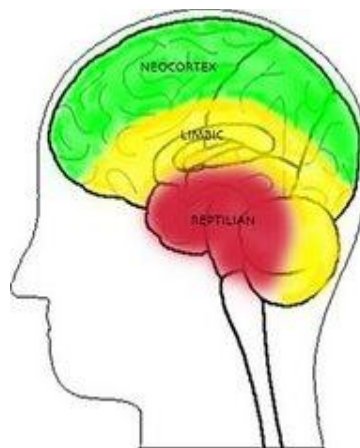


## The Triune Brain

The human brain is one of the most complex structures known to man. Whilst research has shown a great deal about it, it is still not well understood. It is thought that the human brain as we know it, evolved over time to find ways of meeting changing needs. A simple way of understanding the human brain is to think of it as consisting of 3 distinct parts. This way of studying the brain is known as the triune brain model of the brain. The first part of the triune brain to develop was the reptilian brain, or brain stem, followed by the mammalian brain, or limbic system and finally the human brain, known as the cortex or neo-cortex. According to this model, the cortex sits on top of the mammalian brain, which sits on top of the reptilian brain.

### A Simplified Diagram of the Triune Brain



### The Reptilian Brain:

The reptilian brain is the oldest and most primitive part of the brain.

Biologically, it is known as the brain stem.

It controls breathing, sexual arousal, balance, sleep, appetite, and body temperature.

It learns through experience, once a situation has been seen to be dangerous, it will respond accordingly.

Its primary function is to enable survival which it does by identifying dangerous situations and defending its territory.

It always acts out of instinct.

### The Mammalian Brain:

The mammalian brain was the second part of the brain to develop.

Biologically, it is known as the limbic system.

It controls the expression of emotion, the body's response to danger, and the processing of short term memory. It is the social part of the brain, it is playful, and it nurtures and attends to others.

It has no sense of time, living only in the here and now.

It learns through conditioning, responding to rewards or punishments.

Its primary function is to protect itself which it does by responding to danger (e.g. Fight, Flight, or Freeze response). It initiates reactions in response to emotions and memories.

It always makes its decisions and activates behaviours based on how the reptilian brain sees the situation.

The mammalian brain does not identify an object or situation as dangerous and it has no say over what the reptilian brain identifies as being unsafe.

### **The Human Brain:**

The human brain is the part of the brain that developed most recently.

Biologically, it is known as the cortex or neocortex.

It controls all higher level thinking, such as language, self awareness and intention. It can analyse, so it is able to view situations logically and think abstractly. This means it can imagine, describe, plan and calculate future possibility.

It has a sense of time, understanding that there is a past, a present and a future.

Its primary function is to make decisions by processing information.

It is always overridden by the reptilian and mammalian brains. Therefore, the cortex, the 'rational' decision maker or thinking brain, has absolutely no input once a response to a trauma or perceived dangerous situation has been activated.

### **Communication between the 3 parts of the brain**

When the reptilian brain detects danger, the response by the limbic system is immediate. A fraction of a second later the cortex receives the information, and decides what to do next. Those fractions of a second could be fatal if we had not already reacted to the danger. If the information processed by the cortex shows that there is nothing to worry about after all, we have simply had a scare, and that is all. For example, walking downstairs, the carpet is

loose and you slip on the loose carpet, the reptilian brain recognises the danger and the mammal brain makes you respond immediately by grabbing for the handrail, thus preventing you from falling down the stairs. Only then does the human brain think about the possibility of fixing the loose carpet so that further slips can be avoided. Another example, a hot iron is touched accidentally, the reptilian brain senses the danger, the mammalian brain reacts by withdrawing the hand instantly, thus preventing a serious burn. The cortex responds a fraction of a second later and decides to move the iron to somewhere safer, or turn it off.

### **Traumatic Memories**

When a traumatic event happens, such as a road traffic accident, the more primitive parts of the brain, the mammalian and reptilian parts, become over stimulated. Once this has happened, the memory of the traumatic event can become stuck in these primitive parts of the brain. The human or thinking part of the brain, the cortex, may be unable to function during the trauma, so while, non-traumatic memories normally get filed away in various parts of the cortex, traumatic memories are not processed in the normal way, becoming stuck in the mammalian brain or limbic system.

There is a good biological reason why traumatic memories are stored differently from normal memories. When the reptilian brain detects a threat, the limbic system initiates a response by activating the fight, flight or freeze response. It does this through the release of adrenaline, a hormone which not only activates the body to physically respond, but it improves the memory capabilities of the brain to the degree that it only takes one run in with a lion for the body to recognise that this is a dangerous situation.

All sensory input, whether it comes in through sight, sound, smell, taste, or touch can trigger adrenaline release. The sense of smell has been found to make particularly powerful associations in the brain. This is especially evident with Post Traumatic Stress Disorder (PTSD) – often, a familiar scent can trigger the autonomic nervous system faster than anything else.

The adrenaline released during a traumatic event can shrink the part of the limbic system where memories are stored, reducing its ability to place memories in time and space. Thus a person recollecting a trauma can feel as though they are re-experiencing the event.

### **Chronic Trauma**

Each individual's brain develops and its structure determined according to the individual's experiences. The brain has billions of neural pathways, each representing a learning experience. Neural pathways become stronger, when an experience is repeated. Over time, when this happens, the brain adapts and responses become automatic. Certain activities can be performed without thinking about them, so for driving, typing or responding to

a threat – more “practice” means the response becomes more ingrained, more automatic. Once a brain area is determined, it has less plasticity and is less receptive to including new information, hence it becomes harder to learn to play the piano as an adult than as a child.

When the reptilian brain detects a threat and the mammalian brain responds to it by releasing adrenaline, this can be experienced as a pounding heart, elevated blood pressure, heavy breathing, becoming hotter, and many other physical symptoms. These responses to danger are normal, and can be seen as protective biological function. However, anxiety or PTSD may occur when the symptoms continue even after the threat is no longer present, leaving the body in an active state of arousal. This may occur if trauma is constant, as in repetitive abuse throughout childhood, or when a person is somehow unable to return to a state of relaxation after exposure to trauma.