

Introduction and overview

Marijuana use, misuse, abuse and addiction are very much a part of current public consciousness. Much information, some of it accurate, has been disseminated by a variety of sources. With so much public interest in marijuana legalization efforts, marijuana, medical marijuana, and marijuana products, a course on practical approaches to marijuana seems both timely and necessary. Those of us who are charged with the task of helping those individuals with marijuana use, misuse and abuse issues are in need of scientifically accurate information on the drug and methods for dealing with it.

In this course we will explore three general topics. First we will examine what marijuana is and how it operates. Second, we will look at effects of marijuana on a number of human systems. Finally, we will examine a number of therapeutic approaches which have proven to be effective with individuals who have a marijuana abuse and/or dependence problem.

Participants will be able to identify at least two deleterious brain effects of marijuana use. They will also be able to identify at least two mental health effects of marijuana use. You will be able to identify at least two general health effects of marijuana use. In the area of treatment approaches, they will be able to identify the two most common therapeutic strategic treatment errors and three demonstrably effective therapeutic approaches.

What is marijuana?

Marijuana refers to the dried leaves flowers stems and seeds from the hemp plant *cannabis sativa*. The plant contains the mind altering chemical delta-9-tetrahydrocannabinol (THC) and other related compounds. The term marijuana may also refer to extracts with high amounts of the THC made from the cannabis plant.

Marijuana is the most commonly used illicit drug in the United States (Samhsa,, 2014). Its use is widespread among young people. According to a yearly survey of middle and high school students, rates of marijuana use have steadied in the past few years after several years of increase. However the number of young people who believe marijuana use is risky is declining, (Johnston 2014).

In January 2014, marijuana was noted by the national Institute on drug abuse as being the most widely used illicit drug in the United States. Globally, between 129 and 191

million people aged 15 to 64 used marijuana at least one time in 2008 or 2.9 to 3.4% of the world's population. In North America, 29.5 million people used marijuana at least once in 2008. According to the 2010 national survey on drug use and health marijuana was used by 76.8% of current illicit drug users. This is defined as having used the drug at some time in the 30 days before the survey. The most recent data available from 2008 indicates that marijuana was responsible for about 17% of all admissions to treatment facilities in the United States. Only opiates have higher admission rates among abused substances. These marijuana admissions were primarily male (74%), white about 49%, and young. Thirty percent of them were in the 12 to 17 age group. The common factor among 56% of those admitted for treatment was that those who were admitted started their marijuana use by age 14.

In order to understand the best approaches to treating issues of marijuana use, misuse and abuse it will be helpful to review the effects marijuana has upon the human organism. The following is a brief review of marijuana's effects on the brain in both youth and adults, marijuana's effects on mental health and the general health effects that have been noted with marijuana use

A rise in Marijuana's THC levels

The amount of THC in marijuana has been increasing steadily over the past few decades (). For a new user, this may mean exposure to higher THC levels with a greater chance of a harmful reaction. Higher THC levels may explain the rise in emergency room visits involving marijuana use. Research suggests that as THC levels rise, levels of cannabidiol drop. This makes the potency of the THC greater and increases the negative side effects of marijuana

The popularity of edibles also increases the chance of users having harmful reactions. Edibles take longer to digest and produce a high. Therefore, people may consume more to feel the effects faster, leading to dangerous results.

Dabbing is yet another growing trend. More people are using marijuana extracts that provide stronger doses, and therefore stronger effects, of THC.

Higher THC levels may mean a greater risk for addiction if users are regularly exposing themselves to high doses.

A word about Cannabidiol

Cannabidiol (CBD) is a compound found in cannabis that has demonstrated medical benefits. In addition to the benefits already documented through research and medical trials there are a large number of others that are under consideration and are the subject of aggressive scientific and clinical research. The fact is that cannabidiol is non-psychoactive, doesn't cause a high. It also demonstrably mitigates the negative side effects of marijuana. This fact makes it an appealing alternative for potential patients with a range of conditions for which it is suggested this compound might be therapeutically helpful.

Project CBD has identified a number of conditions for which CBD has been found to be helpful for patients looking for help. They include: inflammation, pain, anxiety, psychosis, seizures, spasms and other conditions without disconcerting feelings of lethargy or dysphoria.

They also note that scientific and clinical research - much of it sponsored by the United States government – underscores CBD's potential as a treatment for a wide range of conditions, including arthritis, diabetes, alcoholism, MS, chronic pain, schizophrenia, PTSD, depression, antibiotic resistant infections, epilepsy, and other neurological disorders. Further they note that CBD has demonstrable neuroprotective and neurogenic effects, and its anti-cancer properties are currently being investigated at several academic research facilities in the US and elsewhere in the world.

There is a relationship between levels of cannabidiol (CBD) and Delta-9-tetrahydrocannabinol (THC). In practical fact, the relationship is usually inverse. As CBD levels rise, THC levels fall and vice versa. Growers of marijuana are selectively breeding plants that have high levels of one or the other of the compounds. This practice means that as recreational marijuana becomes higher in THC it will be more dangerous in terms of potential side effects. Cannabidiol mitigates the side effects of THC. As THC levels rise and CBD levels fall, potential side effects will increase and market marijuana will become more and more dangerous. .

Marijuana's effects

The Brain

Delta-9- tetrahydrocannabinol (THC) is the main ingredient in marijuana. It is responsible for many or most of the known effects of marijuana on the brain. When marijuana is smoked its effects begin almost immediately. THC passes rapidly from the lungs into the bloodstream where it is carried to organs throughout the body including and especially the brain. These effects occur almost immediately and can last from one to three hours. If marijuana is consumed in food or beverages the effects begin, later usually in 30 minutes to an hour but then can last for up to four hours.

Scientists have learned a great deal about how THC acts in the brain. THC binds to specific sites called cannabinoid receptors (CBR's). These receptors are located on the surface of nerve cells and are found in high density in areas of the brain that influence pleasure memory and time perception. Cannabinoid receptors are part of a vast communication network known as the endocannabinoid system which plays a critical role in normal brain development and function. In fact, THC effects are similar to those produced by naturally occurring chemicals found in the brain and body called endogenous cannabinoids. These chemicals help control many of the same mental and physical functions that may be disrupted by marijuana use.

As THC enters the brain, it causes the user to feel euphoric—or high—by acting on the brain's reward system, which is made up of regions that govern the response to pleasurable things like sex and chocolate, as well as to most drugs of abuse. THC activates the reward system in the same way that nearly all drugs of abuse do: by stimulating brain cells to release the chemical dopamine.

Along with euphoria, relaxation is another frequently reported effect in human studies. Other effects, which vary dramatically among different users, include heightened sensory perception (e.g., brighter colors), laughter, altered perception of time, and increased appetite. After a while, the euphoria subsides, and the user may feel sleepy or depressed. Occasionally, marijuana use may produce anxiety, fear, distrust, or panic.

Marijuana use impairs a person's ability to form new memories and to shift focus. THC also disrupts coordination and balance by binding to receptors in the cerebellum and basal ganglia—parts of the brain that regulate balance, posture, coordination, and reaction time. Therefore, learning, doing complicated tasks, participating in athletics, and driving are also affected.

Marijuana users who have taken large doses of the drug may experience an acute psychosis, which includes hallucinations, delusions, and a loss of the sense of personal identity. Although the specific causes of these symptoms remain unknown, they appear to occur more frequently when a high dose of cannabis is consumed in food or drink

rather than smoked. Such short-term psychotic reactions to high concentrations of THC are distinct from longer-lasting, schizophrenia-like disorders that have been associated with the use of cannabis in vulnerable individuals.

When someone smokes marijuana, THC stimulates the CBR's (cannabinoid receptors) artificially disrupting function of the natural or endogenous cannabinoids.

Overstimulation of these receptors in key brain areas produces the marijuana high as well as other effects on mental processes. Over time this overstimulation alters the function of CBR's in the brain. These changes can lead to addiction and withdrawal symptoms when drug use stops. They can also lead to a range of other, sometimes durable, changes in the brain.

Heart and Lungs

Marijuana and Mental Illness

Research in the past decade has focused on whether marijuana use actually causes other mental illnesses. The strongest evidence to date suggests a link between cannabis use and psychosis (Hall and Degenhardt 2009). For example, a series of large prospective studies that followed a group of people over time showed a relationship between marijuana use and later development of psychosis. Marijuana use also worsens the course of illness in patients with schizophrenia and can produce a brief psychotic reaction in some users that fades as the drug wears off. The amount of drug used, the age at first use, and genetic vulnerability can all influence this relationship. One example is a study that found an increased risk of psychosis among adults who had used marijuana in adolescence *and* who also carried a specific variant of the gene for catechol-O-methyltransferase (COMT) (Caspi et al. 2005), an enzyme that degrades neurotransmitters such as dopamine and norepinephrine.

In addition to the observed links between marijuana use and schizophrenia, other less consistent associations have been reported between marijuana use and depression, anxiety, suicidal thoughts among adolescents, and personality disturbances. One of the most frequently cited, albeit still controversial, is an amotivational syndrome, defined as a diminished or absent drive to engage in typically rewarding activities. Because of the role of the endocannabinoid system in regulating mood, these associations make a certain amount of sense; however, more research is needed to confirm and better understand these linkages.

Marijuana and Addiction

Long-term marijuana use can lead to addiction; that is, people have difficulty controlling their drug use and cannot stop even though it interferes with many aspects of their lives. It is estimated that 9 percent of people who use marijuana will become dependent on it. The number goes up to about 1 in 6 in those who start using young (in their teens) and to 25–50 percent among daily users. Moreover, a study of over 300 fraternal and identical twin pairs found that the twin who had used marijuana before the age of 17 had elevated rates of other drug use and drug problems later on, compared with their twin who did not use before age 17.

According to the 2008 NSDUH, marijuana accounted for 4.2 million of the estimated 7 million Americans dependent on or abusing illicit drugs. In 2008, approximately 15 percent of people entering drug abuse treatment programs reported marijuana as their primary drug of abuse; 61 percent of persons under 15 reported marijuana as their primary drug of abuse, as did 56 percent of those 15 to 19 years old.

Marijuana addiction is also linked to a withdrawal syndrome similar to that of nicotine withdrawal, which can make it hard to quit. People trying to quit report irritability, sleeping difficulties, craving, and anxiety. They also show increased aggression on psychological tests, peaking approximately 1 week after they last used the drug.

Marijuana and School, Work, and Social Life?

Research has shown that marijuana's negative effects on attention, memory, and learning can last for days or weeks after the acute effects of the drug wear off (Schweinsburg et al. 2008). Consequently, someone who smokes marijuana daily may be functioning at a reduced intellectual level most or all of the time. Not surprisingly, evidence suggests that, compared with their nonsmoking peers, students who smoke marijuana tend to get lower grades and are more likely to drop out of high school (Fergusson and Boden 2008). A meta-analysis of 48 relevant studies—one of the most thorough performed to date—found cannabis use to be associated consistently with reduced educational attainment (e.g., grades and chances of graduating) (Macleod et al. 2004). However, a *causal* relationship is not yet proven between cannabis use by young people and psychosocial harm.

Marijuana users themselves report poor outcomes on a variety of life satisfaction and achievement measures. One study compared current and former long-term heavy users of marijuana with a control group who reported smoking cannabis at least once in their lives but not more than 50 times. Despite similar education and income backgrounds,

significant differences were found in educational attainment: fewer of the heavy users of cannabis completed college, and more had yearly household incomes of less than \$30,000. When asked how marijuana affected their cognitive abilities, career achievements, social lives, and physical and mental health, the majority of heavy cannabis users reported the drug's negative effects on all of these measures. In addition, several studies have linked workers' marijuana smoking with increased absences, tardiness, accidents, workers' compensation claims, and job turnover. For example, a study among postal workers found that employees who tested positive for marijuana on a pre-employment urine drug test had 55 percent more industrial accidents, 85 percent more injuries, and a 75-percent increase in absenteeism compared with those who tested negative for marijuana use.

Marijuana Use and Driving

Because marijuana impairs judgment and motor coordination and slows reaction time, an intoxicated person has an increased chance of being involved in and/or being responsible for an accident (O'Malley and Johnston 2007; Richer and Bergeron 2009). According to the National Highway Traffic Safety Administration, drugs other than alcohol (e.g., marijuana and cocaine) are involved in about 18 percent of motor vehicle driver deaths. A recent survey found that 6.8 percent of drivers, mostly under 35, who were involved in accidents tested positive for THC; alcohol levels above the legal limit were found in 21 percent of such drivers.

Marijuana Use During Pregnancy and Harm to the Baby?

Animal research suggests that the body's endocannabinoid system plays a role in the control of brain maturation, particularly in the development of emotional responses. It is conceivable that even low concentrations of THC, when administered during the perinatal period, could have profound and long-lasting consequences for both brain and behavior (Trezza et al. 2008). Research has shown that some babies born to women who used marijuana during their pregnancies display altered responses to visual stimuli, increased tremulousness, and a high-pitched cry, which could indicate problems with neurological development. In school, marijuana-exposed children are more likely to show gaps in problem solving skills, memory, and the ability to remain attentive. More research is needed, however, to disentangle the drug-specific factors from the environmental ones (Schempf and Strobino 2008).

Additional Health Effects

Breathing and lung problems.

Marijuana smoke irritates the lungs, and frequent marijuana smokers can have the same breathing problems that tobacco smokers have. These problems include daily cough and phlegm, more frequent lung illness, and a higher risk of lung infections.

With all the discussion about marijuana, it is important to remember that it is smoke that is drawn into the lungs. SMOKE. We have become sensitized to the reality of the dangers of cigarette SMOKE. We need to be as sensitized to the fact that with marijuana we have the same SMOKE concerns as we have with cigarettes, perhaps more so. Marijuana contains lung irritants like any smoke generated by the burning of biological material. In fact, Marijuana smoke contains 50 to 70 percent more carcinogens than cigarette smoke. Lung and other cancers are higher in individuals who use marijuana and the trend seems to be toward greater and greater numbers.

Finally, a word about second hand smoke. We accept that second hand cigarette smoke is dangerous and needs to be eliminated. We need to have the same discussion and concerns about marijuana second hand smoke.

Heart and lungs

Increased heart rate.

Marijuana raises heart rate up to 20-100 percent for up to 3 hours after smoking. This effect may increase the chance of heart attack. Best estimates are the increase in heart attack potential is up to 4.8 fold. Older people and those with heart problems may be at higher risk

Impact on Teenagers

Perhaps the biggest public health concern around medical marijuana liberalization and legalization concerns the potential impact on teenagers, who could have greater access to it as a drug of abuse and who may increasingly see marijuana as a “safe, natural” medicine rather than about marijuana’s impact on the developing brain, the existing science paints a picture of lasting adverse consequences when the drug is used heavily prior to the completion of brain maturation in young adulthood. In teens, marijuana appears to

impair cognitive development, may lower IQ and may precipitate psychosis in individuals with a particular genetic vulnerability.

Most states currently don't allow medical marijuana for children, but they too are vulnerable. Accidental ingestion of marijuana edibles by children has increased in Colorado since marijuana was decriminalized for medicinal use in 2009. Also potentially concerning is the possibility of increases prenatal exposure if women self-treat with marijuana to control nausea associated with pregnancy. Research suggests that prenatal exposure could have adverse consequences for children's' future health and brain development. There is yet no research on the potential effects of secondhand marijuana smoke on children growing up in households where parents and others smoke.

Even in conditions for which Delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD) and other cannabinoid constituents of the marijuana plant prove to be medically beneficial, consumption of the marijuana plant itself or its crude extracts via smoking, vaporizing or eating is unlikely to be the most effective, reliable or safe way to obtain these benefits. Laboratory research is ongoing to better understand how cannabinoids work in the brain and body and hopefully guide development of safe, reliable therapeutic compounds that have a minimum of adverse side effects.

TREATMENT

Clinical Challenges presented by marijuana use

Over view

Latency

When thinking about the power of any addiction, several variables need to be considered. Among them is the principle of latency. It is a principle borrowed from behaviorism. It relates to the period of time between a behavior and the reinforcement

for that behavior. The shorter the time between the behavior and the reinforcement, the more powerful is the reinforcement, and the more likely the behavior will be repeated.. This is one of the psychological mechanisms of addiction. In the case of marijuana use, the time between the behavior (intake of the drug) and the reinforcement (the high) is very short. In fact it is nearly instantaneous For many, perhaps most, of the drugs of abuse there is a direct correlation between this short latency period and the rapidity of onset of and power of dependence. Over time, marijuana dependent individuals become habituated to immediate gratification resulting in reduced ability to accept delayed gratification. Since the process of recovery from marijuana dependence takes time, this habitual inability to delay gratification results in impatience with treatment/recovery. Clearly this must be addressed in any treatment intervention. Any interventions or techniques should key into this need for short latency.

Addictive Rituals

Contrast

Lack of A–posteriori comparisons

Introspection difficulties

Therapeutic Tips

Celebrations

Screens

Rituals

Social Therapies

Careful Comparisons

Aha Reinforcement

Bridges

Relevance

Avoid Using Cues

Relaxation

Abstinence, Abstinence, Abstinence

Buddy System

Multiple Hits Treatment

Motivate

The Long Haul Perspective

Commitment