The purpose of this study was to determine the extent to which marijuana, as currently used by the population studied, is an actual hallucinogen rather than an intoxicant or stimulant. There is evidence that marijuana is a potential hallucinogen. Lewin (1) introduced the classification "phantastica" to pharmacology as including drugs capable of evoking unusual sensory experiences and thought patterns. He included marijuana in the category. Bouquet (2) described marijuana intoxication as including hallucinations of color and design. Ames (3) described vivid hallucinations occurring in two of ten subjects during a laboratory experiment involving the administration of cannabis extract to ten subjects. Isbell and associates (4) described hallucinations occurring in subjects receiving tetrahydrocannabinol in laboratory experimentation. Keeler (5) interviewed 56 marijuana users and reported that six described definite hallucinosis when they used the drug. In this study, a determination was made of marijuana users' rates of having experienced each of six specific types of perception and mentation that are typical of reactions usually evoked by LSD or mescaline. Objects that appeared clearer or sharper and colors that appeared more intense were selected to define minor changes in perception. Perceiving objects as twisted out of shape and hallucinating colors and designs were selected as items to detect major changes in perception. The sensations of having felt closer to God, nature, or mankind and of having felt better able to understand the meaning of the universe were selected as descriptive of a type of thought often associated with the hallucinogenic syndrome. The subjects were 42 randomly selected young men who had used marijuana; all attended the same university. A questionnaire technique was used.

This study was not designed to detect psychopathology or difficulties in adjustment. The investigators thought that the tests necessary to do so would be unacceptable to many of the students surveyed. Hallucinosis does not necessarily represent psychopathology.

The study was not designed to detect intensity or duration of hallucinosis. The questions necessary to accomplish this would have to be so detailed as to be inappropriate to a retrospective questionnaire.

It is possible that a person's failure to admit to hallucinogenic reactions while using marijuana might result from the total absence of or denial of such reactions. Questions describing depression, confusion, anxiety, unusual thoughts, mood elevation, and relaxation were included in the survey. Nonreactors were identified by their failure to admit to ever having any of these reactions as well as their denial of the items describing hallucinogenic reactions.
It is possible that a person's previous experience with hallucinogenic phenomena while using LSD or marijuana might predispose him to recognize such reactions while using marijuana. We therefore determined what other drugs the subjects had used.

It is possible that hallucinogenic reactions during marijuana use occur during only a small fraction of total marijuana experiences, even among those who have such reactions. It was therefore determined how often marijuana had been used.

The report of hallucinogenic reactions by individuals who had not used marijuana often would indicate that those who do have such reactions have them during all but a small percentage of total drug experiences.

**Method**

Two hundred names were selected from a list of persons in students' residences. The sample equitably represented students from the upper three years of undergraduate school and fraternity, intown, and dormitory residences.

A series of questionnaires including one pertaining to drug use was hand delivered to the 142 subjects who could be located. (It was often impossible to trace students who had changed residences.) A payment of three dollars was offered for completion of the questionnaire.

All items describing reactions to marijuana were preceded by the phrase, "While under the influence of marijuana, have the following occurred?"

Two items describing minor changes in perception were included:
1. Have colors seemed more intense?

2. Have things you looked at seemed sharper or clearer?

Two items describing major changes in perception were included:

3. Have things you looked at seemed twisted or out-of-shape?

4. Have you seen colors or designs with your eyes open?

Two items describing a type of experience that could be defined as mystic, cosmic, or religious were included. Such reactions and the items used to describe them had been reported by previously interviewed students.

5. Have you felt closer to God, nature, or mankind?

6. Have you felt better able to understand the meaning of the universe?

Seven other items were included to define reactions that are commonly reported as occurring during use of marijuana. Failure to admit to any of these indicated that the reaction was minimal or denied.

7. Have you been confused or mixed up?

8. Have you been anxious or afraid?

9. Have you had unusual thoughts?

10. Have you felt sad or depressed?

11. Have you felt happy?

12. Have you had a good time
13. Have you been relaxed or free from worry?

Subjects were given the option of stating whether each reaction occurred often or infrequently.

Specific inquiry was made as to whether the subjects had ever used LSD, mescaline, psilocybin, or other hallucinogenic drugs. An additional question asked whether any other drug had ever been used for pleasure.

The subjects were asked the number of times they had used marijuana. Experience in interviewing other students had indicated that most marijuana users have difficulty answering this question precisely. Selection among the categories of one to ten, ten to 100, and more than 100 times was therefore used to define frequency of use.

Results

The 138 completed questionnaires revealed that 42 of the 138 subjects had used marijuana. Three of the 42 denied ever having experienced reactions similar to those described in the 13 items.

Ten of the 42 marijuana users had also used either LSD or mescaline. Twenty-three of the respondents had used marijuana less than ten times. Twelve had used it from ten to 100 times. Seven had used it more than 100 times.

Table 1 presents the results of the survey. The questions presented in condensed form are preceded by the same numbers that precede the full text of the questions in the "Method" section. The figures represent the percentage of each group or subgroup that had experienced each reaction while using marijuana.
There is little difference in the results among the total group and the subgroups.

About 90 percent had experienced either or both of the minor perceptual changes while using marijuana. Colors had appeared more intense, or objects had seemed clearer or sharper. About 50 percent had experienced either or both major perceptual changes while using marijuana. Objects had appeared out of shape or twisted and/or colors or designs had been hallucinated. At least 30 percent had felt closer to God, nature, or mankind and/or had felt better able to understand the meaning of the universe while using marijuana. At least 60 percent had experienced major changes in perception and/or mentation characteristic of reactions to hallucinogenic drugs.

The responses to the questions included to detect reactions are not presented in the table. Forty-five percent of the 42 users had been confused; 40 percent had been anxious, afraid, sad, or depressed; 71 percent had had unusual thoughts; 88 percent had been happy and had had a good time; and 19 percent had been relaxed or free from worry while under the influence of marijuana.

Discussion

The 97 percent return indicates that a group's or groups' failure to participate did not invalidate the study. The possibility did exist that many subjects would invalidate the survey by indiscriminately claiming to have had reactions. Only 21 percent claimed to have had all four major changes in perception and both types of mentation selected as indicative of hallucinogenic effect, although 90 percent of the subjects stated they had had at least one of these reactions. There was good selectivity in claims of reaction.

The occurrence of hallucinogenic reactions while using marijuana was as frequent among those who had not used LSD or mescaline as among those who had. It was not necessary to have used marijuana a great many times to have had hallucinogenic reactions.
We conclude that marijuana, as used by the population studied, is an actual hallucinogen. About 90 percent of the subjects had experienced minor changes in perception; about half had experienced major changes. About 40 percent had had ideation commonly reported during reactions to other hallucinogens. About 25 percent stated that they had often hallucinated colors or designs while smoking marijuana. About half often saw colors as more intense, and a similar number often perceived objects as sharper or clearer.

The use of marijuana as a hallucinogen indicates neither that the drug is harmful nor that it is harmless. The survey was not designed to detect psychopathology. It could be argued that the use of other hallucinogens is associated with subsequent psychopathology. It could also be argued that all of the students surveyed who experienced marijuana hallucinosis had maintained good academic standing.

REFERENCES


