A Model for Understanding Addiction

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV TR) divides substance use disorders into two main categories: substance dependence and substance abuse.

In order to satisfy the criteria for substance dependence, an individual must have at least three of the following criteria:

1. Tolerance: need for use of increasing amounts of the substance in order to achieve intoxication.
2. Withdrawal symptoms typical for the substance.
3. Substance taken in larger amounts or over a longer period of time than intended.
4. Desire to cut down or control use.
5. Great deal of time spent on using, obtaining, or recovering from the substance.
6. Reduced social, occupational or recreational activities because of substance use.
7. Continued use despite adverse physical or psychological consequences.

According to the DSM-IV criteria, tolerance and withdrawal are not sufficient or even necessary to make a diagnosis of substance dependence. Compulsive cannabis use, for example, can occur in the absence of significant tolerance or withdrawal symptoms. Likewise, surgical patients can experience tolerance and withdrawal from opioid pain medications without showing signs of compulsive use.

Substance abuse is defined by one of the following criteria:

1. Recurrent substance use resulting in failure to fulfill role obligations at work, school, or home.
2. Recurrent use in physically hazardous situations.
4. Continued use despite social or interpersonal problems caused by the substance.

To better understand the nature of habitual substance use, various models of addiction have been developed. Currently, the most popular model for understanding substance addiction is to view it as a chronic disease, akin to diabetes or asthma, in which behavioral interventions and treatment compliance play a part in controlling a lifelong illness [Leshner AI, Hosp Practice 1997:6-8; McLellan AT, et al. JAMA 2000; 284(13):1689-95]. Although the medical paradigm has done much to lessen the stigma and has resulted in improved treatment services, it is inadequate in that it fails to address the importance of psychosocial and cognitive learning variables in addiction. The motivated behavior model for understanding addiction [McHugh PR, The Perspectives of Psychiatry] takes into account the individual’s free will, biological drive, and conditioned learning, which interact to produce addictive behavior.
• **Drive**

All motivated behaviors (eating, sleeping, and sex) are driven, in part, by biological mechanisms. In the case of addiction, abused substances have been found to cause increased levels of dopamine in the nucleus accumbens, a part of the mesolimbic dopamine system found in the ventral tegmental area of the brain. These structures are among the most primitive areas of the brain and are powerful motivators when stimulated. Animals will perform a task (such as a lever press) several thousand times in order to receive an electrical or chemical stimulus to the nucleus accumbens. This biological “reward system” is modulated not only by dopamine but also by opioid receptors. Cocaine and stimulants directly cause elevated levels of dopamine, while alcohol and opiates increase the firing rate of dopaminergic neurons by acting on opioid receptors.

• **Conditioned Learning**

Conditioned learning shapes behavior by way of psychological and environmental variables. Society can also play a role in initiating and sustaining addiction. This was convincingly illustrated in a study of 898 U.S. servicemen enlisted in Vietnam, where 21% were addicted to heroin while in Vietnam, but only 1% remained addicted upon their return to the U.S. [Robins LN, *Arch Gen Psychiatry* 1975;32:955-61]. Easy access to opiates in Southeast Asia and a culture of opiate use may have been factors contributing to the high rate of heroin use.

Learning is also shaped by reinforcers provided by the drug itself. In the earlier stage of addiction, the “high” or euphoria provided by the drug serves as the positive reinforcer. In later stages, negative reinforcement becomes more important as the addict develops tolerance to the drug. Long-term heroin addicts continue to use the drug not because it makes them “high” but to avoid withdrawal sickness.

Moreover, environmental cues can trigger “cravings” or urges to use the drug. This is best illustrated in nicotine dependence, when smokers experience strong cravings when performing activities usually associated with cigarette smoking. In short, addiction results when biological mechanisms and environmental conditioning combine to produce a new “drive” or hunger to use drugs without the normal checks and balances that usually keep natural drives under control.

• **Choice**

Finally, choice involves the free will of the individual to initiate and continue using the drug. While it is true that choice becomes narrower as addiction progresses, it is by choice that an individual enters treatment resulting in a lifestyle change.