



WHAT IS NEUROPLASTICITY?

Cutting Edge Research - Comprehensive Answers

Neuroplasticity



How would you like to be better at problem solving, learning a new language, increasing your ability to focus, regaining body function due to a stroke, or recapturing some lost brain function from a brain trauma such as an auto accident? Your mind is very capable of creating these incredible lasting changes in function from neuroplasticity shaping techniques.

The term Neuroplasticity is derived from the root words Neuron and Plastic. A neuron refers to the nerve cells in our brain. Each individual neural cell is made up of an axon, dendrites, and is linked to one another by a small space called the synapses. The word plastic means to mold, sculpt, or modify. Neuroplasticity refers to the potential that the brain has to reorganize by creating new neural pathways to adapt, as it needs. Think of the neurological changes being made in the brain as

the brain's way of tuning itself to meet your needs. A simple way to consider how the brain builds new neural pathways as it's challenged by new information and its environment might be to think of the brain as a radio. When dialing the tuning knob on the radio by hand to find something to listen to you might come across a station that sounds interesting, but has a great deal of static so you can't really understand everything they are saying. To bring the station in clearer you would focus and dial the station in slowly a digit at a time to bring it in with as little distortion as possible. You can think of building new neural pathways the same way when learning something new. The more you focus and practice something the better you become at the new skill that you are learning or an obstacle you are trying to overcome. By doing this new neural connections are created in the brain as synapses that don't usually fire together do, which help us to sharpen our new skill.



Focusing to tune in new neural pathways

It was believed until recently that the human brain, which consists of around 100 billion neural cells, could not generate new ones (the generation of new neurons is also known as neurogenesis). The old model assumed that each of us was born with a finite number of neural cells and when a cell died no new cell could grow. This old model of the brain's inability to regenerate new nerve cells is no longer relevant. It has been proven that certain areas in the brain can generate fresh cells. This new understanding of neural cell generation is an incredible discovery. Another misconception was that the brain had an inability to

create new neural pathways. It was once believed that the human brain had a relatively small window to develop new pathways in our life span, then after that the pathways became immutable. This old theory thought our ability to generate new pathways dropped off sharply around the age of 20, and then became permanently fixed around the age of 40. New studies have shown through the use PET, and MRI brain scanning technology, that new neural cells are generated throughout life as well as new neural pathways. Even the elderly are capable of creating measurable changes in brain organization. These changes are not always easy but can happen through concerted focus on a defect area.

Neuroplasticity Terms



Illustration of neurons firing

Neuron - A neuron is the functioning cell unit in the nervous system that is also known as a nerve cell. Neurons are responsible for sending impulse messages to other neural cells. Impulse messages in a neuron are sent via the release of neurotransmitters. The neuron's cell body is called the soma. The neuron cell consists of 3 main sections a soma, axon, dendrite.

Dendrite - Is the tree branch like structure connected to the nerve cell body (soma) that sends and receives information between cells. Can be

thought of as the brain's traffic cops routing messages to their desired cell target.

Axon - Is the lengthy thin straight structure that is part of the neuron body (soma) that conducts nerve impulses away from the cell body to the neuron's terminal buttons.



Illustration of neural synapses passing chemical messages

Synapse - Is the structural space between neurons in the nervous system that is the conduit for a neuron to send a chemical message signal to the targeted neural cell. A synapse is also known as the terminal button. Once a message is received at the postsynaptic cell an electrical message is released and passes through the adjoining neuron to the next presynaptic cell that releases another chemical message. The process will repeat it self until the message reaches it desired target. The word synapse is Greek in origin and means point of contact.



Brain Illustration

Frontal Lobe - Is located at the front of the brain stretching roughly from one side of the temple to the other side of the temple. It is the most dopamine-sensitive area of the brain and houses functions like

emotions, personality, problem solving, sexual and social behavior, as well as judgment, language, and problem solving abilities.

Temporal Lobe - The temporal lobe is located around the ears on both sides of the head and stops just before the rounding of the back of the skull. The temporal lobes house many of the brain's important functions such as auditory interpretation, speech and visual processing, spatial memory as well as short, and long-term memory.

Parietal Lobe - The parietal lobe is located behind the frontal lobe and above the temporal lobe. The parietal portion of the brain contains the areas that are vital for processing sensory information from different areas of the body, our spatial sense, as well being tied to the functioning of solving mathematic problems, reading and writing processes.

Occipital Lobe - The occipital lobe houses the visual cortex of the brain, which contains our visual map of the world we live in.

Cerebral Cortex - Is the neural tissue located around the top front portion of the brain. The cerebral cortex is a very important area of the brain and has a vital role in thought, language, memory, attention, and consciousness.

Cerebellum - Known as the portion of the brain that helps with control of skeletal muscles and in coordination in voluntary motor skills.

Hippocampus - Is the portion of the brain that is part of the limbic system and located in the medial temporal lobe of the human brain. The hippocampus plays a role in spatial navigation and in establishing new long-term memories.

Medulla - Is the small area at the base of the brain that plays a role in the autonomic functioning of the nervous system. It is responsible for automatic functions of the body below the thought process such as respiration, blood pressure, heart beating, and more.

Thalamus - Located in the mid-brain area. The thalamus is responsible for processing of sensory data such as visual, and auditory information. It is also involved in consciousness and levels of arousal.

Hypothalamus - Portion of the brain that is part of the endocrine system. It is responsible for metabolic processes such as hunger, thirst, body temperature and more. The hypothalamus is also responsible for neuro-hormones that influence the pituitary gland.

Pituitary Gland - Is an incredibly important pea sized organ that protrudes at the base of the hypothalamus, and is located at the base of the brain. It is responsible for regulation of body homeostasis. It does this through secreting hormones that regulate body growth, sexual function, metabolism, blood pressure, temperature, and thyroid gland function.

Neuroplasticity Resources

Companies Specializing in Neuroplasticity Software

[The Scientific Learning Company](#) has several software programs specifically designed to help improve the learning potential of students with learning difficulties. Scientific Learning's software programs use exercises to help strengthen students weaker cognitive functioning areas. These programs are designed to create positive neuroplasticity changes in the deficit areas of the child's brain. Scientific Learning's most famous program is called Fast ForWord.

[Posit Science](#) also develops software programs to strengthen target areas of the mind using exercises that are designed to create neuroplasticity changes in the brain. The software that Postit Science designs is targeted at the adult segment of the population that may want to strengthen cognitive areas that they feel are not as sharp as they used to be due to normal age declining cognitive functioning. This company's three most popular programs are Brain Fitness Program, Insight Brain Fitness, and Drive Sharp.

[Cogmed's learning software](#) for people with Attention Deficit Disorder (ADD). The company's programs target three different age groups that have problems with ADD. Cogmed JM is for pre-schoolers, Cogmed RM is for school-age children, and Cogmed QM is for adults. The software creates neuroplasticity changes that are aimed at improving user's working memory.

Literature and Podcasts on Neuroplasticity

The Brain that Changes Itself by Dr. Norman Doidge

[Dr.Doidge](#) is a Canadian Psychiatrist, Psychologist, and best selling book author. In 2007 Doidge wrote a book that focuses on the field of neuroplasticity called "[The Brain that Changes Itself.](#)" The book covers the burgeoning field of neuroplasticity and is an excellent book to learn about the subject. Doidge does a great job of explaining the practical modern application for the field of Neuroplasticity. For people interested in neuroplasticity he gives us this list of words that we may come across that also relate to the field of neuroplasticity cognitive neuro-rehab, cognitive rehab, experience-based plasticity, neuroplasticity, neural plasticity, neuronal plasticity, brain plasticity, and plasticity.

Mind and the Brain: Neuroplasticity and the Power of Mental Force By Dr. Jeffery Schwartz and Sharon Begley

[Dr. Jeffrey Schwartz](#) holds a degree in philosophy as well as being an M.D. in psychiatry. He has spent much of his life focusing on the field of neuroplasticity and obsessive-compulsive disorder (OCD). Begley is an author of multiple books that focus on the brain, she is also a Wall Street Journal Science Columnist. Schwartz and Begley have teamed up to create the very informative book [The Mind and the Brain: Neuroplasticity and the Power of Mental Force](#) on the subject of neuroplasticity and it's implications on applications and research in the

field. A couple of the areas the book touches on are the use of neuroplasticity to heal those that suffer from OCD, and discussing how Buddhist meditating can create neuroplasticity changes in the practitioner's brain.

Brain Science Podcast on Itunes hosted by Dr. Ginger Campbell

[The "Brain Science Podcast"](#) is hosted by Dr. Ginger Campbell. Dr. Campbell's podcasts have really terrific interviews from leading researchers on the cutting edges of their respected fields. I'm not sure how she always manages to have such interesting guests but they are all terrific. The podcast are great leaping board for learning the latest advances and trends in neuroscience including information on neuroplasticity. The link listed on here leads you directly to her website, which houses not only the podcasts but other really good information such as book recommendations, discussion forums, and news. If you are searching for podcasts on a specific topic or interest there is a category drop down menu that will help you find podcast relating to your interest of focus. The podcast can also be downloaded directly on Itunes as well which as Dr. Campbell 'catchingly' states are for everyone that has a brain.

Schools and Medical Centers using Neuroplasticity

[The Arrowsmith School](#) in Toronto Canada was one of the first schools to implement neuroplasticity-teaching techniques to help children with learning disabilities rewire their brains for academic success. The school was founded almost 30 years ago by Barbara Arrowsmith Young, who grew up with severe learning disabilities.

[The Taub Therapy Clinic](#) at University of Alabama Birmingham is named after Dr. Edward Taub. Taub through decades of research in the field of neuroplasticity developed techniques to help stroke victims regain control of lost motor and verbal functioning due to damage to the brain from a stroke. The Taub Therapy Clinic is considered the leader in helping people recover from neurological traumas.