

# The LaGuardia Committee Report New York, USA (1944)

## **The Marihuana Problem in the City of New York**

**Mayor's Committee on Marihuana, by the New York Academy of Medicine**

**City of New York , 1944.**

### **FOREWORD**

**by Fiorello LaGuardia**

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As Mayor of the City of New York, it is my duty to foresee and take steps to prevent the development of hazards to the health, safety, and welfare of our citizens. When rumors were recently circulated concerning the smoking of marihuana by large segments of our population and even by school children, I sought advice from The New York Academy of Medicine, as is my custom when confronted with problems of medical import. On the Academy's recommendation I appointed a special committee to make a thorough sociological and scientific investigation, and secured funds from three Foundations with which to finance these studies.

My own interest in marihuana goes back many years, to the time when I was a member of the House of Representatives and, in that capacity, heard of the use of marihuana by soldiers stationed in Panama. I was impressed at that time with the report of an Army Board of Inquiry which emphasized the relative harmlessness of the drug and the fact that it played a very little role, if any, in problems of delinquency and crime in the Canal Zone.

The report of the present investigations covers every phase of the problem and is of practical value not only to our own city but to communities throughout the country. It is a basic contribution to medicine and pharmacology. I am glad that the sociological, psychological, and medical ills commonly attributed to marihuana have been found to be exaggerated insofar as the City of New York is concerned. I hasten to point out, however, that the findings are to be interpreted only as a reassuring report of progress and not as encouragement to indulgence, for I shall continue to enforce the laws prohibiting the use of marihuana until and if complete findings may justify an amendment to existing laws. The scientific part of the research will be continued in the hope that the drug may prove to possess therapeutic value for the control of drug addiction.

I take this occasion to express my appreciation and gratitude to the members of my committee, to The New York Academy of Medicine, and to the Commonwealth Fund, the Friedsam Foundation, and the New York Foundation which supported these important investigations so generously.

F. H. LaGuardia

Mayor

## INTRODUCTION

**E. H. L. Corwin, PhD, Secretary**

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On September 13, 1938, The New York Academy of Medicine was informed of Mayor LaGuardia's concern about the marihuana problem and of his desire "that some impartial body such as The New York Academy of Medicine make a survey of existing knowledge on this subject and carry out any observations required to determine the pertinent facts regarding this form of drug addiction and the necessity for its control." The Mayor's request was referred to the Committee on Public Health Relations of the Academy, which Committee on October 17, 1938, authorized the appointment of a special subcommittee to study the Mayor's request.

This Subcommittee, consisting of Dr. George B. Wallace, Chairman, Dr. E. H. L. Corwin, Secretary, and Drs. McKean Cattell, Leon H. Cornwall, Robert F. Loeb, Currier McEwen, B. S. Oppenheimer, Charles Diller Ryan, and Dudley D. Shoenfeld, reviewed the existing literature on the subject. On the basis of this review, the Subcommittee could come to no conclusion regarding the effect of marihuana upon the psychological and physiological functions of the human being. Nor were attempts to learn the extent of the use of marihuana in New York City any more successful. A conference with representatives of the Police Department, the Department of Education, the Department of Correction, the Psychiatric Division of the Department of Hospitals, the Court of Domestic Relations, the District Attorney's office, and the Citizens Committee on the Control of Crime served to emphasize the existing differences of opinion regarding the extent of the use of marihuana in this city and its relationship to crime.

The Subcommittee therefore came to the conclusion that, in view of the possibility that marihuana smoking might constitute an important social problem, it was time that a study of its effects be made based upon well-established evidence, and prepared an outline of methods of procedure for the study of the problem. It recommended that such a study should be divided into two parts: ( 1 ) a sociological study dealing with the extent of marihuana smoking and the methods by which the drug is obtained; in what districts and among what races, classes or types of persons the use is most prevalent; whether certain social conditions are factors in its use, and what relation there is between its use and criminal or antisocial acts; and (2) a clinical study to determine by means of controlled experiments the physiological and psychological effects of marihuana on different types of persons; the question as to whether it causes physical or mental deterioration; and its possible therapeutic effects in the treatment of disease or of other drug addictions.

The Committee on Public Health Relations adopted the report of its Subcommittee and recommended to Mayor LaGuardia that he appoint a special committee to carry out the proposed study. Accordingly in January 1939 he appointed the Mayor's Committee on

Marihuana, composed of the members of the Subcommittee of the Committee on Public Health Relations which recommended the study and four ex-officio members: Dr. Peter F. Amoroso, First Deputy Commissioner (later Commissioner) of Correction; Dr. Karl M. Bowman, Director of the Psychiatric Division of the Department of Hospitals; Dr. S. S. Goldwater, Commissioner of Hospitals- and Dr. John L. Rich, Commissioner of Health. Upon his accession to the commissionership of the Department of Hospitals, Dr. Willard C. Rappleye succeeded Dr. Goldwater as a member of this Committee. This Committee studied the broad outlines of the proposed plans for about a year before work was actually begun.

At its first meeting in March 1939 two subcommittees were appointed; one, consisting of Drs. Shoenfeld, Ryan, and Corwin, to plan the sociological study, and the other, composed of Drs. Cattell, Bowman, Cornwall, and Loeb, to work out the details of the clinical study. Drs. Bowman and Wechsler were appointed as special advisers for the clinical study and Dr. J. Murray Steele and Dr. S. Bernard Wortis as the supervisors of this study.

The studies were made possible by the financial support of three Foundations, the Friedsam Foundation, the New York Foundation, and the Commonwealth Fund, each of which donated \$7,500. The whole amounts granted by the Friedsam Foundation and the Commonwealth Fund and \$5,000 of the New York Foundation's grant were to be applied to the clinical study- the remaining \$2,500 given by the New York Foundation was earmarked for the sociological study. The Research Council of the Department of Hospitals undertook the financial supervision of the clinical study and The New York Academy of Medicine that of the sociological study.

The sociological study proceeded under the active direction of Dr. Dudley D. Shoenfeld and was carried out by six police officers who were trained by Dr. Shoenfeld as social investigators. In acknowledgment of the great help rendered to the Committee by these officers, the Committee passed the following resolution at its meeting on March 18, 1941.

Now that the sociological study of the marihuana problem in New York City has been completed, the Mayor's Committee on Marihuana wishes to record its appreciation of the Mayor's interest in this problem and his placing at the disposal of the Committee the services of the Narcotic Squad Division of the Police Department. Without the cooperation of Commissioner Valentine, Inspector Curtayne, Lieutenant Cooper, Sergeant Boylan, and Detective Loures, this study would have been impossible. They helped in planning it and assigned to the Committee six members of the Force, four men and two women, whose intelligence, interest in the work, and desire to obtain the facts of the situation were of invaluable aid in obtaining the information on which the sociological report is based. The four men and two women assigned to us made painstaking observations and reports, acted as investigators and social workers and not as police officers, and brought to the performance of this task a native intelligence, specialized training, and civic interest. The thanks of the Committee are due to them and through them to their superiors.

The clinical study consisted of two parts; the medical, including psychiatric, and the psychological. Dr. Karl M. Bowman directed the medical and psychiatric part of this study and Dr. David Wechsler the psychological part. The members of the Committee closely supervised the work during the course of the study. The staff of the clinical study included:

- Samuel Allentuck, MD, Psychiatrist, who was in charge.
- Louis Gitzelter, MD

- Frank Anker, MD Assistant Physicians
- Robert S. Morrow, PhD
- Florence Halpern, MA
- Adolph G. Woltmann, MA Psychologists
- Miss Rose Horowitz, who was the secretary-stenographer and bookkeeper.

The Committee is indebted to the Department of Hospitals for making available two small wards and office space in the Welfare Hospital (now known as the Goldwater Memorial Hospital), to Dr. Chrisman G. Scheri, the Superintendent of the hospital, and to the laboratory staff of the Third Medical Division for their assistance in the conduct of laboratory experiments. Acknowledgment should also be made of the services of Dr. Robert C. Batterman who interpreted the electrocardiograms and Dr. Hans Strauss for the electroencephalographic work. Professor Walter R. Miles of Yale University assisted in the planning of the psychological part of the study. This whole undertaking would have been impossible without the help and cooperation of Dr. Peter F. Amoroso, of the Department of Correction, who, aside from his services as a member of the Committee, was responsible for arrangements for volunteers from among the prisoners of the Riker's Island Penitentiary. Thanks are due also to the medical staff of the Riker's Island Hospital for their assistance in the narcotic addiction study.

At the suggestion of Dr. Cattell a pharmacological study was done in the Department of Pharmacology of Cornell Medical School by Dr. S. Loewe. Dr. W. Modell collaborated in this work. We are indebted to Dr. Roger Adams, Professor of Chemistry at the University of Illinois, and to Dr. H. J. Wollner, Consulting Chemist of the United States Treasury Department, who supplied some of the active principles of marihuana which were used in the study.

The names of those who conducted the investigations are given under the different chapters. Those sections of the report for which no author is indicated have been written by the Chairman of the Committee.

The tremendous task of compiling, editing, and revising the reports was undertaken by Dr. George B. Wallace, the chairman of the Committee, and Miss Elizabeth V. Cunningham of the staff of the Committee on Public Health Relations of The New York Academy of Medicine. They had the assistance of Dr. Dudley D. Shoenfeld, who prepared the sociological report, Dr. David Wechsler, who revised the psychological reports, and Dr. McKen Cattell, who edited the pharmacological report.

In the judgment of the Committee, this painstaking study should be of considerable value from a scientific and social viewpoint.

## **THE SOCIOLOGICAL STUDY**

**Dudley D. Shoenfeld, MD**

## **INTRODUCTION**

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In order to understand fully the purpose and scope of this particular part of the survey

conducted by the Mayor's Committee on Marihuana, a brief digest of the history of the growth and usage of this drug is essential.

Indian hemp, from which marihuana (the American synonym for hashish) is obtained, has been known to man for more than three thousand years. This plant, although originally indigenous to Central Asia, is now found in practically every section of the world, growing either wild or cultivated, legally or illegally.

When originally discovered, the use to which this plant was principally put was the conversion of its fiber for commercial purposes in the production of cord, twine and textiles. Shortly thereafter its pharmaceutical properties were employed in the practice of medicine and surgery. Authoritative proof is available that the Chinese found it valuable as an effective anesthetic in surgery as far back as two thousand years. It was not until approximately the tenth century that the peoples of Africa and Asia began to use it in a rather indiscriminate manner for its intoxicating effects.

Very shortly after its usage became popular, this drug engaged the attention of the various African and Asian governments, as well as of lay persons interested in medical, religious and sociological problems. Some of these very early investigators propounded the theory that physical and mental deterioration was the direct result of smoking hashish. Others extolled its benefits, deeming it actually essential to life, and urged people to indulge in it.

During this early period, the peoples of Europe were aware of the use of hashish in Africa and Asia, and considered it a vice particularly common to the peoples of those continents. In the nineteenth century their interest was raised to a high pitch because of the fictional reports of the smoking of hashish given by the romanticists of that period. These individuals, who had the power of the pen, experimentally indulged in the smoking of hashish, and described in an expansive, subjective manner the effects the drug had upon them. A review of the fanciful literature reveals that in most instances these writings referred to the authors' experiences with toxic doses. Summed up, the conclusions were that hashish could cause psychotic episodes and even death and that prolonged use would result in physical and mental deterioration. The exalted position held by these romanticists tended to influence the Europeans to accept their conclusions as scientific monographs on the subject of hashish, so that the smoking of hashish did not become popular with them. However, in recent years there has been a fairly wide participation on the part of Europeans in smoking hashish or marihuana, but it is referred to as an American vice. This allows one to infer that whereas the knowledge pertaining to this habit was very early recognized in Europe, at the present time participation in it is from their point of view the direct result of its introduction into Europe not from Africa and Asia, but from America.

In America, Indian hemp was planted in the New England colonies, solely for commercial purposes, as early as the seventeenth century. At the present time it can be found growing either wild or cultivated, legally or illegally, in practically all our states. Lawful cultivation is confined principally to the states of Kentucky, Illinois, Minnesota, and Wisconsin. It has been estimated that not more than ten thousand acres are devoted to its legal production. It is of value commercially in the manufacture of rope, twine, and textiles. The seed is used for bird-food, and the oil extracted from the seed is occasionally used as a substitute for linseed oil in the preparation of artists' paints. A rosin extracted from the plant is used in the production of pharmaceutical preparations.

Since the history of hemp cultivation in America dates back to the seventeenth century, it is exceedingly interesting, but difficult to explain, that the smoking of marihuana did not become a problem in our country until approximately twenty years ago, and that it has become an acute problem associated with a great deal of publicity only in the past ten years.

The origin of the word "marihuana" is in doubt. Some authorities are of the opinion that it is derived from the Portuguese word "mariguano," meaning intoxicant. Others are of the opinion that it has its derivation in the Mexican words for "Mary and Jane." The introduction into the United States of the practice of smoking marihuana has been the subject of a great deal of speculation. The most tenable hypothesis at the present time is that it was introduced by Mexicans entering our country.

It is accepted that in Mexico marihuana smoking is an old, established practice. Therefore, it would appear logical to assume that Mexican laborers crossing our border into the Southwest carried this practice with them. Having used marihuana in their native land, they found it natural to continue smoking it in the new country, and planted it for personal consumption. Once available, it was soon made use of by our citizens. At the present time, the smoking of marihuana is widespread in this nation.

Believing that marihuana smoking might be deleterious, and knowing it to be widespread, federal and municipal governments, private individuals, and such agencies as the Opium Advisory Association, the International Narcotic Education Association, and others investigated the subject. These investigative organizations have contributed a great deal of data and pertinent information to the knowledge of the use of marihuana. The mass of information so obtained when untangled can be summed up with the general statement that a majority of investigators are of the opinion that marihuana smoking is deleterious, although a minority maintain that it is innocuous. The majority believe that marihuana smoking is widespread among school children; that the dispensers of the drug are organized to such an extent that they encourage the use of marihuana in order to create an ever-increasing market; that juvenile delinquency is directly related to the effects of the drug; that it is a causative factor in a large percentage of our major crimes and sexual offenses; and that physical and mental deterioration are the direct result of the prolonged habit of smoking marihuana.

As a result of these official and semi-official conclusions in regard to the disastrous effects produced by this habit, the newspapers and magazines of our country have given it wide publicity. At this point it may be profitable to give the conclusions of some of the investigators and quote the publicity associated with it. In a pamphlet "Marihuana or Indian Hemp and Its Preparations" issued by the International Narcotic Education Association, one finds:

**(quotation)**

Marihuana is a most virile and powerful stimulant. The physiological effect of this drug produces a peculiar psychic exaltation and derangement of the central nervous system. The stage of exaltation and confusion, more marked in some addicts than in others, is generally followed by a stage of depression. Sometimes the subject passes into a semi-conscious state, experiencing vivid and extravagant dreams which vary according to the individual character and mentality. In some the stage is one of self-satisfaction and well-being. In others, it is alarming, presenting the fear of some imminent and indefinite danger or of impending death. Later the dreams are sometimes followed by a state of complete unconsciousness. Sometimes

convulsive attacks and acute mania are developed.

The narcotic content in marihuana decreases the rate of heart beat and causes irregularity of the pulse. Death may result from the effect upon the heart. Prolonged use of marihuana frequently develops a delirious rage which sometimes leads to high crimes, such as assault and murder. Hence marihuana has been called the "killer drug." The habitual use of this narcotic poison always causes a very marked mental deterioration and sometimes produces insanity. Hence marihuana is frequently called "loco weed." (Loco is the Spanish word for crazy.)

While the marihuana habit leads to physical wreckage and mental decay, its effects upon character and morality are even more devastating. The victim frequently undergoes such degeneracy that he will lie and steal without scruple; he becomes utterly untrustworthy and often drifts into the underworld where, with his degenerate companions, he commits high crimes and misdemeanors. Marihuana sometimes gives man the lust to kill unreasonably and without motive. Many cases of assault, rape, robbery, and murder are traced to the use of marihuana.(1)

**(end quotation)**

(1) International Narcotic Education Association. "Marihuana or Indian Hemp and Its Preparations." Los Angeles, 1936.

In an article published in the New York Daily Worker, New York, Saturday, December 28, 1940, there appeared under the column headed "HEALTH ADVICE":

**(start quoted article)**

### **A DRUG AND INSANITY.**

Bill Wilson was strolling by his favorite soda joint on the way home from high school when he heard a familiar voice whisper loudly, "Hey, Bill, c'mere." Behind the Texaco billboard, he found his side-kick Jim, who said excitedly, "I got some reefers!" "Reefers, what're they?"

Mysteriously, Jim reached into his pocket and pulled out two large cigarettes. "Marihuana!" Jim's pupils dilated. "Come on over to the club and we'll smoke 'em. Boy, that's fun!" Bill is only one of thousands of new marihuana smokers created yearly among boys and girls of high school age.

What is this drug? It is a narcotic in the same class as opium and is derived from a plant, which grows wild, extensively in some parts. For this reason, it is hard to control and the drug is easy to obtain at very little cost. Smoking of the weed is habit-forming. It destroys the willpower, releases restraints, and promotes insane reactions. Continued use causes the face to become bloated, the eyes bloodshot, the limbs weak and trembling, and the mind sinks into insanity. Robberies, thrill murders, sex crimes and other offenses result.

When the habit is first started, the symptoms are milder, yet powerful enough. The smoker loses all sense of time and space so that he can't judge distances, he loses his self-control, and his imagination receives considerable stimulation.

The habit can be cured only by the most severe methods. The addict must be put into an institution, where the drug is gradually withdrawn, his general health is built up, and he is kept there until he has enough willpower to withstand the temptation to again take to the weed.

The spread of this terrible fad can be stopped only when the unscrupulous criminals trafficking in the drug are rooted out.

**(end quoted article)**

Dr. Robert P. Walton, Professor of Pharmacology of the School of Medicine of the University of Mississippi, has written a most comprehensive book on the subject of marihuana, embodying in detail pharmacological and social studies.<sup>(2)</sup> A chapter on the "Present Status of the Marihuana Vice in the United States" was prepared by Dr. Frank R. Gomila, Commissioner of Public Safety of New Orleans, and C. G. Lambou, Assistant City Chemist. They refer to New Orleans as being possibly the first large city in the United States where the drug habit became widely established among the native population, and they therefore believe that the authorities in this city had a decided opportunity to observe the progress of the smoking of marihuana as a social problem. Referring specifically to the use of marihuana among school children, they state that reporters in New Orleans not only heard about but observed large numbers of boys of school age actually buying and smoking marihuana cigarettes. One peddler was so brazen as to keep his stock under the street stairs to a girls' high school.

Inquiries further revealed that school children of forty-four schools in New Orleans (only a few of these were high schools) smoked marihuana. As a result of exposure and widespread agitation,

**(start quotation)**

Verifications came in by the hundreds from harassed parents, teachers, neighborhood pastors, priests, welfare workers and club women. Warrington House for boys was full of children who had become habituated to the use of cannabis. The superintendent of the Children's Bureau reported that there were many problem children there who had come under the influence and two who had run away because they couldn't get their "muggles" at the Bureau. The Director of Kingsley House for boys received many pleas from fathers of boys who had come under the influence and were charged with petty crimes.

After personally seeing these boys in an hysterical condition or on the well-known "laughing jags," the director termed the situation decidedly grave. The Waif's Home, at this time, was reputedly full of children, both white and colored, who had been brought in under the influence of the drug. Marihuana cigarettes could be bought almost as readily as sandwiches. Their cost was two for a quarter. The children solved the problem of cost by pooling pennies among the members of a group and then passing the cigarettes from one to another, all the puffs being carefully counted....

The result of these investigations ended in a wholesale arrest of more than 150 persons. Approximately one hundred underworld dives, soft-drink establishments, night clubs, grocery stores, and private homes were searched in the police raid. Addicts, hardened criminals, gangsters, women of the streets sailors of all nationalities, bootleggers, boys and girls, --

many flashily dressed in silks and furs, others in working clothes -- all were rounded up in the net which Captain Smith and his squad had set.

. . . Notwithstanding the thoroughness with which this police roundup was carried out, it did not entirely eradicate in one stroke a vice which had already become so well established. During the next few years New Orleans experienced a crime wave which unquestionably was greatly aggravated by the influence of this drug habit. Payroll and bank guards were doubled, but this did not prevent some of the most spectacular holdups in the history of the city. Youngsters known to be "muggle-heads" fortified themselves with the narcotic and proceeded to shoot down police, bank clerks and casual bystanders. Mr. Eugene Stanley, at that time District Attorney, declared that many of the crimes in New Orleans and the South were thus committed by criminals who relied on the drug to give them a false courage and freedom from restraint. Dr. George Roeling, Coroner, reported that of 450 prisoners investigated, 125 were confirmed users of marihuana. Dr. W. B. Graham, State Narcotic Officer, declared in 1936 that 60 per cent of the crimes committed in New Orleans were by marihuana users.(3)

**(end quote)**

The Mayor's Committee on Marihuana decided to confine its investigations to a limited area. For a number of reasons the Borough of Manhattan seemed to be the most profitable section of the city in which to concentrate. In order to crystallize our particular project we deemed it advisable to direct our efforts to finding answers to the following questions:

1. To what extent is marihuana used?
2. What is the method of retail distribution?
3. What is the general attitude of the marihuana smoker toward society and toward the use of the drug?
4. What is the relationship between marihuana and eroticism?
5. What is the relationship between marihuana and crime?
6. What is the relationship between marihuana and juvenile delinquency?

In the course of our investigations, we have made extensive use of subjective data obtained from those who were actual smokers of marihuana and directly acquainted with its effects and those who were not smokers, but, because of residence, occupation or other interests, were acquainted with the general subject.

(2) Walton, R. P. Marijuana: America's New Drug Problem. J. B. Lippincott Co., Philadelphia, 1938.

(3) Ibid.

## **Organization of Staff**

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In October 1939 Police Commissioner Lewis J. Valentine designated Deputy Chief Inspector Daniel Curtayne, Lieutenant Edward Cooper, Sergeant Bernard Boylan and Detective Joseph Loures of the Narcotic Squad of the Police Department of the City of New York to cooperate with the Mayor's Committee on Marihuana. These police officials submitted a list of intelligent young officers with a suitable background. From this list six officers were selected: two policewomen, and four policemen, one of whom was a Negro. They were: Mr. James Coen, Mr. William Connolly, Mr. Benjamin Weissner, Mr. John Hughes, Miss Adelaide Knowles and Miss Olive Cregan. These police officers were encouraged to read literature on the subject of marihuana and to familiarize themselves with some of the characteristics of the plant, as well as of marihuana cigarettes. They became expert in detecting the aroma of burning marihuana, and were thus able to recognize it and to identify its use in a social gathering.

Regular assignments were made by the director of the survey. At intervals each officer dictated a general report on his activities and findings to a stenographer engaged by the Committee. Frequent conferences were held in the office of the director of the survey, at which time individual reports were discussed in detail and evaluated.

An attempt was made to give the "marihuana squad" a psychological approach to the performance of their duties. At no time were these officers permitted to make known their activity to other members of the police force, or to make arrests. This arrangement was considered essential in order that they might maintain an effective role of investigator without being in any respect recognized as police officers. Although they were members of the police force and constantly in contact with violators of law, their immediate superiors cooperated to an extreme degree by allowing the "marihuana squad" to report directly to the director of the survey.

While on duty the squad actually "lived" in the environment in which marihuana smoking or peddling was suspected. They frequented poolrooms, bars and grills, dime-a-dance halls, other dance halls to which they took their own partners, theatres -- backstage and in the audience -- roller-skating rinks, subways, public toilets, parks and docks. They consorted with the habitués of these places, chance acquaintances on the street, loiterers around schools, subways and bus terminals. They posed as "suckers" from out of town and as students in colleges and high schools.

We highly commend these officers individually for their exceptionally good performances. The aid given by Deputy Chief Inspector Daniel Curtayne, Lieutenant Edward Cooper, Sergeant Bernard Boylan and Detective Joseph Loures throughout deserves mention and appreciation. At times we must have been a source of annoyance to them, but our requests were always cheerfully met and assistance heartily extended.

#### Method of Retail Distribution

In general, marihuana is used in the form of a cigarette. Occasionally some individuals chew the "weed" and seem to get the same effect as do others through smoking. The common names for the cigarettes are: muggles, reefers, Indian hemp, weed, tea, gage and sticks. Cigarettes made of marihuana differ in size as do cigarettes made of tobacco: they are long,

short, thick or thin.

The price varies in accordance with the accepted opinion as to the potency of the marihuana used in the cigarettes, and this appears to be determined by the place of origin. The cheapest brand is known as "sass-fras," and retails for approximately three for 50 cents. It is made of the marihuana that is grown in the United States. Smokers do not consider such marihuana very potent. They have found that they must consume a greater number of cigarettes in order to obtain the desired effect colloquially termed as "high." This opinion, expressed by smokers in the Borough of Manhattan, is at variance with that of some authorities who believe that marihuana grown in the United States is as potent as the marihuana grown in other countries.

The "panatella" cigarette, occasionally referred to as "meserole," is considered to be more potent than the "sass-fras" and usually retails for approximately 25 cents each. The hemp from which the "panatella" is made comes from Central and South America.

"Gungeon" is considered by the marihuana smoker as the highest grade of marihuana. It retails for about one dollar per cigarette. The "kick" resulting from the use of this cigarette is reached more quickly than from the use of "sassafras" or "panatella." It appears to be the consensus that the marihuana used to make the "gungeon" comes from Africa. The sale of this cigarette is restricted to a clientele whose economic status is of a higher level than the majority of marihuana smokers.

A confirmed marihuana user can readily distinguish the quality and potency of various brands, just as the habitual cigarette or cigar smoker is able to differentiate between the qualities of tobacco. Foreign-made cigarette paper is often used in order to convince the buyer that the "tea is right from the boat."

There are two channels for the distribution of marihuana cigarettes-- the independent peddler and the "tea-pad." From general observations, conversations with "pad" owners, and discussions with peddlers, the investigators estimated that there were about 500 "tea-pads" in Harlem and at least 500 peddlers.

A "tea-pad" is a room or an apartment in which people gather to smoke marihuana. The majority of such places are located in the Harlem district. It is our impression that the landlord, the agent, the superintendent or the janitor is aware of the purposes for which the premises are rented. The "tea-pad" is furnished according to the clientele it expects to serve. Usually, each "tea-pad" has comfortable furniture, a radio, victrola or, as in most instances, a rented nickelodeon. The lighting is more or less uniformly dim, with blue predominating. An incense is considered part of the furnishings. The walls are frequently decorated with pictures of nude subjects suggestive of perverted sexual practices. The furnishings, as described, are believed to be essential as a setting for those participating in smoking marihuana.

Most "tea-pads" have their trade restricted to the sale of marihuana. Some places did sell marihuana and whisky, and a few places also served as houses of prostitution. Only one "teapad" was found which served as a house of prostitution, and in which one could buy marihuana, whisky, and opium.

The marihuana smoker derives greater satisfaction if he is smoking in the presence of others. His attitude in the "tea-pad" is that of a relaxed individual, free from the anxieties and cares of the realities of life. The "tea-pad" takes on the atmosphere of a very congenial social club.

The smoker readily engages in conversation with strangers, discussing freely his pleasant reactions to the drug and philosophizing on subjects pertaining to life in a manner which, at times, appears to be out of keeping with his intellectual level. A constant observation was the extreme willingness to share and puff on each other's cigarettes. A boisterous, rowdy atmosphere did not prevail and on the rare occasions when there appeared signs indicative of a belligerent attitude on the part of a smoker, he was ejected or forced to become more tolerant and quiescent.

One of the most interesting setups of a "tea-pad," which was clearly not along orthodox lines from the business point of view, was a series of pup tents arranged on a roof-top in Harlem. Those present proceeded to smoke their cigarettes in the tents. When the desired effect of the drug had been obtained they all merged into the open and engaged in a discussion of their admiration of the stars and the beauties of nature.

Because of the possibility of spreading disease, note should be taken of what seems to be a custom known as "pick-up" smoking. It is an established practice whereby a marihuana cigarette is lit and after one or two inhalations is passed on to the next person. This procedure is repeated until all present have had an opportunity to take a puff or two on the cigarette.

Occasionally a "tea-pad" owner may have peddlers who sell their wares in other localities and at the same time serve as procurers for those who wish to smoke marihuana on the premises.

One also finds other methods of retail distribution. After proper introduction, one may be able to purchase the cigarette in certain places. This is not an easy procedure, but it can be accomplished. In some bar-and-grills, restaurants, and bars our investigators were able to establish contact with someone who in turn, would introduce them to a peddler who apparently made regular rounds of these places in order to sell cigarettes. It appears that the owners of such places are not aware of this practice, and in many instances they would discharge any employee known to be directly or indirectly associated with the sale of marihuana.

On rare occasions public guides, if properly approached would refer one to a place where the "reefer" could be bought. There was no evidence that the guide received money when acting as go-between. Terminal porters, mainly Negroes, appeared to be more directly connected with the traffic of marihuana. They were more conversant with the subject and it was easier for them to establish contact between purchaser and peddler.

Marihuana smoking is very common in the theatres of Harlem according to the observations of the investigators. We have reason to believe that in some instances, perhaps few in number, employees actually sold cigarettes on the premises. In the Harlem dance halls smoking was frequently observed either in the lavatories or on the main floor. The patrons as well as the musicians were seen in the act of smoking. There was no evidence of sales being made by employees on the premises, or that there was any gain on the part of the owners or employees in permitting this practice. Whereas the smoking of marihuana was not encouraged, nothing was done to prohibit such practice.

There are specific sections in the Borough of Manhattan where the sale of marihuana cigarettes appears to be localized: 1) the Harlem district; 2) the Broadway area, a little east and west of Broadway and extending from 42nd Street to S9th Street. While it is true that one may buy the cigarette in other districts, it is not as easily obtainable as in the two localities

mentioned.

## **The Mental Attitude of the Marihuana Smoker Toward Society and Marihuana**

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Most of the smokers of marihuana coming within the scope of our survey were unemployed, and of the others most had part-time employment.

Occasional, as well as confirmed, users were all aware of the laws pertaining to the illegal use of the drug. They did not indulge in its use with a spirit of braggadocio or as a challenge to law as has been reported by some investigators in other districts. They did not express remorse concerning their use of marihuana, nor did they blame this habit as a causative factor in the production of special difficulties in their personal lives. Except for musicians there appeared to be no attempt at secretiveness on the part of the habitual smoker. This attitude is in marked contrast to that usually taken by those addicted to morphine, cocaine, or heroin.

The consensus of marihuana users is that the drug is not harmful and that infrequent or constant use of marihuana does not result in physical or mental deterioration.

In describing the most common reaction to the drug they always stated that it made them feel "high." Elaboration of just what the smoker meant by "high" varied with the individual. However, there was common agreement that a feeling of adequacy and efficiency was induced by the use of marihuana and that current mental conflicts were allayed. Organic illness was not given as a cause for smoking "reefers."

A person may be a confirmed smoker for a prolonged period, and give up the drug voluntarily without experiencing any craving for it or exhibiting withdrawal symptoms. He may, at some time later on, go back to its use. Others may remain infrequent users of the cigarette, taking one or two a week, or only when the "social setting" calls for participation. From time to time we had one of our investigators associate with a marihuana user. The investigator would bring up the subject of smoking. This would invariably lead to the suggestion that they obtain some marihuana cigarettes. They would seek a "tea-pad," and if it was closed the smoker and our investigator would calmly resume their previous activity, such as the discussion of life in general or the playing of pool. There were apparently no signs indicative of frustration in the smoker at not being able to gratify the desire for the drug. We consider this point highly significant since it is so contrary to the experience of users of other narcotics. A similar situation occurring in one addicted to the use of morphine, cocaine, or heroin would result in a compulsive attitude on the part of the addict to obtain the drug. If unable to secure it, there would be obvious physical and mental manifestations of frustration. This may be considered presumptive evidence that there is no true addiction in the medical sense associated with the use of marihuana.

The confirmed marihuana smoker consumes perhaps from six to ten cigarettes per day. He appears to be quite conscious of the quantity he requires to reach the effect called "high." Once the desired effect is obtained he cannot be persuaded to consume more.

He knows when he has had enough. The smoker determines for himself the point of being "high," and is ever conscious of preventing himself from becoming "too high." This fear of being "too high" must be associated with some form of anxiety which causes the smoker, should he accidentally reach that point, immediately to institute measures so that he can "come down." It has been found that the use of such beverages as beer, or a sweet soda pop, is an effective measure. Smokers insist that "it does something to the stomach" and that it is always associated with "belching." A cold shower will also have the effect of bringing the person "down."

Smokers have repeatedly stated that the consumption of whisky while smoking negates the potency of the drug. They find it is very difficult to get "high" while drinking whisky, and because of that smokers will not drink whisky while using the "weed." They do, however, consume large quantities of sweet wines. It is their contention that this mild alcoholic beverage aids the drug in producing the desired effect. Most marihuana smokers insist that the appetite is increased as the result of smoking.

We have been unable to confirm the opinion expressed by some investigators that marihuana smoking is the first step in the use of such drugs as cocaine, morphine, and heroin. The instances are extremely rare where the habit of marihuana smoking is associated with addiction to these other narcotics.

## **Marihuana and Eroticism**

In the popular agitation against the use of marihuana, its erotic effects have been stressed repeatedly. As previously stated in this report, our investigators visited many "tea-pads" in the Borough of Manhattan. It is true that lewd pictures decorated the walls but they did not find that they were attracting attention or comment among the clientele. In fact one of the investigators who was concentrating his attention on the relation between marihuana and eroticism stated in his report that he found himself embarrassed in that he was the only one who examined the pictures on the wall.

Numerous conversations with smokers of marihuana revealed only occasional instances in which there was any relation between the drug and eroticism. At one time one of our investigators attended a very intimate social gathering in an apartment in Harlem, having succeeded in securing the position of doorman for the occasion.

There was a great deal of drinking, and the dancing was of the most modern, abandoned, "jitter-bug" type. This form of dancing is highly suggestive and appears to be associated with erotic activity. The investigator made careful observation of those who were dancing, and found that there was no difference between the ones who were and the ones who were not smoking "reefers." Similar impressions were received after careful observations in public dance halls, places where they knew that some persons were under the influence of marihuana.

Visits to brothels which occasionally also served as "teapads" revealed that the use of marihuana was not linked to sexuality. These observations allow us to come to the conclusion that in the main marihuana was not used for direct sexual stimulation.

## Crime

One of the most important causes of the widespread publicity which marihuana smoking has received is the belief that this practice is directly responsible for the commission of crimes.

During our investigation many law enforcement officers, representing various federal, state and local police bureaus, were interviewed and asked for a confidential expression of opinion on the general question of crime and marihuana. In most instances they unhesitatingly stated that there is no proof that major crimes are associated with the practice of smoking marihuana. They did state that many marihuana smokers are guilty of petty crimes, but that the criminal career usually existed prior to the time the individual smoked his first marihuana cigarette. These officers further stated that a criminal generally termed as a "real" or "professional" criminal will not associate with marihuana smokers. He considers such a person inferior and unreliable and will not allow him to participate in the commission of a major crime.

In the period beginning October 1939 and ending November 1940, the Police Department made 167 arrests for the possession and use of marihuana. Classified according to race they were: white, 33 men, 4 women; Latin-American, 26 men, 2 women; Negro, 83 men, 6 women; Latin-American (colored) 9 men, 1 woman- British East Indies 1, Filipino 1, Chinese 1. Classified according to age, 12 per cent were between the ages of 16 and 20, 58 per cent between the ages of 21 and 30, 24 per cent between the ages of 31 and 40, and 6 per cent between the ages of 41 and 50.

During the period under discussion, the Police Department confiscated approximately 3,000 pounds of marihuana.

The sale and use of marihuana is a problem engaging the vigilance of the New York Police Department. However, the number of officers available for such duty is limited. Officers specifically assigned to the Narcotics Division of the Police Department are acquainted with the problem, but the majority of the officers are fundamentally without authoritative knowledge regarding this subject.

The relation between marihuana smoking and the commission of crimes of violence in the city of New York is described by Dr. Walter Bromberg, psychiatrist-in-charge of the Psychiatric Clinic of the Court of General Sessions, in an article published in the Journal of the American Medical Association:

(start quotation)

In the south of this country (New Orleans) the incidence of marihuana addicts among major criminals is admittedly high. Sporadic reports from elsewhere in the country of murders and assaults due to marihuana appear in the press frequently. It is difficult to evaluate these statements, because of their uncritical nature. The bulletin prepared by the Foreign Policy Association lists ten cases "culled at random from the files of the U.S. Bureau of Narcotics" of murder and atrocious assault in which marihuana was directly responsible for the crime.

Among the ten patients, the second, J. O., was described as having confessed how he murdered a friend and put his body in a trunk while under the influence of marihuana.

J. O. was examined in this clinic; although he was a psychopathic liar and possibly homosexual, there was no indication in the examination or history of the use of any drug. The investigation by the probation department failed to indicate use of the drug marihuana. The deceased, however, was addicted to heroin.

Our observations with respect to marihuana and crime were made in the Court of General Sessions over a period of five and a half years. The material in that court is limited as to residence to New York County, although it must be remembered that the offenders come from many sections of the country and are of many racial types. This is important, because the British investigators have noted in India that cannabis does not bring out the motor excitement or hysterical symptoms in Anglo-Saxon users that occur in natives. There are several other difficulties in collecting reliable material, one being the complete dependence on the history and statements of the prisoners without an opportunity for objective tests or other corroborative check, as in the case of other drugs, e.g., heroin or morphine.

During routine interviews of some 17,000 offenders in six and a half years, several hundred have been found who had direct experience with marihuana. Their testimony checks with experimental results and clinical experiences with regard to the symptoms of intoxication, the absence of true addiction, and the negative connection with major crime. Especially is this noteworthy among sexual offenders and in cases of assault or murder. The extravagant claims of defense attorneys and the press that crime is caused by addiction to marihuana demands careful scrutiny, at least in this jurisdiction....

Most of the narcotic cases in New York County are heard in the Court of Special Sessions, where misdemeanants are handled and where indictments on charges of the possession of drugs for use are returned. In the Court of Special Sessions in the same six-year period, of approximately 75,000 indictments for all crimes, 6,000 resulted in convictions for the possession and use of drugs.

Since neither the law, the district attorney nor the police department makes any distinction between the several kinds of narcotics in arraignments or indictments, there were no figures from which to estimate the number of users of marihuana as distinguished from the number of users of other drugs. A system of sampling the 6,000 cases was therefore adopted in order to furnish an approximate estimate of the total number of marihuana users who came into conflict with the law.

In this sampling the records of 1,500 offenders, or 25 per cent of the 6,000, were examined. Of these, 135 were charged in connection with marihuana. From this fact it was estimated that about 540 offenders, or 9 per cent of all drug offenders coming to the Court of Special Sessions in six years, were users of marihuana. In analyzing this sample of 135 cases, it was found that 93 offenders had no previous record, the previous charges or charges of 8 concerned only drugs, 5 had records including drug charges and 29 had records not including drug charges. Among those with longer records, that is, from four to seven previous arrests, none showed progression from the use of drugs to other crimes.

As measured by the succession of arrests and convictions in the Court of General Sessions (the only method of estimation) it can be said that drugs generally do not initiate criminal careers. Similarly, in the Court of Special Sessions, only 8 per cent of the offenders had previous charges of using drugs and 3.7 per cent had previous charges of drugs and other petty crimes. In the vast majority of cases in this group of 135, then, the earlier use of

marihuana apparently did not predispose to crime, even that of using other drugs. Whether the first offenders charged with the use of marihuana go on to major crime is a matter of speculation. The expectancy of major crimes following the use of cannabis in New York County is small, according to these experiences.(4)

(end quotation)

Bromberg, W., "Marihuana: a psychiatric study." J.A.M.A. 113: 4, 1939.

## Marihuana and School Children

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One of the most serious accusations leveled against marihuana by special feature writers has been that it is widely used by the school children of this nation. These authors have claimed that it has so detrimental an effect on development that it is a major factor in juvenile delinquency. This phase of the marihuana problem was deemed serious enough to merit primary consideration in our study of the marihuana problem in New York City -- specifically in the Borough of Manhattan. We decided to attack this aspect of the problem along the following lines:

1. To observe schools in order to see if pupils bought marihuana cigarettes from any peddlers operating in the neighborhood.
2. To investigate thoroughly complaints made by parents to school and police authorities relative to marihuana and its use by school children.
3. To interview principals, assistant principals, and teachers of many of the schools in New York City with reference to our project.
4. To gather relevant statistics from various city bureaus and private agencies.

Unknown to the school authorities, our investigators had under surveillance many of the schools in the Borough of Manhattan. They would observe a particular school for a number of consecutive days, watch loiterers and suspicious characters in the locality, and, under certain circumstances, follow some of the children. This procedure was repeated at varying intervals in different localities. From time to time the investigators would return to some of the schools which they previously had kept under surveillance. Attention was naturally concentrated upon those schools from which emanated the most numerous complaints and which were located in suspected neighborhoods. We must admit that it would have been possible for such sales to have taken place during the time that our investigators were not on duty, but we came to the conclusion that there was no organized traffic on the part of peddlers in selling marihuana cigarettes to the children of the schools we observed.

Certain of the school authorities deserve special commendation for their alertness in singling out suspicious characters loitering in the vicinity of their schools. While investigating one of the suspected schools, our investigators who were loitering in the neighborhood were suspected and treated as "suspicious characters" by the school authorities.

During the period of this survey the Police Department while engaged in an entirely separate criminal investigation received a lead indicating the sale of marihuana to children in a certain

high school. As a result, one pupil was arrested and convicted for selling cigarettes to his classmates.

In the Harlem district we discovered a few places where school children gathered during and after school hours for the purpose of indulging in smoking ordinary cigarettes, drinking alcoholic beverages, and engaging in homosexual and heterosexual activities.

One of our investigators, having gained entrance to such a place, ostentatiously displayed marihuana cigarettes which he had with him. The madam of the place promptly cautioned him against using the "weed" and insisted that at no time did she permit any person to smoke it on her premises.

A surprising number of school children smoking ordinary cigarettes were noted. A checkup revealed that these cigarettes were being illicitly sold by men on the street and in candy stores in the "loose" form. It is possible that this trade in ordinary cigarettes is occasionally misinterpreted as trade in "reefers."

Interviews with school authorities were very significant, and it is of value to summarize briefly some of the statements actually made by them. The locations of the schools and the names of the persons quoted are in our official files.

1. High School. Predominantly white. The principal stated, "The school has never had any connection with marihuana, not even a rumor."
2. High School. Predominantly white. The principal at first appeared to be evasive and did not readily volunteer information, but after repeatedly being pressed with the question stated that the school "had not had any difficulty with the subject of marihuana."
3. High School. Predominantly white. The principal emphatically stated, "I have had no trouble with marihuana in my school."
4. A vocational school in the Borough of Queens. Mixed. "I have never heard the slightest thing about marihuana in connection with this school."
5. High School. Queens. Mixed. "We never had the slightest connection with marihuana in any way."
6. Junior High School. Harlem. Predominantly Negro and Latin-American. The principal stated that there had been a few marihuana cases among the boys about eighteen months ago. His assistant volunteered the information that there had been some boys in the school who had "reefers" in their possession. On other occasions some of the boys appeared to be intoxicated and when examined confessed to having smoked "reefers." He further stated, "It was difficult to be sure if sleepy, perspiring, pallid-looking boys were feeling the effects of marihuana or were just recovering from too much 'partying' or drinking." He volunteered the opinion that since marihuana was an acute problem among the adult population in that particular district, it could be assumed that marihuana could occasionally become a problem in the school.
7. Junior High School. White and Latin-American. On the fringe of Harlem. Principal and assistant principal stated that they have never had the slightest difficulty arising from marihuana.
8. Junior High School. White and Negro. Bordering on Harlem. The principal, because of his short tenure of office, was unable to express his opinion on the subject. The chief clerk stated that marihuana had never been a problem in the school. She was certain, however, that it was sold in the neighborhood.
9. Junior High School. White, with a high percentage of Negro and Latin-American. The principal stated, "As yet we have had no contact with marihuana although, considering the

neighborhood, it would not be unlikely."

10. Junior High School. Latin-American, Negro, and some white. The principal stated, "We have had no trouble with marihuana." He was of the opinion that because of the locality it would be possible for some older boys to smoke it without anybody being cognizant of it. He added that he would let us know if any boys were detected smoking. During the period of the survey no such report was made.
11. Junior High School. Latin-American predominating. The principal stated that she had not had any trouble with marihuana.
12. Junior High School. White predominating. The principal stated, "I have had no contact with it." However, due to the location of the school, which was near Harlem, she stated she would notify the Juvenile Aid Bureau if such a problem arose. During the period of the survey no such report was received.
13. Junior High School. White. The principal stated that no information concerning the use of any narcotics had ever come to his attention and was equally insistent that teachers would have reported any such information to him.
14. Junior High School. White. The principal stated that she had never found anything to indicate the use of any drug in the school.
15. Junior High School. White and mixed. The principal stated that last year he had suspected that a group of chronic truants were using marihuana but he was unable to obtain any direct evidence.
16. Junior High School. White. The principal and his assistant stated that they had no real evidence of any marihuana problem in the school, and they do not believe that the drug is used to any extent.
17. Junior High School. White. The principal stated that although she had no tangible evidence of marihuana smoking among the students, she has problem groups that gather in premises where she is inclined to think that marihuana could be obtained if they wished to get it. She is certain no marihuana is used in the school itself. We investigated thoroughly the suggestions made by the principal as to premises where marihuana might be sold but we were unable to gather any evidence of its sale.
18. Junior High School. White. The acting principal and a teacher in the school who had been there for a number of years stated that there had never been any evidence of the use of marihuana or any other drugs in the school.
19. Junior High School. White. The health director of this school stated that any evidence concerning the use of narcotics by pupils would have been called to his attention, but none had been.
20. Junior High School. White. The authorities stated that there had been no traces of marihuana smoking.
21. Junior High School. White. The authorities stated that there had never been the slightest suggestion of marihuana smoking in the school.
22. Junior High School. White. The assistant principal stated that he knew of no marihuana problem in the school.
23. Junior High School. White. The principal stated that because of the publicity given to marihuana smoking she had been on the alert to discover indications of its use in her school but had found no evidence of marihuana in the school or of anything that would lead her to believe that any one of her students used marihuana outside of the school.
24. Junior High School. White. The principal stated that nothing pertaining to the use of narcotics had been reported to him in all the years he had been there.
25. High School. Predominantly white. Authorities, including the medical department, stated that no student had ever been reported for being under the influence of marihuana.
26. High School. Predominantly white. The principal stated, "There is no indication of a marihuana problem in the school."
27. Grammar School. The principal stated that anonymous letters had been received from time

to time from pupils in the school in reference to marihuana. One letter was actually signed by a pupil of the school, who reported the sale of marihuana in a candy store in the vicinity. The principal withheld the name of the pupil but requested us to investigate the report. We kept this school, the immediate neighborhood, and all candy stores in the vicinity under strict surveillance, but were unable to gather any evidence which would indicate that the pupils of this school were obtaining marihuana.

28. Junior High School. Negro. Queens. The assistant principal stated that he had never heard anything about marihuana being a problem in his school. We had received a complaint about this school and one of our investigators had an informal chat with one of the teachers of this school who, because of her interest in the school children, appeared to be more conversant than anyone else with general problems at the school. She stated that she was certain marihuana was used by some of the students. She elaborated on the subject and recalled that a few months prior to the interview she had sent home five students (three Negroes and two Italians) whom she had noticed acting "dopey" in the classroom after the noon recess. She was not positive they were under the influence of marihuana but was fairly certain that they were under the influence of some drug. A student had told her that these boys used "reefers" and, noticing their stupor, she had concluded that they were under the influence of marihuana. Superficial examination showed her that their condition was not due to drinking whisky or any alcoholic beverage. In this school it was not necessary to notify the principal if a student was sent home. The teacher did so on her own account, arriving at a diagnosis without informing the principal of the condition. There was no doctor or nurse to examine the students.
29. Grammar School. Negro. The principal and the social worker attached to this school stated that some time prior to the interview they had heard that cigarettes were being sold to children in Harlem. We were told of a certain man who was suspected of selling them to the children. The social worker was certain that a year before the interview marihuana cigarettes were sold on a certain street in Harlem to school children, but she had no knowledge as to whether the condition existed at the time of our investigation. While working on another part of the survey, we interviewed a young Negress, approximately 20 years of age, who was a marihuana smoker. She stated that she and another girl started to smoke marihuana cigarettes while attending this particular school.
30. High School. Mixed, predominantly white. The principal stated that he was positive that there was no marihuana problem in his school.
31. High School. Predominantly white. A student was arrested for selling marihuana cigarettes to other pupils. We kept this school under surveillance after the arrest. Although we heard rumors that the sale of marihuana would start again, we were unable to gather any evidence of this. Our investigators attended the dance of the graduating class of this school at one of the hotels in the city. The dance was well conducted and had a large attendance. There was no evidence of smoking at this affair. The principal was cooperating with the Juvenile Aid Bureau of the Police Department in conducting the investigation of the marihuana problem in his school.
32. High School. White and Negro. Although rumor is widespread that "reefer" smoking is common at this school, thorough investigation did not produce evidence of it at the time of our investigation. We did obtain information, which we consider authoritative, that in 1935 a man was offered the concession to sell marihuana cigarettes to the students of this school. He refused the offer. The principal of this school stated that there had never been any trouble as a result of marihuana smoking and he knew of no actual cases.
33. High School. White, Negro, and Latin-American. The director of health education, who was conversant with the subject, stated that the school had no problem with regard to marihuana smoking on the premises but that a Puerto Rican student who lived in Harlem had informed him that he could obtain marihuana cigarettes in his locality.
34. College. White, some Negroes and Latin-Americans. We did not interview the authorities.

Observation of the behavior of and conversation with students did not reveal any marijuana problem.

35. College. White, some Negroes and Latin-Americans. This college is located near one of the famous "tea-pads" of Harlem. Many of the students pass the house regularly. Continued observation did not reveal any student attendance.
36. Junior High School. Negro. Most of the boys of this school were familiar with the subject of marijuana. The pupils of the school are incessant smokers of ordinary cigarettes. We were unable to obtain any information which would indicate that they used "reefers." Some students were observed entering a house in which there was a "tea-pad," but we never found any of the occupants of this "tea-pad" to be pupils of the school. The counselor at the school stated that during the previous term there were suspicions regarding the use of marijuana.
37. Junior High School. Negro. The principal, who is considered qualified to discuss this subject, stated that for the three months prior to the interview there had been no marijuana problem. She ventured the opinion that a few cases do arise in the spring and summer. Observation of this school reveals that practically every day young boys between the ages of 18 and 20 loitered near the gates of the schoolyard at the close of the session. Some of these boys were known to our investigators as "reefer" smokers, and they associated with the girls of the school. Two young girls known by our investigators to be "reefer" smokers stated that they started to smoke marijuana while at that school.
38. High School. White, many Negroes and Latin-Americans. Many students smoked ordinary tobacco cigarettes. Numerous complaints and rumors were associated with this school. The principal stated that in 1934 they had an acute marijuana problem but that at the present time they did not think it existed. They are constantly on guard, especially at the beginning of a term, because they get many new students from the Harlem district. We are of the opinion that there are definite signs indicating that there is some marijuana smoking in the school.
39. High School. Negro and white. The principal of this school stated that they did not have a marijuana problem. We are certain, however, that this school does to some extent present an acute problem for we have observed a few students smoking "reefers" away from the school. We have reason to believe that some of them smoke it while at school. The girls attending this high school have a very low moral standard.

On the basis of the above statements and findings, we feel justified in concluding that although marijuana smoking may be indulged in by small numbers of students in certain schools of New York City, it is apparently not a widespread or largescale practice. In the belief that actual facts concerning the role played by marijuana in the production of juvenile delinquency could best be revealed in the records of the Children's Court of New York City, we interviewed the proper authorities on this subject. On the basis of the Children's Court records for 1939, marijuana is not an important factor in the development of delinquency.

## Conclusions

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From the foregoing study the following conclusions are drawn:

1. Marijuana is used extensively in the Borough of Manhattan but the problem is not as acute as it is reported to be in other sections of the United States.
2. The introduction of marijuana into this area is recent as compared to other localities.

3. The cost of marihuana is low and therefore within the purchasing power of most persons.
4. The distribution and use of marihuana is centered in Harlem.
5. The majority of marihuana smokers are Negroes and Latin-Americans.
6. The consensus among marihuana smokers is that the use of the drug creates a definite feeling of adequacy.
7. The practice of smoking marihuana does not lead to addiction in the medical sense of the word.
8. The sale and distribution of marihuana is not under the control of any single organized group.
9. The use of marihuana does not lead to morphine or heroin or cocaine addiction and no effort is made to create a market for these narcotics by stimulating the practice of marihuana smoking.
10. Marihuana is not the determining factor in the commission of major crimes.
11. Marihuana smoking is not widespread among school children.
12. Juvenile delinquency is not associated with the practice of smoking marihuana.
13. The publicity concerning the catastrophic effects of marihuana smoking in New York City is unfounded.

## THE CLINICAL STUDY

### PLAN AND SCOPE

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Interest in the effects of marihuana on the human subject follows two main lines: first, concerning what may be called pleasurable effects which account for its widespread use- and second, regarding undesirable effects, including those leading to criminal and other antisocial acts.

In his monograph on marihuana, Walton has reviewed at length the literature on hashish experience. He has grouped these descriptions as retrospective accounts by professional writers and physicians who have taken the drug through curiosity or scientific interest, reports by physicians concerning patients who have taken excessive doses, and observations by psychiatrists on subjects under marihuana influence. In all of these instances a dose toxic to the individual had been taken and the effects described correspond to psychotic episodes of greater or less degree.

In the literature there are commonly described two basic types of effect, one of excitation, psychic exaltation, and inner joyousness, with divorcement from the external world; the other a state of anxiety with fear of consequences, such as death or insanity. Either one of these types of reaction may be experienced alone, but usually both are present during the intoxication. They occur in no regular sequence but replace each other in rapid succession. The euphoric and anxiety states are generally accompanied by mental confusion, a rapid flow of dissociated ideas, and a feeling of prolongation of time and spatial distortion. Sexual desires or phantasies may also occur.

The detailed descriptions of the experience vary. Those given by trained writers, such as Ludlow and Bayard Taylor, are vivid and dramatic, embodying sensual, visual, and auditory illusions-phantasies of overpowering splendor and beauty, on the one hand, and intense

suffering and horror on the other. The authors, familiar with stories of hashish effects and gifted with strong imaginative powers, undoubtedly were expectant of much that happened. The account given by the eminent Philadelphia physician, H. C. Wood, while following the same general pattern, has much less embellishment. He describes a feeling of well-being and inner joyousness and buoyancy and the performance of antics which he knew to be foolish but was unable to control. He was able to recall no illusions or hallucinations. Later a state of anxiety came on, developing into an overpowering fear of death.

A number of studies by psychiatrists on selected subjects have been reported. An excellent example is that of Kant and Krapf. Each acted as subject for the other and the effects of marihuana are described and analyzed at length. In general, the objective in such studies is the interpretation of the reactions in terms of disturbances in psychological processes and functionings. The descriptions referred to have been given by persons of a higher social class, well educated and accustomed by training to act in conformity with conventional social behavior. Although a state of irritability may occur and threats of suicide be made by individuals of this type under toxic doses of marihuana, it is noteworthy that in none of the descriptions is there found an expression of antagonism or antisocial behavior which led to acts of violence or what would be called criminal conduct.

Of more direct interest are the publications of Walter Bromberg, psychiatrist, Bellevue Hospital, Psychiatrist-in-Charge, Psychiatric Clinic, Court of General Sessions of New York County. Marihuana users who are brought before the court or admitted to the hospital come under his observation and he has reported at length on the psychiatric observations of 29 of these who showed psychotic reactions. He describes two types of reactions, one an acute marihuana intoxication with a psychotic syndrome, the other a toxic psychosis. Acute intoxication occurs in any individual if the marihuana is taken in sufficiently large doses. It comes on promptly and passes off some hours later. In marihuana psychosis, the symptoms are much more severe and of longer duration. He describes a number of cases in which the psychotic state continued for a number of days and required hospitalization.

The toxic psychosis seen in marihuana users occurs at any time and is of indefinite duration. Bromberg states that the relationship between cannabis and the onset of a functional psychotic state is not always clear. The personality factor is of undoubted importance and other toxic agents, such as alcohol and other drugs, as well as endogenous elements, may be involved. The symptoms, except for the longer duration, resemble those observed in persons under marihuana intoxication, but often take on the characteristics seen in schizophrenic or manic-depressive psychosis.

A description of 11 cases admitted to Bellevue Hospital is given for illustration. The marihuana was taken in the form of cigarettes. In this group were 5 Negroes, 2 of whom were women, 1 Puerto Rican, and 5 whites, one of whom was a Mexican and another a boy of 16. Except for one of the whites, a homosexual, they were all of a low intellectual and social order. One of the Negroes was arrested for following women in Central Park. The others were admitted at their own request, or were sent in by the police or family. Three of the group had definite sexual stimulation but in none was there an outburst in the form of an attack on women. The Puerto Rican became confused and excited and began chasing people with an ice pick. Shortly after his discharge he was readmitted to the hospital, was diagnosed as definitely psychotic, and was transferred to a state hospital as a schizophrenic. The majority of the group, 8 in fact, had psychopathic personalities and 3 of these were transferred to state institutions for further care. The group as a whole is representative of those who come into the

hands of the police because of abnormal conduct and who are the source of the sensational newspaper and magazine stories.

Bromberg's findings concerning the lack of a positive relationship between marihuana and crime are described in the sociological section of this study.

In marihuana literature, the action of the drug is usually described from retrospective observation of the effects on a single individual. Relationship to varying dosage, to the subject's personality and background, to environmental conditions when the drug was taken, is given little if any attention. It is the lack of information concerning these and other factors involved in marihuana reaction which has given rise to the present confusion regarding its effects.

The clinical study here described was designed to afford information not found in marihuana literature but necessary for any comprehensive view of marihuana action. For obtaining this information there were these requisites: an adequate number of subjects for the study, a clear understanding of the mental and physical make-up of each subject, a uniformity of environmental factors, accurately graded dosage of marihuana, and standardized methods of obtaining and recording marihuana effects. In addition to defining the usual and unusual effects of marihuana, as shown by subjective and objective symptoms and alterations in behavior and in physical reaction, the study was expected to answer questions which must arise in consideration of the problem as a whole. Of special importance are these: Do marihuana users show fundamental traits differentiating them from non-users? Do users present evidence of psychological or physical damage directly attributable to the drug? What are the pleasurable effects which account for the widespread usage of marihuana? To what extent does it lead to antisocial or dangerous behavior?

The sections covering the clinical study are under the following headings:

### **A. Medical Aspects**

1. Symptoms and Behavior
2. Organic and Systemic Functions

### **B. Psychological Aspects**

1. Psychophysical and Other Functions
2. Intellectual Functioning
3. Emotional Reactions and General Personality Structure
4. Family and Community Ideologies

### **C. Comparison Between Users and Non-Users from the Standpoint of Mental and Physical Deterioration**

### **D. Addiction and Tolerance**

## **E. Possible Therapeutic Applications**

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### **Organization for the Study**

The clinical studies were carried out at the Welfare Hospital (1) a New York City hospital for chronic diseases on Welfare Island. The quarters assigned to the study consisted of a ward of eight beds for the group to be studied at any one period, an adjoining ward of two beds for the study of individuals of the group, three additional rooms with equipment for special examinations, and a diet kitchen for the preparation of the subjects' meals.

Four female nurses were employed and the subjects in the larger ward were under constant supervision. In addition to routine records, each nurse reported the behavior of the subjects while she was on duty. Guards were assigned from the Department of Correction and the New York City Police Force for the subjects drawn from the Riker's and Hart Island penitentiaries and the House of Detention for Women.

The facilities of the Third Medical Division laboratory were used for general clinical laboratory examinations and for more detailed study of organ functioning. For measurement of psychological reactions, special apparatus was provided. A description of equipment used for each division of the study is given under its proper section.

### **Subjects Selected for the Study**

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For the purpose of establishing a uniform plan of procedure to be followed throughout the study, a test group of 5 individuals who had had no previous experience with marihuana was selected. These were volunteers who were paid for their services. They were of a low socio-economic level, but classified as of better than average intelligence. Only one of the group came within the range of what is considered normal personality. They represented the type of person who would readily take to marihuana were the opportunity offered.

The main group, 72 subjects, was drawn from the inmates of the penitentiaries at Riker's and Hart Islands and the House of Detention for Women, all of which are under the supervision of the Department of Correction of New York City. There were two advantages in selecting subjects from this particular group; first, they could be kept under continuous observation throughout the period desired, and second, they constituted an excellent sample of the class in New York City from which the marihuana user comes. The subjects all volunteered for the study after having its purpose and the part they were to take in it fully explained to them.

#### **Race, Sex and Age.**

Of the group, 65 were males and 7 were females; 35 were white, 26 were Negroes, and 11 were Puerto Ricans. The ages ranged from 21 to 37 years except for one who was 45 and another who was 43. Of the women, 6 had been opium addicts for a number of years.

#### **Previous Experience with Marihuana.**

Forty-eight of the group, including 6 of the women, gave a history of marihuana smoking. The extent of the usage was variable- for some it was occasional, while others had indulged in the habit fairly steadily over a period of years. Of the 48 users, those who were sellers of marihuana were probably the most consistent smokers, as in carrying on the traffic they would endeavor to keep a stock on hand. But in any instance, the number of cigarettes smoked during any stated period would vary according to circumstance. Thus one user stated that he smoked from 2 to 6 marihuana cigarettes a day, another from 10 to 15 a day, another 3 or 4 a week, and another 5 or 6 a month. Those who smoked daily are here classified as steady users, those who smoked when opportunity was offered but not daily, as occasional users.

(TABLE 1)

The users had all been deprived of marihuana from the time of their arrest, the shortest period being two weeks, the longest, one year and ten months. They all stated that the habit had often been interrupted voluntarily and the enforced discontinuation of it had caused no discomfort.

### **Health Record.**

The subjects were individually selected by Dr. Allentuck as suitable for the study. A physical and neurological examination at the hospital showed no evidence of disease. However, the Wassermann and Kline tests gave positive results for 6 subjects and the Kline test alone was positive for 2 and doubtful for 2. These figures are consistent with those of the population from which the group was selected. Of the 12,000 inmates of the Riker's Island Penitentiary in 1940 and the 8,000 in 1941, 10 per cent reacted positively to serological tests.

### **Intelligence Record.**

Sixty subjects (40 users and 20 nonusers ) to whom the Bellevue Adult Intelligence Test was given had an average I.Q. of 99.3, range 70 to 124. The average I.Q. of the user group was 96.7, range 70 to 124, while that for the non-user group was 104.5, range 93 to 114.

When analyzed according to racial distribution, the two groups were even better equated intellectually than the total results indicate. Of the 28 white subjects examined, the average I.Q. of the 13 users was 106.1, range 77 to 124, and that of the 15 non-users was 106.3, range 96 to 114. The 19 Negro users had an average I.Q. of 92.6, range 70 to 112, and the 5 Negro non-users averaged 98.8, range 93 to 101. Although in the colored group the non-users averaged 6.2 points higher than the users, it must be taken into account that the number of Negro non-users tested was small. The average I.Q. of the 8 Puerto Rican users was 91.0, range 72 to 100; that is, they were very similar in mental ability to the Negro users. From the results obtained from the Bellevue Adult Intelligence Test, one may conclude that neither the users nor the nonusers were inferior in intelligence to the general population.

### **Marihuana Used**

The marihuana that was used for oral administration was supplied by Dr. H. J. Wollner, Consulting Chemist of the United States Treasury Department. It was in the form of an alcohol fluid concentrate, the alcohol content ranging from 55 to 67.3 per cent and the content of solids from 22.9 to 33.6 Sm. per 100 cc.

According to the bio-assay made by Dr. S. Loewe of the Department of Pharmacology of the Cornell University Medical School, the strength of the fluid concentrate was found to be from 71 to 90 per cent of that of the U.S.P. fluid extract for cannabis marketed by Parke, Davis and Company. The fluid extract was not miscible with water and had a characteristic, disagreeable taste which made it easily recognized. For these reasons the concentrate was evaporated to a viscid consistency and made into pill form, with glycyrrhiza as the excipient. Each pill was equivalent to 1 cc. of the concentrate.

For controls, glycyrrhiza pills without marihuana were used. Several products prepared by Dr. Roger Adams in his investigation of the chemistry of marihuana were used. A comparison of their action with that of the concentrate will be found below. In addition to the concentrate, marihuana cigarettes were used. These were obtained from supplies confiscated by the New York City Police. Each contained approximately from .4 to .8 gm. of marihuana. As the quality of the marihuana varied and the amount of active principles taken in with the smoke was unknown, there was no exactness in dosage. In general, however, it appeared that smoking 2 cigarettes was equivalent to taking 1 pill.

The minimal dose of the concentrate which produced clearcut effects was 2 cc. During the repeated observations on each member of the group larger doses were given, commonly up to around 8 cc. and in one instance up to 22 cc. For smoking, from one to as many as eleven cigarettes were used.

### **The Active Principles.**

Determination of relative potencies of drugs having similar action can be made on human beings to a limited extent only. The comparison is based on easily measurable effects on some organ or system on which the drug has a highly selective action, but the existing state of the system influences greatly the ensuing result.

Marihuana effects come mainly from action on the central nervous system. The type and degree of response of this system to stimuli of various origins vary in different individuals and in the same individual at different times. When marihuana is given the pre-existing state cannot be classified but it has influence in determining the response, and the same dose of marihuana does not produce identical effects in different subjects or in one subject at different times. In general, however, when the dose given is definitely effective the responses are of a fairly uniform character.

For this reason the relative potency of the active principles supplied by Dr. Roger Adams could be determined only approximately. The principles used were the natural tetrahydrocannabinol, the synthetic isomer, and the synthetic hexylhydrocannabinol. These all brought on effects similar to those of the marihuana concentrate. The estimate of their relative potency is as follows: 1 cc. of the concentrate, representing the extraction from 1 Gm, of marihuana, had as its equivalent 15 mg. of the natural tetrahydrocannabinol, 60 mg. of the synthetic hexylhydrocannabinol, and 120 mg. of the synthetic tetra compound. In explaining the differences in the estimated potencies, the rates of absorption must be taken into account since the action of marihuana depends on the amount of active principle absorbed and its concentration in the brain at a certain time.

The main conclusion is that the action of the marihuana concentrate is dependent on its tetrahydrocannabinol content and that the synthetic compounds retain the action of the natural

principle.

## Procedure

The procedure for examining the main group of subjects was adopted in the light of the experience gained from the preliminary study.

The subjects were brought to the hospital in groups of from six to ten, and they stayed there from four to six weeks. Each subject had his history taken and was given a physical neurological, and psychiatric examination on the day of admission.

Since it has been shown that pulse variation is the most constant index of marihuana action, the pulse rate was recorded every half hour during the day with the subjects at rest for five minutes before each reading.

During the following days, through careful observation by the Director, the general make-up of the subject, his personality, the character of his responsiveness, and his behavior in new surroundings were determined both before and while he was under the influence of marihuana. Additional information came through the nurses' reports.

In addition, each subject was given a series of tests before and after the administration of marihuana in order that the changes brought about by the drug might be measured. Included among these tests were psychological tests for mental functioning and emotional reactions, psychomotor tests for both simple and complex psychophysical functions, tests to determine such abilities as musical aptitude and the perception of time and space, and laboratory examinations to test the functioning of the various organs and systems of the body.

## Medical Aspects

### SYMPTOMS AND BEHAVIOR

**Samuel Allentuck, MD**

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#### IN PRELIMINARY GROUP

The preliminary study of the 5 volunteer subjects had for its purpose the establishment of methods of procedures to be followed for the main group, and the obtaining of a general picture of the physical and mental effects induced by the drug. Having no knowledge of the safe limits of marihuana dosage, the dosage given to this group was restricted to from 1 to 4 cc. of the concentrate, and for smoking from 1 to 3 cigarettes.

When ingested, 1 cc. of marihuana was slightly effective, the multiples of this more so. There was noted in all subjects some increase in pulse rate and in blood pressure, dilated and sluggish pupils, dryness of the mouth and throat, ataxia, and some clumsiness and incoordination of movement. Symptoms distinctly disagreeable were dizziness in 3 subjects, a sense of heaviness of the extremities in 2, nausea in 2 and faintness in 2. Three showed motor

restlessness. A state classed as euphoria, characterized by laughter, witticisms, loquaciousness, and lowering of inhibitions occurred in 3 subjects. This was not sustained but alternated with periods during which disagreeable symptoms were dominant. In one of the subjects (V.C.) there was no euphoric state, but a feeling of discomfort and depression throughout. Finally in one of the 5 (A.V.) with 2 cc. There was a state of depression with anxiety and with 4 cc. a psychotic episode with fear of death.

With the exception of the one individual during his psychotic episode, the subjects gave no evidence of abnormal mental content at any stage of the drug action, the only change noted being a delay in focusing attention on questions asked and difficulty in sustaining mental concentration. While there was objection at times to carrying out repetitious tests, there was no definite refusal. There was no sexual stimulation giving rise to overt expression.

With the cigarette smoking, ataxia and changes in the pulse rate, blood pressure, and pupils corresponded to those following oral administration. In only one of the subjects, however, was there definite euphoria. The common symptoms were dizziness and drowsiness. Two of the subjects found it difficult to concentrate.

The duration of the effects of marihuana was variable. When it was ingested, the effects usually passed off in from two to four hours, but in one instance persisted for seven hours and in another for fourteen hours. After smoking, the duration of effects was from one to three hours.

## **IN MAIN GROUP**

The evidence of the effects of marihuana was obtained by the subject's statement of symptoms and sensations, by the nurses' reports and by the examiner's observations and interpretation of changes in the subject's mental state and behavior.

The dosage of the marihuana concentrate ranged from 2 to 22 cc. and in each subject the effects of more than one dose were studied. Dosage ranging from 2 to 5 cc. was used for the largest number of subjects, and that from 14 to 21 cc. on only seven occasions. It is known that marihuana intoxication may bring about a comatose state, but no attempt was made to determine the dosage required for this. The number receiving each of the selected doses is shown in Table 2.

### (TABLE 2)

While the duration of action and its intensity tended to increase with dosage, this was not always the case and equal doses did not bring about uniform effects in all those receiving them. Thus, 3 cc. produced a striking effect in one individual, much less in another in still another, 10 cc. produced less effect than 5 cc. Such variations are to be explained by differences in the mental make-up of the subject, and the particular state of his responsiveness at the time when marihuana is taken.

The number of cigarettes smoked ranged from one to eleven. The smoking of a single cigarette took about ten minutes and up to eight could be smoked in an hour. In smoking, increasing the number of cigarettes usually increased the sensation described as "high," but here also there was no uniformity in individuals or groups.

When marihuana was ingested, in dosages from 2 cc. up, its actions became evident in from one half to one hour. The maximum effects were seen in from two to three hours. These subsided gradually, but the time of disappearance was variable, usually three to five hours, in some instances twelve hours or more.

When marihuana cigarettes were used the effects appeared almost immediately. After one cigarette, these had usually disappeared in an hour. After several cigarettes had been smoked the effects increased progressively in intensity and reached a maximum in about an hour. In most instances they disappeared in from three or four hours.

## **The Concentrate**

### Behavior Symptoms.

The effects on the general behavior of the subjects taking the concentrate were variable. If left undisturbed some remained quietly sitting or lying, showing little interest in their surroundings. Others were restless and talkative. Under the heading "Euphoria" there are listed those marihuana effects which give rise to pleasurable sensations or experiences. These are a sense of well-being and contentment cheerfulness and gaiety, talkativeness, bursts of singing and dancing, daydreaming, a pleasant drowsiness, joking, and performing amusing antics. The drowsiness, daydreaming and unawareness of surroundings were present when the subject was left alone. Other euphoric expressions required an audience and there was much contagiousness of laughing and joking where several of the subjects under marihuana were congregated. The occurrence of a euphoric state, in one or another form, was noted in most of the subjects. But except for those who were allowed to pass the time undisturbed, the pleasurable effects were interrupted from time to time by disagreeable sensations.

Quite commonly seen, as with the preliminary group, was a difficulty in focusing and sustaining mental concentration. Thus, there would occur a delay in the subject's answers to questions and at times some confusion as to their meaning. There was, however, except in a few isolated instances, no abnormal mental content evident and the responses brought out by the examiner were not different from those in the pre-marihuana state.

Altered mental behavior which would give rise to more concern was seen in a relatively small number of subjects. In some this took the form of irritation at questioning, refusal to comply with simple requests and antagonism to certain of the examiners. There was, however, only verbal and no active opposition in any of these behaviors, caused by the subject's desire to be left undisturbed and his disinclination to carry out certain tests which in his pre-marihuana period he had considered tiresome and meaningless. With this came antipathy to those conducting the tests.

The occurrence of the disagreeable physical symptoms accompanying marihuana action would naturally lead to a feeling of disquietude and some alarm as to significance and consequences.

This, however, was a prominent feature in relatively few instances. A pronounced state of anxiety reaching a panic stage, associated usually with fear of death or of insanity, was observed only in those subjects experiencing psychotic episodes and here the anxiety state led to pleas for escape and not to acts of aggression. Even in the psychotic states there were no

uncontrollable outbursts of rage or acts of violence.

Some evidence of eroticism was reported in about 10 per cent of the 150 instances in which marihuana was administered to the group. The presence of nurses, attendants and other women associated with the study gave opportunity for frank expression of sexual stimulation, had this been marked. There was no such expression even during the psychotic episodes.

In some isolated instances there was evidence of marked lowering of inhibitions such as loud discharge of flatus, urinating on the floor instead of in the vessels supplied, and in one instance frank exhibitionism. In the last instance the subject, who was not a regular marihuana user, had been arrested on three occasions for indecent exposure.

The frequency with which significant changes in behavior occurred is indicated in Table 3

(TABLE. 3)

As used in Table 3, anxiety means the subject's expressed worry concerning what might happen to him. Excitement, shown by physical restlessness, muscular twitchings and jerky movements, and loud talking, and some degree of antagonism are known to be expressions of an "alarm" or "fear" state.

It is seen from this table that, except for euphoria, the effect of marihuana was definitely more pronounced on the nonusers. This might be taken as evidence of a persisting tolerance to the drug in the user group, but, on the other hand, it may have as its basis a feeling of greater apprehension in the nonusers. Such a feeling would undoubtedly arise among those who have had no previous experience with marihuana and are in a state of uncertainty as to its possible harmful effects.

#### Physical Symptoms.

Of the subjective symptoms, a feeling described as lightness, heaviness, or pressure in the head, often with dizziness, was one of the earliest and occurred in practically all subjects, irrespective of dose. Dryness of the mouth and throat were reported by over half of the subjects as was also a floating sensation. Unsteadiness in movement and a feeling of heaviness in the extremities were commonly experienced as was a feeling of hunger and a desire for sweets especially. Less commonly noted were nausea, vomiting, sensations of warmth of the head or body, burning of the eyes and blurring of vision, tightness of the chest, cardiac palpitation, ringing or pressure in the ears, and an urge to urinate or defecate.

From observation by the examiner, tremor and ataxia were present in varying degrees in practically all instances and in all dosages used, as were also dilatation of the pupils and sluggish response to light.

These effects were often present on the day following marihuana administration.

The frequency of the more common subjective symptoms and their relation to dosage is shown in Table 4. The figures are taken from the subject's reports.

There is a tendency for the symptoms to be more frequent in the non-users than in the users

but the differences are variable and in general not striking.

## **The Marihuana Cigarette**

**(Look for the Jack Benny Jello Hour)**

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### **The Cigarette**

Smoking. When marihuana is smoked, there is, as has been stated, no such accuracy in dosage as is the case when it is ingested. The marihuana user acquires a technique or art in smoking "reefers." This involves special preparation of the cigarette and regulation of the frequency and depth of inhalations. In a group of smokers, a cigarette circulates from one to another, each in turn taking one or more puffs. The performance is a slow and deliberate one and the cigarette, held in a forked match stick, is smoked to its end.

When the smoke comes in contact with the respiratory mucous membrane, the absorption of the active principle is rapid and the effects are recognized promptly by the subject. He soon learns to distinguish the amount of smoking which will give pleasant effects from the amount which will give unpleasant ones and so regulates his dosages. Providing there are no disturbing factors, as is the case in gatherings of small friendly groups or parties in "tea-pads," the regulated smoking produces a euphoric state, which accounts for continued indulgence.

(TABLE 4)

The effect from smoking marihuana cigarettes was studied in 32 subjects. Of these, 20 were classed as users, that is, prior to their arrest they had had more or less extensive experience in smoking. In the study the smoking was repeated by each subject several times, the number of cigarettes smoked within an hour ranging from one to eight.

In all of the user group the smoking produced a euphoric state with its feeling of well-being, contentment, sociability, mental and physical relaxation, which usually ended in a feeling of drowsiness. Talkativeness and laughing and the sensation of floating in the air were common occurrences. These effects were of short duration, from one to three or four hours after the smoking was concluded. In none of these subjects was there an expression of antagonism or antisocial behavior.

In the non-user group the effects were similar except that in one subject a state of mental confusion occurred and in another the main effect was a feeling of dizziness, unsteadiness, and muscular weakness. Finally one subject showed effects entirely different from the others. He smoked one cigarette and became restless, agitated, dizzy, fearful of his surroundings, afraid of death. He had three short attacks of unconsciousness. At one period he had visions of angels, and for a few minutes a euphoric state. The entire episode lasted a little over an hour, after which he went to sleep. This subject had a similar psychotic episode after taking 120 mg.

of tetrahydrocannabinol. On seven other occasions he had been given the marihuana concentrate or tetrahydrocannabinol with no unusual effects.

Of the physical symptoms occurring with smoking, dryness of the mouth and throat, dizziness, and a sensation of hunger were the most common. None of these or other symptoms seemed to lessen materially the pleasurable effects.

The effect of smoking on the 7 females, 6 of whom were classed as users, corresponded to that on the male group. All showed euphoric effects. One of the subjects was nauseated and another was restless, irritable, and contrary. These effects were observed in both of the subjects when marihuana was taken by stomach. One of the users, euphoric after smoking 6 and 10 cigarettes, had a psychotic episode after 8 cc. of marihuana concentrate.

Tea-Pad Parties. (This section on "Tea-Pad Parties" was prepared by Mrs. Halpern.) In addition to the quantitative data regularly obtained from the subject during the course of the testing program, the examiner had opportunity to make diverse observations of the subject's global reactions, which threw interesting light on the general effect of the drug on the individual personality.

When the subject became "high," his inclination was to laugh, talk, sing, listen to music, or sleep, but the requirement that he solve problems, answer questions, or remember drawings created an artificial situation, tending to bring him "down" and spoil his pleasure. In order, therefore, that the influence of the drug might be observed in less formal circumstances and in a set-up more nearly like the customary "tea-pad," two groups of men were given "parties" on the last night of their hospital sojourn. The men were consulted beforehand, and the stage was set according to their desires. They requested that nothing be done until it was really dark outside. They brought the radio into the room where the smoking took place and turned it to soft dance music. Only one shaded light burned, leaving the greater part of the room shadowy. The suggestion was made that easy chairs or floor cushions be procured but the party progressed without these.

The men were allowed as many cigarettes as they wanted. When the "reefers" were passed out they crowded around with their hands outstretched like little children begging for candy. The number of cigarettes the men smoked varied, the range being from two to twelve or thirteen. There were both users and non-users in these two groups. The users of course were highly elated at the prospect of getting much free "tea," and some of the non-users also smoked with genuine enjoyment.

In the beginning the men broke up into little groups of twos and threes to do their smoking, or in some instances went off by themselves. Smoke soon filled the atmosphere and added to the general shadowy effect. After the initial smoking there was some moving about- some men laughed and joked, some became argumentative, while some just stared out of the window. The arguments never seemed to get anywhere, although they often dealt with important problems, and the illogical reasoning used was never recognized or refuted by the person to whom it was addressed. Gradually, as though attracted by some force, all restlessness and activity ceased, and the men sat in a circle about the radio.

Occasionally they whispered to one another, laughed a little, or swayed to the music, but in general they relaxed quietly in their chairs. A feeling of contentment seemed to pervade, and

when one man suddenly got a "laughing jag" they were annoyed at the interruption.

In general, they gave the impression of adolescent boys doing something which was forbidden and thereby adding spice to the indulgence. Many of the adolescent personality patterns as they appear in group activities were clearly observable here. There was the eternal "wisecracker," the domineering "important" individual who tried to tell everyone what to do, the silly, giggling adolescent and the shy, withdrawn introvert. One forgot that these were actually adults with all the usual adult responsibilities. One could not help drawing the conclusion that they too had forgotten this for the time being.

Although urged to smoke more, no subject could be persuaded to take more than he knew or felt he could handle. After about an hour and half of smoking, the men were given coffee and bread and jam and the party broke up. They all went to bed and reported the next day that they had slept very well.

Another attempt at evaluating the effect of marihuana in less formal situations was made in the following manner. The examiner, one of the police officers and the subjects listened to Jack Benny on the Jello Program at 7 o'clock Sunday evening. The police officer noted the number of times the audience laughed, and the length of time the laughter lasted. The examiner checked these items for the subjects. The first time this was done without marihuana; the following week the subjects were given several "reefers" about fifteen minutes before the radio program started. The results were as follows:

Without drug, the subjects laughed 42 times as against 72 laughs in the radio audience. The total time for all laughs was 63 seconds as compared with 139 seconds for the radio audience. With cigarettes the subjects laughed 43 times as compared with 47 laughs in the audience, the total laugh time being 129 seconds as compared with 173 seconds of laughter in the audience. Without drug, the subjects laughed, roughly speaking, only half as often and as long as the audience- while under the drug they laughed almost as often and the laugh time was about 75 per cent that of the audience.

It is obvious that under marihuana the subject laughs more readily and for longer time intervals. This is probably due both to the fact that things seem funnier to him and because when under the influence of the drug he is less inhibited.

### **Differences Between Concentrate and Cigarette**

When marihuana was ingested, it was in the form of the concentrate, containing all the active principles which are soluble in the medium used. The relative proportions of the principles present are unknown, and the effects can be assumed to give a composite picture of different actions, the dominating one being that of tetrahydrocannabinol. There is no information available concerning the principles present in marihuana smoke, and it is possible that some of those found in the concentrate have been destroyed by the heat of combustion. The effects from smoking correspond to those induced by tetrahydrocannabinol taken by stomach, so it may be assumed that this principle is present in the smoke. The rapidity with which effects occur after smoking demonstrates the quick absorption of the cannabinol from the respiratory tract and the short duration of these effects indicates its prompt excretion or detoxification. When the concentrate is taken, the absorption from the intestinal tract is slower and more prolonged. For these reasons it is not possible to make a precise comparison between the

effects of the two forms of administration.

In general the subject's consciousness of unpleasant symptoms is more marked when the concentrate is taken and this may interrupt or obscure the pleasant effects. The long duration of action and the inability of the subject to stop it serve to accentuate the physical symptoms and to cause apprehension concerning what may happen.

The result of all this readily accounts for the irritability, negativism and antagonism occurring. The lessening of inhibitions is not peculiar to marihuana, for in a few subjects who were given alcohol in intoxicating doses the behavior corresponded to that induced by marihuana.

After smoking the main effect was of a euphoric type. Some dizziness and dryness of the mouth were generally present but were not pronounced enough to distract from the pleasant sensations. The condition described as "high" came on promptly and increased with the number of cigarettes smoked, but it was not alarming or definitely disagreeable, and did not give rise to antisocial behavior.

On the contrary it prompted sociability. The marihuana was under the subject's control, and once the euphoric state was present, which might come from only one cigarette, he had no inclination to increase it by more smoking. When a considerable number of cigarettes were smoked, the effect was usually one of drowsiness and fatigue.

The description of the "tea-pat parties" brings out clearly the convivial effect on the groups and the absence of any rough or antagonistic behavior.

## Psychotic Episodes

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### Psychotic Episodes

What has been referred to as psychotic episodes occurred in 9 subjects, 7 men and 2 women. A description of the happenings in each instance is given. (2)

(2) Throughout this section fictitious initials are used to avoid any disclosure of the subjects' identities.

A.V. Male. Non-user. Given 4 cc. of marihuana concentrate. About three hours later he became restless, tremulous, agitated, fearful of harmful effects, suspicious of examiners. For short periods he was euphoric. At one time he had visual hallucinations of figures making gestures suggesting harm. He talked continuously, mainly expressing fear. His answers to questions were delayed but intelligent.

W.P. Male. Occasional user. Given 3 cc., repeated two hours later. At first there was a euphoric state; later he became resistant and negativistic. He showed antagonism to the examiner, demanding to be left alone. He vomited twice. Throughout he was highly excited and talked to himself. The effects in general resembled those seen in a maniacal state. He returned to his normal state in about three hours after the second dose.

F.D. Male. Occasional user. Given 4 cc. Five hours later he became confused, disoriented and slow in answering questions. There were periods of elation and depression with laughter and weeping. The effects passed off in six hours.

R.W. Male. Non-user. Given 5 cc. Three hours later he became disoriented with continued talkativeness and rapid shifting of thought. He had fits of laughter and weeping, grandiose ideas, some paranoid trends. He answered questions clearly but without perseverance. He returned to normal after six hours.

I.N. Female. Occasional user. Also heroin addict for many years. Given 8 cc. Three hours later she became confused and anxious with periods of laughing and weeping. There were several short episodes resembling hysterical attacks and dyspnea, pallor and rapid pulse during which she felt that she was dying and screamed for the doctor and for a priest. Throughout, her response to questioning was intelligent but delayed. There was a return to her normal state in three hours.

E.C. Male. Non-user. Given 6 cc. Two hours later he developed a marked state of anxiety accompanied by a sensation of difficulty in breathing. This began during a basal metabolism test. In the Sanborn equipment used there is a nose clip occluding nasal breathing and a rubber mouthpiece through which the air is inspired and expired. During the test the subject became confused, panicky and disoriented as to time. The anxiety over breathing continued for four hours but could be interrupted by distraction. He was then given 4 cc. more. The breathing difficulty lasted five hours more. The condition here had features seen in claustrophobia. Before the episode, the subject had taken marihuana on five occasions in 2, 4, 5, 5, and 2 cc. dosage, without any symptoms of respiratory distress. However, after the episode he took marihuana on three occasions in 2, 5, and 6 cc. dosage and each time the respiratory symptoms occurred. A certain degree of nervousness was present but there was no mental confusion. The subject realized that there was no physical obstruction to his breathing and had learned that by concentrating his thought on other lines he could keep his respiratory difficulties in abeyance and would not suffer from real anxiety. Smoking up to as many as thirteen marihuana cigarettes did not bring about the respiratory effect. It appeared then that the respiratory symptoms were precipitated by the wearing of the apparatus while under the influence of marihuana, and through suggestibility there resulted a conditioning to the marihuana concentrate which was given subsequently.

The description of these six psychotic episodes fits in with many others found in marihuana literature. They are examples of acute marihuana intoxication in susceptible individuals which comes on shortly after the drug has been taken and persists for several hours.

The main features of the poisoning are the restlessness and mental excitement of a delirious nature with intermittent periods of euphoric and an overhanging state of anxiety and dread.

Three other subjects presented the features of marihuana psychosis.

R.H. Male. White. Age 23. Non-user. In prison for the offense of living on prostitution. The family history was bad. His father never supported his wife or family and there was continual discord at home. When the subject was 9 years old the father deserted the family. Three brothers received court sentences, one for stealing a taxi, one for rape, and one for striking a teacher. R.H. was a problem child at school and on account of truancy and waywardness he

was sent to the Flushing Parental School.

He ran away from this school several times and was transferred to the House of Refuge on Randall's Island. At the age of 16 he was discharged. Since that time he had had two jobs, one for three months in a factory, the other for four and one-half months in the W.P.A. When he was 16 he was run over by a truck and was unconscious for a time. After his return to the Riker's Island Penitentiary from Welfare Hospital further questioning concerning his past revealed that he was subject to "fits" occurring once or twice every two months. During the attacks his body became rigid and his mouth felt stiff.

The subject was admitted to Welfare Hospital for the marihuana study on February 20th. After the usual program of examinations he was given 2 cc. of the concentrate on February 27th and February 28th. These doses brought on the symptoms of dizziness and tremor and heaviness of the head and the state called "high" which is characterized by periods of laughter and talkativeness. These effects passed off in a few hours and were followed by drowsiness and a sense of fatigue. On March 1st at 1 p.m. he smoked one marihuana cigarette. Immediately afterwards he became agitated and restless and suddenly lost consciousness. He recovered quickly and stated that he had had visions of angels and had heard choirs singing. Later he had a second short period of unconsciousness. During the afternoon he continued to be agitated and restless and had periods of laughing and weeping. After he was given phenobarbital he went to sleep. On the next day his only complaint was that he felt dizzy. Following this episode he was given 4 cc. Of marihuana concentrate on March 3rd and 2 cc. on March 10th and 2 cc. of tetrahydrocannabinol on March 5th and 4 cc. on March 8th. The effects corresponded to those seen after the earlier administrations of 2 cc. doses of the concentrate.

On March 11th R.H. was given 5 cc. (75 mg.) of the tetrahydrocannabinol at 11 a.m. and 3 cc. at 2 p.m. No unusual effects were noted during the afternoon and he ate his supper with appetite at 4:30 p.m. At 6 p.m. he became restless, apprehensive and somewhat belligerent. He felt that something had happened to his mother, that everybody was acting queerly and picking on him. He continued to be agitated and fearful, refused medication and slept poorly. This condition persisted and on March 13th he was returned to Riker's Island. After four days there he became quiet and composed. The psychotic state cleared up completely. The resident psychiatrist's report was: Impression 1. Psychosis due to drugs. (Marihuana experimentally administered.) Acute delirium, recovered. 2. Convulsive disorder, idiopathic epilepsy. Petit mal on history.

H.W. Female. White. Age 28. Non-user. Drug peddler, serving three years' indefinite sentence for unlawfully possessing a drug. Her parents died when she was about 10 years old and she was raised in an orphanage. At the age of 19 she entered a training school for nurses, but gave this up after four months and supported herself by prostitution. Her sister and her sister's husband were drug addicts and through them she began taking morphine and heroin, being, according to her account, depressed and dissatisfied at the time. She continued using these drugs up to the time of her arrest, a period of eight years. In 1938 she married a man who was also a drug addict, and engaged in the drug traffic.

On May 7th she was given 2 cc. of marihuana. Aside from a headache and a feeling of muscular weakness and uncoordination, the effect was to make the subject feel gay and very good-natured. On May 8th she was given 3 cc. Of the concentrate and became somewhat confused and unsteady, irritated and upset at carrying out tests, and greatly worried about the

physical symptoms. Five hours after she had taken the drug the effects had largely passed off. Six hours later, however, she became restless and agitated, moving about constantly, and worried about past conduct. This state continued for a few hours. On other occasions the subject was given marihuana in doses of 2, 3, and 4 cc. Twice after the administration of 3 cc. The general effect was of a euphoric type, and after 4 cc. Had been given a state of sadness set in on two occasions and one of euphoria on a third. Toward the end of her stay the subject became depressed and moody, constantly dwelling on the belief that she had committed unpardonable sins.

She was returned to the House of Detention on June 2nd, transferred to the Psychiatric Division of Bellevue Hospital on June 9th, and from there was sent to Matteawan State Hospital on July 10th. On admission to the State Hospital she appeared confused, retarded, apprehensive, and depressed. She had a marked feeling of guilt. She began to improve in September and was discharged, cured, in January. Since her return to New York she reports at frequent intervals to the parole officer. She has secured employment in a food shop and is to be promoted to the position of manager of the shop.

The diagnosis made at the State Hospital was: Psychosis, due to drugs and other exogenous poisons (morphine and heroin).

D.P. Male. Colored. Age 23. Occasional user. Sentenced for unlawful possession of drugs. Since graduation from high school at the age of 16 he had had no occupation. His criminal record dated from his graduation. He was arrested in 1934 for disorderly conduct and in the same year sentenced to Elmira Reformatory for five years for second-degree assault. He was paroled in 1936, but during the same and the following year was arrested three times for assault or robbery. He was returned to Elmira where he remained until his discharge in 1940. In August 1940 he was arrested for the possession of drugs and sentenced to a three-year indefinite term. He had served eight months of this sentence when he was admitted to Welfare Hospital as a subject for the marihuana study.

During his stay at Welfare Hospital, D.P. was given marihuana in the form of a concentrate and as cigarettes on numerous occasions. His symptoms and behavior corresponded to those usually seen, lasting a few hours with no after-effects. When the time came for his return to Riker's Island he urged that he be allowed to stay at the hospital and assist in the study. Two weeks after his return to the penitentiary he developed a psychosis characteristic of schizophrenia. He was transferred to Matteawan where the diagnosis made was: Psychosis with psychopathic personality.

These three cases are of special interest from the standpoint of the relationship of marihuana to the psychosis. The first subject, R.H., had a definite history of epileptic attacks. After smoking one marihuana cigarette he experienced an acute confusional state which lasted a few hours. In the second episode which lasted six days there was a more prolonged confusional state. Epileptics are subject to such attacks, epileptic or epileptic equivalents, which may be brought on by any number of upsetting circumstances. In this case marihuana is the only known factor which precipitated the attack.

The second subject, H.W., was a heroin addict of long standing. During her stay in the hospital, in her retrospective reports on her marihuana experiences there were usually included expressions of worry and remorse at her failure to answer questions or perform tests honestly, informing on the other women in her group, and denials concerning a syphilitic

infection she thought she had had. Prior to this incarceration she had had no prison experience. The mental picture developed from the study at the hospital and at Matteawan and the subject's subsequent history represent a fairly typical example of what is termed a prison psychosis.

The third subject, D.P., did not develop his psychosis until two weeks after he had been returned to the Riker's Island Penitentiary. He had shown no unexpected effects from marihuana and had hoped to be allowed to stay on at the hospital instead of going back to prison to complete more than two years of an unexpired sentence. At Matteawan this subject was considered to have an underlying psychopathic personality. His case also may be taken as an example of prison psychosis. With both the second and third subjects, the exact role of marihuana in relation to the psychosis cannot be stated.

Dr. Peter F. Amoroso, Commissioner of Correction of the city of New York, has given us information concerning the prisoners sentenced to the penitentiary at Riker's Island from whom our subjects were drawn. During the year beginning July 1, 1941, and ending June 30, 1942, there were 1,756 inmates in this institution. They had received an indeterminate sentence, that is, from a minimum of a few months to a maximum of three years. Of this group, 175 were subjected to intensive study by the psychiatrist because they were considered possible psychotic cases, 117 were sex offenders, and 200 were miscellaneous cases referred for mental observation, making a total of 492. Twenty-seven of these cases were committed to state institutions for the criminal insane, namely, 25 to Matteawan and 2 to Dannemora.

Commissioner Amoroso, after reviewing these cases, writes as follows:

"The prison atmosphere may place a most severe strain on those who are physically or mentally abnormal upon commitment . . . Emotionally unstable persons find themselves during incarceration denied the assertion and enjoyment of the basic human urges and impulses and it is natural to expect, therefore, that prison life may result in various types of explosions, such as psychoses, neuroses, sex perversion, and even physical and moral deterioration.'

"I am indeed surprised that we had so little trouble with our volunteers upon completion of their study and sojourn at Welfare Hospital, and the few psychotic episodes that occurred are exactly what we would expect in the whole group without considering the administration and effects of excessive doses of marihuana."

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## Summary

In the study of the actions of marihuana in respect to subjective and objective symptoms and behavior, the marihuana was given a number of times to each of the subjects in the form of the concentrate taken by stomach. The amount given ranged from 2 to 22 cc., in most cases from 2 to 5 cc. After marihuana was taken, the systematic action became evident in from one-half to one hour and the maximum effects were seen in from two to three hours. They passed off gradually, usually in from three to five hours, although in some instances they did not completely disappear until twelve or more hours.

Of the symptoms occurring, a feeling of lightness in the head with some dizziness, a sensation of floating in the air, dryness of the throat, hunger and thirst, unsteadiness and heaviness in the extremities were the most frequent. Tremor and ataxia, dilation of the pupils and sluggishness in responsiveness to light were observed in all subjects.

From observations on the behavior and responses of the subjects, it was found that a mixture of euphoria and apprehension was generally present. If the subjects were undisturbed there was a state of quiet and drowsiness, and unawareness of surroundings, with some difficulty in focusing and sustaining mental concentration. If they were in company, restlessness, talkativeness, laughter and joking were commonly seen. A feeling of apprehension, based on uncertainty regarding the possible effects of the drug and strengthened by any disagreeable sensations present, alternated with the euphoria. If the apprehension developed into a state of real anxiety, a spirit of antagonism was shown. However, any resistance to requests made to the subjects was passive and not physical and there was no aggressiveness or violent behavior observed. Erotic ideas or sensations when present took no active expression.

Six of the subjects developed toxic episodes characteristic of acute marihuana intoxication. The dosage varied from 4 to 8 cc. of the concentrate, and the episodes lasted from three to six hours, in one instance ten hours. The effects were mixtures of euphoric and anxiety states, laughter, elation, excitement, disorientation and mental confusion.

The doses given were toxic to the individuals in question but not to others taking the same or larger ones. Once the drug had been taken the effects were beyond the subject's control. The actions described took unusual expression because for the particular subject at a particular time the dose was unusually effective. A corresponding toxicity did not occur from cigarettes for here the effects came on promptly and on the appearance of any untoward effects, the smoking was stopped.

In three of the subjects a definite psychotic state occurred, in two shortly after marihuana ingestion, in one after a two week interval. Of the first two, one was an epileptic and the other had a history of heroin addiction and a prepsychotic personality. The third was considered a case of prison psychosis. The conclusion seems warranted that given the potential personality make-up and the right time and environment, marihuana may bring on a true psychotic state.

## **ORGANIC AND SYSTEMIC FUNCTIONS**

**Samuel Allentuck, MD**

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The functions of the body organs and systems were studied in the manner common to hospital practice according to the methods and with the equipment in use at Welfare Hospital. The study was designed to show not only the effects of varying doses of marihuana but also whether subjects who had long been users of the drug gave evidence of organic damage. The tests were made before the drug was administered, during its action, and often in the after

period.

The heart and circulation, blood composition, kidney, liver and gastro-intestinal function, and basal metabolism received special consideration.

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## SUMMARY

The most consistent effect of marihuana observed in this division of the study was an increase in pulse rate which began shortly after the taking of the drug, reached a peak in about two hours, and gradually disappeared. In-a few instances a temporary sinus tachycardia or sinus bradycardia was noted, but except for these there were no abnormalities in rhythm. The increase in pulse rate was usually accompanied by a rise in blood pressure.

There was in general an increase in the blood sugar level and in the basal metabolic rate, quite marked in some subjects, but in the majority the levels reached did not exceed the high normal limits.

An increase in the frequency of urination was often observed.

There was, however, no appreciable increase in the total amount of urine passed during the drug action.

Hunger and an increase in appetite, particularly for sweets, was noted in the majority of the subjects, and the taking of candy or sweetened drinks brought down a "too high" effect of the drug.

Nausea and vomiting occurred in a number of instances, diarrhea only during psychotic episodes.

On the other hand, the blood showed no changes in cell count, hemoglobin per cent, or the urea nitrogen, calcium and phosphorus figures. The figures for the circulation rate and vital capacity and the results of the phenolsulfonphthalein test for kidney infection and the bromsulfalein test for liver function were not different from those of the control period. The electrocardiograms showed no abnormalities which could be attributed to a direct action on the heart. In the few observations on gastric motility and secretion no evidence of marihuana action on these functions was obtained.

The positive results observed, increase in pulse rate and blood pressure, increase in blood sugar and metabolic rate, urge to urinate, increased appetite, nausea and vomiting, and diarrhea, were not intensified by an increase in dosage, for they could occur in an equal degree after the administration of any of the effective doses within the range used. All the effects described are known to be expressions of forms of cerebral excitation, the impulses from this being transmitted through the autonomic system. The alterations in the functions of the organs studied come from the effects of the drug on the central nervous system and are proportional to these effects. A direct action on the organs themselves was not seen.

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# Psychological Aspects

## PSYCHOPHYSICAL AND OTHER FUNCTIONS

Robert S. Morrow, PH.D.

In this phase of the study an effort was made to determine the effect of marihuana on various psychomotor and some special mental abilities. Appraisal of these effects was made wherever possible through the use of standardized tests. A number of different tests were originally tried under varying experimental conditions on the group of 5 volunteer subjects who had never before taken marihuana. Only those tests were retained which, in the course of this preliminary investigation demonstrated the greatest potentialities. With the tests finally selected it was hoped to measure the effect of marihuana on the following functions.

### FUNCTIONS AND CAPACITIES TESTED

**Static Equilibrium** This was measured by means of the Miles Ataxiameter, which is an instrument for recording body sway. The subject remains stationary in the ataxiameter with his hands at his sides and his feet together while a system of pulleys attached to a helmet on his head records the direction and degree of movement. The subject's score is the cumulative sway in all directions measured in millimeters. This test was applied to each subject for two minutes with his eyes open and two minutes with his eyes closed. Each trial was followed by a rest period of five minutes.

**Hand Steadiness** Hand steadiness was measured by means of the Whipple Steadiness Tester which consists of a metal disk with a hole  $\frac{3}{16}$  of an inch in diameter, connected in series with dry cells, an electric counter, and a stylus. The subject was instructed to hold the stylus in the hole for two minutes without touching the metal sides. Each contact with the side of the hole was recorded and the total number of contacts gave an index of unsteadiness of hand.

**Speed of Tapping** Speed of tapping was measured in somewhat the same manner as was hand steadiness. The Whipple Apparatus was used, the tapping board replacing the steadiness disk and a thicker and heavier stylus replacing the steadiness stylus. The subject tapped repeatedly on the metal plate for two minutes and the total number of taps was recorded on the counter, thereby giving a measure of motor speed.

**Strength of Grip** The Collins Dynamometer was used to measure the subject's strength of grip. Three trials were made for each hand and the scores averaged.

**Simple and Complex Hand and Foot Reaction Time** Special apparatus was constructed to measure simple and complex hand and foot reaction time. To measure simple hand reaction time, the subject was instructed to press down on a telegraph key and remove his hand as quickly as possible when a red light appeared on the board which stood directly before him. A Cenco counter recorded the reaction time, that is, the time which elapsed between the presentation of the stimulus and the response.

For the measurement of simple foot reaction time, the subject pressed down on a pedal with his foot, removing it as quickly as possible when the red light appeared.

For the measurement of complex (choice or discrimination) hand and foot reaction time either a red or a blue light served as a stimulus. The subject had no advance knowledge as to which color light would appear. For measuring the response with the hand, the subject pressed down on the telegraph key with the right hand and, at the sight of the red light, moved the peg from the red compartment into the center (neutral) compartment with the left hand, then removed the right hand from the key; at the appearance of the blue light, he moved the peg from the blue to the neutral compartment. For measuring complex foot reaction time, the procedure was similar to that for estimating the hand reaction time except that the right foot and the pedal were substituted for the right hand and the telegraph key.

Each subject made fifteen trials for each of the four variations.

**Musical Aptitude** Musical aptitude was determined by means of the Kwalwasser- Dykema Music Tests. The eight tests administered were the tonal memory test, the quality discrimination test, the intensity discrimination test, the tonal movement test, the time discrimination test, the rhythm discrimination test, the pitch discrimination test, and the melodic taste test. The sum of the scores for these separate tests was used to give a total score for musical aptitude.

**Auditory Acuity** By means of the Galton Whistle, the subjects' limits of auditory acuity were gauged for both ascending and descending frequencies.

The final score was the average of the results of three trials in each direction.

**Perception of Time** An attempt was made to appraise the subject's facility in estimating time by asking him to state when, after a given signal, he thought the following intervals had elapsed - fifteen seconds, one minute, and five minutes. Several trials were given for each time interval and the average of the results of the trials was taken as the final score.

**Perception of Length** Subjects were asked to estimate the length of lines which were 3 inches, 5 inches, and 8 inches in length and to draw lines of 3 inches and 7 inches.

**The Subjects** Fifty-four subjects were used in this part of the experiment, 36 marijuana users and 18 non-users. The two groups were equated approximately for the following factors: age, height, weight, years of formal education, and number of arrests. The age range for the user group was from 21 to 45 years with 27.9 years as an average, the age range for the non-user group was from 22 to 43 years with 29.8 years as an average. The range in height for the users was from 54 to 75 inches with a mean of 67.5 inches- for the non-users the range was from 60 to 71 inches with a mean of 66.8 inches. Range in weight for the users was from 123 to 178 pounds with 151.3 pounds as the mean, for the non-users from 115 to 180 pounds with 149.5 pounds as the mean. The schooling of the user group ranged from no education at all to 10 years with a mean of 7.1 years, that of the non- users varied from 6 to 12 years with a mean of 8.3 years. As regards the number of arrests, the range for users was from 1 to 20 with a mean of 5.1 and for the non-users from 1 to 15 with a mean of 5.3.

The two groups differed radically with respect to race. Of the 36 marijuana users, 11 (31 per cent) were white, 18 (50 per cent) were Negroes, and 7 (19 percent) were Puerto Ricans. Of the 18 non- users, 12 (67 per cent) were white, 6 (33 per cent) were Negroes, and none were Puerto Rican.

In addition, the user group was analyzed with respect to the age when the marihuana habit was begun, the duration of the habit, the number of marihuana cigarettes generally smoked per day, and the period of deprivation. The variation of the habit as already described for the entire group of users applies to the 36 subjects studied here.

**Procedure** The tests were first administered to the subjects before they had taken marihuana, then about a week later when they were under the influence of 2 cc. of marihuana, and finally another week later after 5 cc.(1) of marihuana had been administered. On each occasion the psychomotor tests for static equilibrium, hand steadiness, tapping, strength of grip, and reaction time were repeated at hourly intervals for eight successive hours in order that the time-effects of marihuana might be determined.(2) The other tests, that is, those measuring musical ability, auditory acuity, visual ) memory, and perception of time and length were given to the subjects while in the undrugged condition and from three to four hours after the drug had been administered. The music tests were given under normal conditions and after 5 cc. of marihuana had been administered, but not under 2 cc. dosage.

In almost all instances the marihuana was given in the morning shortly after breakfast and generally after a day when no drug had been taken in order that "hangover" effects might be avoided. For the most part the subjects rested and did little or nothing except the prescribed tests on days when marihuana was taken.

The equilibrium, steadiness, tapping and strength of grip tests were given together on one day and the different forms of the reaction- time test on another day. Ordinarily four or five days elapsed between retests.

In addition to being tested after standard doses of the marihuana concentrate had been ingested, 11 users and 9 non-users were tested after smoking marihuana cigarettes.(3) The cigarettes weighed from 4 to 8 grains each. Most of the subjects smoked five cigarettes, two non-users smoked only three, and one nonuser smoked four. The tests with cigarettes were given at quarter-hour, half-hour and hour intervals.

(1) A dose of 5 cc. of marihuana proved "too much" for many non-user subjects in the sense that ingestion of this amount was often followed by nausea and general symptoms of malaise which interfered with further testing.

For this reason the higher dose for non-users was sometimes reduced to 3 cc. or 4 cc. In all, only 6 of the non-user subjects took the S cc. dose. Accordingly, although the higher dosage is referred to as S cc. it should be noted that the actual amount used varied from 3 cc. to 5 cc.

(2) The scores for the first 25 users and 6 non-users were obtained every half hour, but since there was little difference between the half-hourly and hourly results it was decided to record hourly scores only, except for the first half hour.

(3) A short experiment in which placebos were employed was also tried on these subjects. An attempt was made to have the placebos simulate the marihuana as much as possible but unfortunately the placebo pills had a distinctive taste which rendered them easily identifiable. The subjects referred to them as the "licorice" pills or the "blanks." While the experiment was completed and resulted in some interesting findings, the factors which might have invalidated the results were so serious that these experiments are not reported at this time.

## Summary and Conclusions

1. The effect of marihuana on the psychomotor functions depends primarily on the complexity of the function tested. Simpler functions like speed of tapping and simple reaction time are affected only slightly by large doses (5 cc.) and negligibly, if at all, by smaller doses (2 cc.). On the other hand, the more complex functions like static equilibrium, hand steadiness, and complex reaction time may be affected adversely to a considerable degree by the administration of both large and small doses of marihuana.
2. The function most severely affected is body steadiness and hand steadiness. The ataxia is general in all directions rather than predominant in any particular axis.
3. The effects produced by larger doses (5 cc.) are systematically, though not necessarily proportionately, greater than those brought about by small doses.
4. The time required by the drug to exert its maximum effect varies somewhat with the function and size of dose, but, on the whole, time curves for both functions and dosages have similarity of form. The effect of the drug begins from one to two hours after ingestion and reaches its peak at the fourth hour, after which it declines so that by the eighth hour most of it is dissipated.
5. When marihuana is taken in cigarette form the psychomotor effects are similar in character and trend to those observed after the ingestion of the drug but they occur much sooner and taper off more quickly.
6. The effects seem to be essentially the same for women as for men, except that women are sometimes affected maximally at the second or third hour after the drug is administered. In women the return to the normal condition is in some instances quicker and more abrupt than it is in the men.
7. Non-users generally seem to be more affected by the drug when it is ingested than are users.
8. Auditory acuity is not affected by marihuana.
9. There is no evidence that musical ability, of non-musicians at least, is improved by marihuana.
  1. The ability to estimate short periods of time and short linear distances is not measurably affected by the ingestion of marihuana.

## INTELLECTUAL FUNCTIONING

**Florence Halpern, MA**

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In this phase of the study investigation was directed primarily toward establishing the effect of marihuana on the subject's intellectual functioning. An attempt was made to determine

what changes in mental ability occur under different amounts of the drug, what direction these changes take, when they are first measurable, and how long they persist.

**TESTS**

**Bellevue Adult Intelligence Test** This test was used to measure the general mental level of all the subjects. It was chosen in preference to other available scales because it is the only individual test of intelligence which has been standardized on an adult population, takes into account both verbal and performance abilities, and compares the individual with standards established for his particular age group. It consists of ten tests, five verbal and five performance. The verbal tests cover the fields of general information and general comprehension, draw on the individual's capacity for abstract reasoning and test his arithmetical ability and his rote memory. The performance tests also evaluate the subject's comprehension of social situations, but here the results are independent of language. There are also tests of the individual's ability to carry out a routine task, to organize parts into a meaningful whole, to distinguish between essential and unessential details, and to analyze and synthesize.

**Army Alpha (Bregman Revision, Forms A, B, 5, 7 and Bellevue Revision)** This is a group test first used in the United States Army in 1917 and 1918 when it was given to more than a million recruits. It consists of eight tests: test 1, a direction test which was not used in this study since the item does not appear on all forms; test 2, a test of arithmetical reasoning; test 3, a test of common sense in which the subject indicates which he considers the best of three possible responses to a given question; test 4, a modified vocabulary test; tests 5 and 6, in which the subject must mentally reorganize disarranged sentences and then indicate whether the resultant statement is true or false; test 6, a test of numerical relations in which the subject must supply the last two numbers in a numerical series on the basis of the relationship between the first six numbers; test 7, a test of analogies in which the subject determines the relationship between two given words and then underlines one of four words which is related to a third word in the same way; and test 8, which on Forms A and B and on the Bellevue Revision is a test of general information in which the subject is given a choice of five answers to a question. On Forms 5 and 7, this test is a test of directions.

Because this test has five alternate forms which are roughly of equivalent difficulty it could be repeated many times within a short time interval. It was therefore used to establish a curve showing at what time following ingestion the marijuana has an effect on general intelligence and on individual higher mental processes.

**Pyle's Digit Symbol Test** In this test each number from 1 through 9 is associated with a specific symbol, as, for example, number 1 is associated with a square and number 2 with an asterisk. The numbers and their associated symbols appear at the top of the sheet of paper. Below the sample are rows of symbols, five symbols to a row, followed by five blank squares. The subject is expected to fill in each square with the number associated with the respective symbol. With practice the association bond between the number and the symbol becomes stronger and the subject depends less and less on the model at the top of the sheet. He is therefore able to work faster and his learning rate is reflected in the increased number of squares filled.

**Cancellation Test** The subject is required to cross out a specific geometric form wherever it appears on a sheet which is covered with rows of geometric figures. This measures the individual's capacity for carrying out a routine task.

**Form Board Test** The measurement of the ability to manipulate concrete material in contrast to the verbal or abstract ability determined by the Army Alpha test required the introduction of certain form board tests. These were the Seguin Form Board, the Two Figure Board, the Casuist Board, - the Five Figure Board, Healy A, Triangle Test, Diagonal Test, all administered and scored according to the Pintner-Patterson Performance Series. The Seguin Form Board has ten blocks of various geometric forms, to be put in their appropriate places as

rapidly as possible. Three trials are given. The Two Figure Board has nine pieces which, when placed correctly, form a large cross and a large square. Time and the number of moves are recorded. The Casuist Board has twelve pieces which, when correctly placed, form three circles and an oval. Time and errors are recorded. The Five Figure Board has five geometrical figures which are formed by the correct placement of two or three pieces for each figure. Time and errors are recorded. Healy A has five small rectangular pieces which, when placed correctly, form a large rectangle. Time and the number of moves are recorded. The Triangle Test consists of four triangular pieces which are fitted together in a board. Time and errors are recorded. The Diagonal Test has five pieces of various shapes which must be fitted together in a rectangular frame. Time and moves are recorded. Kohs Block Design Test This is a performance test which is less a test of manual dexterity and more dependent on abstract intelligence than are the form board tests. It correlates more highly with intelligence than do most performance items and yet it is entirely independent of language. Therefore, the individual who cannot express himself well or who suffers from a language handicap is not penalized as he is on verbal scales. The test consists of sixteen cubes each with a red, a white, a blue, a yellow, a red-and- white, and a blue-and-yellow side. A colored design which can be reproduced with the cubes is placed before the subject and he is expected to make it. Results are rated numerically, depending upon the time consumed in execution. In this experiment two sets of designs of equivalent difficulty were required- Designs IV, VI, and XIV were selected for one series and V, VII, and XII for the other.

**Memory Tests** Although memory in itself cannot be considered a measure of intelligence, it is essential to any intelligent functioning and must therefore be included in any estimate of intelligence. Three aspects of memory, namely rote memory, the ability to recall presented objects, and visual memory were tested. The rote memory test requires the repetition of digits in forward and reverse order as given on the Bellevue Intelligence Test. Object memory was tested by exposing ten small objects for three seconds and recording the number of articles the subject was able to recall. Visual memory or the ability to reproduce designs after a ten-second exposure was estimated by using the designs and scoring technique from the Army Performance Test. **PROCEDURE** The Bellevue Adult Intelligence Test Each subject was given the Bellevue Adult Intelligence test within two or three days after his admission to the hospital and before any marijuana had been administered.

**The Army Alpha, Pyle's Digit Symbol, and Cancellation Tests** These tests were given as group tests to a total of 20 subjects. The Army Alpha and Pyle's Digit Symbol tests were given every half-hour, beginning a half-hour after drug ingestion. The Army Alpha was continued for seven hours and Digit Symbol for five hours. The Cancellation test was given every hour for six hours, beginning one hour after drug administration. Eleven users and 9 non-users took the Army Alpha and the Digit Symbol tests, while 9 users and 11 non-users took the Cancellation test. Tests 2 through 8 of the Army Alpha require twenty and a half minutes for actual performance while such preparations as the distribution of papers and the reading of directions consume almost ten minutes more, so that had the entire Alpha been given at each half-hourly session, the subjects would have gone from test to test with no intermittent rest period. For this reason the tests were divided and the following schedule arranged: (table a)

Each subject took three test series, one without the drug, one with 2 cc. and one with 3, 4, 5, or 6 cc., depending on individual tolerance. A test series consisted of fourteen half-hour sessions for the Alpha, ten half-hour sessions for the Digit Symbol and seven hourly sessions for the Cancellation tests. Because of the time factor, a series required two days for its completion. The halves of a series were given on successive days, and the different series a

week apart. Thus for example, a subject might take his first test series with 2 cc. on Monday and Tuesday of one week; the following Monday and Tuesday the series would be repeated with the subject in a different drug state (no drug or S cc.); and a final series would be given the third week with the subject in still another drug condition.

An effort was made to obviate practice effect by giving the first test series to one third of the subjects without drug, to one third with 2 cc., and to one third with 3, 4, or 5 cc. However because of the necessity of increasing dosage gradually this ideal presentation was not actually obtained. The following gives the amount of drug administered to users and non-users at each test series.

(table b) Since the various forms of the Army Alpha are not absolutely equivalent in difficulty, their order of presentation for any one group had to be identical in each of the three drug states. However, for each of the three groups tested the order of presentation was different so that all the difficult forms did not come at the same interval, as is shown on the following page. Kohs Block Design, Form Board, and Memory Tests Administration of these tests differed markedly from those discussed above in that no attempt was made to give them at regular successive time intervals. Rather, they formed part of a battery of individual tests given to various subjects under specific drug conditions. For example, 5 cc. of marihuana would be ordered for a patient for 8:00 A.M., and testing began as soon thereafter as the patient appeared "high," the state of "highness" being judged by the subject's own statement, his pulse rate, the condition of his pupils and other physiological signs.

(table c) Kohs Block Design was given to each subject twice, once without the drug and once with 5 cc. The test was taken by a total of 21 subjects, 10 users and 11 non-users. Five users took the test first without the drug, 5 had their first trial with 5 cc. Of the non-user group 8 had their first trial without marihuana, 3 with 4 cc. The average time at which the test was given to the user group was three and a half hours after drug administration, with range from two to five and a half hours. For the nonuser group, the average time of administration of the test was also three and a half hours after the drug was given, range two and a half to five and a half hours.

The two series of designs (one series being Designs IV, VI and XIV, the other V, VII and XII) were presented in such manner that half of the subjects were tested on one series and half on the other series while they were under the influence of marihuana. Thus any difference in degree of difficulty between the two sets of designs was canceled out. The weighted scores given on the Arthur Point scale were used in evaluating the results.

Form Board Tests were divided into three batteries, each battery consisting of the Seguin Form Board, one of the three larger boards (Two Figure, Five Figure, or Casuist) and one of the three smaller boards. Various combinations of boards were used under various drug conditions in order to make the results as comparable as possible. The following indicates the number of times the various boards were used with different dosages of marihuana.

From the results it appears that Gwyn Triangle was used too often with 5 cc. and Healy A was not used often enough.

(table d)

Aside from the Triangle and the Healy A, the distribution of boards in different drug stages

was such as to obviate any differences in degree of difficulty. Nineteen subjects, 10 users and 9 non-users, took this test. The results were scored for time and errors according to the Pintner-Patterson Performance series.

Memory tests. The first digit span test was always given before marihuana had been administered, since the Bellewe Scale was given each patient during the first two or three days of the study. The trials under 2 cc. and 5 cc. were alternated. In all, 28 subjects, 17 users and 11 non-users, took this test before and after the ingestion of marihuana. The final score equaled the number of digits recalled.

To test Object Memory, ten small articles such as a key, a ring, a pill box, and a crayon were placed on a flat, neutral surface and exposed for three seconds. An attempt was made to vary some of the articles at each presentation so that six or seven were the same and three or four were different. Twenty-six subjects, 11 users and 15 non-users, took this test. They were so divided that 10 of them took the test the first time without drug, 10 with 2 cc., and 6 with 5 cc.

To test Visual Memory, Army designs were given each subject three times, once prior to the administration of marihuana, once under 2 cc., and once under 5 cc. The test was given to a total of 28 subjects. 16 users and 12 non-users. Because there is no alternative form for this test, results were definitely influenced by practice.

Here, therefore, more than with any other test, it became important to arrange the order of administration. The following indicates the dosage of marihuana at the first test.

(table e)

It is obvious that the initial examination was given slightly more often when the subjects were not under the influence of the drug.

Improvement derived from practice is therefore more of a factor in the tests which were performed under marihuana.

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## FINDINGS

Bellevue Adult Intelligence Test General Intelligence. The results of the Bellevue Adult Intelligence Test which was administered to 60 subjects, 40 users and 20 non-users, are shown in Table 5. As has been pointed out elsewhere, these findings indicate that both the user and the non-user groups may be classified as of average intelligence.

(Table 5)

Mental Deterioration. Studies of mental deterioration due to toxic, organic or psychotic factors, as given in the literature, reveal that in such cases the subtest scores on the Bellevue Adult Intelligence Test show marked irregularity, depending upon the functions involved in the deteriorative process. As a group, the marihuana users tested show very even functioning, and what little irregularity occurred can be explained on the basis of language and racial factors.(4) From this we may conclude that the marihuana users had suffered no mental

deterioration as a result of their use of the drug. The age factor does not affect the result since the groups were well equated in this respect.

Army Alpha Test Total Mental Functioning. The total scores obtained from this test at the successive testing periods are shown in Table 6. Those recorded before the administration of the drug give a picture like that seen in any learning curve, that is, there is a gradual increment in test scores at each testing interval, interspersed with plateau periods.

Thus, without drug the test score for the second testing interval showed a 2 per cent gain over the initial score, the score for the third testing interval showed a 4 per cent gain over the initial score, and so on up to the last testing period when there was a 13 per cent gain over the initial test score.

Between two and a half and three hours after ingestion of 2 cc. of the drug there appeared to be a possible very slight falling off in mental ability. Otherwise the results paralleled the findings obtained in the undrugged condition except that toward the end of the day the increments were larger than those which occurred when the subjects were undrugged. This may be due to complications in the experimental procedure or may be an indication of accelerated mental functioning resulting from drug ingestion. This point is discussed more fully when the effect on different mental functions is considered.

Deleterious effects were apparent an hour after the ingestion of 5 cc. of marihuana. There was a 3 per cent drop from the initial score at this one-hour period and this first attainment is not surpassed until four and a half hours after drug ingestion. From the four-and-a-half-hour period on to the end of the testing there were gradual increments in score.

Different Mental Functions. A very elaborate study was made of the scores made on the subtest (Table 7). Some irregularities occurred even in the undrugged state, and these may be attributed primarily to chance factors, as, for example, the difference in difficulty of the various test forms. On the whole, the findings were in line with those which one would expect in any situation where constant repetition increases efficiency.

The effects of 2 cc. of marihuana on the different mental functions were variable. Tests involving number concepts gave clear-cut, consistent findings and revealed that impairment occurred an hour after the drug was taken and continued for from two and a half to three hours after ingestion. Results of other tests showed that there was little if any loss in ability, and some of them, especially those done toward the end of the day, showed gains which exceeded the ones made in the undrugged state. It is not possible on the basis of the present data to ascertain whether these large increments indicate that small amounts of the drug serve as stimulants in situations dependent primarily upon verbal facility or whether they are due to certain complications in the test technique. The former theory coincides with the increased verbosity noted on other tests as well as with the clinical impression, but the latter also cannot be overlooked.

Further investigation of this point is definitely indicated.

The effect of the 5 cc. dosage on each function was in line with that reported for total scores, that is, there was a falling off in efficiency one hour after the drug was taken and this impairment continued for anywhere from three and a half to six and a half hours after ingestion. Here too the scores on tests involving number concepts were most severely

affected, recovery for them taking place from six to six and a half hours after drug administration.

Degree and Duration of Drug Effect. In general it may be stated that marihuana has a deleterious effect on mental functioning, the extent, time of onset, and duration of the impairment being related to the amount of drug taken.

The adverse effect of the 2 cc. dosage on global intelligence was slight (about 3 per cent to 4 per cent impairment in efficiency) and of sort duration, occurring at about two and a half hours after ingestion and lasting little longer than a half-hour or an hour. Certain mental functions, especially those dealing with number concepts, appear to have been affected much earlier than others, the effect on the number test scores being measurable as early as one hour after ingestion and continuing until two and a half hours after ingestion. For other functions, in particular those involving verbal facility, the results were variable, in some instances showing no adverse effect and even a slight acceleration.

The effect of 5 cc. of marihuana on global intellectual functioning was apparent within an hour from the time the drug was taken and was operative until four and a half hours after ingestion. All mental functions showed this early impairment but for some of them recovery from the adverse effect was earlier than for others. Those most severely impaired from point of view of duration were the ones dealing with number concepts.

(Table 6)

The testing program was continued for only seven hours after the drug was taken and, therefore, any estimate of the effect of marihuana after this time is purely a subjective one. However, both the subject and the examiner felt that the drug produced a "hang-over" which in most cases continued into the following day. The subject complained of being headachy, sleepy, and unable to work at his usual level, and the examiner also noted that the subject did not work as well or as quickly when called upon to do something on a day following marihuana ingestion.

The impairment reported here is not entirely representative of the maximum impairment which occurs under the influence of marihuana. Two opposing variables account for the results obtained in the drugged condition. One variable is practice effect which tends to increase test scores with each succeeding trial. The other variable, the drug, tends to lower test scores. In the earlier sessions there was evidence that the marihuana, especially when given in large doses, is the more potent force, as seen by the continuing downward trend of the curve during the first few hours. In these earlier phases, in spite of repetition, results were lower with each succeeding trial, or if there was no actual loss, the increments made were never comparable to those made in the undrugged state. Three or four hours after drug administration there was a general trend toward rising scores. Some of this gain must be attributed to increased practice effect which was counteracting, in part at least, the deleterious effect of the marihuana. For this reason it is not certain that the drug was less effective at later points in the curve than it was at the moment of seemingly greatest impairment. This seems particularly plausible because, beginning with the third hour, the subject was no longer working on new tasks but was actually repeating identical tasks that he performed earlier in the day. Thus, at the third hour the test form used was the same as the one given at the initial session; at the end of the three-and-a-half-hour period the form was the same as the one-hour examination, and so on. What is shown in the curves is the effect of marihuana on intellectual

tasks with which the subject has become very familiar. For practical purposes the test situation has the advantage of being comparable with daily living since the tasks performed in daily routine are usually relatively familiar ones.

(Table 7)

**Speed Versus Power.** Intellectual impairment under the influence of marihuana resulted from a loss in both speed and efficiency. There was a slowing up in output indicated by the difference in the number of items done before and after the administration of the drug. On the whole the number of test items attempted tended to increase at each succeeding examination period even when the subject was under the influence of marihuana, but the percentage of increase in the drugged state practically never equaled that attained for the corresponding time interval when the subject had not ingested the drug. The findings for the number of items done in the drugged and undrugged condition follow very closely the findings in respect to the number of items correctly done. From this it may be concluded that under the influence of marihuana an individual functions less rapidly and also less efficiently than when he has had no drug.

Careful analysis of what causes the loss in efficiency reveals that certain factors not necessarily related to mental ability per se were accountable for the reduced scores in the drugged state. For example, under the influence of the drug the subject felt dizzy, had blurred vision, or exhibited other handicapping physiological disturbances. These impeded his efficiency in putting his answer on the correct line, or marking a cross in the right box. Men were observed running their fingers across the page in an effort to keep their place. On the other hand, much of the intellectual loss can be ascribed to an impairment in the thinking processes, and there seemed to be a general confusion of ideas and inability to maintain a fixed goal. Some subjects reported that the reason they accomplished so little was that, by the time they had finished reading a question, they no longer remembered what their purpose in reading it had been. Occasionally perseveration of a form of response specific to one test was found in a subsequent test. For example, some forms of the Same-Opposite test require the subject to mark the answer S or O. In a later test requiring a plus or minus response occasional irrelevant S's or O's appeared.

**Comparison of the Effect of Marihuana on User and Non-User.**

When the group is divided into marihuana users and nonusers certain interesting and suggestive differences are revealed (Table 8).

Although the general findings for total intelligence scores for the two groups follow similar curves, the deleterious effects were not as great on the user as on the non-user. Thus under 2 cc. of marihuana the user showed no real intellectual impairment except for a very short interval beginning about two and a half hours after ingestion and lasting for an hour or an hour and a half. In contrast to this he made gains both at the beginning of the testing and toward the end of the day which exceeded those made in the undrugged state. The non-user who had ingested 2 cc. of marihuana showed a definite drop in score beginning about two and a half hours after ingestion, and for a period from one and a half to two and a half hours after this time he did not make increments comparable to those which he made in the undrugged state. Following this, during the last two hours of testing he, like the user, obtained scores which showed an acceleration not paralleled in the undrugged state.

(Table 8)

Under 5 cc. of marihuana both the user and the non-user showed a 3 per cent loss in efficiency within an hour of the time that the drug was taken. Although recovery was slow for both groups, the user was less severely affected, as is indicated by the fact that at the next testing interval his score was only 1 per cent below his initial score as compared with a 7 per cent loss on the part of the non-user. The disparity in the degree of impairment for the two groups continued for several hours. The more marked drug effect in the case of the non-user was further evidenced by the fact that the user showed recovery four or four and a half hours after ingestion (as measured by the time when his scores approach those made when in the undrugged state) while the non-user, even at the end of seven hours of testing, did not approximate his undrugged performances.

No simple explanation of this difference is available. The most probable reason seems to be that previous use of the drug in some way serves to ameliorate that anxiety and inevitable disorganization which the use of any drug may have on an individual who has never taken it before. Another explanation may lie in possible physiological adaptation to the drug which, though not identical with tolerance in the ordinary pharmacological sense, seems to act in the same direction.

Variability. The results reported here are all in terms of averages.

A study of individual scores indicates that there was marked variability in the effect of the drug on different subjects. In one case the drug action came early and soon disappeared. Another subject experienced no reaction until after he had eaten his lunch, at which time a very definite effect was apparent. A third subject showed impairment late in the day when the drug effect on almost all the other subjects had worn off. There were some hardy souls who did not appear to be affected by even large quantities of marihuana, while a few (mainly non-users) became so ill that they could not continue with the examinations.

Pyle's Digit Symbol Test Comparison of the results obtained on this test when the subject was in the undrugged condition and when he had had 2 cc. of marihuana reveals that small amounts of the drug did not interfere with his ability to carry out the appointed task (Table 9). In fact, as was noted above for certain other tests, the improvement in score at the end of two and a half or three hours was greater after the ingestion of 2 cc. of marihuana than it was when no drug had been administered, and at the end of the five-hour testing period there was a 32 per cent increase in score as against a 22 per cent increase in the undrugged condition.

Under the influence of 5 cc. of marihuana, however, there was a decrease in ability occurring within an hour after the time the drug was administered. Although the scores show no actual loss as compared with the initial score, the increments did not equal those made in the undrugged condition until from four to four and a half hours after ingestion.

It may therefore be concluded that certain types of learning ability are not affected by small amounts (2 cc.) of marihuana, but are impaired when larger amounts (5 cc.) are ingested.

(Table 9) (Table 10)

Cancelling a Geometric Form The results of this test are shown in Table 10.

With 2 cc. of marihuana, there was a slight falling off in the subject's efficiency occurring about three hours after drug ingestion.

At that time he was 3 per cent less efficient than he had been an hour previous. With 5 cc. of marihuana there was a slowing up in the subject's ability to carry out the appointed task, which was apparent two hours after drug ingestion (and possibly earlier). At that time there was only a 4 per cent increment over his initial score as compared with a 10 per cent increment in the undrugged state and a 12 per cent increment when the 2 cc. dosage had been administered.

He improved only slightly at the three- and four-hour testing interval, and only at the five-hour interval did he show an appreciable improvement.

Apparently, the carrying out of a simple routine task is adversely affected to a slight degree and for a short period of time as the result of the ingestion of 2 cc. of marihuana while the ingestion of 5 cc. of the drug produces adverse effects which are more severe and more lasting.

Performance Tests Seguin Form Board. For adults of average intelligence this test is primarily one involving speed of reaction time. The average time taken by the subjects when they were not under the influence of marihuana was 12.8 seconds. This was increased to 14.0 and 14.1 seconds under doses of 2 cc. and 5 cc. respectively. Thus, ingestion of marihuana in 2 cc. and 5 cc. doses caused a 9 per cent delay in performance time.

Form Boards. The time scores for this test remained practically the same whether no drug, 2 cc. or 5 cc. of marihuana had been administered, the average scores in terms of mental age being respectively 11.7, 11.7 and 11.9 years. The error scores also showed little change as a result of drug ingestion, the averages in terms of mental age being 9.7 years (no marihuana), 9.9 years (2 cc.) and 10.2 years (5 cc.), and what change occurred was in a positive direction, that is, there was a very slight improvement in the subject's performance when he was under the influence of marihuana.

Kohs Block Design. This test correlates more highly with abstract intelligence than do any of the other performance tests. Here the drug had a definitely deleterious effect when it was administered in large amounts. The average score was 17.6 when the subjects were not under the influence of marihuana and 14.8 after they had ingested the drug; that is, under 5 cc. of marihuana there was a 16 per cent loss in score as compared with undrugged results.

In general it appears that those functions most closely associated with higher intellectual processes are more impaired by the drug than are the simpler functions.

Memory Tests Rote Memory. As measured by the ability to repeat digits forward there were no changes in rote memory as a result of drug ingestion, the average scores under no drug, 2 cc. of marihuana, and 5 cc. of marihuana being in each case 7.1.

Digits Reversed. Although the giving of digits in reverse order is always grouped with memory tests this task actually requires something over and above mere recall. It demands a mental control not necessary in tests dependent purely upon rote memory. Although simple rote memory, as measured by the ability to repeat digits forward, was not affected by the ingestion of marihuana, the repetition of digits reversed was affected adversely. In the undrugged state the average for the group was 5.4, with 2 cc. the average was 5.0, and with 5

cc. it was 4.8. The impairment was comparatively small but it seems to have been related to the amount of drug taken.

**Object Memory.** The average scores under no drug, 2 cc. of marihuana, and 5 cc. of marihuana were respectively 6.2, 5.6, and 5.9- that is, there was a loss of about 9 per cent in the subject's ability to recall objects which had been exposed to his vision for three seconds when he took the test under the influence of 2 cc. of marihuana, while after the ingestion of 5 cc. the impairment was less, being only about 5 per cent. This seemingly contradictory result is probably due to the fact that by the time the subjects took the test under the influence of 5 cc. most of them had already had it two times previously. The loss in terms of absolute number of remembered articles was slight.

**Visual Memory.** In this test as in the case of digits reversed something over and above simple memory function is involved. A capacity for analysis and synthesis which correlates well with intelligence is required for the successful execution of this task, and it is this function which is adversely affected by the ingestion of marihuana. The average scores were 10.3 (no drug), 9.7 (2 cc.) and 7.8 (5 cc.); that is, after the ingestion of 2 cc. of marihuana there was a 6 per cent drop in score, while under 5 cc. there was a 24 per cent drop.

In general one may conclude that simple memory functions are not affected by the administration of marihuana while the more complex memory functions are affected adversely, the extent of the impairment being related to the amount of drug taken.

Throughout the examination of subjects on individual tests, the same difference was observed in intensity of the effect upon user and non-user as was noted in group tests.

**Experiments with Marihuana cigarettes** In addition to the tests made to determine the effect of the ingestion of marihuana on various intellectual functions, several experiments were tried with marihuana cigarettes. The tests used in this part of the study were the Bellevue Adult Intelligence Test; the Woody McCall Mixed Fundamentals Test, Form I, which consists of thirty-five examples requiring addition, subtraction, multiplication or division; a cancellation test in which the subject is required to cross out a specific number (in this instance the number 8) wherever it appears on a sheet covered with rows of numbers; the Kohs Block Design Test; and the test for rote, object, and visual memory.

The subjects took the test series and individual tests twice, once without the drug and once after having smoked marihuana cigarettes. They were not given a specific number of cigarettes but were told to smoke until they felt "high." The number of cigarettes smoked to produce this effect ranged from two to seven.

The Mixed Fundamentals and cancellation tests were given as group tests and were repeated at half-hour intervals for two and a half hours. In the series given when the subjects were "high," the first test was taken as soon as the cigarettes had been smoked. Time limit on each test was one and a half minutes.

The Bellevue Adult, Kohs, and memory tests were given as individual tests and were administered only twice, once before the subject had smoked marihuana cigarettes and once after he had become "high" from smoking them. If during the course of the examination he wanted another cigarette or the examiner had reason to suspect that he was no longer under the influence of the drug, more cigarettes were smoked. The number of cigarettes used during

a three-hour testing period ranged from six to twelve.

In the cancellation, Kohs, and memory tests the subjects were so divided that half took the tests for the first time before they had smoked and half after they had smoked. In the Woody McCall Mixed Fundamentals Test more non-users had their first tests before they had smoked. The Bellevue Adult Intelligence Test was always given first without the drug during the two or three days immediately following the subject's admission. Four weeks later the test was repeated on 10 subjects while they were under the influence of marihuana cigarettes.

Bellevue Adult Intelligence Test Ten subjects, 5 users and 5 non-users, repeated this test under the influence of marihuana. The results are shown in Table 11.

(TABLE 11)

Since the test taken when the subject was "high" was always his second experience with it, some allowance must be made for practice effect. Without drug the average I.Q. of these subjects was 101.6, while after they had smoked cigarettes it was 104.4. This increase of only 2.8 points is smaller than one would probably get with repetition occurring after such a short time interval. It may be concluded, therefore, that smoking marihuana cigarettes has some negative effect on intellectual functioning, in that the subject benefits less from previous experiences than he would if he had not smoked.

Woody McCall Mixed Fundamentals Test, Form 1 This test was given to 24 subjects, 10 users and 14 non-users.

>From the results which are shown in Table 12 it may be concluded that when the subject was "high" after smoking marihuana cigarettes there was a slowing up in his ability to do simple arithmetic calculations. This lag occurred within the first half-hour after smoking and continued for at least an hour. The deleterious effect was not such as to cause an actual loss in ability but the increments resulting from repeated practice were never as great in the drugged as in the undrugged state. Thus, the initial increment was 10 per cent in the test given before smoking and only 4 per cent in the one administered after the subject had become "high." The final increment at the end of two and a half hours was 20 per cent without drug, 13 per cent with drug.

This test measures the subject's ability to use acquired knowledge.

Under the influence of marihuana cigarettes the capacity for using such an acquired skill is not lost but is slowed down. The adverse effect of smoking marihuana in cigarette form occurs almost immediately in contrast to the delayed action of the pills.

(TABLE 12)

Cancelling 8's Sixteen subjects, 8 users and 8 non-users, took this test, the results of which are shown in Table 13. As a result of smoking marihuana cigarettes the subject worked a little slower in his execution of a routine task than he did when he had not smoked. The increment over the initial score in the test score made a half-hour after he became "high" was only 7 per cent as against an increment of 9 per cent when the cigarettes had not been smoked. His performance was slowed up for one hour after smoking and possibly longer.

(TABLE 13)

**Kohs Block Design Test** This test, which measures performance ability, was given to a total of 9 subjects, 6 users and 3 non-users. The average score without the drug was 18.5, and after cigarettes had been smoked 14.7. This difference in score of 3.8 points indicates a loss in efficiency of 21 per cent.

**Memory Tests Rote Memory.** Thirteen users and 9 non-users took this test.

Neither in repeating digits forward nor in giving them in reverse did the subjects show any disadvantageous effects from the use of marihuana cigarettes, the average scores before and after smoking being 6.9 and 7.1 respectively for the digits forward test and 5.2 and 5.1 for the digits reversed test. The only explanation for this deviation from the results obtained when marihuana was taken in pill form is the inability to control the dosage when marihuana is given in cigarette form.

**Object Memory.** Thirteen subjects took this test. Object memory was not impaired by the smoking of marihuana, the average scores being 6.8 before the cigarettes were smoked and 7.1 when the subjects were "high." **Visual Memory.** There was an .8 point loss (from 10.5 to 9.7) in the average score of the 20 subjects, 11 users and 9 non-users, who took this test. This represents an impairment of about 8 per cent.

**Effect of Marihuana Cigarettes on Users and Non-Users** The difference in intensity of effect of marihuana cigarettes on the user and on the non-user was not the same as the difference in the effect of the marihuana concentrate on these two groups. The user was usually more affected by smoking marihuana than was the non-user, probably because the nonuser did not smoke as much or as intensely as the user and was not as much under the influence of the drug.

## FINDINGS

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### **Rorschach Test**

Table 14 gives the Rorschach findings for 45 subjects both in the undrugged and drugged states. The measurable changes on the test which occurred during the period of drug intoxication were few and not far-reaching. They may be considered indications of tendencies rather than of significant alterations of the personality.

(TABLE 14)

When the subjects were under the influence of marihuana (either 3- 6 cc. or cigarettes, the number of cigarettes being at the discretion of the smoker) there was a slightly freer flow of associations than there was when they were in the undrugged state, an increased productivity which coincided with the impressions obtained from general observation of the subjects when they were "high." Without drug the average number of interpretations made was 20.0, with drug 23.3. This increased number of responses was due primarily to the subject's greater

awareness of small, extraneous details which in his undrugged state he overlooked. Thus, while 17 per cent of the subjects' answers were small or rare detail responses when no marihuana had been administered, with marihuana this increased to 21 per cent. Coincidental with his increased absorption in the irrelevant there was a slight decrease in the subject's drive to organize and synthesize. Whereas without drug 40 per cent of the responses involved the entire blot, with drug this was true of only 36 per cent of the interpretations. Under the influence of marihuana there was a mild tendency for the subject to become preoccupied with minutiae rather than to concern himself with the larger, more important aspects of a situation, and this implies some falling off in meaningful constructive behavior.

When the subject had taken marihuana there was some decrease in the objectivity with which he sized up situations. This was indicated by the fact that without drug 92 per cent of his interpretations were good form, that is, they corresponded to the form of the blot, while with drug this percentage fell to 86 per cent. The drug had an adverse effect on the individual's critical faculty and he was more prone to jump to erroneous conclusions than he was when he was in the undrugged state.

The only other change that occurred on the Rorschach test after the ingestion of marihuana was the decrease in the subject's ability to think in line with the group. This showed itself in the decreased number of popular interpretations made, the drop being from 27 per cent without drug to 20 per cent with drug. In other words, during the period of drug intoxication an individual is somewhat less likely to see the obvious and the commonplace than he is in his normal state.

As important, or possibly even more important, than the changes which occurred on the Rorschach after ingestion or smoking of marihuana, is the fact that some of the most basic personality attributes remained unchanged. Thus it appeared that 33 per cent of the subjects in the undrugged state were what is described as introversive, that is, they were individuals who tend to withdraw somewhat from the world about them and depend primarily on their own inner resources for emotional stimulation; 20 per cent were extravertive, depending mainly on their environment for affective satisfaction; 20 per cent were ambivert, showing equal potentialities in both directions; and 27 per cent were emotionally constricted to the point where they gave little or no evidence of emotional response of any type. With drug 36 per cent were introversive, 22 per cent were extravertive, 20 per cent were ambivert, and 22 per cent were constricted. Marihuana ingestion or smoking served to dilate the emotional life of only 2 of the subjects and shifted the type of 1. In all 3 cases the change was actually a very slight one. The fact that the emotional trends remain essentially unchanged under the influence of marihuana was further revealed by the fact that the ratio for evaluating the individual's emotional type, that is, the ratio of movement to color, remained roughly the same before and after he had taken the drug, being 2.3:1.6 when he was in the undrugged state and 2.9:2.1 when he was in the drugged phase.

Although the quantitative changes occurring with marihuana ingestion or smoking were not large, there was a qualitative difference in the protocols obtained from the subjects in the undrugged and drugged stages. Not only was there a slight increase in the actual number of interpretations made, but the amount of talking and extraneous comment increased. The subject played around with answers and often repeated them. He seemed anxious to get his every thought clearly across to his audience. More than this, he was much freer in the type of interpretation he allowed himself.

For example, one interpretation on Card II read: "Two dogs. Now wait a minute. I don't want to jump to conclusions but it looks as if the dogs were having intercourse and there was a rupture." This response was not repeated when the subject was retested in the undrugged state. Nor was this individual unique in showing this qualitative difference. The disinhibition and lessening of restraint which was a definitely observable effect of the drug was also reflected in the assured explanations and lengthy tirades which the subject offered on topics which in his undrugged state he would undoubtedly feel were beyond him. Thus one subject interpreted Card X as "old bark of trees, roots dried up. It's thousands of years old; it takes thousands of years to do that. I got to tell you that. I got to cover for you. You wouldn't know about a thousand years ago. I'm smart now." In some instances the "cockiness" induced by his drugged condition produced an entirely new attitude in the subject. Instead of the customary deferential, almost ingratiating approach there was now a confident "know-it-all" manner.

The effects of marihuana ingestion on user and non-user were essentially the same, as indicated by the findings in Table 14, except that on the whole the alterations which did occur were more marked for the non-user than for the user. Thus, for example, while the average number of responses given by the user increased only 11 per cent, those of the non-user rose 26 per cent. Again, the user when drugged gave only 6 per cent fewer whole answers as against a decrease of 15 per cent in the whole responses of the non-user in the drugged state. The user showed a 29 per cent increase in small detail interpretations, the non-user 31 per cent. There was only a 2 per cent drop in good form interpretation by the user as against a 12 per cent drop for the non-user. Only in the loss of popular interpretations did the user exceed the non-user, his falling off being as great as 31 per cent as compared with 24 per cent for the non-user. While the number of subjects in both groups was too small to allow of definite statements, the trend seemed to indicate that the ingestion or smoking of marihuana has a greater adverse or disorganizing effect on the neophyte than on the experienced smoker, again, as was the case in the study of mental functioning, suggesting the possibility of psychological habituation.

When the protocols obtained from these marihuana users in their undrugged state are compared with those of the nonusers or with the norms postulated for average adults of this age level, certain deviating personality traits in these users may be noted. The most striking deviation is the small percentage of users who showed an extravertive personality. Only 15 per cent of the marihuana users used in this study responded primarily to emotional stimuli in the world about them as compared with 28 per cent of the non-users.

While no definite figures are given in the literature for the degree of extraversion in the general population, it seems definitely more than 15 per cent. Altogether the personality types among the non-users show a much more even distribution than those among the users as seen in Table 15. Judging by the personality types the majority of marihuana users lack social ease and adroitness and are likely to find it difficult to make good outgoing social contacts.

(TABLE 15)

Sixty-two per cent of the marihuana users' interpretations were determined by the form or outline of the blot. Such responses require an objective critical attitude unmodified by emotional factors. However, when this attitude is maintained to the point where more than 50 per cent of the answers are of this nature the individual has a constricted affective life the degree of constriction being in proportion to the increase in form interpretations. Thus, as was previously noted, there was more than average emotional inhibition evident among the

marihuana users studied in this experiment. Since emotional inhibition frequently causes intellectual constriction it is not surprising to find that the stereotypy in these records was slightly above expectancy, as indicated by the fact that 59 per cent of the responses were animal or animal detail interpretations as compared with a norm of from 25 to 50 per cent.

Finally the marihuana users (as well as the non-users in this experiment) showed a depressive outlook in that more of their responses were determined by the gray and black colors than by the vivid colors. In interpreting this fact it must be borne in mind that the subjects were all prisoners and their depressive attitude may have been a reflection of their present situation rather than of a basic trait.

### **Goodenough Test (Drawing of a Man)**

This test is helpful in studying each individual both in the drugged and undrugged state, but group results are not meaningful (except for one finding given below) because of a lack of similarity both in the drawings obtained in the undrugged state and in the direction of change which occurred after drug ingestion or smoking. However, certain qualitative findings proved interesting and are therefore reported here. In a number of cases the identical drawing was produced in the undrugged, 2 cc., 5 cc., and cigarette state, but the size of the figure increased consistently with the amount of marihuana taken. This increase in size may have been a reflection of a physical sensation induced by the drug, may have been due to a tendency to macrographia which was noted in the writing of some subjects, or may have been the psychological representation of increased feelings of confidence and security.

With marihuana there was an increase in the percentage of subjects who remembered to give their man ears. This again may have been due to a heightened awareness of ears because of physical or auditory sensations or might denote a greater receptivity to what others have to say.

In some cases the amount of time consumed in execution of the drawings was considerably greater when the subject was "high." This additional time was rarely used for elaborating the picture but was caused by the subject's altered mood. In many instances the laughter and joking in which he indulged kept him from completing the job with dispatch. In other cases depression or nausea slowed him up. Although aware of the details which should be included, the subject was often satisfied to indicate such items by a single line or dash rather than discipline himself to the point where he could make a careful picture. In some of these cases the drawing had attributes which resemble the findings sometimes seen in productions of individuals in a manic mood.

When a person is given a sheet of paper and is asked to draw a man on it, the paper and the figure he draws become the situation he must manipulate. If the figure is well centered so that the finished product gives a balanced composition, the subject has handled the circumstance in adequate fashion. The one consistent finding for this test was the fact that the subject's ability to handle situations was not improved by drug ingestion or smoking. In the case of both user and non-user the percentage of balanced compositions produced in the various drug states did not change from the results obtained in the undrugged condition. It is, however, interesting to note that 59 per cent of the marihuana users made "unbalanced" drawings in the undrugged state as compared with only 29 per cent of the non-users. It may be inferred from this that fewer users than non-users are inclined to come out into the center of the scene. This

carries with it implications of poor adjustment and insecurity.

### **Level of Aspiration Test**

In the undrugged state the majority of the subjects manifested reactions which are usual in the experience of other experiments, namely, the tendency to place their estimate just a little above their actual performance. This was demonstrated by the fact that while the average performance time needed for carrying out a set task (putting sixteen blocks in a box, red side up) was 23.6 seconds, the subjects' average estimate for accomplishing this was 21.9 seconds. As their performance improved with practice, the subjects tended to allow themselves less time for the job. Such statements as, "I should do better this time," or "I'll take a chance," were not infrequent. Some subjects wanted to know the best score ever made, and worked energetically to attain it.

With 2 cc. of marihuana there was a slight increase in the average estimated time for the entire group although there was no concomitant increase in performance time. Under this dosage the estimated time was 23.1 seconds, performance time 23.4 seconds. Although the subject actually took no longer to do the job he thought he would work more slowly and in predicting his achievement gave himself more time. His attitude during the test was a much easier, more happy go-lucky one. He occasionally stopped in the middle of the experiment to discuss something with the examiner or call out to someone passing in the hall. There thus appeared to be a small loss in drive which, though not revealed by significant statistical differences, was indicated by the numerical trend and by the subject's attitude toward the test.

After the ingestion of 5 cc. of marihuana the average estimated time was 23.2 seconds and the performance time 24.4 seconds. Here the relationship between estimated and performance time was similar to that found in the undrugged phase, that is, there was a 1.2 second gap between them. During this drug phase the subjects seemed less relaxed than they were under 2 cc., and their main interest seemed to be to get back to bed and be left undisturbed.

Under the influence of marihuana cigarettes the trend was similar to that found with 2 cc., the difference between the estimated time and the performance time being only 0.3 second. As with 2 cc., subjects behavior was generally happy and relaxed.

When the group was divided into users and non-users the trend was the same for both.

(TABLE 16)

On the whole it appears that small doses of marihuana and of marihuana cigarettes tend to lower the individual level of aspiration, that is, there is a slight lessening in the subject's drive and his will to achieve. Larger doses (5 cc.) do not produce this effect.

### **Frustration Test**

The results of the frustration experiment indicated no statistically significant differences between the subject's reactions before and after he had taken marihuana. Again, after the ingestion of marihuana there was a slight trend toward lowering the level of aspiration (Table 17), but the over-all change was not startling when compared with results on the Level of Aspiration Test when no frustrating experience was introduced.

(TABLE 17)

### **Binet Lines**

Binet's interpretation of this test was based upon the principle that suggestible individuals, once embarked on a particular form of activity (in this instance, drawing lines of increasing length), are more prone to continue this activity when the stimulus is altered than are less suggestible people. Judging by the results as given in Table 18, small doses of marijuana (2 cc. and cigarettes) induced this type of perseverative behavior in the users but not in the non-users. In other words, the marijuana user when under the influence of the drug tended to continue an activity he had started without being too discriminatory or controlled about it. The non-user, on the other hand, showed a curtailment in activity and responsiveness. One possible explanation of this difference in effect on user and non-user appears to lie in the fact that the drug made the user more relaxed and easy-going and less controlled in motor activity than he was in his undrugged state, while the non-user was often more tense and disturbed. As was so often the case in the personality tests, the effect on the user of large doses of the drug (5 cc.) was contrary to that of the small ones, probably because in many cases he was made physically uncomfortable and intellectually disorganized.

(TABLE 18)

The lack of consistency in the findings seems to suggest that the individual's psychological and physiological "set" toward the drug affects his reaction and behavior. Thus small doses, which the marijuana user anticipates with pleasure make him more easy-going and therefore probably more suggestible than he would be in his undrugged state, while large doses have a contrary effect. The non-user, on the other hand, appears to be less suggestible as a result of drug ingestion than he ordinarily is.

### **Wechsler Vocational Interest Blank**

The average number of positions chosen by the subjects when they were in the undrugged state was 13.2. With 2 cc. of marijuana the average was 12.9; with 5 cc., 12.7; and with cigarettes, 11.8. There was a very slight but not statistically significant trend toward a decrease in job interest. However, the absence of any appreciable change in the number of positions liked after the ingestion or smoking of marijuana indicates that no real withdrawal is implied.

Analysis of the type of position chosen shows that under the influence of marijuana there was no swing to the more feminine occupations, but in the case of some subjects, especially marijuana users, there was a falling off in the popularity of some jobs which require considerable activity. For example, under the influence of 2 cc. of marijuana or of marijuana cigarettes the jobs of detective, policeman and taxi driver were found among his least desired occupations though they were not in this place when he was in the undrugged state.

The trend was the same for the user and the non-user in both the drugged and undrugged phase. For the user the jobs of aviator, gymnasium teacher, newspaper reporter, sailor and soldier were most frequently chosen; for the non-user aviator, doctor, explorer, forest ranger, newspaper reporter and prize fighter were most popular.

## **Loofbourrow Personal Index: Test I**

Before taking marihuana, the user and non-user on an average indicated familiarity with an identical number of words, 65.2. After he had smoked marihuana cigarettes, the user's vocabulary showed a gain of 6 words, the non-user's 5 words. In both cases the subject's confidence in his verbal capacity was enhanced by the use of marihuana.

## **Wechsler Free Association Test**

In the undrugged state the user and non-user were disturbed by the same stimulus words, namely "lonely," "passionate," "insult," and "sin." The only differences were the disturbance the user showed in response to the words "wish" and "murder" and the delayed reaction of the non-user to the word "pity."

Under the influence of 5 cc. of marihuana or of marihuana cigarettes the user was less disturbed by all these words with the possible exception of "insult," but there was a sharp increase in the agitation aroused by the words "suicide" and "death." It appears that the feeling of well-being produced by the drug tended to alleviate the loneliness, guilt, and frustration which the subject felt, but it was also accompanied by a fear of death. This may be tied up with the anxiety the marihuana user always experiences in regard to the amount of drug he is taking, the always present fear of his "blowing his top," or it may be a reflection of the problems which were most disturbing to him.

The non-user, after taking marihuana, was also less disturbed by the words "lonely," "passionate," and "sin." His reaction to "pity" was also diminished but he, too, was still upset by the word "insult." The new disturbing stimulus words were not those which upset the user but those which were more closely related to his own immediate problems namely "honest," "money," and "sex." Since the non-user in our group was generally an individual who had been sent to prison because of stealing or a sex offense, it seems it was these problems which the disinhibiting action of the drug brought to the fore.

## **Pressey X-O Test**

This test was taken by only 10 subjects, 5 users and 5 nonusers. In general, the smoking of marihuana brought about some increase in the number of words which had an unpleasant meaning to the subject and in the number of things about which he had worried. There was some decrease in the number of things for which the drugged subject thought a person should be blamed. The number of his associations with any one word remained roughly the same in the drugged and undrugged state.

Although less inclined to censure when under the influence of marihuana, the subject was nevertheless more readily disturbed and worried. This undercurrent of irritability and anxiety seemed to be a concomitant of the more obvious feeling of general well-being which is the predominant effect of the drug. Two possible explanations can be given here for this finding: the physiological changes occurring with the smoking -of the drug gave the subject a feeling of anxiety, and the disinhibition which occurred at this time released the restraints which had been imposed not only on the happier reactions but on all the repressed unpleasantness as well, and things which the subject had repressed because he wished to forget them now came to the fore. This was noted when at least two of the subjects had "crying jags" when drugged,

reproaching themselves for what they had done to their mothers and wives.

### **Downey Will-Temperament Test: Test I**

The changes in the subjects' responses on this test showed a shift in their attitude toward themselves as a result of marihuana ingestion. On the whole, more subjects appeared to think better of themselves when they were "high" than they did in their undrugged state. This is indicated by the fact that there was an increase in the number of individuals who under the influence of 5 cc. of marihuana or of marihuana cigarettes believed themselves to be careful, cautious, ambitious, accurate, industrious, impulsive, enthusiastic, and possessing superior characters. There was also a decrease in the number who considered themselves suggestible or extravagant. The only negative traits which the subject admitted to more frequently when he was "high" than he did in his normal state were suggestibility, poor memory and aggression. The change in attitude in regard to aggression was most striking among the marihuana users, 88 per cent of whom considered themselves aggressive after they had had the drug as compared with only 42 per cent in the undrugged state. This increase in the feeling of aggression was not paralleled by the findings of the other tests nor by the behavior of the subjects when they had taken the drug. Like the increased vocabulary noted on the Loofbourrow it can best be interpreted as an indication of the subject's increased feelings of confidence and self-assurance.

(Table 19)

In general the changes which occurred on this test after the subject had had marihuana were not consistent for the user and the non-user or for different amounts of the drug. They merely served to indicate that when the subject was under the influence of marihuana there were shifts in his feelings about himself which reflected a prevailing mood of confidence and self-satisfaction.

### **Thematic Apperception Test**

Without cigarettes the needs most frequently expressed in the subjects' stories were "affiliation," "aggression," "sex," "dominance," "succorance," "self-abasement," and "play." These terms may be defined as follows:(1) Affiliation: to be sociable, to make friends, to love. Aggression: to fight, to criticize, to blame, to accuse or ridicule maliciously, to injure or kill, sadism. Sex: to seek sex objects, to court, to enjoy intercourse. Dominance: to influence or control others, leadership. Succorance: to seek aid, protection or sympathy. Selfabasement: to comply, to surrender, to accept punishment, to apologize, to condone, to atone, to depreciate ego, masochism. Play: to relax tension and alleviate stress by pleasurable and humorously irresponsible activity, motor, verbal or mental.

In general the frequency with which all needs were expressed fell off after the subjects had smoked marihuana cigarettes. The most striking drops were in the need for self-abasement and aggression where the frequency of occurrence changed from 2.4 to 1.1 for the former, and from 2.7 to 1.7 for the latter. Contrary to the general trend there was an increase in the need for dominance.

When the subjects were not "high" the environmental influences most frequently mentioned in their stories were illness and death and accepting parents. After smoking marihuana the general trend was similar to that noted for the "needs," that is there was a falling off in the

frequency with which the subjects used most of the concepts.

There was, however, no diminution in the number of times that illness and death played a part in their tales, the average number being 2.1 before smoking and 2.2 after smoking. Likewise the awareness of restraint and imprisonment remained constant, occurring 1.1 times before smoking and 1.2 after. Contrary to the general trend there was an increased awareness of an accepting love object. This concept appeared in the stories on an average of .8 time before smoking and 1.2 after.

The decrease in the number of times both needs and environmental pressures were expressed in the stories given after the subjects had had cigarettes was not due to a curtailment in the length of the story. The tales were often more wordy in the drugged than in the undrugged state, but their length was frequently due to embellishment and repetition, and there was likely to be less meaningful material. In general the stories obtained from the subjects after smoking indicated that they had less capacity for expressing themselves directly and clearly, and also less concern with self-abasement and aggression. As defined on this test these needs represent a conflict between aggression against the self and against others and appear to stem from insecurity and feelings of guilt and inadequacy. In the drugged state the subjects appeared less disturbed by this conflict and had less need to harry themselves and others. They had a greater need for dominance, a desire for leadership. This ties in with the greater self-assurance demonstrated by other tests and with the increased awareness of acceptance by a love object found on this test.

It is interesting to note that these subjects showed no falling off in their awareness of illness and death or of restraint and imprisonment after smoking. The frequency of the latter concept was undoubtedly related to their status as prisoners, while the former ties in with the findings on the Free Association Test where the word "death" remained a disturbing factor even after marihuana had been smoked or ingested.

(1) Directions for Thematic Apperception Test prepared by Robert W. White and R. Nevitt-Sanford, Harvard Psychological Clinic, February 1941.

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## **FINDINGS ON WOMEN SUBJECTS**

As in the case with the men, when the female subject was under the influence of marihuana her basic personality structure did not change and only some relatively superficial emotional reactions were different. As a group, the women used in this study showed a somewhat constricted personality, and this constriction was not lessened when the subject was "high." The emotional reactions revealed in the Rorschach Test showed that the subjects in this particular group were primarily extravertive, and this remained unchanged after the administration of marihuana. Again, like the men, when under the influence of the drug the women lowered the achievement levels they set for themselves. However, they did not show any increased self-confidence as did the men, either by an increase in the number of words they claimed to know in the Loofbourrow Test or in their appraisal of themselves as indicated in the Downey Will-Temperament Test. In general, the women exhibited a loss of drive for participation in anything requiring effort. This is inferred from their performance in the Level of Aspiration Test, the Vocational Interest Blank, and the Binet Lines Test, as well as from

their behavior.

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## **BEHAVIOR DURING THE TEST PERIOD OF SUBJECTS UNDER THE INFLUENCE OF MARIHUANA**

The findings reported here have all been in terms of objective, quantitative measures. Some effects of the drug, observable during examinations, cannot be quantified but are nevertheless important to the understanding of the drug action. These effects were reflected in those reactions of the subjects which were not directly related to the test situation. Behavior was somewhat different when the subject had ingested marihuana concentrate than it was when he had taken the drug in cigarette form. With pills gastrointestinal disturbances were more pronounced and drowsiness and fatigue seemed greater and more enduring. Some individuals were so overcome by fatigue that they worked for a few seconds only, and then sat with their heads on the table. If spoken to, they made a great effort to do the work but rarely continued for very long. When summoned to take the test, especially toward the end of the day when they were almost invariably lying on their beds, the subjects were overcome with fatigue and were aroused only with the greatest difficulty. In some instances there was definite resentment of this disturbance and the impression was that only the presence of the police officer and all the implications in the prison set-up prevented a definite refusal to continue cooperatively. With both pills and cigarettes many of the men had difficulty in concentrating and maintaining a fixed goal. Subjects often stared vacantly for long periods and when addressed came back to the test with a start. Many burst into uncontrollable laughter over a test which in their undrugged state had evoked no merriment. The laughter frequently affected the entire group and most markedly those who had been given marihuana.

The behavior of the user and non-user with marihuana cigarettes was somewhat different. The user was pleasantly excited at the thought of smoking, selected his cigarettes with the manner of a connoisseur, and criticized or praised the product offered him. His smoking took on something of a ritualistic ceremony and was done in a careful and prearranged fashion which varied slightly from individual to individual. In general the men first opened the end of the cigarette to examine the marihuana, then wet the "stick" by inserting it in their mouths to prevent the paper from burning too rapidly. When the cigarette was ignited the men took several short puffs, at the same time inhaling as much air as possible. This caused the tip of the "stick" to glow and resulted in a succession of low gasping sounds from the subject. The smoke was retained as long as possible, occasionally causing severe paroxysms of coughing. Although eager to be "high" the user was consistent in his fear of "blowing his top," and there was always a point beyond which no amount of talking or cajoling could make them continue smoking.

As a rule, the user liked to smoke in company. He was generally satisfied if one friend, a "kick partner," could be with him. To this friend he would explain his thoughts and feelings which to the objective observer were very superficial. In trying to make a point, and usually a minor one at that, the user, when smoking, would talk on endlessly and soon lose his goal. He cracked many "jokes" which were uproariously funny to him. In some instances "leaping" or involuntary jerking of the arms, head, shoulders or legs occurred. The subject described his sensations as floating, leaping, rocking or most often as being "in the groove." He was obviously enjoying pleasant physical sensations and wanted to be left to himself to lie on his bed, listen to soft music and dream or carry on "deep" conversations. The test questions were

frequently called a "bring down" in that they forced the subject to face reality and abandon his pleasurable feelings. Several subjects concurred in describing part of their drug experience as comparable to the twilight state between sleeping and waking in which the individual floats pleasantly and does not allow outside stimuli to impinge. Just as strong extraneous sensations will bring the sleeper face to face with reality, so the insistence of the examiner that the subject perform certain tasks served to destroy his general feeling of well-being. Aside from the test situation any unpleasant circumstances can serve as a "bring down." This "bring down" apparently only results in destroying the subject's pleasure but cannot do away with the disadvantageous effect on intellectual functioning.

When testing was completed the subject generally lay on his bed and dozed or listened to the radio. His drowsiness persisted for many hours.

Most non-users approached the smoking with apprehension. They were instructed by the users in the art of lighting and inhaling, but they rarely cooperated to the fullest extent? though this was undoubtedly unconscious on their part.

The effects of marihuana on the non-users were variable. A few of them enjoyed the results so much that they claimed they would continue to smoke whenever they had a chance. They described such sensations as "lying in fur," and "floating in space." Some became acutely nauseous and could not continue with their work, while others experienced little or no change in feeling, undoubtedly because they never smoked correctly.

When the subjects were "high," particularly in the case of the non- user, there was a general loss of inhibition and lessening of many social restraints which had previously been exercised. Thus, all the men talked much more freely, confronted each other more directly, and manifested a state of well-being at times amounting to euphoria. They were much more confiding? talked spontaneously about love and sexual affairs, and in two instances exposed themselves and masturbated.

Although there was an undeniable increase in overt sex interest following the ingestion of marihuana, it seems probable that this interest was not the result of direct sexual stimulation but rather a manifestation of a falling off in inhibiting factors. This sex interest seems to have been due primarily to the fact that these men had been imprisoned for varying periods and had not had access to women. It is not at all certain that under free conditions or with different subjects this behavior would have been manifested. In any case, the behavior of these prisoners was more like that which any man deprived of sexual activity for a long period of time would display under a releasing stimulus and not at all like the behavior shown at marihuana "tea-pads."

## **SUMMARY AND DISCUSSION**

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Under the influence of marihuana changes in personality as shown by alterations in test performance are slight. They are not statistically significant and indicate only tendencies or trends. Moreover, the drug effect is not always in proportion to the amount taken, nor are the changes consistently in one direction. In many instances the effect of small doses (2 cc.) or of

marihuana cigarettes is the opposite of the effect of larger doses (5 cc.) (2)

(2) While sufficient experimentation has not been made to validate the finding, it should be noted that the personality changes produced by 2 cc. of marihuana cigarettes are almost always in agreement in contrast to the changes resulting from the ingestion of 5 cc. The 2 cc. Dosage apparently more nearly approximates the amount a person would take if left to his own devices.

The personality changes observed when the subject is under the influence of 2 cc. of marihuana or marihuana cigarettes demonstrate that the subject experiences some reduction in drive, less objectivity in evaluating situations, less aggression, more self-confidence and a generally more favorable attitude toward himself. These reactions can be ascribed to two main causes, namely, an increased feeling of relaxation and disinhibition and increased self-confidence. As the drug relaxes the subject, the restraints which he normally imposes on himself are loosened and he talks more freely than he does in his undrugged state. Things which under ordinary circumstances he would not speak about are now given expression. Metaphysical problems which in the undrugged state he would be unwilling to discuss, sexual ideas he would ordinarily hesitate to mention, jokes without point, are all part of the oral stream released by the marihuana.

At the same time that he verbalizes more freely, there is a reduction in the individual's critical faculty. This is probably due both to the intellectual confusion produced by the drug and to the less exacting attitude his feeling of relaxation induces. He holds himself less rigidly to the standards of his undrugged phase and does not drive himself to achieve. He is satisfied with himself and willing to accept himself as he is. This self-satisfaction undoubtedly helps produce the feeling of self-confidence which allows the subject to come out more freely in fields which he formerly avoided. This increased confidence expresses itself primarily through oral rather than physical channels. Physically the subject reports pleasant sensations of "drifting" and "floating" and he allows himself to become enveloped in a pleasant lassitude.

After the administration of larger doses of marihuana (5 cc.) the pleasurable sensations appear to be outweighed by concomitant feelings of anxiety and, in some cases, of physical distress, such as nausea. Under these circumstances, for many subjects there is little increase in confidence but rather heightened insecurity which precludes outgoing reactions and tends to evoke generally negativistic attitudes to most stimuli.

It is important to note that neither the ingestion of marihuana nor the smoking of marihuana cigarettes affects the basic outlook of the individual except in a very few instances and to a very slight degree. In general the subjects who are withdrawn and introverted stay that way, those who are outgoing remain so, and so on. Where changes occur the shift is so slight as to be negligible. In other words reactions which are natively alien to the individual cannot be induced by the ingestion or smoking of the drug.

Although in most instances the effects of the drug are the same for the user and the non-user, there are some differences both in kind and extent. Where the effects for the two groups are in the same direction they generally are more marked in the case of the non-user. This is not unexpected in view of the non-user's lack of habituation to the drug action. For the nonuser his present experience is a strange, even hazardous one, and the uncertainty and anxiety attendant upon this impairs the sense of well-being which the drug produces in the user. Thus the non-user frequently feels less secure when he is "high" than he does normally and is less

well adjusted than he is in ordinary circumstances.

When the productions of the undrugged marihuana user are studied, certain personality traits which serve to differentiate him from the non-user and from the "average" individual can be discerned. As a group the marihuana users studied here were either inhibited emotionally or turned in on themselves, making little response to stimuli in the world about them. People with this type of personality generally have difficulty adjusting to others and are not at ease in social situations. This withdrawal from social contacts apparently finds little compensatory or sublimating activity elsewhere. These subjects did not have a desire or urge to occupy themselves creatively in a manner which might prove socially useful. They showed a tendency to drift along in passive fashion and gave a good portion of their attention to relatively unimportant matters. These men were poorly adjusted, lonely and insecure. As indicated by their history they seldom achieved good heterosexual adjustment.

## CONCLUSIONS

1. Under the influence of marihuana the basic personality structure of the individual does not change but some of the more superficial aspects of his behavior show alteration.
2. With the use of marihuana the individual experiences increased feelings of relaxation, disinhibition and self-confidence.
3. The new feeling of self-confidence induced by the drug expresses itself primarily through oral rather than through physical activity. There is some indication of a diminution in physical activity.
4. The disinhibition which results from the use of marihuana releases what is latent in the individual's thoughts and emotions but does not evoke responses which would be totally alien to him in his undrugged state.
5. Marihuana not only releases pleasant reactions but also feelings of anxiety.
6. Individuals with a limited capacity for effective experience and who have difficulty in making social contacts are more likely to resort to marihuana than those more capable of outgoing responses.

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## Family and Community Ideologies

Adolph G. Woltrmann, MA

At the outset of the study it seemed worth while to supplement the quantitative data by some qualitative procedures of the projective type which might throw light on the social reactions of the individuals who were being studied. One of the methods that has shown its possibilities, particularly in its use with children, is the play technique in which the individual is permitted to give free expression to some of his unconscious motivations in a way that is not immediately apparent to him. The limitation of this technique is the fact that it is highly interpretive, but it has the advantage of permitting observations of the subject's personality reactions in problem situations.

Such a study was accordingly carried out on 18 subjects in the early part of the investigation.

## METHOD

Two situations were studied: one, subsequently to be referred to as the family set-up, in which toys were used to build an apartment or home, and another, subsequently to be known as the community set-up, in which a second variety of toys were used to construct a town setting.

### The Family Set-up

The equipment used in this part of the study consisted of a box of household toys of the type available in the ten-cent store, including beds, dressers, chairs, tables, sinks, a stove, a bathtub, a wash basin, a piano, lamps, flower boxes, a telephone, doll sets of a man, woman, boy, girl, and maid, and, in addition, several small wooden slats which were intended to be used as room partitions.

The box of toys and materials was presented to the subject with the following directions: "Here are a number of toys which can be placed in such a manner that a house can be built from them. You are supposed to be this doll (man). Go ahead and build yourself a house or apartment. You may use as few or as many toys as you wish. You may also make believe you are a bachelor or a married man with or without a family."

### The Community Set-up

In studying the community set-up the following items were employed: eighteen wooden houses, trees, cars, trucks, fire engines, an ambulance, a radio police car, a railroad train, airplanes, and numerous figures representing men, women, and children from different walks of life. All these toys were handed to the subject at the same time with the instruction to build a town or city. As in the family set-up, no further help or suggestions were given.

The actual method of handling these materials allows for two approaches. In the free method the subject is encouraged to play with any toy and to create and act out any situation that the nature of the toy suggests to him. No help, clues, or hints are given. In the controlled methods either the subject is told to create a specific pattern or his responses and reactions to a predetermined particular situation are elicited. Both methods were used in this study.

After the subject had completed either his family or his community set-up and answered questions regarding certain situations about which the examiner had questioned him the following points were investigated: (1) subject's marital status, both real and assumed; (2) type of home he built for himself (number of rooms, type of furnishing); (3) subject's assumed occupation; (4) monthly income and rent which he posited; (5) his reaction to attempted burglary; (6) his reaction to his wife's and his own infidelity; and (7) the attitude he would take toward civic problems if given a position of responsibility such as mayor. In addition, the examiner appraised the subject's neatness and orderliness in his home and community setup. The experiment was given first when the subject was undrugged and then when he was under the influence of marihuana.

## FINDINGS

Results were collated in terms of the type and frequency of responses to different situations both before and after taking marihuana and in terms of number of items (toys) employed in the set-up, as, for example, in the case of the home situation, the number of rooms the subject thought necessary for his apartment and the amount of rent he thought he ought to pay and its relation to the income he posited for himself; in the case of the community set-up, the

number of times the subject provided for ambulances, firemen, and policemen; in the case of the subject's reaction to burglary, whether he took a passive or a resistant attitude toward the burglary and whether he assumed the burglar had absconded with most of the property and so on; in the case of his attitude toward his wife's adultery, whether he thought he ought to divorce her or try for reconciliation; and, when the subject was unfaithful, whether he thought his wife ought to forgive his delinquency.

In most cases comparisons between responses or reactions showed little difference in attitude before and after the ingestion of marihuana and therefore it would not be too profitable in this short summary of the work to present all the data obtained. However, by way of illustrating the type of material procured, the following tables are given:

(TABLE 20)

(TABLE 21)

The majority of the patients, though unmarried in real life, assumed families and responsibilities in the play situation, and in a free situation acted out family activities and ideologies. These figures reveal that, on the average, the subjects when under the influence of the drug tended to build apartments with somewhat fewer rooms. The impression of the examiner was that this was due primarily to the subject's desire to get through with the task as quickly as possible in order to return to his room to rest and sleep.

(TABLE 22)

A "make-believe" sickness or accident necessitating the use of an ambulance was the most frequently observed play pattern. When the subjects were under the influence of the drug the incidence of the ambulance and the police was considerably less than it was when they were in the undrugged state.

(TABLE 23)

The most frequent form of passive reaction to his wife's infidelity was that the subject would pack up and leave home. The aggressive reactions consisted of ordering the wife out of the home in three instances, jailing the wife and lover in one instance, throwing the wife out in one instance, killing the lover but leaving the wife unmolested in one instance, and beating up the lover and leaving the wife unharmed in one instance.

The following are examples of subjects' responses to the adultery situation. When he was facing the pretended situation before taking marihuana, one subject immediately left his house, borrowed money from his employer, and traveled to the West Coast. After he arrived there he proceeded to drink and in due time became a derelict on the Barbary Coast. When asked about his children he said, "That's closed with the rest of the chapter. Let her ardent lover support the children. I take on an assumed name. Others might get a divorce and custody of the children but in my case my home life would be a closed chapter." After the administration of marihuana he still showed a passive attitude, but, having assumed the role of a psychologist, he felt obliged to act accordingly. At first he considered divorce action, but since that would deprive the children of a home, he finally forgave his wife. Then he stopped in his contemplations, looked at the examiner and said, "Why do I become altruistic? . . . That's beyond me . . . Maybe I become a martyr . . . I commit an act of martyrdom." Another

subject, when in the undrugged condition, ordered his wife out of the house and later divorced her. In the drugged state customary procedures were reversed. The subject went to his parents and remained passively at home while his mother unsuccessfully tried to bring about a reconciliation.

The subject's attitude toward adultery did not change in the drugged state. The data in Table 24 illustrate the fact that ingestion of marihuana generally does not alter the subject's basic attitude.

(TABLE 24)

Practically all the subjects approved of saloons. Gambling was rejected because it deprives wives and children of money and leads to trouble. A heavy loser may try to recoup his losses through holdups, and fights and homicide may develop from quarrels. Prostitution was condoned by about 50 per cent of the subjects both before and after the ingestion of the drug, but the use of marihuana was frowned upon more often when the subject was undrugged than when he was in the drugged state.

(TABLE 25)

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## SUMMARY AND CONCLUSIONS

Eighteen subjects who participated in the marihuana study were subjected to the play situation with the idea of seeing whether the pattern of play or the ideas investigated were materially altered in consequence of the ingestion of the marihuana. Among the ideologies which were appraised were: (1) attitude toward family set-up; (2) attitude toward different occupations; (3) attitude toward income; (4) attitude toward situations ordinarily calling for aggression, namely an attempted burglary of his home and sexual infidelity on the part of his wife; (5) attitude toward authority.

In general the subject's attitude toward family and community ideologies as manifested in play did not change markedly as a result of the ingestion of marihuana. The subjects (in play) were not intolerant of infidelity or aggressive toward lawbreakers either before or after the ingestion of marihuana. On the whole the initial passive reactions already observed in other parts of the study were likewise observed in the play situation experiment. The only very definite change as a result of the ingestion of marihuana was in their attitude toward the drug itself. Without marihuana only 4 out of 14 subjects said they would tolerate the sale of marihuana while after ingestion 8 of them were in favor of this.

Another significant manifestation in the play situation pertains to the construction of the community set-up. In general the community was less orderly and well organized when the subjects had had marihuana. It is probable that this poor organization may be ascribed to the generally indifferent attitude and lack of motor coordination already observed in the more controlled studies.

On the whole, the experiment with play technique gave less information as to the effect of marihuana on subjects than had been hoped for. This may have been due to the incompleteness of the method employed or possibly to the fact that this technique is designed

to give data about the basic personality of the individual rather than such alterations in it as might be caused by pharmacological agents.

## **Comparison Between Users and Non-Users from the Standpoint of Mental and Physical Deterioration**

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A careful testing of the motor and sensory functions of the nervous system was included in the general physical examination of each subject. Of motor functions, reflex activity and muscular response and coordination were determined; of sensory functions, perception of touch, pain and temperature stimuli; of specialized functions, taste, hearing and vision. In the eye, the corneal and light reflexes were tested and a retinal examination was made. In this neurological examination no pathological conditions were found in any of the subjects.

In the psychiatric examination attention was paid to general intelligence and knowledge in relation to the subject's background, to relevancy of talk in conversation, to orientation as to time, place and situation, to memory of past and recent events, to ability in simple arithmetic, to judgment in reaching decisions, and to the presence of abnormal mental content shown by delusions, hallucinations, obsessions, and ideas of persecution. There was no evidence of disordered cerebral functioning in any of the group.

As would be expected, differences in grades of intelligence and in orderliness in thinking and reasoning were noticeable. The Bellevue Adult Intelligence Test was administered to a total of 60 male subjects, 40 marijuana users and 20 nonusers. The average I.Q. for the user group was 96.7, range 70 to 124, and for the non-user group the average I.Q. was 104.5, range 93 to 114. Both groups may therefore be classified as of average intelligence.

When analyzed according to racial distribution the two groups were even better equated intellectually than the total results indicate. For the 28 white subjects examined (13 users and 15 non-users) the average I.Q. for the users was 106.1 range 77 to 124, and for the non-users the average I.Q. was 106.3, range 96 to 114. There were 24 Negro subjects, 19 users and 5 non-users. The average I.Q. for the users was 92.6, range 70 to 112, while for the non-users the average I.Q. was 98.8, range 93 to 101. Although the non-users averaged 6.2 points higher than the users, it must be taken into account that the number of Negro non-users tested was small. In any event, the disparity in results would not be considered significant. The average I.Q. of the 2 Puerto Rican users was 91.0, range 72 to 100.

Reports on mental deterioration due to toxic, organic or psychotic factors as given in the literature reveal that in such cases the individual scores on the Bellevue Adult Intelligence Test show marked irregularity, depending upon the functions involved in the deteriorative process. As a group, the marijuana users tested in this study showed very even functioning, and what little irregularity occurred can be explained on the basis of language and racial factors.

The physical and psychiatric examinations were of a qualitative rather than a quantitative nature. In the special examinations and tests of organ and system function, quantitative measurements were obtained for 17 marijuana users. These subjects were selected for the

reason that they had smoked marihuana for the longest period of time. The figures for years of usage and number of cigarettes smoked daily were taken from each subject's statement.

Marihuana users accustomed to daily smoking for a period of from two and a half to sixteen years showed no abnormal system functioning which would differentiate them from the non-users.

There is definite evidence in this study that the marihuana users were not inferior in intelligence to the general population and that they had suffered no mental or physical deterioration as a result of their use of the drug. Addiction and Tolerance

A drug addiction is characterized by a compelling urge to use the drug for the prevention or relief of distressing mental and physical disturbances which occur when the necessary dose is delayed or omitted. A drug habit is also characterized by an urge to use the drug, but this is not compelling. The abstinence symptoms, which are expressions of nervous states, are not particularly distressing and do not occur as long as the person's attention is placed on other matters.

Drug tolerance in the narrower sense used here means that larger doses than those originally used are required to bring about the effects desired by the subject. In the case of morphine, tolerance develops because of addiction, but in other instances tolerance may be present without addiction and addiction without tolerance. When both are present the matter takes on greater importance because of the extremes to which the addict goes to obtain the drug constantly and in increasing quantities.

As our group of subjects included 48 users of marihuana, opportunity was afforded for some conclusions concerning marihuana addiction and tolerance. Practically all of our group of users stated that they could and often did voluntarily stop the smoking for a time without any undue disturbance from the deprivation. In the sociologic study reported by Dr. Schoenfeld it was found that smokers had no compelling urge for marihuana. If "reefers" were not readily available there was no special effort made to obtain them from known sources of supply. Dr. Walter Bromberg, Psychiatrist-in-Charge, Psychiatric Clinic, Court of General Sessions in New York, states: "The fact that offenders brought up on marihuana charges do not request medical treatment on their incarceration (with its cessation of drug supply) argues for the absence of withdrawal symptoms."<sup>(1)</sup> From interviews with several hundred marihuana users he concludes that true addiction was absent.

(1) Bromberg, W. "Marihuana: a psychiatric study." J.A.M.A. 113:4, 1939.=20

The evidence submitted here warrants the conclusion that as far as New York City is concerned true addiction to marihuana does not occur.

The evidence concerning acquired tolerance is less clear-cut. Tolerance develops during the periods when the drug is being taken and accounts for the necessity of increasing the dosage to bring about the desired effects. How long the tolerance persists after the drug administration is stopped has not been definitely established in any instance.

The statements of marihuana usage and time since stoppage given by eight of our subjects are summarized in Table 26. (TABLE 26)

On one or more of the numerous occasions on which marihuana was administered each of these subjects received what was considered a minimal effective dose. One (J.B.) was given 1 cc., another (A.B.) 3 cc., the others 2 cc. In all instances the customary physical effects, conjunctival injection, dilated and sluggishly reacting pupils, tremors and ataxia, were observed. With these doses the subjects also experienced the sensation described as "high." The only conclusion warranted here is that if acquired tolerance does occur it persists for a limited period only.

Further evidence, though indirect, was brought out by Dr. Shoenfeld's investigation and by personal interviews with our 48 users. There is agreement in the statements that among users the smoking of one or two cigarettes is sufficient to bring on the effect known as "high." When this state is reached the user will not continue smoking for fear of becoming "too high." When the desired effects have passed off and the smoker has "come down," smoking one cigarette brings the "high" effect on again. This could not be the case had a steadily increasing tolerance developed.

The evidence available then=AD-the absence of any compelling urge to use the drug, the absence of any distressing abstinence symptoms, the statements that no increase in dosage is required to repeat the desired effect in users-=ADjustifies the conclusion that neither true addiction nor tolerance is found in marihuana users. The continuation and the frequency of usage of marihuana, as in the case of many other habit-forming substances, depend on the easily controlled desires for its pleasurable effects. Possible Therapeutic Applications

If a drug has well-marked pharmacological actions and low toxicity, as appears to be the case with marihuana, a consideration of special interest is its possible therapeutic application. In the older clinical literature marihuana was recommended for use in a wide variety of disorders, but in recent years it has almost disappeared from the materia medica and it was dropped from the United States Pharmacopeia twenty years ago.

In view of the laboratory and clinical findings obtained in this study the question of the therapeutic possibilities of the drug was considered. Marihuana possesses two qualities which suggest that it might have useful actions in man. The first is the typical euphoria- producing action which might be applicable in the treatment of various types of mental depression- the second is the rather unique property which results in the stimulation of appetite. In the light of this evidence and in view of the fact that there is a lack of any substantial indication of dependence on the drug, it was reasoned that marihuana might be useful in alleviating the withdrawal symptoms in drug addicts.

At the Riker's Island Penitentiary observations were made on 56 inmates who were addicted to morphine or heroin. Two groups were selected, the addicts in each being matched with those in the other group as to age, physical condition, duration and intensity of habit, and number of previous attempts at cure. The subjects in one group received no treatment or were given Magendie's solution according to the usual hospital regimen while those in the other group were treated with 15 mg. of tetrahydrocannabinol three times daily with or without placebo (subcutaneous water injection). An attempt was made to evaluate the severity of the withdrawal signs and symptoms. The impression was gained that those who received tetrahydrocannabinol had less severe withdrawal symptoms and left the hospital at the end of the treatment period in better condition than those who received no treatment or who were treated with Magendie's solution. The ones in the former group maintained their appetite and

in some cases actually gained weight during the withdrawal period.

Since psychological factors play a large part in the withdrawal symptoms of at least a certain proportion of morphine addicts, there are grounds for the assumption that a drug having the properties of marihuana might be of aid in alleviating mental distress during the withdrawal period. However, the studies here described were not sufficiently complete to establish the value of such treatment, and before conclusions can be drawn the problem must be investigated under completely controlled conditions. PHARMACOLOGICAL STUDY (1) S. Loewe, MD (2) (1) From the Department of Pharnacology, CorneU University Medical College. (2) Part of the experimental work here reported was conducted in collaboration with W. Modell SUMMARY

1. This review of the pharmacology of marihuana is centered around the chemical and pharmacological identification of the active principles of hemp. Coordination of chemical and pharmacological investigations as a prerequisite to success in the search for unknown principles and of the analysis of the structure-activity relationship of these compounds is discussed.

2. In a survey of the sources of preparations with marihuana activity, hemp seeds are disclosed as a heretofore unknown source of active substances.

3. Varieties of hemp can be distinguished according to genotypic differences of the content of active principles which persist over generations independently of soil and climate.

4. The pharmacological actions of marihuana are analyzed with regard to their specificity and their usefulness as indicators of specific components.

5. Sixty-five substances from the new class of cannabinols and related classes are reviewed, among which are the essential components of the marihuana-active hemp oils. The discovery of this class, the synthesis of these representatives, and their structural elucidation led the way to the discovery of the active substances.

6. Quantitative assay procedures are described for the most important marihuana effects that are observed in the animal experiment. The assay of the ataxia effect in the dog and of the synergistic hypnotic effect in the mouse with refined procedures are shown to be reliable expedients for measuring these two marihuana actions, whereas the areflexia effect in rabbits failed to show the reproducibility required for quantitative purposes.

7. With the aid of these methods the natural tetrahydrocannabinols are shown to be active principles responsible for ataxia in dogs and psychic action in man. They are intermediate products between the two ineffective substances which compose the bulk of hemp oil: a labile excretion product of the plant, cannabidiol, and a stable end- product, cannabinol. The conversion of cannabidol into active tetrahydrocannabinol by a natural environmental influence has been paralleled by ultraviolet irradiation in vitro.

8. Numerous isomers, homologs and analogs of tetra- and hexahydrocannabinol are shown to possess the specific marihuana action. The potency varies enormously and is highest in natural, optically active=ADlaevogyrous=ADtetrahydrocannabinols.

9. The significance of many of the structural details of the tetrahydrocannabinol molecule for

marihuana activity is elucidated by quantitative determinations of relative potency. Special attention was devoted to a study of the importance of variations in the length of the 3- alkyl side chain of tetrahydrocannabinols. In studying methyl to nonyl homologs of the original amyl derivative occurring in nature, it was found that the maximum potency is not at the amyl, but at the hexyl homolog, and in two out of four homologous series at the representatives with still longer side chains.

10. In addition to the ataxia and the psychic action, other pharmacological attributes of the tetrahydrocannabinols are a decrease in the respiratory and an increase in the pulse rates in the non-narcotized dog.

11. The synergistic hypnotic action of marihuana in the mouse is to be attributed to the otherwise inert cannabidiol.

12. The corneal areflexia action in the rabbit was much stronger in impure distillate oils than in pure tetrahydrocannabinols, which leads to the conclusion that this action is either poorly reproducible or must be attributed to a different, as yet unknown, principle.

13. Only one among the numerous cannabinol derivatives, 7- methyltetrahydrocannabinol, was found to produce a motor stimulant=AD-convulsant=AD-action concomitant with ataxia action. A cannabidiol derivative, tetrahydrocannabidiol, was found to have specific convulsant action in the dog.

1. A central stimulant (benzedrine) considerably increased the ataxia action of marihuana, whereas a hypnotic (amytal) had no influence.