

UNIT 7 – MEMORY, THINKING (COGNITION), and LANGUAGE

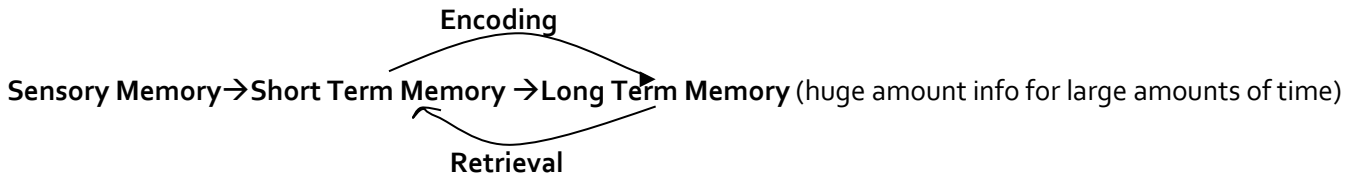
Memory

- ✓ **Cognitive Psychology**- studies internal mental processes (memory, thinking, problem solving, and language)
- ✓ **Memory**- process by which information is retained for later use; an indication that learning has persisted over time

Three Steps to Memory:

Encoding (putting info in) → Storage (holding it in) → Retrieval (getting info out)

3-Stage Model of Memory (Atkinson and Shiffrin):



- ✓ **SM**- holds large amounts of perceptual input for a short time:
 - **Iconic and Echoic Memory**: visual and auditory form of SM, respectively
 - allows us to construct cohesive experience of the world based on sensory input
- ✓ **STM**-working memory; holds relatively little info for few secs; allows for conscious processing of info
 - **Rehearsing**: repeating information over and over to retain it in STM
 - can increase total amount of info stored by **Chunking** (grouping info into clusters or chunks)
- ✓ **LTM**- memory store that holds a huge amount of info for long periods of time
 - **Encoding**: passing info from STM to LTM for storage
 - **Automatic Encoding**: space, time, frequency of events
 - **Effortful Encoding**: committing info to LTM through rehearsal and repetition
 - **Retrieval**: recovering info from LTM for use by STM/working memory
- **Herman Ebbinghaus**- created nonsense syllables to test own memory and found out that rote repetition keeps info in STM temporarily not permanently
 - deeper processing typically leads to better recall
 - **Primacy Effect**: increased memory for the first few stimuli in a set (time for encoding in LTM); especially for counting backward after hearing a list
 - **Recency Effect**: increased memory for the last few stimuli in a set (still in STM); especially for fast presentation of stimuli

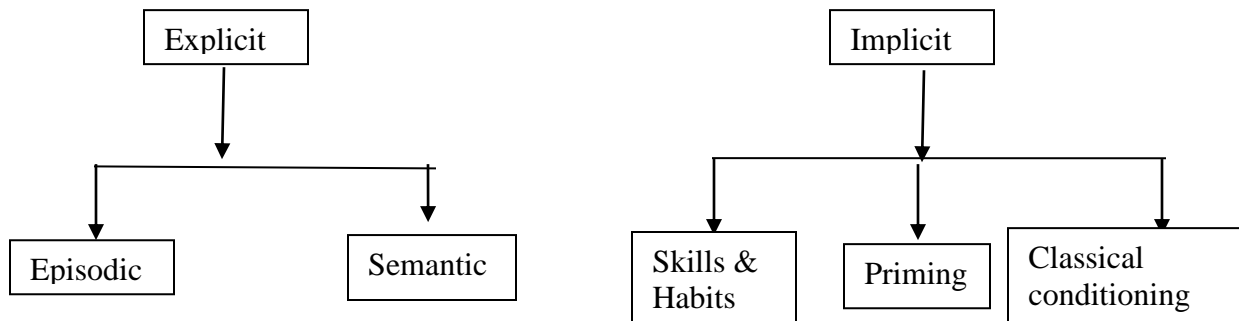
Memory Tips:

1. A little bit of extra time and effort at the beginning will save you lots of time and effort later
2. We remember info better when it is relevant to self (**Self-Referent Effect**)
3. Think info in vivid, imagery-filled ways

Types of Memory:

- ✓ **Explicit (Declarative Memory)**- memory of facts and experiences that can be retrieved at will and stored in LTM, used in STM
 - **Episodic**: memories of events and their context (time, place, and circumstance)
 - **Semantic**: memories of the meanings of words, concepts, and general facts about world
 - **Semantic Network**: semantic memories associated with related concepts in such networks; activation of one unit (e.g. food) in the network spreads to other related ideas (e.g. eat, bread, etc.)
 - Hippocampus active (even with hippocampus damage, older memories persist)
 - Active during slow-wave sleep → consolidation

- ✓ **Implicit (Non-Declarative)**- memory that can't be voluntarily called to mind, but still influences behavior or thinking (e.g. H.M who couldn't form explicit memories)
 - **Habit**: a well-learned response that is carried out automatically when appropriate stimulus is present
 - **Priming**: by having just performed a task, it's easier to perform the same or similar task in the future
 - **Classical Conditioning**
 - cerebellum plays a key role in forming implicit memories (damage leads to failure to learn conditioned responses)
- ✓ **Amnesia**-loss of memory usually caused by accident, infection, or stroke; often a damage to hippocampus
 - **Retrograde Amnesia**: disrupts old memories
 - **Anterograde Amnesia**: leaves already consolidated memories intact, but prevents new learning
 - Clive Wearing: memory loss-lost in time
 - Other important cases: N.N. suffered frontal lobe damage in car accident which led to inability to imagine future



Memory in Neural Level:

- increased serotonin production in certain synapses = greater efficiency of learning
- Long term potentiation- an increase in synapse's firing potential after brief, rapid stimulation
 - sending neuron: less excitatory signal to release neurotransmitter
 - receiving neuron: increased receptor sites

- ✓ **Retrieval cues**: stimuli that trigger or enhance remembering (memory is better when given cues that were present during learning)
 - **Déjà Vu**: eerie sense of having previously experienced a new situation; may be because presence of certain cues may elicit sense of memory, but not memory itself
 - **State-Dependent Memory**: retrieval better if person is in same psychological state that was present when info was first learned (we store emotionally charged memories better than non-emotional memories because of increased noradrenaline production, which is critical for hippocampus functioning)
- ✓ **Flashbulb memory**: an unusually vivid memory of a particularly dramatic event but such memories can become distorted with time

3 Reasons We Might Forget Something:

1) Encoding Failure

- Often don't encode the specific features necessary to 'remember' an object (e.g. change blindness)

2) Storage Decay

- Even after encoding, we sometimes forget often quickly

3) Retrieval Failure

- Inability to retrieve info LTM
- Tip of the tongue phenomenon**: inability to retrieve info, but perception that it is about to be retrieved
- **Inference**: disruption of the ability to remember one piece of info by the presence of other info
 - **Proactive Interference**-when old info disrupts recall of new info
 - **Retroactive Interference**- when new info interferes with old info
- **Repression**: defense mechanism that banishes anxiety-rousing thoughts, feelings, and memories to the unconscious
 - Elizabeth Loftus studied "false memory"

- Memory = stored info + assumptions + what we currently know
- Construction of memories during encoding, **Reconstruction** during retrieval
 - can lead to misinformed memories

Why do false memories happen?

- 1) **Misinformation Effect**- incorporating misleading info into one's memory of an event
- 2) **Source Amnesia**- attributing an event we have experienced, heard about, or imagined to the wrong source

Improving Memory:

- Be aware of ways that memory can fail (study repeatedly, think actively about material, minimize interference)
- Use retrieval cues to your benefit
- Make info personally relevant and emotional
- Attach vivid imagery to info

- ✓ **Method of Loci (Memory Palace):** items to be recalled are mentally placed in familiar locations; walk through locations to remember items
- ✓ **Peg Words:** "one is a bun..."- associate to-be-remembered info with peg words

Thinking

Thinking in Words:

- ✓ **Linguistic Relativity Hypothesis** (Whorf, 1956): our perceptions and thoughts are determined by language
 - Intuitive appeal of thoughts as words but...
 1. Difficulty "putting a thought into words"
 2. Words are often ambiguous, and thoughts are not
 3. Animals think, but do not use a spoken language
 - However, language does influence thinking.
 - Benefits of bilingualism:
 - Development of a cultural understanding
 - learning to inhibit attention to irrelevant info (because we inhibit one language while using another)

Thinking in Images:

Plato, Aristotle, Locke: thought= a stream of mental images

- ✓ **Mental Images:** mental representations as if perceived, but generated from memory rather than sensory input
- ✓ **Mental space:** "area" where mental images seem to occur
 - 3 Properties: spatial extent, limited size, grain

Thinking in Concepts:

- **Thinking in Concepts**
 - **Concepts** – mental grouping of similar objects, events, ideas or people
 - Some members of a group are "better" members of a concept. Like a sparrow versus and ostrich when thinking of the concept of birds
 - **Prototype** – the most typical example of a category (sparrow)
 - The closer to a prototype, the faster you can identify and the more confident you are in labeling that object
 - Memories shift toward prototypes over time
- ✓ **Representation Problem:** the challenge of how best to formulate the nature of a problem
 - **Functional Fixedness/Fixation:** difficulty abandoning one method of problem-solving to adopt another; inability to see problem from a new perspective
- ✓ **Algorithms:** methodical, logical rules that guarantee solving a problem
- ✓ **Heuristics:** a rule of thumb that does not guarantee the correct answer, but offers a likely shortcut to it
 - **Availability Heuristic:** belief that ease of recall= frequency of event (but it may not actually be true)
 - **Representativeness Heuristic:** stereotypes
 - **Anchoring & Adjusting Heuristic:** reference points that serve as anchors from which we adjust our judgements
- ✓ **Using Analogies**
- ✓ **Sudden Solution:** e.g. insight learning
- ✓ **Confirmation Bias:** tendency to search for info that confirms our ideas, beliefs, etc; in doing so we also tend to avoid contradictory info
 - People use their emotional minds, not rational minds, when their own opinions are on the line.
- ✓ **Belief Perseverance:** clinging to our beliefs, even in the face of contrary evidence

Language

- Language is **Generative**, meaning we don't just find sentences stored in our memory and use them; rather, we make them up as we go.
- ✓ **Phoneme**: the smallest sound unit
 - 20 to 80 phonemes in any given language (English≈40)
 - Consonant phonemes carry more info than vowel phonemes
- ✓ **Morpheme**: the smallest language unit that carries meaning
 - Phonemes can be morphemes (e.g. "l", "a", "-s")
- ✓ **Grammar**: system of rules that enables us to communicate
- ✓ **Syntax**: rules for combining words into grammatically sensible structures
- ✓ **Semantics**: rules for deriving meaning from morphemes, words, and sentences
 - e.g. "-ed" = past, "-s" = plural
 - independent from syntax
- ✓ **Pragmatics**: the way that language conveys meaning indirectly; by implying rather than asserting
 - Biggest obstacle to computerized language
 - Key to understanding metaphor
 - Although language is mostly centered in the left hemisphere of the brain, the ability to understand jokes depends on the right hemisphere.

Language Development:

- ✓ **Production**: the ability to speak, use language to communicate info
 - Controlled by **Broca's Area** (left frontal lobe)
- ✓ **Comprehension**: the ability to understand the message conveyed by language
 - Controlled by **Wernicke's area** (left temporal lobe)
- ✓ **Aphasia**: disruption of language caused by brain damage
 - **Broca's Aphasia**: problems producing language, long pauses, leaving out functional words
 - **Wernicke's Aphasia**: difficulty understanding others, "empty speech"
 - Not an absolute split; Broca's Area is somewhat involved with comprehension, and Wernicke's with production

Is language a result of Nature or Nurture?

- **Nature (Nativism)**: vocab, grammar acquisition much too rapid and novel to be simply learned.
 - **Language Acquisition Device (LAD)**: innate brain mechanism that allegedly contains grammatical rules common to all languages
- **Nurture (Empiricism)**: language learned through conditioning
 - Association between sights of objects and sounds of words
 - Limitation of models and reinforcement

Animal Cognition and Language

- Do animals think? Yes of course.
- Forming Concepts – animals know what other animals are
- Insight Learning – chimps are the best example, problems solving by using tools and figuring out how to get the banana (Kohler)
- Cultural Concepts among Animals
 - At least 39 localized chimp customs, tools used, grooming, courtship etc.
 - Australian dolphins (scientists are about to call dolphins sentient even)
 - These animals have a sense of self
- Communication v Language
 - Vervet monkeys have danger signals and calls
 - Honey bee dances
 - Rico the border collie knows over 200 items by name but is this language
- Criticisms of Language Research
 - Difficulty in learning signs
 - When sign are learned it's only for rewards
 - Lack of syntax in the chimps being taught
 - People only see the results they want to see