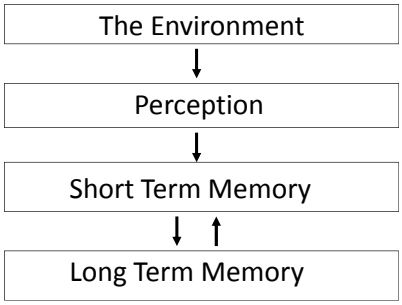
Memory

PSY 102 -- Lecture 10 -- Chapter 7

How does it all fit together?



Memory

- Ability to store and retrieve information.
  -What is information?
  -Everything is memory!

- Psychologists have three general questions:
  (1) How does information get into memory?
  (2) How is information maintained in memory?
  (3) How is information pulled back out of memory?

Three Systems of Memory

- Three memory systems, which differ on two dimensions.
  - Span: *How much info a memory system can retain.*
  - Duration: *Length of time a memory system can retain info.*

Fig. 7.3

Three Systems of Memory

1) Sensory Memory
   - Storage of perceptual information before *(if)* passed to short-term memory.
     - Iconic
     - Echoic
     - Haptic

-Very short retention periods.

-1.5 - 10 seconds

-Constantly updating.

Three Systems of Memory

2) Short-Term Memory
   - Information we are currently thinking about, attending to, actively processing, or working with.

- Retains information for limited durations.
  - No longer than 20 seconds.

-Lost quickly as a result of:

-Decay: Fading of information over time.

-Interference: Loss of information due to competition with other information.

Short-Term Memory

- Two types of interference:
  - Proactive Inhibition
    - Interference with acquisition of new information due to retention of previous information.

-Biology class before Psychology class.

  - Retroactive Inhibition
    - Interference with retention of old information due to acquisition of new information.

-Psychology influencing recall of biology.

Chunking

- Organizing info into groupings.
- Extends span of short-term memory. *7+2*

XIBMSATMTVPHDX

vs.

X IBM SAT MTV PHD X

-Chunks more effective if they are meaningful!

Short-Term Memory

- Rehearsal
  - Repetition increases how long info is retained.
  - Neglect to rehearse?

-Info will become inaccessible!

  - Maintenance Rehearsal:
    - Repeating stimuli in original form.
  - Elaborative Rehearsal:
    - Linking stimuli to each other in a meaningful way.

-Depth of processing:

-Deeper we "transform" info, the better we remember it.

Short-Term Memory

- Organizational Encoding
  - Act of categorizing information by noticing relationships among a series of items.
  - Improves recall!

Catregorizations!

Three Systems of Memory

3) Long-Term Memory
  - Sustained retention of info.
  - Times longer than short-term memory.

-Minutes, years, permastore.

Long-Term Memory

- Von Restorff Effect
  - Tendency to remember distinctive stimuli better than less distinctive stimuli.
- Primacy Effect
  - Tendency to remember the words at the beginning of a list very well.

-Reflects rehearsal and long-term me-

- Recency Effect *mory processes.*
  - Tendency to remember the words at the end of a list very well.

-Reflects short-term processes.

Types of Long-Term Memory

- Explicit (Declarative) Memory
  - Relates to facts and knowledge.
  - Conscious awareness of information.
  - Memories we recall intentionally.

Long Term Memory -> Explicit -> Semantic ->Episodic

-Two Types:

-Semantic memory.

-Episodic memory.

Long Term Memory -> Implicit -> Procedural -> Priming -> Conditioning -> Habituation

Types of Explicit Memory

- Semantic Memory
  - Knowledge of facts about the world.
  - General concepts and their relations.

-Does not refer to personal experiences.

-Example:
Clive + his piano.
-Are summers hot in Ecuador?

Types of Explicit Memory

- Episodic Memory
  - Recollection of events in our lives.
  - Personal experience is remembered in its temporal-spatial relation to other such experiences.

-Example:
-I have an appointment at 9:00 AM tomorrow."

Types of Long-Term Memory

- Autobiographical Memory
  - Memory regarding ourselves and our past events.
  - Contains both semantic and episodic information.

The Woman who can't forget by Jill Price (remembers every single moment of her adult life).

Autobiographical Memory

- Observer Perspective:
  -You there.
  - More common for distant memories.
- Field Perspective:
  -You not there.
  - More common for recent memories.

Types of Long Term Memory

- Implicit Memory
  - Memories we don't deliberately remember.
  - Automatic, doesn't require conscious effort.
  - 1) Procedural Memory
    - Memory for how to do things (inc. motor behaviour).
  - 2) Priming
    - Ability to identify a stimulus more quickly after we have previously encountered a similar/related stimuli.

Example of priming;

-Fill in the blanks: K---.

-King - because earlier in the lecture we encountered queen in red letters.

Types of Long Term Memory

- 3) Classical Conditioning
  - Associative conditioning between neutral and innately meaningful stimuli.
- 4) Habituation
  - Decrease in attention to familiar stimuli over time.

Information -> Knowledge; How?

Three stages of memory:

Encoding -> Storage ->

Three Stages of Memory

1) Encoding
  - Process of getting information into memory.
  - Information is translated into a neurologically meaningful messages.
  - Stored within the brain and recalled later from short-term or long-term memory.

Three Stages of Memory

2) Storage
  - Keeping information in memory.
  - Use of schemas to organize knowledge structures.
  - Law of Distributed Practice
    - Small increments over time is superior for retaining information.

-Not large increments over a brief amount of time.

-Massed Practice.

-Gives us frames of reference for interpreting new situations.

-Schemas simplify information processing.

Three Stages of Memory

3) Retrieval
- Reactivation/reconstruction of info from memory stores.
- Recall

-Retrieving previously remembered info.

- Recognition

-Retrieving previously remembered information from an array of options.

Retrieval Playing Tricks

-Tip of the Tongue Phenomenon

-The experience of knowing that we know something but being unable to access it.

Encoding Specificity

- We remember better when:
  - Conditions of retrieval are similar to those when we were encoding.

- Context-Dependent Learning
  - Superior retrieval of memories when the external context of the original memories matches the retrieval context.

Encoding Specificity

- State-Dependent Learning
  - Superior retrieval of memories when the organism is in the same physiological and/or psychological state as it was during encoding.

Based on memory research…

- Some helpful study tips for your final exams:

Distributed vs. Massed Study	Spread out study time, avoid cramming.
Elaborative Rehearsal	Connect new knowledge with existing.
Levels of Processing	Process ideas deeply and meaningfully, in your own words (not someone else's).
Mnemonic Devices	Recall cues to help connect your existing knowledge base to new material.

Neural Basis of Memory

- Karl Lashley (1920s)
  - Interested in finding the engram.
  - Physical trace of each memory in the brain.

-Rats in maze, cerebral lesions, impair memory?
-Location of damage didn't seem to matter!

- Donald Hebb (1949)
  - Engram is not located in any one place!
  - Rather in 'cell assemblies' of neurons.

-"Neurons that fire together, wire together."

Case of "H.M."

- At 16, experienced an epileptic seizure.
- At 27, multiple seizures per day.
- Dr. William Scoville, radical surgery (1953).

-Local anesthetic.
-Hand-held rotary drill.
-Two holes above eyes.
-Lever lifted frontal lobes.
-Sucked out parts of;
-Temporal lobe.
-Hippocampus.
-

-Issues with long term memory.
-No sort- to long term memory.
-Short-term and procedural types were okay.

-Didn't recognize himself in a mirror.

-Walked two block?
-Unable to find his way back.
-Went to the bathroom?
-Could not find his way back to his work-station.
-Even though it was marked with a flag.
-When he worked?
-Needed to be reminded of the task.
-Read a newspaper?
-Put it down. pick it up and read it again.

Amnesia as Memory Loss

- Retrograde Amnesia
  - Loss of episodic memories of our past before onset of amnesia.
- Anterograde Amnesia
  - Inability to encode new memories from our experiences since onset of amnesia.
- Infantile Amnesia *and Toddlerhood Amnesia*
  - Inability to recall events or personal experiences from infancy.

-Clive Wearing - The man with no short-term memory

-Case of H.M

Memory and Aging

- Memory loss varies with age!
- Many types do not show decline.
- Recall of new information, without cues.
  -Typically declines with age.
- Recognition of new information, with cues.
  -Typically does not decline with age.

Jeanne Calment - 122 years, 164 days

Besse Cooper - 116 years, 80+ days

-Many types do not show decline.

-Older adults can = younger.

-e.g., semantic, autobio, procedural.

Aging, Memory Loss, & Dementia

- 14.9% of Canadians 65 and older (n=747,000, 2011).
- Alzheimer's Disease: 64% of all dementias in Canada (2011).
  - Neural loss, beta-amyloid plaques, neurofibrillary tangles.
- Begins with recent events. *Hippocampus.*
- Ends distant past events.

Neural Basis of Memory

- Hippocampus
  - New explicit memories.
  - Short- to long-term.
- Temporal Lobes
  - Works with hippocampus.
  - Explicit memory.
  - Long-term memory.

-Where do other types of encoding take place?

-Frontal Lobes

-Semantic memory

-Occipital Lobes

-Visual Memory

Neural Basis of Memory

- Long-Term Potentiation (LTP)
  - Changes with neurons and synapses in forming memory.
  - Gradual, long-term strengthening between neurons.
  - Result of repetitive, simultaneous stimulation of pre- and post-synaptic neurons.

False Memories

- Elizabeth Loftus
  - Demonstrated the effects of misleading suggestions on memories.
- Misinformation Effect
  - Creation of false memories by providing misleading information about an event after it takes place.
- Implanted Memories