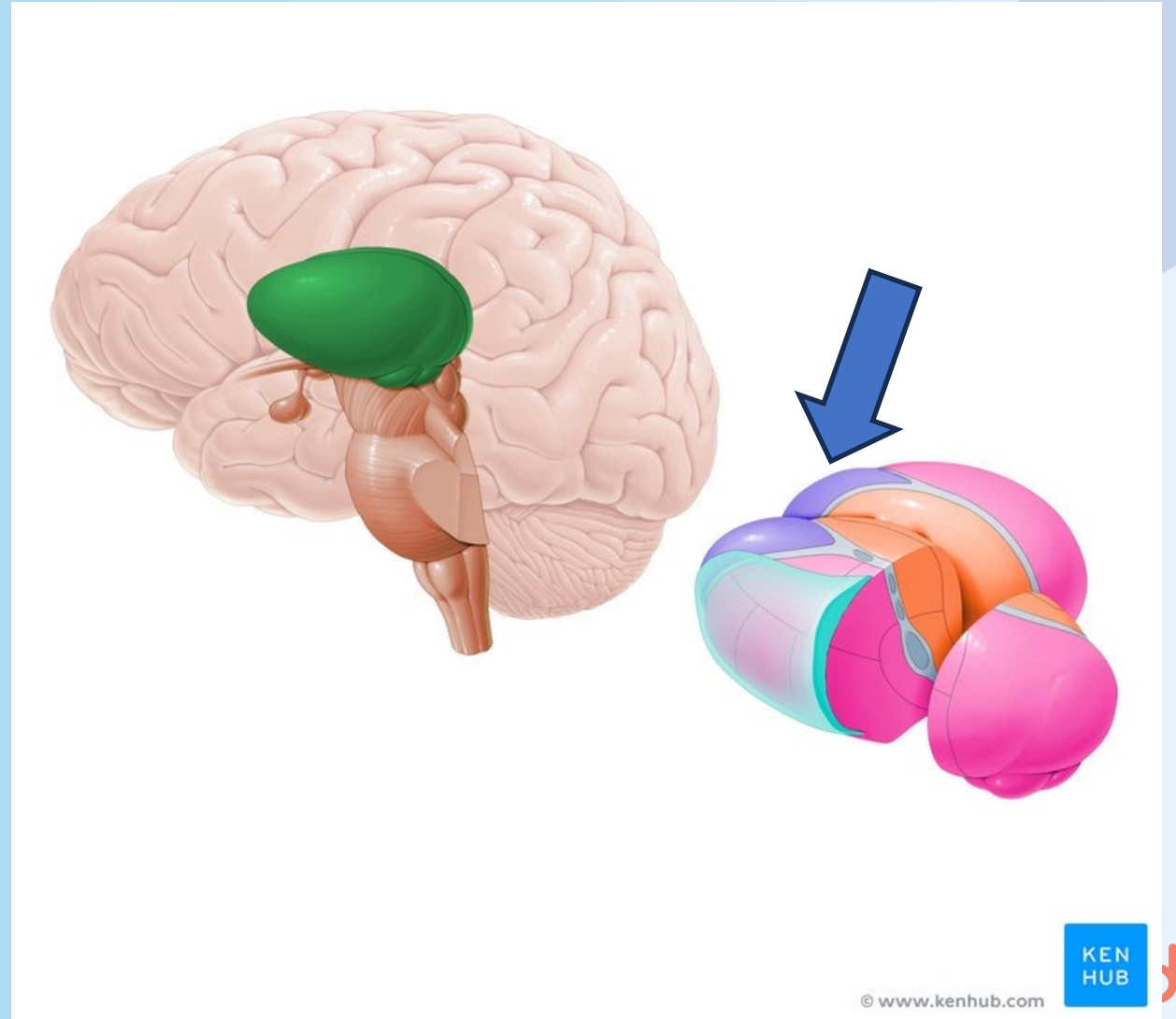
- Feeding
- Forgetting (memory)
- Fighting (emotional response)
- Family (sexual reproduction and maternal instincts)
- Fornicating (sexual behaviour)

Thalamus

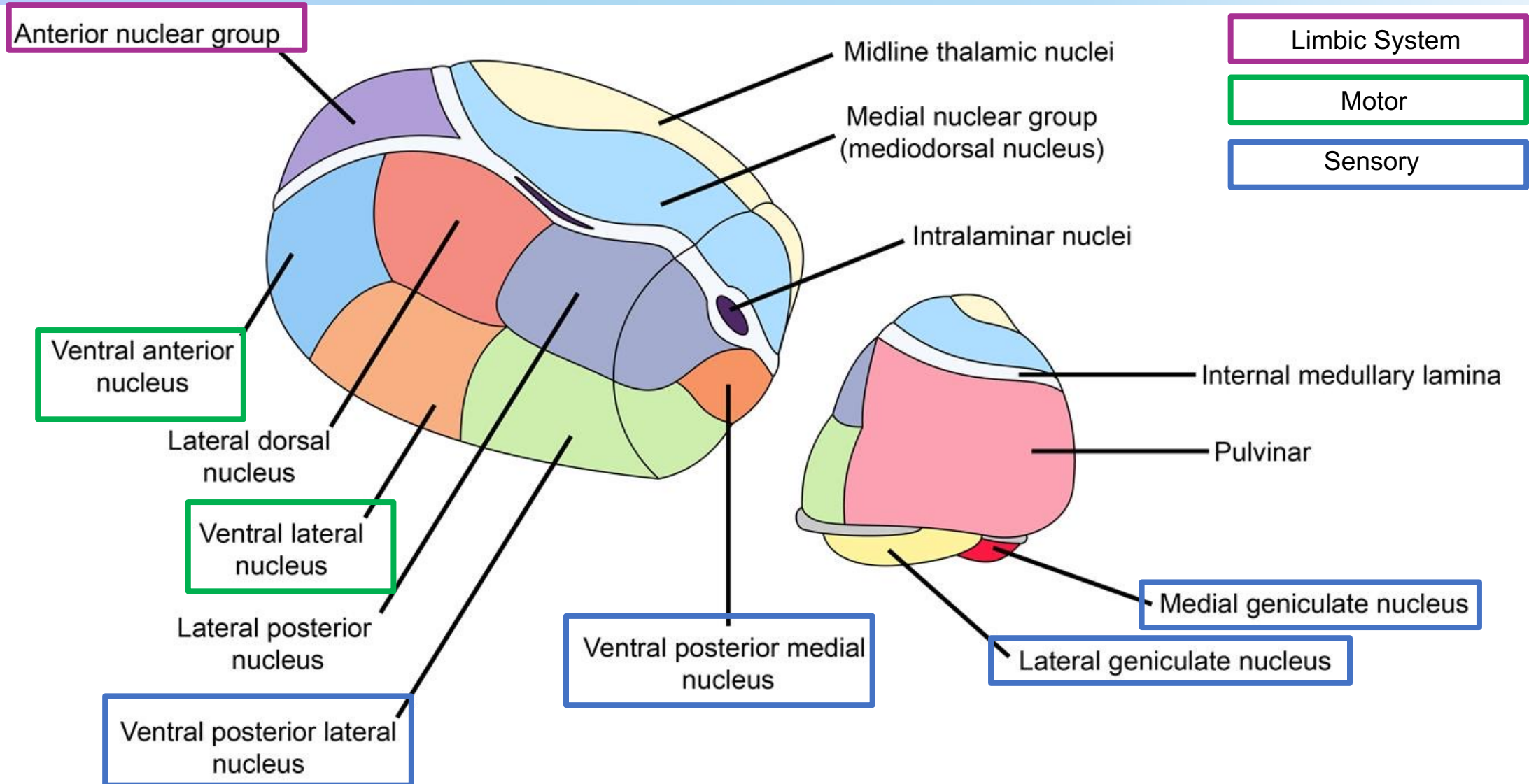


Thalamus

- **Nuclei:** Clusters of neuronal cell bodies
 - Each lobe has 3 main parts- each contain a group of nuclei (ant, lat, med)
 - Ant nuclei = Limbic system!

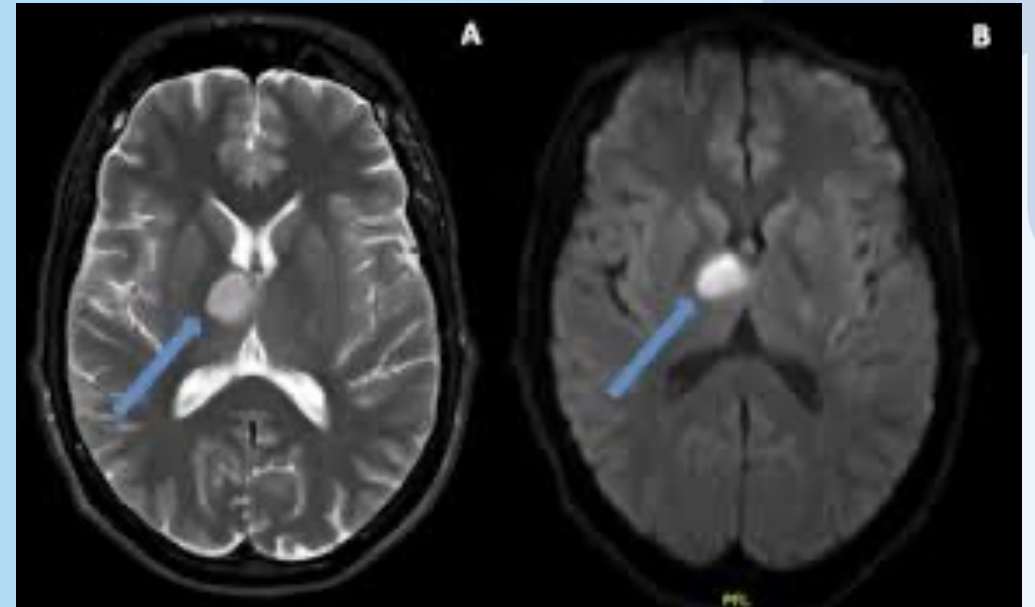


Thalamic Nuclei



Thalamic Stroke

- Ischemic or hemorrhagic
- Thalamic pain syndrome- appears after stroke
 - Contralateral symptoms/ deficits
 - **Hyperalgesia**- Pain is greater to a stimulus than what is typical
 - **Allodynia** - pain to stimulus that usually does not cause pain
- Differential when patient had a cerebrovascular accident with neuropathic pain



Hypothalamus

➤ Homeostasis!

➤ Controls most autonomic functions

➤ Function: TAN HATS

Thirst and water balance

Adenophysis

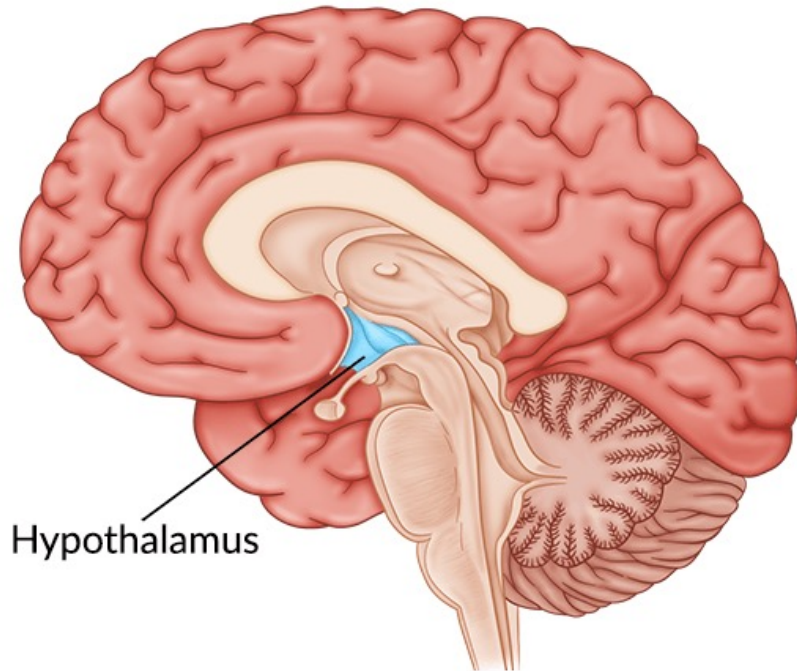
Neurohypophysis

Hunger

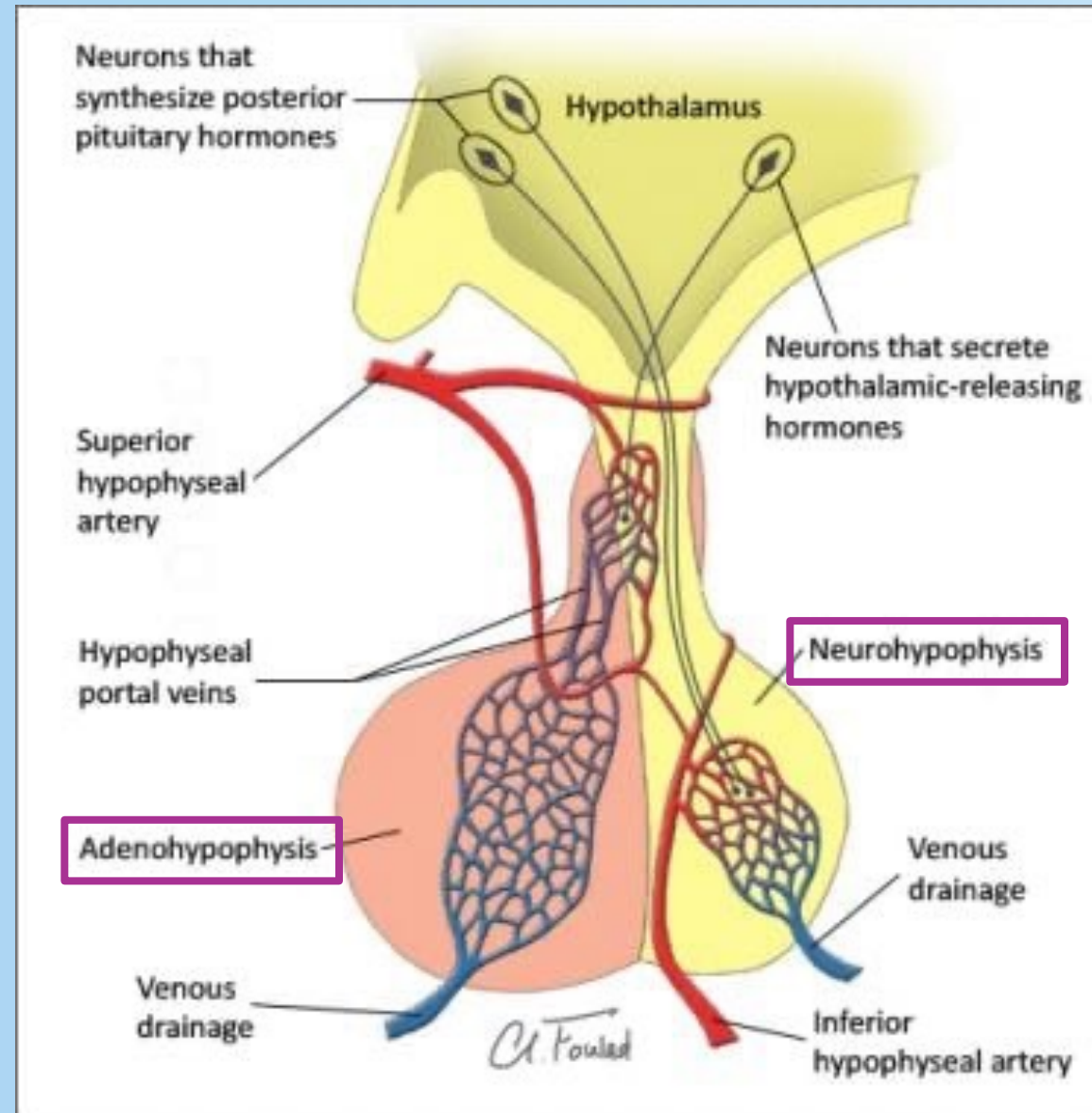
Anger

Temperature regulation

Sexual function



Hypothalamic- Pituitary Axis



Hunger and Satiety



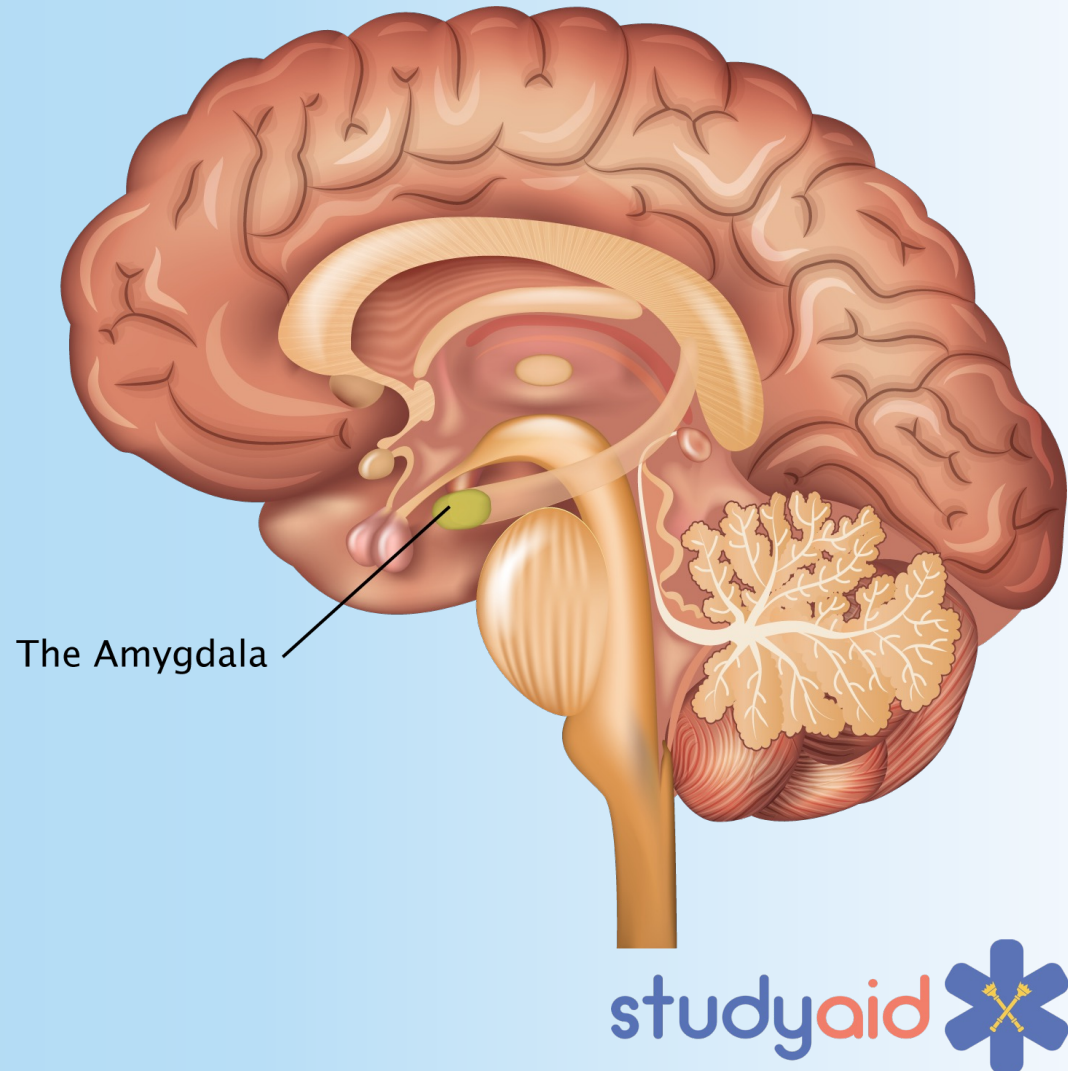
Long term effects

- Ghrelin inc appetite & GH release
- Leptin dec appetite

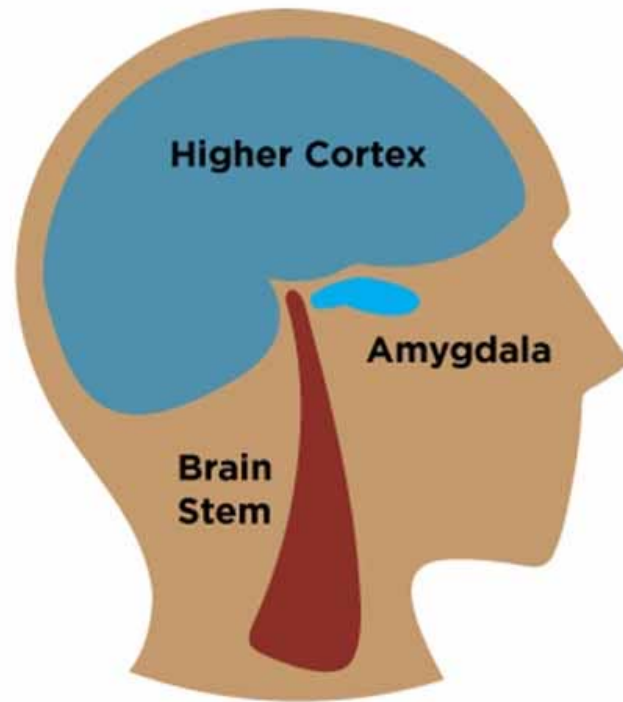
Ghrelin makes you gain weight
Leptin makes you loose weight

Amygdala

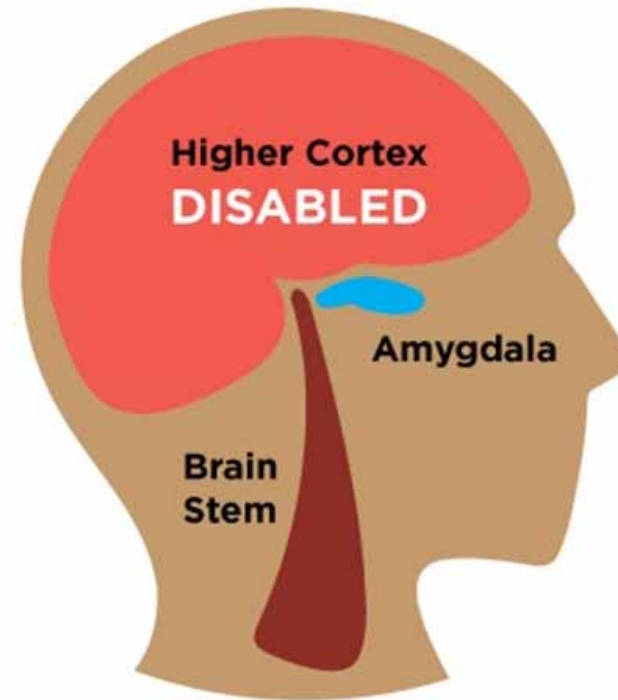
- Processes emotions
 - Fear !
- Operant conditioning
- Memory consolidation
- Processing and use of implicit memory



Amygdala Hijack



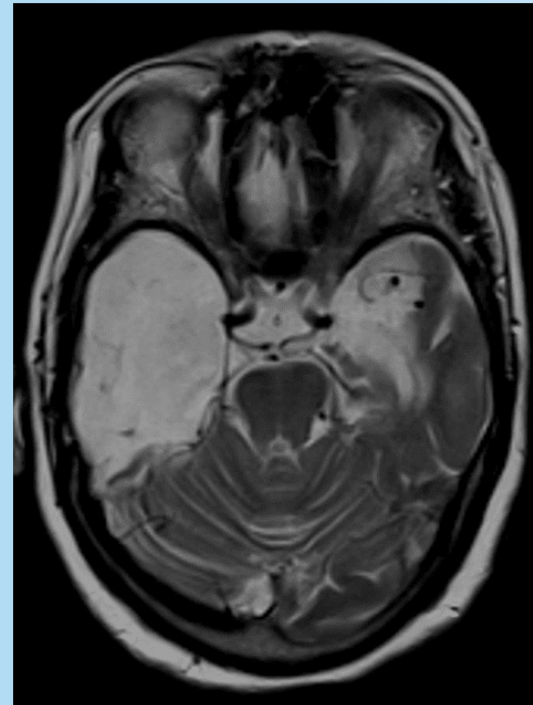
LOW Emotion
(Calm, Relaxed)



HIGH Emotion
(Anger, Fear, Excitement, Love,
Hate, Disgust, Frustration)

Kluver - Bucey Syndrome

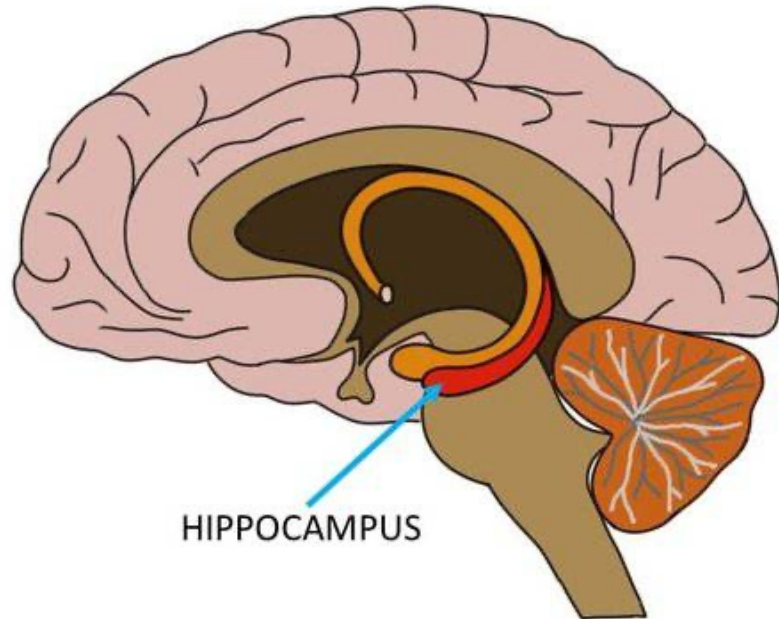
- **Bilateral lesions of amygdala**
- Disinhibited behaviour, hyperorality, hypersexuality, visual agnosia, amnesia
- **Causes:**
 - Herpes Simplex Encephalitis
 - Stroke
 - Traumatic brain injury
 - Alzheimer's





Hippocampus

- Memory consolidation- episodic memory becomes long term memory
- Spatial orientation
- A site of **neurogenesis**: adult stem cells become new neurons

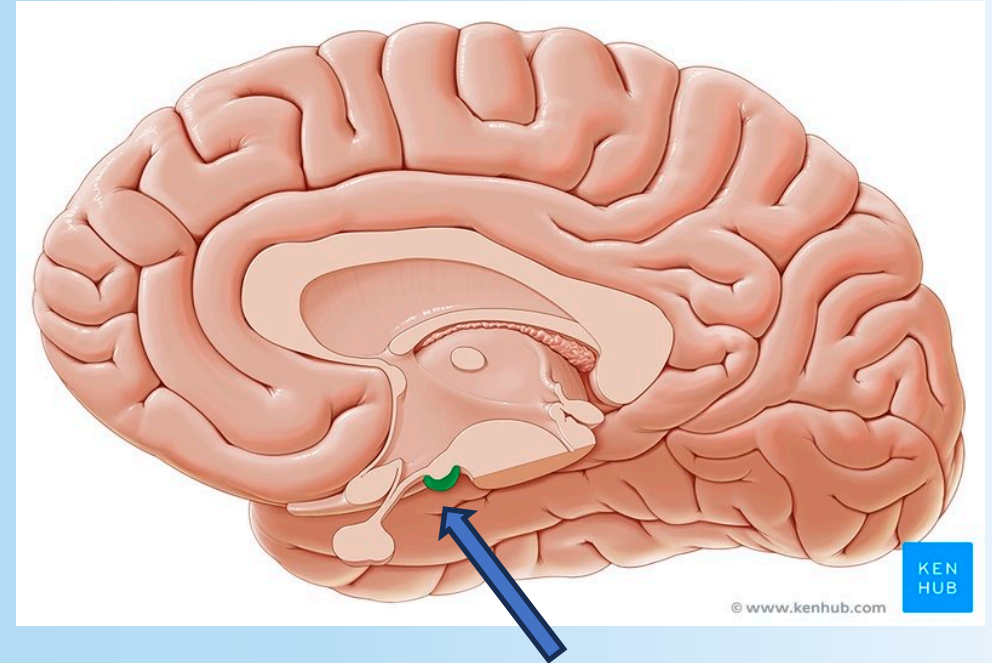


DAMAGE!

- Anterograde amnesia
- Longterm memory is preserved!
- Alzheimer's disease

Mamillary Bodies

- **Function: Recollective memory**
- Helps create appropriate behavioural reactions



DAMAGE!

- Memory damage: retrograde and anterograde amnesia

Wernicke Korsakoff Syndrome

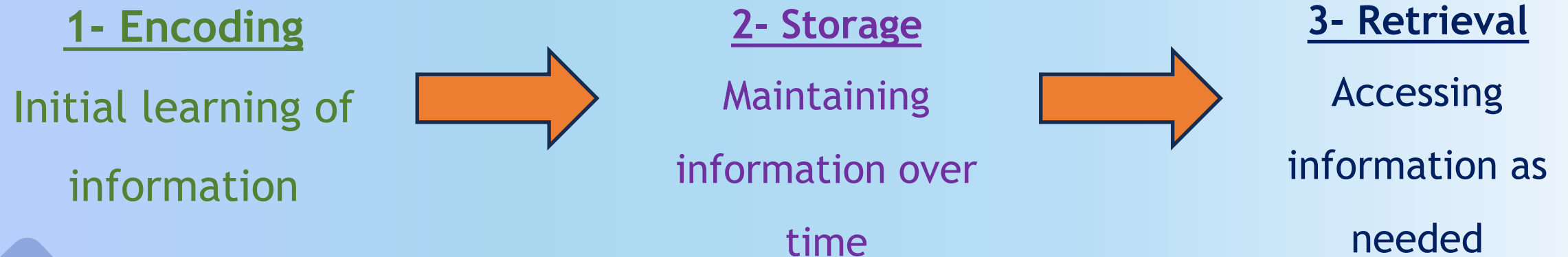
- Neuronal atrophy- degeneration of mamillary bodies
- Caused by Thiamine (vit B1) deficiency
- Symptoms
 - Altered mental status
 - Nystagmus
 - Ataxia
 - Confabulation



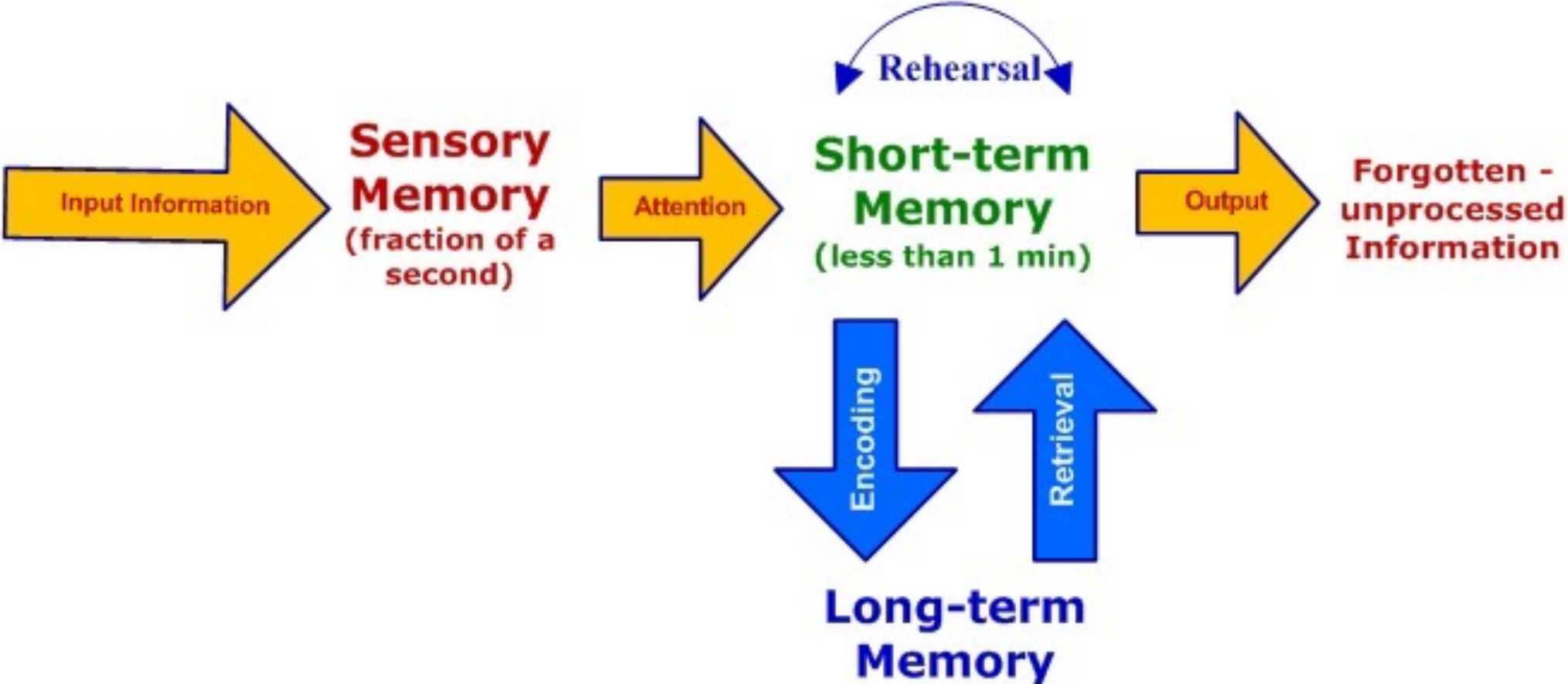
Higher Brain Function

Memory and learning

- **Learning:** Generally, acquisition of a new skill or knowledge
- **Memory:** Expression of skill, and ability to recall it later
- 3 main steps in memory formation

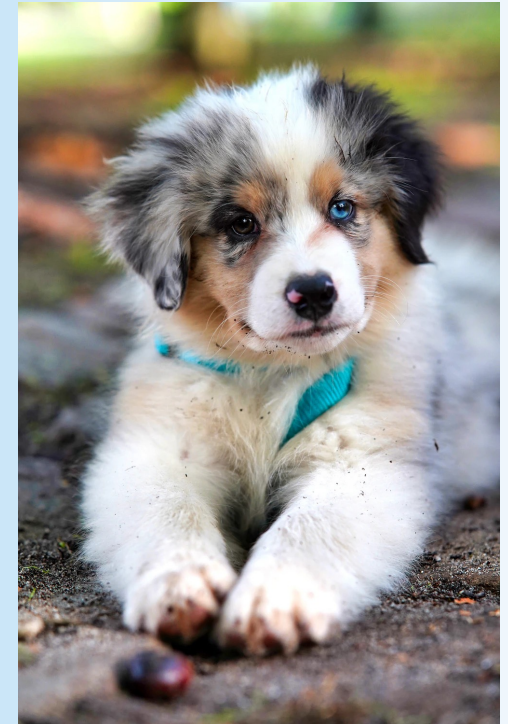


Memory Formation



How to Access Memory

- **Recall:** Access information without clues
 - My favourite colour is -
- **Recognition :** Identify information you previously learned after encountering it again
 - Different types of animals
- **Relearning:** Learning information you have previously learned
 - Relearning a language you forgot during school

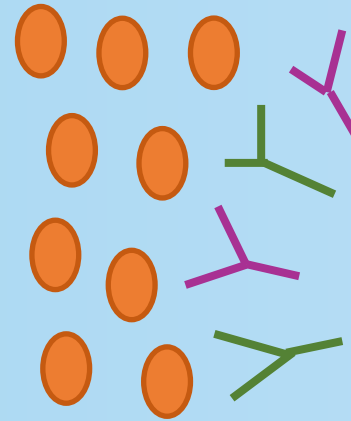


Neuronal Plasticity

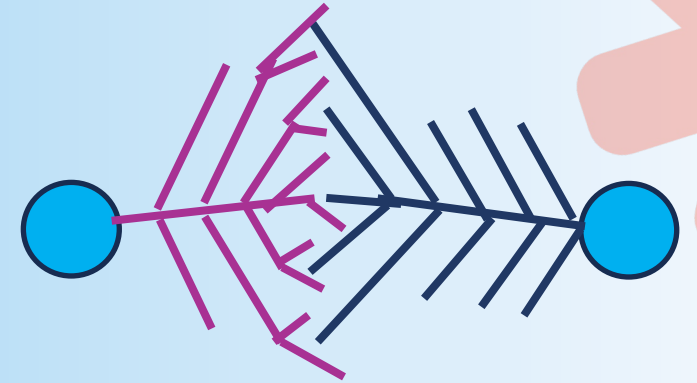
- Potentiation



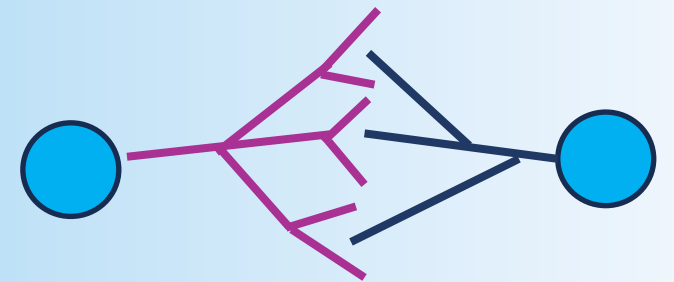
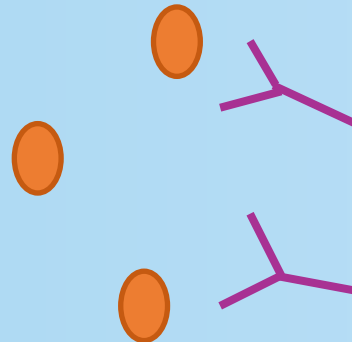
Synaptic



Structural



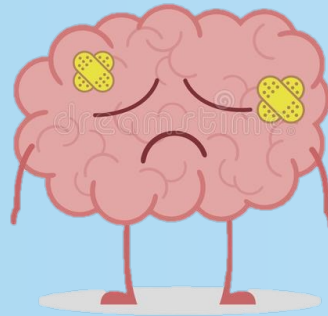
- Depression



Amnesia

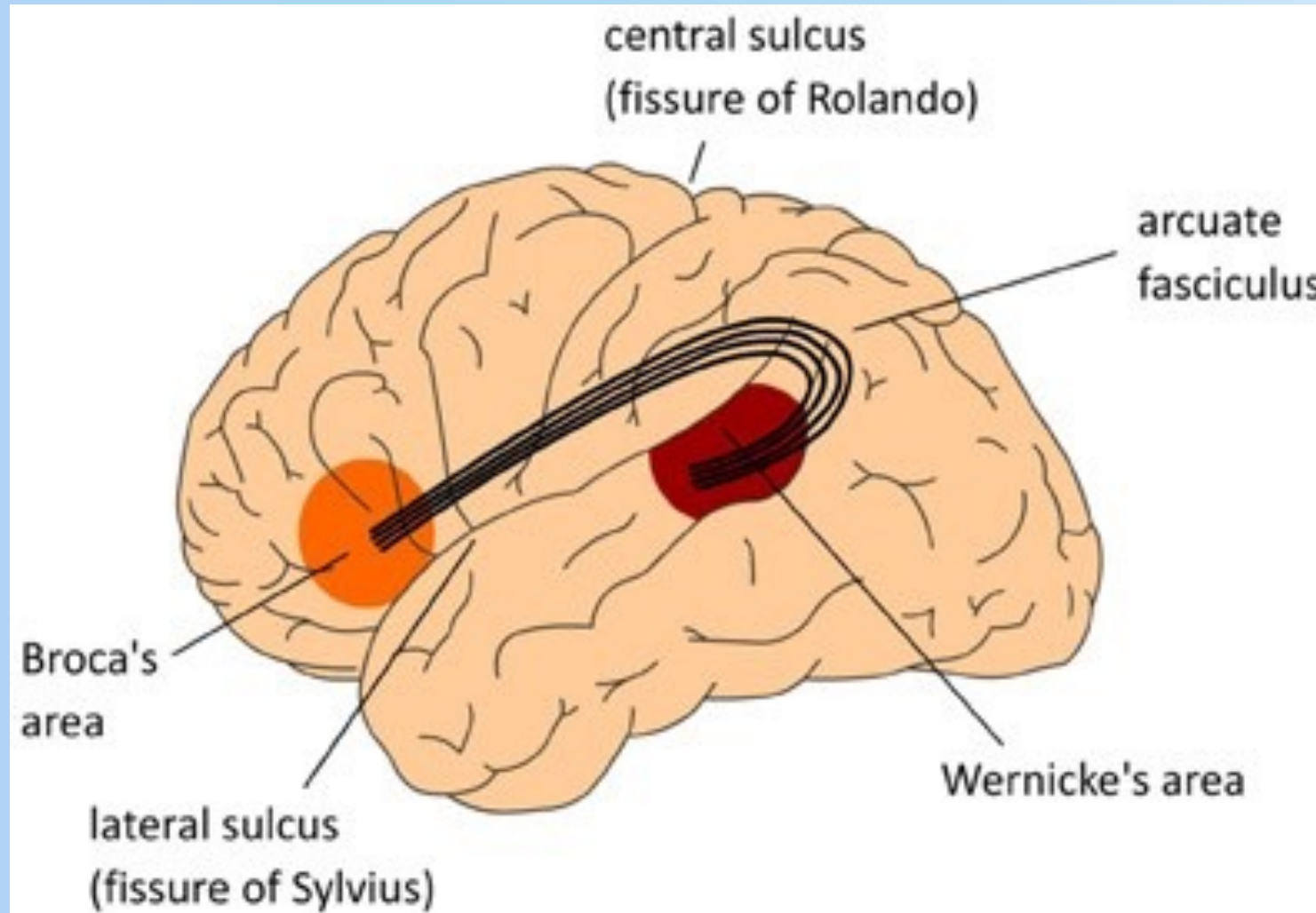


- Information before amnesia onset is lost



- Impaired capacity for new learning

Language



Language- Damage

Broca's Aphasia



https://youtu.be/dTQLI7-_DXY?si=3zYrsdR7Mdz1Z2cn

- Impaired speech
- Ability to understand words is intact

Wernicke's Aphasia

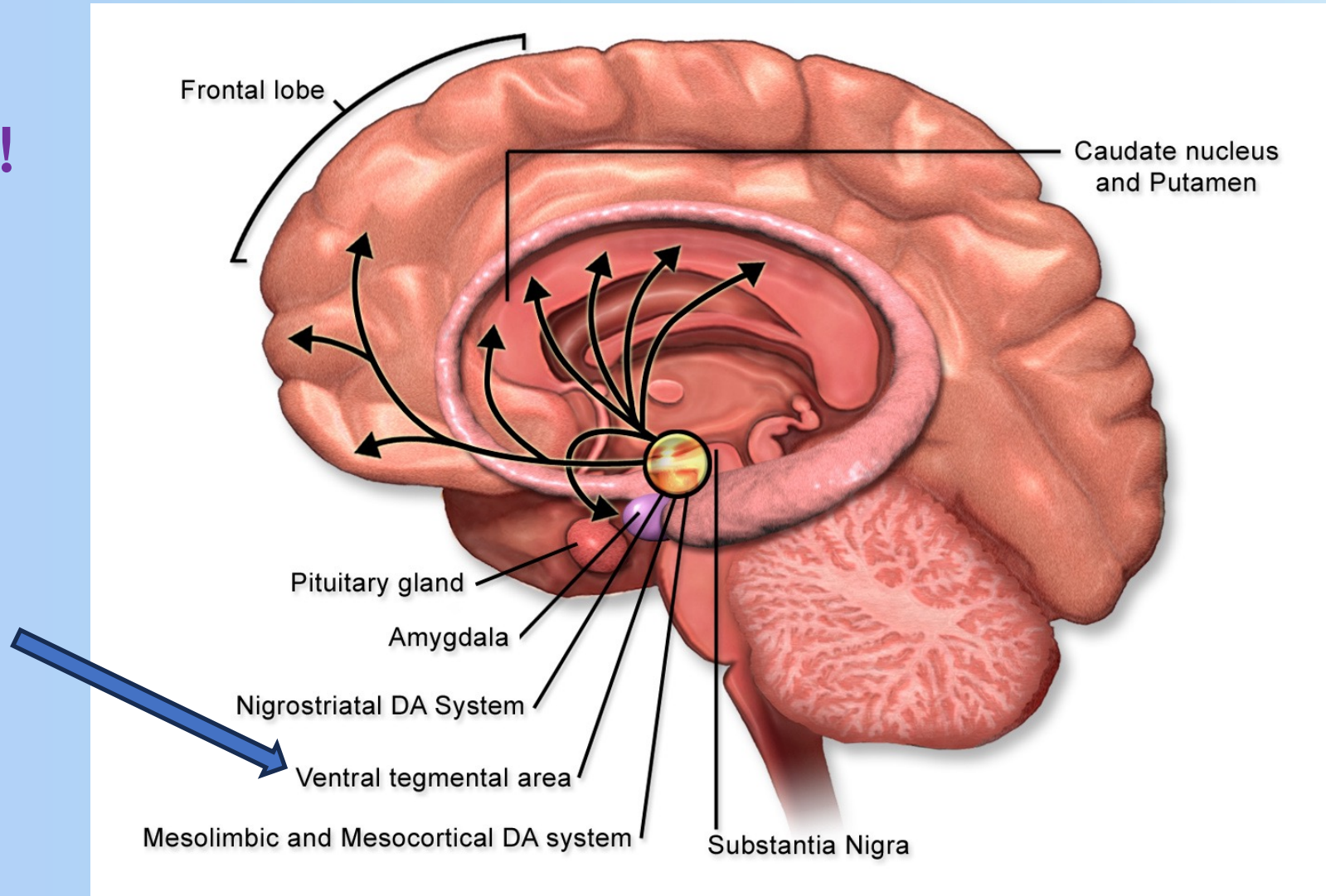


<https://www.youtube.com/watch?v=3oef68YabD0>

- Ability to speak is retained
- No comprehension to what the patient is saying

Reward Pathway

Dopamine!



Quiz time :)



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