4. EFFECTS ON MAN OF USING CANNABIS

4.1 Influence of different preparations, dose levels, and routes of administration

It is now generally believed that A9-THC accounts for a large part of the pharmacological activity of cannabis preparations (see section 2.1). The percentage of A9-THC in cannabis preparations varies markedly (see section 3.1). To a large extent, the potency of various preparations varies directly with their A9-THC concentration. Because A9-THC is insoluble in water, the only practical routes of administration in man, as yet, are by ingestion and by inhalation of smoke (see section 3.1). In medicine and in much of the older experimental work, cannabis was administered orally as a concentrated and biologically standardized alcoholic extract.

To obtain the maximum effect from cannabis preparations they must be smoked by a technique that is somewhat different from that of smoking tobacco cigarettes and must be learned by practice.1 When this technique is followed, about 50% of the A9-THC in marijuana comes over in the smoke and most of the remainder is converted to CBN or CBD or both (Manno et al., 1970). Exhaled air contains practically no A9-THC when the specified technique is used. It is thus assumed that roughly 50% of the A9-THC content of a marijuana cigarette is absorbed by the lungs and constitutes the dosage actually delivered to the smoker (Manno et al., 1970). Available data on the amounts of A9-THC delivered by smoking are relatively meagre; more research is needed on the variations in the dosage obtained from marijuana and other cannabis preparations when different smoking devices and techniques are used. A9-THC is about 3 times as potent when smoked as when ingested (Isbell et al., 1967). The subjective effect begins very rapidly when A9-THC or cannabis preparations are smoked, an experienced smoker being able to perceive subjective effects within a minute after one or two puffs of a potent preparation. The peak effects are probably reached within 20-30 minutes after smoking. In contrast, when A9-THC or extracts of cannabis are taken orally, about 30 minutes elapse before subjective effects are perceived. The duration of action varies with the dose, but the effects of a single administration are usually dissipated 3-4 hours after smoking or about 8 hours after oral administration. The degree and duration of effect after smoking a given amount also probably vary with the speed of smoking.

4.2 Immediate effects

4.2.1 Usual symptoms and signs
Symptoms refer to subjective sensations reported by the user and signs to observable physiological and behavioural changes that the observer can quantify in some manner (e.g., pulse rate, blood pressure, conjunctival injection, increased laughter).
4. EFFECTS ON MAN OF USING CANNABIS

Symptoms after taking A9-THC or cannabis preparations depend on the dose, as well as on the setting and the expectations and personality of the user. In experiments with one sample of A9-THC, threshold doses of 50 tig/kg by smoking, or 120 tig/kg orally, caused chiefly mild euphoria (Isbell et al., 1967). With doses of 100 lag/kg by smoking, or 240 tig/kg orally, some perceptual and sensory changes also occurred. Doses of 200-250 gg/kg by smoking, or 300-480 gg/kg orally, resulted in marked distortion of sensory perception, depersonalization, derealization, and both optical and auditory hallucinations. Hollister et al. (1968) administered oral doses ranging between 30 and 70 mg total dose (400 and 1 000 gg/kg), with a median dose of 50 mg (700 lig/kg). The characteristic syndrome was euphoria plus psychic changes similar to those reported by Isbell and co-workers after oral doses of 300-480 itg/kg. As these symptoms subsided they were followed by sedation and sleep. In the study by Mayor's Committee on Marihuana (1944), doses of an extract of cannabis, with an estimated content of 30-75 mg of A9-THC, caused symptoms similar to those reported by Isbell et al. and by Hollister et al. Isbell et al. (1967) were unable to detect any significant qualitative differences in symptoms when the drug was given orally, as compared with smoking. The symptoms observed under laboratory conditions appear to be similar to those obtained by Tart (1970) in a retrospective study of marihuana smokers, who replied to a questionnaire concerning the symptoms they experienced after smoking cannabis in their usual environment.

The signs are few. They consist of injection of conjunctivae, a decrease in muscular strength, as measured with a finger ergograph, and an increase in pulse rate; these effects do not regularly occur with a placebo and the increase in pulse rate parallels the intensity of the subjective effects at peak time. Resting systolic and diastolic blood pressure, respiration rate, body temperature, threshold for eliciting the knee jerk, and pupil size are not affected. Only minimal changes have been reported in the resting electroencephalogram, namely, a slight decrease in alpha percentage and sometimes a slight drop in alpha frequency. Reports of increased hunger for sweets during intoxication with cannabis have focused attention on possible decreases in blood sugar level. Early investigators did report decreases (Beringer, 1932; Lindemann, 1933), but more recent studies have demonstrated no change (Hollister et al., 1968; Weil et al., 1968) or a slight increase (Mayor's Committee on Marihuana, 1944). Various doses of cannabis preparations produce some impairment of body and hand steadiness, which persists as long as the effects of the drug (Mayor's Committee on Marihuana, 1944). However, gross ataxia does not generally result, even at "high" doses. Speed of tapping and simple reaction time are only slightly impaired, but a 20% decrease in complex reaction time has been measured for an oral dose estimated at 75 mg of A3-THC (Clark & Nakashima, 1968; Mayor's Committee on Marihuana, 1944). When smoked, doses of marihuana that on assay contained 5.0-10.0 mg of A3-THC produced impairment of pursuit rotor tests (Manno et al., 1970; Weil et al., 1968). One preliminary study showed the smoking of two marihuana cigarettes to have little effect on the more complex task of operating a driving simulator (Crancer et al., 1969), although the subjects in that study reported achieving a "social high". However, there is some uncertainty about the potency of the preparation used, since other investigators using different samples from the same batch of cannabis found their samples to contain less A3-THC than had been stated by those furnishing the materials (Rodin et al., 1970). The matter deserves further investigation, with attention to the effect of cannabis at various dose levels not only on psychomotor performance but also on the attention and judgement required of drivers (Kalant, 1969).
influence of cannabis generally indicate impairment. The degree of impairment of psychomotor performance, as indicated in the above paragraph, is larger for "e" subjects (i.e., those who have never, or only rarely, taken cannabis previously), for large doses, and for complex tasks.

Among the more frequently reported effects of cannabis are sensory and perceptual distortion, particularly of the sense of time. Most often, time is perceived as being longer than clock time. This phenomenon has been experimentally confirmed by many investigators; it is more evident for "filled" time, i.e., when the subject makes an estimate of the time that has elapsed during the performance of a task, than for "unfilled" time. Cannabis users often report increased auditory sensitivity and enhanced appreciation of music. Tests of pitch discrimination and other measures purported to measure musical aptitude were, however, unchanged or impaired following the administration of cannabis or synthexyl to non-musicians; although some studies have suggested an enhancement of auditory acuity (Williams et al., 1946; Walton, 1938, citing Kant and Kraft). In one interview study of 357 jazz musicians, 19% of subjects felt after taking cannabis that the musical performance of musicians to whom they listened had been improved, while 31% indicated that the performers' ability had been impaired (Winick, 1960). The remainder perceived no difference or could not decide. Some people have reported a subjective sense of enhanced touch, taste, and smell while using cannabis (Tart, 1970). However, measurements of threshold for touch, vibration, two-point discrimination, olfactory acuity, and visual brightness have shown no change (Caldwell et al., 1969; Williams et al., 1946).

Consistent reports of interference by cannabis with short-term and immediate memory functions have focused experimental investigation on these and other cognitive areas. Measurement of very simple tasks, such as ability to repeat a series of digits (digit span), has given mixed results. Ability to recall objects and reproduce designs after brief exposures was slightly to moderately impaired (Mayor's Committee on Maru-huana, 1944). The more complex tasks of performing arithmetical calculations aimed at reaching a specified goal showed much greater impairment and are clearly dose-dependent (Melges et al., 1970).

An oral dose of 20 mg of 6.3-THC resulted in decreased accuracy of serial addition in "naive" subjects (Waskow et al., 1970). When marihuana was smoked, doses that on assay contained 10.0 mg of AR-THC caused a significant decrease in accuracy in this type of task when the subject was distracted by delayed audio-feedback (Manno et al., 1970). Oral doses of cannabis (an estimated 20 mg of 43-THC) given to "naive" subjects severely impeded a learning task that required the subject to discover and remember several associations via trial and error. It also significantly impaired reading comprehension (Clark et al., 1970). In experienced users the smoking of cannabis (an estimated 18 mg of .6,3-THC) caused a pronounced decrease in the coherence, clarity, and time orientation of speech and an increase in free association and dream-like imagery (Weil & Zinberg, 1969). The impairment in performance of these more complex tasks appears to arise from difficulty in maintaining a logical train of thought.

Various other psychological tests, e.g., the digit-symbol substitution task, generally show a moderate impairment of performance, which increases for more complex tasks, larger doses,
and "naive" subjects.1

In summary, cannabis significantly impairs cognitive functions, the impairment increasing in magnitude as the dose increases or the task is more complex or both.

4.2.2 Acute psychotoxic reactions

As noted already, the nature and intensity of the symptoms and signs resulting from the use of cannabis generally increase with the size of the dose. At the higher dose levels indicated in section 4.2.1 a state of acute intoxication is usually seen, the major manifestations of which often include paranoid ideas, illusions, hallucinations, depersonalization, delusions, confusion, restlessness, and excitement.2 Such a syndrome may resemble an acute psychotic episode. In occasional instances, there may be additional features of a toxic psychosis, such as delirium, disorientation, and marked clouding of consciousness. In still other cases, marked agitation and excitement with apparent fear may be particularly prominent. In most cases such acute effects are temporary and disappear within a few hours, although in some instances they may persist for 1-3 days and occasionally up to 7 days. Syndromes resembling acute intoxication may occur following relatively small doses of cannabis, e.g., after smoking one cigarette, especially among "naive" users.3

Another type of acute psychotoxic reaction is seen in persons who appear to be overwhelmed by marked anxiety, fear, and panic (e.g., fear of death or of "going crazy"). Such persons are usually agitated and depressed, and occasionally withdrawn. There is usually very little or no evidence of disorientation, delusions, illusions, or hallucinations (Weil, 1970). The presence of a reassuring person significantly reduces the likelihood of this syndrome occurring and alleviates the symptoms if it does occur. Its duration may be from a few hours to, more rarely, a few days. This syndrome tends to occur after relatively small doses (e.g., the equivalent of one or two marihuana cigarettes), as well as after larger ones. It has been observed in persons who later insisted that it followed their first experience with cannabis.4 Newly initiated users are also reported occasionally to develop a depressive syndrome after small doses (Weil, 1970).

4.3 Delayed phenomena

The "usual symptoms and signs" and "acute psychotoxic reactions", described in section 4.2, are consistently and closely related in time to the smoking or ingestion of cannabis preparations or A9-THC. In addition to these immediate manifestations after the use of cannabis, other phenomena have been described as being associated with repeated or long-term cannabis use; the latter phenomena occur between, as well as during, periods of intoxication. In general, however, the degree and nature of any relationships that may exist between these "delayed
4. EFFECTS ON MAN OF USING CANNABIS

phenomena " and the prolonged and/or intensive use of cannabis have not been established.

4.3.1 Physical disorders

Many predominantly physical effects have been attributed to the use of cannabis, but few can consistently be related to it. There is general agreement that persistent physical effects of a significant nature are un-common following even prolonged use of bhang, if ingested in "moderate " quantity (Chopra & Chopra, 1957). However, it has been reported in India that the smoking of ganja and hashish over long periods of time leads to various respiratory disorders (e.g., chronic bronchitis). Since cannabis is usually combined with tobacco for smoking in that country, it is difficult to assess the role of cannabis in the etiology of such conditions. It is questionable whether weight loss, emaciation, anaemia, constipation, etc., which have been reported to be associated with cannabis smoking in India, are due to the drug or to poverty, poor nutritional status, and intercurrent infections. Studies in the USA have, by and large, failed to show any significant physical deterioration after an average of 7-8 years of marihuana use (Freedman & Rockmore, 1946; Mayor's Committee on Marihuana, 1944).

In a recent study in Morocco, a high proportion of relatively heavy kif (marihuana) users were found to have arteritis, and a positive correlation was postulated between the intensity of the inflammation and fluctuations in the use of kif (Sterne & Ducastaing, 1960).

Reports from India have stressed the occurrence of eye changes following long-term use of charas and ganja. The conjunctival injection seen during acute intoxication persists even when the drug is not being used and the conjunctiva as a whole assumes a somewhat dull appearance (Chopra & Chopra, 1957; Dhunjibhoy, 1928).

Preliminary reports of in vitro studies have not shown any cannabis-related increases in chromosomal abnormalities in rats or man (Martin, 1969; Neu et al., 1969). Nor have teratogenic effects of cannabis been observed in man, although they have been found in rats, hamsters, and rabbits when high doses of cannabis extracts were administered.1

4.3.2 The question of psychoses

Various psychiatric conditions purportedly related to or associated with the use of cannabis have been described, covering a wide range of disorders and situations. They can be considered as comprising the following groups:

(1) Specific cannabis disorders:
(a) acute and subacute disorders
(b) residual psychoses
(c) personality deterioration following prolonged use

(2) Other psychiatric disorders, precipitated or aggravated by the use of cannabis
4. EFFECTS ON MAN OF USING CANNABIS

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(3) Coincidental association of a psychiatric disorder with cannabis use.

Certain "acute psychotoxic reactions", such as those discussed in section 4.2.2, would be included in group I (a). They may or may not be "delayed phenomena", depending on whether they occur in newly initiated or long-term users. They are, however, always closely associated in time with cannabis use and are usually of quite short duration, i.e., a few hours to a few days. These reactions, a significant number of which are of psychotic proportions, appear to comprise the majority of the acute specific cannabis disorders.

Also included in group 1 (a) would be a group of psychotic reactions generally associated with "heavy" cannabis use, lasting from 1 to 6 weeks, and presenting quite varied symptomatology, often including schizophrenic, manic, or acute organic features. Residual amnesia is also characteristic.

The following three factors tend to support the hypothesis that the clinical pattern described in the preceding paragraph is causally related to "heavy" cannabis use: (a) the close temporal association between cannabis use and the disorder, (b) the relatively short duration of the syndrome as compared with functional psychoses, 5 (c) a reported decline in the incidence of "cannabis-related" psychiatric hospital admissions accompanying the replacement of hashish by crude preparations (Bouquet, 1951; Porot, 1942). Some authors have noted that "heavy" cannabis use and the development of cannabis-related mental disturbances are to be found almost exclusively among males (Bouquet, 1951; Warnock, 1903) in the areas from which the reports were made; however, male hospitalized psychotics far outnumber females, even after the removal of cases attributed to cannabis (Dhunjibhoy, 1928; Ewens, 1904). More importantly, the substantial variety of clinical symptomatology reported does not support the hypothesis, particularly when insufficient information is available on the following points: (a) the prevalence of various patterns of cannabis use in the general population and among persons admitted to hospital, and (b) the prevalence and incidence of various psychiatric syndromes among adequately matched comparison groups of cannabis users and non-users.

In summary, only limited, presumptive evidence is available in favor of the existence of a specific cannabis psychosis of the type described in the preceding paragraph. The evidence is sufficient, however, to warrant the initiation of carefully controlled investigations.

The question of residual, specific cannabis psychoses is related to the doubts concerning the existence of acute and subacute psychiatric disorders caused by, or otherwise closely associated with, a particular pattern of cannabis use. If there were no such specific cannabis disorders, the matter of "residual" states would not arise. If specific cannabis disorders do exist, it remains to be determined whether some affected patients do develop a prolonged, chronic, or "residual" state. Should this prove to be so, it would be useful to determine what factors appear to be associated with the process.

The literature often mentions the existence of a characteristic personality deterioration among older habitual users after prolonged "excess-ive" use. Such individuals are frequently described as showing a simple-minded, carefree state, the following terms being typically applied: "chronic, cheerful mania"; "kif-happy vagabonds"; and "hilarious and full of a sense of well-being". No systematic scientific study has been made to assess their previous personalities, the social factors involved, and the occurrence of such a syndrome among non-users of cannabis. This syndrome could, in theory, be a primary specific cannabis disorder as well as a residual effect of a more acute disturbance. Hence it is not subsumed entirely...
4. EFFECTS ON MAN OF USING CANNABIS

Written by Administrator
Thursday, 04 March 2010 00:00 - Last Updated Tuesday, 04 January 2011 19:40

under "residual psychoses" in the classification given at the beginning of this section. Roland & Teste (1958) indicate that cannabis may precipitate latent psychiatric disorders, or aggravate existing psychiatric problems, or do both. To help determine the validity of this clinical observation, it will be necessary to determine the prevalence and incidence of various psychiatric disorders among groups of persons, drawn from the general population, who differ only in their cannabis-taking patterns, including a comparison group of non-users. Such studies would also help to clarify questions about the existence of specific cannabis disorders. Of less importance, they would provide objective data about the extent to which psychiatric disorders are only coincidentally associated with different levels of cannabis use in various cultures.

4.3.3 Some psychosomatic aspects

Keeler et al., (1968) reported the spontaneous recurrence of unusual somatic and visual sensations originally experienced during reactions to marihuana. These recurrences were intermittent, and all occurred during the period immediately following the use of marihuana, the length of this period varying from 2 days to 3 weeks for different persons. None of the 4 subjects of the report had taken other psychoactive drugs. There are a number of reports of these "flash-back" phenomena among the users of lysergide (LSD). Weil (1970) reports that marihuana precipitates flash-backs in persons who have also taken LSD. Since many users of marihuana have also used LSD, the report of Keeler et al. is of particular interest. In some instances, persons experiencing the effects ordinarily produced by taking cannabis, but occurring after the usual period of drug effect, found the experience enjoyable, as they did when the sensation was experienced during drug intoxication. Others, however, became so apprehensive as to require hospitalization.

There is evidence that, under certain conditions, the regular use of cannabis for several years is associated with measurable deficits in a number of psychomotor and cognitive functions. In a study of 850 hashish users and 839 non-users as controls, drawn from a population of prisoners in Egypt, Soueif (unpublished data) showed differences between users and controls in a number of standardized objective tests. These assessed speed and accuracy of psychomotor performance, initial reaction time, memory for digits, and memory for designs. Comparisons were made between subgroups of test and control subjects equated for education. In most of the tests used, the hashish users had poorer scores than the controls. In general, the higher the level of education of the users and non-users the larger was the discrepancy between their respective test scores. It must be stressed that the association between cannabis use and the reported deficits does not necessarily indicate a causal relation-ship. The differences might pre-exist or might be related, for example, to changes in life style occasioned by regular participation in socially disapproved and unlawful activities.

A number of authors claim a fairly consistent association between "heavy" use of cannabis and a characteristic symptomatology, sometimes called the "amotivational syndrome". It has been especially emphasized with cannabis use among young persons in Europe and the USA. Among the main characteristics usually cited are apathy, emphasis on the present rather than the future, preference for fantasy rather than rationality, child-like thinking, and preference for a
loosely structured type of life rather than one that is well structured and goal-directed (McGlothlin & West, 1968). It has been suggested that the clinical picture resembles that of patients with an organic brain syndrome (Brill et al., 1970). How-ever, the evidence might equally suggest a learned constellation of behaviour in which cannabis acts as a catalytic agent. Among impressionable ado-lescents, cannabis-induced suggestibility (Soueif, 1967; Zinberg & Weil, 1970) may facilitate the rapid adoption of new values and behaviour patterns, especially when the drug is taken in a socially alienated subculture that advocates and strongly reinforces such changes.

It is possible that some long-term behavioural effects attributed to cannabis use are due largely or in part to the sociocultural context in which the drug is taken. For example, in a society where cannabis use is illegal and generally disapproved of, the user is ipso facto engaged in non-conforming behaviour. This, in itself, may close various avenues of social adjustment to him, and lead to the adoption of a different style of life. The latter may involve a number of characteristic behaviour patterns developed independently of drug use. Some of these patterns may be viewed as deviant by a majority of the society, but one would not be justified in attributing them to the pharmacological action of the drug.

4.3.4 Cannabis and crime

The arguments purporting to relate cannabis use to crime fall generally into 3 categories:
(a) Loss of control during cannabis intoxication may result in violence or other forms of impulsive behaviour.
(b) Cannabis-induced lethargy may lead to loss of legitimate earnings and hence to petty thieving.
(c) Cannabis may provide persons predisposed to criminality with the courage to commit antisocial acts.

The evidence in support of the first argument is generally anecdotal, although it appears that, of those cases coming to the attention of the authorities, violent and impulsive behaviour is not infrequent among persons with relatively acute psychotic reactions to cannabis.1 On the other hand, disruptive behaviour plays a significant role in determining whether or not an individual with an acute cannabis psychosis is hospi-talized (Indian Hemp Drugs Commission, 1894; Peebles & Mann, 1914), so that those exhibiting violent behaviour are probably over-represented in the hospitalized samples. Some authors in the USA have attempted to establish the direct role of cannabis in violent acts, 2 but these reports are of little value because there is usually no effort to establish the validity of the claimed relationship, nor is information provided on the relative incidence of such cases among otherwise comparable populations of users and non-users. Several investigators have sought to establish the overall prevalence of detected crime among users.3 Their studies show a correlation of cannabis use with crime, but do not establish causal relationships. They show an association between cannabis use and minor asocial or antisocial behaviour, but not between cannabis use and major crime. Those studies that begin with a sample of persons arrested for using cannabis generally show a much higher positive
correlation with subsequent delinquent behaviour than do studies that begin with a more representative sampling of cannabis users (Blum et al., 1969b). Indeed, even among persons who have never used cannabis, a positive correlation exists between arrest and subsequent delinquent behaviour (Lunden, 1964). Three military studies found that marihuana users exhibited poor adjustment to military life but little aggressive criminality. Two studies of Brazilian prisoners similarly concluded that cannabis played a minimal role in crimes of violence (Moraes Andrade, 1964; da Veiga & de Pinho, 1962).

In the USA, the relation of marihuana to crime has been studied by observers living in the culture. The Mayor's Committee on Marihuana (1944) found that many marihuana users committed petty crimes, but found no evidence that the practice was associated with violence or major crime. A recent study of juvenile drug users, mostly from lower-class minority groups, found that marihuana users were less likely to show aggressive behaviour than were the group who preferred alcohol (Blumer et al., 1967). Moreover, they found that a shift from alcohol to marihuana was likely to be accompanied by a tendency towards less delinquent behaviour. Some reports from West and South Africa have indicated that cannabis is occasionally used to provide courage to perform criminal acts. Blumer et al. (1967) also described one type of user who takes marihuana to fortify himself in criminal operations, although amphetamines and barbiturates tended to be preferred for this purpose.

A revealing way to assess the contribution of cannabis to crime and violence is through a comparison with alcohol. The latter provides an established base-line, both from everyday experience and from reliable statistics. On the basis of such comparisons, most authors are of the opinion that alcohol is much more closely associated with aggression and violence than is cannabis.

4.4 Questions of tolerance and physical and psychic dependence

In a description of drug dependence of the cannabis (marihuana) type (Eddy et al., 1965) the following characteristics were listed: (a) moderate to strong psychic dependence on account of the desired subjective effects; (b) absence of physical dependence, so that there is no characteristic abstinence syndrome when the drug is discontinued; (c) little tendency to increase the dose and no evidence of tolerance. These characteristics must now be re-examined because of subsequent findings.

4.4.1 Tolerance

Tolerance is " an adaptive state characterized by diminished response to the same quantity of a drug " (Eddy et al., 1965). Recent animal experiments have shown rapid development of high degrees of tolerance to A9-THC and extracts of cannabis in pigeons, 1 mice and rats (Carlini, 1968; Moreton & Davis, 1970), and dogs (Dewey et al., 1969).
Some evidence of tolerance in "heavy users has been reported. In an experimental study in which subjects smoked marihuana ad libitum for 39 days, the number of cigarettes taken daily slowly increased throughout the period, while the characteristic euphoric reaction and the increase in pulse rate disappeared after the first few days (Williams et al., 1946). Some ganja and charas smokers in India consume daily amounts that can be estimated roughly to contain an average of 720 mg of A9-THC (Chopra & Chopra, 1939). It seems doubtful whether such large doses could be consumed unless some degree of tolerance developed. The question of tolerance to cannabis in man dearly deserves further investigation.

4.4.2 Physical dependence

Physical dependence has been described as "an adaptive state that manifests itself by intense physical disturbances when the administration of the drug is suspended... These disturbances, i.e., the withdrawal or abstinence syndromes, are made up of specific arrays of symptoms and signs of psychic and physical nature that are characteristic for each drug type" (Eddy et al., 1965). As noted above (section 4.4) these authors stated, on the basis of data then available, that cannabis did not cause physical dependence. Certainly there was no evidence then, nor is there now, to suggest that the withdrawal of cannabis even from an extremely "heavy" user produces an abstinence syndrome that begins to approach in severity those produced by drugs of the alcohol, barbiturate, and mor-phin types. However, reports of some degree of possible abstinence phenomena have been made. The phenomena described in most of these studies include mild to moderate anxiety, depression, weakness, sleep disturbances, sweating, and fine tremors. One author (Fraser, 1949) reports possible brief psychoses. Further study is necessary to determine more precisely the circumstances in which withdrawal-associated signs and symptoms may appear. If such signs and symptoms are consistently demonstrated in a substantial number of cases, it will be necessary to seek the mechanisms involved.

4.4.3 Psychic dependence

This has been described as a condition in which a drug produces "a feeling of satisfaction and a psychic drive that require periodic or con-tinuous administration of the drug to produce pleasure or to avoid discom-fort" (Eddy et al., 1965). As in nearly all biological, and particularly behavioural, phenomena, there is no hard and fast line between a state of psychic dependence and its absence. Rather, there is a continuum of phenomena, at one end of which psychic dependence clearly does not exist, while at the other it clearly does. Between these extremes there is a zone of behaviour that is not sufficiently characteristic of either extreme for it to be said that psychic dependence does or does not exist. In judging the presence or absence of psychic dependence in an individual, it is important to ascertain how far the use of cannabis appears to be a life-organizing factor, or to take precedence over the use of other coping mechanisms, or both (Cameron, 1971). The Group
was of the opinion that many regular (almost daily) users of cannabis exhibit psychic
dependence, as do some less frequent but relatively "heavy" users, whereas the great majority
of people who use it a few times on an experimental basis, or casually on a few festive
occasions a year, could not be said to exhibit psychic or any other dependence on cannabis.

1 Failure to use this technique may partly account for the apparent lack of effect when cannabis
is first smoked by a novice (Becker, 1953).

1 Hollister et al., 1968; Isbell et al., 1967; Jones (unpublished data).
2 Hollister et al., 1968; Isbell et al., 1967; Manno et al., 1970.

1 Hollister et al., 1968; Isbell et al., 1967; Manno et al., 1970.
2 Rodin et al., 1970; Wikler & Lloyd, 1945; Williams et al., 1946.
3 Fere, 1901; Hollister et al., 1968; Mayor's Committee on Marihuana. 1944; Pond, 1948.

1 Ames, 1958; Clark et al., 1970; Jones (unpublished data); Weil et al., 1968; Williams et al.,
1946.
2 Aldrich, 1944; Mayor's Committee on Marihuana, 1944; Williams et al., 1946.
3 The discrepancies noted in this section between reported subjective feelings and objective
measurements are not intended to disprove the existence of the former, nor their "reality" for
the person experiencing the sensation. Objective measurements of performance are not
necessarily relevant to the existence of reported subjective experiences. The relationship
between cannabis use and sexual gratification is illus-trative. At the subjective level, cannabis
(a) often enhances touch and other senses, (b) generally prolongs the perception of time, and
(c) sometimes imparts novelty to familiar objects and activities. All these may enhance the
sense of gratification expe-rienced by some people during the sexual act, whether or not
enhancement of sensations or of performance can be verified by objective measurements.
4 Mayor's Committee on Marihuana, 1944; Melges et al., 1970; Waskow et al., 1970.

1 Hollister & Gillespie, 1970; Jones (unpublished data); Weil et al., 1968.
3 Bromberg, 1934; Defer, 1968; Roland & Teste, 1958; Talbott & Teague, 1969.

1 Bromberg, 1934; Talbott & Teague, 1969; Weil, 1970.
1 Geber & Schramm, 1969a, 19691); Persaud & Ellington, 1968.

1 Chopra et al., 1942; Defer & Diehl, 1968; Roland & Teste, 1958.
2 Asuni, 1964; Christozov, 1965; Dhunjibhoy, 1930; Ewens, 1904; Indian Hemp Drugs Commission, 1894; Sigg, 1963.
3 Chopra et al., 1942; Indian Hemp Drugs Commission, 1894; Roland & Teste, 1958; Warnock, 1903.
4 Chopra et al., 1942; Defer & Diehl, 1968; Dhunjibhoy, 1930; Roland & Teste, 1958.
5 Asuni, 1964; Christozov, 1965; Dhunjibhoy, 1930; Ewens, 1904; Indian Hemp Drugs Commission, 1894.

1 Chopra et al., 1942; Christozov, 1965; Indian Hemp Drugs Commission, 1894; Roland & Teste, 1958; Warnock, 1903.
2 Frosch et al., 1965; Louria, 1968; Smart & Bateman, 1967.
3 It should be noted that the flash-back phenomena associated with the use of LSD sometimes occur at substantial intervals after the last drug dose.

1 Bouquet, 1951; Chopra et al., 1942; Christozov, 1965; Roland & Teste, 1958; Warnock, 1903.
2 Merrill, 1938; Munch, 1966; Wolff, 1949.
3 Bromberg, 1934; Chopra et al., 1942; Gardikas, 1950; Polansky, 1967; Robins et al., 1970.

1 Bromberg & Rodgers, 1946; Freedman & Roekmore, 1946; Siler et al., 1933.
3 Anonymous, 1951; Bouquet, 1951; Chopra et al., 1942; Indian Hemp Drugs Commission, 1894; Murphy, 1963; Tinklenberg & Stillman, 1970.

1 Black et al., 1970; Frankenheim et al., 1970; McMillan et al., 1970.
2 Chopra & Chopra, 1939; Dhunjibhoy, 1930; Ewens, 1904.
3 Bouquet, 1944; Chopra & Chopra, 1957; Christozov, 1965; Kielholz & Ladewig, 1970.