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AUDITORY AND VISUAL THRESHOLD EFFECTS OF MARIHUANA IN MAN¹

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Summary.—Auditory and visual thresholds were measured before and after smoking marihuana (*Cannabis sativa* L.) for 20 experienced Ss. Marihuana was administered until S reported experiencing a "high." Results indicated no effect on visual acuity, whereas one of three auditory measurements differentiated between marihuana and control Ss.

Psychological and physiological changes following marihuana smoking in a neutral setting have recently been reported (Weil, Zinberg, & Nelson, 1968). Marihuana-naïve Ss did not manifest a strong subjective experience for either of two dose levels (viz., 4.5 or 18.0 mg. tetrahydrocannabinol), although measures indicated a dose related performance impairment. In contrast, experienced marihuana users, who received only a high dose, improved on two of the three behavioral tasks and showed no change for the third. Previous research in our laboratory (Myers & Caldwell, 1969a, 1969b; Caldwell, Myers, Domino, & Merriam, 1969), with a group of marihuana-naïve Ss had failed to find changes in either visual or sensory threshold following the smoking of one 300-mg. cigarette (3.936 mg. Δ^9 -THC).

The present investigation was an attempt to measure auditory and visual acuity in a group of experienced marihuana smokers using standardized psychophysical techniques (Guilford, 1954, pp. 101-117). Furthermore, to allow for a more natural set, Ss were fully informed of the substances they were about to receive and were allowed to smoke until they experienced their own subjective "high." The element of artificiality (neutrality) was introduced through the administration of psychological tests in a "sterile" laboratory test room.

METHOD

Subjects

Ss were 20 college students, with a mean age of 23.3 yr. and were all experienced users of marihuana and signed a subject release form specifying this fact. Each S received a psychiatric interview and physical examination prior to assignment to either the experimental or control group. Ss smoking marihuana remained in the laboratory over night.

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Material

The marihuana for this investigation was provided by the N.I.M.H. who assayed it to contain 1.312% Δ^9 -tetrahydrocannabinol. Each cigarette contained 300 mg. of crude marihuana (3.93 mg. Δ^9 -THC). Alfalfa cigarettes (300 mg.) were used for the control substance.

Procedure

The following test battery took approximately 1 hr. to administer. *Visual Brightness Test* (VBT) determined S's ability to match a 1-in. diameter white light of 2.40 ft-c intensity located at a distance of 6 ft. to a second light of one of 10 predetermined foot-candle illuminance values ($M = 2.79$ ft-c, range = 1.12 to 4.00 ft-c). The procedure was repeated for a second series of 10 light intensities ($M = 4.76$ ft-c, range = 2.80 to 7.00 ft-c) to a fixed standard of 4.80 ft-c. Testing was done in a totally dark room with 15 sec. between presentations of each stimulus pair. S was able to adjust the intensity of the variable light by means of a hand-held toggle switch. There was no time limit for light matching. Illuminance-foot candle values were computed by use of a photoconductive cell (Clairex, Model CL505L) positioned at S's field of vision.

Auditory Threshold Test (ATT) was the standard hearing test. A monaurally presented 100 Hz tone (Hewlett-Packard Model 200 CD Oscillator) was presented in five ascending and five descending 2-db step intervals from above and below hearing threshold. This sequence was repeated 10 times.

Auditory Intensity Differential Threshold Test (AIDT) required monaurally presenting S with a sequential pair of 500 msec., 1000-Hz tones separated by 30 msec. of silence. The first member of the tone pair was of constant intensity (80 db, re 0.0002 dyne/cm²) and was compared to the second tone of the pair. All tone-intensity calibrations were done with a sound-level meter fitted to the earphone (General Radio Co. Type 1551-C Soundlevel meter). Five louder tones differing in 1-db steps (range = 81 to 85 db) and five quieter tones (range = 79 to 75 db) were alternately presented in each test series. Ten series were presented alternately beginning above and below the standard and beginning from different starting points. S reported after hearing each tone pair whether the second tone was louder, equal or quieter compared to the first tone.

Auditory Frequency Differential Threshold Test (AFDFT) followed the same basic procedures as for the AIDT, except that intensity was held constant (viz., 80 db) and frequency was varied against a standard tone of 1000 Hz. The variable frequency tone changed in 3-Hz units from 15 Hz above to 15 Hz below the standard (Hickok Model DP150 Digital Counter). S reported after hearing each tone pair whether the second tone was higher than, equal to or lower than the first tone. In addition to difference limens, point of subjective equality and constant error were computed for each S for both the AIDT and AFDT.

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For the experimental group, the procedure consisted of (a) smoking one 300-mg. alfalfa cigarette, (b) a 15-min. waiting period, (c) administration of the total visual and auditory test battery, (d) administration of as many 300-mg. marihuana cigarettes as *S* needed to obtain a subjective "high," (e) a 15-min. rest period, (f) a second administration of the total test battery. Procedure was the same for control *Ss* except that during the second smoking period, namely (d), *Ss* received a second 300-mg. alfalfa cigarette. Testing commenced at either 6:00 p.m. or 9:00 p.m. and no participant knew of his treatment assignment until the actual time of testing. *Ss* were given 15 min. to smoke either the alfalfa or marihuana cigarette and no attempt was made to interfere with *Ss*' personal technique of smoking marihuana, although our observations indicated a high degree of consistency in smoking technique.

Four separate statistical analyses were performed for each of the five threshold measures. Initial mean performance scores were compared for experimental and control groups for the presence of performance differences during the first test session. Next, first-test performance for control *Ss* was compared with second-test performance to determine practice effects. A comparison of second-test performance for experimental and control groups provided the test for the effects of marihuana on thresholds. A comparison of the experimental group's first- and second-test periods was made to examine the effects of marihuana performance if significant practice effects could not be demonstrated.

RESULTS AND DISCUSSION

The mean amount of crude marihuana smoked to reach a subjective "high" was 483.0 mg.; $\pm 1 SD = 92.9$ mg. ($M = 6.337$ mg. of Δ^9 -THC). One of the consistent findings for all marihuana smokers was the abrupt cessation of smoking when *S* experienced the onset of the drug effect. Onset of the "high" experience occurred for *all Ss* during the smoking period.

Table 1 presents the group mean performance scores for all measures obtained in this study. Student *t* tests (Walker & Lev, 1953, pp. 151-156) for repeated or independent measures, where appropriate, were used. Analyses showed groups met the criterion of random sampling for treatment assignment. Furthermore, practice effects were not a confounding variable. Only the measure for auditory intensity DL differed between control and marihuana groups ($M = 0.94$ db and 1.51 db respectively, $.025 > p > .01$, two-tail test). All group comparisons for point of subjective equality and constant error were statistically nonsignificant.

The results of this investigation indicate that marihuana minimally affects those measures of sensory acuity tested in this study. This was of interest in light of *Ss*' expressed feelings of superior performance following the marihuana test session. Although a significantly lower intensity DL was recorded for control *Ss* when compared to the marihuana *Ss* for the second test session, the absence of a significant difference between first- and second-test performance for

TABLE 1
MEAN PERFORMANCE SCORES FOR CONTROL AND EXPERIMENTAL MARIHUANA
GROUPS FOR VISUAL AND AUDITORY DISCRIMINATION MEASUREMENTS

Measure	First Test Session		Second Test Session	
	Cont.	Exp.	Cont.	Exp.
I. Visual Brightness Test (ft-c)				
2.40 ft-c standard	2.25	2.51	2.21	2.46
4.80 ft-c standard	4.09	4.93	4.60	4.91
II. Auditory Intensity Threshold Test (db)				
Difference threshold	1.46	1.71	0.94*	1.51*
Point of subjective equality	14.56	14.40	14.59	14.41
Constant error	-1.44	-0.66	-0.40	-0.63
III. Auditory Frequency Threshold Test (Hz)				
Difference threshold	3.64	4.06	2.53	3.79
Point of subjective equality	1001.67	1001.24	1000.88	1000.02
Constant error	+1.67	+1.24	+0.88	+0.02
IV. Auditory Threshold Test (db)	75.11	73.83	75.87	76.74

* $t = 2.25$; $.025 > p > .01$.

marihuana Ss makes difficult an interpretation of this finding. Neither the position of this test in the battery nor its nature appears to account for this result. However, since the intensity DL decreased from first to second test session for the marihuana Ss, another interpretation would be that marihuana Ss failed to improve *as much* as control Ss. This view suggests the possibility of a specific task-related, dose-response phenomenon.

Several directions for further research were raised from Ss' comments following their participation in the study. First, the degree to which suggestibility functions in the experiencing of a marihuana "high" arises from S's statements that, "I could have become 'high' from smoking the alfalfa cigarette if I hadn't been told what it was." This point emphasized to us the importance of informing S of the substance being smoked in order to obtain a *valid* measure of the marihuana "effect" and to reduce the placebo "effect." However, a large proportion of the experimental Ss reported that the "high" experience, although pleasant, was reduced in intensity by the sterile laboratory environment (viz., bright lights, plain tile walls, test equipment, people in laboratory coats, etc.). The most provocative comment was the frequent report of the ability to "turn-off" the "high" at time of stimulus presentation, thus enabling S to perform as in a normal or nondrugged state. Some Ss attributed this to not being excessively "high" because of the sterile environment, while others reported the "turn-off" phenomenon to be a *normal* concomitant of the marihuana experience. This apparent ability to turn-off the marihuana "high" during periods requiring short attention spans raises the issue whether such tests (which comprise the majority

MARIHUANA REMENTS	
id Test Session	Exp.
21	2.46
60	4.91
94*	1.51*
59	14.41
40	-0.63
53	3.79
88	1000.02
88	+0.02
87	76.74

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of those used in studies reported to date) are valid indicants of the marihuana experience or simply measures of an interesting concomitant of the drug's effect, namely, the ability to respond normally at will? Whether this phenomenon is possible only for tasks of short-term duration or would be manifest in sustained performance tests is partially answered in the Weil, *et al.* (1968) study where marihuana users *improved* from baseline levels on digit symbol substitution and pursuit rotor tests, both being more sustained performance tasks than any used in the present study. Furthermore, no performance decrements were observed for a 5-min. continuous performance test following marihuana smoking for either naive or experienced Ss. Moreover, Crancer, *et al.* (1969) have reported no impaired performance for marihuana-intoxicated Ss in a simulated driving condition. All tests, however, were basically measures of eye-hand coordination, whereas the present study measured pure sensory response data. Since simulated driving is a relatively complex motor-coordination task and since Crancer's Ss were administered large doses of marihuana (viz., 1700 mg. of 1.312% Δ^9 -THC concentration), the relationship of task type and complexity to level of intoxication warrants further study.

Data obtained under both the neutral and the "psychedelic" setting with purified substance administered both to "effect" as well as on a milligram per kilogram basis are needed to elucidate the marihuana experience. Studies should concern not only the pure pharmacologic effects of the compound but also the psychologic factors involved.

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Pleistocene record is also provided by changes in the coiling direction of *G. truncatulinoides*.

The most important criteria which distinguish Pleistocene pelagic sediments from sediments of earlier epochs of the Cenozoic Period are the general occurrence of *Globorotalia truncatulinoides* in abundance and the absence of discoasters.

Our time scale, based on magnetic reversals, dates the beginning of the Pleistocene, as defined by the first appearance of *Globorotalia truncatulinoides* in abundance, at about 2 million years ago.

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CURRENT PROBLEMS IN RESEARCH

Clinical and Psychological Effects of Marihuana in Man

Andrew T. Weil, Norman E. Zinberg, Judith M. Nelsen

In the spring of 1968 we conducted a series of pilot experiments on acute marihuana intoxication in human subjects. The study was not undertaken to prove or disprove popularly held convictions about marihuana as an intoxicant, to compare it with other drugs, or to introduce our own opinions. Our concern was simply to collect some long overdue pharmacological data. In this article we describe the primitive state of knowledge of the drug, the research problems encountered in designing a replicable study, and the results of our investigations.

flowering tops, leaves, seeds, and stems of female plants of Indian hemp *Cannabis sativa* L.; it is usually smoked. The intoxicating constituents of hemp are found in the sticky resin exuded by the tops of the plants, particularly the females. Male plants produce some resin but are grown mainly for hemp fiber, not for marihuana. The resin itself, when prepared for smoking or eating, is known as "hashish." Various *Cannabis* preparations are used as intoxicants throughout the world; their potency varies directly with the amount of resin present (1). Samples of Amer-

macological activity, depending on composition (tops contain most resins, seeds, and lower leaves) and on the conditions under which plants were grown. In addition, different varieties of *Cannabis* probably produce resins with different proportions of constituents (2). Botanists feel that only one species of hemp exists, but work on the phytochemistry of the varieties of *Cannabis* is incomplete (3). Chronic users claim that samples of marihuana differ in quality of effects as well as in potency; that some types cause a preponderance of physical symptoms, and other types tend to cause greater distortions of perception or of thought.

Pharmacological studies of *Cannabis* indicate that the tetrahydrocannabinol fraction of the resin is the active portion. In 1965, Mechoulam and Gaoni reported the first total synthesis of Δ^1 -trans-tetrahydrocannabinol (THC) which they called "the psychotomimic."

This work was conducted in the Behavioral Pharmacology Laboratory of the Boston University School of Medicine, sponsored and supported by its division of psychiatry, and at the Harvard Medical Center, Boston, Massachusetts. The present addresses of the authors are: Dr. A. T. Weil, Mt. Zion Hospital and Medical Center, San Francisco, California 94115; Dr. N. E. Zinberg, Harvard University, Cambridge, Massachusetts; and Miss Nelsen, Department of Pharmacology and Experimental Therapeutics, Boston

ally active constituent of hashish (marihuana)." Synthetic THC is now available for research in very limited supply.

In the United States, the use of *Cannabis* extracts as therapeutics goes back to the 19th century, but it was not until the 1920's that use of marihuana as an intoxicant by migrant Mexican laborers, urban Negroes, and certain Bohemian groups caused public concern (3). Despite increasingly severe legal penalties imposed during the 1930's, use of marihuana continued in these relatively small populations without great public uproar or apparent changes in numbers or types of users until the last few years. The fact that almost none of the studies devoted to the physiological and psychological effects of *Cannabis* in man was based on controlled laboratory experimentation escaped general notice. But with the explosion of use in the 1960's, at first on college campuses followed by a spread downward to secondary schools and upward to a portion of the established middle class, controversy over the dangers of marihuana generated a desire for more objective information about the drug.

Of the three known studies on human subjects performed by Americans, the first (see 5) was done in the Canal Zone with 34 soldiers; the consequences reported were hunger and hyperphagia, loss of inhibitions, increased pulse rate with unchanged blood pressure, a tendency to sleep, and unchanged performance of psychological and neurological tests. Doses and type of marihuana were not specified.

The second study, known as the 1944 LaGuardia Report (6), noted that 72 prisoners, 48 of whom were previous *Cannabis* users, showed minimum physiological responses, but suffered impaired intellectual functioning and decreased body steadiness, especially well demonstrated by nonusers after high doses. Basic personality structures remained unchanged as subjects reported feelings of relaxation, disinhibition, and self-confidence. In that study, the drug was administered orally as an extract. No controls were described, and doses and quality of marihuana were unspecified.

Williams *et al.* in 1946 (7) studied a small number of prisoners who were chronic users; they were chiefly interested in effects of long-term smoking on psychological functioning. They found an initial exhilaration and euphoria which gave way after a few days of smoking to indifference and lassitude

that somewhat impaired performance requiring concentration and manual dexterity. Again, no controls were provided.

Predictably, these studies, each deficient in design for obtaining reliable physiological and psychological data, contributed no dramatic or conclusive results. The 1967 President's Commission on Law Enforcement and the Administration of Justice described the present state of knowledge by concluding (3): "... no careful and detailed analysis of the American experience [with marihuana] seems to have been attempted. Basic research has been almost nonexistent. . . ." Since then, no other studies with marihuana itself have been reported, but in 1967 Isbell (8) administered synthetic THC to chronic users. At doses of 120 $\mu\text{g/kg}$ orally or 50 $\mu\text{g/kg}$ by smoking, subjects reported this drug to be similar to marihuana. At higher doses (300 to 400 $\mu\text{g/kg}$ orally or 200 to 250 $\mu\text{g/kg}$ by smoking), psychotomimetic effects occurred in most subjects. This synthetic has not yet been compared with marihuana in nonusers or given to any subjects along with marihuana in double-blind fashion.

Investigations outside the United States have been scientifically deficient, and for the most part have been limited to anecdotal and sociological approaches (9-12). So far as we know, our study is the first attempt to investigate marihuana in a formal double-blind experiment with the appropriate controls. It is also the first attempt to collect basic clinical and psychological information on the drug by observing its effects on marihuana-naïve human subjects in a neutral laboratory setting.

Research Problems

That valid basic research on marihuana is almost nonexistent is not entirely accounted for by legislation which restricts even legitimate laboratory investigations or by public reaction sometimes verging on hysteria. A number of obstacles are intrinsic to the study of this drug. We now present a detailed description of our specific experimental approach, but must comment separately on six general problems confronting the investigator who contemplates marihuana research.

1) Concerning the route of adminis-

the possibility of giving marihuana smoking because, they say, the drug cannot be standardized (13). We consider it not only possible, but important to administer the drug to humans by smoking rather than by the oral route for the following reasons. (i) Smoking is the way nearly all Americans use marihuana. (ii) It is possible to have subjects smoke marihuana cigarettes in such a way that drug dosage is reasonably uniform for all subjects. (iii) Standardization of dose is not assured by giving the drug orally because little is known about gastrointestinal absorption of the highly water-insoluble cannabinoids in man. (iv) There is considerable indirect evidence from users that the quality of the intoxication is different when marihuana or preparations of it are ingested rather than smoked. In particular, ingestion seems to cause more powerful effects, more "LSD-like" effects, longer-lasting effects, and more hangovers (12, 14). Further, marihuana smokers are accustomed to a very rapid onset of action due to efficient absorption through the lungs, whereas the latency for onset of effects may be 45 or 60 minutes after ingestion. (v) There is reported evidence from experimentation with rats and mice that the pharmacological activities of natural hashish (not subjected to combustion) and hashish sublimates (the combustion products) are different (14).

2) Until quite recently, it was extremely difficult to estimate the relative potencies of different samples of marihuana by the techniques of analytical chemistry. For this study, we were able to have the marihuana samples assayed spectrophotometrically (15) for THC content. However, since THC has not been established as the sole determinant of marihuana's activity, we still feel it is important to have chronic users of a sample and rate marihuana used in research. Therefore, we assayed our material by this method as well.

3) One of the major deficiencies in previous studies has been the absence of negative control or placebo treatments, which we consider essential to the design of this kind of investigation. Because marihuana smoke has a distinctive odor and taste, it is difficult to find an effective placebo for use with chronic users. The problem is much less difficult with nonusers. Our solution to this dilemma was the use of portions of male hemp stalks (16), devoid of THC, in the placebo cigarettes.

knowledge about marijuana, it is difficult to predict which psychological tests will be sensitive to the effects of the drug. The tests we chose were selected because, in addition to being likely to demonstrate effects, they have been used to evaluate many other psychoactive drugs. Of the various physiological parameters available, we chose to measure (i) heart rate, because previous studies have consistently reported increases in heart rate after administration of marijuana (for example, 5); (ii) respiratory rate, because it is an easily measured vital sign, and depression has been reported (11, 17); (iii) pupil size, because folklore on effects of marijuana consistently includes reports of pupillary dilatation, although objective experimental evidence of an effect of the drug on pupils has not been sought; (iv) conjunctival appearance, because both marijuana smokers and eaters are said to develop red eyes (11); and (v) blood sugar, because hypoglycemia has been invoked as a cause of the hunger and hyperphagia commonly reported by marijuana users, but animal and human evidence of this effect is contradictory (6, 10, 11). [The LaGuardia Report, quoted by Jaffe in Goodman and Gilman (18) described hyperglycemia as an effect of acute intoxication.] We did not measure blood pressure because previous studies have failed to demonstrate any consistent effect on blood pressure in man, and we were unwilling to subject our volunteers to a nonessential annoyance.

5) It is necessary to control set and setting. "Set" refers to the subject's psychological expectations of what a drug will do to him in relation to his general personality structure. The total environment in which the drug is taken is the setting. All indications are that the form of marijuana intoxication is particularly dependent on the interaction of drug, set, and setting. Because of recent increases in the extent of use, and in attention given this use by the mass media, it is difficult to find subjects with a neutral set toward marijuana. Our method of selecting subjects (described below), at the least, enabled us to identify the subjects' attitudes. Unfortunately, too many researchers have succumbed to the temptation to have subjects take drugs in "psychedelic" environments or have influenced the response to the drug by asking questions that disturb the setting. Even a question as simple as, "How do you feel?" contains an element of suggestion that alters the drug-setting interaction.

We took great pains to keep our laboratory setting neutral by strict adherence to an experimental timetable and to a prearranged set of conventions governing interactions between subjects and experimenters.

6) Medical, social, ethical, and legal concerns about the welfare of subjects are a major problem in a project of this kind. Is it ethical to introduce people to marijuana? When can subjects safely be sent home from the laboratory? What kind of follow-up care, if any, should be given? These are only a few specific questions with which the investigator must wrestle. Examples of some of the precautions we took are as follows. (i) All subjects were volunteers. All were given psychiatric screening interviews and were clearly informed that they might be asked to smoke marijuana. All nonusers tested were persons who had reported that they had been planning to try marijuana. (ii) All subjects were driven home by an experimenter; they agreed not to engage in unusual activity or operate machinery until the next morning and to report any unusual, delayed effects. (iii) All subjects agreed to report for follow-up interviews 6 months after the experiment. Among other things, the check at 6 months should answer the question whether participation in the experiment encouraged further drug use. (iv) All subjects were protected from possible legal repercussions of their participation in these experiments by specific agreements with the Federal Bureau of Narcotics, the Office of the Attorney General of Massachusetts, and the Massachusetts Bureau of Drug Abuse and Drug Control (19).

Subjects

The central group of subjects consisted of nine healthy, male volunteers, 21 to 26 years of age, all of whom smoked tobacco cigarettes regularly but had never tried marijuana previously. Eight chronic users of marijuana also participated, both to "assay" the quality of marijuana received from the Federal Bureau of Narcotics and to enable the experimenters to standardize the protocol, using subjects familiar with their responses to the drug. The age range for users was also 21 to 26 years. They all smoked marijuana regularly, most of them every day or every other day.

The nine "naïve" subjects were selected after a careful screening process. An initial pool of prospective subjects

was obtained by placing advertisements in the student newspapers of a number of universities in the Boston area. The advertisements sought "male volunteers at least 21 years old, for psychological experiments." After nonsmokers were eliminated from this pool, the remaining volunteers were interviewed individually by a psychiatrist who determined their histories of use of alcohol and other toxicants as well as their general personality types. In addition to serving as a potential screening technique to eliminate volunteers with evidence of psychosis, or of serious mental or personality disorder, these interviews served as the basis for the psychiatrist's prediction of the type of response an individual subject might have after smoking marijuana. (It should be noted that the marijuana-naïve volunteer had to be disqualified on psychiatric grounds. Only after a prospective subject passed the interview was he informed that the "psychological experiment" for which he had volunteered was a marijuana study. If he consented to participate, he was asked to sign a release, informing him that he would be "expected" to smoke cigarettes containing marijuana or an inert substance." He was also required to agree to a number of conditions, among them that he would "discontinue the course of the experiment taking no psychoactive drugs, including alcohol, other than those drugs administered in the course of the experiment."

It proved extremely difficult to find marijuana-naïve persons in the student population of Boston, and nearly 6 months of interviewing were required to obtain nine men. All those interviewed who had already tried marijuana volunteered this information quite freely and were delighted to discuss their experience with the psychiatrist. Nearly all persons encountered who had tried marijuana admitted this somewhat apologetically. Several said they had been meaning to try the drug but had not got around to it. A few said they had no access to it. Only one person cited the current laws as his reason for not having experimented with marijuana. It seemed clear in the interviews that many of these persons were actually afraid of how they might react to marijuana; they therefore welcomed the chance to smoke it under medical supervision. Only one person (an Indian exchange student) who passed the screening interview refused to participate after learning the nature of the experiment.

The eight heavy users of marijuana

were obtained with less difficulty. They were interviewed in the same manner as the other subjects and were instructed not to smoke any marijuana on the day of their appointment in the laboratory.

Subjects were questioned during screening interviews and at the conclusion of the experiments to determine their knowledge of marijuana effects. None of the nine naive subjects had ever watched anyone smoke marijuana or observed anyone high on marijuana. Most of them knew of the effects of the drug only through reports in the popular press. Two subjects had friends who used marijuana frequently; one of these (No. 4) announced his intention to "prove" in the experiments that marijuana really did not do anything; the other (No. 3) was extremely eager to get high because "everyone I know is always talking about it very positively."

Setting

Greatest effort was made to create a neutral setting. That is, subjects were made comfortable and secure in a pleasant suite of laboratories and offices, but the experimental staff carefully avoided encouraging any person to have an enjoyable experience. Subjects were never asked how they felt, and no subject was permitted to discuss the experiment with the staff until he had completed all four sessions. Verbal interactions between staff and subjects were minimum and formal. At the end of each session, subjects were asked to complete a brief form asking whether they thought they had smoked marijuana that night; if so, whether a high dose or a low dose; and how confident they were of their answers. The experimenters completed similar forms on each subject.

Marihuana

Marihuana used in these experiments was of Mexican origin, supplied by the Federal Bureau of Narcotics (20). It consisted of finely chopped leaves of *Cannabis*, largely free of seeds and stems. An initial batch, which was judged to be of low potency by the experimenters on the basis of the doses needed to produce symptoms of intoxication in the chronic users, was subsequently found to contain only 0.3 percent of THC by weight. A second batch,

Table 1. Composition of the dose. The placebo cigarette consisted of placebo material, tobacco filler, and mint leaves for masking flavor. The low dose was made up of marihuana, tobacco filler, and mint leaves. The high dose consisted of marihuana and mint leaves.

Dose	Marihuana in each cigarette (g)	Total dose marihuana (2 cigarettes) (g)	Approximate dose THC
Placebo	—	—	—
Low	0.25	0.5	4.5 mg
High	1.0	2.0	18 mg

assayed at 0.9 percent THC, was rated by the chronic users to be "good, average" marihuana, neither exceptionally strong nor exceptionally weak compared to their usual supplies. Users consistently reported symptoms of intoxication after smoking about 0.5 gram of the material with a variation of only a few puffs from subject to subject. This second batch of marihuana was used in the experiments described below; the low dose was 0.5 gram, and the high dose was 2.0 grams.

All marihuana was administered in the form of cigarettes of standard size made with a hand-operated rolling machine. In any given experimental session, each person was required to smoke two cigarettes in succession (Table 1).

Placebo material consisted of the chopped outer covering of mature stalks of male hemp plants; it contained no THC. All cigarettes had a tiny plug of tobacco at one end and a plug of paper at the other end so that the contents were not visible. The length to which each cigarette was to be smoked was indicated by an ink line. Marihuana and placebo were administered to the naive subjects in double-blind fashion. Scented aerosols were sprayed in the laboratory before smoking, to mask the odor of marihuana. The protocol during an experimental session was as follows. The sessions began at approximately 5.30 p.m.

Time	Procedure
0:00	Physiological measurements; blood sample drawn
0:05	Psychological test battery No. 1 (base line)
0:35	Verbal sample No. 1
0:40	Cigarette smoking
1:00	Rest period
1:15	Physiological measurements; blood sample drawn
1:20	Psychological test battery No. 2
1:50	Verbal sample No. 2
1:55	Rest period (supper)
2:30	Physiological measurements
2:35	Psychological test battery No. 3
3:05	End of testing

Experimental Sessions

Chronic users were tested only in high doses of marihuana with no practice sessions. Each naive subject was required to come to four sessions spaced about a week apart. The first was always a practice session, in which the subject learned the proper smoking technique and during which he became thoroughly acquainted with the tobacco and the protocol. In the practice session, each subject completed the entire protocol, smoking two hand-rolled tobacco cigarettes. He was instructed to take a long puff, to inhale deeply, and to maintain inspiration for 20 seconds as timed by an experimenter with a stopwatch. Subjects were allowed 8 to 12 minutes to smoke each of the two cigarettes. One purpose of this practice smoking was to identify and eliminate individuals who were not tolerant to high doses of nicotine, thus reducing the effect of nicotine on the variables measured during subsequent drug sessions (21). A surprising number (five) of volunteers who had described themselves in screening interviews as heavy cigarette smokers, "inhaling" up to two packs of cigarettes a day, developed acute nicotine reactions when they smoked two tobacco cigarettes by the required method. Occurrence of such a reaction disqualified a subject from participation in the experiments.

In subsequent sessions, when cigarettes contained either drug or placebo, all smoking was similarly supervised by an experimenter with a stopwatch. Subjects were not permitted to smoke tobacco cigarettes while the experiment was in progress. They were assigned to one of the three treatment groups listed in Table 2.

Physiological and

Psychological Measures

The physiological parameters measured were heart rate, respiratory rate, pupil size, blood glucose level, conjunctival vascular state. Pupil size was measured with a millimeter rule under constant illumination with eyes focused on an object at constant distance. Conjunctival appearance was rated by an experienced experimenter for dilation of blood vessels on a 0 to 4 scale with ratings of 3 and 4 indicating "significant" vasodilatation. Blood samples were collected for immediate determinations of serum glucose and for the serum to be frozen and stored for

able after a 4-hour session. Subjects were asked not to eat and not to imbibe a beverage containing sugar or caffeine during the 4 hours preceding a session. They were given supper after the second blood sample was drawn.

The psychological test battery consisted of (i) the Continuous Performance Test (CPT)—5 minutes; (ii) the Digit Symbol Substitution Test (DSST)—90 seconds; (iii), CPT with strobe light distraction—5 minutes; (iv) self-rating bipolar mood scale—3 minutes; and (v) pursuit rotor—10 minutes.

The Continuous Performance Test was designed to measure a subject's capacity for sustained attention (22). The subject was placed in a darkened room and directed to watch a small screen upon which six letters of the alphabet were flashed rapidly and in random order. The subject was instructed to press a button whenever a specified critical letter appeared. The number of letters presented, correct responses, and errors of commission and omission were counted over the 5-minute period. The test was also done with a strobe light flickering at 50 cycles per second. Normal subjects make no or nearly no errors on this test either with or without strobe distraction; but sleep deprivation, organic brain disease, and certain drugs like chlorpromazine adversely affect performance. Presence or absence of previous exposure to the task has no effect on performance.

The Digit Symbol Substitution Test is a simple test of cognitive function (see Fig. 1). A subject's score was the number of correct answers in a 90-second period. As in the case of the CPT, practice should have little or no effect on performance.

The self-rating bipolar mood scale used in these experiments was one developed by Smith and Beecher (23) to evaluate subjective effects of morphine. By allowing subjects to rate themselves within a given category of moods, on an arbitrary scale from +3 to -3, it minimizes suggestion and is thus more neutral than the checklists often employed in drug testing.

The pursuit rotor measures muscular coordination and attention. The subject's task was to keep a stylus in contact with a small spot on a moving turntable. In these experiments, subjects were given ten 30-second trials in each battery. The score for each trial was total time in contact with the spot. There is a marked practice effect on this test, but naive subjects were

Table 2. Order of treatment.

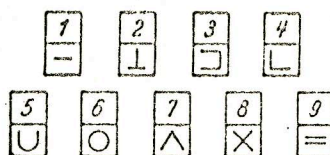
Group	Drug session		
	1	2	3
I	High	Placebo	Low
II	Low	High	Placebo
III	Placebo	Low	High

Table 3. Subjects' appraisal of the dose.

Actual dose	Guessed dose			Fraction correct
	Placebo	Low	High	
Placebo	8	1		8/9
Low	3	6		6/9
High	2	6	1	1/9

brought to high levels of performance during their practice session, so that the changes due to practice were reduced during the actual drug sessions. In addition, since there was a different order of treatments for each of the three groups of naive subjects, any session-to-session practice effects were minimized in the statistical analysis of the pooled data.

At the end of the psychological test battery, a verbal sample was collected from each subject. The subject was left alone in a room with a tape recorder and instructions to describe "an interesting or dramatic experience" in his life until he was stopped. After exactly 5 minutes he was interrupted and asked how long he had been in the recording room. In this way, an estimate of the subject's ability to judge time was also obtained.



2	1	3	7	2	4	8	1	5	4	2	1
1	5	4	2	7	6	3	5	7	2	8	5
6	2	5	1	9	2	8	3	7	4	6	5

Fig. 1. This is a sample of the Digit Symbol Substitution Test as used in these studies. On a signal from the examiner the subject was required to fill as many of the empty spaces as possible with the appropriate symbols. The code was always available to the subject during the 90-second administration of the test. [This figure appeared originally in *Psychopharmacologia* 5, 164 (1964)]

Results.

1) *Safety of marihuana in human volunteers.* In view of the apprehensions expressed by many persons over the safety of administering marihuana to research subjects, we wish to emphasize that no adverse marihuana reactions occurred in any of our subjects. In the five acute nicotine reactions mentioned earlier were far more specific than any effects produced by marihuana.

In these experiments, observable effects of marihuana were maximum 15 minutes after smoking. They diminished between 30 minutes and 1 hour, and they were largely dissipated 3 hours after the end of smoking. Delayed or persistent effects beyond 3 hours were observed or reported.

2) *Intoxicating properties of marihuana in a neutral setting.* With a high dose of marihuana (2.0 grams) chronic users became "high" (24) on their own accounts and in the judgment of experimenters who had observed many persons under the influence of marihuana. The effect was consistent even though prior to the session one of these subjects expressed anxiety about smoking marihuana and submitting to tests in a laboratory.

On the other hand, only one of nine naive subjects (No. 3) had a definite "marihuana reaction" on the high dose. He became markedly euphoric and laughed continuously during his first battery of tests after taking the drug. Interestingly, he was the one subject who had expressed his desire to get high.

3) *Comparison of naive and chronic user subjects.* Throughout the experiments it was apparent that the groups of subjects reacted differently to identical doses of marihuana. We caution, however, that our study was designed to allow rigorous statistical analysis of data from the naive group; it was not designed to permit formal comparison between chronic users and naive subjects. The conditions of the experiment were not the same for the groups: the chronic users were tested with the drug on their first visit to the laboratory with no practice and were informed that they were to receive doses of marihuana. Therefore, differences between the chronic and naive groups reported below—although statistically valid—must be regarded as trends to be confirmed or rejected in additional experiments.

4) *Recognition of marihuana ve*

placebo. All naive subjects were unable to identify the taste or smell of marijuana in the experimental cigarettes. A few subjects remarked that they noticed differences in the taste of the three sets of cigarettes but could not interpret the differences. Most subjects found the pure marijuana cigarettes (high dose) more mild than the low dose or placebo cigarettes, both of which contained tobacco.

The subjects' guesses of the contents of cigarettes for their three sessions are presented in Table 3. It is noteworthy that one of the two subjects who called the high dose a placebo was the subject (No. 4) who had told us he wanted to prove that marijuana really did nothing. There were three outstanding findings: (i) most subjects receiving marijuana in either high or low dose recognized that they were getting a drug; (ii) most subjects receiving placebos recognized that they were receiving placebos; (iii) most subjects called their high dose a low dose, but none called his low dose a high dose, emphasizing the unimpressiveness of their subjective reactions.

5) *Effect of marijuana on heart rate.* The mean changes in heart rate from base-line rates before smoking the drug to rates at 15 and 90 minutes after smoking marijuana and placebo (Table 4) were tested for significance at the .05 level by an analysis of variance; Tukey's method was applied for all possible comparisons (Table 5). In the naive subjects, marijuana in low dose or high dose was followed by increased heart rate 15 minutes after smoking, but the effect was not demonstrated to be dose-dependent. The high dose caused a statistically greater increase in the heart rates of chronic users than in those of the naive subjects 15 minutes after smoking.

Two of the chronic users had unusually low resting pulse rates (56 and 42), but deletion of these two subjects (No. 11 and No. 15) still gave a significant difference in mean pulse rise of chronic users compared to naives. Because the conditions of the sessions and experimental design were not identical for the two groups, we prefer to report this difference as a trend that must be confirmed by further studies.

6) *Effect of marijuana on respiratory rate.* In the naive group, there was no change in respiratory rate before and after smoking marijuana. Chronic users showed a small but statistically significant increase in respiratory rate

Table 4. Change in heart rate (beat/min) after smoking the best material. Results are recorded as a change from the base line 15 minutes and 90 minutes after the smoking session.

Subject	15 Minutes			90 Minutes	
	Placebo	Low	High	Placebo	Low
<i>Naive subjects</i>					
1	+16	+20	+16	+26	+6
2	+12	+24	+12	+6	+4
3	+8	+8	+26	+4	+4
4	+20	+8			+20
5	+8	+4	+8		+22
6	+10	+20	+28	+20	+4
7	+4	+28	+24	+12	+8
8	+8	+20	+24	+3	+8
9		+20	+24	+8	+12
Mean	+7.8	+16.9	+16.2	+0.8	+7.6
S.E.	2.8	2.7	4.2	3.8	3.2
<i>Chronic subjects</i>					
10		+32			+4
11		+36			+36
12		+20			+12
13		+8			+4
14		+32			+12
15		+54			+22
16		+24			
17		+60			
Mean		+33.2			+15.0
S.E.		6.0			5.0

Table 5. Significance of differences (at the .05 level) in heart rate. Results of Tukey's test for all possible comparisons.

Comparison	15 Minutes	90 Minutes
Low dose versus placebo	Significant	Significant
High dose versus placebo	Significant	Not significant
Low dose versus high dose	Not significant	Significant
Chronic users versus high dose	Significant	Significant

Table 6. Significance of differences (at the .05 level) for the Digit Symbol Substitution Test. Results of Tukey's test for all possible comparisons.

Comparison	15 Minutes	90 Minutes
Low dose versus placebo	Significant	Significant
High dose versus placebo	Significant	Significant
Low dose versus high dose	Significant	Not significant
Chronic users versus high dose	Significant	Significant

Table 7. Digit Symbol Substitution Test. Change in scores from base line (number correct) 15 minutes and 90 minutes after the smoking session.

Subject	15 Minutes			90 Minutes		
	Placebo	Low	High	Placebo	Low	High
<i>Naive subjects</i>						
1	-3	-	+5	-7	+4	+
2	+10	-8	-17	-1	-15	-
3	-3	+6	-7	-10	+2	-
4	+3	-4	-3		-7	
5	+4	+1	-7	+6		-
6	-3	-1	-9	+3	-5	-
7	+2	-4	-6	+3	-5	-
8	-1	+3	+1	+4	+4	-
9	-1	-4	-3	+6	-1	-
Mean	+0.9	-1.2	-5.1	+0.4	-2.6	-
S.E.	1.4	1.4	2.1	1.9	2.0	
<i>Chronic users</i>						
10			-4			-
11			+1			+
12			+11			+
13			+3			+
14			-2			+
15			-6			+
16			-4			+
17			+3			+
Mean			+0.25			+
S.E.			1.9			

after smoking, and we do not regard the change as clinically significant.

7) *Effect of marihuana on pupil size.* There was no change in pupil size before and after smoking marihuana in either group.

8) *Effect of marihuana on conjunctival appearance.* Significant reddening of conjunctivae due to dilatation of blood vessels occurred in one of nine subjects receiving placebo, three of nine receiving the low dose of marihuana, and eight of nine receiving the high dose. It occurred in all eight of the chronic users receiving the high dose and was rated as more prominent in them. The effect was more pronounced 15 minutes after the smoking period than 90 minutes after it.

9) *Effect of marihuana on blood sugar.* There was no significant change in blood sugar levels after smoking marihuana in either group.

10) *Effect of marihuana on the Continuous Performance Test.* Performance on the CPT and on the CPT with strobe distraction was unaffected by marihuana for both groups of subjects.

11) *Effect of marihuana on the Digit Symbol Substitution Test.* The significance of the differences in mean changes of scores at the .05 level was determined by an analysis of variance by means of Tukey's method for all possible comparisons. Results of these tests are summarized in Tables 6 and 7.

The results indicate that: (i) Decrements in performance of naive subjects following low and high doses of marihuana were significant at 15 and 90 minutes after smoking. (ii) The decre-

ment following marihuana was greater after high dose than after low dose at 15 minutes after taking the drug, giving preliminary evidence of a dose-response relationship. (iii) Chronic users started with good base-line performance and improved slightly on the DSST after smoking 2.0 grams of marihuana, whereas performance of the naive subjects was grossly impaired. Experience with the DSST suggests that absence of impairment in chronic users cannot be accounted for solely by a practice effect. Still, because of the different procedures employed, we prefer to report this difference as a trend.

12) *Effect of marihuana on pursuit rotor performance.* This result is presented in Table 8. Again applying Tukey's method in an analysis of variance, we tested differences in mean changes in scores (Table 9). Decrements in performance of naive subjects after both low and high doses of marihuana were significant at 15 and 90 minutes. This effect on performance followed a dose-response relation on testing batteries conducted at both 15 minutes and 90 minutes after the drug was smoked.

All chronic users started from good baselines and improved on the pursuit rotor after smoking marihuana. These data are not presented, however, because it is probable that the improvement was largely a practice effect.

13) *Effect of marihuana on time estimation.* Before smoking, all nine naive subjects estimated the 5-minute verbal sample to be 5 ± 2 minutes. After placebo, no subject changed his

guess. After the low dose, three subjects raised their estimates to 10 minutes, and after the high dose raised their estimates.

14) *Subjective effects of marihuana.* When questioned at the end of participation in the experiment, persons who had never taken marihuana previously reported minimum subjective effects after smoking the drug, or, precisely, few effects like those commonly reported by chronic users. Chronic users reported little euphoria, no distortion of visual or auditory perception, and no confusion. However, some subjects mentioned that "things seemed to take longer." Below are example comments by naive subjects after doses.

Subject 1: "It was stronger than the previous time (low dose) but I really think it could be marihuana. Things seemed to go slower."

Subject 2: "I think I realize why I took our watches. There was a sense of past disappearing as happens when you're driving too long without sleeping. When you start you wake up to realize you're asleep for an instant; you discover yourself driving along the road. It was the same tonight with eating a sandwich. I look down to discover I'd just swallowed a bite but I hadn't noticed it at the time."

Subject 6: "I felt a combination of being almost-drunk and tired, with occasional fits of silliness—not my normal reaction to smoking tobacco."

Subject 8: "I felt faint briefly, but the dizziness went away, and I felt normal, slightly tired. I can't believe I had a dose of marihuana."

Subject 9: "Time seemed very distorted. I would keep forgetting what I was doing, especially on the continuous performance test, but somehow every time 'X' (the critical letter) came up, I found myself pushing the button."

After smoking their high dose, chronic users were asked to rate themselves on a scale of 1 to 10, 10 representing "the highest you've ever been." All subjects placed themselves between 7 and 10, most at 8 or 9. Many of these subjects expressed anxiety at the start of their first battery of tests after smoking the drug when they were feeling very high. Then they expressed surprise during and after the tests when they judged (correctly) that their performance was as good as or better than it had been before taking the drug.

15) The effect of marihuana on the self-rating mood scale, the effect of marihuana on a 5-minute verbal sample, and the correlation of personality type with subjective effects of marihuana will be reported separately.

Table 8. Pursuit rotor (naive subjects). Changes in scores (averages of ten trials) from base line (seconds).

Subject	15 Minutes			90 Minutes		
	Placebo	Low	High	Placebo	Low	High
1	+1.20	-1.04	-4.01	+1.87	-1.54	-6.54
2	+0.89	-1.43	-0.12	+0.52	+0.44	-0.68
3	+0.50	-0.60	-6.56	+0.84	-0.96	-4.34
4	+0.18	-0.11	+0.11	+0.06	+1.95	-1.37
5	+3.20	+0.39	+0.13	+2.64	+3.33	+0.34
6	+3.45	-0.32	-3.46	+2.93	+0.22	-2.26
7	+0.81	+0.48	-0.79	+0.63	+0.16	-0.52
8	+1.75	-0.39	-0.92	+2.13	+0.40	+1.02
9	+3.90	-1.94	-2.60	+3.11	-0.97	-3.09
Mean	+1.8	-0.6	-2.0	+1.6	+0.3	-1.9
S.E.	0.5	0.3	0.8	0.4	0.5	0.8

Table 9. Significance of differences (at the .05 level) for the pursuit rotor. Results of Tukey's test for all possible comparisons, 15 and 90 minutes after the smoking session.

Comparison	15 Minutes	90 Minutes
Low dose versus placebo	Significant	Significant
High dose versus placebo	Significant	Significant
Low dose versus high dose	Significant	Significant

Several results from this study raise important questions about the action of marihuana and suggest directions for future research. Our finding that subjects who were naive to marihuana did not become subjectively "high" after a high dose of marihuana in a neutral setting is interesting when contrasted with the response of regular users who consistently reported and exhibited highs. It agrees with the reports of chronic users that many, if not most, people do not become high on their first exposure to marihuana even if they smoke it correctly. This puzzling phenomenon can be discussed from either a physiological or psychosocial point of view. Neither interpretation is entirely satisfactory. The physiological hypothesis suggests that getting high on marihuana occurs only after some sort of pharmacological sensitization takes place. The psychosocial interpretation is that repeated exposure to marihuana reduces psychological inhibition, as part of, or as the result of a learning process.

Indirect evidence makes the psychological hypothesis attractive. Anxiety about drug use in this country is sufficiently great to make worthy of careful consideration the possibility of an unconscious psychological inhibition or block on the part of naive drug takers. The subjective responses of our subjects indicate that they had imagined a marihuana effect to be much more profoundly disorganizing than what they experienced. For example, subject No. 4, who started with a bias against the possibility of becoming high on marihuana, was able to control subjectively the effect of the drug and report that he had received a placebo when he had actually gotten a high dose. As anxiety about the drug is lessened with experience, the block may decrease, and the subject may permit himself to notice the drug's effects.

It is well known that marihuana users, in introducing friends to the drug, do actually "teach" them to notice subtle effects of the drug on consciousness (25). The apparently enormous influence of set and setting on the form of the marihuana response is consistent with this hypothesis, as is the testimony of users that, as use becomes more frequent, the amount of drug required to produce intoxication decreases—a unique example of "reverse tolerance." (Regular use of many intoxicants is

accompanied by the need for increasing doses to achieve the same effects.)

On the other hand, the suggestion arising from this study that users and nonusers react differently to the drug, not only subjectively but also physiologically, increases the plausibility of the pharmacological-sensitization hypothesis. Of course, reverse tolerance could equally well be a manifestation of this sensitization.

It would be useful to confirm the suggested differences between users and nonusers and then to test in a systematic manner the hypothetical explanations of the phenomenon. One possible approach would be to continue to administer high doses of marihuana to the naive subjects according to the protocol described. If subjects begin reporting high responses to the drug only after several exposures, in the absence of psychedelic settings, suggestions, or manipulations of mood, then the likelihood that marihuana induces a true physiological sensitization or that experience reduces psychological inhibitions, permitting real drug effects to appear, would be increased. If subjects fail to become high, we could conclude that learning to respond to marihuana requires some sort of teaching or suggestion.

An investigation of the literature of countries where anxieties over drug use are less prominent would be useful. If this difference between responses of users and nonusers is a uniquely American phenomenon, a psychological explanation would be indicated, although it would not account for greater effects with smaller doses after the initial, anxiety-reducing stage.

One impetus for reporting the finding of differences between chronic and naive subjects on some of the tests, despite the fact that the experimental designs were not the same, is that this finding agrees with the statements of many users. They say that the effects of marihuana are easily suppressed—much more so than those of alcohol. Our observation, that the chronic users after smoking marihuana performed on some tests as well as or better than they did before taking the drug, reinforced the argument advanced by chronic users that maintaining effective levels of performance for many tasks—driving, for example (26)—is much easier under the influence of marihuana than under that of other psychoactive drugs. Certainly the surprise that the chronic users expressed when they found they were per-

forming more effectively on the CPT, DSST, and pursuit rotor tests than they thought they would is remarkable. It is quite the opposite of the false sense of improvement subjects have under some psychoactive drugs that actually impair performance.

What might be the basis of this suppression? Possibly, the actions of marihuana are confined to higher cortical functions without any general stimulatory or depressive effect on lower brain centers. The relative absence of neurological—as opposed to psychiatric—symptoms in marihuana intoxication suggests this possibility (7).

Our failure to detect any changes in blood sugar levels of subjects after they had smoked marihuana forces us to look elsewhere for an explanation of the hunger and hyperphagia commonly reported by users. A first step would be careful interviewing of users to determine whether they really become hungry after smoking marihuana or whether they simply find eating more pleasurable. Possibly, the basis of this effect is also central rather than due to some peripheral physiological change.

Lack of any change in pupil size of subjects after they had smoked marihuana is an enlightening finding especially because so many users and law enforcement agents firmly believe that marihuana dilates pupils. (Since users generally observe each other in dim surroundings, it is not surprising that they see large pupils.) This negative finding emphasizes the need for data from carefully controlled investigation rather than from casual observation or anecdotal reports in the evaluation of marihuana. It also agrees with the findings of others that synthetic THC does not alter pupil size (8, 27).

Finally, we would like to comment on the fact that marihuana appears to be a relatively mild intoxicant in our studies. If these results seem to differ from those of earlier experiments, it must be remembered that other experiments have given marihuana orally, have given doses much higher than those commonly smoked by users, have administered potent synthetics, and have not strictly controlled the laboratory setting. As noted in our introduction, more powerful effects are often reported by users who ingest preparations of marihuana. This may mean that some active constituents which enter the body when the drug is ingested are destroyed by combustion, a suggestion that must be investigated in man. Another prior

MARIHUANA PSYCHOSIS

*A Case Study**

BY GERALD D. KLEE, M.D.

INTRODUCTION

In recent years, there has been widespread concern, and some controversy surrounding the subject of the illicit use of the so-called psychedelic drugs. Since the early 1960's, this type of drug abuse has been of epidemic proportions in many areas throughout the country, largely among young people in their late teens and early twenties. The drugs have been used for such purposes as thrills and kicks, "finding greater self-awareness," "mind expansion," and for "religious purposes." The drugs employed include a wide assortment including Cannabis (marihuana and hashish), LSD, DMT, STP, Psilocybin, and the amphetamines. There have been a number of clinical reports documenting the occurrence of adverse effects resulting from the use of many of these drugs, especially LSD and amphetamines.¹⁻⁸ In many cases the adverse effects have been of serious nature, including prolonged psychotic reactions, and occasionally, suicidal and homicidal behavior. Although the actual incidence of drug use is difficult to ascertain, there seems to be no doubt that marihuana is the most widely used of these drugs. While few will contest the potential harmfulness of the other drugs listed, there is widespread debate as to whether or not marihuana is significantly harmful. There are many, indeed, who advocate that the use of marihuana be entirely legalized.

It is the opinion of many psychiatrists and other medical people that adverse reactions to Cannabis are not at all rare, but that they often fail to come to medical attention. The literature contains relatively few reports of clear-cut, adverse reactions to marihuana.⁹⁻¹⁷ I have seen numerous patients, however, who have had a wide variety of psychiatric difficulties associated with marihuana use. Most of these patients, however, have had pre-existing psychiatric disturbances and have also taken other drugs, so that it is difficult to establish a definite cause-effect relationship between marihuana use and the ensuing psychiatric disturbance. More information is required to bring light to this controversial subject.

*This paper was received by the QUARTERLY on April 30, 1969.

Statistical and epidemiological studies are needed to provide more data on the incidence and nature of adverse marihuana reactions. Detailed clinical studies of individual cases are also necessary, to provide in-depth understanding.

The case to be presented is unique in that the relationship between marihuana use and the psychiatric disturbance is unmistakable. In addition, this case illustrates several other significant points, such as the relationship between the marihuana reaction and the subject's personality characteristics, and the association of an adverse marihuana reaction with pathological reactions to alcohol in the same individual.

CASE REPORT

The patient, Mr. P B, is a 26-year-old, single, white, male of Italian birth. He is a college graduate, an army veteran, and a junior executive in a large business concern. He had never before consulted a psychiatrist, nor felt any need to do so. In early January 1969, he called, urgently requesting a psychiatric appointment, "as soon as possible." He reported that on the preceding Sunday, he had had a terrifying experience and wanted to get help as quickly as possible, to try to understand what had happened. On Sunday, his girl friend told him she would like to try some marihuana, which she had never had before, and suggested that he get some. He had no experience with other drugs except alcohol, but had used marihuana before with no remarkable effects. In order to comply with his girl friend's request, he visited some friends who had a batch of marihuana and were smoking it. He purchased a small amount and returned to his girl's apartment. His verbatim account of what happened then is as follows:

Mr. P B's Account Of His Marihuana Experience

My girl and I had occasion to use marihuana. We smoked, between us, two cigarettes which I rolled. At first, there seemed to be nothing out of the ordinary of what had happened to me before, concerning marihuana. I had marihuana, oh, four or five times before, but actually had only smoked it to any appreciable degree twice or three times. On which occasions, as I say, I got high and nothing else. This time an entirely different experience happened. It was really unbelievably horrible.

As I said, we rolled two cigarettes. After rolling and smoking the second cigarette I felt myself getting very high. I left the living room to go to the bathroom, for what reason I don't know. Whether it was

to simply use the bathroom or not, I don't remember, but on going to the bathroom, and later returning to the living room, I thought that I felt myself coming down from my high. And I felt possibly we had smoked too much and I had gone too high, so I suggested that we go to the bathroom where the air was cleaner. After getting there, I realized that while the windows were all shut, there's no windows in the bathroom to begin with, smoke would have just gotten there anyway. We returned to the living room and I opened the window in the living room, attempting to bring some fresh air into the apartment. After returning from opening the window things started to happen.

I had a terrible feeling of falling into a deep, black hole. Then I could visualize my girl's face, and every time I saw her face a word would appear in my mind, or I would hear a word and the face would flit to a different expression and a different position, and I would hear another word, faster and faster, a different position on the face, a different word, and after a few words the sentence started to make sense, and after a few more words I started to realize what the sentence was leading to, what it was going to say. It was telling me that I was dying and in the end, that I was dead. The sentence made some sort of reference to, "And in the face that you see, is the face that you see before you die." With this I remember being either on my knees or stretched out completely on the floor, yelling and screaming that I was dead and that I was in Hell. As I later found out, my girl was very, very frightened by what was happening, and she ran out of the apartment and down the steps. I must have followed her because I wound up on the landing outside of her apartment, next to the apartment next door. People in the apartment next door must have heard me because they came out and the young man and girl who were there, picked me up, and I gather, after his shaking me and slapping me around, I came to, or at least, I could see faces. I was no longer in a black pit as I thought I had fallen into. And now I started thinking, this is after they took me into their apartment, and actually into their kitchen, I started thinking and realizing that I was not dead and then I started thinking that I killed my girl and I asked them to find out for me where she was, after which the young man went downstairs and did find her on the landing and brought her upstairs. After being in their apartment and sitting down on their couch for a few minutes, it seemed that I started to snap out again. I think I requested a glass of water and I think that they gave it to me, but I really don't remember drinking any water specifically but some memory of water throughout this whole experience. I remember asking for water and being very, very dry. After a matter of minutes of being in their apartment, I remember asking the girl next to me,

every few seconds, what time it was, and I kept on looking at my own watch and telling her, "See, time is going backwards, time is going backwards." It's phenomenal, it was happening constantly throughout this whole experience. As I remember the words that I was hearing when seeing my girl's face before I was dead, were actually words that were being repeated to me, or that I heard backwards, that were coming to me backwards. As I said, there were many things in this whole experience that happened.

After being in there I must have snapped out because as it seems, I lunged across the room, knocked down a Christmas tree that they had there, banged up against the door, or a wall, and had gone into a fit. After coming out of it enough to say things, I wound up again and I thought I was dead, only this time it wasn't Hell, it was Purgatory I was in, and in Purgatory I was imagining that I had tasks to do. One of them was to scrape the floor. This girl's apartment, her floor, had been scraped and sanded. She had had it sanded just a while back. I was scraping the floor of their apartment with my hands and feet. I did not have my shoes on. Another thing was that I was supposed to have pain. I felt that I was being punished and pain was being inflicted, only I didn't feel any remorse to it, I felt happy because of the idea that I was in Purgatory and that each task was simply to get me out of there, and that I would eventually get out of there. I kept seeing the two faces of the girls, of my girl and the girl next door's as faces of people who were human angels who were there to help me through this experience, to tell me when things were to be done and when things were over. I do remember that the young man walked out and made some comment. I remember him making some comment about his father being an alcoholic and that he couldn't stand things like that and he walked out. He later returned to make sure that I got out and that his girl was alright. I can't blame him for leaving. I must have gotten very violent because the girl in the apartment next door and my girl tied me up. They tied both my hands and my feet, and wrapped me in a blanket. I remember things happening here. I was in Purgatory, I had tasks to do and then I got to a point where it seemed as if, you know, the point of no return, reached the end or the halfway point, and things again started to go backwards. Tasks I had done started to reverse themselves. I had thrown myself across the room, and flipped and hit the door, and now I was going backwards. Pine needles which had been embedded in my foot which I pulled out were now going back in and then coming back out again. A nail which I had pulled out of my foot and handed to the girl, I remarked to her "O.K. lady, come on, it's time for a nail, got to put the nail back in," and I remember her saying about what I was

doing to the floor. "Got to scrape the floor, lady," I told her, "Got to scrape the floor," all the time feeling very happy about it all as if this was something that I had to do and get over and done with because I was leaving this place. It was at a place that was only temporary. I also remember laying on the floor and having them grab my hands as if they were pulling me up out of Purgatory, that I was coming out. This was before they had tied me. I don't think they had me tied much before they took me out of her apartment, but things again kept reversing themselves here. I had fallen into Purgatory; I had done my tasks, and then everything reversed itself and I was coming back out and all the while the two faces. Eventually, I gather they did get me tied up. They wrapped me in a blanket and took me next door to my girl's apartment where, I guess, the other girl was a little disgusted with what was happening and she was leaving, or she was going back to her apartment. I thought that this had reached the point where this woman, this helper, well, she had accomplished her task and now she was leaving and I said goodbye to her. As a matter of fact I said, "I won't see you any more, will I?" and as I remembered I looked down at my girl and said, "Will you be with me?" and she kept on saying, "Always," at least I thought she was saying "Always." It seems that people were saying things to me. I see now where the explanations of what happened, as my girl has told me, where people were saying things, and yet, I was not hearing everything they were saying, or, I was not hearing anything they were saying. I was simply hearing what I wanted to hear. I was simply pulling from sentences the words that I wanted to hear, that's why any time I asked a question it seemed that everybody was agreeing with me, as to where I was, what was happening, what I was doing. Then I remember myself coming back. I was no longer in Purgatory. I was going back to life. I felt as if they had wrapped me up in that blanket and I was degenerating down to the, well, down to decayed matter. I felt as though I was in a paper bag being put in a trash can and later, this bag being removed from the trash can and I was coming back, but I was coming back as a cat, and then I imagined myself coming back as one of my friends, this boy named Danny, and later it was even my brother, I felt I was coming back as my brother. My girl mentioned that I even remarked that I thought I had gone back as far as the womb. I don't remember actually going back there, but certainly I wouldn't put it past me if I had imagined it, being that I imagined everything else. Maybe my memory functions were supposed to have stopped by then and maybe my mind was telling me I wasn't supposed to remember this. I remember lying on the floor as if I was in a bassinet, I was a baby then. My

girl remarked that at one point, I had gone back so far that I sounded as if I was even speaking in an Italian accent, which I lost quite a few years ago.

It took quite a while for me to get my senses back. All through this experience I guess, every now and then for a few moments, it seemed as if I was coming out of it, but, then it seemed as if I went back deeper. My girl tells me that every time it seemed as if I was coming to the top she only knew, and she was afraid that I would only slip back, you know further. How many times it happened, I just don't remember exactly. I don't know what the breakoff points are.

It was a very long time before I really started thinking rationally again. This all started from our smoking 'round about 2:15 in the afternoon, and it was well after 8 pm before I felt competent enough to even think of leaving her apartment. All during this time she was terrified, I am sure of this.

It seemed such an unbelievable experience. Yet, it wasn't as if it was a dream. At the time it was so fantastically real. I did feel pain, I felt anguish, I *felt* everything. When I was in Hell, or when I thought I was in Hell, and dead, the pain hurt. When I was in Purgatory, or when I thought I was in Purgatory, the pain didn't hurt. It was pain, but yet, it was pain that I knew would lead to better things, or I thought would lead to better things.

One other thing I guess I should point out, that I don't think was brought out before, is that when it first started, when I first thought of myself as dying and throughout this whole thing, I kept on thinking of God. At first I thought, well, this is it. The man upstairs has called for me, and this is what he deems as the necessary punishment for, well, the way I've lived. I remember, now I remember while I'm talking about it, I remember that when I found myself in Purgatory, or I found myself thinking I was in Purgatory, a feeling of exhilaration, well that I had made it, so to speak. I remember jumping up and down, and screaming and yelling, and throwing my arms and yelling and how I think, "Oh God, how much I love you. Oh! God, how much I love you." And, well, all I had to do was perform my tasks in Purgatory and I was getting out, I was going upstairs, where everything was fine. I think I've remarked before that I did not imagine any of the faces, I didn't, but I did imagine that, you know, the roof of this apartment is completely brown, it's wood. I imagined clouds when I was laying on my back and the two girls were pulling me up by my hands. I imagined clouds. They were pulling me up into clouds. I did imagine clouds a few times. I guess I imagined myself going to Heaven. I never got there. It would have been a lot better experience

had I. A lot better than the two places that I did visit, but I did never get there.

The patient reported that a number of other people had smoked marihuana from the same batch as he had without any untoward effects. He did not know the original source of the marihuana but there is no reason to believe either that it was unusually potent or that it was adulterated in any way with other harmful substances.

Mr. B's girl friend, Miss O who is a somewhat prim, undramatic young lady was interviewed at length. She was an excellent and apparently an objective informant. She filled in some details about his marihuana experience and other aspects of Mr. B's history, which were missing from the patient's account.

During the time that Mr. B was seeing the face of death in her face, he was approaching her with his hands extended, as though he meant to strangle her. If she hadn't run out at that time she feels he might have killed her. She emphasizes his violence during the reaction, which included screaming and banging, and damaging some furniture. He behaved in a very docile fashion, however, when she and the other girl tied him up. She related this episode to his behavior when drinking. Although usually jolly at such times, he can become very irritable and nasty. It has been only when he was drinking that they have had fights. He apparently is quite angry about her refusal to agree to marriage and expresses this anger when drunk. At times, and especially during the marihuana reaction, she has felt that, "There is something about me that P hates very much." What it might be, she cannot say. She also reported that during the psychotic episode and while tied up in the blanket, P was talking about his friend Danny, and moving in such a way as to suggest that they were having enjoyable homosexual relations. This she has not told him, because she believes he feels quite insecure about his masculinity. He also imagined himself having sexual relations with her, and said, "It's wrong, it's wrong."

Miss O had only mild effects from the marihuana herself, since she was unable to inhale the smoke properly. Hence it is unlikely that her observations were much affected by her own use of the drug. The past history is reported largely as told by the patient. Since Miss O knows Mr. B and his family well, some details have been added from her account.

Past History and Family History

The patient was born in Italy during World War II and lived there until he was 8 years old, when he moved to the United States with his mother and younger brother. His father came to the United States several years before the rest of the family and brought them over when

he had earned enough money to afford it. The patient has one sibling, a brother, four years his junior. Father was described as a skilled workman, small in stature, and not verbally communicative. He was reported to be extremely authoritarian, frequently resorting to physical violence to enforce obedience and discipline. Mother was also described as having very similar characteristics. Mother is by far the dominant partner in the marriage. Both parents were, and are, highly volatile and "physical," but unaffectionate. The father, and sometimes mother, frequently beat the patient with hands, feet, sticks, or belts, until he was in his late teens and "refused to take it anymore." His brother was raised in similar fashion, except that the parents were much less consistent in disciplining him. The brother frequently got into trouble as a youngster, and the parents repeatedly intervened to spare him from taking the consequences of his delinquent behavior. According to Miss O, the brother W is the favored son, and the mother is obsessed with him. During the past several years, W has not held a steady job and has become a narcotics addict. A few days before Mr. B's psychotic episode there was a violent episode at home, involving all four members of the family. W, who was having withdrawal symptoms, became somewhat violent. Both parents became "hysterical" and Mr. B had to take them all in hand and tie up his brother. Shortly afterward, W was admitted to a psychiatric hospital for withdrawal.

W is larger and stronger than Mr. B and has an explosive temper. Mr. B usually "walks away" from any conflict, or tries to cool it off, but on occasion engages in explosive arguments with W and with his parents. The home is described as filled with tension when W is there. Mr. B also admits to feeling great inner tension when at home.

Mr. B claimed, at first, to have no feelings, except indifference toward any members of his immediate family. He lives with them, he said, but has as little to do with them as possible. Later he reported that he has deep concern about all of them. He sees himself as the good son and the stable one who holds the family together. If he left he believes that the others would be unable to live together.

Mr. B attended strict, all-Italian Roman Catholic schools in Philadelphia throughout the elementary and high school years, and was a good student. Because of his immigrant status, he states, he was known to the other children as a "dumb wop." Small in size, and "different," he was often bullied. He has always been somewhat troubled by his small stature (about 5'5" at present). During puberty he began to fight back viciously, and later, in high school, joined the football team and was not molested again. He felt some bitterness toward the priests and the sisters, whom he felt were rather harsh with him. In order to escape from the strict Roman Catholic influence, he attended college at a large, secular university in the vicinity.

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He reports himself as being successful and relatively contented at his job, although it involves a fair amount of high-pressure work. He has known his girl friend, a 25-year-old school teacher, for five years and denies any conflicts in their relationship, or in his feelings about her. On further inquiry it was learned that there is conflict between them over who is to be in "control." They go steady, and may eventually marry. After a long courtship, involving heavy petting, he finally persuaded her to have intercourse for the first time about one month before the marihuana episode. Miss O states that he expressed feelings of guilt and inadequacy about his sexual performance.

He would like to get married. She is in no hurry since she wants to travel and is not ready to settle down. She also has had some doubts about marrying P, because of his behavior when drinking, (and more recently the marihuana episode) and because he seems enigmatic to her, seldom expressing his thoughts and feelings.

The patient describes himself as having been sexually naïve, until the age of 21, when he fell in love with the first girl he went to bed with, and promptly caught gonorrhea from her. He doesn't remember too clearly how much guilt he felt. When he saw a physician for diagnosis and treatment, he "jokingly" suggested that the doctor cut off his penis. His further association was that as a child, he believed that priests had their penises cut off. He also recollected his mother wanting him to become a priest.

His sexual experience has been limited to a few women, and he acknowledges some feelings of guilt and a lack of aggressiveness in sexual matters. He denies feelings of masculine inadequacy.

There is no history of serious physical illness. Mr. B denies any history of previous psychiatric symptomatology of any nature. Except for his brother's addiction, no family history of mental illness is reported. He has a wide circle of friends, is fairly athletic and is quite successful in his work. He does report, however, that on a few occasions he has had unusual and alarming reactions to alcohol. Although not a habitual or usually a heavy drinker, he has used liquor many times. On a few occasions, usually when high, (on about a half pint of whiskey) he has been explosive and assaultive. On very slight provocation he has fought and beaten one, two, three, or four other men—friends or enemies—sometimes much larger than himself. On these occasions he has been quite vicious, continuing to beat and kick his victim after knocking him down. His memory after the event tends to be rather hazy. These occurrences are described more with an air of alarm than of braggadocio. Only on rare occasions, in adult years, has he ever been violent when not under the influence of alcohol. He came in search of psychiatric help after the realization that there

was something dangerously explosive inside of him that was brought out by alcohol and marihuana.

Mental Status

The patient is a short, neat, stocky, young man, friendly and on first meeting, somewhat anxious. He was mild-mannered, and highly cooperative. There was no evidence of hallucinations, delusions, thought disorder, or any other manifestations of a psychotic disturbance. He was intelligent, articulate, and very much in control of his feelings. Indeed, on subsequent interviews, he appeared as a very cool and detached person who never gets ruffled or angry—something like a human computer who thinks clearly and logically, but has few feelings. It readily became evident, however, that beneath this facade of reaction formation, denial, and isolation of affect, there was a high degree of tension, and anger. An illustration is as follows:

Several days after the psychotic episode described above, the couple from the apartment next door, who had helped out during his disturbance, sent a bill of \$70 for "damages and services rendered." The bill was presented very coldly and his girl felt there was no justification for it. In fact, she was quite upset and angry. He took it very blandly, shrugged his shoulders and said, "Well, let's pay it," and she exclaimed that it was remarkable he could be so cool about such a thing. In presenting this information during the psychiatric interview, he still maintained that he had practically no feelings about the matter. On further exploration, however, it turned out that after paying the bill he had fantasies of scratching up the ear of the couple, cutting their telephone wires, or burning the house down. Somewhat painfully he came around to the realization that he was really in a rage with them. In the course of subsequent interviews, numerous other episodes involving his parents, his fellow employees and others, were discussed in which similar mechanisms operated to exclude awareness of anger or rage, tenderness, and other emotions.

Psychological Testing

The Minnesota Multiphasic Personality Inventory, was administered to the patient one month following his marihuana episode. The findings were reported as follows:

"People with Mr. B's pattern tend to show psychopathic behavior.

They tend to be overactive and impulsive, irresponsible and untrustworthy, shallow and superficial in their relationships. Their values fluctuate. They expend great energy in satisfying their inner needs but find it hard to adhere to externally imposed responsibilities. They generally show an easy, out-going exterior and have relaxed social lives. However, they lack judgment and control.

Patients with this pattern are often diagnosed either as manic or as personality disorders. They are seldom seen as neurotic. They are overactive, frequently irritable and occasionally violent. The symptoms which are not dissipated by acting out are usually overt somatic expressions of anxiety.

Mr. B's record differs from that of the out-and-out psychopath by the addition of passivity and a philosophical sensitivity to ideals generally not seen as important by those who are driven by immediate need for gratification of basic wants."

DISCUSSION

A single case tells us nothing about the incidence of adverse reactions to marihuana. Although the incidence of adverse reactions of all types is unknown, clinical experience suggests that they are not rare. The experience of this patient is atypical, as were his reactions to alcohol. His experience demonstrates what *can* happen to a predisposed individual who uses this "innocuous" drug. It is only one out of many less dramatic examples. A number of important points about the marihuana psychosis are illustrated by this report. They are as follows:

(1.) As with other drugs, such as LSD,⁸ the nature of the reaction to marihuana is influenced by the personality of the patient, including both psychodynamics and character structure. In this case, the patient's religious training, his anger and feelings of guilt, among other things, were reflected in the content of his delusional experiences during the marihuana psychosis. The drug reaction also shows several points of correlation with the MMPI results. The patient's immediate state or "set" at the time he takes the drug, is also considered an important determining factor in the drug response. Mr. B's conscious "set" was to have a good time. His unconscious "set" may have been quite different. It is more than likely that his emotional state was affected by the great tensions in his life at the time. One might, therefore, speculate, post hoc, that his unconscious set was to release some of the accumulated tensions. The setting is also important. In this instance, the patient was in the presence of women, who were able to tie him up. A very different reaction might have

occurred if a man had tried to tie him up. His girl friend, Miss O, believes that many of the feelings that came out relate to his ambivalence toward her.

The most striking thing about this patient is his character structure, which involves a rigid, but brittle, set of defenses (especially reaction formation, denial and isolation) against explosive feelings. On occasion, drugs, or as he puts it fearfully, "almost anything else" which interferes with ego functions, might bring out the latent psychopathology. It would appear, however, that there is an interactive effect, in that the patient had a markedly toxic reaction to a small dose of marihuana (time running backward, marked visual and auditory perceptual disturbances, etc.). In other words, the marihuana augmented his psychopathology and vice versa.

(2.) Even a small dose of Cannabis can be sufficient to precipitate a psychosis in a predisposed individual.

(3.) Previous use of Cannabis without any harmful effects is no guarantee that such effects will not occur with subsequent use.

(4.) Individuals who have pathological reactions to one centrally active drug have an increased risk of pathological reactions to other centrally active drugs. It has been the author's observation, in extensive experimental studies with LSD in human subjects,^{8, 18} that those who had a history of unusual or pathological reactions to alcohol were more likely to have unusual or pathological reactions to LSD. It should be emphasized that the nature of the pathological reaction, in the same individual, varies according to the characteristics of the drug. This patient's marihuana reaction was distinctly different from his reactions to alcohol, although it would have been difficult to distinguish it from a reaction to LSD or one of the other hallucinogens.

Although some people appear to use marihuana with apparently little or no harm, there can be no doubt that this drug, on occasion, can precipitate psychiatric disturbances. This case is only one of the more flagrant examples. There are many others to be observed in everyday clinical experience, and still others in the literature. Prolonged psychotic reactions can also be precipitated by Cannabis, as can depressions, and apathy. There may also be consequences of other behavior often associated with the use of Cannabis, such as the abuse of even more potent drugs. The report of Mayor LaGuardia's committee on marihuana of 1944¹¹ is often cited by the apologists for this drug as evidence that marihuana is harmless. The facts are quite the opposite. As part of the study, 72 volunteer subjects were given marihuana concentrate

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experimentally. Nine of these subjects had psychotic reactions to the drug, and many others had a variety of adverse reactions.

An article appearing in *Science*¹⁹ recently, reports some interesting findings from a controlled, experimental study of the psychophysiological effects of marihuana in man. Using experienced and "naïve" subjects (as far as previous use of marihuana was concerned), they reported, "the fact that marihuana appears to be a relatively mild intoxicant in our studies." According to their data, this conclusion must be accepted. Unfortunately, the inference might be drawn that marihuana is a safe drug. In any case this is the interpretation which the popular press placed upon it in reporting the study to the public.* This is, of course, an unwarranted generalization. The subjects in this study consisted of a total of 17 persons (9 marihuana naïve, and 8 chronic users). All were described as healthy male college students, and all underwent prior psychiatric screening, "to eliminate volunteers with evidence of psychosis, or of serious mental or personality disorders." It is not remarkable then that such subjects, smoking two marihuana cigarettes under controlled laboratory conditions, did not suffer extreme reactions. By a similar line of reasoning, one might conclude from observing an average cocktail party that alcohol is innocuous.

Many marihuana proponents point to the serious problem of alcoholism in our society and offer the erroneous line of reasoning that if marihuana were legalized, and generally used, alcohol would fall into disuse and cease to be a problem. This is a highly dubious proposition, both in its premises and in its conclusions. Even if it were true, however, and marihuana replaced alcohol, there is reasonable doubt that society would be better off. In at least some instances, as illustrated by the case presented, and possibly in most, the same persons who react adversely to alcohol are also predisposed to adverse reactions to marihuana. There is also the possibility that some individuals who can use alcohol safely would be harmed by marihuana use. Beyond this are the risks associated with other drugs which marihuana users so often go on to try, after being "initiated" by smoking "pot."

*The harmlessness of marihuana was further emphasized by the same authors in an article appearing in the *New York Times Magazine* section dated May 11, 1969, after this paper was submitted for publication.

SUMMARY

A case is presented of a 26-year-old man, with no previous psychiatric history, who had an acute psychosis after smoking less than two marihuana cigarettes. The patient's own verbatim account of his psychosis is reported. The same patient also has a history of pathological reactions to alcohol. Personality factors in the patient, which help to account for his drug reactions are discussed. Factors influencing a subject's reaction to marihuana are described as including personality factors, the set and the setting. The pharmacological actions of the drug and the dosage interact with the above factors. The same statements can be made with regard to other centrally active drugs.

The implications of this case, which illustrates many important points, are reviewed.

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Sept. 10

John -

I believe this is a reasonably accurate account of the drug bills' status as of today. If not, you or Mike can set me straight!

Alan

John Dean

The Attorney General

September 10,
1970

Wallace H. Johnson
Associate Deputy Attorney General

Administration's Drug Control Legislation

At long last, our drug bill--now known as the "Comprehensive Drug Abuse Prevention and Control Act of 1970"--appears destined for final House action within a week. The Committee on Interstate and Foreign Commerce will file its report today on H.R. 18583, as amended, with possible minority views on librium and valium. Commerce and Ways and Means will immediately request a hearing before the Rules Committee, which it is anticipated will take place next Tuesday (September 15). We believe floor consideration will follow on September 16 or 17. Any amendments we are pushing will be offered on the House floor so that the Senate may consider the bill intact. The floor amendments are being coordinated today by John Dean and Mike Sonnenreich.

As reported, H.R. 18583 will contain three titles. Title I establishes rehabilitation programs by expanding the Community Mental Health Centers Act and the treatment authority for Public Health Service hospitals to treat drug abuse; by facilitating additional research in drug abuse; and by providing for consultation between HEW, Justice, and the private sector on appropriate treatment for addiction. The 12 pages making up this title are attached. Title II contains the control and enforcement provisions, and Title III is the Ways and Means submission on importation and exportation.

Titles II and III contain, in essence, all of the provisions we have been favoring since the measure was sent to the Hill. As you know, Title I has been a part of the legislation since H.R. 18583 was introduced on

July 22 by the Subcommittee on Public Health and Welfare when they finished considering this measure. Congressman Paul Rogers was naturally the main moving force in the inclusion of this title.

When the bill is taken up in the Senate, we can reasonably expect Senators Verborough and Hughes to push for a referral to their Committee (Labor and Public Welfare). John Dean and Mike Sonnenreich are continuing to work with Senators Hruska, Dodd, and others in order to anticipate resistance to immediate consideration and passage of the House version. While the addition of Title I makes things more difficult, we believe we have enough guns to get the bill placed on the calendar for early consideration without Committee referral, or alternatively to have the bill referred to Judiciary rather than Public Health and Welfare if Committee referral becomes necessary. In the latter event the bill will be expeditiously reported for early floor consideration.

September 10, 1970

MEMORANDUM FOR

THE ATTORNEY GENERAL

Bill Timmons called me after he discussed the leadership meeting with the President this afternoon and reported the following. The meeting will commence at 8 AM. The President will talk generally about his message and then call on you to discuss the major crime legislation, i.e., Drugs, S. 30 and Explosives.

I prepared the attached memo for you earlier today when I learned that you might be called on tomorrow to discuss the drug bill.

If I can be of any further assistance tonight or in the morning, the White House switch board can find me.

JOHN DEAN

6:30 PM

September 10, 1970

MEMORANDUM FOR THE ATTORNEY GENERAL

SUBJECT: Drug Bill - Background for Leadership Meeting

In addition to background information Wally gave you in anticipation of the leadership briefing re the drug bill, I thought you should be aware of the following:

(a) There are three key amendments that we will seek on the House Floor.

- I. To change the 5 schedules back to 4 schedules. This is to make the House bill consistent with the Senate passed version and with the Model State bill, which have 4 schedules. Also, there is no logical or medical justification for 5 schedules. It is designed to take care of the concerns of Hoffman LaRoche (i.e., Librium and Valium) and their desire that Librium and Valium not be in the same schedule as the barbiturates and amphetamines.
- II. To add Librium and Valium as a controlled drug under the bill. To give Hoffman LaRoche 5 schedules and not to include Librium and Valium would be to give them their cake and let them eat it as well! But even more important is the fact that if we hope to get swift Senate action on the House passed bill we must get Librium and Valium in the bill; otherwise Dodd will become a serious problem.
- III. Conform the professional criminal provision to the related provision in S. 30. The present version of the drug bill represents a serious departure from the original and the provision in S. 30. The present version creates an "offense" of professional criminal as opposed to a sentencing procedure we recommended.

Dick Poff is prepared to offer this amendment and we have given him extensive materials -- as has Bob Blakey -- in preparation for Floor action.

(b) I have been seeking the assistance of Bill Springer to offer amendments I and II. He was unwilling to file "additional views" to the Report on the bill dealing with these issues and his influence dissuaded other minority members of the Committee from doing so. However, he has indicated he may be willing to offer these amendments on the Floor. Clyde Flynn (Dirksen's former AA) has been working on Springer to offer the Amendments. I am optimistic that we will have his assistance.

(c) With regard to the Hughes problem of seeking jurisdiction of the bill in the Senate, I offer the following thoughts:

- he would have an extremely difficult time sustaining the argument that the addition of Title I gives his Committee jurisdiction. I am sure that Hruska has confirmed this point with Wally and you.
- Eastland does not often -- if ever -- lose jurisdiction of his bills, and he is concerned enough to fight to hold this one.
- Outside Democratic pressure is being placed on Hughes to "cool it". This effort is being pursued by Tom Corcoran and Ed Foley who, as you know, have a vital interest in this bill becoming law as quickly as possible.
- I believe we can make an effective partisan charge of "stalling the Administration drug bill" if Hughes seeks jurisdiction. The threat of such a charge could produce Democrat leadership pressure on Hughes to "cool it".

Accordingly, as I mentioned to you on the phone, I think that we have a nuisance problem, and the problem can be handled. I hope to have it resolved before the bill leaves the House Floor.

I do not believe it is possible to strike Title I from the bill, although it would be to our advantage to have it removed and not only because of this jurisdictional problem. Substantively, it establishes a program of Federal drug rehabilitation that we have not thought through sufficiently to know whether it is good or bad. It is an effort to do something, but it may set the course in the wrong direction. I personally am opposed to the Title because I believe drug rehabilitation programs should be developed at the State and local level; the Federal responsibility

should be limited to Federal prisoners and offenders and pilot and research programs to improve techniques. Title I suggests an increasing Federal role.

To date, I have been unable to find an appropriate soldier to offer the amendment to strike Title I. I will continue looking and I'm sure we'll find someone before the bill goes to the Floor.

In your discussion with the leadership it may be worthwhile to discuss these problems because of the imminence of action on the bill. Indeed, a strong commitment from the leadership could help solve these problems.

JOHN DEAN