DISORDERS OF MEMORY

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PG 1
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OUTLINE

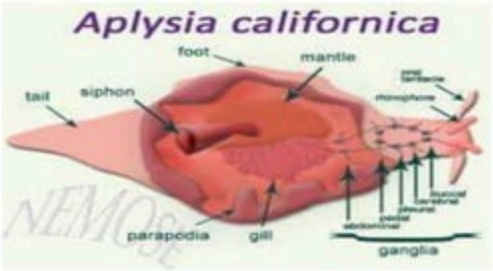
- BIOLOGY OF MEMORY
- LONG TERM POTENTIATION
- TYPES OF MEMORY
- AMNESIA
- DISTORTIONS OF MEMORY

BIOLOGY OF MEMORY

- Memory is the glue that binds mental life , the scaffolding for personal history.
- Memory is a special case of the general biological phenomenon of neural plasticity.
- Neurons can show history-dependent activity by responding differently as a function of prior input, and this plasticity of nerve cells and synapses is the basis of memory.

Eric Richard Kandel

- He is an Austrian - American medical doctor specialized in psychiatry , neuroscience.
- He was a recipient of the 2000 Nobel Prize in Physiology or Medicine for the research on the "physiological basis of memory storage" in neurons.
- Kandel made his most famous breakthrough working with the Aplysia californica.



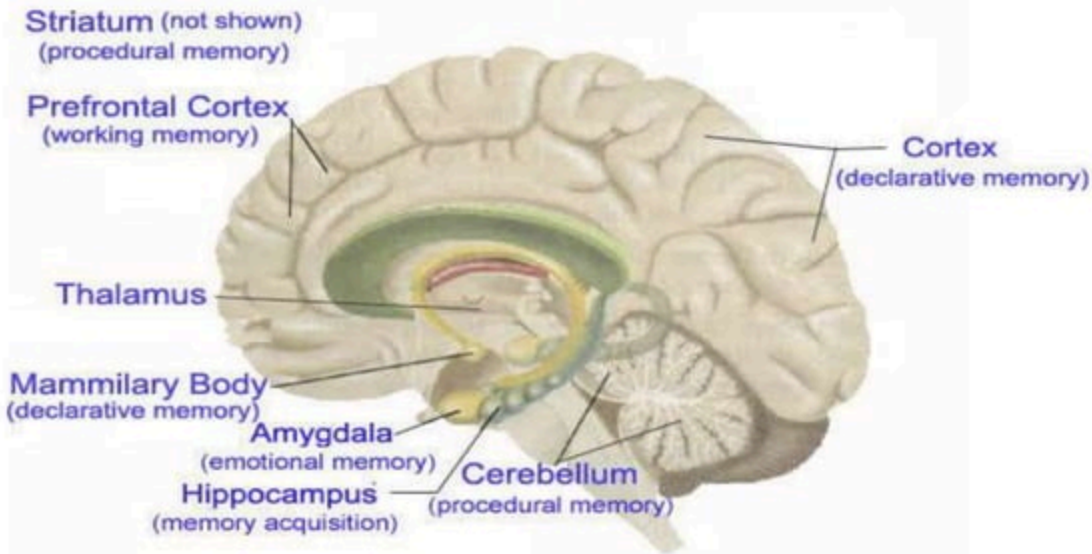
- A major source of information about memory has come from extended study of the marine mollusk Aplysia californica.

- Aplysia is capable of associative learning (including classic conditioning and operant conditioning) and non associative learning (habituation and sensitization).

- In vertebrates, memory cannot be studied quite as directly as in the simple nervous system of Aplysia.

- Long term memory in vertebrates is thought to be based on morphological growth and change, including increases in synaptic strength along particular pathways.

The Brain and Memory



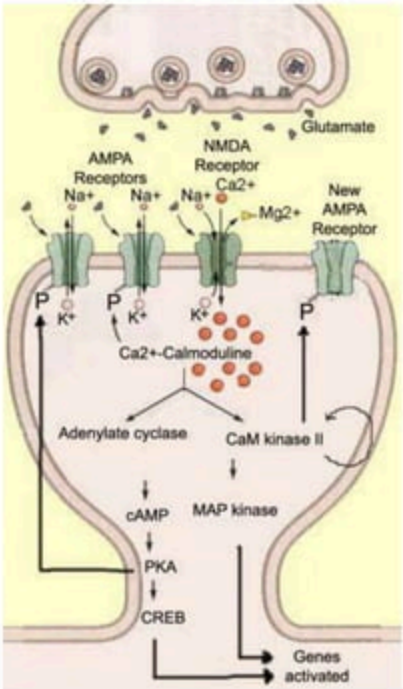
Long term potentiation (LTP)

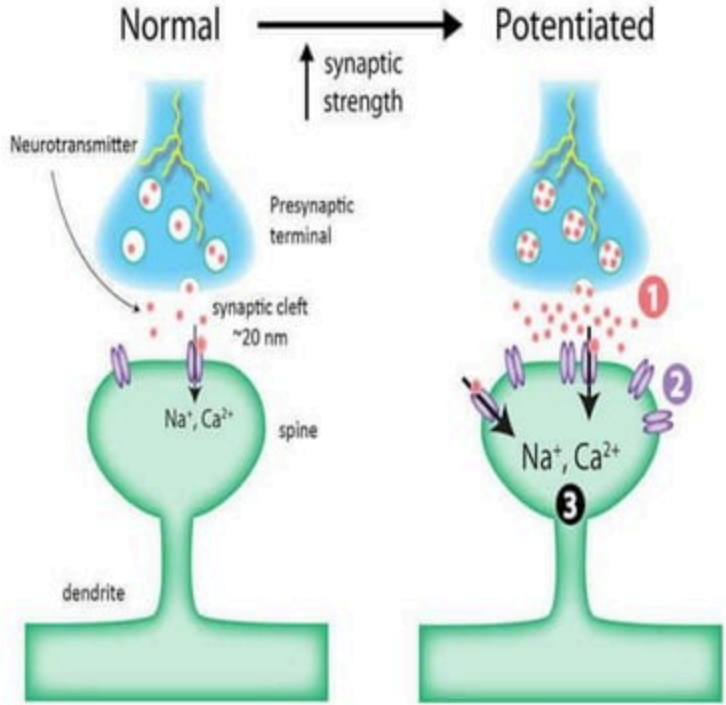
- The phenomenon of LTP ➡ candidate mechanism for mammalian long term memory.

LTP

Observed when a postsynaptic neuron is persistently depolarized after a high frequency burst of pre-synaptic neural firing.

Has number of properties that make it suitable as a physiological substrate of memory.

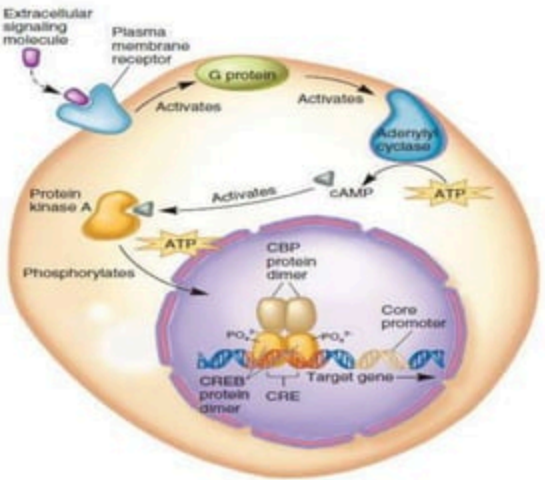

Glutamate
AMPA Receptors
NMDA Receptor
New AMPA Receptor
Na+
Ca2+
Mg2+
K+
P
Ca2+-Calmoduline
Adenylate cyclase
CaM kinase II
cAMP
MAP kinase
PKA
CREB
Genes activated


Normal
synaptic strength
Potentiated
Neurotransmitter
Presynaptic terminal
synaptic cleft
~20 nm
Na+, Ca2+
spine
dendrite
1
2
3

- It is established quickly and lasts for a long time.
- It is associative , in that it depends on the co-occurrence of pre synaptic activity and post synaptic depolarization.
- It occurs only at potentiated synapses, not all synapses terminating on the post synaptic cell.
- LTP occurs prominently in the hippocampus, a structure important for memory.

CREB protein

- It is a transcription factor capable of binding DNA and regulates gene expression.(somatostatin gene.)
- It binds to specific DNA sequence region called CRE.
- It is activated by phosphorylation from various kinases (PKA , Ca+ , Calmodulin dependent PK)



Functions :

- It has well documented role in neuronal plasticity and long term memory.
- CREB down regulation is implicated in pathology of alzheimer's disease.
- Has a role in development of drug addiction (psychological dependence).
- It is important for the survival of neurons in brain.

Involvement of CREB Protein :

- Huntingtons disease.
- Major depressive disorders (in dentate gyrus)
- Circadian rhythm : Per-1 , Per-2 genes regulate the mammalian circadian clock.
- Day light → excites photosensitive retinal ganglion cells → (Via RHT) SCN → Glutamate → NMDA receptors → Ca+ influx → CREB → Per-1 Per-2 gene expression

STAGES OF MEMORY

1. Adequate perception, comprehension and response to the material to be learned.
2. Short term storage.
3. Formation of durable trace.
4. Consolidation.
5. Recognition that certain materials need to be recalled.
6. Isolation of the relevant memory.
7. Using the recalled material.

TYPES OF MEMORY

1. Sensory
2. Short term
3. Long term

SENSORY MEMORY

- Registered for each of the sense and its purpose is to facilitate the rapid processing of incoming stimuli so that the comparison can be made with material already stored in short and long term memory.
- Fades within few seconds.
- Closely related to attention.

- Ex : Echoic (auditory)

  Iconic (visual)

  When a person sees an object briefly before it disappears , once the object is gone, it is still retained in memory.

SHORT TERM MEMORY

- Working memory/ primary memory.
- For storage of memory much longer than the few seconds available to sensory memory.
- Aids the constant updating of one's surroundings.
- Ex : When someone is given a phone number and is forced to memorize it , if there is no way to write it down.
- It can be improved by chunking.

LONG TERM MEMORY

- When memories are rehearsed in the short term they are encoded in the long term memory.
- Encoding is a process of placing information into what is believed to be a limitless memory reservoir.
- Storage of material in long term memory allows for recall of events from the past and for utilization of information learned through educational system.

- **Autobiographical memories** - memories of events that relate to oneself.
- **Flashbulb memories** - specific type of autobiographical memory in which the person becomes aware of an emotionally arousing event.
- These memories are stored on one occasion and retained for a life time .

  Ex : 26/11 , 2008 Mumbai attack

  9/11, 2001 WTC Tower attack

  Today many people can recall, where and what they were doing when they heard the news.

EXPLICIT MEMORY

- Declarative/relational memory.(conscious recollection)

- Patient is conscious that they are remembering.

- Hippocampus - stored

- 2 types -

1. Episodic memory - memory of specific events.
2. Semantic memory - memory of abstract facts.

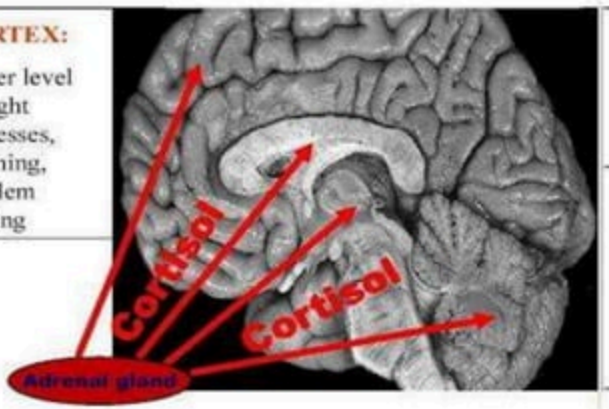
IMPLICIT MEMORY

- Procedural / skills
- Limbic system (amygdale + cerebellum)
- Performance of tasks such a typing , swimming and cutting a loaf of bread are also expressions of prior learning but there is no active awareness of memory is being reached in undertaking the particular skill.
- Remembering a specific driving lesson is an example of explicit memory.
- while improved driving skill as a result of the lesson is an example of implicit memory.

Explicit and Implicit Memory

CORTEX:

higher level thought processes, planning, problem solving



HIPPOCAMPUS:

Explicit memory - governs recollection of facts, events or associations

AMYGDALA:

Implicit memory – No conscious awareness (procedural memory – e.g., riding a bike and emotional memory- e.g., fear)

Chronic stress = overstimulation of the **Amygdala,** resulting in the release of cortisol, possible shrinkage or atrophy of the **Hippocampus** and **Cortex,** affecting memory and cognition, and leading to anxiety or depression.

(Adapted from: Brunson, Lorang, & Baram, 2002)

PROCESS OF REMEMBERING

- It has 4 parts

1. Registration
2. Retention
3. Retrieval
4. Recall

NORMAL MEMORY FAILURE

- If an item is not rehearsed the memory fades and therefore cannot be retrieved.
- Normal memory decay :

Proactive interference - when old memory prevents the recall of newer memory .Ex : when trying to recall new phone number the old phone number could proactively interferes the recall

Retroactive interference - When more recent memories get in the way of trying to recall older information. Ex :Calling ex-boy/girl friend by new boy/girl friend's name , the new name retroactively interferes with the old one.

AMNESIA

- Partial or total inability to recall past experience and events.

1. Organic

2. Psychogenic

PSYCHOGENIC AMNESIA

1) Anxiety amnesia
2) Katathymic amnesia
3) Hysterical amnesia

1) Anxiety amnesia

- Psychogenic reactions.
- Amnesia caused by impaired concentration.
- It resolves once underlying disorder is treated.
- Morbid anxiety - particularly in depressive illness.

2) Katathymic amnesia

- Motivated forgetting
- The inability to recall specific painful memories, and is believed to occur due to the defense mechanism of repression.
- conscious motivation to forget, i.e. suppression.
- whether it is unconscious, i.e. primary repression.
- This is more persistent and circumscribed than dissociation.
- There is no loss of personal identity.

Hysteria

Normal persons with painful memories

3) Hysterical amnesia

- Dissociative amnesia.
- There is a complete loss of memory and personal identity but the patient can carry out complicated patterns of behavior and is unable to look after himself.
- Often associated with fugue or wandering state.
- More common in those with prior history of head injury.

ORGANIC AMNESIA

1) Acute brain disease
2) Sub acute coarse brain disease
3) Chronic coarse brain disease

1) Acute coarse brain disease

Poor memory is due to disorders of **perception** and **attention** and the **failure to encode** material in long term memory.

A) Retrograde amnesia
B) Post traumatic amnesia
C) Antero grade amnesia

A) Retrograde amnesia -

- Acute head injury
- Amnesia which embraces the events just before the injury
- Disturbance of short term memory loss.

B) Post traumatic amnesia -

- The period between loss of consciousness and appearance of full awareness and memory.
- Duration is directly related to severity of the head injury.

C) Anterograde amnesia

- Events occurring after the injury.
- The patient is fully conscious , but has no memory for the events which occur.
- Result of failure to make permanent traces.
- Seen in :-
  - Alcohol blackout
  - Delirium
  - Twilight state due to epilepsy
  - Pathological drunkenness

2) Sub acute coarse brain disease

- The patient is unable to register new memories.
- The memory disorder is characterized by inability to learn new information (anterograde amnesia) and recall previously learned information (retrograde amnesia).
- Memories from remote past remains intact.
- Seen in :
- Korsakoff's syndrome
- CVA
- Multiple sclerosis
- Head injury
- ECT

3) Chronic coarse brain disease

- The amnesia extends over many years.

- **Ribot's law of memory regression** :

  In dementing illness the memory of recent events is lost before the memory for remote events.

DISTORTION OF MEMORIES

- Paramnesia
- Falsification of memory by distortion.

1.Distortion of recall

- Retrospective falsification
- Retrospective delusions
- Munchausen syndrome
- Delusion memories
- Confabulations
- Vorbeireden(Ganser)
- Cryptamnesia

screen memory
Pseudologia fantastica
False memory

2.Distortion of recognition

- Déjà vu
- Jamais vu
- Deja entendu
- Deja pense

Retrospective falsification

- The subject modifies his memories in terms of his general attitudes.

- Unintentional distortion occurs when it filtered through a person's current emotional, experiential and cognitive state.
- The depressed patient describes all past experiences in negative terms due to the impact of his current mood.

- Normal people - degree of retrospective falsification is inversely related to the degree of insight and self criticism of the individual

- The unconscious distortion of past experiences to conform to a person's needs in present.

- Seen in :
  - Hysterical personality
  - Depressive illness
  - Agitated depression
  - Mania
- Ex : An adult suddenly remembers being sexually abused as a child.

Retrospective delusions

- The psychotic patient backdates his delusions in spite of the clear evidence that the illness is of recent origin.
- Primary delusional experiences may take the form of memories.
- These memories distorted during recall.
- Schizophrenia.

Confabulations

- Pictorial thinking (Leonard) , Memory Hallucinations (Bleuler)
- A false description of an event , which is alleged to have occurred in the past.
- Filling in of gaps in memory by imagined or untrue experiences.
- Diminishes as the impairment worsens.

- 2 broad patterns emerge -

1) Embarrassed type in which the patient tries to fill in gaps as memory as a result of an awareness of a deficit.
2) Fantastic type in which the lacunae is filled by details exceeding the need of memory impairment.

- Embarrassed is more common.

- Seen in :

  Organic states
  Hysterical psychopaths
  Amnestic syndrome
  Chronic schizophrenia

- **False memory** - Recollection of an event which did not occur but which the individual believes did take place.
- Source amnesia: Difficulty in remembering the source from which the information was acquired.(from one's own recall or external source)

Screen memory - Recollection that is partially true and partially false.

The individual recalls part of true memory because the entirety of the true memory is too painful.

Pseudologia fantastica

- Fluent plausible lying,the confabulation that occurs in those without organic brain pathology such as personality disorder of anti social and hysterical type.

- There is a blurring of the boundary between fantasy and reality.

Munchausen's syndrome -

- Variant of pathological lying in which the individual presents to the hospital with bogus medical illness, complex medical histories and often multiple surgical scars.
- Factitious disorder imposed on self to draw attention , sympathy.
- It is extremely improbable tales of their past experiences.
- Proxy form: The individual (parent) produces factitious illness in somebody else (child).

Ganser's syndrome

- Vorbeireden (German - approximate answering)
  Patient understands the question but deliberately avoids the correct answer

- Clouding of consciousness with disorientation,Auditory and visual hallucination.

- Ganser observed this amnesia in four criminals to avoid court appearance.
- Seen in : hysterical pseudo dementia
  Conversion symptoms
  Recent head injury
  Infection
  Severe emotional stress

- **Cryptamnesia** - experience of not remembering that one is remembering.

- **Hyperamnesia** - exaggerated registration , retention and recall.
- Flashbulb memories : that are associated with intense emotion.

Disorders of recognition

- **Déjà vu**
- The subject has the experience that he has seen or experienced the current situation before, although it has no basis in fact.
- The sense of recognition is never absolute.

  Normal people

  Temporal lobe lesion

- **Jamais vu** - event that has been associated before is not experienced with appropriate feelings of familiarity.

- **Deja entendu** - "Already heard"
- A false sense of familiarity upon hearing something new. (Feeling of auditory hallucination)
  Ex : A new song on the radio seems strangely familiar.

- **Deja pense** - "False memory"
- The feeling where you have had the same thoughts before even you have not.

Misidentification :-

Positive misidentification

Negative misidentification

Positive misidentification :

- Patient recognizes strangers as his friends and relatives

- Some patients assert that all the people whom they meet are doubles of real people.

  Confussional state

  Acute schizophrenia

  Chronic schizophrenia

Negative misidentification :

- Patient denies that his friends and relatives are people whom they say they are and insists they are strangers in disguise

- Excessive concretization of memory images.

Psychological Assessment of Older Adults

Detailed Assessment (contd.)

Neuropsychological Test Batteries (NPB):

- Halstead and Reitan NPB
- Luria Nebraska NPB
- Wechsler Adult Intelligence Scale (WAIS)
- PGI Battery of Brain Dysfunction (PGIBBD)
- PGI Assessment of Mental Efficiency in Elderly (PGIAMEE)
- NIMHANS NPB
- AIIMS Comprehensive NPB in Hindi

Rorschach Psychodiagnostics

Luria-Nebraska-neuropsychological battery

1. motor functions,
2. rhythm,
3. tactile functions,
4. visual functions,
5. receptive speech,
6. expressive speech,
7. writing,
8. reading,
9. arithmetic,
10. memory,
11. intellectual processes,
12. pathognomic,
13. left hemisphere and
14. right hemisphere.

The probability of brain damage is assessed by comparing an individual's score on each of the battery's 11 clinical scales to a critical level appropriate for that person's age and education level.

For example, if a person has five to seven scores above the critical level, they most likely have some sign of neurological impairment. Eight or more scores above the critical level indicate a clear history of neurological disorder.

	Dementia (chronic)	Delirium (acute)	Amnesia
Age effect	Aging is a risk factor (increases with aging)	Affected by aging but lower than dementia	Aging isn't risk factor (can happen in any age)
Reversible or irreversible	In most cases it's irreversible, but depends on the cause of it	Reversible (fully treated)	Can be reversible or irreversible
Severity	High severity	Moderate severity	Cognitive impairments are usually lower and more limited than delirium and dementia
Main causes	- Genetics - Brain trauma - Stroke - Heart issues	- Worsening of previous medical conditions - Abuse of medications or drugs - Alcohol or drugWithdrawals - Mental illness	- Concussion - Traumatic brain injuries - Post-traumatic stress - Alcoholism
Effect on cognitive functions and memory	Impairment of cognitive function sufficient to cause functional decline and severe impairment in memory, judgment, orientation, and cognition	Short-term confusion and changes in cognition	Memory impairment and forgetfulness
Onset	Slow and gradual, with an uncertain beginning point	Sudden, with a definite beginning point	Sudden onset of memory loss

DEMENTIA	DEPRESSIVE PSEUDODEMENTIA
Progressive onset	Rapid onset
Long term symptomatology	Short term symptomatology
Mood variations	Consistently depressed mood
The patient tries to answer to the questions	Short answers like "I don't know", negativism
Patient is concealing amnesia	Highlighting amnesia
Constant cognitive decline	Fluctuating cognitive impairment

Table 1:Differential diagnosis between dementia and pseudodementia

THANK YOU


3x a week
25
minutes


Cinnamon
Sugar
cinnamon
tea
cinnamon
french toast


wH
BLUEBERRY
extract


wH
BUTYRATE

Delirium, Dementia, and Amnesia

- Delirium
  - Consciousness change – reduced awareness of environment with reduced ability to focus, sustain, or shift attention
  - Cognition change
  - Develops over a short period of time (hours to days)
- Dementia
  - Memory impairment
  - One or more of the following:
    - Aphasia – language disturbance
    - Apraxia – impaired ability to carry out motor activities despite intact motor function
    - Agnosia – impaired ability to recognize or identify objects despite intact sensory function
    - Executive functioning disturbance – planning, organizing, sequencing, abstracting
  - Alzheimer's, Parkinson's, HIV, cerebrovascular disease
- Amnesia
  - Memory impairment without other disorders
  - May be caused by trauma or substance induced

Munchausen :

- Exaggerates signs and symptoms.
- Intention of seeking attention ,sympathy from medical personnel's.

Hypochondriasis :

- Normal person constantly thinks that he has a serious medical problem.
- Less worried about symptoms ,more worried about illness.
- Do not deliberately attempt to seek attention from medical personnel's

Somatization :

- Patient attention is directed towards the somatic symptoms only.

Malingering :

- Patient acts to gain any financial benefits or to avoid responsibilities.