CERTAIN EFFECTS OF MARIJUANA

ON THE HUMAN BEING

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TABLE OF CONTENTS

ABSTRACT

Marijuana has become the number three most widely used drug in America. It is not confined to any one race, class, age group, or geographic location. The research has explored some of the effects of marijuana on the human body and mind and also a brief history.

Marijuana does effect the human body to a certain degree, but at this point as far as the evidence indicates not a harmful effect. Subjectively, it seems to give the user a sense of relaxation and vivid visual awareness. The results indicate that marijuana should possibly be decriminalized.

The general purpose of this thesis is to explore the uses and psychological effects of marijuana. I will examine the history, chemistry and effects of marijuana on individuals and society. Currently, marijuana possession is a felony in most states; however, several have decriminalized it. The studies reviewed were by no means the only ones done, but I feel these give an accurate overview of the effects of marijuana.

History

The history of marijuana is sketchy. A good source of information was Ray (1972, chap. 8). One of the earliest references to marijuana was in a pharmacy book written about 2737 B.C. By 1000 A.D. the social use of marijuana had spread to the Moslem world and North Africa. By the twelfth century, the social use of marijuana was considered epidemic. By the 1830's and 40's, everyone was using or thinking about using psychoactive agents. Also, along psychological lines, the writings of William James and others introduced the possibility of using marijuana in studying psychological processes.

At the beginning of the twentieth century, concern for marijuana was not too widespread even though its use was widespread. In 1931, the Commisioner of Narcotics, Harry Anslinger, stated that only 16 states had anti-marijuana laws and the bureau's file was less than two

inches thick. Puls (1972) points out that in 1932 the National Conference of Commisioners on Uniform State Laws included an optional marijuana provision. Even though there were no scientific studies done on the effects of marijuana, by 1937 every state had prohibited its use for one reason or another. Ray indicates that the reason for was an unfounded belief, linking marijuana to crime and certain ethnic groups. The reaction to this was a kind of panic resulting in such movies as "Reefer Madness." However, at this point, the government was not so alarmed as were some of the public.

Mayor Fiorillo La Guardia of New York City asked the New York Academy of Medicine to study marijuana. The report was issued in 1944 and basically stated that marijuana impairs intellectual functioning in general but does not change basic personality structure. The report also stated that those who had been smoking marijuana for years showed no mental or physical deterioration which could be attributed to the drug.

For no apparent reason, in the 1950's, when penalties for narcotic violations escalated, marijuana penalties went right along with them (Puls, 1972). Eventually, a first offense for possession of marijuana was subject to as high a penalty as five years in prison.

Chemistry

Any psychological drug can be dangerous depending upon intensity, frequency and duration of use (Puls, 1972). There are many studies on marijuana available, but it must be pointed out that we are a long way from knowing all there is to know. Just recently, the studies have become more objective and less sensational than previous ones.

I will now turn to the plant itself and describe its chemical make-up and its effects on humans. Smith (1970, p. 11) describes the marijuana plant as "a crude preparation of flowering tops, leaves, seeds, and stems of female plants of Indian hemp, Cannabis Sativa." The active ingredient in marijuana is Delta-tetra-hydrocannabinal (THC). Plants vary in the amount of THC present.

> The Cannabis Sativa plant has separate male and female plants, and both manufacture the psychoactive material (THC) in usable amounts. The psychoactive material is most concentrated in the resin of the plant, and this resin is secreted in highest quantity by the unfertilized flowers of the female. Ray (1972, p. 260)

Weisman (1972, p.139) points out the three main effects of THC. When THC is smoked as marijuana the effects are rapid heart beat, redness of eyes, and changes in motor functioning when taken in higher doses.

I will examine these effects in more detail later.

Marijuana is normally smoked; this method of using the plant results in the fastest psychological effect. Marijuana can be taken orally, but the effects take much longer to occur, and they are usually not as noticeable.

Psychology

I would like to note one final area before going into the psychological affects of marijuana. It seems that the quality of the marijuana plus the amount of experience of the user interact to achieve the desired high (Smith, 1970, p. 15). In fact, many times a novice will not even get high the first time using marijuana.

The subjective effects of marijuana are varied. Williams (1972, p. 114) studied 150 experienced users, covering an estimated 37,000 occasions of use to try and uncover common effects of marijuana in a non-laboratory setting. The following were the most common characteristics:

> Perception of external environment is changed in practically all sensory modalities. With respect to vision, characteristic effects reported are: seeing forms and meaningful patterns in visual material that normally is ambiguous, and finding visual imagery more vivid than usual. For hearing, the awareness of subtle qualities of sound, i.e., purity, distinctness and rhythms is one of

> the most characteristic effects reported. The subjective enhancement of the non-dominant senses, such as touch, taste and smell is very common. The perception of the space/time matrix normally serving as a background for sensory perceptions is radically changed in marijuana intoxication. This is probably related to changes in time perception--slowing down, even stopping of time--which are most striking. Interpersonal relations are also changed by marijuana to such a degree that many users feel it is a social drug par excellance (p. 114).

At this point I would like to cite Weisman (1972) concerning the factors involved in marijuana use. He lists five factors, including:

1. the users experience or inexperience with the drug
2. personality of the user
3. route of administration
4. the dosage
5. circumstances surrounding the drug use (p. 114).

In my several interviews with chronic marijuana users two other subjective effects occurred: marijuana is relaxing and it makes it easier to understand music. Consequently, a favorite place for using marijuana is at a rock concert.

Kiplinger, Manno, Rodda, and Forney (1971, p. 650) demonstrated that if the set and setting are kept constant,

and Delta-THC is delivered in individually calibrated cigarettes, the subjective response of subjects (naive and occasional users) is significanly related to the dose. However, in a double-blind study by Jones (1971, p. 21), using marijuana and a placebo, many subjects rated their subjective level of intoxication the same for both marijuana and the placebo. A note of caution here though is that there was never a test to determine if in fact the placebo had any effect on the subject.

Salvendy and McCabe (1975) did a study on human performance and marijuana. Four groups of ten subjects, representing different levels of marijuana usage, performed two different psychomotor tasks. One group had never smoked marijuana; one group had smoked marijuana previously to that but stopped. The other two groups consisted of habitual smokers of marijuana; one smoked a placebo, and the other smoked marijuana just prior to performing the tasks. The basic purpose of this study was to examine the effects of marijuana on human manipulative and co-ordination skills.

The first two groups performed the task with nothing, the third group smoked a placebo, and the fourth smoked marijuana. However, there was no control over the quality or the quantity of the marijuana used, nor was there any evidence that the placebo was neutral. The two tasks involved were the One Hole Test (Salvendy and Seymour, 1972)

and the Rotary Pursuit Test.

Each of the three measures was analyzed separately (One Hole Test, Rotary Pursuit time, Rotary Pursuit error). The One Hole Test effect was highly significant. Marijuana smoking was associated with a 15% decrease in the initial performance level and a 21% decrease in the final performance score on the One Hole Test relative to non-smokers.

In the Rotary Pursuit Test for time, the results are in agreement with those obtained from the One Hole Test. They illustrate the superior performance of the non-smokers of marijuana relative to those subjects who utilized marijuana. During the latter trials, the non-smoking groups had a 37% higher performance score than marijuana smokers.

The error data from the Rotary Pursuit Test is related to the Rotary Pursuit time measure, since a trade off exists between speed and accuracy. This study indicates that the smoking of marijuana immediately before performing manipulative or co-ordinated tasks decreases performance. There is also an indication that those who had previously smoked marijuana did not do so well as those who had never smoked marijuana. We can now turn our attention to the perceptual motor co-ordination.

Milstein, MacCannell, Karr and Clark (1975 a) studied the effects of marijuana on perceptual motor co-ordination. Motor ability and visual perception were compared in

marijuana-experienced and naive subjects. Eight males and and eight females who were experienced in the use of marijuana and eight males and eight females who had never used marijuana were given marijuana or a placebo on different occasions seven days apart. Each group of sixteen subjects was selected at random on the basis of age and education from a pool of 1500 volunteers from a large Canadian city. The experienced group had an age range from 21-42 years (an education level of 10-14 years); the non-experienced group had an age range of 25-59 years and an education level of 10-13 years. Everyone in the experienced group had used marijuana and had been intoxicated by it previously. Their use in the past ranged from two to 100 times and the mean for the group was 29. All participants were examined by a medical doctor and a psychiatrist and were judged physically and emotionally fit to participate.

The marijuana or placebo was administered on separate occasions during two 24 hour visits made one week apart. The order of administration was randomly determined with half receiving the placebo first and half receiving the marijuana first. Both sessions were conducted in a double-blind manner. Administration on both occasions began approximately nine hours after arrival at the laboratory and took thirty minutes. By spending the whole day in the laboratory, the subjects were able to become more comfortable

with each other and the researchers. Since marijuana is normally smoked in the evening, administration took place about 5:30-7:00 P.M. Experienced and non-experienced subjects were never mixed in the same groups.

The laboratory consisted of a living room with kitchenette, a bathroom, and two separate test rooms and a control room. This not only was a comfortable setting, but also was a more socially typical situation than had been used in the previous study of Salvendy and McCabe (1975). The idea was to keep the atmosphere as casual and relaxed as possible.

Two hundred milligrams of either marijuana or a placebo were administered every ten minutes until a total of 600 milligrams had been administered in thirty minutes. This is about the average amount of marijuana needed to achieve a "high". Three of the tests were a perceptual motor test, the horizontal vertical groove, and the hand [illegible] maze.

The perceptual motor task, hand steadiness, consisted of placing the one millimeter stylus into each of nine progrssively smaller holes (12.70 to 2.03 millimeters in diameter) and holding it in each for fifteen seconds while trying not to touch the sides. Also, two similiar measures of motor ability, finger and toe tapping, were employed. The visual recognition threshold was measured by presenting

a series of letters to subjects for varying durations of exposures.

A three-factor (drug by experience by sex) analysis of co-varience with repeated measures of one factor (drug) and prescore on the tasks as a co-variate was used to compare changes in performance on each of the perceptual motor tasks.

The perceptual motor results demonstrated a statistically significant difference between the change in performance after smoking marijuana. The data revealed that on all four measures, subjects in the marijuana condition showed a post-smoking decrement in performance. Table 1 indicates that except for the different number of

Insert Table 1 about here

errors on the horizontal groove test, their decrement was always greater in the experienced than in the non-experienced group. There were no statistically significant changes in performance on either measure of motor performance or on the visual perception tasks.

Milstein, MacConnell, Karr and Clark (1975 b) did another study on marijuana concerning its effects on pain tolerance. This particular study was one of a series of ten carried out by researchers at the University of

of Calgary to determine the effects of marijuana on experienced and naive subjects.

The methods for the study were almost the same as the previous study. There were the same number of people--eight males and eight females and also the same dosage. It was also done using double-blind technique. They used a device in their study to try and even out the amount of THC involved. This device consisted of: a constant temperature, burning chamber connected to a .4 liter smoke collecting bottle which in turn was connected to a two-way anesthetic valve. By using forced air, the device delivered smoke to the mouth of the subjects, who were instructed to breath normally but not to hold the smoke. Post-experimental analysis indicated that 34% of administered THC was actually retained by the subjects. Placebo retention was not measured.

After the marijuana or placebo was administered, pain tolerance was measured with a pressure algometer. The device consists of a thumb holder and a hydraulically driven rod, 0.5 cm. in diameter. Pain tolerance is determined by placing the thumb in the algometer with the thumbnail directly under the metal rod, then pressure is applied automatically and continually increased from 0 kg (at a rate of 1 kg/0.75 seconds) until the subject pushes a stop button or until a maximum of 7 kg pressure is applied to the thumb. A pressure of 7 kg was found to be just below the

point at which damage to blood vessels, tissues and nail could occur.

There were also subjective measures of intoxication applied: first the drug administrator made an appraisal of whether the subject was intoxicated or not. This was done using the criteria of redness of eyes, memory lapse, ability to carry on a coherent conversation and changes in affective statement. Secondly, the Primary Affect Scale was administered to the subjects. This scale contains five subscales measuring anger, arousal, depression, fear and happiness.

A separate three-factor (drug, experience, and sex) analysis of co-variance with repeated measures of one factor (drug) and pre-score as a co-variate was used to compare changes in pain tolerance for the preferred and non-preferred hand. The results for the analysis carried out for the preferred hand revealed a statistically significant change in tolerance under the marijuana condition. The data indicated that this significant difference resulted from an increase in pain tolerance after smoking marijuana. While there was no significant interaction between drug and experience, further examination of the data showed a trend toward a greater increase in tolerance for the experienced than for non-experienced users.

There were no significant differences between experienced

and non-experienced users or male and female subjects. Thirteen of 15 experienced and 11 of 16 non-experienced subjects showed clinically obserable intoxication after taking THC.

Hill, Goodwin, Scwin and Powell (1974) did another study investigating the effects of marijuana on pain, and touch and visual perception. Thirty-one men aged 21-30 were given either marijuana or a placebo. Subjects in the marijuana group smoked 1 gr. containing 1.4 percent of delta-9 THC. The method of smoking consisted of inhaling for five seconds, holding for 15 seconds and resuming normal breathing for 35 seconds. The dose delivered over 15 minutes was calculated at approximately 12 mg.

The researchers used a pre-treatment post-treatment design to determine the effects of marijuana on CFF (critical flicker fusion). Subjects were tested in a dark room 15 minutes before and 15 minutes after smoking.

Using the method of limits, stimuli were presented in alternating ascending and descending series. Ten measures (ascending and descending) were obtained from each of the subjects before and after the smoking period. The flicker rate of the light was varied from 20 to 60 cycles per second.

Following a determination of the subjects' pain tolerance, similar to the previous experiment, the current

was then lowered further until the subject reported that the sensation had disappeared entirely. In this way, the five threshold measures are shown in the table.

Insert Table 2 about here

Altman and Evenson (1973) replicated a study by Kolansky and Moore (1971) in which the authors concluded that moderate to heavy use of marijuana in adolescents and young people without predisposition to psychiatric illness may lead to ego decompensation ranging from a mild ego disturbance to psychosis.

There were 158 subjects involved in the study. They were all first admission patients and currently under treatment at several mental health clinics and hospitals. The patients ranged from ages 13 to 24 and cosisted of 106 males and 48 females.

There were 43 subjects whose use of marijuana antedated psychiatric involvement. Five of these were eliminated on the basis of their case histories indicating severe maladjustment. The remaining 38 patients were similar in many ways to the patients reported by Kolansky and Moore. They reported repeated instances of poor social judgment, poor concentration, confusion, anxiety, depression, apathy, and passivity.

Altman and Evenson replicated the same type of study only they chose eighteen other factors besides the marijuana factor in order to determine whether any of these alternate events might also have had an onset during adolescence while antedating hospitalization or psychiatric symptoms. This was a self report questionnaire. They asked the age at which the event began, and also the age that outpatient or inpatient help was first received. For example, if marijuana use antedated first symptoms, the case was a "marijuana hit." Events other than marijuana were handled similarly. The results are shown in Table 3. It is shown, for example,

Insert Table 3 about here

that 38 youngsters began use of marijuana before appearances of psychiatric symptoms, however, 94 youngsters initiated dancing prior to appearances of psychiatric symptoms.

The thing that concerned me most was the fact that the study was fairly well published and raised quite a few eyebrows. However, if someone would point out that really no conclusion should have been made because of the absence of the control group, people would have dismissed it as nit-picking, especially if the individuals were biased in the first place and really wanted to believe the results. This study is a good example of one of the common pitfalls of of the case history method.

Lunberg (1971) reports a study of 701,057 consecutive hospital admissions in the Los Angeles area from 1961 to 1969, suggesting that there are rarely acute effects from smoking or eating marijuana serious enough to require hospitalization, but points out that the long-term effects of marijuana use are not known. He further states that there is no evidence linking marijuana and chronic psychosis, although it is possible that marijuana may aggravate some existing psychiatric problems. Unfortunately the studies that usually get published in the mass media are the more sensational ones like Kolansky and Moore even though other studies are sometimes more reliable.

Discussion

We have seen that marijuana does indeed effect our senses and some of our motor functions. One weakness in some of these studies is that the quantity has not been altered enough. It seems that they use one dosage then compare that with a placebo or with nothing. I would like to see some more studies completed varying the amount or dosage within the experiment. This not only would give us an indication as to how much marijuana effects our system, but also to what degree a given amount effects us. This information could help users of marijuana to establish some pattern of moderate use of the plant.

I have also indicated in one study that marijuana does

not seem to significantly affect visual perception. There seems to be some controversy in this area. Williams (1972) indicated that a marked increase in amount of time to recover from glare was associated with marijuana use. There needs to be more research done in this are, in order to determine just how much marijuana, if any, effects the visual perception. This is an extremely important area as it concerns one's ability to perform an array of perceptual-motor tasks, like driving an automobile following marijuana use.

Also, in regard to pain tolerance, it was shown that marijuana users had greater tolerance than the non-experienced users. This would go along with the findings of Salvendy on motor performance suggesting that pain impulses do not get to the brain as efficiently following marijuana use. This greater amount of pain tolerance could be considered as an advantage, especially to an aching back after a hard day of work.

These studies have helped to set down some guidelines for state laws. In several states marijuana is no longer a felony but a misdemeanor. I do see one problem arising in the fact that the laws do not cover driving while intoxicated on marijuana. There should be some sort of limit or guideline established so as not to endanger the lives of others if someone were to overdo it. Williams (1972) indicates that a significant dose related increase in

brake-time after injesting marijuana.

There are several important factors one should keep in mind while examining marijuana. The first and foremost thing that must be strictly controlled in studies is the quantity and quality of the drug. Both these factors should be scientifically measured and administered in order to obtain accurate results. However, this should be done in as natural and casual a situation as possible. Perhaps in some cases people get nervous in the typical laboratory situation and may try too hard, thus producing erroneous results. Secondly, there does seem to be evidence that the placebo (oregano in most cases) actually had no effect on the subject. There is the possibility that just the typical manner in which marijuana or the placebo is smoked could be altering subjects' performances. Thirdly, it is very important to use the double-blind method to keep everything as objective as possible.

In order to establish the perfect study, all the factors mentioned above should be present. But practically speaking that would be impossible. However, the more factors that are present, the more reliable the study. Many of the studies indicated are somewhat pioneer and need to replicated with some improvement. For instance, this would increase their validity and reliability, and provide more information to the people. In effect then, there is

no perfect study that could be made, but combinations and series of studies have been completed to give us a better overall look at marijuana.

Conclusion

According to a recent government survey 24 million Americans over the age of eleven have used marijuana at least once. (Puls, 1972). About 8,300,000 persons still use marijuana and about 500,000 are still considered heavy users.

There is no clear medical evidence that marijuana is in any way harmful to the human body. I have indicated various ways that it effects the body, but these are not necessarily harmful effects. Marijuana offers the users a type of relaxation that is not found in other drugs. I do not mean to imply that we should be dependent on drugs for relaxation, but man from earliest times has used various types of stimulants and depressants .

If marijuana were to be legalized, there are several precautionary measures that should be taken. First, there would have to be a standard set up to insure that everyone is getting the same quality. With the current set up, people are guessing as to the quality of the drug. One may purchase the lower stems of the plant, which is as potent as hay, to possibly another mixture which would be almost as strong as hashish, (which is almost solid THC).

Both of these mixtures could be sold on the street on a given day, for approximately the same price and the consumer would have no way of knowing which he had bought until he tried it. With legalization, it would eliminate the black market and its tax free profits.

The national commission on marijuana has recommended, "Possession of marijuana for personal use, would no longer be an offense, but marijuana possession in public would remain contraband and subject to seizure and forfeiture." (Puls,1972). So in effect what they are saying is private use of marijuana should be legalized, but it would be illegal to carry a lot of it around in public to sell. How then could a person go about obtaining marijuana? Presently, Ohio, Oregon, and California have reformed their marijuana laws and several other states are currently considering such bills in legislature. I think it would be an advantage both to the government and to the average marijuana consumer if marijuana were not only legalized, but also standardized and to a certain degree controlled.

Besides a reform of the marijuana laws, there should also be a program to better educate the public as to just how marijuana does effect the body. Too much of any one thing is bad and marijuana is certainly no exception. People would have to learn to smoke marijuana not only quantitatively in moderation, but also one should be aware

of how much time he spends smoking. Marijuana use should be a socially acceptable means of relaxation and should not be judged a criminal act. Laws should be made to curb any abuses of marijuana, which might occur. For instance, a person who is heavily intoxicated on marijuana should not be permitted to operate a motor vehicle. For the majority of people this would be no problem, but there is always a small minority who will take advantage of anything and run it to its limit. People should be punished who use marijuana irresponsibly or try to take advantage of other people as does the current black market who enjoy high tax free profits.

More than anything else, time will tell us more about marijuana than any study or government report. We still do not know the long range effects of the drug, or the long range effects of marijuana on the society in general. The studies that have been mentioned seem to be a fair cross-section of the current marijuana research. But again these studies must be a little more objective and then repeated to insure reliability.

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Table 1

Summary of Analysis of Drug and Drug X Experience Interaction Effects For All Performance Measures

Measure	Fs for Drug (D) Effect	Fs for (D) X Experience	Effect of M on Performance	% Decrement
Vertical Groove Errors	3.81	.64	I	18
Contact Time	6.60	.27	I	27
Horizontal Groove Errors	7.35	.05	I	35
Contact Time	8.68	.51	I	67
Maze Errors	23.50	9.66	I	
Contact Time	24.41	11.75	I	
Hand Steadiness Errors	7.71	.97	I	16
Contact Time	26.04	10.56	I	
Finger Tapping	2.80	.55	None	
Toe Tapping	.82	.02	None	
Visual Recognition	.27	.14	None	

*I--impairment

(Milstein, 1975)

Table 2

Mean Current Level (in Microamps)

Before and After Receiving THC or Placebo

Response	Pretreatment	Post-treatment	Difference	t Value
THC (N=20)				
A* Sensation	425.31	388.23	-37.08	-.79
D* Sensation	622.73	539.60	-82.13	-2.37
A Pain	1,231.52	1,006.12	-225.40	-2.25
D Pain	1,188.96	1,075.61	-113.35	-1.82
Pain Tolerance	1,959.07	1,803.15	--155.92	-2.09
Placebo (N=6)				
A sensation	415.50	433.39	+17.89	+.06
D Sensation	514.50	563.33	+48.83	+.61
A Pain	783.61	887.28	+103.67	+1.35
D Pain	952.44	1,303.33	+350.89	+2.39
Pain Tolerance	1,345.00	1,544.88	+199.88	+.60

*A--Ascending
*D--Descending

(Hill, 1974)

Table 3

Number of Patients Whose Psychiatrtic Symptoms Were Subsequent to Use of Marijuana and Other Variables

(Total M=158)

Variable	Number of Patients
Marijuana	38
Growing long hair	54
Masturbation	54
Driving a car	64
Sex education	66
Sexual intercourse	76
Beer drinking	85
Dancing	94
Tobacco	107
Kissing	112
Late movies	123

(Altman, Evenson, 1973)

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