

THE CONSOLIDATION GORDONS

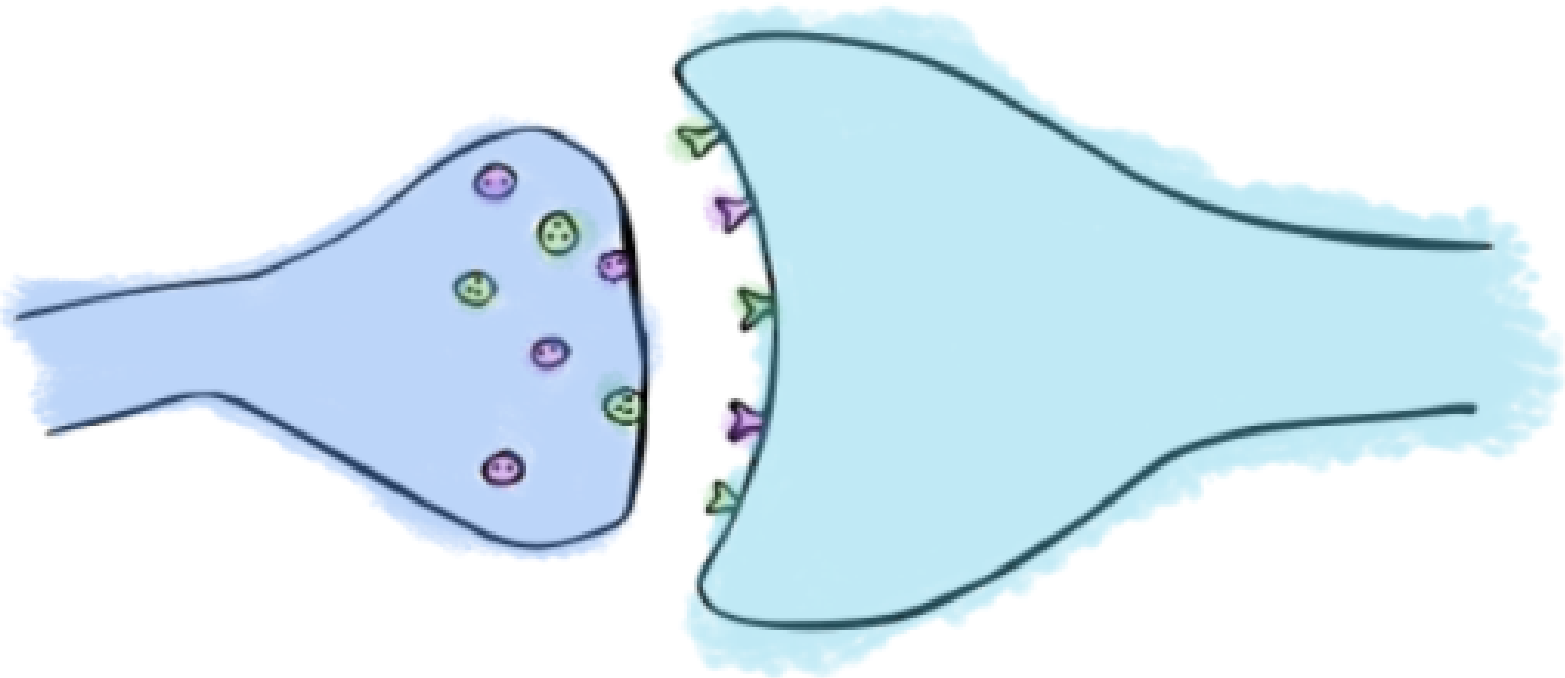
LEARNING INTENTIONS

1. Name the key brain structures involved in memory.
2. Outline the differences between short term and long term memory.
3. Be aware of the role of neurons and neurotransmitters in memory consolidation.
4. Distinguish the different types of long term memory.
5. Be aware of creating a false memory.

Experiences & Outcomes

SCN 3-12a - I have explored the structure and function of organs and organ systems and can relate this to the basic biological processes required to sustain life.

SCN 1-20a - I have contributed to discussions of current scientific news items to help develop my awareness of science.

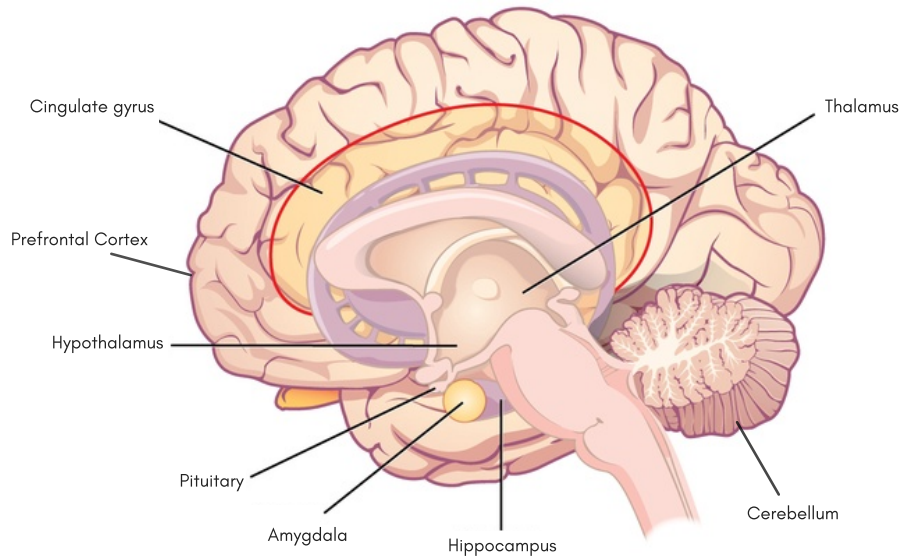


BY KATIE WELDON

WHAT IS MEMORY

Memory is the term given to the process of retaining and recalling information. Memory shapes who we are, the way we think and react to situations, and the emotions we feel.

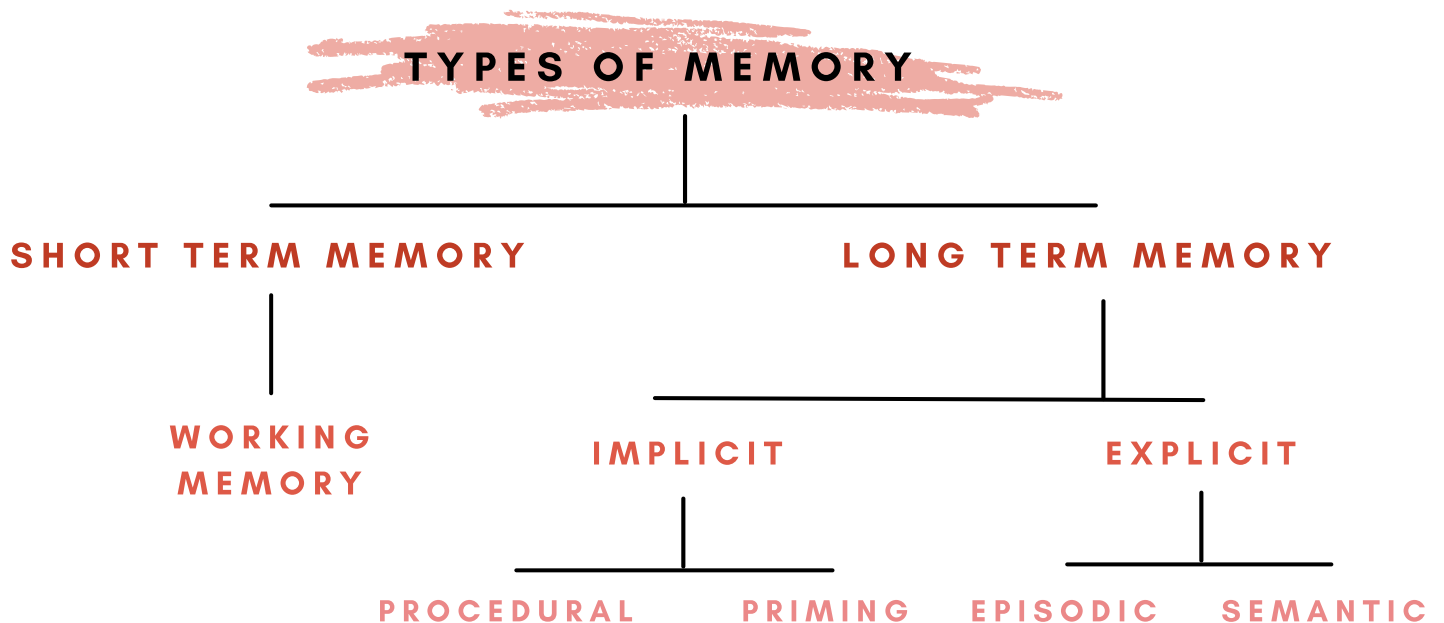
Processing of memory is not limited to one brain region and instead involves many different brain regions. There are four key areas of the brain involved, the amygdala, the hippocampus, the cerebellum, and the prefrontal cortex.



TYPES OF MEMORY

There are two main types of memory: short term memory and long term memory which is further divided into two categories.

#There is also a third type of memory called working memory which is a type of short term memory that allows us to remember information while doing something else. For example, remembering someone's address while being given directions to get there.



SHORT TERM MEMORY

Short term memory temporarily stores information then dismisses it or transfers it into long term memory.

Short term memory has a limited duration of around 15-30 seconds and a limited capacity of approximately 7 items. We can increase the capacity of our short term memory by a process called **chunking**.

Chunking is when we group information together improving the amount of information we can remember. An example of this is learning the first 12 digits of Pi. Trying to recall the 12 digits individually can prove difficult, instead we can group them to create four sets of numbers:

3.14159265358 → 314 - 159 - 265 - 358

MEMORY CONSOLIDATION

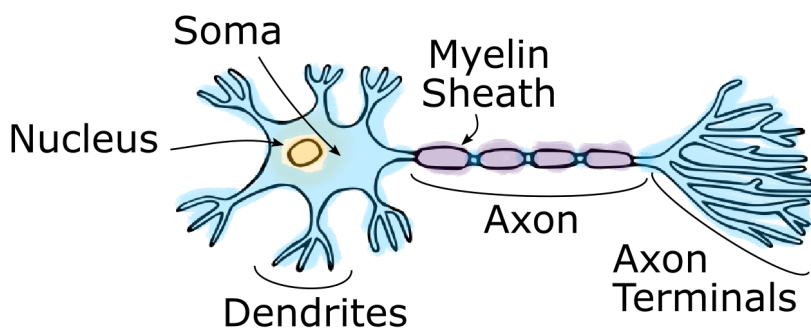
Memory consolidation is the process of converting short term memory to long term memory.

Our brains contain billions of nerve cells called neurons. These cells communicate with each other at a specialised point called a synapse - a gap between the neurons. Neurons send messages through electrical impulses and chemical messengers called neurotransmitters. Repeated activity by neurons leads to increased neurotransmitters in the synapses and stronger synaptic connections.

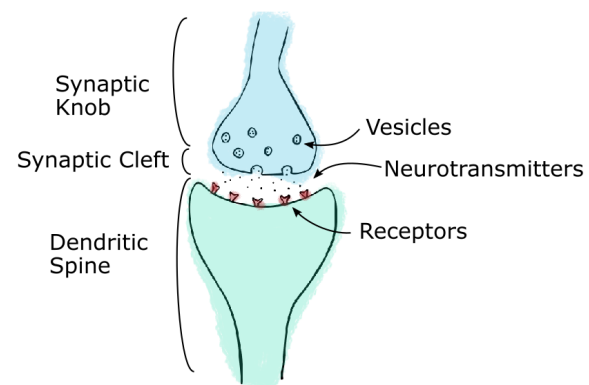
The stronger the synaptic connections are the easier it is to retrieve the memory.

Did you know... Sleep aids memory consolidation, make sure to get a good nights sleep after studying to help improve your memory of the information!

BASIC STRUCTURE OF A NEURON



SYNAPSE



Fun Fact: Every time we form a new memory, we create new synaptic connections meaning our brain is continuously changing!

LONG TERM MEMORY

Memories stored in long term memory are stored for an extended period of time, this can be days, months, years, or even a lifetime.

Once a memory is stored in long term memory it does not mean we will remember it forever. If we stop retrieving a memory, the synaptic connections can weaken, and we can forget it.

Long term memory is further divided into two categories, **implicit and explicit memory**.

IMPLICIT

Implicit memory is commonly referred to as unconscious or automatic memory. Implicit memory is further divided into two subcategories:

1. Procedural memory involves our memory of body movements for example riding a bike or tying your shoelaces.



2. Priming memory involves a piece of information stimulating the thought of another piece of information. For example associating the word blue with the sky or the word green with grass.



EXPLICIT

Explicit memory is commonly referred to as conscious memory. Like implicit memory, explicit has two subcategories:

1. Episodic memory involves recalling specific events from our lives. For example your last day of school or your holiday last summer.



2. Semantic memory involves remembering general knowledge and facts. This can include knowing the capital city of Scotland is Edinburgh or recalling a formula for your maths class.



Fun Fact: Over time our explicit memories can become implicit memories. For example, when we hear the word Scotland we might automatically think of Edinburgh.

DEMENTIA

Dementia is a general term for conditions associated with a decline in brain functions including memory, language, thinking, or judgement.

Alzheimer's disease is the most common type of dementia however there are lots of different types.

Dementia is caused by damaged neurons, this stops the neurons communicating normally in the affected brain region. This means that region can't perform its normal functions.

STEPS - CONSOLIDATION GORDON

Suggested dance incorporates steps from the Gay Gordon's.

Dancers represent how a memory enters the brain as a short term memory and becomes either disregarded or consolidated into a long term memory through neuron activity.

Why not have a go at creating your own dance steps to represent memory consolidation?

SCIENCE

Information enters the hippocampus as a short term memory to be processed.

Not all memories make it to long term memory with some being forgotten. For some memories neurons begin to make connections.

Neurons form stronger connections firing neurotransmitters across the synapse representing memory consolidation.

The memory becomes consolidated to long term memory and is stored throughout the brain.

DANCE STEPS

Couples form two lines making a tunnel with their arm.

Top three couples run through the tunnel. Dancers then link hands forming a big circle round the three couples.

Outer circle gallop round the middle couples switching direction after 4 beats.

One dancer of the middle couple twirl under the arm of the other for a beat of 4. One of the couples in the middle polka out breaking the bigger circle. The other two dosey doe round one another.

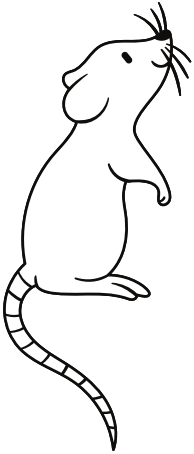
Dancers arrange themselves in groups of three with the middle person turning the other two dancers' round by the elbow one at a time.

Dancers regroup with their original partner and polka around the room.



To build on this session take a look at our [Canadian Brain Dance](#) resource exploring how neurons communicate.

CREATING A FALSE MEMORY



Researchers are currently carrying out work to trick our brains and create fake memories. This research is carried out in mice or rats and allows scientists to explore the parts of the brain involved in memory encoding and storage.

A team of scientists in Boston successfully demonstrated this by creating a fear memory in mice by giving the mice a small foot shock in a particular environment. They were able to then reactivate the neurons associated with this memory in a completely new environment. On doing this the mouse demonstrated a freezing behaviour which is their response to fear, showing the memory had successfully been activated in the mouse despite it having no reason to be scared in the new environment.

By understanding the processes involved in memory encoding and storage we can progress to treating memory conditions such as Alzheimer's.

NOTES

Websites

Short term memory: <https://www.verywellmind.com/what-is-short-term-memory-2795348>

Long term memory: <https://human-memory.net/long-term-memory/>

Brain regions involved in memory: <https://human-memory.net/memory-storage/>

Videos

Memory overview: <https://www.youtube.com/watch?v=TUoJc0NPajQ>

Memory overview: <https://www.youtube.com/watch?v=yOgAbKJGrTA>