



Short communication

## A survey of hallucinogenic mushroom use, factors related to usage, and perceptions of use among college students

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## ABSTRACT

**Background:** Recreational usage and attitudes toward psilocybin-containing hallucinogenic mushrooms among college students are seldom explored.

**Methods:** We surveyed 882 randomly selected undergraduates at Skidmore College in upstate New York and quantified whether participants had ever used psilocybin mushrooms, their attitudes toward the drug, and polydrug use.

**Results:** There were 409 responses and 29.5% of the sample reported psilocybin use. Among users, the mean number of times they reported using mushrooms was 3.4 (mode = 1). The top factors cited that influenced their decisions to try hallucinogenic mushrooms for the first time were 'curiosity', 'to achieve a mystical experience', and 'introspection'. Users and non-users had significantly different perceptions of mushrooms: non-users were more likely to say that hallucinogenic mushrooms were addictive and had the potential for abuse than users. Users did not believe that psilocybin negatively impacts their academics, mental health, or physical health, while non-users did. Both users and non-users of psilocybin reported high life-time use of alcohol (97% vs 96%, respectively), marijuana (98% vs 73%, respectively) and tobacco (82% vs 54%, respectively). Psilocybin users were significantly more likely to use other drugs such as cocaine, ecstasy, opiates, non-prescribed prescription drugs, opiates, and lysergic acid diethylamide (LSD) than non-users of psilocybin.

**Conclusion:** This study uncovers important insights into hallucinogenic mushroom use by college students.

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### 1. Introduction

Psilocybin-containing mushrooms have long been sought after and consumed for their hallucinogenic properties. Symptoms of psilocybin consumption include altered perceptions, hallucinations, disorganized thinking, anxiety, and an altered perception of time (Hollister, 1961; Isbell, 1959; Malitz et al., 1960; Wittmann et al., 2007; Wolbach et al., 1962). There are 22 species of mushrooms in the genus *Psilocybe* that contain psilocybin in the United States and Canada (Guzmán, 2005), as well as a number of species in other genera that contain psilocybin (Stamets, 1996). Commonly consumed species include *Psilocybe cubensis* and *Psilocybe semilanceata*.

Psilocybin is an agonist of several serotonin subreceptors, including 5-HT<sub>1A</sub>, 5-HT<sub>1D</sub>, 5-HT<sub>2A</sub>, and 5-HT<sub>2C</sub>, and it binds to the receptors with different affinities (for a review, see Passie et al.,

2002). Antagonism of the 5-HT<sub>2A</sub> subreceptor blocks the subjective experience of hallucinations (Vollenweider et al., 1998). The National Survey on Drug Use and Health is a comprehensive annual drug survey that includes hallucinogenic drug use. The survey currently combines LSD, PCP, peyote, mescaline, ecstasy (MDMA), and hallucinogenic mushrooms into a single category, despite the fact that this group comprises pharmacologically unrelated compounds that have differing mechanisms of action in the brain. In 2010 they found that 22% of college students aged 18–22 used one or more of these hallucinogens (Substance Abuse and Mental Health Services Administration, 2011).

No recent survey has examined hallucinogenic mushroom use on the college campus. In our current study, we sent out an online survey to nearly 900 matriculated undergraduates at a liberal arts college in upstate New York. Our survey assessed hallucinogenic mushroom use, including contributing factors that led to initial experimentation. We also surveyed the reasons non-users reported for abstaining. In addition, we surveyed both users and non-users about their perceptions of the mushrooms, including their potential for abuse and their perceived addictiveness.

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**Table 1a**

Factors influencing the decision to try hallucinogenic mushrooms for the first time (all factors column) and the single most important factor ( $N=108$ ) that influenced that decision (most important factor column) ( $N=109$ ). The dependent variable shown is the percent of respondents.

What factors influenced your decision to try hallucinogenic mushrooms for the first time?		
Answer options	All factors	Most important factor
Curiosity	92.7	57.4
Achieve a mystical experience	62.4	19.4
Introspection	61.5	11.1
Enhance creativity	40.4	2.8
Friends were doing it	34.9	4.6
To get high	33.9	0.0
Relaxation	22.0	0.0
Other (please specify)	10.1	4.6
Increase socialization	5.5	0.0

## 2. Methods

### 2.1. Participants

Skidmore College is a private liberal arts college in Saratoga Springs, New York (approximately 30 miles north of Albany), with approximately 2650 matriculated undergraduates. A random sample of one third of all matriculated undergraduate students from each graduating year was used in this study. There were 208 first-year students, 204 sophomores, 248 juniors, and 222 seniors randomly selected to participate in this study. Participants were not compensated in any way for participation in the study.

### 2.2. Survey

The survey was made in SurveyMonkey, an online survey manager, and a link to the survey was emailed to the selected students. The email stressed that the survey was voluntary, and that names of participants and IP addresses from computers would not be collected. Students were given one week to complete the survey, and a single reminder email was sent out 1 day before the survey closed. A link to a SurveyMonkey address was given in the Once participants clicked on the SurveyMonkey web link, students were directed to a disclaimer and a statement of consent. After giving consent, the survey began and there were five demographic questions (e.g., gender, age, and major). Next, participants were asked if they had consumed hallucinogenic mushrooms. Depending on whether they answered 'yes' or 'no', they were directed to different sets of questions, although some questions were asked to both groups. Questions that required a numerical answer (e.g., 'how many times have you used hallucinogenic mushrooms') were free-response while all others were multiple choice. Some questions allowed participants to select more than one answer and others allowed only one answer. Questions are described in Section 3. The survey concluded with instructions on how to clear the browsing history, cookies, and cache. Research was approved by the Skidmore College Institutional Review Board.

## 3. Results

Of the 882 students contacted, 409 students gave consent to participate in the survey (response rate = 46.4%). There were 398 students who identified their gender: there were 141 males, 254 females, and 3 who indicated 'other'. The mean age of the participants was 19.86 ( $\pm 1.32$  SD) years of age. The range was 18–29, and 62 were 18 years old, 104 were 19 years old, 86 were 20 years old, 115 were 21 years old, 16 were 22 years old, and 7 were between 23 and 29. Out of 397 responses, 29.5% (117 participants) indicated that they had intentionally consumed hallucinogenic mushrooms. The following series of questions was asked of the 117 hallucinogenic mushroom users.

### 3.1. Usage patterns and sources of the mushrooms

The mean number of times they reported using mushrooms was 3.4 (mode = 1: range 1–20). A total of 37% reported using mushrooms just once. Participants were asked to indicate all factors that influenced their decision to use mushrooms the first time. Additionally, they were asked to select the single most important factor that influenced this decision. See Table 1a. Participants classified their

experience(s) with hallucinogenic mushrooms as mostly positive, positive, neutral, negative, or mostly negative. Here, 92.7% selected mostly positive or positive, and 7.3% selected neutral.

Participants indicated the single most common source of their hallucinogenic mushrooms: 65.4% reported that they got their mushrooms from a friend, 31.7% reported that they bought them from a dealer, and 2.9% reported that they grew the mushrooms. When participants were asked to indicate all sources of hallucinogenic mushrooms, 78.5% reported that they have gotten them from a friend, 57.0% bought them from a dealer, 7.5% grew them, and 3.7% reported that they have picked them in the wild.

### 3.2. Differences between hallucinogenic mushrooms users and non-users

Users indicated that they had  $15.3 \pm 10.9$  (mean  $\pm$  SD) friends who have taken hallucinogenic mushrooms (median = 12: range 1–50). Conversely, non-users reported having  $5.2 \pm 5.9$  friends who have used hallucinogenic mushrooms (median = 4: range 0–40).

Users were less likely than non-users to believe that hallucinogenic mushroom use was harmful to their health, relationship with friends, relationship with family, academics, career, and physical health;  $\chi^2$  analyses compared the answers for each of these six comparisons between users and non-users and found a significant difference between the groups;  $p < 0.001$  for each comparison. See Table 1b for the results to this question.

Users and non-users showed significant differences between opinions of whether mushrooms are addictive or not,  $\chi^2$  (1,  $n=364$ ) = 17.77,  $p < 0.001$ . The majority of users, 98.1%, reported that mushrooms are not addictive. Conversely, 81.6% of non-users reported that hallucinogenic mushrooms are not addictive. Users and non-users also showed significant differences between whether they believe there is a potential for abuse of hallucinogenic mushrooms,  $\chi^2$  (1,  $n=369$ ) = 40.25,  $p < 0.001$ . Among users, 62.4% reported that there is no potential for abuse. In contrast, 72.7% of non-users reported that there is the potential for abuse of hallucinogenic mushrooms.

Hallucinogenic mushroom users and non-users showed significant differences in the other drugs they reported using,  $\chi^2$  (11,  $n=1251$ ) = 165.30,  $p < 0.001$ . For this analysis, a single chi-square tested differences between users and non-users for all 11 drugs listed, see Fig. 1.

### 3.3. Reasons non-users have not used

Lastly, the non-users were asked what factors have influenced their decision to avoid hallucinogenic mushrooms. Lack of interest was selected by 67.3% of respondents, fear of a bad trip by 56.5%, fear of damaging mental health by 47.7%, physical dangers by 43.1%, and do not do drugs by 38.8%. Interestingly, 16.2% of respondents selected 'unable to acquire them'.

## 4. Discussion

We surveyed recreational use of psilocybin-containing hallucinogenic mushrooms in a small private college in upstate New York. Recent surveys on this drug have not been completed, and the surveys that do exist are flawed. As such, this survey provides insight into recreational use of psilocybin-containing mushrooms in college students. Overall, we found that 29.5% of our sample reported using these mushrooms. In 1985, Thompson et al. found that psilocybin mushroom usage was 14.8% among University of California and California State University students. More recently, Barrett et al. (2006) interviewed 149 drug-using undergraduate students from McGill University in Montreal, Canada, and found that 65% of them had used psilocybin mushrooms. To qualify as

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