

Brain Structure

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When a child is born the brain has basically developed all of the brain cells it will ever develop. As brain cells become injured or die they are not generally replaced, but rather routed around by a process called neuroplasticity.

The newborn brain is complete with about 100 billion cells or about a total of 3% of the total brain mass. The mature brain contains about 100 trillion connections which comprises 97% of the brain mass. The fact that the brain increases in size as the child matures is due to advancing neuro-connections. These neuro-connections are made as the child is stimulated and learns to interact in his environment and develops processing and learning skills.

No one child's brain is ever stimulated exactly the same as another child's brain. All normal brain development follows distinct and predictable developmental patterns. A child's individuality lies in part with the specific input of stimulation from the child's environment.

Stimulation by way of sensory input and increasing the processing skills of the child is what brings about neuro-organization and also produces organized neuro-connections that increase the brain's size and weight. Neuro-organization can also be stated as neuro-efficiency, or the effectiveness that the brain can receive, process, store, retrieve and utilize any given input to the brain.

Neuro-plasticity is an innate process by which healthy brain cells will take over the function of injured or dead cells and damaged connections. There is always more than one center of the brain that can take over the function of lost or impaired centers. Stimulating therapies will accelerate this "rewiring" of the brain by providing sufficient opportunity for the brain to establish new connections to healthy brain centers.

In neurodevelopment there are receptive functions and expressive functions. Receptive functions are tactile, auditory and visual input. Expressive functions are language, motor skills and academics. The expressive or output functions of the brain (i.e. language, motor skills, and academics) are direct indicators of receptive function, neuro-efficiency and processing skills. A brain that is limited in opportunity by either lack of stimulation or injury will have limited output functions. This brain will have a reduced number of neuro-connections and limited function as opposed to the healthy brain that is receiving plenty of clean and organized input (hearing, feeling, and seeing). Output functions of the brain can be stimulated with organized activities and therapies that can help produce targeted neuro-connections. These activities or therapies need to have specific intensity and frequency to be most effective. Random input may be mildly stimulating but will not produce specific results (like a brightly colored playroom or classroom without specific organized activities required to improve function).

Hemispheric dominance is an integral part of brain structure. This is where one hemisphere of the brain is in dominant control. In the case of mixed dominance there are a lot of inefficiencies in brain organization that results in information being transposed from one side of the brain to the other as in dyslexia. Other inefficiencies will be un-coordinated motor skills function low processing abilities, long term memory shortfalls and emotionality. (That will be the topic of my next article!)

Neuroplasticity

For years researchers have attempted to map the human brain. One thing they have found is that the part of the brain that performs a specific function can change in the space of a few weeks making the process of mapping very difficult. This makes every map of the same brain different from one time to the next. The reason for this is neuroplasticity.

Neuroplasticity is an innate ability that every central nervous system has. In the case of a traumatic brain injury, this process works where a healthy part of the brain and central nervous system can take up the function of an injured part. The key to this happening is to make the opportunity available for rerouting an injury to happen. This can happen in physical therapy when the brain is given the opportunity to rewire around a damaged area by providing the desired function that sends the signals to the brain. The brain will then begin to wire in a new pathway if the frequency, intensity, and duration of the therapy are adequate.

I know this principle of neuroplasticity from both my personal experience and clinical experience. I personally suffered from the neurological ravages of polio as a child, which did damage to my spinal anterior motor horn neurons and also a de-myellination to the pons level of my brain. I was left unable to walk. At the age of four I was given the opportunity to learn how to walk with adequate intensity and duration of a simple process called patterning. The walking function of the brain is located generally in the pons level of the brain. One area of my brain injury was on the pons level of the brain. Through the miracle of neuroplasticity, another part of my brain took up the function of walking which gave me a "cortical walk" instead of a walk from the pons level. Obviously the best part of the brain to use would have been the original pons of the brain. Unfortunately, the patterning I received only patterned my legs and not my arms and upper body and was not thorough enough to give me a perfect walk. My walking was crude and my running was very sloppy so consequently I fell down a lot but I was walking!

Some 30 years later and after thousands of spills, trips, and falls along with enduring barbaric braces I discovered what only a few people know and even fewer talk about and almost no one teaches. This remarkable discovery was that I did not swing my arms when I walked! This developmental milestone was missing from my brain organization and not only caused my stumbling gate and

affected my coordination challenges, but also affected almost every other level of my motor skills development from that milestone forward!

After a few short weeks of appropriate cross-pattern walking, my 30 something year old brain was figuring out how to walk appropriately for the first time! I began walking without falling down (falling down in public is very embarrassing for anyone and more so for an adult). And even more remarkably, other parts of my brain became more organized and efficient!

The scientific fact is that we only use less than 3% of our brain cells. This leaves us with quite an untapped capacity not only for learning but also for rerouting around damage. I have seen neuroplasticity work in severe cases of cortical blindness and deafness by providing the brain with the opportunity to rewire using appropriate therapies. These therapies are applied with specific frequency, intensity, and duration until the patient recovers most if not all of the impaired functions.

If you have a brain injured or neurologically challenged child (or adult) I highly recommend that you become educated by first studying these writings and others like it and secondly, seek out the counsel of a qualified Neuro Development Consultant.

By all means, do what you know to do by utilizing any developmental therapies as soon as you have found the lowest level of function that is inappropriately developed to start with. Then you can go on to higher levels when the lowest ones are completed developmentally.

For instance if your child does not walk appropriately, start by checking their cross pattern belly crawl to see if it is fluid and smooth. If it is not, this stage of development was, either skipped completely, damaged, or not accomplished long enough to complete the development stage before the child moved to the next step. In this case, he or she needs to do an army crawl, (belly crawl, alligator crawl, or whatever is most fun name for the child) several times a day for a couple of minute durations each time. Continue this patterning until absolutely smooth and fluid cross pattern crawling is achieved every time. Then do it a few more weeks to assure that its pathway is firmly established.

Once the brain acquires a developmental function, it will not lose that function without an injury or recurring insult. (Just like riding a bike, one never forgets!)

In the event that your child develops an appropriate cross pattern crawl or some other desired function only to lose it again a few weeks or months later, then there are other issues that are disrupting and damaging neurological functions that need to be discovered and dealt with. These issues will be metabolic, parasitic, bacterial, or fungal and should be dealt with naturopathically before you can achieve permanent results in neurological development. A prime example of a recurring insult would be a fungus that helps to disrupt normal sensory input in the autistic brain.