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May 6, 2008

SOC 620

### Drug Addiction: A Disease

Drug abuse is an issue that greatly affects our society today. Many people feel the impact of drug abuse, not just the users themselves. Their families, friends, co-workers, doctors, treatment specialists, and law enforcement officials are all impacted by drug abuse as well; and they all have opinions on what exactly drug abuse is. There are social, economic, medical, and legal consequences of drug addiction that affect society as a whole by using money and other resources, such as the criminal justice system (National Institute on Drug Abuse 2007). People have differing views on what drug dependence and drug addiction are and their causes. There are some that feel drug addiction is caused by psychological factors in the user, while others think the user suffers from a lack of will power (Volkow 2006). Some feel addiction is a question of morality rather than a health problem (National Institute on Drug Abuse 2007). Then there are those that view drug addiction as a disease that makes the user powerless (Volkow 2006). Studies have shown that genetics play a large role in determining who is more likely to become addicted (Volkow 2006). There is evidence that drug addiction may be inherited, the same way other diseases are. There is neurological evidence that shows drug use causes changes to occur in the brain, making the user lose control over their use. Like other diseases, these changes in the brain cause addiction to develop and become worse over time. Neurological changes also explain why drug use during adolescence increases the chances of developing addiction. Environmental cues may also explain why an addict has no control over their drug use. Drug addiction is similar

to other biological diseases, such as diabetes, hypertension, and depression, just to name a few (Leshner 2001). All of these diseases are caused by damaged or malfunctioning organs and need treatment. Finally, both the Diagnostic and Statistical Manual of Mental Disorders and the International Classification of Diseases recognize drug dependence and abuse. Each have their own criteria as to what dependence and addiction are. It is important to know whether or not drug addiction is a disease because it will affect the treatment of drug addicts, government support of drug treatment, and reduce the stigma that is associated with being addicted.

One idea that may help to explain why addiction is a disease is the neurological changes that cause a person to want to use drugs. Studies have shown that, over time, repeated drug use causes many changes in the brain to occur. These changes affect one's ability to make decisions and control their behavior. Addiction is the result of neurological changes and the programming of drug-related "cues" that occur in the brain. "It is as if drugs have high jacked the brain's natural motivational control circuits, resulting in drug use becoming the sole, or at least the top, priority for the individual" (Leshner 2001:75). When compared to a normal brain, an addict's brain differs in the number of neurotransmitters and receptors (Volkow 2006). Certain neurotransmitters are altered as a result of drug use, causing the addict to want to continue his or her use.

One well-known neurotransmitter that is affected by drug use is dopamine. Dopamine is associated with motivation and pleasure, and it enables people to carry out activities that are essential to survival, such as eating, sex, and social interactions (Volkow 2006). All drugs of addiction affect the amount of dopamine in the user's brain. Drug use affects dopamine the same way those basic needs of survival do. Dopamine sends signals to the brain, which motivate one to do a certain behavior. In some cases, that behavior can be to take a certain drug. The big

difference in the way drugs affect dopamine is that once the behavior is carried out, the dopamine levels that send the signals do not decrease. The drug user is constantly receiving signals to take drugs, resulting in addiction. When the amount of dopamine increases, the brain tries to compensate by reducing the number of dopamine receptors. Brain scans have shown that drug addicts have less dopamine receptors in their brains compared to a normal brain (Volkow 2006).

Dopamine is not the only neurotransmitter/receptor that is affected by drug use. Gamma-aminobutyric acid, or GABA, which inhibits neurons, is reduced as a result of drug use (Interlandi and Kelley 2008). Certain drugs that stimulate the production of GABA have been effective in treating patients who are addicted to cocaine. Glutamate is another neurotransmitter in the brain that causes the user to experience cravings for the drug they are addicted to. There are drugs already on the market that suppress Glutamate (Interlandi and Kelley 2008). This disruption of neurotransmitters explains why people are motivated to take drugs and why they continue to do so. The changes that occur in the brain as a result of drug use alter the function of the brain; and over time, with continuous use, one becomes addicted. If drug addiction were caused by functions in the brain, than one would assume it is a disease rather than an act that the addict is choosing to engage in.

Another part of the brain that is affected by drug use is the orbital frontal cortex, located at the front of the brain, at the top of the eyes. This part of the brain allows us to exert inhibitory control and assigns value to stimuli, two very important functions (Volkow 2006). The orbital frontal cortex is disrupted in addicts' brains, which impairs the ability to control one's actions. Addicts do not continue to use drugs because they lack the will power to control their actions, but rather because the part of their brain that affects control is damaged. While brain scans have

shown that addicts' brains have neurological differences, there is no statistical correlation between these brain differences and drug-taking behavior (Satel 1999). Those who oppose the disease model of addiction would say that the differences or changes in the brain do not cause a person to use drugs or to become addicted, since the changes were caused by repeated drug use. One might suggest that the changes in the brain were the result of addiction rather than the cause of it.

There are other neurological changes that indicate drug addiction is a disease that develops over the course of the addict's life. The brain develops and undergoes changes during adolescence. Certain differences in the adolescent's brain may put them at a higher risk for poor decision-making, such as using drugs (National Institute on Drug Abuse 2007). Additionally, those that take drugs during adolescence are more likely to become addicted than those who do not (Volkow 2006). The age at which addiction is likely to develop peaks at 18, with the likelihood of developing addiction decreasing after age 25 (Volkow 2006). This can be explained by neurological differences that are seen in adolescents and young adults. One difference is that adolescents' brains are more receptive to stimuli than adults' brains (Volkow 2006). Children and adolescents have an easier time learning and that knowledge lasts longer as a result of their brains being more receptive. As a result of this, the effects of drug use last longer in younger users than in older users.

Studies with alcohol, nicotine, and marijuana have shown that the younger a person is when they first start using, the more likely it is that they will later be addicted. Another way adolescents' brains differ from adults' is in the frontal cortex, which allows us to control our actions and emotions, and the sub-cortical regions, which also affects emotions (Volkow 2006). Brain imaging has shown that this is one of the last parts of the brain to develop (Volkow and Li

2005). This could explain why the risk of developing addiction does not decrease until age 25.

The connection between these two areas of the brain is not fully formed in adolescents. This may explain why they are more likely to use drugs to begin with, because they have less control over their actions than adults. This idea explains why people who use drugs during adolescence become addicted later in life. At the same time, it fails to explain addiction in adults who did not use drugs during adolescence.

Addiction may also be explained by the environmental cues that drug users or addicts associate with a certain drug. While some may feel that these environmental cues are learned responses and are influenced by social interactions, they can be caused by neurological changes. There are certain parts of the brain that are associated with rewards. Dopamine is increased by these rewards and over time, is influenced by stimuli that predict the reward (Valjent 2003). Researchers are currently testing a drug called D-cycloserine, or DCS, which may be effective at erasing these environmental cues (Interlandi and Kelley 2008). DCS has already been effective at reducing acrophobia and it is now being tested for cocaine addiction (Interlandi and Kelley 2008).

Drug addiction may be caused by neurological changes in the user, but there are some people that are more likely to become addicts. Genetics plays a large role in drug addiction by making some people more vulnerable to addiction than others. Some scientists estimate 40 to 60 percent of a person's vulnerability to addiction is due to genetic factors (National Institute on Drug Abuse 2007). Predisposition theories view addiction as a disease that people are either born with or develop before they start to use drugs and that people are predisposed to becoming addicted once they use drugs (McKim 1999). People with parents that have substance abuse problems are more likely to have substance abuse problems as well (Goldberg 2008). Certain

personality traits, such as aggressions or hyperactivity, have also been shown to predict addiction and are also inherited. An “externalizing disposition” is inherited and makes people more vulnerable to a set of behaviors, rather than just one (Goldberg 2008). Some of these behaviors include, antisocial behavior, rule breaking, and addiction. Therefore, a person may inherit the risk for addiction, even if neither of his or her parents have had problems with drugs or alcohol. One problem with this idea is that researchers have yet to find a specific gene that causes alcoholism or addiction (Goldberg 2008). Another problem is addiction may be the result of environmental factors, such as the stress of living with an addicted parent, and not from genes passed from the parent to the child (Goldberg 2008). A person may learn addiction from watching and living with an addicted parent. Additionally, studies done on monozygotic twins found that if one twin is an alcoholic, the risk of the other twin developing alcoholism is only 50 percent (Goldberg 2008). Monozygotic twins share the same DNA, so their risk for developing alcoholism should be the same. Another problem is many people with an inherited risk to externalizing behaviors do not develop any (Goldberg 2008). Just because a person has a genetic risk to develop an addiction does not mean that they necessarily will.

There may also be a gene that prevents people from developing alcoholism, which would make those who lack this factor, more likely to develop the addiction. “There is a genetic factor that causes low activity of an enzyme that is important in the metabolism of alcohol” (Wade and Tavris 2005:587). This genetic difference is common among Asians but rarely found in Europeans, which may explain why Asians have lowered rates of alcoholism compared to Europeans. However, this fails to explain why Native Americans, who have this same genetic protection, have high rates of alcoholism (Wade and Tavris 2005).

While there may be a debate over whether or not drug addiction is a disease, addiction is very similar to other diseases that are accepted and recognized by the medical community and society (Leshner 2001). Addiction has been compared to heart disease, both disrupt the normal functioning of organs, both have harmful consequences, and both are preventable and treatable (National Institute on Drug Abuse 2007). The same is true for addiction and many other well-known diseases. Those who do not think that drug addiction is a disease will argue that addiction is the result of behavioral and social factors, but there are other accepted diseases that have behavioral and social aspects. Depression, schizophrenia, and Alzheimer's are influenced by environmental factors and biological factors, such as genetics (Leshner 2001). As previously stated, addiction may be caused by neurological changes and genetic factors. The causes of some other diseases may also be related to neurological changes, as well as genetics. Certain diseases, such as depression, are inherited and certain people have a greater risk of developing a disease (Leshner 2001). Both addiction and other diseases cause side effects that are felt by and seen in the patient. Over time, as the disease progresses, those who are affected are unable to control certain behaviors that are caused by their condition. Just as schizophrenics have no control over delusions and those suffering from Parkinson's cannot control the trembling, addicts cannot control their desire to use drugs (Leshner 2001). All of these behaviors become compulsive in those affected. And just like those with diabetes or asthma, treatment is dependent on lifestyle choices. There are certain activities asthmatics cannot participate in, such as running or intense exercise, as they aggravate the disease and cause breathing problems. Diabetics have to maintain a certain diet; there are certain foods that will make their condition worse. Over the course of treatment, diabetics may relapse, just like drug addicts do (Leshner 2001). In both addiction and

other diseases, success of treatment depends on the patient's motivation and behavior (Leshner 2001).

One weakness to comparing addiction to other diseases is that drug use is a voluntary action that the user chooses to partake in. No one chooses to have Parkinson's disease or asthma, nor are these diseases caused by the actions of the patient. Drug addiction is however the result of the patient using drugs (Satel 1999). However, as previously stated, there are certain genetic and neurological factors that cause addiction rather than personal choice, which would implicate that becoming addicted is involuntary. Additionally, there are other diseases that are the result of voluntary behavior the patient chooses to partake in. Lung cancer is considered a disease and is caused by smoking. Certain types of diabetes and cardiovascular diseases can develop as the result of a poor diet (Leshner 2001). A weakness of this idea is that patients with lung cancer and diabetes may become worse as a result of physical reasons that are no fault of the patients (Satel 1999). Even if they follow all the instructions, their disease still may become worse over time. The only cause of a relapse in addiction however are the addicts themselves. But eating disorders, such as anorexia-nervosa and bulimia are classified by the DSM-IV (Wade and Tavris 2005) and are brought on by voluntary actions. Treatment of eating disorders is also directly dependent on the patient's actions. Addiction is similar to many other recognized diseases as far as the cause, symptoms, side effects, and treatment. Even though there are many similarities, some still do not feel that drug addiction is a disease.

There are some medical organizations that acknowledge drug addiction as a disease. Substance abuse and dependence are listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM), which is published by the American Psychiatric Association, and the International Classification of Diseases (ICD), which is overseen by the World Health

Organization. Each has separate yet similar criteria for diagnosing substance abuse in a patient. There are seven criteria for substance dependence according to the DSM-IV: tolerance; withdrawal symptoms; unsuccessful efforts to stop or control substance use; taking a substance in larger amounts or for a longer period of time than intended; occupational, social, or recreational activities are reduced or given up; spending a great deal of time obtaining, using, or recovering from substance use; and continued substance use despite hazardous health effects (Saunders 2006). The ICD-10 has six criteria for diagnosing substance dependence: tolerance, withdrawal symptoms, a strong desire or compulsion to use the substance, difficulties controlling substance use, neglecting other activities as a result of substance use, increased amount of time spent obtaining and using a substance, and recovering from the effects (Saunders 2006). Medical organizations recognizing substance dependence reinforces that it is a medical condition that needs medical treatment, rather than a condition the addict is responsible for and can overcome by use of will power.

No matter what drug addiction is or what it is caused by, it is harmful to both the addict and society as a whole. Drug addiction causes those affected to suffer and decreases their ability to function in life. When a person is addicted to drugs, it affects their families, co-workers, and communities (National Institute on Drug Abuse 2007). Addiction also affects society by using economic, medical, and legal resources. Addiction has many health consequences such as cancer, stroke, cardiovascular disease, HIV/AIDS, Hepatitis B or C, Obesity, and other mental disorders (National Institute on Drug Abuse 2007). These health problems then need the attention of medical professionals, which is a strain on medical and financial resources and takes away from other members of society in need of medical assistance. The criminal justice system also spends time arresting, prosecuting, and imprisoning addicts for drug-related crimes that could have been

avoided. Treating drug addiction would reduce the costs to society by eliminating these problems.

There have been many theories that have attempted to explain drug addiction, the theory of addiction as a disease is one of them. There is evidence that supports this theory. Neurological changes, such as a reduction in neurotransmitters, cause drug users to continue to use drugs, leading the one time occasional user to become addicted. The brains of addicts differ from non-addict's brains in the areas that enable us to control our actions, implying that drug addiction is not a matter of will power. There are other neurological differences in adolescents in the same area, the frontal cortex, which explains why adolescents have less control over their actions and are more likely to make bad decisions. This may explain why those who use drugs at a younger age are more likely to develop addictions. Environmental cues caused by changes in the brain also explain why some people develop addictions and lose control over their drug use. Genetics also play a role in the development of addiction. Evidence shows that certain people are more vulnerable to addiction and that addiction and other behaviors may be part of certain inherited personality traits. There are neurological, genetic, and physiological similarities between addiction and other diseases, such as diabetes and heart disease. This and future evidence may one day lead to addiction being accepted as a disease by society. It is already classified as a mental disorder by the DSM-IV and as a disease by the ICD-10. Hopefully one day the rest of society will view it that way as well. If addiction were recognized as a disease, it would not only improve how society views addicts, but also would determine and improve policy on treating addiction. More financial support may be given to improve treatment facilities and programs, train medical professionals treating addiction, and make treatment available to anyone that needs it. Treating addiction effectively would help society by reducing the time and cost spent on

arresting and prosecuting addicts, imprisoning or hospitalizing them, and treatment that does not work.

Research on this subject would influence how addiction is treated and whether or not a medical approach would be more effective than other approaches. Currently, there are drugs being tested on neurotransmitters that will hopefully decrease the addict's compulsion to use drugs (Interlandi and Kelley 2008). If this research shows that drugs are effective at treating addiction, it could be a step towards medical treatment being the preferred treatment for addicts. Future research may want to examine specific genes that cause or predict addiction. If a specific gene is found, researchers can then focus on controlling that gene. Whether or not drug addiction is a disease, there is no doubt that it is a problem in today's society that needs to be addressed and treated in order to improve the lives of addicts and their role in society.

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