

Parts of the brain and its associated function

Where is it?	What does it do?	What happens when it is injured?
<p><u>The brainstem</u> is located at the base of the brain and extends down to become the spinal cord. Three main parts make up the brainstem, including the medulla, the pons, and the midbrain.</p>	<p>The medulla controls basic involuntary life functions such as respiration, blood pressure, heart rate and body temperature control.</p> <p>In the pons and extending up through the midbrain is a structure called the reticular activating system. This system affects sleep onset and a person's level of alertness.</p>	<ul style="list-style-type: none"> • A disturbance in breathing, heart rate, or other vital bodily functions • Decreased levels of alertness and arousal • Dysphagia - difficulty swallowing food and water • Sleeping difficulties (e.g., insomnia, sleep apnea) • Disturbance in sleep/wake cycles
<p><u>The cerebellum</u> is located underneath the lower back part of the cerebral hemispheres.</p>	<ul style="list-style-type: none"> • Controls balance, timing and equilibrium • Coordination of both fine and gross body movement such as walking, sitting down, and manipulating objects with the hands 	<ul style="list-style-type: none"> • Ataxia - failure in muscle coordination e.g., a limb may appear to shake, making it difficult to use the limb • Balance problems, making it difficult to stand or walk independently • Difficulty reaching out and grabbing objects • Persistent dizziness or vertigo • Slurred speech
<p><u>The basal ganglia</u> are a small collection of neurons located deep inside the cerebral hemispheres on either side of the thalamus.</p>	<ul style="list-style-type: none"> • Control of involuntary movement such as that seen in resting-type postural movement and body position when there is no voluntary movement • Initiating voluntary movement such as walking or talking. 	<ul style="list-style-type: none"> • Movement disorders such as an inability to initiate voluntary movements e.g., person needs to be cued to take a step before beginning to walk • Lack of postural control or control over body position e.g., person will slouch to one side when sitting at rest

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<p><u>The thalamus</u> sits at the top of either side the brain stem in the centre of the brain.</p>	<p>Central relay station for incoming sensory information. The thalamus decides where the information must go within the cortex and sends it there to be perceived and analysed.</p>	<p>This is dependent on which sensory receiving area is damaged (e.g., if it is the visual receiving area, information will not be properly sent to visual areas in the cortex and visual deficits will result).</p>
<p><u>The hypothalamus</u> is directly below (hypo) that thalamus as the base of the brain.</p>	<p>The hypothalamus controls the behaviours that require us to interact with our environment in order to survive such as the regulation of feeding, drinking, sexual behaviour, sleeping temperature control, and emotional expression.</p>	<p>Hypothalamic damage can result in deficits such as:</p> <ul style="list-style-type: none"> • How to recognise when the stomach is full or empty. • How to recognise when the body needs fluids. • How to recognise when the body needs rest. • Regulation of sexual urges/signals. • Emotional liability - bouts of uncontrollable crying or laughing.
<p><u>The limbic system</u> is a ring-like collection of structures deep within the cerebral hemisphere adjacent to the basal ganglia.</p>	<ul style="list-style-type: none"> • Areas of the limbic system like the hippocampus are responsible for storing and recalling explicit memories • Others, like that amygdala are involved in the production of feelings or emotions 	<p>Numerous problems of internal body regulation and higher behaviours can result, such as:</p> <ul style="list-style-type: none"> • Memory and learning difficulties • Inability to explicitly recall information • Extreme inappropriate emotional states

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<p>The occipital lobe is located in the extreme rear of the cerebral hemisphere at the back of the brain.</p>	<ul style="list-style-type: none"> • This lobe is dedicated entirely to vision in terms of detection, identification, and interpretation of objects. 	<ul style="list-style-type: none"> • Visual agnosia - not consciously knowing that one has seen an object. • Difficulty locating objects in the environment. • Colour agnosia - difficulty with identifying colours. • Word blindness - difficulty in recognising words. • Inability to track the movement of objects.
<p>The frontal lobe is located at the front of the brain just behind the forehead.</p>	<ul style="list-style-type: none"> • Provides executive control over much of the brain's higher functions. • Consciousness. • Self-awareness. • Judgement. • Initiation / motivation. • Control over emotional responses. • Planning/sequencing. • Word formation. • Prospective memory - remembering to do something. 	<ul style="list-style-type: none"> • Inability to synthesize signal from the environment. • Inability to assign priorities. • Inability to make decisions. • Inability to initiate actions. • Inability to control emotions. • Inability to behave and interact socially and make plans. • Changes in personality. • Inflexible, simplistic, and/or concrete thinking. • Poor judgement. • Inability to plan a sequence of complex movements needed to complete multi-stepped tasks. • Inability to behave appropriately in social situations.

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<p><u>The parietal lobe</u> is located on both sides of the head near the top and to the back.</p>	<ul style="list-style-type: none"> • Responsible for perceiving, analysing, and assembling touch information from the body. • Integrates visual, auditory, and touch information in order to formulate a complete impression of the world. <p><u>Left parietal lobe</u> Area where letters come together to form words and where words are put together in thoughts.</p> <p><u>Right parietal lobe</u> Responsible for understanding the spatial aspects of the world including recognising shapes, being aware of one's body space and deficits.</p>	<ul style="list-style-type: none"> • Difficulties with hand and eye coordination. <p><u>Left parietal lobe</u></p> <ul style="list-style-type: none"> • Inability to recognise or locate touch sensations from the right side of the body. • Inability to know the meaning of words. • Anomia - inability to name objects • Dyscalculia - inability to do mathematical calculations. • Agraphia - inability to locate words for writing. <p><u>Right parietal lobe</u></p> <ul style="list-style-type: none"> • Inability to recognise or locate touch sensations from the left side of the body. • Perceptual agnosia - "not knowing" (e.g., not able to recognise familiar objects touched by the hands). • Difficulty with drawing objects. • Lack of awareness of certain body parts and/or surrounding space.

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<p><u>The temporal lobe</u> is a large thumb-shaped extension of the cerebral hemispheres located near the temples on either side of the head.</p>	<p>A small section at the top of each temporal lobe, known as the auditory cortex, is responsible for hearing.</p> <p>The temporal lobes are also involved in memory acquisition, perception, and categorisation of objects.</p> <ul style="list-style-type: none"> • Involved in processing auditory information (e.g., sound discrimination, comprehension of language, listening, reading; music). • Important for memory acquisition, storage. • Important for sense of smell. • Involved in complex visual analysis. <p><u>Left temporal lobe</u></p> <ul style="list-style-type: none"> • Specialised for the comprehension of language such as listening and reading. <p><u>Right temporal lobe</u></p> <ul style="list-style-type: none"> • Specialised for the comprehension of music. 	<ul style="list-style-type: none"> • Disturbance with selective attention to what is seen and heard. • Memory problems. • Categorisation problems. <p><u>Left temporal lobe</u></p> <ul style="list-style-type: none"> • Wernicke's Aphasia - an inability to read and comprehend what someone is saying (e.g., can form word associations but they are not language based). • Persistent talking. <p><u>Right temporal lobe</u></p> <ul style="list-style-type: none"> • Inability to recognise and appreciate music. • Prosopagnosia - difficulty in recognising faces. • Difficulty understanding spoken language (i.e., some types of aphasia). • Specific memory impairments (e.g., prosopagnosia/inability to recognise faces). • Impaired detection of smell.

Roles of the left and right hemispheres of the brain

	Left Hemisphere	Right Hemisphere
Processing & Analysis of information	<ul style="list-style-type: none"> • Logical • Sequential • Analytical • Concentrates on details • Deductive reasoning 	<ul style="list-style-type: none"> • Holistic • Global • Parallel processing • Comprehension • Inductive in reasoning
Specialised Skill	<ul style="list-style-type: none"> • Verbal • Lexical aspects of relative spatial abilities • Relationships between self and environment • Analytical space-time concepts (e.g. numerical operations) • Language (speaking, listening, reading, writing) 	<ul style="list-style-type: none"> • Spatial abilities (knowing directions), especially in 3 dimensions without reference. • Solving puzzles • Drawing pictures • Recognising objects and people • Nonverbal language (timing, intention, pragmatics) • Space-time complex concepts e.g., physics
Sensory Perception & Motor Function	<ul style="list-style-type: none"> • Responsible for the right side of the body's skeletal muscles and somatosensation. • Interprets the left visual field • Bilateral audition 	<ul style="list-style-type: none"> • Responsible for the left side of the body's skeletal and muscles and somatosensation. • Interprets the right bilateral field • Audition

For more techniques and strategies relating to specific cognitive, behavioural / emotional or physical impairments please refer to the appendix.