



# Memory and Brain Injury

## What is memory?

Throughout the years, memory has been described in different ways. The ancient Greeks described memory as a warehouse where information is kept. Plato and Aristotle described memory as a bird cage. Birds that flew into the cage represented information that was being taught, birds in the cage represented what we already knew and birds on their way out of the cage represented information about to be forgotten.

When we talk about memory, we mean a person's ability to store information and to recall the information at a later time. Memory functions include the ability to receive and store as well as interpret and use stored information. Memory is part of what characterizes our personality. Memory contributes to our identity through providing the skills to store and recall hopes and aspirations as well as perceive time and context.

Our driving force to remember something is largely influenced by our values and previous life experience. Strong emotions can often amplify a memory. Memory is also associative, which means the thought of something will make us remember other related things. The associations are not usually conscious in thought, and many memories are afterthoughts.

It is human nature to fill in memory blanks or guess something we did not really understand.

## Memory is a process

Memory is a process and there are extensive brain networks that control and regulate this process. The process can be summarized in three steps.

Firstly, we perceive information through senses: sight, hearing, touch, smell and taste. The more senses involved in the memory process, the easier it will be to remember. For example, smell can amplify the memory of an event. Additionally, memory can be enhanced when information is written down after hearing information. To perceive what is happening around us, we need concentration and attention.

Secondly, new information is stored as soon as it has been processed. To store the information, we must first register and process it. In turn, information can then be encoded and stored appropriately.

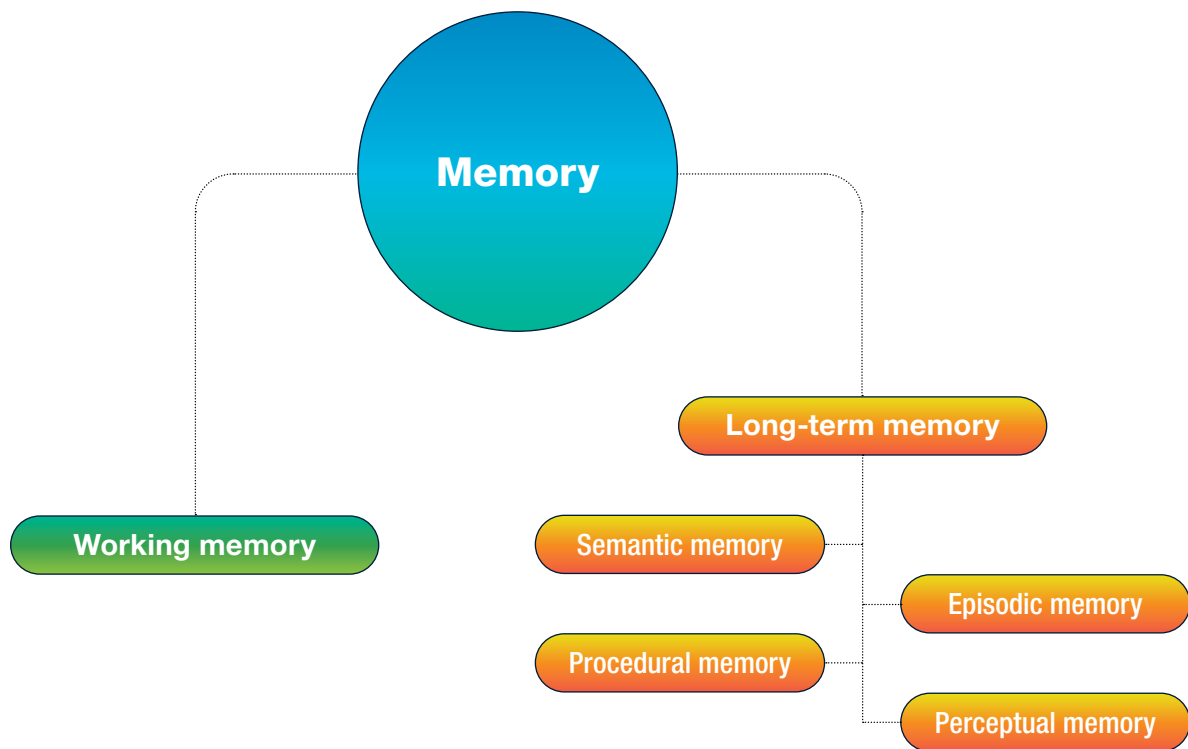
Thirdly, and the last part of the process is the retrieval. We need to be able to find information and pick it up later. Memory problems may be due to a breakdown anywhere along the process.



There is no one center in the brain for storing memories, instead many parts of the brain are involved in the process. Where memories, or parts of memories, are stored is determined at the time of entry by the type of task the memory is stored for. The Hippocampus is an important structure in the brain when it comes to memory for events and facts. The Hippocampus is found in the inner part of the temporal lobe and is central to connecting the memory networks. It is described as the center that binds memories into a whole.

## Memory systems

Memory is divided into working memory and long-term memory. Working memory is about keeping current information available for a short while. Long-term memory is a more lasting memory which consists of several different subsystems that have interacting functions. The most familiar long-term memory systems are memory for events (episodic memory) and memory for facts (semantic memory). The longterm memory system also includes the memory of skills (procedural memory) and memory for identifying objects and orienting ourselves in the outside world (perceptual memory).



## Time axis of the memory

Memory processes and stores what we have done or learnt earlier in life. Our memory also keeps track of what is happening in the present and what we are expected to do in the future.

### Retrospective memory

Retrospective memory is about remembering what has happened in the past. It includes memories of personal experiences, knowledge we have acquired and skills we have learnt.

### Prospective memory

Prospective memory helps us keep in mind what we're going to do in the future, such as remembering to buy milk on the way home from work, turning the oven off or taking medicine. Prospective memory helps us perform a specific action at a certain time. For a person living with an acquired brain injury it is common to be dependent on others or to need compensatory strategies and aids to cope with everyday life if prospective memory is impaired. The prospective memory is also known as the planning memory.

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## Memory problems

Memory problems can affect everyday life. Some of the most common problems for people with memory impairment are that they:

- forget what they have been told
  - forget names
  - forget where they placed things
  - get lost in known and unknown places
  - forget to do important things
  - forget if they did something or not
  - ask the same question several times
  - tell the same story several times
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## Cause of memory problems

This text focuses on memory impairment after acquired brain injury. Acquired brain injury (ABI) means an injury to the brain that occurred after birth. The most common causes of ABI are trauma

and stroke. Memory difficulties are one of the most common problems after an ABI. Memory problems can occur regardless of where the brain damage is located and can present in different ways. Generally, problems with working memory are more common than problems with long-term memory.

Memory is also affected by other medical conditions such as dementia, anxiety and depression. In addition to various medical conditions, there are other factors that impact on memory. Below are some factors that can be addressed to positively influence memory impairment.

### Motivation:

If we do not feel a sense of benefit or if we lack a connection to the information presented, the likelihood of remembering will decrease. Interest or motivation plays an important role in the ability to remember. Motivation can be interpreted as a reason for memory impairment when in fact; memory impairment is often caused by the direct damage to the brain. For example, the person with a brain injury might be told that he or she will perform better if they just try harder. If memory problems have occurred after brain injury, the solution is rarely to try more, but instead to gain a greater understanding of how memory works and find new ways to cope with their changes.

### Stress and sleep:

Stress is a state of increased psychological and physiological preparedness. It is the body's way of responding to internal or external factors (stressors) that are interpreted as threatening. Our body reacts with a stimulated immune system, elevated heart rate and respiratory rate, as well as increased blood pressure and muscle tension. In the short term, we can function better, but in the long term the effects of stress will be negative.

Sleep problems and stress are usually related. High stress can cause sleep problems, but sleep problems can also cause stress. When we do not get the recovery we need, it is easy for our body to get into a cycle where sleep loss leads to increased stress, which in turn leads to even worse sleep.

Working memory is negatively affected by stress and sleep deprivation. Concentration and attention also worsens due to stress which reduces learning ability and long term memory storage.

### Organisation:

It is beneficial to 'think big' which is a strategy of focusing on the overarching purpose of the task instead of the individual components. This strategy reduces strain on memory.

If there are limitations in routine and organisation in everyday life, a strain is put on the memory. For example, it is a common belief that it is due to poor memory when we cannot find our keys. Instead, it is often a lack of organisation, as we do not have a routine and consistent location for where we place the keys.

### Age:

Memory capacity changes with age but with great individual differences. The memory system that is most affected by age is episodic memory, that is, the memory of our personal experiences. Often, the ability to remember what happened recently, what was talked about a few days ago, or was done a week ago is affected. On the other hand, the memory for knowledge (semantic memory) is not as negatively affected with age. The brain processes information slower as we age, and for working memory to function well, it is necessary to make subsequent adjustment, for example, take more time to handle information.

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