How Your Brain Can Rewire Itself

For many decades, the school of thought among neuroscientists was that the adult brain developed to a standard, hardwired, unchangeable form, functioning in a one-mode fashion. Sure it could create and lose synapses (the connecting space between neurons that become encoded with learning memories. And it was vulnerable to degenerative changes such as senility and Alzheimer's. Yet whatever configuration on neurons that developed (to control your eyes, hands, etc.), that was it for life.

New research in recent years however has changed all that. Now neuroscientists are aware that changes in the messages the brain receives can change its structure and function. This new model of brain activity is termed "neuroplasicity."

Much of this new view came about from Harvard Medical School neuroscientist Alvaro Pascual-Leone's research using a process called transcranial-magnetic-stimulation (TMS), where a coil of wire is placed over the subject's brain that sends a short magnetic pulse into the motor cortex of he brain, which is located in the brain in a strip-like configuration from the top of the head (the crown) down both sides (ear to ear).

At Harvard, Leone and his staff ran a series of studies having volunteers learn and practice a brief five-fingers piano exercise for two hours, five days in a row. After which, the volunteers would take a test under the TMS coil. What the testing revealed was that as the week of testing progressed, the TMS readings showed that the strip of motor cortex exhibited new pathways extending into surrounding areas. So when signals from the hand muscles bombard the motor cortex, the brain expands that area. These results clearly confirm that the more use of a particular brain function, the more area the brain then devotes to that capacity.

This important discovery means, for example, that when one is blinded at birth, or early in life, the visual cortex adapts by strengthening one's capacity for auditory hearing or sensory feeling. This phenomenon explains how a Ray Charles or Stevie Wonder emerges with musical genius.

So how can this new understanding of the brain's ability lead us to help improve our dealing with stress? To explore this issue, neuroscientist Richard Davidson, of the University of Wisconsin, tested very experienced Buddhist monks, who have spent as much as 10,000 hours in meditation.

Through his earlier studies, Davidson had discovered that more activity in the left prefrontal cortex (as opposed to the right prefrontal cortex) has been shown to be associated with a higher level of contentment. This cerebral marker (known as the "happiness set point") is a state of mind where individuals return to after they experience profound good fortune or great emotional loss.

In his new clinical studies, Davidson tested whether the mental training of meditation can alter the fundamental levels of one's happiness. Using *fMRI (*functional magnetic resonance imaging), measured Buddhist monks brain activity during a variety of mental states. As a comparison group, Davidson used volunteers who were given a brief training in mediation. In the experienced monks, testing indicating greater activity in brain areas associated to empathy and maternal love. Connections between the frontal lobes and the emotional regions were also strengthened. The differences between the monks and the volunteers came as the monks showed profound activity in the left prefrontal cortex and low activity in the right cortex (correlated to negative moods), while the volunteers showed no huge imbalance in activity. The results show that strengthening the positive happiness set point is an acquired ability that can be trained. And they signal to the rest of us that improving our handling of stress is reachable through the proper techniques.