How Psychotherapy Changes the Brain

Eric Collett

PSYCH 311 section 03

Brigham Young University – Idaho

Abstract

This paper goes into the changes of the brain caused by psychotherapy. These changes include structural changes and functional changes. Psychotherapy is defined and elaborated on for better understanding. A short history of psychotherapy is shared for help to understand where it came from, and how long it’s existed. Certain mood disorders are looked at specifically for help to show changes in the brain through psychotherapy. Many studies are used within the paper to show actual results supporting brain changes and the positive effects of psychotherapy for treatment. It compares the effects of medicine and psychotherapy in helping with disorders. Articles were found for general topics of psychotherapy, and more specific topics. The bonuses of seeing the brain change physically with neuroimaging to show the actual results of the psychotherapy. Neuroimaging and psychotherapy are also bridged with one article trying to bring the two together. It discusses white and gray matter within the brain and the changes that occur by increases both those types of matter within a brain.

How Psychotherapy Changes the Brain

**Introduction of Psychotherapy**

The brain is constantly changing, but sometimes not in the right ways. In his book, *An Introduction to the History of Psychology*, Hergenhahn (2009, 2005), author and Professor Emeritus at Hamline University, writes, “Psychotherapy is any attempt to help a person with a mental disturbance” (p. 489). Most often we hear of psychotherapy just as “therapy”. To help with those changes psychologists and psychiatrists alike use psychotherapy to help change the brain. They do this by talking to the patient, or patients, during which time they try to understand how the patient’s brain is working. A few different settings where psychotherapy would be appropriate are individual therapy, group therapy, couples therapy, or even family therapy. Ultimately the changes come from the patients themselves changing their own behaviors and patterns of thinking. The real change happens within the brain, however. All types of disorders may be treated through psychotherapy.

Kartsson argues that psychotherapy is used for not only psychologically based disorders, but also biologically based disorders. He says, “…any change in our psychological processes is reflected by changes in the functions or structures of the brain.” (Kartsson, 2011, p. 21) Any time we choose to do something different, or think a different way, our brain changes the way it works. During psychotherapy the brain undergoes many changes which illustrate the plasticity of the brain, or reorganizing the pathways in the brain. This helps certain connections to be forgotten or changed. For example, if someone had a problem with Post Traumatic Stress Disorder (PTSD) their brain would need to reorganize to the point where the stressor would no longer create negative images. “Psychotherapy appears efficacious in enabling sufferers of psychological trauma to cope better with the memories of their traumatic experience, with the reconstruction of the traumatic memories” (Peres, 2008, p. 485). The brain would need change its network to instead activate positive images from that stressor. Instead of thinking of the grenade that hit them, they think about fireworks on the fourth of July. Psychotherapy is designed for positive improvements to the patient. Essentially psychotherapy rewires the brain.

**Brief History of Psychotherapy**

Psychotherapy was one of the early approaches for treating mental illness. People often would be confined because of their mental illnesses for the benefit of the community (Hergenhann, 2009, 2005, p. 489). The therapeutic processes would consist of either treating them according to psychological causes, or supernatural causes. Supernatural causes were sometimes helped through exorcisms, magical rituals, or incantations (p.490). Often times people’s heads were opened to release those “evil spirits”, a procedure called trepanation (p. 491). Psychotherapy has always been a huge piece of society, especially from the beginning before they had all the technology we have today.

Psychotherapy continued on into many schools of psychology, but was changed to conform to their school. Psychoanalysis is the often related in-depth form of psychotherapy. Freud used psychoanalysis to go even deeper than psychotherapy would. There are aspects of psychotherapy in every school of psychology because no matter what your view of how psychology should work therapy for people will always be there. The types of therapy will be the only aspects that differ.

**Changes from Psychotherapy**

**Personality Disorders**

Much of the brain is made of white matter, and those with personality disorders have reduced amounts of white matter. Christopher Filley (2005), a professor of neurology and psychiatry at the University of Colorado Medical School, says, “Now researchers are discovering how [white matter] provides much of the brains connectivity” (p.1). The information given here on the importance of white matter helped researchers study psychotherapy’s effects on the brain within adults who had major depressive disorder. Their study showed that psychotherapy increased the actual integrity of the white matter of the brain. Certain types of psychotherapy increase the white matter for different parts of the brain (Wang, 2013, p. 4-6). This “white matter” contains the myelin sheath which provides faster signal transmission between neurons so we can think faster react faster. This would help everyone, not just those with mood disorders.

Mindfulness is a major form of psychotherapy used to help those with disorders. With mindfulness the patient maintains a constant awareness of thoughts, feelings, sensations, and the environment around them. When practicing mindfulness they found an increase in gray matter within the patients who had borderline personality disorder (BPD) (Chafos, 2014, p. 297). The increase was seen in parts of the brain such as the thalamus, left inferior temporal gyrus, and the hippocampus (p. 299). All of these sections had to do with emotion regulation and response control, some of the most affected areas for those with mood disorders and personality disorders. New disorders are studied every so often providing more research towards psychotherapy’s changes within the brain.

Gabbard (2000) shares one study of two men with similar personality disorders in which psychotherapy seemed to change the brain more than medicine did:

Initial SPECT [single photon emission computer tomography] imaging showed that both men had markedly reduced serotonin uptake in the medial prefrontal area and thalamus, when compared with 10 healthy subjects. Repeat SPECT imaging showed that the man who had received 1 year of psychodynamic therapy had normal serotonin uptake, while the control patient who did not receive psychotherapy continued to have markedly reduced serotonin uptake. Since the patient who received psychotherapy did not take medication in conjunction with the therapy, the finding suggests that the dynamic therapy itself may have normalized the serotonin metabolism. (Gabbard, p. 4)

Medications alter the whole body, while psychotherapy is able to modify the brain to make the body work even better. In this study the man who had a year of psychotherapy was able to change his own mind, with the help of a therapist. Because of this his body responded to those changes in his brain and allowed him to live free of medications, while the other man still needed them to function properly in society. Gabbard also references another study on cancer where psychotherapy increased the amount of time patients lived compared to those who didn’t receive the therapy (p. 4-5). On the other hand he states near the end of his article that, “To observe that psychotherapy may make changes to the brain does not imply that medication is no longer needed as a psychiatric intervention or that psychotherapy can alter all biological substrates” (p. 5). Psychotherapy doesn’t always eliminate the need for medicine, but often times its effects on the brain are better than what the medicine can do.

In a practical application of psychotherapy Daniel Wiswede (2014) and his colleagues tracked the functional brain changes in patients with depression (p. 1). First, their results “showed enhanced activation compared to controls in several limbic and subcortical regions, including amygdala and basal ganglia” (p.1). Second, they noted that the brain activity differences that they had noted were no longer apparent between the control and the patients (p. 1). Their research shows that psychotherapy actually helps those with depression bring their brains to the same functionality as those without disorders. Those changes weren’t always visible for us, but slowly we’ve been able to actually picture the structure of the brain while it’s at work.

**Brain Imaging and Psychotherapy**

Neuroimaging revolutionized the way we view the brain. These images allow us to see how differently brains work with disorders compared those without. In one study images of the brain from those without disorders were compared to those with disorders and showed significant difference, proving that they worked. The tests show major differences between the brain activity before psychotherapy, and after psychotherapy. In the conclusion it gives a theory from Kandel saying:

[He] has proposed that psychotherapy can lead to long-term changes in behavior through learning. This type of learning would be mediated by changes in gene expression that modify the strength of synaptic connections and structural changes that modify the anatomical pattern of interconnections between neurons. (Beauregard, 2009, p. 13)

From this we read that psychotherapy has the potential to increase the strength between certain neurological connections. Also it changes how certain places in the brain are connected. Their results supported the view that the “mental functions and processes implicated in the different types of psychotherapy exert [significant influences] on the functioning and plasticity of the brain” (p.13). The physical evidence is growing rapidly. Brain imaging has also helped for further studies on long-term psychodynamic psychotherapy.

A group of psychologists and psychiatrists worked together on a study to test the differences in brain function after 15 months of long-term psychotherapy. Trained psychoanalysts treated the patients for 15 months with psychodynamic therapy. They found that in patients with mood disorders there was critical improvement compared to the control group. It was also noted that the results gained from brain imaging that they had would help increase psychotherapy’s effectiveness. Psychotherapists are able to know exactly how patients are being affected and they know where to send the patient throughout their own minds (Buchheim, 2012, p. 4-6). First you have to know what changes need to be made to the brain, then you can help change it. Psychotherapists are specifically trained for that exact purpose.

For the struggle of PTSD professors and researchers got together and studied the effects of psychotherapy on them and connected the research to neuroimaging. They found that with the process of using psychotherapy to reconstruct the memories those victims had would help relieve their symptoms. By reconstructing those memories they theorized that there would be less fragmented memories, and the formation of new memories (Peres, 2008, p. 485). These patients have a chance at a fresh start away from all the confusion and chaos in their minds. This shows an example of neuroimaging helping find the cause to solve a problem. Because of the change in their minds from the combination of psychotherapy they can live a more normal life.

**Conclusion**

There were definitely lots of limitations among all these studies reviewed. Some didn’t have very large sample sized, while others had to avoid being unethical. Most areas of the brain have innumerable things to learn about them still. All the changes occurring daily require constant study and research. The more research we find the greater our knowledge grows in the fact that psychotherapy proves to be one of the best treatments for disorders today.

From the previous examples there are many instances where psychotherapy changes the structures the brain creates. The brain regulates everything in the body. When a problem arises which isn’t quite understood there’s usually a link to the brain. The mind-body relationship has been consistently questioned of how closely related they really are. Psychotherapy shows the power of the mind to change the brain and its functions, thus changing the body along with the brain. A few cases show that it works even better than medicine by making the change longer lasting, or even permanent.

Many of the functions and structures of the brain are strengthened by means of psychotherapy. Psychotherapy is designed to help people readjust to reality and integrate themselves back into society. When the brain stops working correctly there’s a problem with the connection of neurons somewhere. The plasticity of the brain allows those changes to be made frequently. Psychotherapy provides the tools the change and rewire the brain, bringing it one step closer to normal.

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