Memory, Amnesia, and the Brain

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Watch Memento, Bourne Identity

More is known about Organic Amnesia (result of brain damage):

- Retrograde Amnesia -> inability to recall memories before trauma.

- Aterograde Amnesia -> inability to form new memories after trauma.

Types of Amnesia

Organic Amnesia	Inorganic Amnesia
Retrograde Amnesia	Dissociative Fugue
Anterograde Amnesia	Transient Global Amnesia
	Psychogenic Amnesia

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Functional Amnesia = Inorganic Amnesia.

- Transient Global Amnesia -> lose all sense of their identity and former memories, but are able to form new memories.

- Psychogenic Amnesia -> amnesia caused by a psychological break in an individual.

Fugue

Upp disappeared a day before the start of the fall term in 2008, leaving all her belongings behind.

She disappeared for three weeks, and was discovered and rescued from the water about a mile from the southern tip of Manhattan.

She had no recollections of her whereabouts during these three weeks.

"I went from going for a run to being in the ambulance. It was like ten minutes had passed. But it was almost three weeks."

Hannah Emily Upp

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A period of dissociation for the individual experiencing this. Patients hold no memory of these dissociative episodes. The cause of them is still unclear, but patients are usually pulled out of these episodes when their identity is being questioned.

Organic Amnesia

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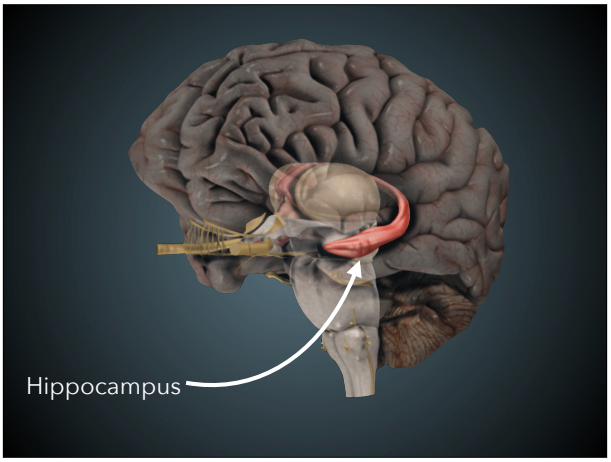

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Hippocampus - responsible for long-term memory, shaped like a seahorse.

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Henry Gustav Molaison - aged 26 when he underwent surgery.

Temporal Lobes and Amnesia

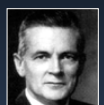
In the late 1940s and early 1950s, surgeons tried to treat neurological illnesses with surgery.

These procedures often led to unanticipated cognitive impairments.

In 1953, patient H.M. underwent bilateral temporal lobe resection because his epileptic seizures were not responding to medication.

The operation led to gross anterograde amnesia for H.M.


Brenda Milner


William Scoville

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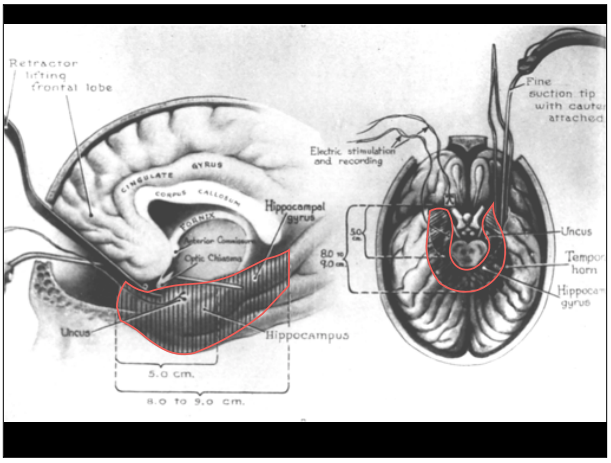
H.M underwent bilateral temporal lobe resection for epilepsy.

H.M's surgery led to gross anterograde amnesia.



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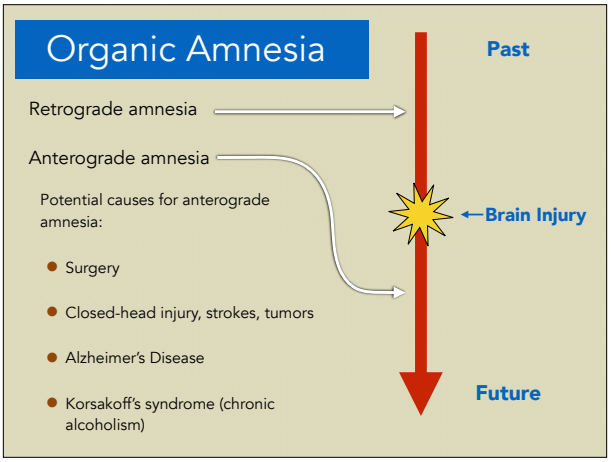

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Retrograde - inability to recall memories prior to brain injury.

Anterograde - inability to form new memories after brain injury.

- Causes: surgery, strokes, tumors, Alzheimer's, chronic alcoholism, or lack of oxygen to the brain.

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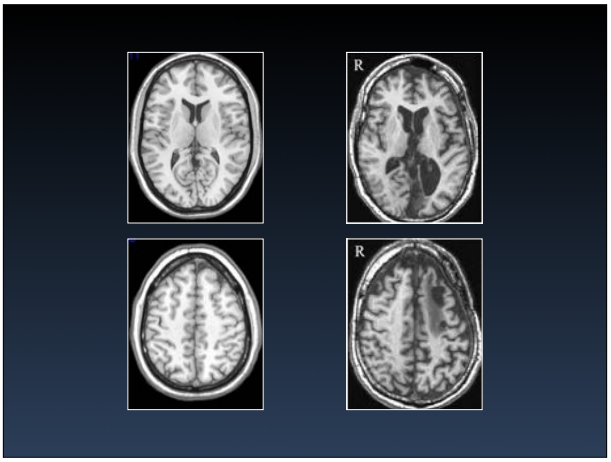

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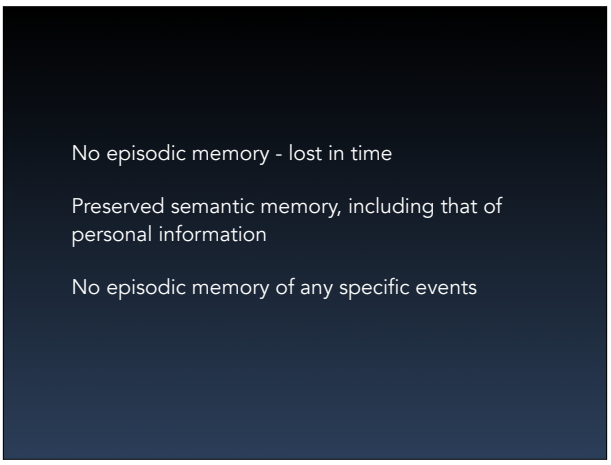
Graded Retrograde Amnesia - Not all memories prior to the injury are equally clear... Older memories may be clearer than those that were formed very close to when the injury occurred.



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K.C.

No episodic memory - lost in time.

Preserved semantic memory, including that of personal information.

No episodic memory of any specific events.

Preserved working memory

No episodic memory even after deep encoding and a short retention interval!

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K.C.'s working memory still functioned just fine.

However, he has no episodic memory even after utilizing deep encoding methods and a short retention interval.

Unable to envision the future.

Episodic memory enables mental time travel - in both forward and backward directions.

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Those with anterograde amnesia are unable to envision the future.

It is episodic memory that enables mental time travel - in both backward and forward directions.

Normal sensory functioning

Normal language (no aphasia)

Normal I.Q. (but typically show some declines relative to pre-injury)

Normal working memory

Normal general knowledge/semantic memory

Extraordinarily rapid forgetting after a delay

~~Normal memory for life events before brain injury~~

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While patients with anterograde amnesia tend to show pretty normal sensory functioning, working memory, IQ (typically some declines relative to pre-injury), general knowledge / semantic memory, BUT extraordinarily rapid forgetting after a delay.

Can Amnesiacs Learn?

Claparede worked with an amnesic patient to whom he introduced himself every day, but she had no recollection of ever meeting him.

One day, Claparede hid a pin in his hand and pricked the patient with the pin when they shook hands…

Edouard Claparede

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Claparede worked with an amnesic patient who had no memory of Claparede despite working with him every day. Thus, Claparede hid a pin in his hand and pricked the patient when shaking her hand. The patient was then weary of shaking his hand after this experiment. She had no memory of it occuring, but she associated the handshake with Claparede with pain / danger.

"I carried out the following curious experiment on her: to see whether she would better retain an intense impression involving affectivity, I stuck her hand with a pin hidden between my fingers. The light pain was as quickly forgotten as indifferent perceptions; a few minutes later she no longer remembered it. But when I again reached out for her hand, she pulled it back in a reflex fashion, not knowing why. When I asked for the reason, she said in a flurry, "Doesn't one have the right to withdraw her hand?" and when I insisted, she said, "Is there perhaps a pin hidden in your hand?" To the question, "What makes you suspect me of wanting to stick you?"she would repeat her old statement, "That was an idea that went through my mind," or she would explain, "Sometimes pins are hidden in people's hands." But never would she recognize the idea of sticking as a "memory."

Claparede, 1911

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Implicit Memory

A new term that refers to an old idea: The notion that people can demonstrate after-effects of an experience in their behavior without being able to consciously recollect the experience.

Ebbinghaus: Savings in Relearning (1885)

Interest in unconscious influences on behavior (Freud)

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Implicit memory - an expression of memory, or memory from past occurences, unintentionally.

People can demonstrate after-effects of an experience in their behavior without being able to consciously recollect the experience.

Warrington & Weiskrantz (1970)

Tested 4 amnesics and 8 controls

Subjects studied a list of words. E.g., Metal, Lock…

Subject were then tested in one of 4 ways:

- Free recall
- Recognition
- Word-stem completion: cha__
- Word-fragment identification:

Elizabeth Warrington

Lawrence Weiskrantz

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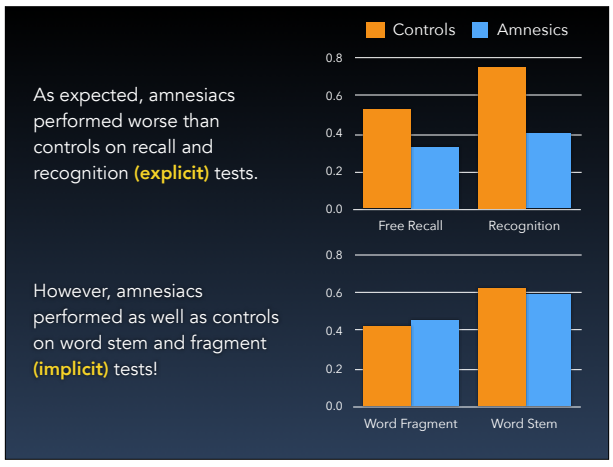

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Amnesiacs performed worse than controls on recall and recognition (explicit) tests.

However, amnesiacs performed as well as controls on word stem and fragment (implicit) tests.

Implicit vs. Explicit Test

Explicit Test: Make direct reference back to a prior episode and measure intentional retrieval.

Implicit Test: Do not make direct reference to the past, measure the effects of past experience on current behavior -- incidental retrieval.

Priming: Facilitation in processing, relative to some baseline, on a task that does not require conscious recollection of prior experiences.

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Explicit - inentional retrieval.

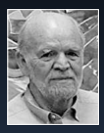
Implicit - incidental retrieval.

Priming - Facilitation in processing, relative to some baseline, on a task that does not require conscious recollection of prior experiences.

Dissociating Explicit and Implicit Memory

If explicit and implicit memory are indeed different forms of memory, then one should be able to dissociate them even within healthy, non-amnesic, subjects.

Jacoby and Dallas (1981)



Larry Jacoby

Subjects studied words under three levels of processing conditions (structural, phonemic, semantic).

Two different memory tests:

- Standard yes/no recognition test
- Word naming (words flashed for 50ms) -- name the briefly presented word.

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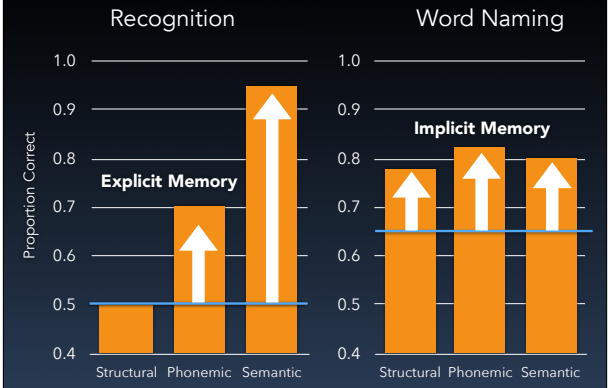
Jacoby and Dallas proved that healthy subjects can dissociate between explicit and implicit memory.



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Manipulations that affect explicit memory can have no influence on implicit memory (and vice versa).

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This proved that manipulations that affect explicit memory can have no influence on implicit memory (and vice versa).

Retrieval Mode

Memory is cue-dependent, a product of what is encoded and what is in the retrieval cue. Appropriate cues are necessary for remembering.

But there is one more critical piece: According to Tulving (1983), you must also be in retrieval mode.

A cognitive mode (or mental set) in which you are ready to intentionally retrieve.

Ocean

Potential retrieval cues are all around -- but you must be in retrieval mode to use them.

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Retrieval mode - a cognitive mode in which you are ready to intentionally retrieve information.

Potential retrieval cues are all around, BUT you must be in retrieval mode to use them.

Amnesiacs are unable to retrieve information from episodic memory because they cannot enter retrieval mode.

But implicit memory does not require one to enter retrieval mode.

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