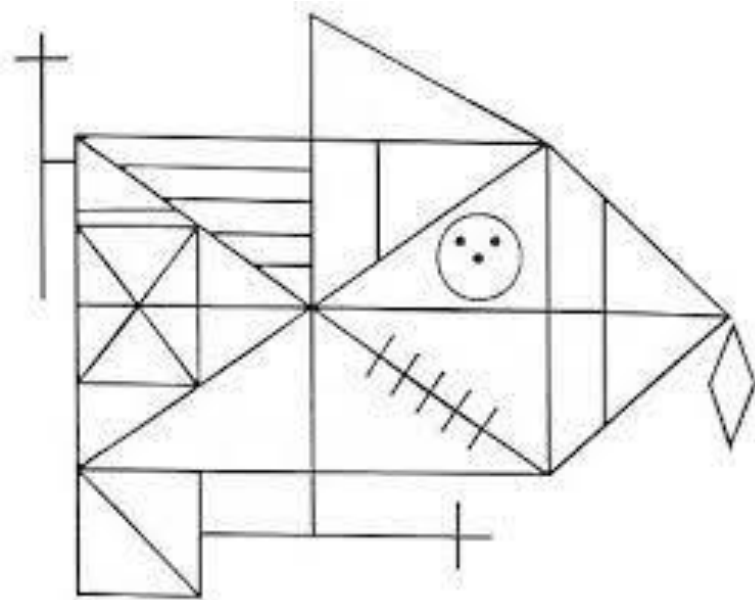# Class 10
Episodic and Semantic Memory

5th September 2022
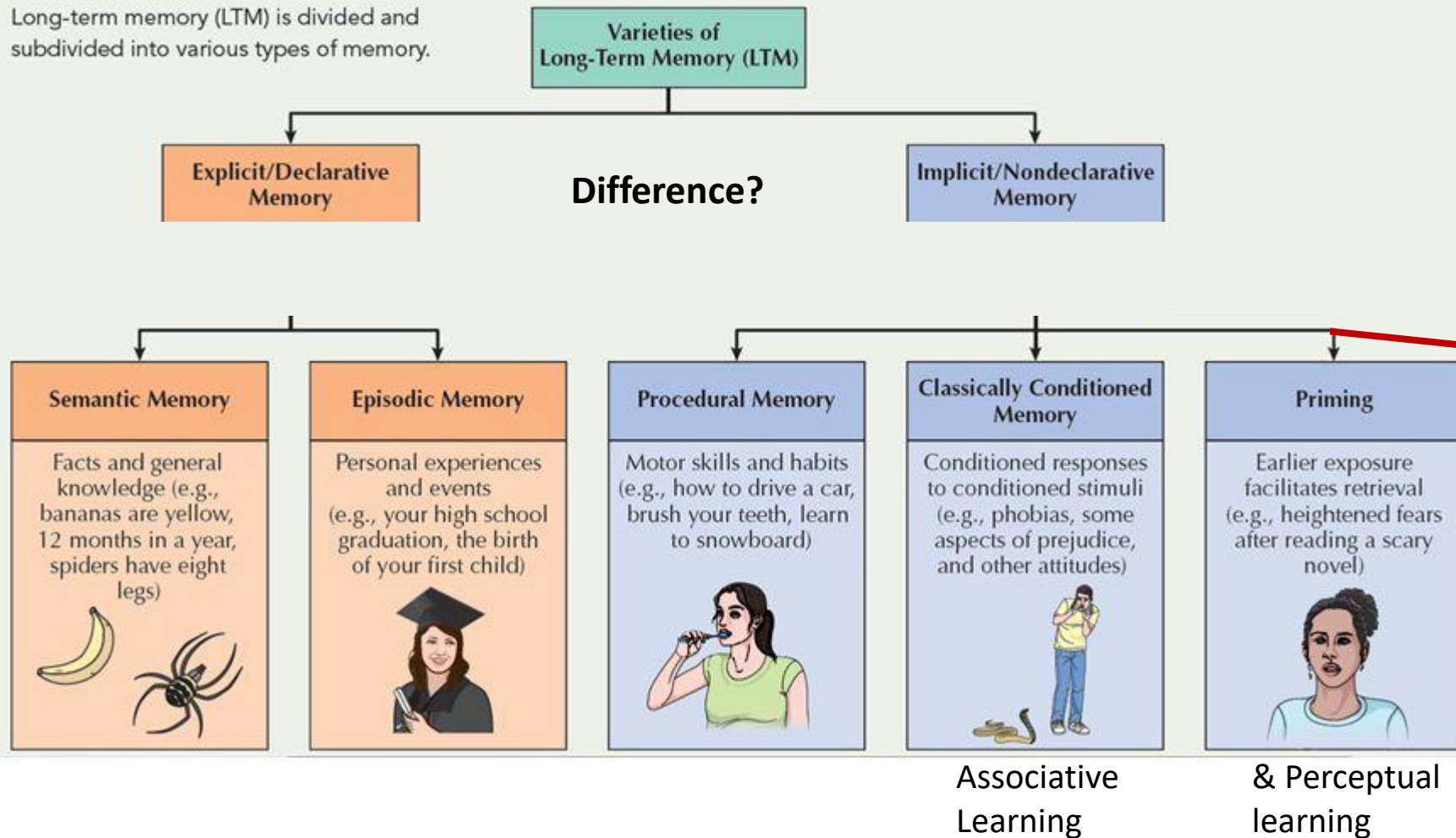
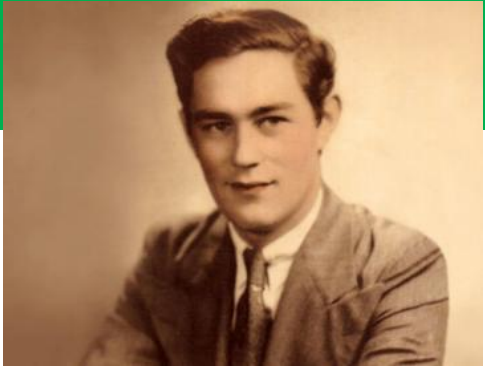Monday

Types of Long-Term Memories

Long-term memory (LTM) is divided and subdivided into various types of memory.

Varieties of Long-Term Memory (LTM)

Explicit/Declarative Memory

Difference?

Implicit/Nondeclarative Memory

Semantic Memory

Facts and general knowledge (e.g., bananas are yellow, 12 months in a year, spiders have eight legs)

Episodic Memory

Personal experiences and events (e.g., your high school graduation, the birth of your first child)

Procedural Memory

Motor skills and habits (e.g., how to drive a car, brush your teeth, learn to snowboard)

Classically Conditioned Memory

Conditioned responses to conditioned stimuli (e.g., phobias, some aspects of prejudice, and other attitudes)

Priming

Earlier exposure facilitates retrieval (e.g., heightened fears after reading a scary novel)

Non-associative
Habituation and Sensitization

Associative Learning

& Perceptual learning

Patient HM

- Henry Molaison (1926-2008)

- Most studied patient in the history of neuroscience

- At age 7, HM was knocked down by a bicycle

- Accident resulted in seizures or epileptic attacks

- Seizures worsened after he turned 16 and could not lead a normal life

Patient HM

Normal brain   H.M.'s brain

Hippocampus   Hippocampus removed

- At 27, HM's bilateral medial temporal lobes removed to control his seizures.

- After surgery, HM could remember his name, family, and childhood.

- But he could not remember his day- to- day activities, not even his doctor, Dr. Scoville, who visited HM daily.
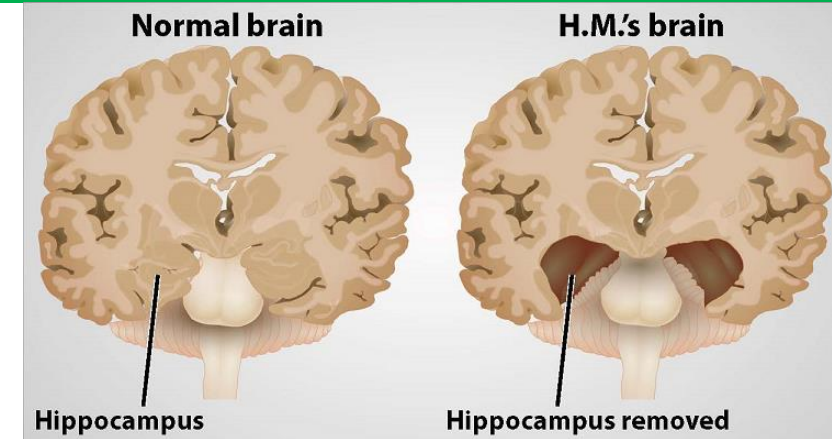
Dr. William Scoville
Neurosurgeon
Hartford Hospital
Connecticut, USA

Dr. Brenda Milner (b. 1918 - present)
Clinical Neuropsychologist
Donald Hebb's student at McGill University

Patient HM

- Over many years of testing HM, Brenda's team found that HM's IQ was intact.

- He could remember facts and general knowledge (Semantic Memory)

- He could also learn motor skills (like tracing a star by looking at its mirror reflection) over many practice trials, but was never conscious of these learning sessions. This type of learning is independent of the hippocampus.
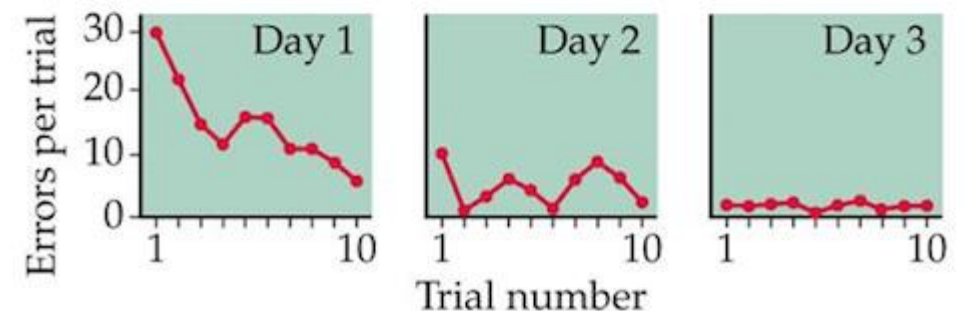
Video
Patient Clive Wearing – pianist with amnesia

(a) The mirror-tracing task

(b) Performance of H.M. on mirror-tracing task
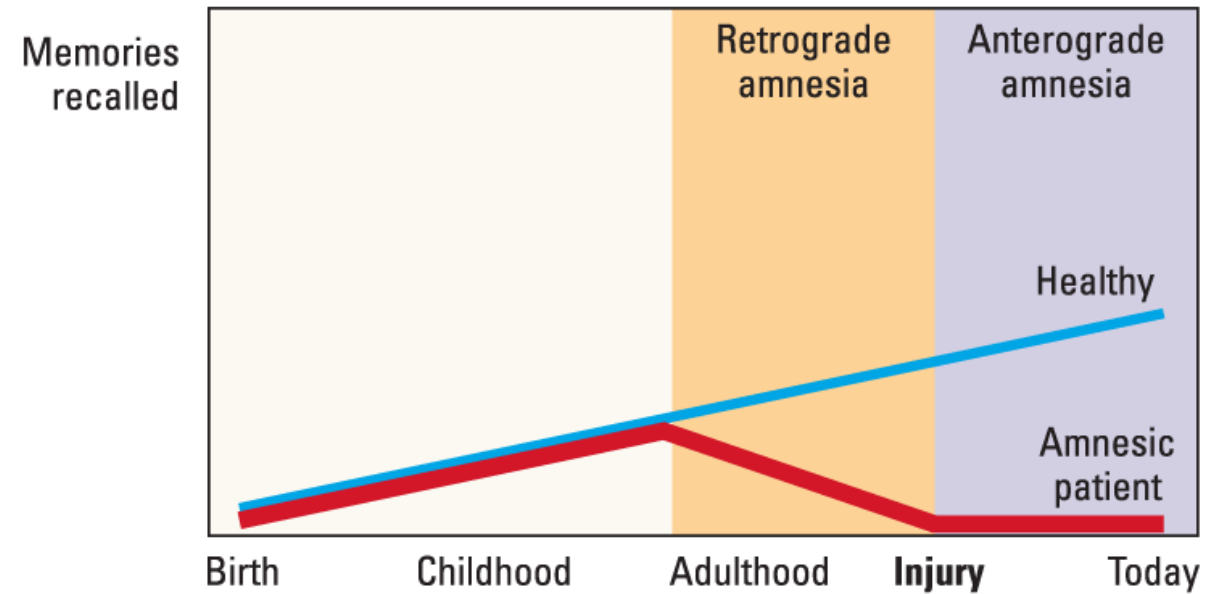
Amnesia

Ribots gradient
In the late 1800s, Theodore Ribot noticed that individuals with head injury often developed **retrograde amnesia**, gradient loss of memories for events that occurred before the injury

Gluck et al., *Learning and Memory*, 4e, © 2020 Worth Publishers

Retrograde amnesia - difficult to remember events from the past few years leading up to his (HM) surgery
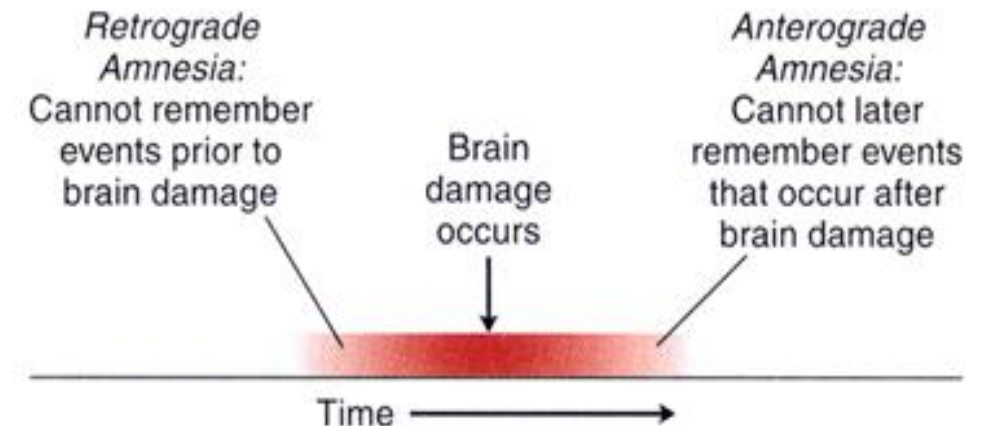
Antero-grade amnesia – HM could not form new memories, which is why he could not remember his doctor.

He lived only in the present.
The 'hippocampus' - important for forming, maintaining, and retrieving long term memories.

Transient Global Amnesia

- **Transient global amnesia (TGA)** is a transient, or temporary, disruption of memory not due to known causes such as head injury or epilepsy
  - TGA is difficult to study because it does not usually last long
- Temporary abnormality in hippocampal functioning

A Anterograde amnesia: memory for new information
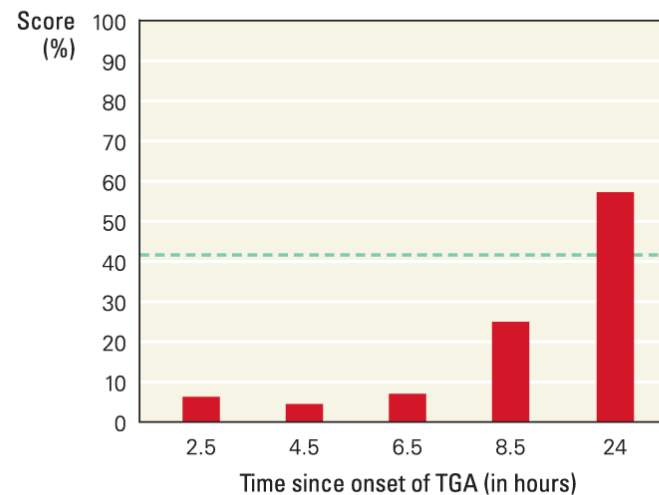
B Retrograde amnesia: memory for personal semantic information

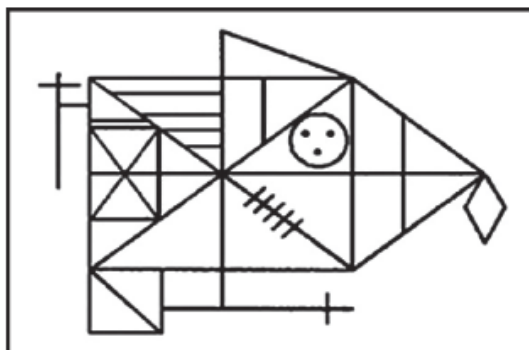Gluck et al., *Learning and Memory*, 4e, © 2020 Worth Publishers
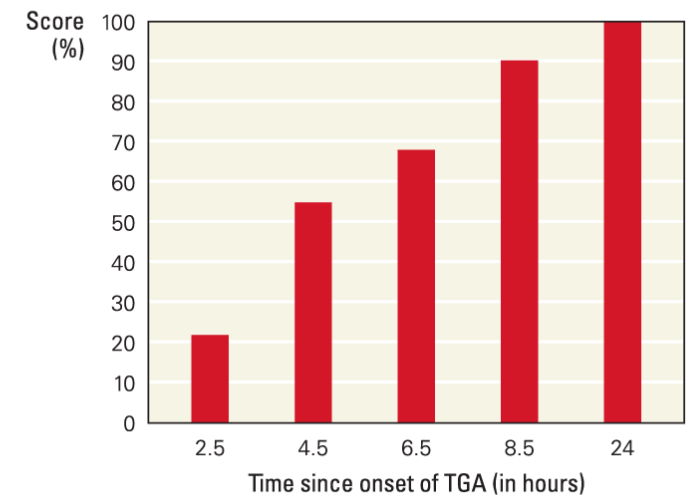
Functional Amnesia

- (sometimes called *psychogenic amnesia*) is a sudden, massive retrograde memory loss that seems to result from psychological causes (psychological trauma), not physiological injury

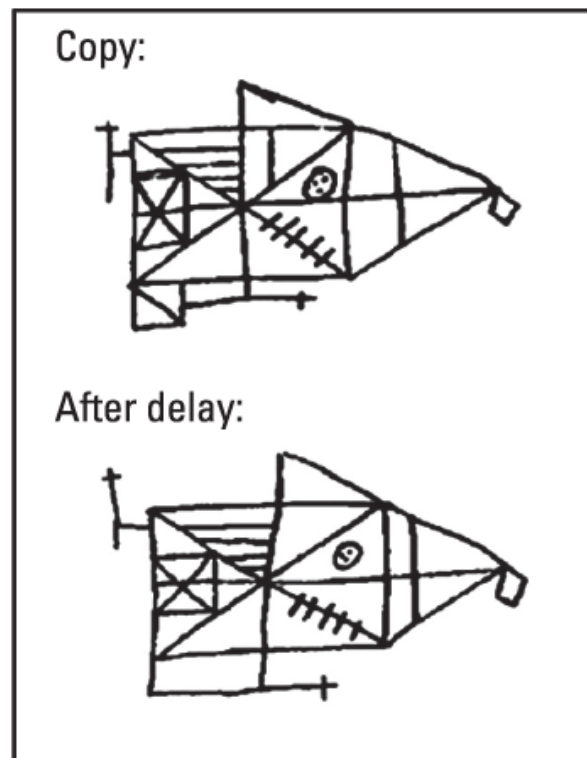   - Organic amnesia is brought on by a physiological injury (HM)

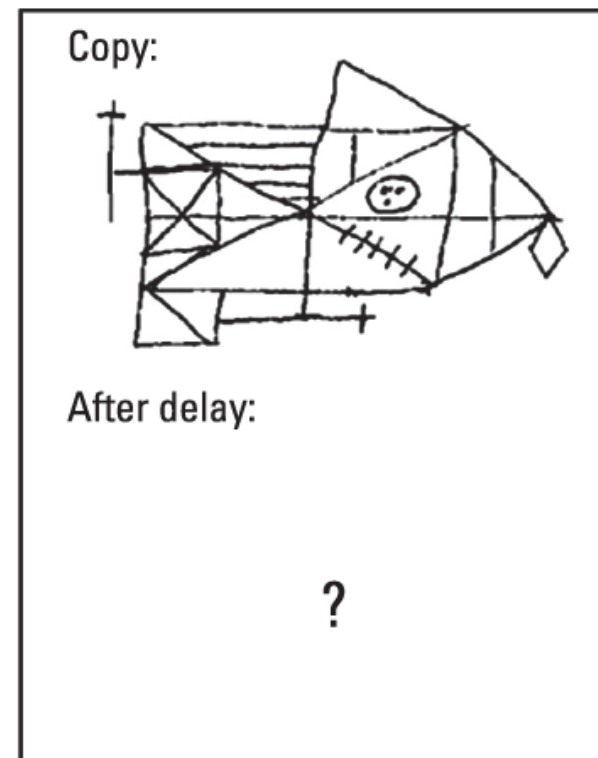# Figure drawing

Anterograde Amnesia in Patient E.P.

A   **Original figure**

B   **Healthy control**
Copy:
After delay:

C   **E.P.**
Copy:
After delay:
?

Gluck et al., *Learning and Memory*, 4e, © 2020 Worth Publishers

Features of Episodic Memory and Semantic Memory

Episodic memory	Semantic memory	Same (Yes) or Different (No)
Event related: "I remember"	*Factual:* "I know"	**No**
Can be *communicated flexibly*—in a format other than that in which it was acquired	Can be *communicated flexibly*—in a format other than that in which it was acquired	**Yes**
Consciously accessible (you know that you know)	*Consciously accessible* (you know that you know)	**Yes**
Attached to a *spatial and temporal context*	*Not necessarily* attached to a spatial or temporal context	**No**
You must have experienced the event *personally*	Can be *personal or general* information	**No**
Learned in a *single exposure*; can be weakened by exposure to similar events	Can be learned in a single exposure but can also be *strengthened by repetition*	**No**

Episodic Memory and Semantic Memory

- In general, semantic memory is strengthened by repetition (abstracted from episodic content), but episodic memory can be weakened by repeated exposure to similar events
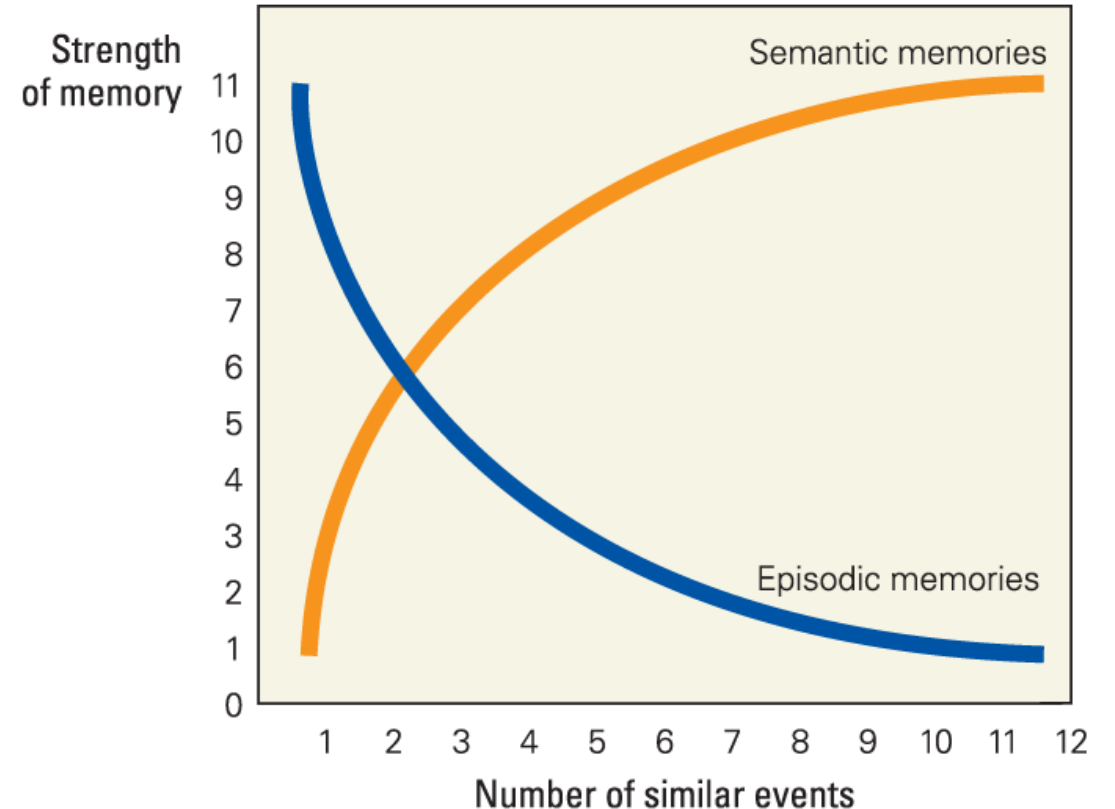
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Episodic or semantic?

1. A college senior takes his Latin vocabulary exam. The first phrase to be translated is *carpe diem*. This is an easy one; he knows the answer is "seize the day," even though he cannot remember exactly where he first heard this expression. Is this student using semantic or episodic memory?

2. The second phrase to be translated is *ne tentes, aut perfice*. This is harder; the student can remember studying the phrase, and he even recalls that the phrase was printed in black ink on the lower left of a page in his textbook, but he cannot recall the translation. Is the student using semantic or episodic memory?

3. Later in the day, the senior is helping a new student learn her way around campus. When the tour finishes, the newcomer asks where she can buy a cup of coffee. The senior thinks for a moment, then says that the coffee is better at a nearby Starbucks than at the student center. How might the senior be using both semantic and episodic memory here?

Alphabetical order of first and last letter

- Bucket
- Kangaroo
- Chair
- Stone
- Grass
- Apple

Living or non-living

- Sky
- Pencil
- Grapes
- Ant
- Laptop
- Frog

Do you remember the picture on the first slide of today's class?

Free recall: a memory test that involves simply generating requested information from memory. Remember all you can.

Were there students wearing masks?

Cued recall: a memory test that involves some kind of prompt or cue to aid recall

Recognition: a memory test that involves picking out (or recognizing) a studied item from a set of options

Short or Long answer questions

What kind of remembering?

Multiple choice questions

What kind of remembering?

# Mere Exposure to Information Does Not Guarantee Memory

Can you pick out the correct coin?

Most people have very poor ability to recognize the details of a coin face, though they may have seen the coin several times

Memory Is Better for Information That Relates to Prior Knowledge

- A basic principle of memory is that new information is easier to remember if you can relate it to things you already know. E.g. what is the hippocampus?
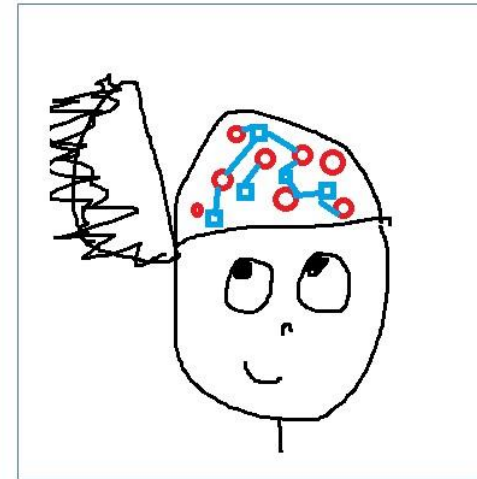
Number of ideas recalled

No topic   Topic before   Topic after
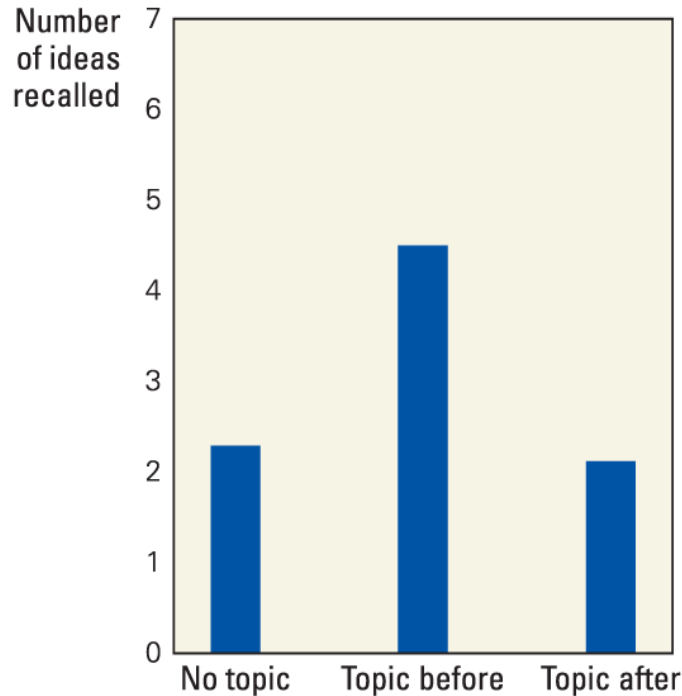
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You already know a TON of stuff.
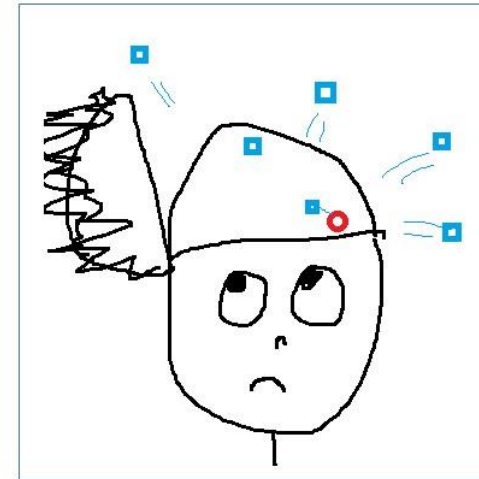
If you can connect the new stuff you learn to the old stuff you already know, chances are you will remember it much better. "

If you just learn new stuff without connecting it to something you already knew before, it will be harder to remember.

Stuff you know.

Connect **new stuff** to the **stuff you already know**.

If you don't connect **new knowledge** to **existing knowledge**, you will remember less.

Yes or No

- Pencil
- Apple
- Sky
- Chair
- Frog
- Stone
- Bucket
- Kitten
- Grapes
- Laptop
- Grass
- Ant

Alphabetical order of first and last letter
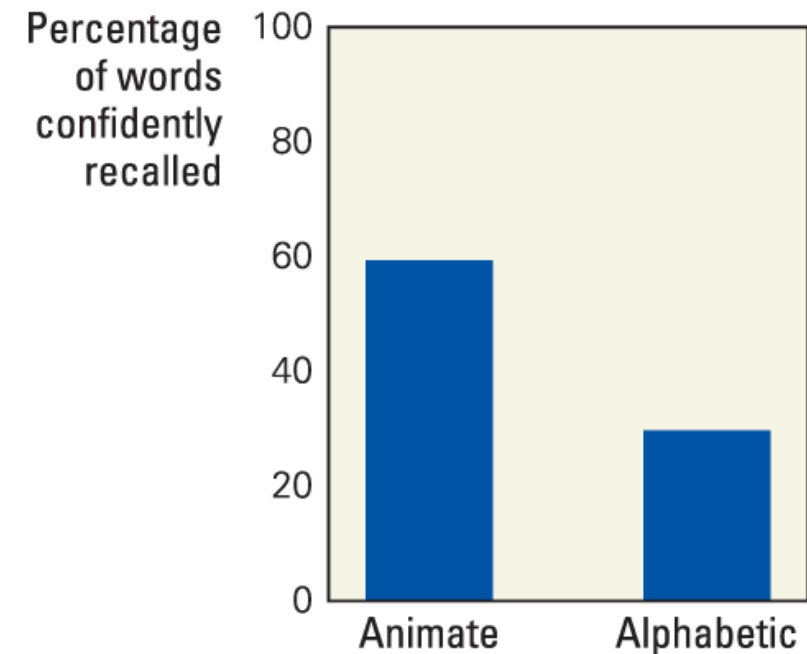
- Bucket
- Kangaroo
- Chair
- Stone
- Grass
- Apple

Living or non-living

- Sky
- Pencil
- Grapes
- Ant
- Laptop
- Frog

Deeper Processing at Encoding Improves Recall Later

- **Levels-of-processing effect:** the finding that, in general, deeper processing (such as thinking about the semantic meaning of a word) leads to better recall of the information than shallow processing (such as thinking about the spelling or pronunciation of a word)

Giving Examples to understand a concept also helps deeper processing – making more neuronal connections

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Principles of Encoding New Memories

- Three basic principles that govern how successfully a new episodic or semantic memory is encoded, or stored in memory
  - Mere exposure to information does not guarantee memory
  - Memory is better for information that relates to prior knowledge
  - Deeper processing at encoding improves recall later

Encoding Specificity: Similar Conditions at Encoding and Retrieval

- how closely the current context (physical or mental) resembles the context in which the information was originally acquired
- The **encoding specificity effect** states that retrieval is more likely to be successful if the conditions at recall are similar to those that occurred at encoding

- E.g. Lectures and exams in the same classroom
- E.g. remembering certain events when you see an old friend or visit an old school