

Medial Temporal Lobe and Long-Term Memory

H.M.'s task is to trace between the two outlines of the star while looking only at his hand in a mirror.

Crossing a line constitutes an error.

Korsokoff's Disease

15:1

Structures damaged in Korsokoff's

Dorsomedial nucleus of thalamus

Mammillary bodies

The Medial Temporal Lobe

(A) Anatomical structures: Cingulate gyrus, Fimbria/fornix, Mammillary bodies, Hippocampus, Dentate gyrus, Perforant path.

(B) Hippocampal circuitry: CA1, CA2, CA3, CA4, Ammon's horn, Entorhinal cortex, Subiculum, Dentate gyrus.

(C) Structures: Mammillary bodies, Anterior thalamus, Nucleus accumbens, Hippocampal formation, Subiculum, CA1, CA3, DG, Entorhinal cortex, Other direct projections, Perirhinal cortex, Parahippocampal cortex, Neocortex.

The Hippocampus

Corpus callosum

Thalamus

Olfactory bulb

Mammillary body

Left temporal lobe

Hippocampus

Cerebral cortex

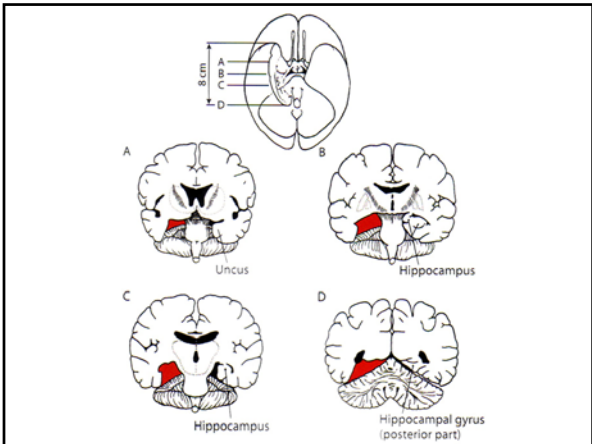
Hippocampal section through left posterior cerebral cortex

Hippocampus

Location of the missing hippocampus

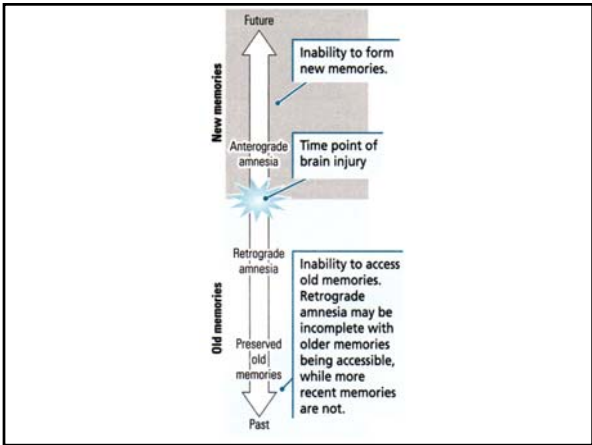
H.M.

- Suffered from severe epilepsy
Hippocampus (and Medial Temporal Lobe) are often source of epileptic disorder
- Went through surgery for removal of hippocampus and several neighboring structures



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- Suffered from severe epilepsy
Hippocampus (and Medial Temporal Lobe) are often source of epileptic disorder
- Went through surgery for removal of hippocampus and several neighboring structures
- The surgery helped his epilepsy, but...
- H.M. suffered from severe anterograde amnesia

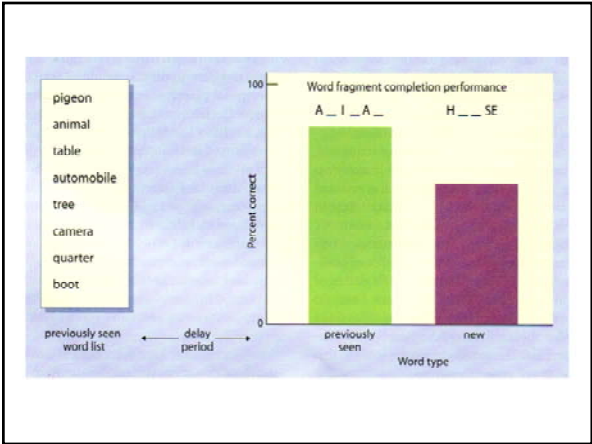


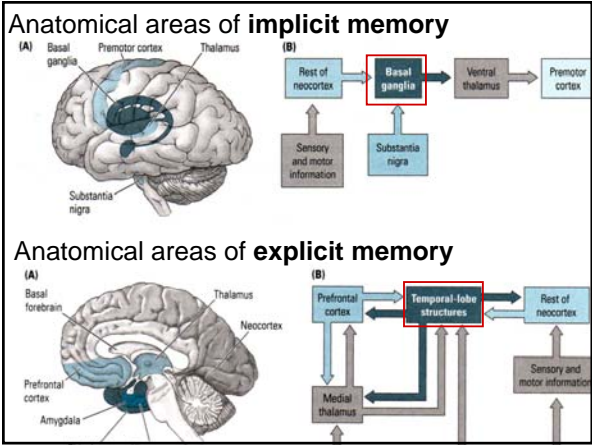
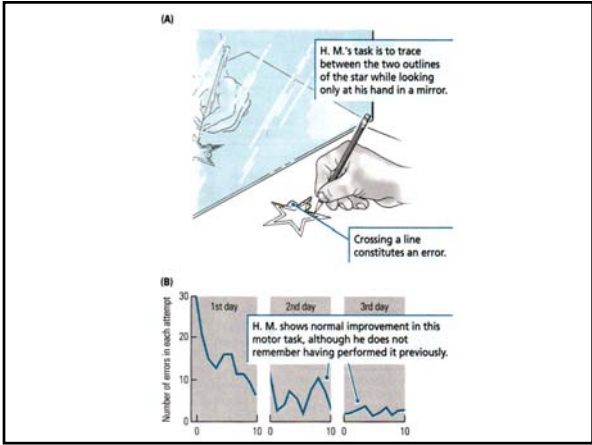
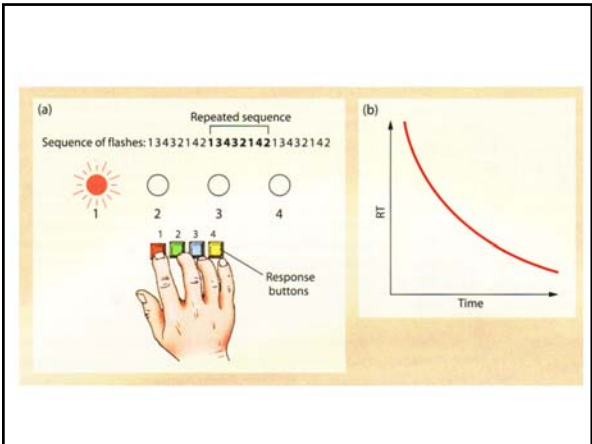
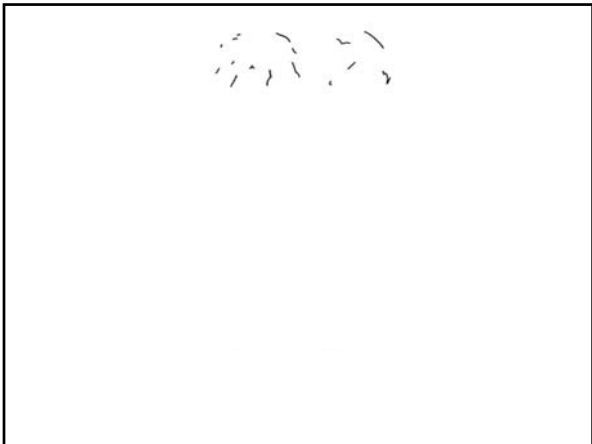
H.M.

Anterograde amnesia (cannot form new memories)
 Limited retrograde amnesia (~2 years prior to surgery; older memories preserved)

What does that tell us about hippocampal function?

Some memory tasks H.M. is good at....



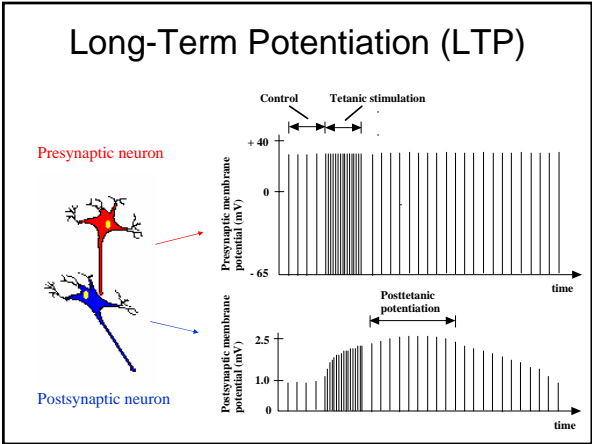


Medial Temporal Lobe and Epilepsy

- epileptogenic focus (shown in red) - the region where the electrical seizure originates

narrow epileptogenic area

wide-spread epileptogenic area



Hebb's Rule

- proposed in 1949 by the psychologist Donald Hebb

"When an axon of cell A... excites[s] cell B and repeatedly or persistently takes part in firing it, some growth process or metabolic change takes place in one or both cells so that A's efficiency as one of the cells firing B is increased."

- simultaneous firing is important
- places emphasis on the conditional probability and the history of the two cells