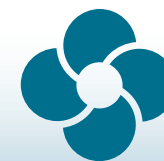


## Pornography and the Brain: Understanding the Addiction

1. We need to understand the Nature of Addiction and never downplay the ominous power of the images.
2. We should call it what it is. Curiously, because we don't like to "label" people, we tend to downgrade what is actually an addiction into something we think less offensive—particularly with youth—as if a label can alter their status. We don't mince "labels" with a 16-year-old heroin addict, and we do so with a 16-year-old pornography addict at their peril. When we sidestep addressing it for what it is, the effort and resources will never be mobilized for recovery, "for if the trumpet give an uncertain sound, who shall prepare himself to the battle?" (I Corinthians 14: 8) In such a case, the young man or young woman will likely continue to use into young adulthood, and can't help but bring it into their marriage. Sadly, I feel that such is the case in the majority of newer marriages today.
3. Remarkably, some married couples think it is acceptable to watch pornography—as long as they do it together. This is nearly always male-driven. The wife should understand, though, that when they have intimate relations the

"mirror systems" of the husband's brain will project him into the movie with the actors; she may provide the proxy body, but he is having sexual relations in the movie—not with her.

4. Many think it is strictly a moral or religious matter, and as such, confession to an ecclesiastical agent clears everything up. This opinion is dangerously naïve and painfully shortsighted. While a person may gain a measure of spiritual and emotional strength with ecclesiastical help, the problem—the brain addiction—requires a lifelong system of supports and education. Therapy and support groups are essential— even vital, for lifelong healing. Without this, those with pornography addiction are destined for a lifetime of discouraging relapses and exhausting struggles. With it, we see healing and recovery.



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## Pornography and the Brain: Understanding the Addiction

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The human brain is programmed to incentivize behaviors that contribute to our survival. One system (the mesolimbic dopaminergic) rewards eating and sexuality with the release of powerful pleasure incentives. But cocaine, opioids, alcohol and other drugs hijack these pleasure systems and cause the brain to think that a drug "high" is also necessary for our survival. There is now strong evidence that natural rewards which come from eating and sex affect the brain's reward systems in the same way taking drugs affect them, thus explaining the current interest in what is called "natural addiction."

Addiction—whether to cocaine, food or sex—occurs when the drug use, eating, or sexual behavior ceases to contribute to a healthy state of homeostasis and instead causes detrimental consequences. For instance, when eating causes morbid obesity, few will argue that such a body is in healthy balance. Similarly, pornography causes harm when it impairs or destroys a person's capacity to develop emotional intimacy.

Sex is a very powerful drive and ensures the survival of our species. Like all rewards, desire for sex is driven by the release of dopamine in the brain, an excitatory neurotransmitter. Once released, the signal touches several areas of the brain: the frontal executive control regions add perspective to the raw full-strength dopamine's desire; other areas bring meaning and context to the brain's pleasure reward. Thus, when balanced, this desire—that leads to pleasure—motivates us to participate in behaviors that help us survive and thrive.

Addiction occurs when this natural drive for pleasure gets out of balance and instead of simply motivating us, it dominates and controls. Such a person realizes they can't quit smoking the cigarette or joint, or they must have that shot of alcohol, or they must find a pornographic video to masturbate to. Because if they don't, they sense a growing tension and obsession, a "brain itch" of sorts which initially whispers, then calls,

then shouts, and finally commands that person to act out in their addiction of choice, thus temporarily relieving what has become an absolutely unbearable tension.

Once we understand how the brain changes with addiction, it shouldn't be surprising that we can become addicted not only to *substances* but also to *behaviors*. We must first have a basic understanding of how the brain changes with learning. Two decades ago we thought the brain was "ceramic," meaning it reached a point in adulthood where it ceased to change with learning. In 1995, however, that began to change with the "Violin Studies." We found that the part of the brain that controls a violin player's string hand *enlarges* as the person practices—no matter their age.<sup>1</sup> Since then, many studies have confirmed that virtually every learning activity changes the brain structurally, whether it's juggling<sup>2</sup> or taxi driving<sup>3</sup> or studying for exams.<sup>4</sup> As Zatorre explained, "The brain is the source of behavior, but in turn it is modified by the behaviors it produces; ...learning sculpts brain structure."<sup>5</sup>

In a study on how brain cells change with addiction learning, Kauer and Malenka explain, "addiction represents a pathological [disease-related], yet powerful, form of learning and memory."<sup>6</sup> Knowing what we now know about learning and how it physically changes the brain, we would expect that their

1. Elbert T, Pantev C, Wienbruch C, Rockstroh B, Taub E. Increased use of the left hand in string players associated with increased cortical representation of the fingers. *Science*. 1995;270:305-7.

2. Draganski, et.al. Neuroplasticity: Changes in Grey Matter Induced by Training. *Nature* Jan 2004

3. Maguire et al., Navigation-related structural change in the hippocampi of taxi drivers. *Proceedings of the National Academy of Sciences*, Vol 7: No. 8, 1999.

4. Draganski et al, Temporal and spatial dynamics of brain structural changes during extensive learning. *Journal of Neuroscience*, 26(23):6314-6317, 2006.

5. Zatorre et al, Plasticity in gray and white: neuroimaging changes in brain structure during learning. *Nature Neuroscience*, 15(4):528-36, 2012.

6. Kauer, J. A., & Malenka, R. C. (2007). Synaptic plasticity and addiction. *Nature reviews neuroscience*, 8(11), 844-858.

learning model of addiction would also be associated with changes in the brain, and it is. Many studies of both *drug* addictions<sup>7,8,9</sup> and *behavioral* addictions<sup>10,11,12</sup> have demonstrated this. In any type of addiction learning the brain's reward centers *shrink*, along with impairment in the executive control regions. It should come as no surprise, then, if we were to find that pornography also changes the brain.

Based on what we learned from a previous DNA study, we predicted in 2011 that scientists would eventually see evidence of physical and metabolic changes in the brain with pornography—similar to that caused by cocaine and other drugs.<sup>13</sup> Our prediction was confirmed in a 2014 study out of the Max Planck Institute in Germany, published in the *Journal of the American Medical Association - Psychiatry Edition*. It found that those addicted to pornography have relatively shrunken reward areas of the brain, as well as impaired connection to the frontal control centers. And the more hours per week the subjects had viewed pornography, the more the change in the brain.<sup>14</sup>

Other studies in 2014 confirmed our prediction that the brain would also be altered metabolically. A study out of Cambridge University in England showed that the brain of those addicted to *pornography* respond in a similar way to those addicted to *drugs*, paralleling what is called The Incentive Motivation Model of Addiction.<sup>15,16</sup> Dr. Norman Doidge, a neurologist at Columbia University, in his book *The Brain That Changes Itself*, describes how pornography causes a rewiring of the brain's neural circuits. He notes a study on men as they viewed Internet pornography in which the men looked “uncannily” like rats pushing the lever

to receive cocaine in the experimental “Skinner” boxes. Like the addicted rats, the men were desperately seeking their next fix by clicking their computer mouse—just like the rats pushing the lever.<sup>17</sup>

Drug addictions, while powerful, are rather *passive* in a “thinking” kind of way, whereas pornography viewing—especially on the Internet—is a much more *active* process neurologically. The constant searching and mental evaluation of each image or video clip (which have been deliberately produced for potency and effect) is an exercise in brain learning and neuron re-wiring. Pornography addiction is frantic, desperate learning, so perhaps this is why many who have struggled with several kinds of addictions report that pornography addiction was the most difficult kind for them to overcome.

In August of 2011 the American Society of Addiction Medicine (ASAM) formally recognized destructive compulsive consumption of natural rewards, including food, sex and gambling, as *natural addictions*. This new definition makes two bold statements: the first is that addiction is a *disease of the brain*; and second, that addiction is not limited to *substances* such as cocaine and opioids, but includes *behaviors* involving food, sex and gambling.

### Consider this explanation of the new definition:

Addiction is a primary, chronic disease of brain reward, motivation, memory and related circuitry. Addiction affects neurotransmission and interactions within the reward structures of the brain (including nucleus accumbens, anterior cingulate cortex, basal forebrain and amygdala) such that motivational hierarchies are altered, and addictive behaviors (which may or may not include alcohol and other drug use) replace healthy, self-care related behaviors. Addiction also affects cortical and hippocampal circuits of the brain such that the memory of previous exposures to rewards (such as food, sex, alcohol and other drugs) leads to a biological and behavioral response to external cues, which in turn triggers craving and/or engagement in addictive behaviors. (See <http://www.asam.org/DefinitionofAddiction-LongVersion.html>)

17. Doidge, *The Brain that Changes Itself*. Chapter 4, Acquiring Tastes and Loves, 2007.

The formal definition was four years in the making and involved over 80 addiction experts. It affirms the primary role neurobiology plays in all addictions, and describes compulsive destructive sexual behavior as a *brain* addiction.

In light of this emerging evidence, the pornography industry is desperately fighting the “addiction” label associated with its product, and has academic apologists who vigorously defend pornography. They claim that pornography is harmless fantasy; that restricting it is a violation of First Amendment rights; that it actually decreases sexual assault and is therefore socially useful; and that it can be used to enhance marital intimacy, and so on.

But scientific evidence shows that pornography is not fantasy to the brain, as the brain's “mirror systems” powerfully merge fantasy with reality. Thus, individuals watching pornography “resonate with the same motivational state” of the actors in the films.<sup>18</sup> And what is that motivational state? A recent study found that almost 9 out of 10 of the most popular pornography movies show aggression toward women,<sup>19</sup> and one male actor acknowledged that was his goal.<sup>20</sup>

Pornography is damaging to adult men and women, but it is particularly damaging to youth: 1) It often becomes their primary mode of sexual learning, and constructs their sexual templates at increasingly younger ages; 2) The immature brain's of youth have an impressive reward system that is primed to learn, and pornography is a powerful and ready teacher; 3) A brain protein called DeltaFosB is important to the development of all addiction (drug and behavioral), and this protein is more potent in the immature brains of youth;<sup>21</sup> 4) Growing brains go through complex “pruning” and “myelination” processes that are not completed until the mid-20s, which means that youth are more vulnerable to “building” an addicted brain than adults.

Even though few may acknowledge it, the near universal availability of hard-core porn may have

18. Mouras et al., *Neuroimage*, 42(3):1142-50, 2008.

19. Bridges et al., Aggression and sexual behavior in best selling pornography videos: a content analysis update. *Violence Against Women*, 16(10):1065-1085.

20. Bill Margold, pornography performer; Gail Dynes, *Pornland: How Porn Has Hijacked our Sexuality*. Beacon Press, Boston 2010, pg xxvi

21. Ehrlich et al., *Journal of Neuroscience*, 1 Nov 2002, 22(21):9155-9159.

already addicted a majority of our young men. The rewards released within the brain are so powerful that when young men—and an increasing number of young women—watch these carefully filmed sexual scenes and masturbate to them, their brains can quickly become addicted.

Internet pornography has two characteristics that make it particularly addictive. First, it is immediately at hand and has almost infinite novelty. This may be like an endless candy store that entices a person into its vortex with the promise of unlimited variety. The second characteristic is the remarkable potency of the material. Nikolaas Tinbergen won a Nobel Prize in the 1970s for his study of animal behavior and coined the term *supranormal stimulus*. This describes the promise of a reward above that which the organism naturally encounters in nature.

For example, he made plaster bird eggs bigger and painted them brighter than normal bird eggs, and found that birds would try to roost on the plaster eggs—and ignore their own real eggs. In a test more pertinent to us, he made artificial butterfly wings in a species where the male is attracted to the female based on the color of her wings. He purposely made the fake wings on his butterflies look more appealing than the real ones. What did he find? When exposed to both, male butterflies would try to mate with the fake females instead of the real females.

Pornography is a *supranormal stimulus*, and like butterflies, many males—and increasingly females—are choosing its larger-than-life artificial rewards over real human sexuality.<sup>22</sup> Virtual reality (VR) pornography will only accelerate this phenomenon. Pornography's potent rewards have fostered the hook-up culture prevalent on many college campuses. Despite strong denials from professional porn defenders, it is also fueling the rise in sexual assaults on campuses, in the military and society at large. It is driving the majority of divorces today. And in marriages that continue despite its presence, pornography is destroying the emotional integrity of the relationship.

Setting aside the impressive cultural and individual denials that seem to prevail on this issue, we would do well to address it using the following multifaceted approach:

22. Hilton, Pornography addiction: a supranormal stimulus considered in the context of neuroplasticity. *Socioaffective Neuroscience and Psychology*, Vol 3, 2013.

7. Franklin et al., *Biological Psychiatry*, 2002

8. Thompson et al., *Journal of Neuroscience*, 2004

9. Lyoo et al., *Psychopharmacology*, 2005

10. Pannaccuilli et al, *Neuroimage*, 2006

11. Schiffer et al., *Journal of Psychiatric Research*, 2007

12. Zhou et al., *European Journal of Radiology*, 2011

13. Hilton and Watts, Pornography addiction: A neuroscience perspective. *Surgical Neurology International*, 2011

14. Kuhn and Gallinat, Brain structure and functional connectivity associated with pornography consumption: the brain on porn. *Journal of the American Medical Association Psychiatry*, May 28, 2014.

15. Voon et al., Neural correlates of sexual cue reactivity in individuals with and without compulsive sexual behaviors. *Plos One*, July 2014

16. Mechelmans et al., Enhanced attentional bias towards sexually explicit cues in individuals with and without compulsive sexual behaviors. *Plos One*, 2014.