Memory

- **Memory is acquisition of information and consist of three main stages:**

1. Store or encoding (processing and combining of received information)

2. Storage (creation of a permanent record of the encoded information)

3. Recall or retrieval (call back the stored information in response to some cue for use in some process or activity.

- **Memory requires following:**

1. Recognition
2. Registering
3. Cataloguing of stimulus
4. Skill acquisition
5. Recall (retrieval)

- **Main Areas of Storage Are:**

1. Cerebral cortex (long term over all)
2. Basal ganglia (motor programming & cognition)
3. Spinal cord (reflex)
4. Synapses (facilitation & inhibition)
5. Hippocampus (declarative memory)
6. Amygdala (emotional memory)
7. Cingulate gyrus (social interaction)

Memory

- ## Types of memory:

1. **Short term memory** or working memory is immediate recall of a short message. It can be compared as RAM of computer.

❖ **Functions**:

- Addition, sentence composition, space used is recycled & does not become a permanent memory.

❖ **Site:**

- probably it is a cortical phenomenon.

2. **Long term memory** (compared to as Hard drive of computer) includes:

A. Declarative memory (Explicit) and , and is subdivided into :

1) Memory of events (episodic): used for personal memories such as sensation , emotions like particular events within on own life.exp: u got ur MD

2) Semantic memory: memory of word, rules, languages. It allows the encoding of abstract knowledge about the world such as "London is a capital of Great Britain".

✓ Center is situated in **Hippocampus** (medial most part of temporal lobe)

- N.B Hippocampus : consolidation of memory

B. Procedural or Implicit memory:

- Memory for skill / behavior, which is hard to acquire & hard to lose eg. We never forget how to ride bike.
- It is reflexive in nature. eg. Conditioned reflex.
- It means skill full learning eg. Playing games, playing instruments, solving a puzzle.

❖ **Site:**

- cerebellum

Memory

❖ Declarative memory can be split in three parts:

1. Sensory memory
2. Working memory
3. Long term memory

1. Sensory Memory:

- Is the store of all sensory information that has been processed. It is held in stores that are modality specific (visual store, tactile store) with a very high capacity and in such information fades quickly within 0.5s.

2. Working Memory:

- It contains information that we process "right now".

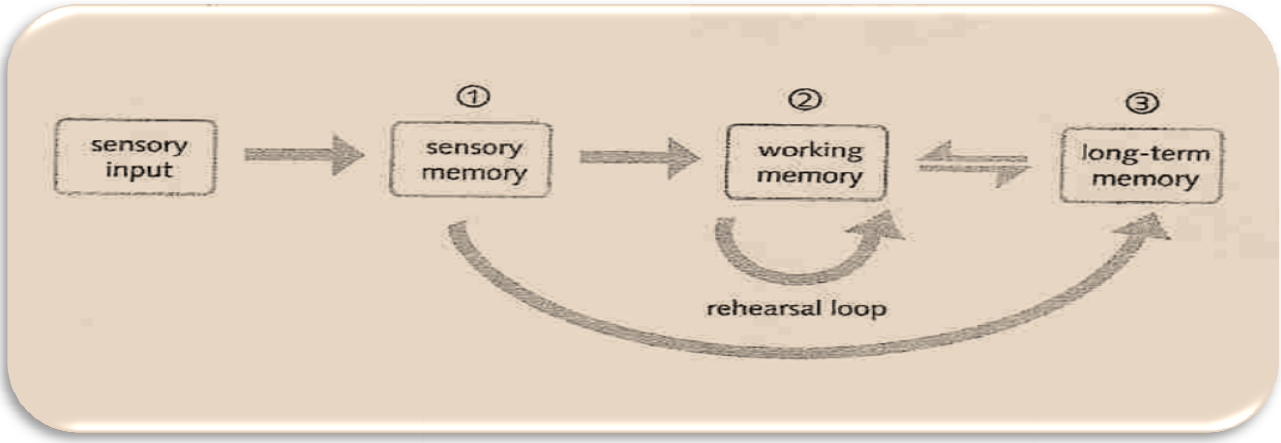
- It functions like a push drawer that new informations displace the old information and only stores for few minutes at most. In other words it can be defined as short memory that stores the informations regarding the instructins and immediate result.

Other types of memory:

- **Visual memory: acquired by seeing.**
- **Verbal memory: by listening.**
- **Semantic memory: refers to long established factual knowledge.**

Memory

☒ *Three stage model of memory:*



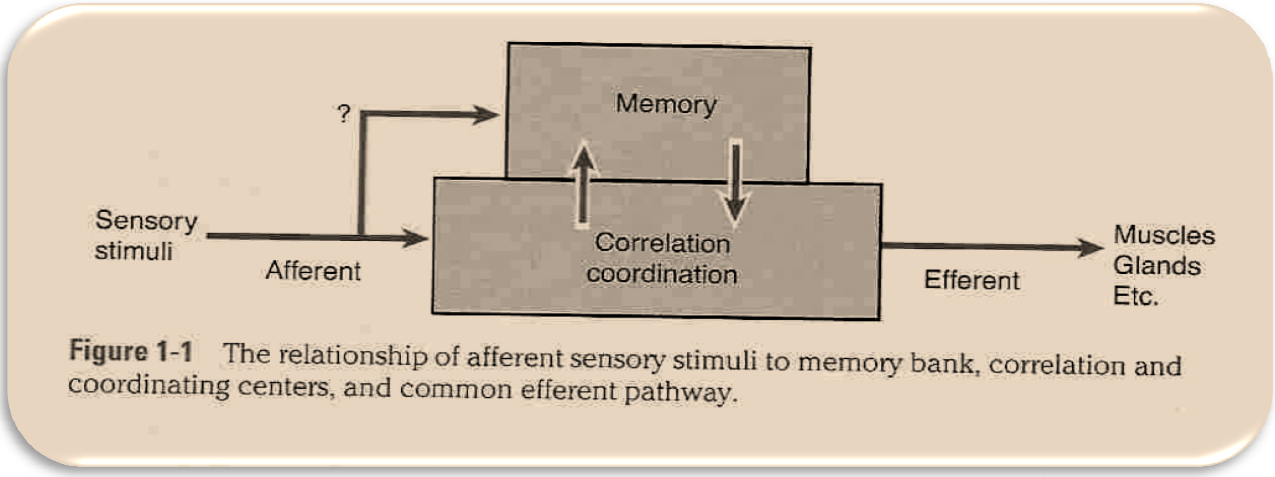
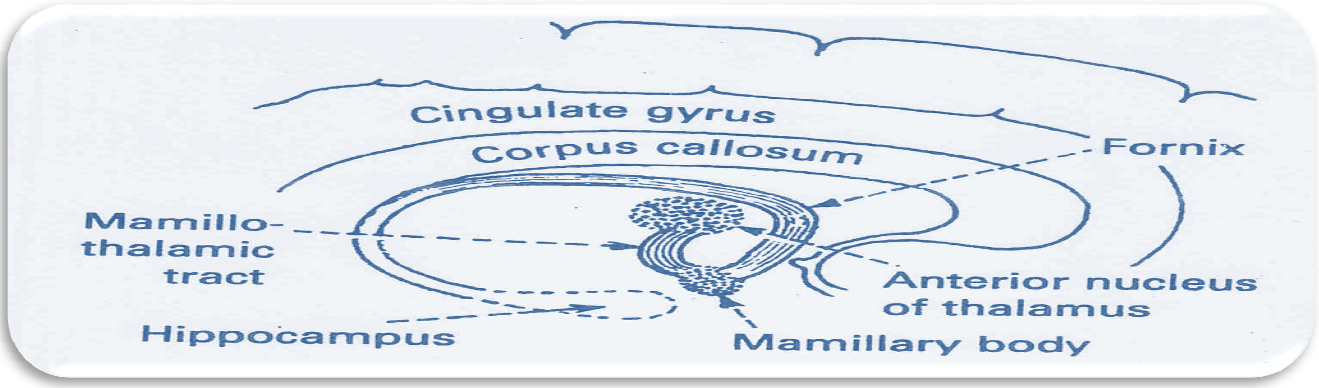


Figure 1-1 The relationship of afferent sensory stimuli to memory bank, correlation and coordinating centers, and common efferent pathway.

- **Don't forget that memory is a reflex:**
  1. habituation(inhibition)
  2. long term potentiation : at the level of the hippocampus (u repeat a word to memorize it)
- **The receptor here is called NMDA:**
  - ✓ The NT is GLU
  - ✓ The receptor is closed by Mg^{+2}

Papez Circuit



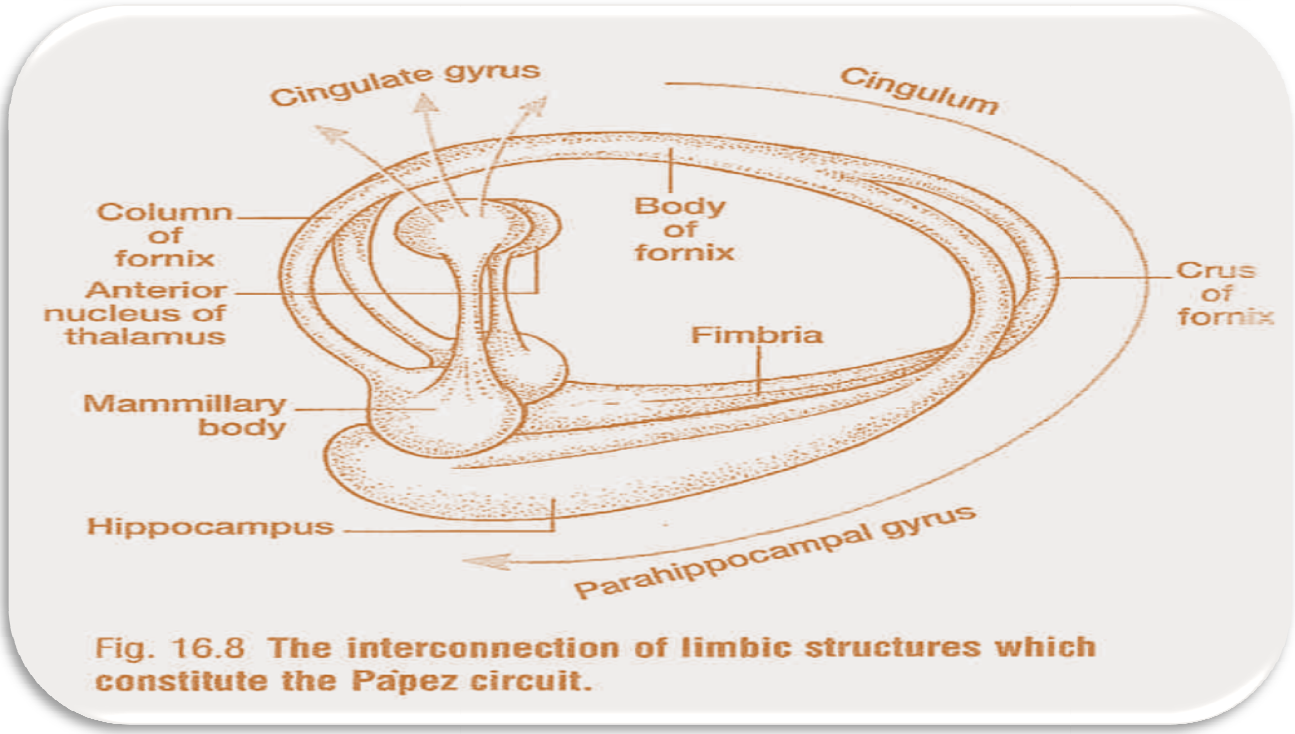


Fig. 16.8 **The interconnection of limbic structures which constitute the Papez circuit.**

Cingulate gyrus ➥ hippocampus ➥ fornix ➥ mamillary body ➥ anterior nucleus of the thalamus

Memory

MEMORY TEST

Testing requires alertness and is not possible in a confused or dysphasic patient.

IMMEDIATE memory –	Digit span – ask patient to repeat a sequence of 5, 6 or 7 random numbers.
RECENT memory –	Ask patient to describe present illness, duration of hospital stay or recent events in the news.
REMOTE memory –	Ask about events and circumstances occurring more than 5 years previously.
VERBAL memory –	Ask patient to remember a sentence or a short story and test after 15 minutes.
VISUAL memory –	Ask patient to remember objects on a tray and test after 15 minutes.

Note: **Retrograde amnesia** – loss of memory of events leading up to a brain injury or insult.

Post-traumatic amnesia – permanent loss of memory of events for a period following a head injury.

REASONING AND PROBLEM SOLVING

Test patient with two-step calculations, e.g. 'I wish to buy 12 articles at 7 pence each. How much change will I receive from £1?'

Ask patient to reverse 3 or 4 random numbers.

Ask patient to explain proverbs.

Ask patient to sort cards into suits.

The examiner must compare patient's present reasoning ability with expected abilities based on job history and/or school work.

EMOTIONAL STATE

Note: Anxiety or excitement
Depression or apathy
Emotional behaviour
Uninhibited behaviour
Slowness of movement or responses
Personality type or change.

Memory

THE AMNESIC SYNDROME is characterised by –

Retrograde amnesia – impairment of memory for events that antedate illness or injury
Anterograde amnesia – inability to learn new verbal or non verbal information from onset of the illness or injury
Intact retrieval of old information
Intact intellectual function
Intact personality
Tendency to confabulate

CAUSES

Korsakoff's syndrome: results from
- alcoholism
- encephalitis
- head injury

Lesions occur within the thalamus and the mamillary bodies. Commonly associated with confabulation – a false rationalisation of events and circumstances.

Post-traumatic amnesia: after trauma, retrograde amnesia may span several years, but with recovery, this gradually diminishes. The duration of post-traumatic amnesia on the other hand remains fixed and relates directly to the severity of the injury.

Amnesic stroke: bilateral medial temporal lobe infarction from a posterior circulation stroke is usually associated with hemiplegia and visual disturbance or loss e.g. Anton's or Ballint's syndrome (page 111).

Amnesia with tumours: tumours that compress thalamic structures or the fornix may produce amnesia – e.g. colloid cyst of the 3rd ventricle.

Temporal lobectomy: amnesia will only occur if function in the unoperated temporal lobe is abnormal. Pre-operative assessment during a unilateral carotid injection of sodium amytal minimises this risk.

Transient global amnesia: memory loss of less than 36 hours during which time patients will often carry out complex cognitive tasks e.g. drive to the office and do a day's work. There is usually nothing objectively wrong. Episodes are sometimes precipitated by exercise. The disorder is benign but requires investigation to exclude temporal lobe disease.

Psychogenic amnesia: affects overlearned and personally relevant aspects of memory e.g. 'What is my name?', while less well learned memory remains unaffected. Clinically evident acute mental stress may precipitate this. This inadequate defence mechanism suggests a serious underlying psychiatric or personality disorder.

DISORDERS OF MEMORY RETRIEVAL

Senescence – as part of normal aging, rapid retrieval of stored memory becomes defective.
Depression – impaired memory is a common complaint in depressive illness. The disorder is one of motivation and concentration.
Subcortical dementia – This will be described later (page 122). The major abnormality is that of a slowed (but correct) response rate to questions of memory function.

NB DEMENTIA, TUMOURS and CEREBROVASCULAR DISEASE are all often associated with memory loss but this is usually combined with evidence of more widespread disordered cognitive function.