Changing Minds Everywhere: "The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science" – A Review

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We all have heard it: the ancient adage that people do not and cannot radically change, and leastwise not by themselves. Norman Doidge, M.D. challenges the basis of this belief by introducing how the power of optimistic thinking changes the actual mechanism of our thoughts. No, this isn't some Dr. Phil self-help book on how to see the glass half full, but rather a scientific account describing how what we think has a direct effect on how we think. Dr. Doidge's 2007 novel, "The Brain That Changes Itself," is revolutionizing minds everywhere by presenting the mounting studies on neuroplasticity, or how our thoughts can change the physical structure and function of our brain. Although this book may be classified as a scientific novel, there are self-help applications to all through the miraculous case studies of individuals overcoming brain disorders through therapy. By reading about the struggles and successes of neuroscience concerning neuroplasticity, it is easy for readers of all backgrounds to feel optimistic about the amazing clinical and practical applications.

The journey starts with the disproving of localization, or the idea that the brain was set in place and relatively immutable after childhood. Up until about over a decade ago, the term 'neuroplasticity' was as taboo in the neuroscience world as the act of 'cannibalism' is to the Western culture. Through the emergence of surmounting evidence of neural plasticity in adult brains, neuroscientists have been able to accept that that the brain can and will change throughout the course of its existence. But how does this affect us?

As a psychiatrist at the University of Toronto, Dr. Doidge shares how clinically applying the idea of neuroplasticity in the form of a therapy could impact patients where conventional drug administration alone could not. Through his novel, Dr. Doidge connects the gap between cutting edge scientific research and how it can be applied to every individual for a mental and physical benefit. Consider the case of Cheryl, the first 'story' presented in the book.

Cheryl sustained an injury to her vestibular apparatus, altering her balance and making it impossible to stand upright due to a continuous falling forward feeling. Dr. Doidge tells the story of how lead brain plastician Dr. Paul Bach-y-Rita devised a balance apparatus to place on her tongue so that by various electrical tongue 'zaps' Cheryl could determine if she was leaning in any direction. Through the various tongue 'zaps,' Cheryl was able to teach her brain to bypass the sensory pathway connecting her tongue to her sensory cortex, and create a new brain map to connect the feeling of 'up-rightness' from her tongue to the place in the brain that processes balance. Over months of training, Cheryl strengthened that pathway in her brain and

caused her brain to re-evaluate her perception of balance. After enough treatments, Cheryl effectively did not require the assistance of the apparatus to stop the spinning, allowing her to live a normal up-right life.

Dr. Doidge successfully illustrates how the effects of therapies involving change in how we think by describing phenomenal situations of patients whose lives have been drastically impacted from brain stimulation. Perhaps the most amazing case study presented was Michelle. Michelle suffered a massive blood blockage on the left side of the brain before birth and consequentially only developed the right half of her brain. Her half-brain had to learn the functions of the left in addition to the functions of the right in order for her survival. Because she the blockage occurred in utero, upon birth Michelle had to manually create the left hemisphere pathways such as speech, on her existing right side throughout her childhood. Not only did she succeed, but through brain exercises Michelle now in her late 20s is far exceeding any doctors' expectations. Today she not only lives a relatively normal life with only a few speech and processing delays, but Dr. Doidge hints that she may even be a mathematical savant. It is in these kinds of miraculous case studies Dr. Doidge highlights as truly amazing and inspirational examples of how we can train our own brains to heal and correct ourselves.

When it comes down to the actual biology of how plasticity occurs, Dr. Doidge, however, is a little vague. The book does a good job at explaining the basics, but mainly clings on to Hebb's principle as the chief reason plasticity occurs. Not only does the novel cling to Hebb's principle that neurons who fire together, wire together and vice versa, but Hebb's dogma is repeated almost at nausea throughout each chapter. True, perhaps there is a lot of speculation into the actual mechanism of plasticity, but a little more detail would have been nice. Nonetheless, keeping it simple (maybe a little too simple) allows others with little scientific knowledge to appreciate an otherwise daunting scientific topic as well.

In addition to citing the miraculous case studies of 'personal triumph,' Dr. Doidge also highlights the dangers of having a dynamic brain in the modern world. Dr. Doidge didn't plan on staying on the 'safe' side of science; instead, he charged right into explaining sexual fetishes and addictions to porn through brain plasticity. The book definitely paints an interesting (and sometimes grotesque) picture when it comes to Bob Flannagan's story about sadomasochism. Dr. Doidge postulates that perhaps one of the reasons individuals may find sexual pleasure in pain is that part of the brain's pain and pleasure pathways are crossed at some point, due to a traumatic past event. The new crossed pathway is then reinforced and strengthened through pleasure/pain seeking actions and rushes of dopamine, and voilà! A sadomasochist is formed. Or so Dr. Doidge believes. The book also attempts to describe the cultural phenomenon of internet porn addiction similarly, via dopamine-induced reinforcement in one of the pleasure pathways.

Although Dr. Doidge does deserve some credit for making the leap to fetishes and sexual addictions, his passage on love and brain plasticity does leave something to be desired. The idea of connecting these things is novel, however as a reader it would be nice to have more solid support rather than merely the presence of a hormone concoction. In some ways Dr. Doidge presents neuroplasticity as an answer to behavioral mysteries and boils down problems to just a thinking circuit. This begs the reader to ask: Is it really all in our head?

Even though explaining the occurrences of sexual fetishes, attraction, love, and addiction to porn may seem a little farfetched for some, linking what surrounds us in modern culture to brain plasticity is what makes this risky leap all the more interesting. Dr. Doidge even continues the discussion of the effect of culture on the brain in the appendix. It is necessary in our culture today to be literate, yet human brains have not evolved a single reading circuit innately at birth. We can acquire this circuit at any age through learning and strengthening the circuit which (as long as reading is practiced) the circuit is maintained. Thus, other influences in our modern culture shape our brain as well, such as internet use, texting ability, what is attractive, etc. A dramatic example resides in one culture along the Burmese archipelago where a group of nomads called the Sea Gypsies train their brains to consciously control the shape of the lenses and pupils in their eyes to adjust to the change in light refraction. To prove that this was a learned trait and not some weird genetic mishap, the Sea Gypsies successfully trained a group of Swedish students to do this as well. Thus culture is not only learned, but it physically alters our perception and alters the functioning of our brain. This seemingly simple thought is brilliantly hinted at in the novel and further illustrated in the appendices.

In addition to providing detailed accounts of patient's stories to illustrate neuroplasticity, Dr. Doidge's effort to include the evolution of scientific research does not go unnoticed. The underlying theme of going against the accepted and challenging the limits is repeated in how a few neuroscientists changed the widely held view of the static brain. The narrative of the discoveries interspersed throughout the novel makes the reader feel the frustration and excitement of the research while not dismissing the details of the cutting edge science being found.

Despite Dr. Doidge's attention to scientific detail, one reoccurring theme in the novel was somewhat distracting from the objectivity of the science. As well as being a psychiatrist, Dr. Doidge is also a practicing psychoanalyst working with patients via free association therapies. Commonly throughout the novel, Dr. Doidge refers to Freud and insinuates that it was Freud who was a lead founder in plastic thought. The stretch of both Freudian theory and psychoanalysis to neuroplasticity culminates with the story of 'Mr. L,' who suffered a childhood trauma of losing his mother. Dr. Doidge explains how through free association, 'Mr. L' was able

to transgress 60 years to recover his infantile brain maps and thus behave 'child-like' to solve old attachment issues resulting from his mothers loss.

Now wait a minute, this is confusing. After spending a large amount of time explaining the brain's 'use it or lose it' adage and how existing brain maps are literally competing over cortical space, a brain map from when 'Mr.L' was less than a year old is able to survive 60+ years and be dealt with? This might be a stretch, even from a plastic point of view. It almost seemed like a hidden part of Dr. Doidge's agenda was to uphold psychoanalysis and the use of free association as a modern therapeutic tool. Perhaps there is some thread of truth in this, as it did seem to help in 'Mr. L's' case, but I need a little more convincing.

Regardless of the inclusion of disputed psychological therapies in the book, readers cannot dispute the wide applications of plasticity presented. Ultimately, it is through exercising the mind in new ways which causes the most dramatic improvements and benefits. Dr. Doidge highlights a computer program called *FastForward* which aims at improving cognitive function for both old and young. The idea of *FastForward* is to provide challenging and rewarding practice in areas or pathways of the brain that need to be developed. For children with learning delays or speech and attention impairments, specific programs can focus on strengthening those pathways in a rewarding manner. Similarly with the aging population, specific computer programs are able to stimulate strengthening and growth to prevent against or even reverse neural decline.

In addition to computer programs designed to strengthen connections, the book highlights a version of physical therapy for stroke patients or brain damaged patients to recover some or all of what they lost. This form of therapy is based on the idea that the brain and body adapts to a lack of input quickly, and thus right after a stroke one can undergo learned nonuse if no input from a sense is being received. The Constraint-Induced Therapy developed by Dr. Taub involves placing a sensory muffler (such as an oven mitt) on the functionally dominant appendage. By restraining the dominant appendage, the weaker side is then forced to struggle with neural demands and thus forcing the weak side to strengthen and improve.

The applications are vast for the relatively new concept of neuroplasticity and the frontier is only getting brighter. Although Dr. Doidge makes some leaps in his book, the personal stories of truly amazing recoveries combined with the timeline of scientific discovery cannot but produce optimism for the future of cognitive therapies. Ultimately, "The Brain That Changes Itself" preaches to never mentally settle, but rather to constantly challenge our brain by trying new skills, accomplishing new tasks, and exploring our vast surroundings. Dr. Doidge urges his readers to use neuroplasticity to the minds advantage, as the key to the perception of personal happiness lies within the health of our own brain. In this sense, it really is the mind that holds the power of reinforcement over matter.