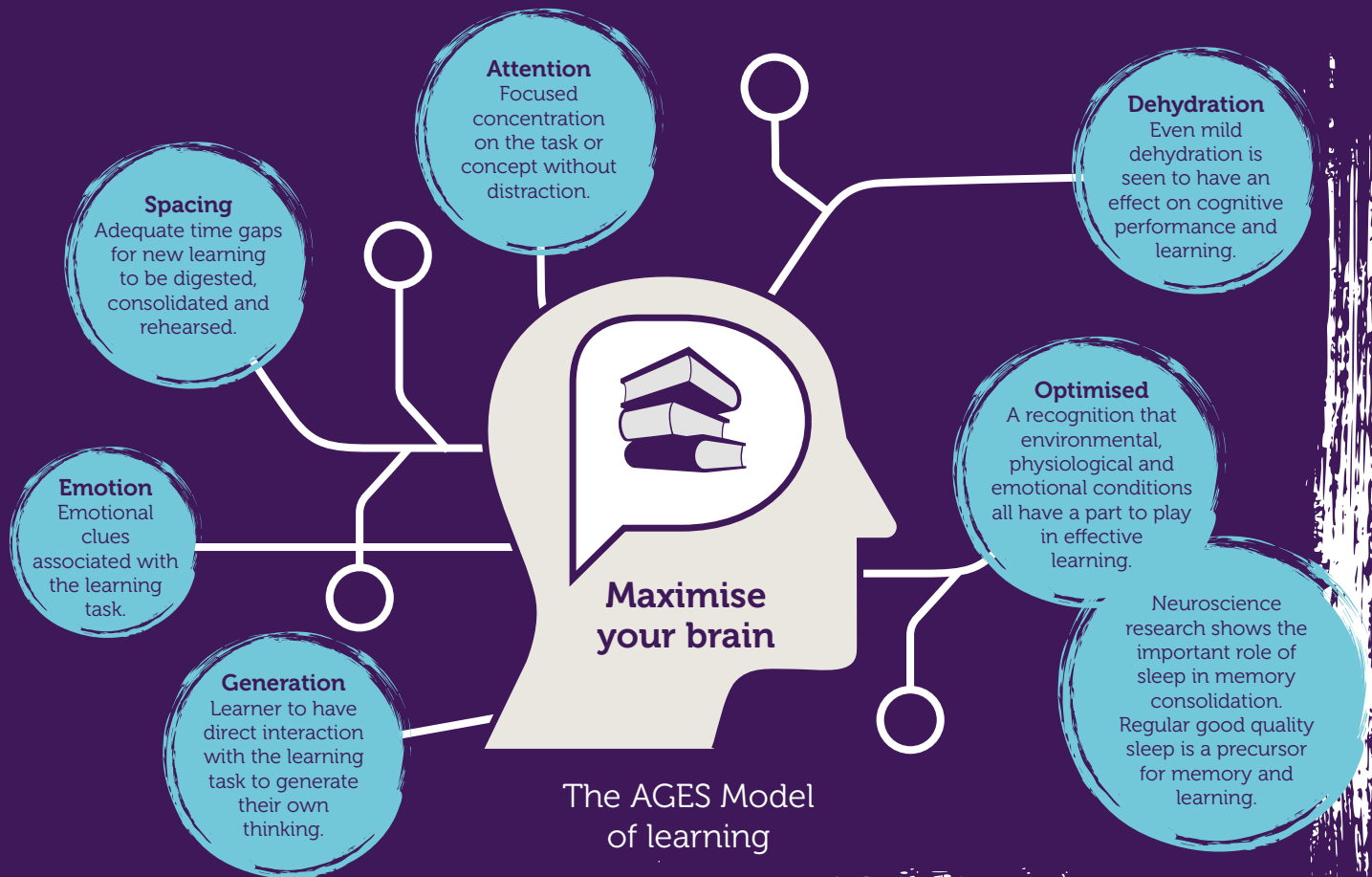


# Learning and the brain



Without memory we cannot learn. When we pay attention, memories are formed and stored which can be recalled. Memory has a three-part process:

Now more commonly called 'working memory', our short-term memory provides capacity for holding a small amount of information in mind in an active, readily available state for a few seconds or minutes. Some of this information will be lost or forgotten, while some will be processed into long-term memory.

Our capacity to store information for anything from a few minutes to years. While short-term memory lasts only about 20–30 seconds, information can remain in long-term memory indefinitely.

## DID YOU KNOW?

**Recognition**  
The act of remembering words or situations that were previously learned or studied. It is also acknowledging and understanding something that is familiar.

**Reconstruction**  
Rather than recalling memories, we reconstruct them. As the brain is plastic, each memory is influenced by our experiences, so in one sense our memories are 'unstable' or fluid.



## Memory

When you remember something, it's not like finding a snapshot in your brain. Instead, your brain has to construct pieces of the memory from different clues. It's easier to remember events that you had strong feelings about.

**Procedural**  
the part of our long-term memory that is responsible for knowing how to do things or perform certain procedures, also known as motor skills: such as walking, talking and riding a bike. Procedural memories are easy to do but difficult to explain to others and are less likely to be forgotten.

**Declarative**  
the part of our long-term memory that refers to memories that can be consciously recalled such as facts (semantic memory) and personal experiences (episodic memory) indefinitely.

# Learning and the brain (continued)

## Neuron

Nerve cells that are the building blocks of your brain. They are constantly communicating with each other and responsible for transmission of information through long fibrous projections called axons, and shorter, branch-like projections called dendrites. The connections between the billions of neurons in all the different parts of your brain is what makes your brain work. Your brain has been measured to have approximately 86 billion neurons.

## Neuron: Motor

A neuron that carries information from the central nervous system to muscles which causes them to move.

## Neuron: Sensory

A neuron that picks up information from the body's sensory receptors in the skin, muscles, joints, tongue, ear, nose and eyes, and carries it towards the central nervous system. Sensory neurons detect environmental information necessary for the body to survive.

## DID YOU KNOW?

### Neuroplasticity

The ability for our neural networks to change and update based on new information. Neuroplasticity continues into later life meaning that we can continue to learn new things challenging the concept that 'you can't teach an old dog new tricks'.

### Neurogenesis

The birth of new brain cells replacing old ones, particularly in the memory centres of our brain, even into late adulthood. Neurogenesis in the hippocampus means we are capable of continually extending the connections between neurons as we learn, and even adding additional ones.

## Neural networks

Connected neurons that embed and store our learning. We develop neural networks for working in every situation.

## Dendrites

Part of a neuron that receives messages. They appear like the branches of a tree, with more branches representative of more connections.

## Bits of your brain

## Synapse

The connection between brain cells. The synapse is a tiny space where two neurons meet and messages are communicated by way of neurotransmitters.

## Axon

The extended part of a neuron that carries an impulse towards the synapse and transmits the message to other neurons.

## Neurotransmitter

Chemical signals that relay information across the space between one neuron's nerve terminal and another neuron's dendrites. They are the means by which neurons 'talk' to each other and make the brain work. They help determine how you feel, think and act.

## Serotonin

A neurotransmitter that is involved in mood, such as helping you feel happy. It flows in the brain when you feel important. Our brain equates attention with survival because when we are born we rely on other people for survival. We build self-reliance over time, but those early 'circuits' are still there. It's natural to seek a feeling of importance, no matter how much we already have because the serotonin feels good! It is also involved with sleep, mental health, blood pressure and heartbeat.

## Oxytocin

Acts as a chemical messenger and is important in human behaviours including sexual arousal, recognition, trust, anxiety and mother-infant bonding. As a result, oxytocin has been called the 'love hormone'.

## Sending signals

## Endorphins

Are produced by the central nervous system and pituitary gland and are associated with feelings of euphoria that can also mask physical pain and cause sleepiness.

## Dopamine

Dopamine is key neurotransmitter in reward-motivated behaviour. It reinforces and strengthens neural connections with each repetition of the thought or behaviour that caused it. The brain releases dopamine when you encounter something which in the past has led to gratification or success and is key in embedding learning.