



# Mild Traumatic Brain Injury

## What Is It? – Part One

Mild Traumatic Brain Injury (concussion) is difficult to detect as there are no obvious signs of trauma. While called mild in nature these types of injuries can have devastating consequences. Symptoms related to the injury may show up immediately or slowly develop over time, and may have diffuse behavioral, cognitive and emotional consequences. Subsequent to medical examination biofeedback assessment and treatment techniques may be beneficial in reducing the symptoms associated with this trauma.

## Mild Traumatic Brain Injury: What Is It?

Mild traumatic brain injury (MTBI), commonly known as concussion, is defined as a head injury with a temporary loss of brain function causing a variety of physical, cognitive, and emotional symptoms. There is no overt physical evidence (i.e. blood) of trauma, and the victim may immediately appear to be confused, disorientated, dazed or even experience a brief loss of consciousness. These symptoms often resolve within a brief period of time or may last for days, weeks, months and even years after the incident. Clinical experience shows that fatigue becomes a notable factor over time with reports of decreased performance and needing more rest.



Current diagnosis of MTBI include observation and behavioral checklists. Long-term symptoms may be examined with a CT scan or MRI and neuropsychological testing. Presently the quantitative EEG (qEEG) is one of few techniques to accurately diagnose MTBI.

### Skull Brain interface



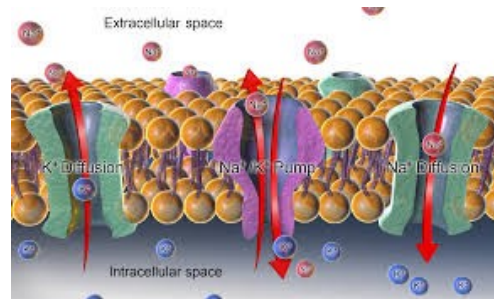
MTBI occurs when the brain hits the inside of the skull. This happens when a body (skull) stops suddenly, changes direction suddenly or is repeatedly exposed to micro traumas. The brain is enclosed in cerebral spinal fluid which acts to cushion the brain from hitting the skull. If the change in direction or force is too great the brain will collide with the skull.

In the front of the skull sit the sinus cavities; above, around and below the eyes and along the sides of the skull towards the ears. These structures are jagged and sharp. When these structures impact the brain they tear and causing micro bleeding. The areas most commonly affected are the prefrontal, frontal and temporal lobes. The back of the skull is quite smooth and curved and will instead cause extensive bruising. Injuries caused by hitting the sinus cavities are usually quite discrete (specific as to effect), whereas injuries caused by hitting the back of the skull are quite diffuse.

## Symptoms

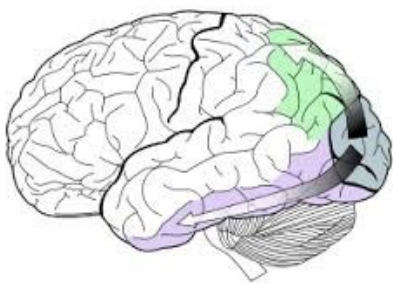
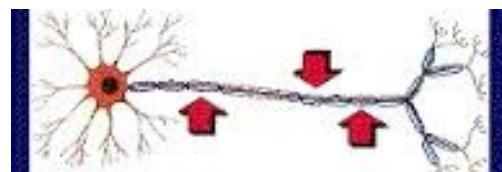
As the skull stops moving, the brain continues to move subject to the laws of physics. The sudden change(s) in direction and the impact upon the inside of the skull lead to several potentially traumatic events occurring. Based upon the physics, verified by MRIs we know that:

- i. Diffuse protein-lipid damage occurs in ionic channels resulting in a reduction of general intelligence and information processing and slowness of thought.



- ii. Frontal-temporal contusions (bruises and tearing) resulting in short-term memory reduction, reduced self-awareness, reduced social acuity, and depression.

- iii. Shear forces on grey and white matter resulting in a stretching of axons. This leads to a reduced clarity and slowness of thought.



- iv. In addition, rotational forces can damage the pontine-occipital connections and other brain stem connections resulting in problems of balance, sleep, and double vision.