CHAPTER 6 Memory

Links to Learning Objectives

ENDURING ISSUES IN MEMORY
THE SENSORY REGISTERS
Role of sensory registers
Theories of attention
SHORT-TERM MEMORY
Defining STM
Capacity, Encoding, & Maintenance
LONG-TERM MEMORY
Definition, Capacity, & Encoding
Holding information in LTM
Types of LTM & implicit/explicit memories
THE BIOLOGY OF MEMORY
Long-term potentiation
memory storage, role of sleep
FORGETTING
Biological factors
Types of interference
State-dependent & reconstructive memories
SPECIAL TOPICS IN MEMORY
Influences of culture
Autobiographical memory & childhood amnesia
Examples of extraordinary memory
Eyewitness testimony & recovered memories

Enduring Issues

Nature-Nurture
Stability-Change
Diversity-Universality
Mind-Body

To what extent can memories be changed by events outside the person, and what is the importance of environmental cues in triggering memories?
In what ways does memory change in the first few years of life?

In what ways does memory differ among individuals and across cultures?

What are the biological bases of memory?
The ability to remember the things that we have experienced, imagined, & learned.

**Information-Processing Model**

**The Sensory Registers**
The Sensory Registers

**LEARNING OBJECTIVE:** Describe the role of the sensory registers and the length of time information remains there. Distinguish between the **icon** and the **echo**.

**Visual register**
- Icon
- Masking: New information replaces old information almost immediately

**Auditory register**
- Echo
- Fades more slowly

The Sequence of Information Processing

Donald Broadbent
- Filtering process at the entrance of the nervous system
- Compare stimuli that get through filter to what we already know

Anne Treisman
- Modified the filtering theory
- Filter as a variable control (i.e., volume control on a radio) rather than simple on-and-off switch

Attention

**LEARNING OBJECTIVE:** Compare Broadbent and Treisman’s theories of attention. Explain what is meant by the “cocktail-party phenomenon” and “inattentional blindness.”

- Filtering process at the entrance of the nervous system
- Compare stimuli that get through filter to what we already know

- Modified the filtering theory
- Filter as a variable control (i.e., volume control on a radio) rather than simple on-and-off switch
Cocktail-party phenomenon: Surrounded by a group of people having conversations, an individual will filter out all of the conversations around him/her.

Inattentional blindness: Failure to attend to something we are looking at or listening to:
- Attending to auditory information reduces ability to accurately process visual information.

Attention

Inattentional blindness:

Short-Term Memory

Short-term Memory

LEARNING OBJECTIVE: Define short-term memory (STM), explain why it is called “working memory” and describe.

Holds the information that we are thinking about at a given moment in time:
- Stores new information briefly and works on that and other information.
- Sometimes called “working memory” to emphasize its active role in the memory system.
Capacity of STM

LEARNING OBJECTIVE: Describe the capacity of STM, including the role of chunking and interference, the way information is encoded in STM, maintenance of information in STM, and the effect of stress on STM.

Can hold only as much information as can be repeated or rehearsed in approx. 1.5 to 2 seconds

• Positive impact
  • Chunking
• Negative impact
  – Interference
  – Stress/worry

Encoding in STM

Verbal information: Encoded phonologically, i.e. based on how it sounds

Visual information: Encoded both phonologically and as an image (dual coding)

• makes visual information easier to remember

Maintaining STM

Rote rehearsal: Repeating information over and over

• Useful in holding information in short-term memory
Long-Term Memory

LEARNING OBJECTIVE: Define long-term memory (LTM), including the capacity of LTM and the way information is encoded in LTM. Explain the serial position effect.

Portion of memory that is more or less permanent, corresponding to everything we “know”.

Capacity: Can store large amounts of information for years

Encoding: Most information stored in terms of meanings

Serial Position Effect
Maintaining LTM

LEARNING OBJECTIVE: Differentiate rote rehearsal from elaborative rehearsal and explain the role of mnemonics and schemata as forms of elaborative rehearsal.

Rote rehearsal: repeating information over and over

Elaborative rehearsal: linking new information in short-term memory to familiar material in long-term memory

– Mnemonics: making words or sentences out of the material to be recalled (i.e. ROY G BIV)

Memory as an Information-Processing System

Types of LTM

LEARNING OBJECTIVE: Distinguish between episodic memories, semantic memories, procedural memories, emotional memories, explicit memories, and implicit memories. Explain how priming and the tip-of-the-tongue phenomenon shed light on memory.

Long-term memories of personally experienced events
Types of LTM

- Episodic: Long-term memories of general facts and information.
- Semantic: Long-term memory that stores information relating to skills, habits, and other perceptual-motor tasks.
- Procedural: Learned emotional responses to various stimuli.
### Applying Psychology

**Improving Your Memory**

1. Develop motivation.
2. Practice memory skills.
3. Be confident.
4. Minimize distractions.
5. Stay focused.
7. Use mental imagery.
8. Use retrieval cues.
9. Rely on more than memory alone.
10. Be aware of distortions from your own schemata.

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### Explicit and Implicit Memory

**Explicit memory:** Memory for information that we can readily express in words and are aware of having; memories can be intentionally retrieved
- Episodic
- Semantic

**Implicit memory:** Memory for information that we cannot readily express in words and may not be aware of having; memories cannot be intentionally retrieved
- Procedural
- Emotional

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### Priming

1. Person is shown a stimulus (a word)
2. Person is later shown a fragment of that stimulus (part of a word)
3. Person is asked to complete fragment
   - More likely to complete the fragment with word shown earlier
   - Evidence that explicit memory and implicit memory can interact

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Tip-of-the-Tongue Phenomenon

Knowing a word but not being able to immediately recall it
• Demonstrates distinction between explicit and implicit memory

Types of Memories

<table>
<thead>
<tr>
<th>Table 6-1 TYPES OF MEMORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Explicit</td>
</tr>
<tr>
<td>Semantic</td>
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<tr>
<td>Memories of facts and concepts</td>
</tr>
<tr>
<td>Example: recalling that Albany is the capital of New York</td>
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</tbody>
</table>

The Biology of Memory
LEARNING OBJECTIVE: Define long-term potentiation, identify the areas of the brain that play a role in the formation and storage of long-term memories. Describe the role of sleep in the formation of new memories.

**Long-term potentiation (LTP):**
Long-lasting change in the structure or function of a synapse
- Increases efficiency of neural transmission
- Thought to be related to how neurons store information

**The Biological Basis of Memory**

**The Role of Sleep**

Plays an important part in the formation of new memories
Initial learning of information and deep sleep = same patterns of neural activity in the hippocampus
Forgetting

Once formed, memories do not remain forever in the brain.

The Biology of Forgetting

LEARNING OBJECTIVE: Describe the biological factors that influence forgetting, including the phenomenon of retrograde amnesia.

Decay Theory: The passage of time leads to deterioration of memories

Retrograde Amnesia: Inability to recall events preceding an accident or injury

Alzheimer’s Disease: Associated with below-normal levels of the neurotransmitter acetylcholine
Information learned EARLIER interferes with information learned LATER

Proactive Interference
Retroactive Interference
Information learned LATER interferes with information learned EARLIER

LEARNING OBJECTIVE: Differentiate between retroactive and proactive interference.

Experience and Forgetting
LEARNING OBJECTIVE: Explain what is meant by “state dependent memory” and the “reconstructive” nature of remembering.

State-dependent memory:
Person who learns material in a specific physiological state tends to recall that material better in that same state

“Reconstructive” nature of memory
• Schemata used to reconstruct memories
• Sometimes hard to differentiate between what actually happened and something that was heard or imagined
• Can lead to huge errors

Factors that Affect Forgetting

<table>
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<th>FACTORS THAT AFFECT FORGETTING</th>
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<tbody>
<tr>
<td>Trace</td>
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<tr>
<td>Storage interference</td>
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<tr>
<td>Neurochemical damage</td>
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<tr>
<td>Neurosynaptic damage</td>
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<tr>
<td>Retroactive interference</td>
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<tr>
<td>Proactive interference</td>
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<tr>
<td>Situational factors</td>
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<tr>
<td>Reconstruction</td>
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Special Topics in Memory

Cultural Influences

LEARNING OBJECTIVE: Describe the influence of culture on memory.

Culture influences the types of things that people remember.
- People are more likely to remember information about things that are relevant to their culture.

Autobiographical Memory

LEARNING OBJECTIVE: Define autobiographical memory and describe the several theories that attempt to explain childhood amnesia.

Autobiographical memories: Our recollection of events that have happened in our life and when those events took place.

Childhood amnesia: Difficulty adults have remembering experiences from their first two years of life.
Extraordinary Memory

LEARNING OBJECTIVE: Describe examples of extraordinary memory (including eidetic imagery and flashbulb memories).

Eidetic imagery (photographic memory):
The ability to reproduce unusually sharp and detailed images of something one has seen

Mnemonists:
Highly skilled at using memory techniques

Flashbulb Memories

Vivid recollections of certain events and the incidents surrounding them, even after a significant amount of time has passed

• Fact that memories are vivid does not mean that they are accurate

Eyewitness Testimony

LEARNING OBJECTIVE: Discuss the accuracy of eyewitness testimony and recovered memories.

Assumed to be accurate, but often inaccurate because of:

• source error: confusion about what you have heard about an event with what you actually witnessed
Recovered Memories

Controversial topic
Typically involves the “recollection” of real or imagined experiences of physical and/or sexual abuse

Lecture Activities

As a class, let’s list some of the major hardware components of computers. How might these components be analogous to parts of human memory?
MASKING
The sensory register holds visual information very briefly. Information that is not “selected” for further processing is lost. This can happen for various reasons, including a process called masking—a process whereby interfering information presented before and/or after target information can make it difficult to remember.

On the next slide, you will be shown three rows of letters. They will appear very briefly. See how many of them you can remember.

That array of letters flashed for about 100 milliseconds—about the duration of the iconic sensory memory store. If information is presented immediately before and after the array of letters, they will be considerably more difficult to read. In the next part of this experiment, the masking phenomenon will be demonstrated.
The second array of letters flashed for the same amount of time as the first array. The difference in this experiment was that interfering information was flashed before and after the array. This interfering information masked some of the letters that you were trying to pull from your iconic sensory register.

Digit Span Test

Digit span refers to the amount of information that you can maintain in consciousness at any given moment. For most, digit span is about 7 to 9 pieces of information. To test your digit span, I'm going to read off a list of numbers. When I'm through, I'll have you write down as many of these numbers as you can recall.
Proactive vs. Retroactive Interference

Decide which of the following illustrations might result in **proactive** or **retroactive interference**. Discuss your rationale.

1. Moving from the United States to England, where people drive on the left instead of the right side of the road.
2. Trying to make a call on your old cell phone after having the new one for a year.
3. Moving from one word-processing program to a different one, such as from WordPerfect to Microsoft Word.
### Summary Table: Memory as an Information-Processing System

Morris/Maisto, 9/e p. 196

<table>
<thead>
<tr>
<th>Time Lucia</th>
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### Summary Table: Factors that Affect Forgetting

Morris/Maisto, 9/e p. 206

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