

AN INTRODUCTION TO THE NEUROBIOLOGY OF THE BRAIN, ADDICTION, AND NEUROPLASTICITY

Brain 101 – How do drugs and alcohol typically damage the brain?

The human brain is a complex system that is responsible for ensuring our survival through the communication of brain cells. The brain's job is essentially to keep us alive by providing us information on what our body needs; such as food, safety, rest, etc. Brain cells receive data from the body signaling us, for example if our stomachs' are empty, do we need to sleep, etc. The brain also alerts us to danger, what actions to take to keep us safe, and it analyzes and interprets data to instruct the body what to do next. The brain acts as a navigator to point us towards whatever is needed for safety, and dictates behaviors to assist us moment by moment to survive and thrive. So, the brain is continuously receiving and sending information. Billions of brain cells essentially talk and listen to each other.

Addictive drugs and alcohol can damage the brain just as any chronic illness can damage the body. To put it simply, alcohol and drugs can disrupt the operation of this communication system impairing our internal signals. If we divide the brain into three primary areas we have what is called our "rational brain", the "reptilian brain", and the "limbic system".

In short, the rational brain is responsible for learning, decision-making, and cognitive process. The reptilian brain generates our life sustaining systems such as breathing, sleeping, waking, and feeling hunger, thirst, pain, and temperature. The limbic system is where our emotions are generated from, as well as our internal alarm system, which warns us of danger.

Alcohol and drug use over time can cause brain cells to die, which disrupts the finely tuned communication of the brain cells, and ultimately results in actual shrinkage of the brain. Much damage occurs in the frontal lobe, which has a part in providing our good judgment, problem solving ability, memory, impulse control and more. Damage to this area of the brain easily explains why an addict cannot understand that their behavior is problematic. The cerebellum is also attacked by excessive use and this area of the brain provides our ability to balance, walk, coordination, as well as rational thinking and the ability to reason.

Addiction – Chronic, relapsing, brain disorder.

Neurotransmitters are chemical messengers in the brain that are critical in ensuring our systems are operating optimally for safety. Neurotransmitters are secreted in the healthy brain in exact amounts and connect to a specific receptor for all to go well. The ingestion of alcohol and drugs wreaks havoc on the neurotransmitters altering their amounts, ratios, and timing, which can result in too much or too little of neurotransmitter emission.

There are approximately 40 neurotransmitters in the brain and all are affected by chronic chemical use. Continued consumption particularly affects the neurotransmitters Serotonin and Dopamine causing an enormous release of these neurotransmitters, which influence the experience of feeling "high", and wanting to get "high" again. The brain is always seeking and searching for novelty. The result of an abundant excretion of Dopamine flooding the brain results in the desire for more.

What is called the Dopamine Loop is the process wherein the brain continues to secrete this seeking hormone but has no stop instruction to communicate to the addict that it has had enough. Excess dopamine creates the feeling of euphoria. [When using chemical substances] Our brains now no longer receive messages about when one has ingested enough or too much or if my behavior is helpful for my survival or not. The brain no longer has a healthy road map that leads to survival and safety. The brain however is resilient and is able to regulate itself so when things are off the brain alters itself to manage the new chemical changes drugs and alcohol have produced. In order to achieve homeostasis, the brain can find balance again by creating tolerance. So now the brain has adjusted to the excess levels of certain neurotransmitters and the addict finds he/she requires more and more of the drug or alcohol to feel the “high” the addict once experienced before the brain adjusted to the chemical changes. This is why we see people struggling with addiction solely focused on finding the drug of choice, going to great lengths to acquire it, putting themselves at risk, and unable to see how their new primary focus disconnects them from life, relationships, and impairs their logic, reason, ability to learn, their sleep, and more.

Drugs and alcohol move to the top of the list of primary needs’ above safety, food, sex, and connection with others. When an addict suddenly stops using, the system is again disrupted. The system is resistant to change again. It has been hijacked once and does not want to be hijacked again. Cravings continue, thinking distortions and poor decision making continue. A metaphor I use to provide a visual on what the inside of the brain might look like following sudden cessation of use, is that of a Christmas Globe that after we shake, the once settled snowflakes are moving rapidly within the globe frenetically competing for a new place to land. The snowflakes are like excited cells looking for their safe place to land, to connect, but the cells don’t settle back easily or quickly.

Brain – Resiliency and Healing

Recent research shows that the brain develops its capacity for resilience, through the experience of engaging and communicating with other brains. Capacity to handle life challenges is innate in the brain but this can be changed if we are subjected to repeated, negative long-term exposure to tragedy or trauma. Our neural circuitry diminishes. In essence, the best way to develop resilience is to develop our capacity for resilience in early childhood through a healthy attachment figure, such as Mom. If we feel cared for and safe in early childhood and also have experiences that build confidence and trust the capacity for resilience grows as we see others bounce back from tragedy and receive the support and care we need when we are suffering.

The brain however is a remarkable structure that has the capacity to rewire itself. This is what neuroplasticity is; the brain’s ability to change, build new neuronal pathways, and repair itself when damaged.

Therapy – Neuroplasticity Treatment

Research continues to show that the best outcome of the therapeutic relationship occurs when there is empathy in the relationship. In other words, a patient or client feels true empathy from the therapist. The patient feels understood and that the therapist “gets me”. This does not mean the therapist necessarily agrees with a patient’s behavior or

decision-making but the therapist can communicate to the patient that what the patient is experiencing or doing makes sense based on what the patient is struggling with. If someone “feels felt” then empathy exists. This in turn begins the integration of healthy self-perception and belief, with trust, and finding meaning in past unhealthy behaviors and/or experiences that can begin the building of new neural pathways that strengthen over time and replace the old self-deprecating beliefs and their neural pathways.

In many patients I have worked with I have seen traumatic experience as the root cause of addictions, which I view, as symptoms of these deeper issues. By addressing the root trauma early in treatment and simultaneously exposing the patient to a consistent experience of staff who are empathetic, compassionate, and kind, the new neural pathways that strengthen healthy self- perception, behavior, and connection, the process of neuroplasticity begins. When we speak of the brain we hear “use it or you will lose it” I tell patients “I want you to lose it” then I will help them build new pathways to health. In essence, fostering neuroplasticity may involve re-parenting an adult. Being a role model for healthy behavior, healthy coping behaviors, and challenging gently any thinking distortions. I support the use of movement therapy to help the brain and calm the nervous system. Sound healing, involving drumming circle and acutonics are also a big part in building new neural pathways. Teaching new tasks and focusing not only on nutrition, exercise, psychotherapy, naturopathic and allopathic medicine but also, sleep.

Sleep is always disrupted when alcohol and drugs are involved. The Thalamus is one part of the brain also greatly damaged by chemical use and this part of the brain regulates sleep, plays a part in memory, and keeping us alert when needed. If we treat sleep in a sleep laboratory we can acquire key information about sleep patterns and sleep disorders, which often look like depression, difficulty learning, cognitive impairment, and memory issues. From there we can develop the Master Treatment Plan to include appropriate interventions to acquire healthy sleep cycles, which in turn improves overall mood and cognitive ability. Every time we learn a new skill, such as playing guitar, riding a horse, or hiking a mountain, new neural networks are built. Repetition of consistency strengthens the networks and eventually overrides those that were not working well to ensure our survival. There are many therapeutic modalities that are designed to resolve nervous systems dysregulation, release body memories, regulate sleep cycles, take healthy risks, and develop healthy connection with others. All of these and more when presented with consistent, kind, and empathetic care assist the process of neuroplasticity.

Re-Wiring the Brain – Timing

Having repeatedly been asked, “how long does the process of re-wiring the brain take?” I can’t provide a specific length of time. Every individual is different and depending on the severity of their issues and what other symptoms they present with; it can take quite a bit of time. We can provide an excellent launching pad but they must continue the work. I prefer a patient in treatment stay for 6 weeks as I have noticed a genuine readiness to make the next change after 6 weeks. Many patients still need the safety nest treatment provides them at 5 weeks and often need an additional week to prepare for the next steps with greater confidence and less fear. In addition, patients with complex PTSD need more time, as do those with long-term opioid addiction. So, there is

no magic number that tells us the brain has completed its process of rewiring for improved health, safety, and survival.

Healing begins with kindness

Aside from seeking help from a great therapist or psychiatrist, I recommend simple things such as focusing on gratitude. Making a list or verbally stating, “I am happy and grateful for _____”. It might seem difficult at first but in short order most of us can come up with a fairly long list. We know that when we are in gratitude, our brain is releasing endorphins and does help us feel better.

Other recommendations are to go outdoors. We tend to feel better when we are out in nature or at least out. If one lives in an area where it is sunny, just 10 minutes in the sun can help us to naturally manufacture Melatonin, which supports us having normal sleep and wake cycles. Movement is also helpful. Even a 10-minute walk can begin to intervene on lethargy. In addition, anyone can practice intervening on his or her negative thoughts. We all have the power to choose what we think. So in any given situation, rather than making an assumption, or making up a story about negative things happening, stop and reflect on the buffet of thoughts you have to choose from. Choose the thought that results in the least amount of emotional pain or anxiety.

There is also research out that demonstrates if we tell ourselves on a daily basis for at least two minutes, positive affirmations, overtime we will not only believe the affirmation is true but we will have evidence it is true. For example, if I am afraid of public speaking and for 10 days look in the mirror for two minutes verbalizing things like “I am a confident and an interesting public speaker”, “I have no fear of public speaking”, “I love public speaking”; eventually I become a confident public speaker with no more anxiety about doing so. Lastly, as humans require other humans to survive and thrive, connect with healthy people. Find laughter.

Kindness. Kindness. Kindness.

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