

MUSHROOM USE BY COLLEGE STUDENTS*

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ABSTRACT

This study investigated the extent of hallucinogenic mushroom use among 1507 college students and compared mushroom users to nonusers. The subjects, who completed an anonymous questionnaire, were students from California State University, Northridge, and the University of California, Los Angeles. The major finding was that among the respondents who reported use of hallucinogenic drugs (17%), over 85 percent had used hallucinogenic (psilocybin) mushrooms and over half had used mushrooms but no other hallucinogens. The data suggest a high level of experimental use compared to other hallucinogens. Survey research into hallucinogenic mushroom use should be extended, and mushroom use should be distinguished from use of other hallucinogens.

Approximately two decades ago the "drug problem," which now is a social and health care issue, was just coming into the public eye. One of the causes of greater public awareness was the increasing numbers of middle-class adolescents and young adults who began to use drugs, including psychedelics, as they were popularly termed, or hallucinogens, as they will be referred to in the context of

*This research was supported in part by USPHS grants DA 03541 and DA01070 from the National Institute on Drug Abuse.

this article.¹ Because widespread use of these chemicals was relatively new to our society, the general public knew little about them. In spite of ensuing legislation regulating these substances, the use of hallucinogens became epidemic among the young. By the mid-1970's, however, the use of hallucinogenic substances stabilized and in the latter part of the decade seemed to decline slightly. This pattern was also observed of other illicit drugs [3].

During the early period of hallucinogen use in the 1960's, LSD was the drug receiving the most attention. As time passed, interest in other compounds was stimulated by burgeoning literature as well as availability. Two other illicit chemicals that became popular were mescaline, found in *Lophophora* and a few other genera of cacti, and psilocybin, found in over eighty species of mushrooms [4]. Research with those chemicals diminished by the early 1970's. Generally, whenever drug use was surveyed, LSD remained the focus in the hallucinogenic class of drugs. Even today most compilations of drug use data list "LSD and other psychedelics" [1,2]. Although this labeling may have been valid into the mid-1970's, the present study indicates a need to separate the categories. In the mid-70's LSD may have been the major hallucinogenic drug of choice, but this has slowly changed because of the spread of mushroom use.

In 1975 Shulgin claimed that many scientifically documented hallucinogens were unknown in popular usage, for example, psilocybin and psilocin from the Mexican mushroom *teonanacatl* [5]. In the same year Pollock reported that mushroom use had become endemic in various parts of the United States (namely those areas where psychoactive mushrooms were indigenous), but street samples of "magic" mushrooms and psilocybin were usually found to be non-psychoactive mushrooms treated with LSD [6]. This was substantiated by reviews of street drug analysis programs: in 1970-1972, none of the alleged psilocybin samples were psilocybin, and in 1972-1974, 91 percent were not psilocybin [7].

Although true psilocybin, or magic mushroom use was negligible in 1975, the last nine years have shown a rising trend in their use. In 1977 Andrew Weil reported that more people than ever were using "psychedelic" mushrooms [8]. Although he supported the view of Pollock and others that most alleged psilocybin mushrooms on the streets were actually treated with LSD [6,7], he noted that use of true psilocybin mushrooms was spreading as new species were being identified and new areas where they grow were being discovered. He also claimed that information on recent use of psychoactive mushrooms would continue to grow. Manuals on growing and identifying psychoactive mushrooms proliferated in the late 1970's. With the advent of the 1980's, Weil's predictions seemed to be confirmed.

¹ We have chosen to use the term hallucinogen over other descriptive terms because it is commonly used in published surveys [1,2]. Although PCP is not strictly a hallucinogen, we have included it as such because Johnston [1] and Skager [2] do.

McDonald pointed out in 1980 that the resurgence of interest in mushrooms among anthropologists and popular users had far exceeded interest among mycologists and psychopharmacologists [9]. The popular media have also documented increasing interest in psychoactive fungi. *High Times Magazine* reported [10]:

Mushroom people now nearly outnumber acidheads . . . the growing popularity of mushroom highs may soon make the funky fungus America's number one psychedelic of choice.

This claim is substantiated by the number of advertisements for mushroom spores, mushroom mycelium, mushroom growing kits, and books on mushroom cultivation. Spores, growing kits, and cultivation instructions can be purchased through magazines and "head shops" in most states, significantly increasing the availability of psychoactive mushrooms [11,12].

In 1982, an entire issue of *The PharmChem Newsletter* was devoted to psilocybin mushrooms [13]. It reported an increase in the cultivation of certain species of psychoactive mushrooms. Moreover, the quality of mushrooms purchased in the streets had changed. In the PharmChem 1982 Drug Analysis Results, Messinger reported that rarely are these mushrooms adulterated with drugs such as LSD; they either contain the active ingredients claimed or they do not [14]. In the case of a "No Drug(s) Detected" result, Messinger concluded that the mushrooms were probably psychoactive mushrooms, but due to failure of synthesis in nature or extended storage they had no psilocybin upon analysis. Some may have been species that did not produce psilocybin. In the PharmChem Laboratories results, 80 percent of the samples either contained the alleged drug or no detectable drug.

The British literature in the last six years documents the growing interest in psychoactive mushrooms among English drug users [15-19]. In the United States not much note of this phenomenon has appeared in the scientific literature, which has been focusing on cannabis and cocaine. Because of the lack of social and scientific research into this phenomenon in the United States, some attention to psychoactive mushrooms seems appropriate. This study was designed to investigate the extent of mushroom use in relationship to the use of other drugs and to explore the assertion of widespread use of mushrooms. Another goal of this project was to compare the characteristics of mushroom users to non-users, especially with respect to use of other drugs.

METHOD

Subjects

Survey respondents were undergraduate students attending either the University of California, Los Angeles (UCLA), or California State University, Northridge

(CSUN). The total number of respondents was 1507. Forty-three percent were men ($n = 654$) and 57 percent were women ($n = 853$). The mean age of men was 19.0 years, and of women was 18.8 years. The mean class level was 1.6 on a scale from 1 to 5, 1 being freshman level and 5 being graduate level. The percentages of respondents in each major field of study were: science/math, 20.6 percent; economics/business, 12.3 percent; health sciences, 10.1 percent; fine arts/humanities, 9.4 percent; engineering/computer science, 6.2 percent; history/political science, 5.9 percent; behavioral sciences, 5.7 percent; education, 0.8 percent; other, 28 percent; uncommitted, 1.1 percent.

Respondents from UCLA made up 76 percent of the sample ($n = 1145$) of which 44.8 percent were men ($n = 513$) and 55.2 percent were women ($n = 632$). Our sample slightly over-represented the women and under-represented the men in comparison to the general UCLA student population. The mean age was 18.7 years. The mean class level was 1.5. The distribution of respondents across major fields of study closely reflected that of the overall UCLA student population with the exception of a high report of health science majors among our sample.

The source of 93.5 percent ($n = 1071$) of the UCLA respondents was introductory psychology classes (a general UCLA requirement), and the other 6.5 percent ($n = 74$) were obtained from an abnormal psychology class. Nearly all the students present in the class rooms participated; however, this represented only 70 percent of those enrolled. An average of 30 percent of each class was absent on the day of sampling.

The respondents from California State University, Northridge (CSUN), made up 24 percent of the sample ($n = 362$). They were 39 percent men ($n = 141$) and 61 percent women ($n = 221$). In our sample the women were slightly over-represented and the men slightly under-represented in comparison to the CSUN population. The mean age was 19.7 years, and the mean class level was 1.8. The distribution of respondents across major fields of study very closely resembled the overall distribution of students at CSUN. In comparison to the distribution in the total sample, among CSUN respondents were 10 percent more economics/business students and 10 percent fewer science/math students. All respondents at CSUN were taken from introductory biology classes, a general CSUN requirement.

Material

The investigators designed a thirty-eight question survey, which had five demographic variables: campus, sex, age, class level, and major field of study.² Ten questions were asked specifically about psilocybin mushrooms: use or non-use; whether non-users would try mushrooms if available; approximate

² The questionnaire is available from the authors.

number of acquaintances who used mushrooms; whether the respondent believed mushroom use had increased in the last two years; lifetime and last six-month usage levels; if using respondents would continue to use; the general psychological effects that were felt; and whether users had tried to cultivate mushrooms. Also included was a list of nine other drugs that were to be rated for lifetime use levels and age at first use. These drugs were alcohol, marijuana, cocaine, amphetamines, peyote/mescaline, tobacco, LSD, PCP, and heroin.

Procedures

The participants were informed that the instrument was an anonymous survey to determine the extent of psilocybin, or magic mushroom use as well as use of other drugs. They were asked to fill out the thirty-eight-question survey using numbered answer codes. If they wished to participate in a more in-depth survey, they were to fill out a separate form so that the investigators could contact them. All respondents were encouraged to participate further.

The surveys were distributed, completed, and collected during the Fall semester of 1982 at CSUN, and during the Fall quarter of 1982 and Winter and Summer quarters of 1983 at UCLA.

RESULTS

Epidemiology

Table 1 compares the percentages of our respondents reporting use of eleven drug categories to use reported by respondents in three other studies. Our study found similar overall prevalence rates, although the rates seem a bit conservative in comparison to the two national surveys by Miller and Cisen [3] in 1983 and Johnston, Bachman, and O'Malley in 1981 [1]. Amphetamine and PCP usage were especially different. The reported amphetamine use in our study was half that of the comparison studies, and PCP use was approximately one-third. In general, though, our results were comparable to the other studies.

In Figure 1 all of our respondents who reported using any hallucinogens were separated into groups according to which hallucinogen(s) they had used, and the percentages of the total were calculated. As shown in Figure 1, of all hallucinogen users ($n = 257$), 56.4 percent (Segment A) had used only mushrooms and 30.3 percent (Segments B-I) had used mushrooms and another hallucinogen, for a total of 86.7 percent. For this group, 30.7 percent (Segments B, C, and G-K) reported having used LSD, with only 5.1 percent reporting having used LSD exclusively (Segment C). Approximately three times as many users of hallucinogens used mushrooms ($n = 223$) than used LSD ($n = 79$).

Although mushrooms were the most widely used hallucinogen in the sample (see Table 1), the respondents reported fairly low lifetime participation rates. Of the 223 who reported mushroom use, seventy-one (32%) had used only once;

Table 1. Substance Abuse Lifetime Prevalence Rates^a

<i>Substance</i>	<i>Present Study</i> (<i>n</i> = 1507) <i>College</i> <i>Students</i> <i>1982-83</i>	<i>Skager</i> ^b [2, 21] (<i>n</i> = 296) <i>11th Grade</i> <i>1983</i>	<i>Johnston</i> [1] (<i>n</i> = 17,500) <i>12th Grade</i> <i>1982</i>	<i>Miller</i> [3] (<i>n</i> = 2044) <i>18-25 Years</i> <i>1982</i>
Alcohol	88.2%	76.8%	92.8%	94.6%
Marijuana	53.8%	41.4%	58.7%	64.1%
Tobacco	50.9%	47.8%	70.1%	76.9%
Cocaine	26.5%	19.1%	16.0%	28.3%
Psilocybin (mushrooms)	14.8%	—	—	—
Amphetamines	14.6%	24.7%	27.9%	18.0%
LSD	5.3%	7.3%	9.6%	—
Hallucinogens	17.1%	13.1%	12.5%	21.1%
PCP	2.5%	9.6%	6.0%	—
Peyote/mescaline	2.1%	—	—	—
Heroin	0.7%	1.0%	1.2%	1.2%

^a Adapted from unpublished dissertation, David Sherman, UCLA [20].

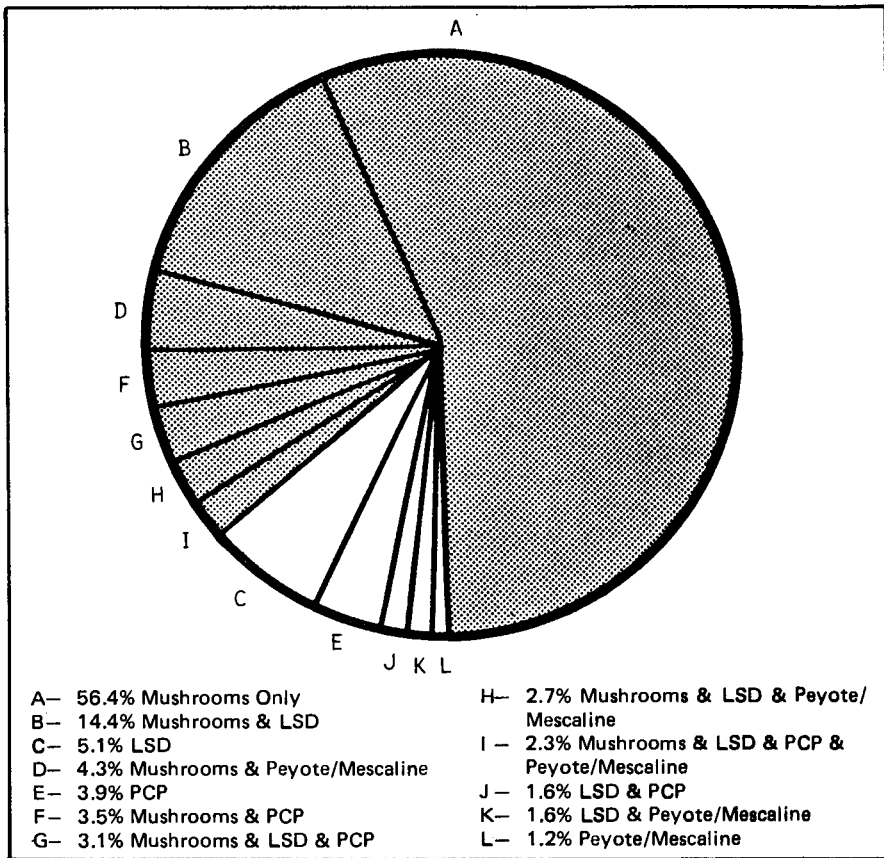
^b Amphetamines, Marijuana, Cocaine and LSD from Skager [2]. Other drugs from Skager [21].

^c Total percentage for Psilocybin, LSD, Peyote, and Mushrooms separately and in all combinations.

seventy-six (36%) had used two to four times; thirty-six (16%) five to nine times; twenty-nine (13%) ten to twenty-four times; and six (3%) twenty-five or more times. (There are two cases with missing data.) Thus, approximately 90 percent of the mushroom-using respondents had used them ten times or fewer at the time of the survey.

Characteristics of Mushroom Users

Of the total sample, 14.8 percent reported some mushroom use (see Table 1). Three of the five demographic variables showed significant relationships with mushroom use or nonuse. First, there was a significant difference in the prevalence of mushroom use between the two campuses: at CSUN 18.5 percent of the respondents reported some use; at UCLA only 13.6 percent reported some use, $\chi^2 (1, N = 1507) = 5.20, p < .05$. Second, there was a significant difference in the sex of users and nonusers, $\chi^2 (1, N = 1507) = 31.305, p < .01$. Twice as many men as women have used mushrooms. Users were slightly more advanced in their educational level, $t(1500) = 3.85, p < .01$. On a scale of 1-5, (1 = freshman, 5 = graduate student), the mean level for users was 1.8, and the mean for nonusers was 1.5.



Note: Shaded area indicates extent of mushroom use alone and in combination.

Figure 1. Percentage of users of four hallucinogens used alone and in combinations.

Two differences were found with respect to the approximate number of fellow users respondents reported knowing. Nonusers were separated into three levels based on willingness to try mushrooms: wouldn't try ($n = 893$), unsure ($n = 270$), and would try ($n = 121$). The total mean number of friends who have used for each group was 4.5, 9.0, and 11.7, respectively. The mean for users ($n = 223$) was 18.7. These data illustrate a common finding in drug abuse epidemiology: that use or attitudes toward use of an illicit drug is correlated with the number of drug-involved friends [1].

Mushroom users were also different from nonusers in lifetime frequency and age at first use of other drugs. Mushroom users were more likely to have used each of the nine other drugs (see Table 2). The largest differences were found for

Table 2. Other Lifetime Drug Use of Mushroom Users and Nonusers

<i>Drug</i>	<i>Users (%)</i> <i>n = 223</i>	<i>Nonuser (%)</i> <i>n = 1284</i>	χ^2 *
Alcohol	98.20	83.56	29.24
Marijuana	97.30	45.40	206.42
Cocaine	84.30	16.40	452.89
Tobacco	74.88	45.71	61.61
Amphetamine	51.56	7.92	290.96
LSD	26.45	1.63	228.51
Peyote	11.21	0.62	94.50
PCP	10.31	1.09	67.86
Heroin	4.48	0	58.28

*All values $p < .01$.

marijuana, cocaine, and alcohol use respectively; these drugs constitute three of the four most prevalent drugs used by our sample. Age at first use was significantly different between mushroom users and nonusers for four of the nine drugs surveyed: alcohol, marijuana, cocaine, and PCP (see Table 3). For alcohol, marijuana, and cocaine, mushroom users began use approximately one year earlier than nonusers. For PCP the relationship was reversed. The mean age difference for all these figures is approximately 1.2 years, no matter what the direction of the relationship.

Mushroom consumers were asked whether they would or would not continue to use mushrooms or if they were unsure about continuation of the practice. The respondents were about evenly divided among the three choices.

Analysis of variance of the respondents' extent of mushroom use showed significant differences between these three groups (see Table 4). Those respondents who would continue mushroom use had the highest prevalence for both lifetime and last six months. Those unsure about continuing consumption of mushrooms had the next highest prevalence rates, followed by those who would not continue use.

Table 3. Age at First Use

<i>Drug</i>	<i>Users</i> <i>n = 223</i>	<i>Nonusers</i> <i>n = 1284</i>	<i>t</i> *	<i>df</i>
Alcohol	12.9	14.1	4.35	1290
Marijuana	14.3	15.3	5.43	798
Cocaine	16.6	17.5	3.78	395
PCP	17.0	15.5	2.73	35

* $p < .01$.

Table 4. Relation Between Past Use and Intention to Continue

<i>Time Period</i>	<i>Mean Number of Uses by Intention to Continue</i>			<i>ANOVA Results</i>	
	<i>Yes n = 75</i>	<i>Unsure n = 75</i>	<i>No n = 71</i>	<i>F*</i>	<i>df</i>
Lifetime	8	4.2	2.5	8.67	2,218
Past six months	1.8	0.7	0.25	8.85	2,219

*Both values $p < .01$.

The Tukey pairwise contrast procedure showed the significant differences to be between the "yes" and the "unsure" groups and between the "yes" and the "no" groups, but not between the "unsure" and the "no" groups. This held true for both the lifetime and the past-six-months analyses.

There were also differences between these three groups of mushroom users in the extent of their use of three other drugs: marijuana, amphetamines, and LSD. Respondents who would continue mushroom use had the highest involvement in all three drugs; those who were unsure about continuing mushroom use had the next highest use of all three drugs; and those who would not continue mushroom use had the lowest extent of use of these three drugs. The chi-square scores were: $\chi^2 (2, n = 223) = 33.50, p < .01$ for marijuana; $\chi^2 (2, n = 223) = 13.08, p < .01$ for amphetamine; and $\chi^2 (2, n = 223) = 9.61, p < .01$ for LSD.

Mushroom users were also asked to rate the general psychological effects they had experienced from their use of mushrooms. Figure 2 shows the percentages of users in each of five categories specifying how they evaluated the effects that they experienced. Out of all users 73.2 percent reported some positive effects and approximately 45 percent reported only positive effects. In contrast, 5.1 percent reported only negative effects.

The whole sample was asked whether they felt mushroom use had increased in the past two years or if they were unsure about an increase in the prevalence of use (see Table 5). Fifty percent of the respondents were unsure, 30 percent responded "yes," and 20 percent responded "no." A difference was

Table 5. Response To the Question:
"Have You Perceived an Increase in Mushroom Use in the Past Two Years?"

	<i>Yes n = 460</i>	<i>Unsure n = 755</i>	<i>No n = 292</i>
Users	45%	29%	26%
Nonusers	28%	54%	18%
Total Sample	31%	50%	19%

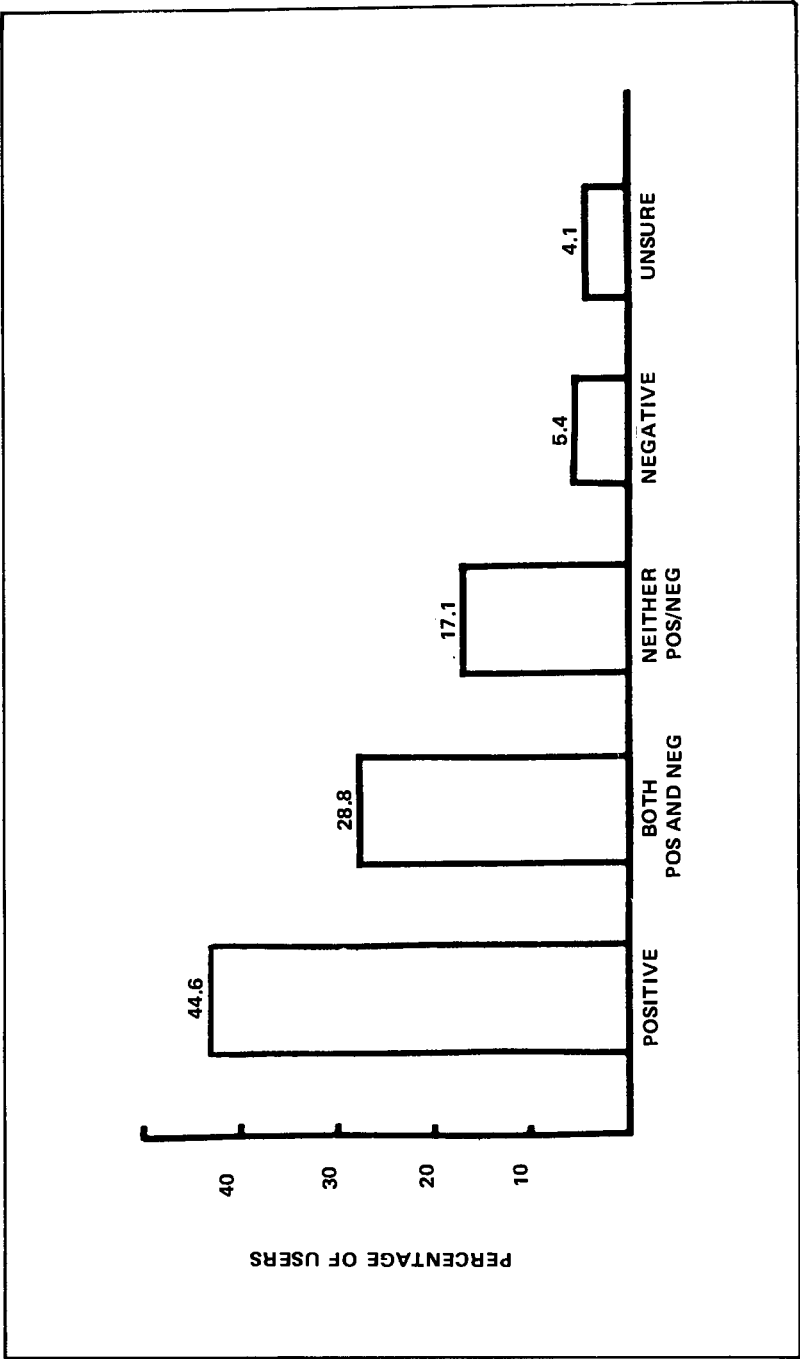


Figure 2. General psychological effects.

found between the responses of users and nonusers of mushrooms, $\chi^2 (2, N = 1507) = 46.80, p < .01$. An increase was reported by 45 percent of the users and 28 percent of the nonusers, while 54 percent of the nonusers and 29 percent of the users were unsure whether there had been an increase in mushroom use.

DISCUSSION

The prevalence estimates of our mushroom use data seem plausible because the rates of use of most other drugs we surveyed are similar to those reported in the comparison studies [1-3]. The rates of use found by our study are somewhat conservative by comparison, but several factors may contribute to this phenomenon. Our sample was comprised exclusively of college students, whose drug use patterns may be different because of the selectivity of college admission and because of the academic environment. It is also possible that people who were absent from class during data collection may have had higher rates of use. It is particularly difficult to account for the relatively low rate of amphetamine use, which is inconsistent with the previously cited surveys. Those who use amphetamines may not proceed to the university system from high school, or they may have made up a larger portion of the absent group. In general, though, we have no reason to doubt the data, and if anything, the conservativeness of the figures strengthens confidence.

The results indicate that mushrooms are now the most widely used hallucinogenic drug, but extended use is not common. This suggests that mushroom use is predominantly experimental in nature or that use of them by the general public is a recent phenomenon. Availability of the fungi and a suitable location for the experience may be necessary conditions. Our most striking finding is that over half of our reported hallucinogen users limited themselves only to mushrooms. This high percentage of use has not been noted in previous drug studies. Most of the national surveys on drug use classify hallucinogens as "LSD and other hallucinogens," failing to distinguish between categories of hallucinogens [1-3, 20]. The trends that these studies show for the period after 1975 is a gradual decrease in hallucinogen use from 1975 to 1979 and then a stabilizing of lifetime prevalence. Some studies after 1980 indicate a slight increase in use, while others indicate continuing stability. We suggest that this stability or slight increase may be accounted for by increased mushroom use, which itself is due to promotion by word of mouth, the media, availability of spore kits, and cultivation. Our data suggest that the mushroom, not LSD, is the major hallucinogen presently being employed.

The evidence presented in this study suggests a recent dramatic increase in mushroom use. One third of the sample reported noting an increase in use over the last two years. Drug educators and legislators should be interested in such results for public information and policy decisions. Many of those who use mushrooms told us informally that they would never take LSD, which suggests that researchers should differentiate mushrooms from other hallucinogens.

People who take mushrooms may not be answering questions on hallucinogenic drug use because they do not equate mushrooms with LSD the way researchers do. It is apparent that considerable change has taken place in the use of these drugs since the 1960's.

While the prevalence rate of mushroom use does seem to be increasing, only 16 percent of our mushroom-using sample had used mushrooms ten times or more. The low frequency and few negative effects of use indicate that abuse does not present a social problem, nor is there evidence for predicting the development of a problem. The 1981 Drug Abuse Warning Network (DAWN) annual report showed only twenty-three emergency room mentions of psilocybin alone or in combination. The 1982 DAWN annual report showed only thirty-one mentions [22]. By comparison, the mentions of LSD, mescaline, and marijuana for the two years were 1466, 414, and 4671 and 1498, 418, and 5295 respectively [23]. However, given the current findings, the phenomenon is worthy of monitoring by those engaged in drug abuse epidemiological research.

Two important characteristics distinguish users of mushrooms from nonusers. The first is use of other drugs. Mushroom users made more use of all the other drugs surveyed, especially marijuana, cocaine, and alcohol. The second is that the age at first use of alcohol, marijuana, and cocaine is approximately one year earlier for users. Thus, and not unexpectedly, mushroom users reported using more kinds of drugs than nonusers, and they started using the more common drugs at an earlier age. Overall, these results suggest that mushroom users may be more inclined to risk-taking and sensation-seeking behavior. These results are not unlike those found for users of marijuana in studies conducted prior to 1975 [24].

The hallucinogen users of today are different from those of the 1960's in their experimental drug of choice—mushrooms. Mushroom use should be approached as a new phenomenon and the trend and extent of use should be monitored. Behavioral aspects of the user population should be studied also. To this end we propose that drug use studies be more specific in the collection and analysis of data concerning psychoactive mushroom use.

ACKNOWLEDGMENTS

The authors wish to thank Matt Futterman, Eric Holman, Jan Fazio, and JoAnn Costello for assistance in the preparation of this manuscript.

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