


Chapter 6:  
**Memory**



A cartoon illustration of an elderly person sitting up in bed, looking at a sign on the wall. The sign reads "First pants, THEN your shoes". The person is wearing a blue nightgown and is looking towards the sign with a slightly confused or thoughtful expression. The room has a window showing a sunrise or sunset.

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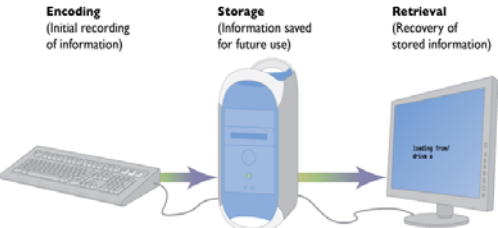
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### Memory

- Process by which one encodes, stores, and retrieves information



A diagram illustrating the memory process using a computer. It shows a keyboard on the left, a central tower PC, and a monitor on the right. Arrows indicate the flow of information: from the keyboard to the PC (labeled "Encoding (Initial recording of information)"), from the PC to the monitor (labeled "Storage (Information saved for future use)"), and from the monitor back to the PC (labeled "Retrieval (Recovery of stored information)"). The monitor screen displays "Loading from Drive A".

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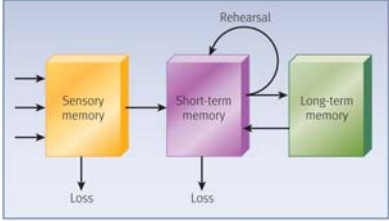
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### The Three Systems Model of Memory

- Each system differs in terms of span and duration



A diagram of the Three Systems Model of Memory. It consists of three colored boxes: an orange box for "Sensory memory", a purple box for "Short-term memory", and a green box for "Long-term memory". Arrows show the flow of information: from Sensory memory to Short-term memory, and from Short-term memory to Long-term memory. A curved arrow labeled "Rehearsal" loops back from Short-term memory to itself. Below each box is a downward arrow labeled "Loss", indicating that information is lost from each system over time.

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The Three Systems Model of Memory

- 1. **Sensory memory** - very brief storage of perceptual information; each sense has its own form

Iconic (visual) and echoic (auditory) memories

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The Three Systems Model of Memory

- 2. **Short-term memory** - limited duration (< 20 seconds) and capacity (the magic number =  $7 \pm 2$  pieces of information)

- Includes working memory – information we’re actively processing
  - Subject to fast decay and interference (2 types)
  - a) retroactive inhibition - acquisition of new info interferes with retention of old
  - b) proactive inhibition - old info interferes with acquisition of new info
  - Most likely when old and new stimuli are similar

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How can we Increase our STM?

- **Chunking** - organizing info into meaningful groupings to extend the span of STM beyond  $7 \pm 2$

XIBMSATMTVPHDX

vs.

X IBM SAT MTV PHD X

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### How can we Increase our STM?

- **Rehearsal** - repeating info to extend the duration of STM
  - **Maintenance rehearsal** - repeating stimuli in the original form (e.g., repeating phone number long enough to dial it)
  - **Elaborative rehearsal** - linking stimuli in a meaningful way
- **Levels-of-processing model** - the more deeply we transform info, the better we remember it

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### The Three Systems Model of Memory

#### 3. **Long-term memory** - permanent store of information

Differs from STM

- LTM capacity is very large
- LTM may endure for decades
- **Permastore**
- **Errors of LTM differ from those of STM**
  - Semantic vs. acoustic

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### Forms of Long-Term Memory

#### 1. **Explicit (or declarative) memory** - accessible to conscious awareness, can be stated "declaratively"

- a) **Semantic memory** - knowledge of facts
- b) **Episodic memory** - knowledge of events in our lives

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### Forms of Long-Term Memory

- 2. **Implicit memory** - not deliberately remembered ("automatic"), doesn't require conscious effort, many different forms
  - a) **Procedural memory** - motor skills and habits, "know how" memory

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### Implicit Memory Types

Fill in the blanks:

K \_ \_ \_

Remember *Queen* from the word list? If you said *King*, you demonstrated a priming effect

- b) **Priming** - facilitated recognition of a stimulus after seeing it, or a similar stimulus, previously

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### Implicit Memory Types

- c) **Classical conditioning** - associative conditioning between neutral and innately meaningful stimuli
- d) **Habituation** - decrease in attention to familiar stimuli over time

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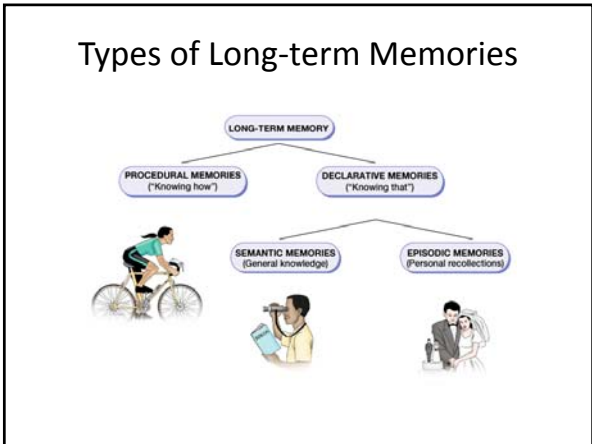
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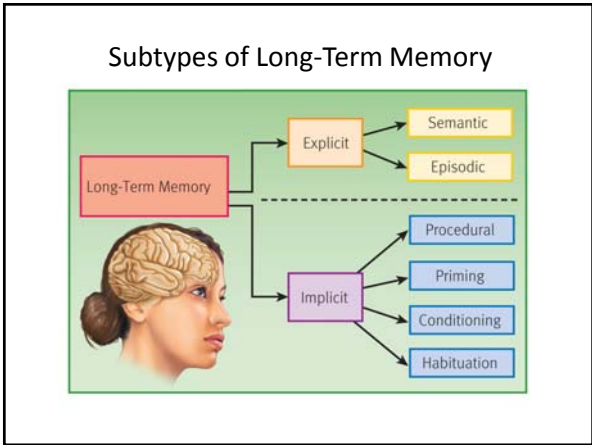
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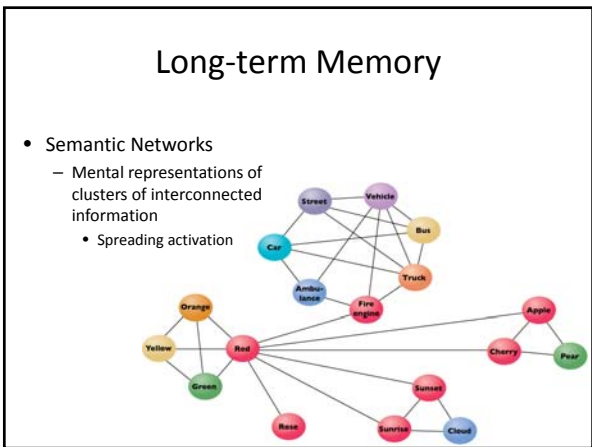
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### Measuring Memory: 3 Rs

- **Recall** - generating previously remembered information
- **Recognition** - selecting previously remembered information from an array of options
- **Relearning** - "savings"; how much more quickly we reacquire something learned before

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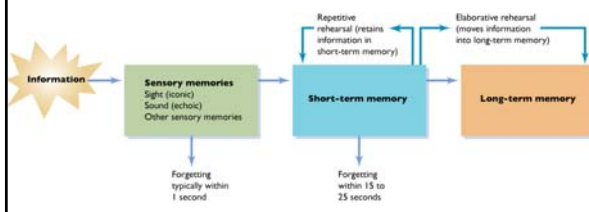
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### Three-System Memory Review



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### Tip-of-the-Tongue Phenomenon

- The experience of knowing that we know something but are unable to access it
  - “What’s the name of that song?”
  - “Who was that we just saw?”
- Memory was stored, but not *retrieved* properly

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### Retrieving Memories

- Memories are **reconstructive**
- Many types of forgetting result from retrieval errors: the memory is present but not accessible
  - Retrieval cues help

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### Retrieval Cues

- Recall
  - Specific piece of information must be retrieved
- Recognition
  - Occurs when one is presented with a stimulus and asked whether he has been exposed to it previously, or is asked to identify it from a list of alternatives

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### Levels of Processing

- Levels-of-processing Theory
  - Suggests that the amount of information processing that occurs when material is initially encountered is central in determining how much of the information is ultimately remembered

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### Flashbulb Memories

- Memories related to a specific, important, or surprising event that are so vivid they represent a virtual snapshot of the event
  - Source amnesia
  - Example:
    - September 11<sup>th</sup>, 2001

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### Rebuilding the Past

- Processes in which memories are influenced by the meaning one gives to events
  - Schemas
    - Organized bodies of information stored in memory that bias the way new information is interpreted, stored, and recalled
- Construction of memories, however, means that false memories can be easily implanted, or real memories changed

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### False Memories

- **Flashbulb memories** - very vivid, able to be recalled in detail
  - But subject to change over time, just like other memories
  - Study of *Challenger* explosion
- **Source monitoring** - ability to identify the origins of a memory
  - **Cryptomnesia** - failure to recognize that one's idea actually originated with someone else

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### Implanting False Memories

- **Misinformation Effect** - creation of fictitious memories by providing misleading information afterward
- Loftus car crash study
  - Smashed into vs. contacted
- Children are particularly vulnerable to this

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### Implanting False Memories

- Implanted memories
  - Lost in the mall study
  - Easier to implant memory for
    - Plausible events
    - Events in the distant past
  - Existence proofs for implanted memories
    - Hot air balloon ride
    - Bugs Bunny at Disneyland
  - Demand characteristics? Not likely, many subjects continue to insist on the validity of false memories even when told they are implanted

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### Eyewitness Testimony

- Weak correlation between witness confidence in their testimony and its accuracy
- Less accurate when
  - Observing others of different race
  - Witness has talked to other witnesses
  - The observed situation is stressful (e.g., threatening, weapon involved)
- Improved accuracy with sequential (vs. simultaneous) lineup

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### The Eyewitness on Trial

- Eyewitnesses are not always reliable
- Factors which influence accuracy
  - Cross race identification
  - Question wording
    - Crashed versus hit
  - Misleading information

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### Children’s Testimony

- Under what conditions are children more suggestible?
  - Being very young
  - When interviewers expectations are clear
  - When other children’s memories for events are accessible

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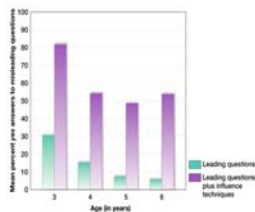
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### Children’s Testimony

- Asked if a visitor committed acts that had not occurred
  - Few 4-6 year olds said yes
  - 30% of 3-year olds said yes
- When investigators used techniques taken from real child-abuse investigations, most children said yes



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### Constructive Processes in Memory

- Autobiographical Memory
  - Recollection of circumstances and episodes from our own lives
  - One tends to forget information about one's past that is incompatible with the way in which he currently sees himself

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### Why We Forget

- Failure of Encoding
  - Did not pay attention to material
- Decay
  - Loss of information through non-use
    - Memory traces
- Interference
  - Information in memory disrupts the recall of other information

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### Why We Forget

- Cue-dependent Forgetting
  - Occurs when there are insufficient retrieval cues to rekindle information that is in memory
  - Mood, physical state, location can all be cues
- Interference and cue-dependent forgetting appear to be key in most cases
  - Little support for decay as a major process

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### Proactive and Retroactive Interference

- Proactive Interference
  - Information learned earlier disrupts the recall of newer material
- Retroactive Interference
  - Difficulty in the recall of information because of later exposure to different material

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### Memory Dysfunctions

- Alzheimer’s Disease
- Amnesia
  - Retrograde
  - Anterograde
- Korsakoff’s Syndrome
  - Afflicts long-term alcoholics

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## Improving Memory

- Effective strategies
  - The keyword technique
  - Organization cues
  - Take effective notes
  - Practice and rehearse
  - Do not believe claims about drugs that improve memory

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