Published in final edited form as:

Pediatr Ann. 2006 August ; 35(8): 565–571.

Nonmedical Use of Prescription Stimulants Among Students

Amelia M. Arria, PhD[deputy director of research]

Center for Substance Abuse Research, University of Maryland College Park, College Park, MD

Eric D. Wish, PhD[director]

Center for Substance Abuse Research, University of Maryland College Park

It is estimated that 4.1 million people 12 and older in the United States in 2003 had used methylphenidate without a physician's prescription at least once in their lifetime.^{1,2} This estimate represents a slight decrease from the 2002 estimate of 4.5 million people. Although these estimates represent a small fraction of the population (1.8% and 1.9%, respectively), the extent of nonmedical use of prescription stimulants has drawn attention from the general public, policymakers, educators, and health professionals.

The purpose of this article is to provide a comprehensive review of the scientific literature regarding the epidemiology of nonmedical use of prescription stimulants in adolescents and young adults. This is intended to inform clinicians, albeit in a limited way, about the nature and extent of this phenomenon. To this end, we highlight trend data in the nonmedical use of prescription stimulants from national epidemiologic surveillance systems, including the National Institute on Drug Abuse (NIDA) Monitoring the Future Survey,^{3,4} and the Substance Abuse and Mental Health Services Administration (SAMHSA) National Survey on Drug Use and Health.^{1,2} In addition, we review the few published empirical studies of high school and college students regarding nonmedical use of prescription stimulants.

METHODOLOGICAL CHALLENGES

Unlike the study of specific illicit drugs, where there are usually only one or, at the most, a few “forms” of the drug (eg, cocaine powder versus crack cocaine), the multiple formulations of prescription stimulants offer new challenges to researchers. The most common stimulants prescribed for children and adolescents for the treatment of attention-deficit/hyperactivity disorder (ADHD) are methylphenidate, dextmethylphenidate, and amphetamine–dextroamphetamine combination, sold in different formulations under several brand names. All of these drugs are stimulants developed to help children with ADHD improve their focus and attention. Methylphenidate is a central nervous system stimulant.⁵ Amphetamine–dextroamphetamine is a stimulant, but instead of being made of methylphenidate, it is a mixture of different amphetamine salts. A review of the epidemiologic literature on stimulant drug use is complicated because researchers often focus on different brand names when asking subjects to report their use. In this article, we will specify brand names as they were used in the referenced material.

Another challenge to research involving the nonmedical use of prescription stimulants is to define nonmedical use clearly to survey respondents. Usually, questionnaire administration time does not allow for a full explanation and, as a result, respondents may report nonmedical use based on an inconsistent understanding of the question being asked.

Address reprint requests to: Amelia M. Arria, PhD, University of Maryland Center for Substance Abuse Research, 4321 Hartwick Road, Suite 501, College Park, MD 20740; or aarria@cesar.umd.edu..

The authors have no industry relationships to disclose.

Moreover, people may be reluctant to disclose illicit behavior or health conditions such as ADHD because of confidentiality concerns, and any reluctance could lead to inaccurate responses. Building trust and rapport is essential for improving the veracity of survey data and usually can be accomplished more effectively in a face-to-face interview than with a questionnaire.

Nonmedical use of prescription stimulants can be defined in several ways. The first is the use of a patient's prescribed medication in a manner not consistent with the physician's orders. For example, taking the drug more or less than intended by the physician, in the broadest sense of the definition, could qualify as nonmedical use. It is controversial whether being inconsistent with a physician's orders should qualify as nonmedical use, as patients who take less of the medication may be using it medically but may have low compliance. Also, patients may increase the dose of the medication occasionally to achieve better treatment outcomes.

A second type of nonmedical use, and the most widely accepted definition, is using the drug without a prescription for the person taking the medication. In this case, the drug could be obtained in a variety of ways, including receiving the drug free or by purchase — either from someone who has a prescription or from someone who does not — or by ordering the drug from Internet sources without a legitimate prescription.

In summary, what makes research about nonmedical use of prescription stimulants particularly challenging are the multiple formulations of different drugs and the definition of nonmedical use. Keeping these caveats in mind, we will discuss trends in the prevalence of nonmedical use of prescription stimulants from national surveys.

TRENDS IN NONMEDICAL USE

Two important pieces to the puzzle of nonmedical use of prescription stimulants come from national epidemiologic surveillance systems: trends in the prevalence of use and characteristics of users. If the measurement tool (or wording of the question) remains the same throughout

It is controversial whether being inconsistent with a physician's orders should qualify as nonmedical use

time, then survey data can show whether there are significant increases or decreases in the number and proportion of users throughout time. Moreover, these data can provide information on whether users tend to share certain demographic characteristics in comparison with nonusers.

Monitoring the Future

The Monitoring the Future Survey (MTF) is an annual nationwide survey of eighth graders through young adults conducted by researchers at the University of Michigan and funded by the NIDA.^{3,4} This survey began following trends of methylphenidate use in 1976 by asking about Ritalin use but, unfortunately, did not include questions regarding subsequently approved formulations of methylphenidate.

Since 1976, the MTF has asked what is called a “branching question” to assess past year use of specific amphetamines, including, but not limited to, prescription stimulants. Information on the type of stimulant used is gathered only if the respondent indicates that he or she took an amphetamine without a physician's orders at least once in response to an initial “stem” question. Figure 1 (see page 566) presents data from the secondary “branching” question asked in MTF from 1976 through 2004. As can be seen, the estimated percentage of students

reporting nonmedical use of methylphenidate was less than 0.5% on average until 1995. From 1995 through 1998, the estimate increased to a plateau level of about 2.0% to 2.5%, which continues to the present.³

Figure 2 presents data from a different question from the MTF. This question, which was first asked in 2001, is a direct standalone or “tripwire” question about nonmedical use of methylphenidate. The only standalone question asked was about Ritalin; no other questions were asked about other prescription stimulants. The question pertaining to Ritalin is asked of all respondents about specific types of nonmedical stimulant use and does not require a particular answer to an initial stem question. This figure, based on MTF data,³ shows that tenth and twelfth graders are slightly more likely than their eighth grade counterparts to have used methylphenidate nonmedically (eg, for 2003, the corresponding percentages are 4.1%, 4.0%, and 2.6%, respectively). Also, for the period between 2001 and 2003, very little change in the estimate has occurred. None of the variations during the 3-year time period are statistically different. However, it is notable that the estimates obtained from the use of this standalone question are higher than the estimates obtained using the branching question described earlier.

As shown in Figure 3, from data also based on the MTF, boys are more likely to have used methylphenidate than girls in eighth, tenth, and twelfth grades; however, the difference appears most striking in twelfth grade, where approximately twice as many boys used methylphenidate nonmedically compared with girls.

Figure 4 displays the association between plans to complete college and methylphenidate use from both the 2001 and 2002 MTF data. In all cases, students who had no college plans were much more likely to have used methylphenidate than adolescents from every age group who planned to complete 4 years of college. This finding is somewhat paradoxical given that, once in college, the risk of nonmedical use of stimulant drugs increases; full-time college students reported higher use of methylphenidate than noncollege students in the same age group (5.7% versus 2.5%).⁴ Both male and female college students show higher rates of methylphenidate use than noncollege students of either sex (male, 8.4% versus 2.1%; female, 3.9% versus 2.8%). It is plausible that the reasons for use among noncollege bound high school students (eg, for curiosity or for fun) might be different from reasons for use given by college students (eg, to stay awake, to study).

Figure 5 (see page 569) displays data from the SAMHSA National Survey on Drug Use and Health (formerly the National Household Survey on Drug Abuse).^{1,2} Before 1998, this survey collected general information about the nonmedical use of prescription stimulants but did not ask about specific formulations. Therefore, data are presented from 1999 to the latest data available, which asked the following question: “Have you ever, even once, used Ritalin or methylphenidate that was not prescribed for you or that you took only for the experience or feeling it caused?”

These data show that there has been a gradual increase in the lifetime prevalence estimate — ever using the drug nonmedically at least once in one's lifetime — for those 18 to 25 years old, but that the estimates for the other age groups are flat, except for a slight decrease from 2002 to 2003. Between 2001 and 2002, the increase in the estimate is statistically significant for those 18 to 25 years old; between 2002 and 2003, the decrease is statistically significant for those 26 or older.^{1,2}

EMPIRICAL STUDIES OF NONMEDICAL PRESCRIPTION STIMULANT USE

In addition to several isolated case reports in the literature of nonmedical methylphenidate use,⁶ there are six notable empirical studies of nonmedical use of prescription stimulants in

samples of adolescents and young adults.^{6–11} Of the six, two involve clinical samples of adolescents attending treatment for substance abuse disorders.^{6,7} The remaining four studies of samples were obtained from the general population.^{8–11}

The first of these general population studies was conducted by Low and Gendaszek.⁸ A sample of 150 undergraduate students recruited from psychology classes

The estimated percentage of students reporting nonmedical use of methylphenidate was less than 0.5% on average until 1995. From 1995 through 1998, the estimate increased to a plateau level of about 2.0% to 2.5%, which continues to the present.

completed anonymous questionnaires about their use of prescription stimulants in the previous 12 months. The questionnaire response rate was 93.8%, and the average age of the students completing the survey was 20.1. Students were categorized into “nonabusers” and “abusers,” with those who had a prescription (10% of the sample) classified as nonabusers. Students were asked questions regarding their motivation for using stimulants and completed assessments to measure perfectionism and sensation seeking.

In this study, approximately one-third (35.3%) of all students used amphetamine–dextroamphetamine, methylphenidate, or dextroamphetamine without a prescription.⁸ Of these users, 10% used them monthly and about 8% weekly. Common motivations reported included “to improve intellectual performance” (23.3%), “to be more efficient on academic assignments” (22.0%), and to “use in combination with alcohol” (19.3%). There were no gender differences in the reported reasons for use, but men were more likely to use prescription stimulants than women. In the open-ended section of the survey, some students commented that methylphenidate enabled them to “party longer and drink more.” An additional motivation for use included improving athletic performance.

The second study was conducted by Babcock and Burne⁹ and involved the mailing of an anonymous survey to the entire student body ($n = 1,401$) of the Massachusetts College of Liberal Arts, a public 4-year college in North Adams, MA. The survey included 10 yes or no questions about the nonmedical use of methylphenidate, amphetamines, and cocaine. No incentive for completing the survey was provided, and 20% percent of students ($n = 283$) returned completed surveys. Any questions that were left blank or were ambiguous were coded as a negative response.

Student responses were analyzed in relation to their student status and age. Many of the respondents were 24 and older and were categorized as nontraditional students, while students younger than 24 were labeled traditional students. The researchers surmised that older students might be unaware of substance abuse trends, so their responses were studied separately.

Sixteen percent of the total sample reported using methylphenidate (21% of traditional students and 3% of nontraditional students). Thirteen percent of the entire sample reported that they had used methylphenidate intranasally. Close to half (45.5%) of the traditional students said that they knew a student at the college from whom they could purchase methylphenidate, while less than 2% had a prescription for it. More than one-third believed that methylphenidate was a drug of abuse on the campus. No students older than 25 reported use of methylphenidate, but they more frequently reported a lifetime history of cocaine and amphetamine use. In the discussion of their findings, these authors report anecdotal information from students in the study that methylphenidate was used primarily as a study aid.

The third study was conducted by Teter and colleagues¹⁰ at the University of Michigan. A random sample of 3,500 students were chosen for the study and sent an e-mail requesting

them to complete a Student Life Survey online. The response rate was about 64% (70% for women and 58% for men), yielding a total sample size of 2,250 students. In this study, 3% of the students surveyed were found to have used methylphenidate in the past year.¹⁰

Teter et al.¹⁰ observed prevalence estimates similar to that of the 2002 MTF. Importantly, they found methylphenidate users also are more likely to be polydrug users than nonusers of methylphenidate. Almost all of the participants who used prescription stimulants nonmedically reported binge drinking in the previous 2 weeks. All users reported smoking marijuana in the previous year, and 58% reported using ecstasy (3,4 methylenedioxymethamphetamine, or MDMA). Those who used stimulants nonmedically also reported more negative primary and secondary consequences of alcohol or other drug-related use in the previous year than either legitimate stimulant users or nonstimulant users. There were significant associations between weekly party behavior, having multiple sexual partners, fraternity and sorority membership, and high family income. Students who reported party behavior of 10 or more hours per week were 12 times more likely to have used methylphenidate in the past year than students who reported 0 party hours.⁹ These studies involving college students are summarized in the Table (see page 570).

Finally, Poulin¹¹ reported data from a 1998 survey of more than 13,000 randomly sampled seventh- through twelfth-grade students in Canada. This survey defined nonmedical stimulant use as an affirmative response to this question: "In the past 12 months have you taken stimulants (Benzedrine, Dexedrine, speed, uppers, bennies, pep pills) without a prescription or without a doctor telling you to do so?" Also measured was the prevalence of medical stimulant use as defined by the use of Benzedrine, Dexedrine, methylphenidate, pemoline, or diet pills in the previous 30 days as prescribed by a physician, and whether there was any evidence of diversion of these medications to others either on purpose or by having the drug stolen. Overall, 8.5% reported nonmedical use of stimulants as defined above, and 5.3% used stimulants under a physician's supervision. Of the students who reported past-year medical stimulant use, 14.7% reported giving their prescription away for free and 7.3% reported selling the medication, with significant overlap between the two groups.

SUMMARY

Despite the caveats discussed above, national epidemiologic surveys are useful in estimating the prevalence and historical trends of nonmedical use of prescription stimulants. Because it would be difficult and cost-prohibitive to ask several more in-depth questions on these national surveys, other smaller-scale research studies should be undertaken to understand more about the patterns and consequences of nonmedical use of prescription stimulants.

The data from the few studies of college students suggest college students are more likely to use prescription stimulants than their noncollege-attending counterparts and suggest college students may experience a need to stay awake to study given the high level of demands in the college environment. More and more people are taking advantage of the opportunity to go to college, making the selection process more competitive.¹² More data are needed regarding the availability of prescription stimulants on college campuses and, in particular, the availability and use of other types of prescription stimulants other than methylphenidate. Data from the college studies presented here also suggest that, in addition to using prescription stimulants as a study aid, students use prescription stimulants to stay awake longer to party or drink more. Because heavy drinking is known to be associated with a wide variety of negative consequences,¹³ it is important to learn more about this particular interaction so that appropriate prevention initiatives can be developed.

EDUCATIONAL OBJECTIVES

1. Identify methodological challenges involved in the investigation of the nature and magnitude of nonmedical prescription stimulant use.
2. Discuss trends in the nonmedical use of prescription stimulants among secondary school and college students in the United States.
3. Describe the relationship between nonmedical use of prescription stimulants and other alcohol and drug use.

REFERENCES

1. [Accessed February 4, 2005] 2003 National Survey on Drug Use and Health. US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Available at: <http://oas.samhsa.gov/nhsda/2k3nsduh/2k3Results.htm>.
2. [Accessed February 4, 2005] 2002 National Survey on Drug Use and Health. US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Office of Applied Studies. Available at: <http://oas.samhsa.gov/nhsda2k2.htm>.
3. Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. Secondary School Students. Vol. Volume I. US Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse; Bethesda, MD: 2004. Monitoring the Future National Survey Results on Drug Use, 1975–2003; p. 545NIH Publication No. 04-5507
4. Johnston, LD.; O'Malley, PM.; Bachman, JG.; Schulenberg, JE. College Students and Adults Ages 19–45. Vol. Volume II. US Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse; Bethesda, MD: 2004. Monitoring the Future National Survey Results on Drug Use, 1975–2003; p. 267NIH Publication No. 04-5508
5. [Accessed February 4, 2005] InfoFacts: Methylphenidate (Ritalin). US Department of Health and Human Services, National Institutes of Health, National Institute on Drug Abuse. September. 2004 Available at: <http://www.drugabuse.gov/Infofacts/Ritalin.html>.
6. Williams RJ, Goodale LA, Shay-Fiddler MA, Gloster SP, Chang SY. Methylphenidate and dextroamphetamine abuse in substance-abusing adolescents. *Am J Addict*. 2004; 13(4):381–389. [PubMed: 15370936]
7. Marsh L, Key J, Payne T. Methylphenidate misuse in substance abusing adolescents. *J Child Adolesc Subst Abuse*. 2000; 9(3):1–14.
8. Low KG, Gendaszek AE. Illicit use of psychostimulants among college students: a preliminary study. *Psychology, Health, & Medicine*. 2002; 7(3):283–287.
9. Babcock Q, Byrne T. Student perceptions of methylphenidate abuse at a public liberal arts college. *J Am Coll Health*. 2000; 49(3):143–145. [PubMed: 11125642]
10. Teter CJ, McCabe SE, Boyd CJ, Guthrie SK. Illicit methylphenidate use in an undergraduate student sample: prevalence and risk factors. *Pharmacotherapy*. 2003; 23(5):609–617. [PubMed: 12741435]
11. Poulin C. Medical and nonmedical stimulant use among adolescents: from sanctioned to unsanctioned use. *CMAJ*. 2001; 165(8):1039–1044. [PubMed: 11699699]
12. [Accessed February 4, 2005] American Community Survey 2003 Multi-Year Profile. US Census Bureau. September 9. 2004 Available at: <http://www.census.gov/acs/www/Products/Profiles/Chg/2003/ACS/Tabular/010/01000US2.htm>.
13. [Accessed February 4, 2005] A Call to Action: Changing the Culture of Drinking at US Colleges. Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism. April. 2002 Available at: http://www.collegedrinkingprevention.gov/Reports/TaskForce/TaskForce_TOC.aspx.

Figure 1.
Trends in past-year prevalence of Ritalin use for all high-school seniors.³

Figure 2. Past-year prevalence of nonmedical Ritalin use among eighth, tenth, and twelfth graders, 2001–2003.³

Figure 3. Past-year nonmedical Ritalin use among male and female eighth, tenth, and twelfth graders, 2003.³

Figure 4. Past-year prevalence of nonmedical methylphenidate use among eighth, tenth, and twelfth graders associated with projected college plans, 2001–2002.³

Figure 5.
Trends in lifetime prevalence of nonmedical methylphenidate use by age group.¹

TABLE
Summary of Studies on Nonmedical Use of Prescription Stimulants Among College Students

Author	Year(s)	Location	Students	Methodology	Response Rate	Results	Limitations
NIDAMTF ^{3, 4}	2002–2003	National	College students	Follow-up sample of those studied in high school	N/A	2002: 5.7% used Ritalin nonmedically; 2003: 4.7% used Ritalin nonmedically	Lifetime prevalence not asked
Low & Gendaszek ⁸	2002	Small US college	150 psychology students	Anonymous questionnaire during class. Definition: taking methylphenidate, Adderall, or dextroamphetamine without a prescription	93.8%	Average age: 20.1; 35% used prescription stimulants nonmedically. Of illicit users, 10% used monthly; 8% weekly. Correlation observed with sensation seeking and perfectionism (see text)	Students who were prescribed psychostimulants all were considered nonabusers
Babcock et al. ⁹	2000	Public university (MA)	293 students	Anonymous questionnaire sent by mail	20.1%	Median age: 21; 16.6% "took Ritalin for fun (nonmedical) purposes"	Question wording does not clearly include using Ritalin for studying. Low response rate
Teter et al. ¹⁰	2003	Large public university (MI)	2,250 students	Self-administered, anonymous, Web-based survey	64%	Average age: 20.1; 3% used Ritalin without a physician's prescription	Did not report lifetime prevalence of nonmedical use of Ritalin, even though the question was asked