

Motives and Perceived Consequences of Nonmedical ADHD Medication Use by College Students

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Rabiner, D.L., Anastopoulos, A.D., Costello, E., Hoyle, R.H., McCabe, S.E., & Swartzwelder, H.S. (2008). Motives and Perceived Consequences of Nonmedical ADHD Medication Use by College Students: Are Students Treating Themselves for Attention Problems? *Journal of Attention Disorders*, 13(3), 259-270.

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Abstract:

Objective: This study examines why college students without a prescription take ADHD medication, what they perceive the consequences of this to be, and whether attention problems are associated with this behavior. **Method:** More than 3,400 undergraduates attending one public and one private university in the southeastern United States completed a Web-based survey. **Results:** Nonmedical ADHD medication use in the prior 6 months was reported by 5.4% of respondents and was positively associated with self-reported attention difficulties. Enhancing the ability to study was the most frequent motive reported; nonacademic motives were less common. Students perceived nonmedical use to be beneficial despite frequent reports of adverse reactions. **Conclusion:** Students without prescriptions use ADHD medication primarily to enhance academic performance and may do so to ameliorate attention problems that they experience as undermining their academic success. The academic, social, and biomedical consequences of illicit ADHD medication use among college students should be researched further. (*J. of Att. Dis.* 2009; 13(3) 259-270)

Keywords: attention deficit/hyperactivity disorder (ADHD) | college students | methylphenidate | motives | prescription stimulants | prescription drug abuse

Article:

The nonmedical use of ADHD medications by U.S. college student populations is now well documented (Babcock & Byrne, 2000; Johnston, O'Malley, & Bachman, 2003; Low & Gendaszek, 2002; McCabe, Knight, Teter, & Wechsler, 2005). In a nationally representative sample of students attending 119 four-year colleges and universities, the past year prevalence of nonmedical use of prescription stimulants ranged from 0% to 25%, and approximately 10% of colleges had a prevalence of 10% or higher (McCabe et al., 2005). Nonmedical use was higher at schools with more competitive admission standards, and among students who were White, who

belonged to a fraternity or sorority, who had lower GPAs, and who engaged in substance use and other risky behaviors (McCabe, Teter, & Boyd, 2006; Teter, McCabe, Boyd, & Guthrie, 2003).

Recent work by Teter, McCabe, and colleagues has added to our understanding of the nonmedical use of stimulant medication by undergraduates by examining the motives for this behavior (Teter, McCabe, Cranford, Boyd, & Guthrie, 2005). The motives most commonly reported were to help with concentration (58%), to help with alertness (43%), and to “get high” (43%). In a second study, the most commonly reported motives were to help with concentration (65.2%), to help with studying (59.8%), to increase alertness (47.8%), and to “get high” (31%; Teter, McCabe, LaGrange, Cranford, & Boyd, 2006). Similar findings have recently been reported by White and colleagues (White, Becker-Blease, & GraceBishop, 2006).

In the study reported below, we examined nonmedical ADHD medication use by college students at one public and one private university in the southeastern United States. This study extends prior work on this issue in several ways. First, rather than having students simply check all the reasons for which they had ever used ADHD medication nonmedically, which was the procedure used to assess students’ motives in prior studies, we had students rate the frequency of different motives for nonmedical use using a Likert-type scale. This change in measurement may have important implications for understanding the relative importance of different motives for nonmedical use. For example, as noted above, several studies have reported that more than 30% of students who use ADHD medication nonmedically have done so to “get high.” However, because students only indicated the reasons why they had ever taken ADHD medication, but not the strength or frequency of those reasons, it is impossible to determine the percentage for whom the desire to “get high” was a strong and frequent reason for use. Employing a more differentiated method for assessing students’ motives should lead to a clearer understanding for why students typically engage in nonmedical ADHD medication use.

We also sought to build on prior work by inquiring about the consequences of nonmedical ADHD medication use that students experience, an area that has not yet been carefully examined. Thus, in addition to asking students why they used ADHD medication, we asked how often taking ADHD medication produced the results they desired. For example, when students use ADHD medication to enhance their ability to concentrate while studying, how often is this result obtained? Learning about the benefits that students perceive from nonmedical ADHD medication use is an interesting issue in itself, and may inform efforts to prevent this behavior. We were also interested in the adverse effects of nonmedical use that students experience—both the frequency of common side effects as well as more potentially serious consequences such as becoming dependent on ADHD medication. This is another area that has not received careful attention.

Finally, although multiple risk factors for college students’ nonmedical ADHD medication use have been identified (McCabe et al., 2006; Teter et al., 2003), the possible contribution of undiagnosed ADHD and concerns about academic performance have not been explored. Because students report using ADHD medication to help with concentration, studying, and alertness (Teter et al., 2005; Teter et al, 2006; White et al., 2006), it is likely that some students turn to ADHD medication because they experience themselves as struggling in these areas. We thus predicted that self-reported ADHD symptoms would increase the likelihood of nonmedical ADHD medication use, but not the nonmedical use of other prescription medications, even when controlling for other known risk factors and other psychiatric symptoms. We also expected that students engaged in nonmedical use would report greater concerns about their academic performance.

Method

Participants

Participants were 3,407 undergraduates from one public and one private university located in the southeastern United States who submitted the Web-based survey described below; the Institutional Review Board at each university approved the study protocol and all participating students provided informed consent online. The public university serves predominantly in-state students and has a female to male ratio of more than 2 to 1. The private university is highly selective, admits a more geographically diverse student body, and enrolls a roughly equal number of males and females. Details on the participation rate and demographic characteristics of the sample are provided below.

Measures

Survey overview. Information on a variety of factors that may be related to the nonmedical use of ADHD medications by college students was collected from all participants (e.g., drug and alcohol use, personality traits, ADHD symptoms, academic concerns, etc.). A detailed inquiry about nonmedical use was conducted with those students who reported it. Aspects of the survey that are central to the current study are described below.

Demographics. All students were asked to provide their gender, ethnicity, race, class standing, and whether they were members of a fraternity or sorority.

Nonmedical ADHD medication use. For the purpose of this article, nonmedical ADHD medication use is defined as the use of ADHD medication by students without a prescription for it. Students who misuse medication that has been prescribed for them (e.g., taking it more often or in higher doses than prescribed) are not considered here.

Students without a current prescription for ADHD medication were shown a list of commonly prescribed medications asked whether they had “ever taken any medication(s) used to treat ADHD even though you did not have a prescription for the medication(s).” They reported on this for three time periods: prior to beginning college, since beginning college, and during the prior 6 months; the latter corresponded to the current school year. Students reporting nonmedical use were asked to check all the different ways that they had obtained it. Only students whose use occurred during the prior 6 months were asked about the motives and consequences for their use that are described below.

Motivations for nonmedical ADHD medication use. Students rated how often during the prior 6 months they had used ADHD medication for each of the following reasons: to be able to concentrate better in class, to be able to concentrate better while studying, to feel less tired so that they could study longer, to feel less restless in class, to feel less restless while studying, to keep track of their assignments, to prevent others from having an academic edge over them, to feel better, to get high, to prolong the intoxicating effects of alcohol or other substances, and to lose weight. Students rated each motive on a 5-point scale according to whether it was never (1), rarely (2), sometimes (3), often (4), or always (5) a reason for their use.

Perceived effects of nonmedical ADHD medication use. Students were asked how often using ADHD medication helped them to concentrate better in class, concentrate better while studying, study longer, feel less restless in class, feel less restless while studying, keep better tracking of assignments, lose weight, feel better, and get high. Students indicated how frequently they experienced each effect on the same 5-point scale as above. Students were also asked to rate the overall impact of using ADHD medications on a 1 (very negative) to 5 (very positive) scale.

Possible adverse consequences of nonmedical ADHD medication use. Students reported on a range of potential side effects of nonmedical ADHD medication use including headaches, stomachaches, irritability, sadness, reduced appetite, sleep difficulty, dizziness, and difficulty getting along with friends. These ratings were made using the response scale described above.

Students were also asked about other adverse consequence of ADHD medication use, including whether it contributed to their taking other nonprescribed medications, whether it contributed to other substance use, and whether it resulted in their having to see a physician, seek treatment in an emergency room, or seek treatment for substance abuse.

ADHD symptoms. Because ADHD symptoms in the Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev.) may not adequately capture manifestations of ADHD in young adults (Barkley, Fischer, Smallish, & Fletcher, 2002), we developed items to measure inattentive and hyperactive-impulsive symptoms that are directly relevant to college students. The six-item inattention scale included items inquiring about attention difficulties related to college academic tasks—for example, “It is difficult for me to pay attention during classes,” “I believe that most students in my courses concentrate better in class than I do,” and “I have difficulty keeping track of my different school assignments.” Students responded on 5-point scales anchored by *strongly disagree* and *strongly agree*; item responses were summed and then standardized with higher standard scores reflecting greater self-reported attention difficulties. In a prior study in which this scale was used, the alpha for the scale exceeded .90 and students who reported an ADHD diagnosis had significantly higher scores—nearly a full standard deviation—than other students (Rabiner et al., 2008). Alpha for the current sample was .92. Hyperactive-impulsive symptoms were assessed with five items selected to reflect the manifestation of such difficulties in college students—for example, “I feel restless and fidgety during my classes,” “I feel restless and fidgety when completing schoolwork outside of class,” and “I am an impulsive person.” Item responses were summed and then standardized with higher standard scores reflecting greater self-reported attention hyperactive-impulsive symptoms. In a prior study, the coefficient alpha for this scale was .84 and students with self-reported ADHD had significantly higher scores than other students, again by nearly a full standard deviation (Rabiner et al., 2008). The alpha for the current sample was .82.

Depressive symptoms. Depressive symptoms were assessed so that we could test whether ADHD symptoms were uniquely associated with the nonmedical ADHD medication use or whether this behavior was related to psychopathology more generally. To assess depression, we used an eight-item scale derived from the Center for Epidemiologic Studies Depression Scale (Radloff, 1977). Students were asked how often during the previous 2 weeks they had experienced a variety of depressive symptoms—for example, “felt sad, blue, unhappy or down in the dumps,” or “felt that you were not enjoying the activities you used to”—and responded on 5-point scales ranging from never to most of the time. Coefficient alpha for the scale was .90.

Responses were summed and then standardized, with higher standard scores reflecting greater self-reported depressive symptoms.

Nonmedical use of other medications. We asked about students' use of other prescription medications so that we could test whether ADHD symptoms are uniquely associated with the nonmedical use of ADHD medication, or to the nonprescribed use of medications more generally. Students were asked, "In the past 6 months, have you taken any of the following types of medications even though you do not have a prescription for the medication?" The categories listed were opiates, sedatives, antidepressants, mood stabilizers, and antipsychotics/neuroleptics, with several well-known medications included as examples from each category (e.g., Opiates: Vicodin, OxyContin, Percocet; Sedatives: Ambien, Klonopin, Fiorinal, Ativan, Valium, Xanax; Antidepressants: Zoloft, Wellbutrin, Paxil, Prozac; Mood Stabilizers: Depakote, Depalone, Tegretol, Neurontin; Antipsychotics/Neuroleptics: Thorazine, Mellaril, Risperdal, Zyprexa).

Alcohol, tobacco, and drug use. Students were asked whether they had used alcohol, tobacco, marijuana, cocaine, and inhalants during the past 6 months. In addition to examining the use of these substances individually, a composite substance use variable was created by summing the number of substances students reported using— this ranged from 0 to 5—and then standardizing this sum. Coefficient alpha for the scale was .71, indicating an adequate level of internal consistency.

Academic concerns. This four-item scale assessed students' concerns about their early academic performance and ability to succeed academically. Two items were framed positively—for example, "I feel satisfied with how well I am doing academically"—and two were framed negatively—for example, "I worry that my grades will not be as good as I need them to be." Students responded to each item on a 5-point scale ranging from strongly disagree to strongly agree. Positively worded items were reverse scored and the four items were averaged so that higher scores indicate greater concerns about academic performance. In a prior study, the coefficient alpha for this scale was .76 and students with self-reported ADHD had significantly higher scores than other students (Rabiner et al., 2009). The alpha for the current sample was .80.

Procedure

The survey was administered via the Web at a public and private university located in the southeastern United States during the 2007 spring semester. At each university, data collection occurred over a 5-week period beginning approximately 6 weeks into the spring semester. Because this was part of a longitudinal study in which all students enrolled as freshmen during the prior fall semester had been recruited, and we wanted to maximize the number of students for whom two waves of survey data were available, all current sophomores were invited to participate. In addition, 50% of the freshmen, juniors, and seniors at each university were randomly selected so that a cross-sectional sample of the different classes could be obtained. Here we focus on results from this cross-sectional sample.

Invitations to participate were sent via e-mail to 5,929 students at the public university and 3,896 students at the private university. The invitation assured students that their responses would remain confidential, that the researchers would not be able to link individual

students to their responses (students accessed the survey using a randomly generated ID number), and that a certificate of confidentiality to protect their privacy had been obtained. Students were free to skip any question they did not wish to answer; this resulted in there being a slightly different number of respondents for the different variables reported on below.

A \$10 campus bookstore gift card was offered as a participation incentive. Students were informed that they would also be eligible to win 1 of 10 \$100 bookstore gift cards at each campus. Three additional invitations were sent at weekly intervals to students who neither responded nor opted out. Surveys were submitted by 1,657 students from the public university (28%) and 1,750 students from the private university (45%). Across the two schools, the participation rate was 35%. Although this is lower than the 46% response rate obtained during the prior year's administration that involved exclusively freshmen (Rabiner et al., 2008), it is in the range of response rates attained for other recently published college-based survey studies of this issue (Babcock & Byrne, 2000; Johnston et al., 2003; Low & Gendaszek, 2002; McCabe et al., 2005, Teter et al., 2005).¹

Although we would have ideally conducted a brief follow-up survey with nonrespondents to determine whether they differed from participants on key study variables, the participating universities have phone numbers for fewer than 25% of students; this reflects students' increasing reliance on cellular phones rather than phone service provided by the university. Because of this, we did not believe that a phone follow-up with nonresponders would prove helpful. We chose not to conduct a Web-based follow-up with nonresponders because we reasoned that those who did not respond to our prior four requests would be unlikely to respond, and we were also concerned that sending additional requests would irritate a number of students.

Results

Sample Characteristics

Table 1 shows the demographic characteristics of participants in relation to the demographics of those invited to participate. For example, at the private university, 43% of participants were males and 51% of the students invited to participate were male.

As seen in Table 1, the demographic characteristics of participants were generally consistent with the characteristics of the overall population that we tried to recruit. However, our sample included a larger percentage of female and Asian students, and a smaller percentage of African American students and seniors, than in the overall population. As noted previously, sophomores are overrepresented relative to students in other classes because we invited all sophomores to participate, rather than a randomly selected 50% of the class.

Frequency of Nonmedical Use and Means of Obtaining ADHD Medication

In all, 291 students across the two universities, approximately 8.9% of respondents, reported using ADHD medication nonmedically since beginning college. Rates at the public and private university were highly similar at 8.8% and 9.0%, respectively. One hundred and eighty-three students, approximately 5.4% of respondents, reported nonmedical use within the past 6 months. This included 5.7% of students at the private university and 5.0% of students at the public university, a nonsignificant difference, $\chi^2 = .59$, $p = .44$. The most common method for obtaining ADHD medication was having it given to them by a student with a prescription

(n = 141). Fifty-five students reported purchasing it from a student with a prescription, 50 had it given to them by a student without a prescription, and 17 reported purchasing it from a student without a prescription. Only a single student reported stealing ADHD medication from another student. Methods of obtaining ADHD medication were similar across the two universities.

Table 1 Percentage Distributions of Sample/Population Characteristics

Characteristic	Private <i>n</i> = 1,744	Public <i>n</i> = 1,646	Total Sample <i>N</i> = 3,390
Gender			
Male	43/51	24/31	34/39
Female	57/49	76/69	66/61
Race/ethnicity			
White	63/65	78/73	70/70
African American	6/10	15/22	11/18
Asian	24/21	3/4	14/10
Hispanic	6/3	2/1	4/1
Other	<1/<1	1/1	<1/<1
Class/year			
Freshman	24/21	21/20	23/21
Sophomore	41/41	26/24	23/22
Junior	19/19	26/25	34/31
Senior	16/19	26/31	21/26

Note: Entries indicate the percentage of respondents in each demographic group.

Characteristics of Students Engaged in Nonmedical ADHD Medication Use

Nonmedical use of ADHD medications within the past 6 months was more common among Whites than non-Whites (7.2% vs. 1.8%; $\chi^2 = 36.6$, $p < .0001$), among males than females (7.2% vs. 4.5%; $\chi^2 = 7.95$, $p < .01$), and among students in the Greek system than students not part of the Greek system (10.5% vs. 4.2%; $\chi^2 = 40.2$, $p < .001$). During the prior 6 months they were also more likely to report having used alcohol (97.7% vs. 75.4%, $\chi^2 = 45.09$, $p < .0001$), cigarettes (50.3% vs. 13.3%; $\chi^2 = 176.2$, $p < .0001$), marijuana (73.5% vs. 18.2%; $\chi^2 = 304.42$, $p < .0001$), cocaine (25.4% vs. 2.3%; $\chi^2 = 253$, $p < .0001$), and inhalants (10.7% vs. 1.5%; $\chi^2 = 74.0$, $p < .0001$). Self-reported GPAs were lower among nonmedical users (3.28, vs. 3.16; $F(1, 3179) = 8.69$, $p < .001$) and concerns about academic performance were higher (.28 vs. -.03; $F(1, 3133) = 15.64$, $p < .001$).

We also examined whether students engaged in nonmedical ADHD medication use reported higher rates of ADHD and depressive symptoms than nonusers. Compared to nonusers, nonmedical users had higher self-reported scores for inattentive symptoms (.52 vs. -.07; $F(1, 3140) = 59.69$, $p < .0001$) and hyperactive-impulsive symptoms (.42 vs. -.06; $F(1, 3142) = 37.33$, $p < .0001$). The groups did not differ on self-reported depressive symptoms (.10 vs. -.02; $F(1, 3116) = 2.42$, $p = .12$).²

Table 2 Percentage of Students Endorsing Different Reasons for Nonprescribed ADHD Medication Use

	Never	Rarely	Sometimes	Often	Always	Avg.
To concentrate better while studying	14.0	12.0	12.0	19.9	41.4	3.62
To be able to study longer	23.1	13.4	16.1	21.0	26.3	3.14
To feel less restless while studying	34.4	11.7	12.8	14.4	26.7	2.85
To concentrate better in class	60.5	10.8	10.8	9.7	8.1	1.94
To feel less restless in class	69.7	11.4	8.1	5.4	5.4	1.65
To keep better track of assignments	69.7	13.0	7.0	4.3	6.0	1.64
To feel better	71.5	13.0	9.7	2.7	3.2	1.53
To get high	74.7	9.1	10.2	3.8	2.2	1.49
To prolong the intoxicating effects of alcohol or other substances	79.6	8.6	6.5	3.8	1.6	1.39
To prevent other students from having an academic edge over me	85.0	4.3	8.0	1.6	1.1	1.30
To lose weight	85.5	5.4	7.0	1.1	1.1	1.27

Motivations for Nonmedical ADHD Medication Use

Table 2 shows the distribution of responses for the different motives for nonmedical use during the prior 6 months; because we did not have an a priori basis for predicting site related difference in the motives or perceived consequences of nonmedical ADHD medication use, and to simplify presentation of the data, responses are combined across the sites.³ Motives are listed in descending order according to how frequently the motive was either *always* or *often* the reason for use. The final column shows the average rating for each motive, where 1 corresponds to *never*, 3 to *sometimes*, and 5 to *always*. For example, 41.4% of nonmedical users reported that a desire to “concentrate better while studying” was *always* a motive for their use, whereas 19.9% reported that it was *often* a motive. The average score for this motive was 3.62.

The three most strongly endorsed motives for nonprescribed ADHD medication—to concentrate better while studying, to be able to study longer, and to feel less restless while studying—all pertained to enhancing students’ ability to study outside the classroom; all were reported to be *often* or *always* a reason for use by 41% to 61% of nonmedical users. Although the three motives with the next highest ratings were also related to boosting academic performance—to concentrate better in class, to feel less restless in class, and to keep better track of assignments—enhancing performance in class was clearly less prominent than enhancing studying outside the classroom. These motives were reported to be *often* or *always* a reason for use by only 10% to 18% of nonmedical users. Nonacademic reasons for use—to feel better, to get high, to prolong the intoxicating effects of alcohol or other substances, and to lose weight—were strongly endorsed by a relatively small number of students, and few students reported frequently using in order to keep peers from having an academic edge on them; the percentage of students indicating that these were *often* or *always* a reason for nonmedical use ranged from 2% to 6%.

We next assessed the proportion of students who used ADHD medication purely for academic enhancement reasons, purely for nonacademic reasons, or for both sets of reasons. For this analysis, motives that a student rated as rarely, often, or always a reason for use were coded as present and those rated never were considered absent. Students were coded as using ADHD medication for academic reasons if any of the academically relevant motives were present and to use for nonacademic reasons if any of the nonacademic motives were present. Based on this coding scheme, 54% of nonmedical users used ADHD medication exclusively for academic reasons, 6% used it exclusively for nonacademic reasons, and 40% used it for both academic and

nonacademic reasons. The remaining students did not rate any of the motives as being present, despite having reported using ADHD medication nonmedically during the prior 6 months.

Students who used ADHD medication for academic reasons, either exclusively or in combination with nonacademic reasons, differed in important ways from students who used it exclusively for nonacademic purposes. Specifically, they reported more difficulties with attention (.62 vs. -.65; $F(1, 162) = 13.23, p < .001$) and greater academic concerns (.32 vs. -.91; $F(1, 161) = 16.93, p < .0001$); in fact, on these two variables the groups differed by more than 1.2 standard deviations. Group differences on hyperactive-impulsive symptoms, depressive symptoms, and, surprisingly, substance use, were not significant. On the latter, even students who reported using ADHD medication exclusively for academic reasons had an average standard score on the composite substance use measure that was a standard deviation higher than that of nonusers.

Table 3 Number of Students Experiencing Different Effects of Using ADHD Medication

Helped Me . . .	Never	Rarely	Sometimes	Often	Always	% Often/Always
Concentrate better while studying	4	1	10	25	95	89
Concentrate better in class	2	0	5	15	30	87
Study longer	2	2	9	22	82	89
Feel less restless in class	2	2	5	9	16	74
Feel less restless while studying	4	2	13	20	59	81
Keep better track of assignments	0	2	6	10	14	75
Feel better	0	0	10	4	14	64
Get high	0	1	10	6	10	59
Lose weight	0	1	9	4	2	38

Perceived Effects of Nonmedical ADHD Medication Use

To examine students' perception of how they were affected by nonmedical ADHD medication use, we asked about effects that were directly linked to the motives described above. For example, students had been asked how often they used ADHD medication to "get high" and we wanted to know how often they believed this effect was obtained. We limited our examination of each effect to those students who had reported using ADHD medications to obtain the particular effect at least *sometimes*. For example, if a student indicated that they *never* or *rarely* used ADHD medication to "get high," we did not include their report of how often using ADHD medication produced a high. This reflected our interest in learning how often students felt that ADHD medication produced effects that they were more frequently motivated to attain. Results for this analysis are presented in Table 3.

Because the entries in Table 3 depend on the number of students who reported the corresponding motive for nonmedical ADHD medication use either *sometimes*, *often*, or *always*, the totals differ for each effect. For example, there were 130 students who had reported that a desire to "concentrate better while studying" was either *sometimes*, *often*, or *always* a reason they used ADHD medication nonmedically; this number is obtained by summing the entries listed for this effect. In contrast, 50 students had reported that a desire to "concentrate better in class" was either *sometimes*, *often*, or *always* a reason for their nonmedical use. For each effect, the table entries reflect the number of students who reported that nonmedical use *never*, *rarely*, *sometimes*, *often*, or *always* produced it. For example, of the 135 students who used ADHD

medication to “concentrate better while studying,” the numbers who felt that this result was *never, rarely, sometimes, often, or always* obtained were 4, 1, 10, 25, and 95, respectively.

The final column in Table 3 shows the percentage of students who reported that the desired effect was obtained either *often* or *always*. As can be seen, for all of the academically relevant motives, the desired effect was reported to occur *often* or *always* by a strong majority of students, that is, at least 74%. Two thirds of students who used ADHD medication to “feel better” felt it had the desired outcome, as did more than half who used ADHD medication to “get high.” Losing weight was the only motive for which less than half the students reported the desired effect.

Reports of Adverse Effects of Nonmedical ADHD Medication Use

Table 4 shows students’ reports of various side effects they experienced from taking ADHD medication. The final column in this table—labeled S, O, T—represents the percentage who reported that the side effect occurred either *sometimes, often, or always*.

Appetite reduction and sleep difficulties were the most commonly reported side effects. In addition, nearly 50% of students reported experiencing irritability at least *sometimes*. Only a small percentage of students reported experiencing any of the remaining side effects more often than *rarely*.

Table 4 Percentage of Students Reporting Different Adverse Effects of ADHD Medication

	Never	Rarely	Sometimes	Often	Always	S, O, T
Gave me headaches	66.7	15.0	12.2	4.4	1.7	18.3
Gave me stomachaches	66.7	16.1	13.9	3.3	0.6	17.8
Made me irritable	37.8	17.2	23.9	13.9	7.2	45.0
Made me sad	75.0	8.9	9.4	3.9	2.8	16.1
Reduced my appetite	30.0	6.7	18.9	20.6	23.9	63.4
Sleep difficulties	28.3	12.2	21.1	22.8	15.6	59.5
Made me dizzy/lightheaded	65.0	16.7	12.2	4.4	1.7	18.3
Led to social difficulties	81.1	11.7	5.0	2.2	0	7.2

Note: S, O, T = percentage reporting the side effect either *sometimes, often, or always*.

Table 5 Percentage of Students Reporting Concerns Related to Nonmedical ADHD Medication Use During the prior 6 Months

	Never	Rarely	Sometimes	Often	Always
Distracted by thoughts of taking ADHD medication	64.8	20.3	13.7	1.1	0
Worried about being able to obtain ADHD medication	64.8	25.3	8.8	<1	<1
Felt I needed ADHD medication to do my best academically	39.0	19.8	29.7	9.3	2.2
Worried about becoming dependent on ADHD medication	73.1	14.8	9.9	2.2	0

Students were asked about several other potential adverse consequences of using ADHD medication. In response to the question, “Do you think that taking ADHD medication during the past 6 months has contributed to your taking other nonprescribed medication?” the percentage indicating that it had *definitely not, probably not, maybe, probably, and definitely* was 82.7, 8.1, 4.3, 3.2, and 1.6, respectively. When asked whether this had contributed to their using other substances, students’ responses were essentially identical, with about 5% of students reporting

that it probably or definitely had. Only a single student indicated that using ADHD medication led him or her to seek substance abuse treatment or to visit an emergency room; 5 students reported that it resulted in their having to see a doctor.

The final questions pertaining to adverse affects asked how often students (a) were distracted by thoughts of taking ADHD medication; (b) worried about the possibility of being unable to obtain ADHD medication; (c) felt that ADHD medication was necessary to maximize academic performance; and (d) worried about becoming addicted to, or dependent on, ADHD medication. As seen in Table 5, a small minority of students reported that they experienced distracting thoughts or worries related to ADHD meds at least *sometimes*. Many more reported feeling that they required ADHD medication to do their best academically.

Overall Impact of Nonmedical ADHD Medication Use

Students rated the overall impact of using ADHD medication on a 1 (*very negative*) to 5 (*very positive*) scale. The average rating was 3.97 and just more than 70% students reported either a *positive* or *very positive* impact. Only 9 students felt the impact was *negative* or *very negative*. Ratings did not differ as a function of site, gender, race, or class standing but did differ in relation to frequency of use. Among students who used ADHD medication nonmedically 9 or fewer times in the prior 6 months, the average impact rating was 3.88, and just more than 67% of students rated the impact as *positive* or *very positive*. The overall rating for students using 10 or more times was 4.45, and 89.7% rated the impact as *positive* or *very positive*. The mean difference in overall impact ratings was significant, $F(1,174) = 9.6, p < .01$.

Are ADHD Symptoms Uniquely Associated with Nonmedical ADHD Medication Use, Use of Other Prescription Medications, and Substance Use?

The final analyses planned examined the association between ADHD symptoms and three different substance use outcomes during the prior 6 months: nonmedical ADHD medication use, nonmedical use of other prescription medications, and other substance use. For the latter, students were grouped according to whether their score on the composite substance use variable was a standard deviation above the sample mean. This corresponded to using at least three of the following substances—alcohol, cigarettes, marijuana, cocaine, and inhalants—during the prior 6 months.

A series of multivariate logistic regressions were then conducted to determine the association between self-reported ADHD symptoms and these different types of substance use, after controlling for a number of other variables that may be related to these outcomes. Race was dichotomized into White vs. non-White groups, and GPA, impulsivity, depression, and inattention were all entered as standard scores. Results of these analyses are presented in Table 6, with entries representing the odds ratio for each predictor after adjusting for all other predictors.

As seen in Table 6, site was not associated with any form of substance use, whereas gender was a significant predictor of substance use only, with males nearly 3 times as likely as females to be in the high substance use group. Being White was a risk factor for all three types of substance use, as was class standing, with use being more common among more advanced students. Greek membership and having a lower GPA were only associated with increased odds of nonmedical ADHD medication use.

Of particular interest was the association between self-reported inattention, impulsivity, and depression to the three forms of substance use. Students scoring a standard deviation above the mean on attention difficulties were nearly twice as likely as students at the mean to be nonmedical users of ADHD medication; attention difficulties had no association, however, with using other prescription drugs or other substances. The association between attention difficulties and ADHD medication use remained essentially unchanged when other substance use was included as a control variable, even though substance use was also a significant independent predictor of nonmedical ADHD medication use. Hyperactive-impulsive symptoms did not predict ADHD medication use ($p > .10$), but did increase the odds of using other prescription drugs and of being in the high substance use group. Students high on self-reported depression were more likely to use other prescription medications but were actually less likely to use ADHD medication nonmedically.

Discussion

Results from this study support and extend previous findings on the nonmedical use of ADHD medications by college students. Consistent with prior research, nonmedical ADHD medication use was more common among students who were Caucasian, who belong to a fraternity or sorority, who had lower GPAs, and who engaged in other forms of substance use (Teter et al., 2003; McCabe et al., 2006). Our results also replicate prior work on students' motives for nonmedical use in that most students engaged in this behavior to enhance academic performance, even though a substantial minority of nonmedical users also reported having taken ADHD medication to "feel better" or "get high" (Teter et al., 2005; Teter et al., 2006; White et al., 2006).

Our results also build on current knowledge of college students' nonmedical ADHD medication use in several important ways. By inquiring about academically relevant motives in and out of the classroom, we learned that students use ADHD medications primarily to enhance their ability to study outside of class, whereas improving concentration and reducing restlessness in class was far less important. Having students rate the frequency of different motives, rather than simply checking any motive that had previously applied to their use, also resulted in a clearer picture for why students use ADHD medications. Specifically, although up to 30% of nonmedical users reported using ADHD medication for reasons unrelated to performance—for example, to get high, to lose weight, or to prolong the intoxicating effects of alcohol—only about 5% indicate that these are frequent reasons for their use. Thus, although recreational use is a concern, our findings place prior data on this issue in a broader context by suggesting that this is rarely a frequent motive for illicit use. Instead, most students who take ADHD medication nonmedically do so primarily, if not exclusively, to enhance their academic success. In fact, only a small minority of nonmedical users—about 6%—did so exclusively for nonacademic reasons.

Results from this study also indicate that students evaluate the impact of using ADHD medication as strongly positive. The vast majority of students who used ADHD medication to enhance academic performance, either inside or outside the classroom, believed that this was helpful to them. When asked to rate the overall impact of taking ADHD medication, about 70% felt it was *positive* or *very positive*, and favorability ratings were higher among students who used with greater frequency. Conversely, only about 5% of users believed that using ADHD medication had affected them negatively. Thus, most students who use ADHD medication without a prescription would seem to have little motivation to stop. Of course, although most

students who use ADHD medication nonmedically believe that it helps them academically, whether this is true remains unknown and would be an interesting question to pursue in subsequent work.

Despite these generally positive perceptions, reports of adverse consequences were relatively common. In fact, the percentage of nonmedical users reporting frequent instances of appetite reduction, sleep difficulties, irritability, and sadness appeared higher than what is typically reported in clinical trials. We also found that roughly 5% of nonmedical users felt that using ADHD medication had contributed to their using other prescription medications and illicit substances; a similar percentage experienced occasional concerns related to obtaining ADHD medication and/or to becoming dependent on ADHD medication. Many more nonmedical users felt that they required ADHD medication to perform their best academically. Collectively, these findings suggest that adverse effects of ADHD medications may be greater when used nonmedically, and that some students experience distress about their use; a more careful analysis of these issues is warranted, particularly in light of recent findings indicating that more than 5% of 18- to 25-year-old individuals who use ADHD stimulants nonmedically meet criteria for stimulant dependence or stimulant abuse (Kroutil et al., 2006).

Of particular interest were results from the multivariate logistic analyses pertaining to the association between self-reported ADHD symptoms and nonmedical ADHD medication use. Students who reported higher rates of inattentive symptoms were more likely to report nonmedical ADHD medication use even after controlling for a variety of other factors associated with nonmedical ADHD medication use, including the use of other substances. They were not, however, more likely to use other prescription medications or any of a variety of other substances. In contrast, hyperactive-impulsive symptoms increased the odds of using other prescription medications as well as other substances, but were not related to nonmedical ADHD medication use. Finally, nonmedical ADHD medication use was specific to attention difficulties, as elevated depressive symptoms increased the odds of using other prescription medications, but actually reduced the likelihood of nonmedical ADHD medication use. Although academic concerns did not emerge as an independent predictor on nonmedical ADHD medication use, these concerns were significantly higher among nonmedical users than among other students. They were also substantially higher among students who used for academic reasons compared to students who used only for nonacademic purposes.

These data strongly suggest that although some students may use ADHD medications nonmedically for recreational reasons, and/or because they are seeking an “academic edge,” this represents only a small minority of nonmedical users. Instead, even though nonmedical ADHD medication use is concentrated among students who are prone to use other substances, most students who use ADHD medication nonmedically are concerned about their academic performance, and, most importantly, report difficulties with attention that they are likely to experience as undermining their academic success. Thus, many of these students may turn toward ADHD medication in an effort to treat their attention difficulties. The fact that these students tend to have lower GPAs and greater concerns about academic performance than other students suggests that they may have been less prepared to meet the academic demands of college to begin with, and it would have been interesting to know whether their high school GPA and test scores were below average for their institution.

Overall, these results are consistent with a recent study showing a positive screening for ADHD was associated with increased likelihood of nonmedical use of prescription stimulants among 12,990 Canadian students in Grades 7, 9, 10, and 12 (Poulin, 2007). One important

implication of these results is that the availability of less abusable forms of ADHD medication is not likely to significantly diminish nonmedical use by college students, as most students are not using for recreational purposes. Instead, curtailing students' nonmedical ADHD medication use must include efforts to identify students who may have undiagnosed ADHD, and to provide them with appropriate supervised treatment.

There are several limitations to this study that are important to acknowledge. First, we sampled students from only a single public university and a single private university. Although these universities serve different types of students, participants were not representative of the wider population of undergraduates in the United States and caution is required in generalizing these results to the wider student population. Even within the two universities in our sample, the overall participation rate of 35% may have introduced bias into the study, although this concern is mitigated somewhat by the fact that the demographic composition of our participants was reasonably similar to the population from which they were drawn.

The cross-sectional nature of our data also imposes limitations on the inferences that can be drawn from several of the findings. For example, class year was positively correlated with ADHD medication use, suggesting that students' use increases with their time in college. However, without following a class of students across time, it is not possible to rule out cohort effects as an explanation for this pattern. Our results also suggest that experiencing high rates of attention difficulties predisposes students to turn toward ADHD medication in an effort to ameliorate these problems. Developing greater confidence in this hypothesis also requires longitudinal data to test whether self-reported attention difficulties early in one's college career predicts the onset of illicit ADHD medication use later on.

Finally, longitudinal data is especially necessary to better understand the actual consequences of nonmedical use of ADHD medication by college students, about which little is currently known. Does nonmedical ADHD medication use actually promote more positive academic outcomes? Does it promote important negative outcomes for some students in the form of other nonmedical substance use or adjustment difficulties? These are key questions to answer as most students believe that using ADHD medication is helpful to them and may thus have little inclination to desist from this behavior.

Notes

1. Among the students who responded, 115 reported that they had a current prescription for ADHD medication. These students were not asked about nonmedical use and data from these students are not included in this article.
2. The numbers of students in these analyses, and in other analyses presented in the article, differ slightly because different numbers of students elected to skip items required to calculate a score for each scale. The self-reported depression scale came toward the end of the survey and was skipped by a greater number.
3. Exploratory analyses were conducted to examine whether students' motives for nonmedical ADHD medication use varied by site, gender, race (coded as White vs. non-White because very few non-Whites reported nonmedical use), and class standing. Students who endorsed a motive as *often* or *always* a reason for use were coded as *high* for the motive and students who endorsed it as *never*, *rarely*, or *sometimes* a reason for use were coded as low. Logistic regression was used to test whether the probability of being *high* versus *low* on each motive varied by site, gender, race, or class standing. For

all of the academic motives except for “preventing others from having an academic edge over me,” attending the public university was associated with significantly greater odds of being in the *high* group. For the nonacademic motives, no site related differences were found. The only significant effect found for any of the other demographic variables was for using ADHD medication to “feel better,” where non-White students were more likely to report that this was *often* or *always* a reason for their use. Detailed information on the results of these analyses is available on request.

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