Memory
By: Glossololia
Three Stage Model of Memory

- Sensory Memory
- Short-term Memory
- Long-term Memory
Sensory Memory

- **Sensory Memory** is the set of sensory registers, one for each of our senses, that serve as holding places for incoming sensory information until it can be attended to, interpreted, and encoded into short term memory.

- In Short: sensory memory is the shortest-term memory storage that we have.
- It is used to retain the impression of a stimulus even after the stimulus has stopped.
- Without sensory memory, we would not be able to experience anything.
- **Iconic memory** is the visual sensory register that holds an exact copy of the incoming visual input but only for a brief period of time, less than one second.
- Iconic memory is like photographic memory but it only lasts for less than one second. During this time an exact copy of the visual information exists in the brain.
- A way to prove the existence of this type of memory is through a temporal integration procedure =>
Short-term Memory

- Short-term Memory is the memory stage with a small capacity and brief duration that we are consciously aware of and in which we do our problem solving, reasoning, and decision making.

- To test a person’s short term memory researchers use a memory span task in which they present a series of items on at a time and the person has to remember them in the order they were presented.

- These tests are used to measure a person’s memory span by the average number of items they can remember over multiple tests.

- The items in these tests can be classified as chunks or a meaningful unit of memory.
Researcher’s have also estimated the duration of short term memory to be less than 30 seconds.

To measure this, researchers came up with a method called the distractor task.

Using this method individuals are provided with a small amount of information to recall and are then given a mildly difficult task, such as counting backward by 3s aloud, to distract them from memorizing the information for a certain period of time. After the distraction time is over the individual is then instructed to recall the information. Multiple tests with varying distraction times results in the individual’s average short-term memory duration.

A method used to combat short term memory loss is Maintenance rehearsal, in which a person repeats the same information multiple times in order to maintain it in the short-term memory space.

Working memory is defined as the mechanisms that allow short term memory to accomplish its tasks such as processing audio and visual cues and how they relate to one another to create a meaningful experience.
Long-Term Memory

- **Long-term Memory** is the memory stage in which information is stored for a long period of time and whose capacity is essentially unlimited.

- The different types of long-term memory are:
  - Explicit (declarative) memory
    - Semantic memory
    - Episodic memory
  - Implicit (nondeclarative) memory
    - Classical conditioning
    - Procedural memory
    - Priming
Explicit memory is things that we consciously remember or consciously committed to memory

- It is made up of semantic memories (factual knowledge) and episodic memories (personal experiences)

Implicit memory is things that we do not consciously remember

- It is made up of classical conditioning (automatic conditioned responses), procedural memory (muscle memory and procedural thinking), and priming (influence by an earlier stimulus to the response to a later stimulus)
Distinction between Short-Term Memory and Long-Term Memory

- In order to determine that there is a difference between long-term and short-term memory researchers use a test called the free recall task where participants are given a list of words to remember and the participant is allowed to recall the words in any order they wish.
- This shows the primacy effect and the recency effect
- The primacy effect is related to long term memory. It is considered the superior recall of the beginning of the list in comparison to the middle of the list
- The recency effect is related to short term memory and it is considered the superior recall of the end of the list in comparison to the middle of it.
**Primacy effect**
Initial items are stored in long-term memory more efficiently.

**Recency effect**
Last few items are still in working memory and are readily available.

*Source: Two Stage Mechanisms in Free Recall (1966), Glanzer & Cunitz*
Amnesia

- **Amnesia** is the loss of long-term memories due to brain damage, disease, or psychological trauma.
- An Amnesiac is a person with severe memory deficits after brain surgery or injury.
- There are two different types of amnesia, anterograde amnesia and retrograde amnesia.
- Anterograde amnesia is the inability to form new memories while still retaining memories from before the injury or surgery.
- Retrograde amnesia is the inability to remember the past, especially episodic information.
* There is also **infantile/child amnesia**

* This is the inability of adults to recall events that happened before the age of three.

* Scientists believe that this amnesia is due to the fact that the hippocampus (the part of the brain responsible for episodic explicit long-term memories) is not fully developed yet.
Encoding Information into Memory
There are three essential processes in our memory system—encoding, storage, and retrieval.

- Encoding: the process of transferring information from one memory stage to the next (from sensory into short-term memory and from short-term into long term memory)
- Storage: refers to the process of maintaining information in a particular stage. Storage is temporary except for in long-term memory.
- Retrieval: the process of bringing information stored in long-term memory to the conscious level in short term memory.
There are three essential processes in our memory system—encoding, storage, and retrieval.

- **Encoding**: the process of transferring information from one memory stage to the next (from sensory into short-term memory and from short-term into long-term memory)

- **Storage**: refers to the process of maintaining information in a particular stage. Storage is temporary except for in long-term memory.

- **Retrieval**: the process of bringing information stored in long-term memory to the conscious level in short-term memory.

Encoding and retrieval determine the flow of information within the three-stage system. Information is first encoded from sensory memory to short-term memory, where it can be stored temporarily.

Information is then coded from short-term to long-term memory, where it is stored more permanently, but can be retrieved and brought back into short-term memory when we need to use it.
How We Encode Information

- **Automatic processing** is memory processing that occurs subconsciously and does not require attention. For a particular type of processing to become automatic, much practice is needed. For example, when you’re learning to read, it is very difficult and effortful at first, but after years of practice, it becomes easier and more automatic.

- In contrast, **effortful processing** is memory processing that occurs consciously and requires attention. For example, say you are trying to learn a word in Spanish. You will constantly have to practice saying that word in order to learn it.

- Processing explicit memories require conscious effortful processing.

- Subconscious automatic processing is responsible for storing implicit memories.
The levels-of-processing theory was founded by Fergus I. M. Craik & Robert S. Lockhart. The theory describes types of encoding lead to better retrieval. This theory assumes that incoming information can be processed at different levels, from the simplistic physical level to the semantic level. The semantic processing, especially the elaborative semantic processing to better memory.

According to this theory there are three (3) general levels of processing—physical, acoustic, and semantic. Each level is deeper than the next.

Say you are trying to process the word “apple" You can process it as a string of lower case letters. That would be the physical level. Then, you can process the word “apple" by how it sounds. That would be the acoustic level. Thirdly, you can process what the word “apple" means and then elaborate on its meaning by relating it to what you know about apples.
Elaborative Rehearsal is a type of rehearsal in short-term memory that is done by relating the new material to information already encoded in your long-term memory.

This organization leads to more successful retrieval of the information than shallower processing. It also provides more retrieval cues (links with other information in long-term memory) for the new information.

In elaborative rehearsal, you should try to relate the new information to something you know well. Because you know yourself so well, you should elaborate by tying the new information to yourself. To learn new concepts, you should personalize them by thinking of examples of these concepts in your own experiences. It is easier to remember information related to yourself. This is called the **self reference-effect**. (Symons & Johnson, 1997)
Environmental Effects on Encoding

- The **encoding specificity principal** proposes that the environmental cues (both internal and external) present during encoding serve as the best cues for retrieval.

- Internal environmental cues refer to internal cognitive processing, what you were thinking about during rehearsal. (A person’s mental activities at the time of encoding.)

- Many research studies have shown that long-term memory is better when the physical study and test environments are as similar as possible.

- External environmental effects on learning diminish when the learning has taken place in several environments (Smith, Glenberg, & Bjork, 1978).

- **State-dependent memory**: the best long-term memory occurs when people are in the same physiological state at the time of encoding and retrieval.
  - For example, people who are drunk at the time of encoding would recall best if they were drunk at the time of retrieval.
Mood-dependent memory is when the retrieval of a particular memory is better when a person’s mood at retrieval is the same as it was during encoding. It is like state-dependency memory, except the retrieval depends on your emotional state instead of your physical state.

Mood-congruence effect is the tendency to recall memories that are congruent with a person’s current mood. A particular mood cues memories that are consistent with that mood. We tend to remember more positive events when we are feeling good and more negative events when we are feeling down.
How to Improve Encoding (Memory)

- A mnemonic is a memory aid. Mnemonics are useful for remembering lists of items, especially ordered lists, speeches, and long passages of text.

- **Method of loci (Yates, 1966):** a mnemonic in which sequential pieces of information to be remembered are encoded by associating them with sequential locations in a very familiar room or place, and then the pieces of information are retrieved by mentally going around the room (place) and retrieving the piece at each location.

- **Peg-word system:** you visually associate the items in a list with a jingle that you first memorize. You then associate each successive item in the list with the object for each successive number.

There are three concepts that will help improve encoding and retrieval other than elaborative rehearsal and the use of mnemonics:

1. Distributed studying is better than cramming
2. Practice makes perfect
3. Testing enhances memory

**Spacing Effect:** Superior long-term memory for spaced study verses massed study. Your memory will improve if you distribute your studying for an exam over the entire preparation interval and not just a few days before the exam (Payne & Wenger, 1996). The more you study, the more you learn.