

“Our Primitive Brain: The Force Behind the Relapsing Addict”

Armando Maliano

August 26, 2002

One of the most important challenges facing society today is that of addiction and the need to update our knowledge of addiction as a disease. Current neuroscience has made great strides in showing us the neurological process of addiction as a disease of the brain and nervous system.

In the past, addiction was often viewed as habituation: as a habit that could be altered by will power and self-motivation. Being addicted was viewed as a character flaw. Even today, we refer to addicts as having a drug “habit”. But the truth is that the addict has lost control despite awareness. He suffers from a compulsive addiction.

In a recent article¹ critical of the feasibility of residential treatment programs, relapse rates ranging from sixty to ninety percent were described. With the high cost of treatment and the deleterious effect on the addict, his life, and those who care about them, these numbers reflect a tragic reality. The need for higher rates of successful early recovery cannot be ignored. There seems to be an inadequate understanding of relapse.

What is needed is for health care professionals to help addicts understand the neurological and physiological processes underlying relapse. Professionals need to understand these processes well enough to be able to explain them to an addict in such a way that the addict can comprehend and better understand themselves and what they are up against. Both parties need to understand normal functioning and the impact of addiction upon it.

It is hard to understand and to explain in simple common sense language to addicts how the neuroscience of addiction works. Among the many reasons making it difficult is the fact that the information is relatively new even to practitioners; it is unfamiliar to the general public and certainly to addicts; the neuroscience is complex as it involves many parts, functions, and processes; what actually happens to the brain and nervous system seems subtle to us since it involves the autonomic nervous system; and the information itself is described in long, scientific words that can be off-putting to addicts. In addition, addicts may resist listening to and understanding this new information since denial is a common defense of addicts and since it is frightening for them to realize that they are not in control of their addiction and are likely to relapse. As a student pursuing my dream of becoming a certified drug counselor, here is how I am learning to describe addiction using this new science.

¹ Noxon, Christopher, “The Trouble With Rehab,” Playboy Magazine, (March: 2002), pgs 88-89, 152-155

One basic thing to understand is that the nervous system has three major areas: the central nervous system, the autonomic nervous system, and the somatic peripheral nervous system. These three systems connect to the brain, which has developed over a long period of time into three parts known generally as the hind brain, mid-brain, and forebrain functionally including the spinal cord.

To explain addiction to an addict, I would focus only on the primitive brain and the frontal cortex because of their particular functions. The former responds to our basic survival needs (such as hunger, pleasure, sex, and nurturing) and the latter controls overall functions, conscious thought, attention span, judgment, impulse control, and concentration.

The primitive brain works through a cyclic process of response to messages from the body pertaining to primal areas. One example of primitive brain response is when one feels hungry, one seeks to obtain food, ingests food, reaches satiation, and rests. There is a reward component to the process which reinforces the repetition of successful pleasurable behaviors involving those primal areas. These impulses are so strong that they can easily overcome the thinking part of our brain - the newer part - the cerebral cortex. To quote Plato, "Passions, desires, and fear make it impossible for us to think." These impulses are so strong that they can override our drive for survival itself.

The way that messages travel to and from the brain is through a process known as neurotransmission, along a route called the mesolimbic, dopaminergic reward pathway. In a normally functioning brain, when a nerve cell is stimulated it reacts by producing in its nuclei chemical substances known as neurotransmitters, which are contained in vesicles. These substances are then transported through the axon by an electrical impulse or charge similar to static electricity. The vesicles are sent to the end of a dendrite of the nerve cell. The dendrite is shaped like a long finger.

Nerve cells do not connect directly or electrically but rather chemically across a synaptic gap. The vesicles release their neurotransmitter chemicals into this gap through their pre-synaptic membranes, which results in loose chemical floating between the dendrites of that nerve cell and the next nerve cell. The chemical can be received by the next nerve cell's dendrite post-synaptic receptor site. Reception of this chemical triggers a transmitter signal or electrical charge to the nucleus of the receiving nerve cell where it again repeats the process, thus sending the message along its way.

In the synaptic gap, there are four dynamics or functional processes which can happen to the chemical. The four processes are binding, reuptake, enzymatic degradation and autoreceptor function.

When chemical is received on the next post-synaptic membrane receptor site, binding occurs and causes an electrical charge. Reuptake occurs when loose chemical is collected and returned to the originating vesicle to be transported back to the neuron where it originated. Enzymatic degradation occurs when and if any chemical gets away from the gap; enzymes in the brain then break down and change the chemical's molecular structure so that it is no longer a neurotransmitter. The autoreceptor function occurs when a neurotransmitter receptor on the bottom of a sending neuron signals the cell to produce more or less of a particular neurotransmitter substance; this is a regulatory function. All of these dynamic processes happen over and over from neuron to neuron.

The principle adhered to by all of these activities is to maintain of a state homeostasis or balance. The body automatically knows when it is imbalanced and seeks to return to balance. Side effects are produced by the body in an attempt to rectify imbalance.

Neurotransmitters produce feelings and sensations in the body. Neurotransmitters include dopamine, norepinephrine, endorphins, serotonin, and GABA. Dopamine produces pleasure and a sense of well-being. Norepinephrine gives a feeling of energy and enhances concentration. Endorphins have an effect of analgesia and pleasure. Serotonin affects sleep, rest, sensations of pleasure and appetite. GABA's effect is calmness. The depletion of these neurotransmitters produces their opposite effect.

As John J. Ratey, MD, explains, "The brain never sleeps."² The brain is always adding new connections, so many billions of connections that we can't count them all. Brain cells weaken if not used on a communication pathway. New pathways can be utilized and old pathways can be strengthened. All of those processes are connected to the frontal cortex, which gives us information about our interior and exterior reality. This information allows us to predict ahead what can happen in space and time. As we know, the brain is always busy seeking homeostasis and the frontal cortex oversees that process like a CEO.

What happens to a normal brain and nervous system functioning with alcohol or drug (AOD) use? The brain is protected normally by a barrier called the blood-brain barrier. Psychoactive drugs are the ones that can affect the brain after penetrating that barrier. They can do this because they are fat molecules and not water-soluble molecules.

There are different categories of psychoactive drugs, grouped together by their differing effects. One group includes sedatives, depressants, benzodiazepines, barbiturates, and alcohol. Another group includes stimulants, anorectics, amphetamines, Ritalin and other similar drugs. A third group is the opioids, such as opium, analgesic pain killers, codeine, morphine, heroin, Fentanyl, Demoral, Darvon, and Nethadone. A fourth group is the hallucinogens, LSD, mushrooms, mescaline, and peyote. Last is the group of antipsychotic medicines such as Phenothiazine, Haloperidol, Clozaril, Risperidone, et cetera.

All of these drugs are fat molecules able to penetrate the blood brain barrier which tries to protect the brain from toxins and poisons. These drugs have a way of fooling the brain's supply of chemicals by stimulating the receptor sites at the synaptic gap into triggering neurotransmitters. These drugs either exaggerate or interfere with the outcome of the chemical synapse in various ways. Darryl S. Inaba describes this process as hijacking the chemicals from the brain's drugstore.³

These drugs can make vesicle membranes "leaky", meaning less neurotransmitter will make it to the receptor sites. They can also block reuptake so more chemical is available for receptor sites; they can stimulate release of neurotransmitter (agonist effect) or block receptor sites (antagonist effect); they can inactivate enzymes which lessens the amount of neurotransmitter degraded; and they can serve as a precursor for stimulation of neurotransmitter production. To give an example, when an opiate binds with a receptor site, it fools the cell into producing endorphins and enkephalins which then produce their individual effects upon the body.

Each time a drug is ingested by some method, whether by inhalation, oral ingestion, intravenously, etc., a psychoactive effect takes place in the brain and sets off a chain reaction of neurotransmitter production which literally cascades throughout the brain. Signals are transmitted to targeted zones of the body, creating the high that the addict is trying to feel.

² Ratey, MD, John J., The User's Guide to the Brain, Random House, New York, 2001

³ Inaba, Darryl S., Uppers, Downers, and All Arounders, Random House, New York, 4th Ed. 2000
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There are many features of addiction that favor the likelihood of relapse for an addict. One of these features is that the intensity of effect in ratio to how much drug is taken will create a high beyond what our bodies normally feel. The normal range of pleasure sensations does not produce side effects upon withdrawal. But with psychoactive drugs such as those listed above, when the amount of associated neurotransmitter produced is depleted, the addict does not feel high anymore. Instead, he experiences an “almost high” which gets him trying to re-experience the original high that was chemically produced. The brain is hence being rewired not to produce the normal amount of that chemical. This causes the addict in withdrawal to feel the opposite effect from that neurotransmitter’s particular high. It is hard to sustain perpetual discomfort and the temptation is great for relapse.

This altering of the normal range of pleasure sensation can happen with one-time drug use or gradually over several uses, but it will happen. The person has now rewired their brain to use drugs to feel normal.

Another feature favoring relapse is the lengthy period in recovery of anhedonia, the inability to feel pleasure, which occurs because the body requires an extended period of time to recover. It is difficult for an addict to tolerate that state for very long. Individual recovery times vary, but all addicted bodies must go through a period during which the body returns to original levels of homeostasis and a normal (albeit now lesser) high for the addict.

Since his brain is rewired toward using drugs, the addict literally lives inside a drug-seeking organism that automatically, strongly, quickly, and physiologically responds to trigger cues for the desired drugs(s). For example, even an addict’s pupils will dilate in the presence of the drug, despite his not using it yet. This is a very powerful incentive to use again. The primitive brain has quit listening to the frontal cortex saying “no, that drug is bad for you.” And the addict’s lifestyle is literally full of trigger cues that are impossible to completely avoid. A smell, sound, sight, occasion, memory - anything associated with drug use and pleasure can set off an addict’s physiological responses.

Another feature of drug addiction which favors relapse is the need for instant gratification that the drug use provides the addict. During normal development, we learn to delay gratification for bigger results in a more distant future. This is normal maturation. Instant gratification is the enemy of normalcy. Recovery requires lots of delayed gratification, even some continual abstinence, which is very difficult for addicts to sustain. They sought quicker gratification with drug use originally, reinforced it during use, and may lack the development and practice of delayed gratification. We also live in a society encouraging instant gratification.

Another feature is the unrealistic perception of reality produced by drug addiction. One may not notice danger cues, one may exaggerate the danger of something not dangerous (paranoia), or one may ignore subtle body cues of oncoming illness and fall into poor health.

Since an addict doesn’t need others to feel high and indeed others can interfere with their getting high, often addiction produces isolation. The high makes addicts not care what is going on around them or who is with them, etc. They feel and behave different - separate - they are addicts who join a subculture of addicts. This isolation means each addict is alone with his high, or lack thereof. Even when with other addicts, each is in a real way alone with his or her own experience which is the high. Addicts have a relationship to their drug more than to others. Recovery involves reconnecting or making new connections which is challenging. It fosters low self esteem in comparison to others who are connected and have productive lives going on. Difficulties in building a new life often produce the stresses and cues for relapse. Facing the devastation of

their lives with its losses, guilt, shame, difficulties, traumas, etc., makes recovery extremely difficult for addicts.

Another feature of addiction is that often addicts have dual or triple diagnoses which require multiple aspects of treatment. Many times this is not understood, not diagnosed, or adequate treatment is not received.

And finally, drug use for an addict is their anchor in the world. The way they relate to life is mediated through the drug. When the drug availability is stopped, they have lost their anchor, so to speak. All they have is the “now” moment, which either feels good or bad. That leaves them right at the point of relapse.

Given the difficult challenge of recovery, what do addicts need? They need understanding of their addiction on the physical level: how it works. They need to know that they are going to relapse if they do not learn different coping skills from the ones which got them into addiction/relapse. They need to respect the power of the primitive brain's hold on them that seeks instant gratification. They need to understand their plan of recovery and not have health care professionals discount that road to recovery. They need to reach out for help and trust that help.

Addicts need their counselors to support them as they rewire their brain so that they can function normally without drugs. They need support to tolerate the lengthy period of limbo during which they will not feel good or feel the high while they disconnect from old ways and learn new ways to cope. Acquiring new coping skills requires different time cycles for different people according to their ability to manage recovery. Addicts also need education about the necessity of accepting natural levels of pleasure which are less intense than what drug use initially provided them.

What do drug addiction counselors need in order to help the addict recover and not relapse? They need more education about the neuroscience of addiction. They need to be better educated about relapse, since relapse is almost a given. They need to build their professional ethics, skills, and integrity in order to present this information credibly to the addict without pushing them away or scaring them. They need to be able to teach the addict to say, “Good-bye to the high!”