

Memory Processes

by Sophia



WHAT'S COVERED

This lesson is going to cover the process information goes through to become a memory. You will also consider how understanding this process can help strengthen your problem solving skills. You will be examining:

1. Memory

One of the most important aspects of human psychology is memory, or the way the mind acquires, encodes, stores, and later uses information. This is a process that is behind all of the higher-level mental processes that we use.

➞ **EXAMPLE** For instance, you can't form opinions about other people if you don't remember who they are or what kind of prior experiences you've had with them.

As important as memory is, knowledge about how memory actually works is somewhat limited. It is known that there are certain brain structures involved with forming memories:

- *The Hippocampus*. This is a structure that is located inside the brain as part of the limbic system, and it helps in the formation and organization of new memories.
- *Neurons*. When a person learns, new connections are created between neurons. There are new dendrites and axons that branch together and create those connections.
- *The Cerebral Cortex*. There are certain areas of the cerebral cortex, the wrinkled outer layer of the brain, that are responsible for certain types of memory.

There isn't one specific area in the brain that is devoted entirely to memory, but again, exact studies about memory can be somewhat difficult considering the nature of memory and how it works. The biological study of memory is a bit more limited.

2. Memory Formation

Despite these challenges, information about the process of memory and all the different steps that occur to form new kinds of memory are known. In the process of forming new memories, a person starts with all of the sensory information that is constantly occurring around them like sights, sounds, smells, tastes, and touch. Most of this is not paid attention to because there is too much going on to take it all in at once.



WATCH

Ever wonder why a favorite meal reminds us of home? Or why flavor can bring on such strong feelings? In this video, celebrity chef Ashley Clay and neuroscientist Rachel Herz do a deep dive into the tastes that trigger our memories. You'll discover why the foods we eat matter so much in our minds and explore the science behind this psychological phenomenon.

2a. Sensory Memory

This sensory information goes into our **sensory memory**. This is a brief, normally unconscious, copy of the sensory information occurring all around, within the brain. Most of this information is discarded, but some is retained for later use.

Now, there are different kinds of sensory memory:

- **Iconic Memory:** Any visual or sight information taken in
- **Echoic Memory:** Any auditory or hearing information that is absorbed. Most of this is unconscious and lasts for only a few seconds.



TERMS TO KNOW

Sensory Memory

Brief, normally unconscious copies of sensory information around us, which can either be discarded or remembered for later use.

Iconic memory

Visual/sight sensory memory.

Echoic Memory

Auditory/hearing sensory memory.

2b. Stages

Once information passes from our sensory memory, there are three basic steps that this information undergoes in order to create a new memory:

1. **Encoding.** This is where the brain processes this sensory information into a form that can be remembered.
2. **Storage.** Next, the brain retains that information for later use. That information is kept in the brain as either short-term or long-term memory.
3. **Retrieval.** This is the last stage, in which a person retrieves that information from storage for use.

IN CONTEXT

Suppose you are walking down the street on your way to work one day. As you walk through the crowd, you see all sorts of people around you.

Information about them—their clothes, their faces, etc.—is being taken in by your sensory memory, but most of it is forgotten because it is not considered important. Only when something grabs your attention will the information make its way to the encoding stage.

Suddenly you see a clown walking through the crowd. This might divert your attention enough to take that information and encode it as part of your general memory.

You would attach some bit of information to the sensory information, like the thought, “It is very strange to see a clown walking down the street on a Tuesday.” This is when that information would move to the storage stage.

Finally, that information would go to the third stage of the general memory, when you retrieve the information to tell your coworker later that day.



TERMS TO KNOW

Encoding

The first stage of forming a memory, where the brain processes the sensory information into a form that can be remembered

Storage

The second stage, in which the brain holds on to and retains the information for later use

Retrieval

The third stage, in which the person remembers the information that was stored, or they retrieve the information from storage

3. Short-Term Memory

When forming memories, much of the information a person first takes in is discarded. However, if something catches a person’s attention or they choose to focus on a piece of sensory information, it will move into **short-term memory**.

Short-term memory is a system of memory that temporarily stores small amounts of information that we are aware of. The important aspect of short-term memory is what is called selective attention. Selective attention allows us to focus on specific details and information, and bring them to our conscious awareness.

➞ **EXAMPLE** If a teacher is in a noisy classroom, they might not be able to focus on every student at once. The teacher can use their selective attention to focus on one particular student that needs help, and not be overwhelmed by the sensory information around them.

Working memory is similar to short-term memory in that it allows us to take information and be aware of it consciously for a short period of time, but it also allows us to manipulate and process it. It helps a person to encode the information with meaning, which is later used to store the information in the long-term memory.



TERMS TO KNOW

Short-Term Memory

The system of memory that holds small amounts of information that we are consciously aware of for short periods of time.

Working Memory

Memory which allows us to not only take in information like short-term memory but also examine,

manipulate and process it.

3a. Capacity

So, what is actually meant by short-term memory?

- Information can be retained in the short-term memory anywhere from just a few seconds up to 20 to 30 seconds in length. This period of time can be extended, and the information kept longer if it is repeated or rehearsed. When information is repeated, it is put right back into the short-term memory.
- Short-term memory is very sensitive to interruptions. Suppose you are trying to remember a phone number. If someone comes up to you and begins talking to you about other numbers, you may lose the phone number from your short-term memory.
- Short-term memory can hold approximately seven to nine different **information bits**. If you're trying to remember a person's phone number, then remembering seven numbers is doable. However, if you also have to remember the area code, now you've got 10 pieces of information to remember, which might be a lot more difficult.
- We can remember more information if we divide it into **chunks**. Chunking means putting together the pieces of information into more meaningful groups so we can more easily remember them. If you had four numbers like 1, 9, 8, and 4, you might forget them when trying to remember each one individually. However, if you put them together into 1984, like the year, then you will be able to remember those numbers more easily.}}
- Information can also be stored within the short-term memory visually, as images or aspects of images, but more often information is stored through phonetic meaning, or the sounds that the information makes. A person is more apt to remember a name that they hear in the short term versus a picture or place.
- Information in the short-term memory can be further processed and passed on to the long-term memory for longer storage. Or, information in the short-term memory can be forgotten. Most of the information in the short-term memory simply gets dropped from memory; only important things are remembered in the long-term memory.

IN CONTEXT

It might be helpful to use an analogy to understand memory. Think of your memory as an office worker sorting paperwork. The papers are piling up on this person's desk. Most of these papers are ignored. They are just sensory information, and they are tossed directly into the trash.

Certain papers, however, have a big notice at the top, that says "PAY ATTENTION!" The worker will review these documents. They represent your short-term memory.

At this point, most of these papers are still irrelevant, and will get discarded, but those that are important will be filed for later use by the worker.



TERMS TO KNOW

Information Bits

Individual pieces of information that a person can retain in their short-term memory (which holds between 7 and 9 bits at a time).

Chunk

Information put into a meaningful group, which allows a person to remember more.

4. Long-Term Memory

Long-term memory is a system of memory that allows information to be filed and stored away for later retrieval and use. This memory storage is seemingly limitless. A person doesn't need to forget old information in order to remember something new.

In the long-term memory, information is stored according to its meaning, because information encoded with meaning is stored better. Humans don't tend to remember things in lists; information isn't memorized without any context to it.

Instead, people put information into categories grouped by similarities, differences, images, or symbols. This helps a person to place bits of information together and to connect it in their mind so that it makes sense. This concept plays a role in cognitive theories of psychology and the creation of schema, which are mental constructs that organize information.

These long-term memories are considered to be relatively permanent. Unless something interferes with the information or it's badly encoded, to begin with, it will be remembered essentially for the rest of a person's life.

Long-term memory is normally outside of consciousness. A person doesn't remember all of their memories all the time. If information in long-term memory is needed, it is retrieved or brought to consciousness by memory in order to be used.

There are different types of long-term memory storage that a brain uses:

- Procedural Memory
- Declarative Memory



TERM TO KNOW

Long-Term Memory

The system of memory that allows information to be filed or stored away for later retrieval and use.

4a. Procedural Memory

The first type is **procedural memory**, which pertains to actions or skills, or how to do certain things. Procedural memory includes abilities like riding a bike, driving, tying shoes, or cooking a meal.

Procedural memory is more implicit, and is a conditioned response. It is related particularly to the hindbrain, the section of the brain that includes the cerebellum; it is a more basic part of the brain, and at the core.



DID YOU KNOW

In cases of amnesia where people forget information like who they are, who their spouse or children are, or even their childhood memories, the person oftentimes will still retain their procedural memory. They will still be able to perform certain kinds of practiced actions that they learned throughout their lives. They haven't lost all of their memory, just more of their declarative memory, which will be covered next.



TERM TO KNOW

Procedural Memory

Long-term memory of actions and skills, or how to do certain things.

4b. Declarative Memory

Declarative memory is the opposite of procedural memory. This is the long-term memory of more explicit and factual information like words, numbers, or symbols. Declarative memory comes in two forms:

- **Semantic memory**, which is any fact-based memory that is impersonal and detached. It isn't directly related to the person and is more knowledge of the world around us.
- **Episodic memory**, which is personal information of specific events, experiences, or different episodes in our lives. The episodic memory would include things like your fifth birthday, your first kiss, the birth of your child, or your marriage.



Problem Solving: Skill Tip

With a better understanding of how your brain stores memories, you can avoid the tricks your brain plays on you as you try to retrieve those memories. This insight will help you access information more easily, strengthening your problem solving skill.



TERMS TO KNOW

Declarative Memory

Long-term memory of more explicit, factual information, like words, numbers, and symbols.

Semantic Memory

Fact-based, impersonal knowledge of the world.

Episodic Memory

Personal memory of specific events and experiences.



SUMMARY

Memory is one of the most important parts of psychology because much of a person's higher functions are based on it. Knowledge about how memory works is somewhat limited; while some of the physical structures associated with memory are known, it is a difficult aspect of psychology to study.

There is, however, some understanding of the **stages of memory formation**. Information starts by entering our sensory memory. Most of this is unconscious, and much of this information is discarded. If something is important, it enters the encoding part of the process. It is then stored in either short-term or long-term memory. The final stage of memory formation is the retrieval of the information.

When a person decides to focus on a piece of sensory information, it will move into **short-term memory**. This is the system of memory that temporarily stores small amounts of information.

Short-term memory has limited **capacity**. Information can be held for up to 30 seconds, but this

timeframe can be extended if the information is repeated. Short-term memory is also sensitive to interruptions. Only around seven to nine bits of information can be retained at a time, but the amount can be increased by chunking information into meaningful groups.

Long-term memory is a system of memory that allows information to be filed and stored away for later retrieval and use. The storage space is seemingly limitless and relatively permanent. Information is stored and tied with meaning. There are two types of long-term memory. **Procedural memory** is memory of action or skills, while declarative memory is the memory of more explicit, factual information, like words, numbers, and symbols. **Declarative memory** comes in two forms: semantic and episodic. Semantic memory pertains to information that is impersonal, like scientific facts, and episodic memory involves information related to an individual's personal memories of specific events and experiences.

Good luck!

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TERMS TO KNOW

Chunk

Information put into a meaningful group, which allows a person to remember more.

Declarative Memory

Long-term memory of more explicit, factual information, like words, numbers, and symbols.

Echoic Memory

Auditory/hearing sensory memory.

Encoding

The first stage of forming a memory, where the brain processes the sensory information into a form that can be remembered.

Episodic Memory

Personal memory of specific events and experiences.

Iconic Memory

Visual/sight sensory memory.

Information Bits

Individual pieces of information that a person can retain in their short-term memory (which holds between 7 and 9 bits at a time).

Long-Term Memory

The system of memory that allows information to be filed or stored away for later retrieval and use.

Procedural Memory

Long-term memory of actions and skills, or how to do certain things.

Retrieval

The third stage, in which the person remembers the information that was stored, or they retrieve the information from storage.

Semantic Memory

Fact-based, impersonal knowledge of the world.

Sensory Memory

Brief, normally unconscious copies of sensory information around us, which can either be discarded or remembered for later use.

Short-Term Memory

The system of memory that holds small amounts of information that we are consciously aware of for short periods of time.

Storage

The second stage, in which the brain holds on to and retains the information for later use.

Working Memory

Memory which allows us to not only take in information like short-term memory but also examine, manipulate and process it.