

# **DISCLAIMER**

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The information contained herein includes both psychological and non psychological interventions. The delivery of psychological services requires a medical referral whilst non psychological services do not.

Each person is an individual and has a unique psychological profile, biochemistry, developmental and social history. As such, advice will not be given over the internet and recommendations and interventions within this website cannot be taken as a substitute for a thorough medical or allied health professional assessment or diagnosis.

# The Human Brain

## Article QUICK LINKS :

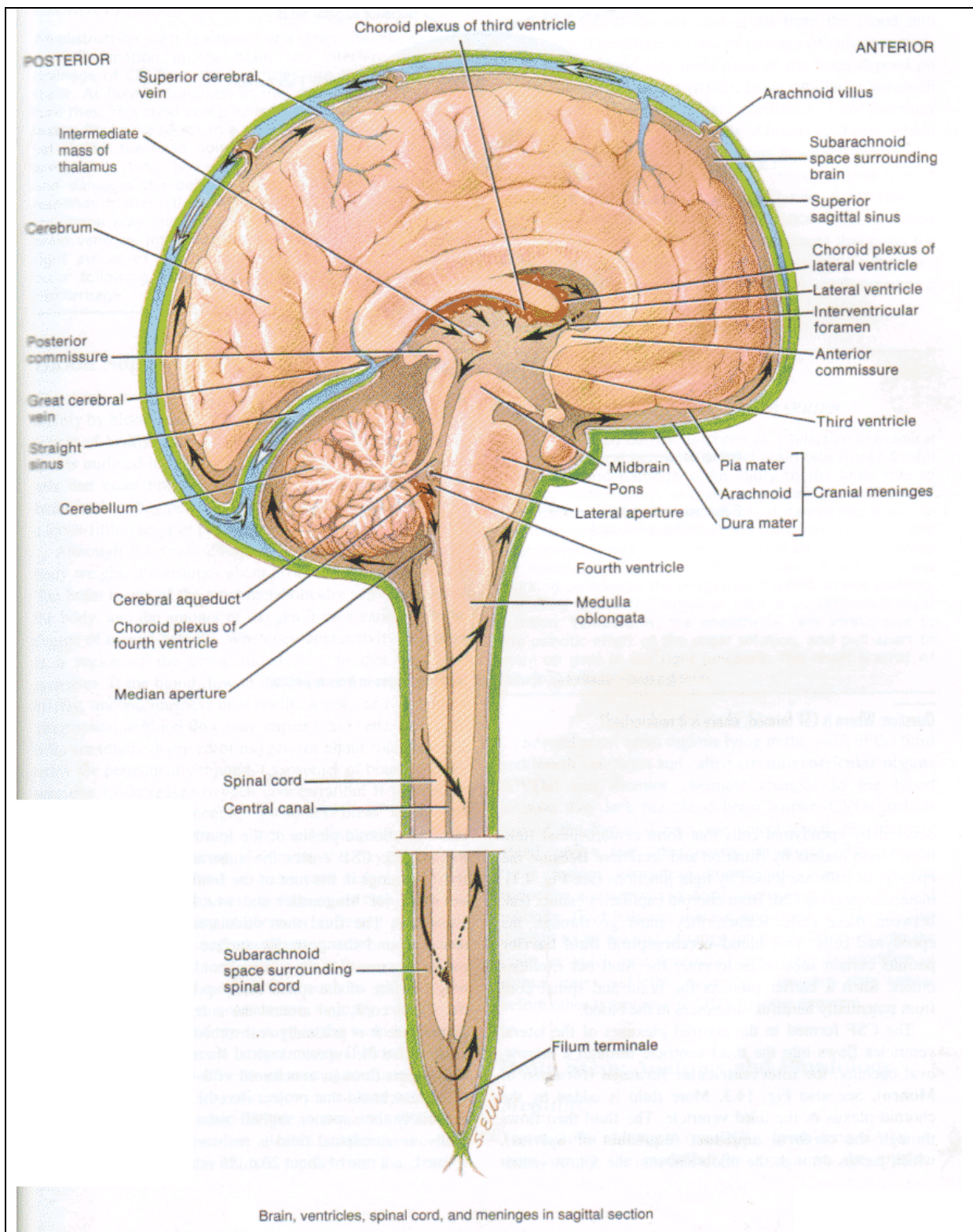
[Introduction](#) / [Frontal Lobes \(or prefrontal cortex\)](#) / [The Cingulate system](#) / [Temporal Lobes](#) / [Brain Stem](#) / [Cerebellum](#) / [Limbic system](#) / [Further Reading Suggestions](#)

## INTRODUCTION

The human brain sits at the top of our living caduceus, controlling bodily functions in near perfect homeostasis. As the body's command centre, it is jealously guarded, 'floating' in a nourishing and protective sea of Cerebro Spinal Fluid (CSF), bounded by the meninges, the dura mater (which means literally, 'Strong Mother'), the sub-arachnoid space and the pia mater, and of course the hard casing of the human skull. (See diagram below)

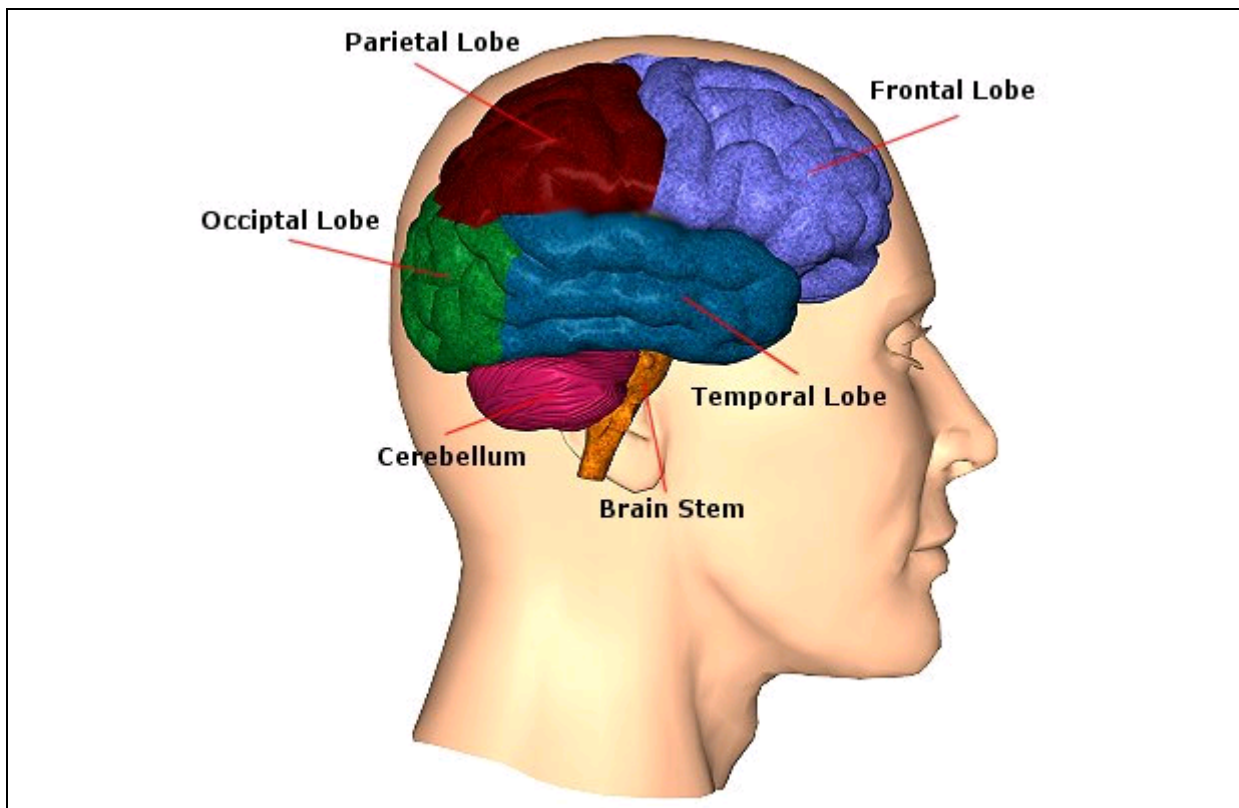
Nevertheless, even a slight blow to the head from any angle can potentially cause substantial damage to the delicate nerve fibres and neural networks that form our functional and thinking patterns.

## Brain, Ventricles, Spinal Cord and Meninges in sagittal section

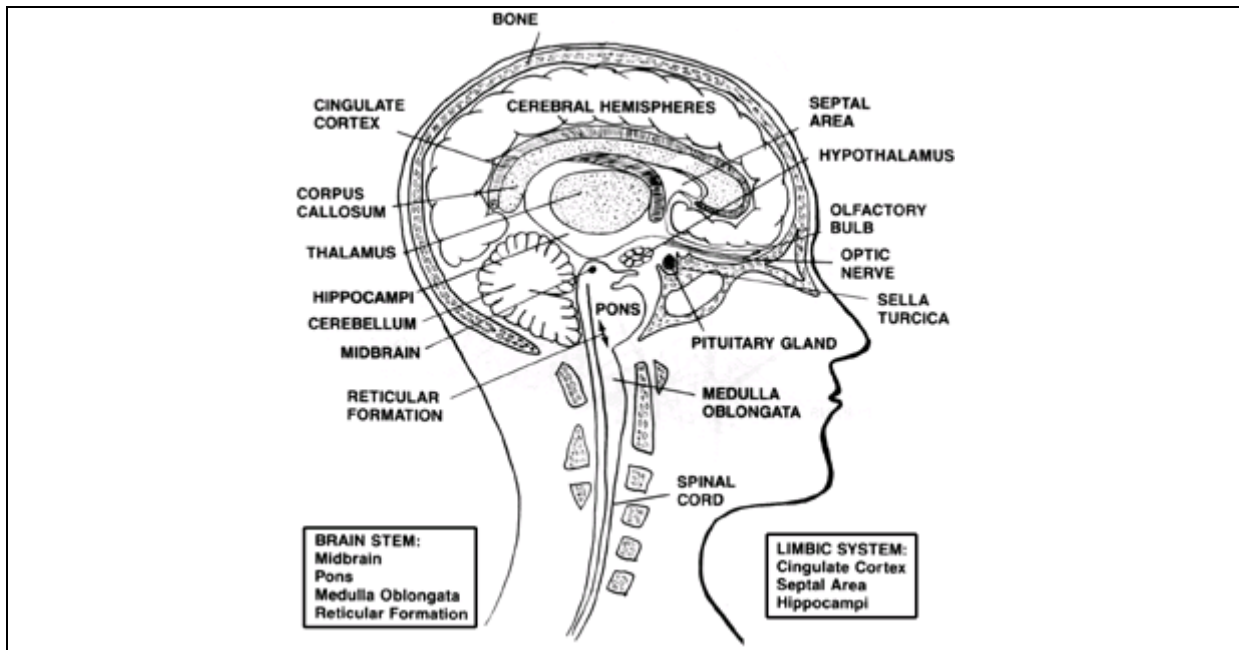


Obtaining a general understanding of the brain and its functions is important to understanding the rehabilitation process in any presenting difficulty. It is very important, however, to understand that rehabilitation concerns the whole person not just the 'affected part'. The identification of an individual problem simply gives the therapist areas in which to focus treatment plans designed to work toward the rehabilitation/rebalancing of the whole person. Each problem area affects other areas. Resolving one problem often has a major impact on other problems. For example, re-establishing postural balance and eliminating dizziness greatly enhances concentration and attention, which allows for improved cognition and problem solving.

### The Basic Divisions of the Human Brain



## Diagrammatic Sagittal Detail



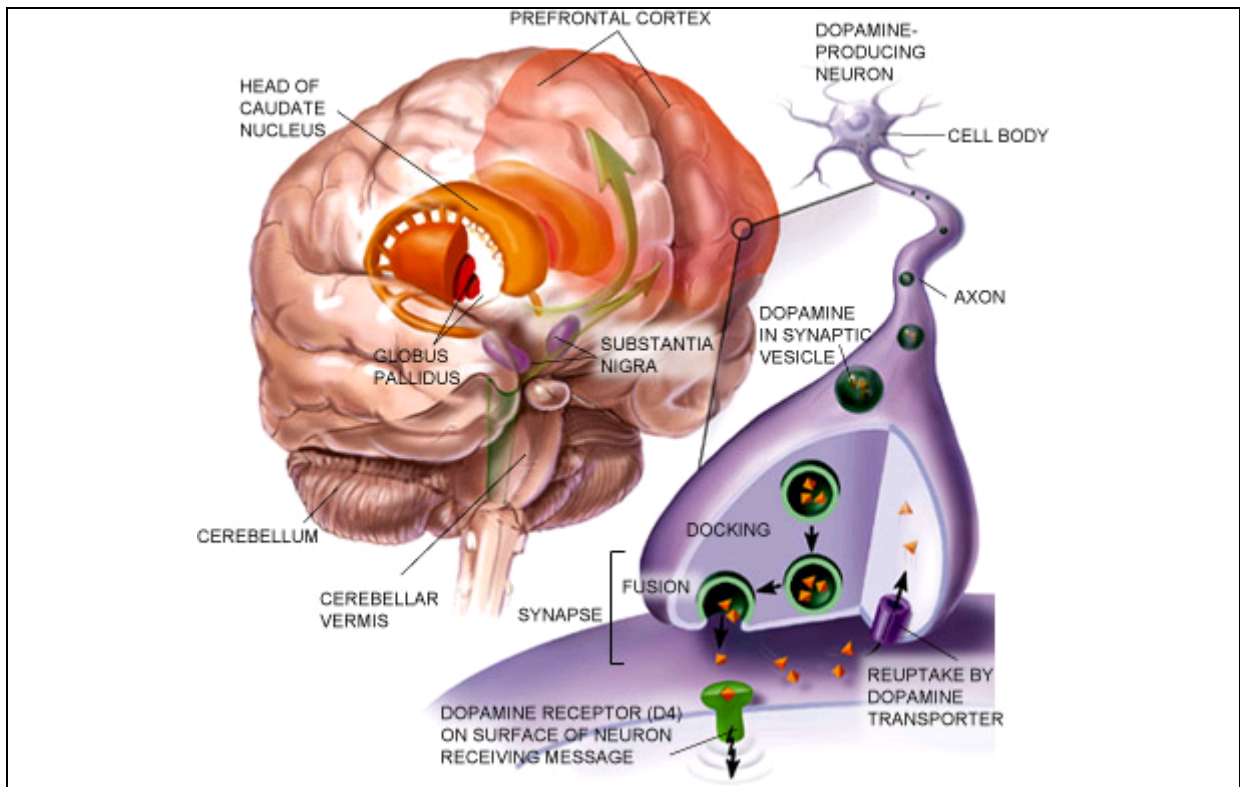
Dysfunction or injury to the brain may occur in a specific location, or may be diffuse (many different locations). Difficulties resulting from brain dysfunction include:

- Visual illusions - inaccurately seeing objects.
- Word blindness - inability to recognize words.
- Difficulty in recognizing drawn objects.
- Inability to recognize the movement of an object (Movement Agnosia).
- Difficulties with reading and writing.
- Short term memory difficulties
- Personality changes and / or emotional liability.

### **FRONTAL LOBES (or Prefrontal cortex)**

Located at forehead above eyes.

The frontal lobes receive input from various neocortical regions including the dorsomedial thalamic nucleus, and the parietal association cortex. The prefrontal orbital cortex, however, receives fibres from the pars magnocellularis of the mediodorsal thalamic nucleus, and from the mesencephalic reticular formation as well as from limbic structures. In this way the prefrontal cortex appears to receive information about all sensory modalities and also about motivational and emotional states of the individual. There are strong efferent connections to the motor and pre motor cortex, the basal ganglia and the caudate nucleus. Orbital-prefrontal regions send fibres into the hypothalamus, subthalamus, septum, mesencephalon and the pons.<sup>11</sup>



Functions associated with the frontal lobes:

- Conscious thought
- Concentration
- Perseverance
- Judgement
- Attention span
- Impulse control - self monitoring and supervision
- Problem Solving
- Organisation
- Critical thinking
- Forward thinking
- Ability to feel and express emotions
- Empathy

Decreased activity in the prefrontal cortex is a finding often cited in people who have cognitive difficulty, such as in schizophrenia or major depression. Abnormal frontal activity is a major factor in [ADD and ADHD](#).

The prefrontal cortex is involved in mediating concentration, impulse control and critical thinking.

## **THE CINGULATE SYSTEM**

At the top of the brain, in the middle of the frontal lobes is an area of the brain termed the "cingulate gyrus". It is the part of the brain which allows you to shift your attention from thing to thing, to move from idea to idea, to see the options in life. Feelings of safety and security have also been attributed to this part of the brain. The term that possibly best relates to this part of the brain is 'cognitive flexibility'.

### **Functions of the Cingulate System:**

- Allows shifting of attention
- Helps the mind move from idea to idea
- Allows the mind to see options
- Cognitive flexibility (helps you go with the flow)
- Adaptability
- Ability to cooperate

Increased activity in the top, middle portions of the frontal lobes is frequently cited as a finding in obsessive-compulsive disorder, a condition where people become "stuck" on certain thoughts or behaviours. Aggressive people often become "stuck" on real or imagined injustices and think about them over and over. Oppositional, and addictive behaviours are also evident. Chronic pain, eating disorders and road rage appear to accompany cingulate dysfunction.

## TEMPORAL LOBES

Located at sides of head above ears, the temporal lobes form the wings of the soul of our living caduceus.

### FUNCTIONS

**The dominant side is usually the left hand side and governs:**

- Hearing ability
- Understanding and processing language
- Memory acquisition - particularly long term memory
- Some visual perceptions
- Categorisation of objects.

**The non dominant side or right side governs:**

- Recognition of facial expressions
- Decoding vocal intonation
- Rhythm
- Music
- Visual learning

### OBSERVED PROBLEMS

- Difficulty in recognizing faces (Prosopagnosia).
- Difficulty in understanding spoken words (Wernicke's Aphasia).
- Disturbance with selective attention to what we see and hear.
- Difficulty with identification of, and verbalization about objects.
- Short-term memory loss.
- Interference with long-term memory and amnesia
- Increased or decreased interest in sexual behaviour.
- Inability to categorise objects (Categorisation).
- Right lobe damage can cause persistent talking.
- Increased aggressive behaviour.
- Dark or violent thoughts
- Religious or moral preoccupation
- Social skill troubles
- Emotional instability



- Hypergraphia (excessive writing)
- Periods of spaciness or confusion
- Seizures

## **BRAIN STEM**

Located deep in the brain, leads to spinal cord. Often referred to as The 'Reptilian' or 'Primitive' Brain. The majority of the cranial nerves exit from the brain stem at the pons.

### **FUNCTIONS**

- Breathing
- Heart Rate
- Swallowing
- Reflexes to seeing and hearing (Startle Response).
- Controls sweating, blood pressure, digestion, temperature (Autonomic Nervous System).
- Affects level of alertness.
- Ability to sleep.
- Sense of balance (Vestibular Function).

### **OBSERVED PROBLEMS**

- Decreased vital capacity in breathing, important for speech.
- Swallowing food and water (Dysphagia).
- Difficulty with organisation/perception of the environment.
- Problems with balance and movement.
- Dizziness and nausea (Vertigo).
- Sleeping difficulties (Insomnia, sleep apnoea).

## **CEREBELLUM**

Located at the base of the skull, and attached to the rear of the brain stem. It is sometimes referred to as The Little Brain.

### **FUNCTIONS**

- Coordination of voluntary movement
- Balance and equilibrium
- Some memory for reflex motor acts.

### **OBSERVED PROBLEMS**

- Loss of ability to coordinate fine movements.
- Loss of ability to walk.
- Inability to reach out and grab objects.
- Tremors.
- Dizziness (Vertigo).
- Slurred Speech (Scanning Speech).
- Inability to make rapid movements.

## **LIMBIC SYSTEM**

Is a group of cellular structures located between the brainstem and the cortex. It is often referred to as the mammalian brain.

### **FUNCTIONS**

- Maintaining homeostasis - body temperature, blood pressure, heart rate, blood sugar levels.
- Controls appetite and sleep cycles
- Strongly linked to emotional reactions that have to do with survival.
- Sets the emotional tone of the mind
- Filters external events to internal states (creates emotional colouring)
- Ear marks events as internally important
- Stores highly charged emotional memories
- Modulates motivation
- Promotes bonding
- Directly processes the sense of smell (which is another reason why aromatherapy can be so effective)
- Modulates libido

The limbic system has two key components: the **hypothalamus** (below the thalamus) and the **pituitary gland**.

The hypothalamus regulates eating, drinking, sleeping, waking, body temperature, balance and many other functions. Through a combination of electrical and chemical messages, it directs the pituitary gland - the master gland of the body.

### **OBSERVED PROBLEMS**

- Moodiness, irritability and clinical depression
- Increased negative thinking
- Negative perceptions of events
- Decreased motivation
- Appetite and sleep problems
- Increased or decreased sexual responsiveness
- Social isolation

The human brain has evolved over time, and from the archaeological records, it has demonstrated spectacular growth in the past few million years.

This growth, presumably in consciousness as well as size and capacity for creativity, allowed us to change the environment in which we live and our ability to make those changes is increasing. The problem lies in the fact that our ability to create always leaps ahead of our ability to adapt. Thus we are locked in a cycle of adapting to unprecedented situations.

**For more information or to make an appointment please contact us on (02) 9637 9998 during business hours.**

### **FURTHER READING SUGGESTIONS**

- Attention Deficit Disorder (ADD) & Attention Deficit Hyperactivity Disorder (ADHD)
- Post Concussive Syndrome / Head Injury