

Notes on Memory – Chapter 6

“Tell me and I’ll forget; show me and I may remember; involve me and I’ll understand”.

Chinese Proverb

“Everyone has a photographic memory. Some just don't have any film.”

Author Unknown

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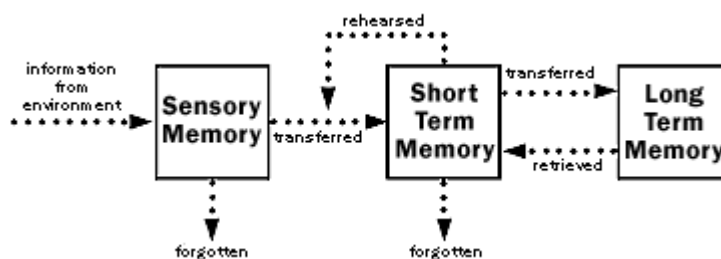
Essential Questions:

- *How do humans encode, store, and retrieve information from memory?*
- *How can humans enhance memory encoding, storage, and retrieval?*

Unit Objectives:

- Analyze how humans encode, store, and retrieve information in memory.
- Apply memory enhancement techniques to everyday life.

I. Memory – Information Processing Approach



<http://www.mhhe.com/socscience/intro/ibank/ibank/0083.jpg>

A. *Encoding* – the process of converting sensory information (acoustically, visually, semantically) into a form that can be stored in memory

1. *Organization of Encoded Information*

- a. Automatic Processing – encoding without conscious awareness such as space, time, and frequency (it is difficult to shut off) [ex. – during a test remembering where the answer was on a page or how many times you passed a friend in the hallway that day]
- b. Effortful Processing – encoding that requires attention and conscious effort [ex. – name of a person you just met]
 1. *Visual encoding* – the encoding of picture images [ex. your first car/house]
 - a. our first memories tend to be visual imagery or mental pictures
 2. *Acoustic encoding* – the encoding of sound, especially the sound of words [ex. your name]
 3. *Semantic encoding* – the encoding of meaning, including the meaning of words [ex. a racial slur]
 - a. *chunks* – individual items that are lumped together into familiar, manageable units; often occurs automatically
 - b. *hierarchies* – using categorization, not just chunks, to manage information

2. Cognitive theories

- a. *Levels of Processing Approach*: theory suggests that the brain processes and encodes information (stimuli) in different ways and at different levels
 1. Shallow Processing
 - a. Involves simple repetition or rehearsal
 - b. Example: numbers and symbols on a touch tone phone

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2. Deep Processing
 - a. Associations used between new information and information already stored
 - b. Example: building on math concepts, relating information learned in class to real life
 - b. *Semantic Encoding* – making connections to the meaning of words (rhyming, synonyms)
 - c. *Encoding Specificity Principle*: effectiveness of a retrieval cue depends on how well it matches up with the originally encoded information [you remember that the person who gave you their phone number is almost like your friend Sara’s number. Will you remember the number??]
 - d. *Transfer Appropriate Processing*: initial processing information that is similar in type to the process necessary for retrieval [cues must match up]
 3. Neurobiological theory
 - a. *Parallel Distributed Processing*: the brain is organized into neural networks that process information simultaneously at different places in the brain (based on PET scans)
 4. Forgetting and Encoding
 - a. Information never encoded
 - b. Much stimuli/what we sense we never use
 - c. Nickerson/Adams – too familiar with information to notice details
 - d. Bias – we encode more readily that confirm our beliefs
- B. *Storage* – is the process of retaining information in memory
1. Sensory Memory –
 - a. as a sense happens, like a lightening flash, you retain a brief image of it
 - b. iconic storage: a visual sensory representation
 - c. echoic storage: an auditory sensory representation
 - d. eidetic storage: a lingering mental representation of a visual image (commonly called photographic memory)
 - e. brief and temporary
 2. Short-Term Memory (also called working memory) –
 - a. Miller’s theory
 1. memory span: working memory (or short term)
 2. a limited number of items or “chunks” can be stored (about 7 plus or minus 2)
 3. maximum of about 30 seconds
 3. Rehearsal: repeating information to keep it in active memory
 - a. *Maintenance rehearsal*: repetitive review
 1. phonological loop – the speech based part of working memory that allows for the verbal rehearsal of sounds or words
 2. visuospatial sketchpad – the storage buffer for visual-spatial material held in short-term memory
 - b. *Elaborative rehearsal*: repetitive review with analysis
 - c. *Next-in-line-effect* – when going around a circle and introducing people, the most difficult name to remember is the one right before you because you are focused on your own performance and do not pay as much attention as you should to the one before you
 4. Drugs block neurotransmitter (acetylcholine) which disrupts storage
 5. Long-Term Memory (Tulving) –
 - a. *Episodic* – memories for events you have experienced personally (ex. wedding, birth of a child)
 - b. *Semantic/declarative* – memories of factual knowledge (ex. the year of WWII)
 - c. *Procedural* – memories related to skills or habits (ex. brushing your teeth)
 - d. *Retrospective* – memory of past experiences or events and previously acquired information
 - e. *Prospective* – memory of things one plans to do in the future

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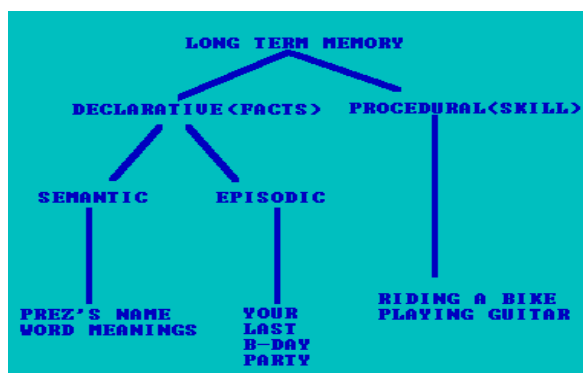
6. Strategies for Memory –
 - a. *Mnemonic devices*: improving encoding and retrieval by remembering a simple series (ex. colors of the visible spectrum – ROY G BIV)
 1. *Method of Loci*: way to remember using a list of objects with a numbered sequence (ex. numbered shopping list)
 2. *Acronyms* – a word composed of the first letters of a series of words (PETA)
 3. *Acrostics* – a verse or saying in which the first or last letter of each word stands for something else (Every Good Boy Deserves Fun)
 - b. *Chunking*: grouping like items (ex. shopping list – list by produce, meat, boxed, and canned items)
 - c. *Mediation*: linking items or visuals to help to remember (ex. John and Tille, John reminds you of a bathroom and you find tiles in that room)
 - d. *Von Restorff Effect*: deliberately making something you want to remember stand out
 - e. *Visual cues or visual imagery* – pictures to help remember (charts/graphs)
 - f. *Serial Position Effect* – individuals remember the last and the first items better than those in the middle
 - g. *Spacing Effect* –
 1. the tendency for distributed study or practice to yield better long term retention over time than is achieved through mass study or practice
 2. studying material for short periods of time (15 minutes) over time (for a week)
7. Memory and the Brain –
 - a. Through PET scans, research has found that the hippocampus processes memory for storage (short-term memory)
 1. Damage to the left side of the hippocampus – difficulty remembering verbal information
 2. Damage to the right side of the hippocampus – difficulty remembering visual information
 3. when the hippocampus is removed from monkeys, loss of recent memories, long term memory intact
 - b. long-term memories stored in the frontal and temporal lobes
 - c. amygdala activated to help make personal or emotional memories
 - d. synaptic changes –
 1. experiences modify the brain's neural networks
 2. increased activity in a particular pathway strengthens that neural network and releases more of the neurotransmitter serotonin into the synapse [which Kandel and Schwartz believe help synapse to become more efficient]
 - e. Long-term potentiation (LTP) –
 1. rapidly stimulating certain memory-circuit connections has increased their sensitivity for hours or even weeks to come
 2. the send neuron now needs less prompting (threshold) to release their neurotransmitter and receptor sites increase
 3. prolonged strengthening of potential neural firing called LTP help with learning and making connections (most drugs damage LTP)
 4. if LTP has occurred, it is difficult to wipe out old memories or connections
8. Forgetting related to Storage –
 - a. Short-term memory dump
 - b. Encoding difficulties
 - c. Interference: overwriting
 - d. Decay of information

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- e. Amnesia
 - 1. *retrograde amnesia* – loss of memory of past events
 - 2. *anterograde amnesia* – loss or impairment of the ability to form or store new memories
- f. Alzheimer's/dementia

C. *Retrieval* – is the process of accessing and bringing into consciousness information stored in memory

- 1. Retrieval cues – cues associated with the original learning that facilitate the retrieval of memories
 - a. *context cues*: perhaps it is the process of reinstatement of context cues that accounts for the helpfulness of hypnosis in recall
 - b. *mood*: state dependent memory refers to the improvement in recall that can occur when the same emotional state is created as was present in the acquisition phase
- 2. Long-term memory –
 - a. *Episodic*: easy to recall because it deals with personal events and is very detailed
 - b. *Semantic/declarative*: retrieval depends on cues and complexity
 - c. *Recall*: person must retrieve information learned earlier (ex. fill in the blank test)
 - d. *Recognition*: person identifies items or people learned (ex. person that they had met)
 - e. Best retrieval cues come from associations formed at the time one encodes a memory
 - f. Similar context or surroundings can cause a flood of retrieval cues (*déjà vu*)
 - g. *State-dependant memory* – things we learn in one state (drunk, time of day, mental illness) are more easily remembered when in the same state
 - h. *Mood-congruent memory* – tendency to recall experiences that are consistent with one's mood
 - i. organization of long term memory:



- 3. Explicit, Implicit Memory and Priming Tasks –
 - a. *Explicit memory* – memories people are aware of
 - b. *Implicit memory* – memories people are not conscious of
 - c. *Priming tasks* – an experimental task in which subjects are presented with a stimulus that primes them to respond in a certain way to subsequent stimuli (ex. if a subject reads the word elephant and next comes to the fragmented form E_E_ _ A_T, those subjects who were exposed to the word previously are more likely to complete the word than those who were not)
- 4. Forgetting related to retrieval –
 - a. Interference - attention
 - b. Retrieval cues
 - 1. tip-of-the-tongue phenomenon – an experience in which people are sure they know something but can't seem to bring it to mind
 - c. Repression (psychoanalytic theory)
 - d. Amnesia
 - e. False memory
 - f. decay

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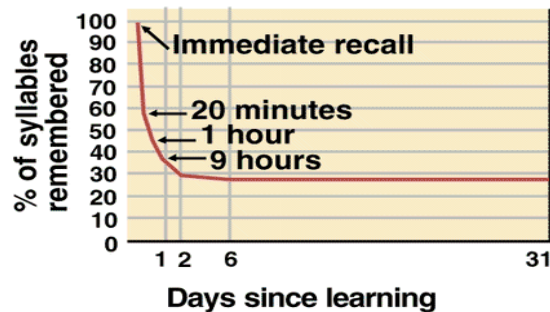
D. Special Memory/Forgetfulness

1. *Flashbulb memory* –
 - a. Emotional events which are rehearsed create vivid memories (ex. recalling exactly where you were when JFK died, the Challenger exploded, or on 9-11)
2. *Extraordinary memory*
 - a. Developing an almost perfect memory by using and practicing special chunking or mapping strategies
3. *Constructivist Theory*
 - a. A theory that holds that memory is not a replica of the past, but a representation, or a reconstruction of the past
4. *Eyewitness Testimony (Elizabeth Loftus)*
 - a. Since memory is a reconstructive process, Loftus contends that people forgets, recall vents incorrectly, make mistakes, or have unconscious biases which make their testimony inaccurate
 - b. Children are most susceptible to having false memories planted by parents or lawyers
 - c. Misinformation effect:
 1. a form of memory distortion that affects memory and that is caused by misinformation provided during retention interval (Loftus also believed that it greatly effected eyewitness testimony)
 2. when people are exposed to misinformation, most people will misremember
 3. Confabulation (or false memory) – a mistake in memory during which a person “remembers” information that was never stored in memory
 - d. Imagination effect:
 1. repeatedly imagining nonexistent actions and events can create false memories
 2. the more vivid people can remember things the more convinced they become that these things happened [ex. – people who claim to have been abducted by aliens and subjected to medical exams]
 - e. Source Amnesia: (also called source misattribution) –
 1. attributing memories to the wrong sources (authors and songwriters sometimes think that an idea came from their own creative imagination when in fact they unintentionally plagiarized they had earlier read or heard)
 2. During three presidential campaigns Ronald Reagan told and retold a heroic sacrifice in which the brave soldier he served with received the Congressional Medal of Honor posthumously. A reporter looking into the story could not find a similar story – so he kept digging and found the exact scene told in the movie *A Wing and a Prayer* (1944).
 - f. Accuracy of eyewitness testimony involves the following:
 1. ease of recall – people who take longer to answer questions are less likely to be accurate
 2. degree of confidence – in memory is associated with better accuracy
 3. general knowledge about a subject – are better at testifying (ex. a mechanic could be better at identifying a specific car involved in a crime)
 4. racial identification – people are generally better able to recognize and recall their own race
 5. types of questions – leading or suggestive questions will produce misidentification of perpetrator
5. *Forgetting*
 - a. Decay theory (Ebbinghaus) – that memories consist of traces laid down in the brain that gradually deteriorate and fade away over time
 1. he found that most forgetting occurs very soon after learning
 2. however, when meaningful material is used, the forgetting curve is not so precipitous

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3. measures used:
 - a. retention is the amount of material remembered
 - b. recall - subjects produce the information on their own (e.g., essay questions)
 - c. recognition - subjects identify previously learned information (e.g., multiple choice questions)
 - d. most research shows that recognition is easier than recall
 - e. relearning - look for savings in the second time of learning

Ebbinghaus's Forgetting Curve



www.sc.maricopa.edu/.../psychscience/ FIGURES/forgetting.gif

- b. Interference theory – forgetting is the result of the interference of memories with each other
 1. retroactive interference – a form of interference in which newly acquired information interferes with retention of material learned earlier (ex. material was clear at 9:00 am in class and now home studying it does not seem clear)
 2. proactive interference – a form of interference in which material learned earlier interferes with retention of newly acquired information (ex. keep dialing an old phone number by mistake)
 3. serial position effect – the tendency to recall items at the start or end of a list better than the items in the middle
 - a. primacy effect – the tendency to recall items better when they are learned first
 - b. recency effect – the tendency to recall items better when they are learned last
- c. Motivating forgetting – repression of anxiety-provoking material
- d. Repressed Memories –
 1. Freud long ago suggested that memories repressed:
 - a. repressed memories are those which for some reason the individual keeps in the unconscious
 2. some people have suggested that memories which are "recovered" by therapists are memories which the therapists have created ("false memories")
 3. could be due to problems in source monitoring (remembering the origins of the memories)
 4. could be due to failures in memory reconstruction

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6. So Now What? - Improving Memory
 - a. study repeatedly to boost long term recall
 - b. spend more time rehearsing or actively thinking about the material
 - c. make the material personally meaningful
 - d. to remember a list of unfamiliar items, use mnemonic devices
 - e. refresh your memory by activating retrieval cues
 - f. recall events while they are fresh, before you encounter possible misinformation
 - g. minimize interference
 - h. test your knowledge, both to rehearse it and to help determine what you do not know

Notes based on information from the following sources:

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