

Introduction to the Brain

What does the brain do?

The brain controls and co-ordinates everything we do. Its purpose is to receive messages, process those messages and respond to them. The responses generated by the brain allow us to think, move, breathe, speak, show emotion and regulate all of our other bodily functions.

The brain forms a part of our central nervous system. It is a soft jelly-like substance weighing about three pounds on average and sits inside the skull, cushioned by a liquid known as cerebrospinal fluid. Although the brain only accounts for two percent of body weight, it uses twenty percent of the body's oxygen supply and blood flow.

What is it made of?

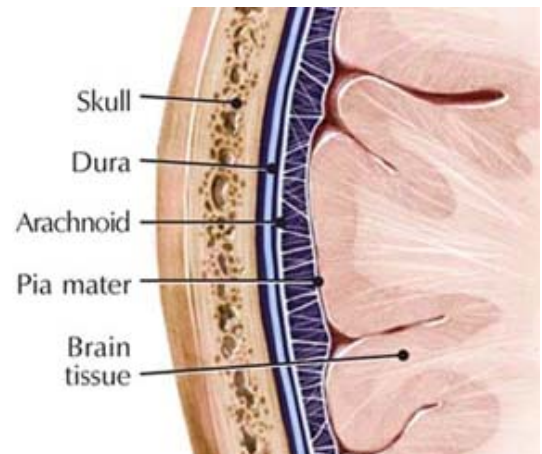
The brain is made of billions of brain cells. Some cells, known as *neurons* are responsible for carrying messages to and from the brain. Other cells, known as *glia* provide the support structure for the neurons.

Neurons require oxygen to function, and begin to die within 3 to 5 minutes without it. The neurons themselves are quite fragile and need extensive protection from being crushed, infected or other harm. The long fibrous parts of the neurons, called axons are prone to tearing when the brain is injured by sudden movements such as those that occur during a car accident. This can result in a form of injury known as **diffuse axonal injury**.

Protective Layers

There are several layers of tissue that protect the brain. Beneath the skin of your scalp is bone (your skull). Below the skull are three special coverings called the *meninges*. Meningitis is an infection of the meninges. The outer layer of the meninges is called

the *dura*. This is a tough thick layer which restricts the movement of the brain within the skull and so protects it from damage. Bleeding below this layer can result in a **subdural haematoma**. Bleeding above the dura can result in an **extradural haematoma**. The middle layer of the meninges is called the *arachnoid*. A bleed that occurs in the space between this layer and the next is a **subarachnoid haemorrhage**. The inner layer, the one closest to the brain, is called the *pia mater*.

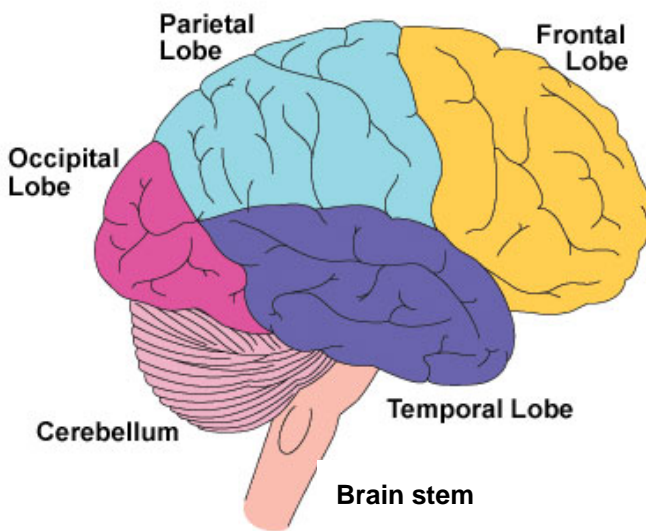


Internal Structure of the Brain

Over the course of its long evolution the brain has developed three major parts: 1) the cerebral cortex, or cerebrum is the large mass of tissue shaped like a wrinkled walnut. 2) The cerebellum is the fist-like structure located at the rear and base of the brain and 3) the brain stem is the lowest (and oldest in evolutionary terms) part of the brain connected to the spinal cord. The cerebral cortex is divided into two halves or hemispheres, known as right or left cerebral hemispheres. The two hemispheres transfer information through a bridge of nerve fibres called the corpus callosum.

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The left hemisphere controls the right side of the body. For most people the left hemisphere is involved in the understanding and expression of language. The right hemisphere controls the left side of the body, and is involved in spatial and artistic skills. Each half, or hemisphere of the cerebrum is divided into four areas known as lobes. The four lobes are: 1) Frontal lobe 2) Parietal lobe 3) Temporal lobe and 4) Occipital lobe



What does each part do?

Lobes of the cerebrum

The **frontal lobe** is located behind the forehead and is involved in tasks such as reasoning, planning, problem-solving and organising along with acting as a control for personality, behaviour and emotions. Marked changes in a person's personality and social skills can occur from damage to this area. The motor cortex at the back of the frontal lobes controls movement.

The **parietal lobe** controls the sense of touch including pressure, temperature and pain.

It is involved in fine motor movements, arithmetic and spelling. At the front of the parietal lobe is the sensory cortex which runs in line with the motor cortex in the frontal lobe. This controls our perception and how we interpret sensation and movement.

The **temporal lobe** is involved in receiving and processing auditory information e.g. music and speech and plays a major role in memory storage and learning.

The **occipital lobe** is situated at the back of the head and is instrumental in controlling the sense of sight.

The cerebellum

The cerebellum helps to regulate balance and coordination. It provides a "feedback mechanism" to adjust muscle activity so that balance is maintained. It also plays a role in regulating muscle tone.

The brain stem

The brain stem comprising of the pons and medulla oblongata regulates essential life functions such as breathing, heart rate and blood pressure. It also serves as a "relay station" for messages regarding movement and sensation. Cranial nerves are located in the brain stem, which regulate a number of functions such as swallowing, speech and eye movement.

The limbic system

The limbic system which is sometimes known as the "emotional brain," is found buried within the cerebrum near the temporal lobe and is made up of the thalamus, hypothalamus, amygdala and hippocampus.

This system deals with sensory information such as vision, controls hunger and thirst. It also plays a role in emotions such as fear and is essential in memory and the process of memory retrieval and learning.

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