

Physiology of the Brain and Stress

Triune Brain Theory

In 1950's neurologist Dr. Paul MacLean proposed we had three brains instead of one which operate like three interconnected biological computers. These parts are called our Reptilian Brain made up of the brainstem and the cerebellum, the Limbic System which is the emotional control centre located deep in the center of the brain and the Neocortex which is the upper, thinking part of the brain. Since the Neocortex is the highest evolved and largest part of the brain, it was thought to dominate the other two more primitive brain regions. However, our two lower, primitive parts of the brain which are responsible for our survival are the ones in charge when we feel threatened. They react automatically 7/10th of a second before conscious thought is triggered.

Dinosaur Brain, our most primitive part of the brain, begins to develop in utero within the first several weeks of life. This part is programmed with all of our primitive reflexes which stimulate us to move and develop. It also controls automatically important body functions such as our heart rate, respiration, circulation, digestion, muscle movement and balance. Dinosaur Brain is not a thinking part of the brain so it does not plan and make good choices when it is triggered. Its reptilian characteristics make it more cold, unemotional, rigid, ritualistic, obsessive compulsive, and repetitive. When stuck in your Dinosaur Brain since it is not thinking, you will fail to learn from your mistakes. Gang behaviors, road rage and other habitual, reactive patterns are also indications of this brain's problematic, primitive functioning.

The mammalian part of the brain which is often referred to as the Limbic System also is not a thinking part of the brain. Some of its functions are to register our emotions, regulate our body temperature, appetite, sexual desires and attachments. Developmentally it is activated between fifteen month and four years of age and it is wired based on our experiences and the quality of our attachment relationships. The Limbic System also contains the Autonomic Nervous System which has two parts called the Sympathetic and Parasympathetic Systems. The Autonomic Nervous system is constantly monitoring what is happening around us and will trigger us into Fight, Flight or Freeze if it senses danger. Many times the Dinosaur Brain and the Emotional Brain work together like a team to help you survive.

Over 70% of our brain mass is made up of the Neocortex which is the superior, thinking part of the brain. The Frontal Cortex at the forehead is the highest evolved, thinking part. It is what makes us human and is capable of complex reasoning, problem solving, creativity and change. Developing from four years of age on it is divided into two hemispheres which are connected by a bundle of nerves called the Corpus Callosum. The left hemisphere processes in a more linear, logical, detailed step by step kind of way and is the language centre of the

brain. The right hemisphere thinks more holistically, is more spatial, abstract, intuitive, creative and directly connected to our feelings. The left hemisphere registers our conscious thought process and the right hemisphere is where our more hidden, subconscious thought processes occur.

Under stress Dinosaur Brain and the Emotional Brain hijack higher mental functioning in order to help you survive. Energy which normally flows up to the thinking part of the brain is reserved for the primitive brain areas and the brain reverts to a bottom up processing. The Fight, Flight or Freeze mechanism is switched on, draining the blood flow from the Frontal Cortex (forehead) down into the core of the brain/body. During Fight or Flight reactions the dominant hemisphere is operating but loses much of the neural connections to the non dominant hemisphere. Sensory information based on what you are seeing, hearing touching or feeling physically in your body may decrease, depending on how the information does or does not connect to your dominant hemisphere. Over all, the brain's ability to think critically or solve problems is compromised as your brain/body creates a homolateral energy flow pattern to conserve energy.

Other Stress Responses

Brain cells which typically have a higher rate of metabolism than other cell types, consume more oxygen than any other organ. Normally our brain utilizes over twenty percent of the body's oxygen even though it weighs less than two percent of the whole body. Under stress our oxygen usage is compromised as we revert to a shallow, upper chest breathing pattern. Since most of our oxygen rich blood cells reside in the bottom third of our lungs, it becomes much harder to get oxygen rich blood up to the brain, compromising our thinking abilities.

Another body reaction to stress is to produce high levels of adrenaline and cortisol. These chemical messengers trigger the Tendon Guard Reflex so that you shorten muscles and tendons as your body prepares to fight or flee. If the stress response stays for an extended time, physical pain in the calf muscles, lower back or neck and shoulders can result from these over-contracted muscles and tendons. When you have over-contracted muscles in the lower back, this will reduce the flow of cerebrospinal fluid up the spine and throughout the brain, blocking the flow of information throughout the brain and whole nervous system.

Breathing exercises are especially important for reestablishing oxygen flow, reducing heart rate and lowering anxiety for anyone who is experiencing a stress response. Consciously taking deep breaths from your diaphragm helps interrupt any involuntary breathing responses and restores your body's normal breathing patterns. Gentle movement and stretches can also help to switch off the stress response. When the muscles which have become contracted and painful are gently stretched, the spindle cells reset allowing the muscle to release the blocked energy (pain) and return to their normal length.