Characteristics of College Students With Attention-Deficit Hyperactivity Disorder Symptoms Who Misuse Their Medications

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Abstract. Objective: The purpose of the current investigation is to examine the characteristics of college students with attention-deficit hyperactivity disorder symptoms who misuse their prescribed psychostimulant medications. **Methods and Participants**: Forty-three undergraduate students with a prescription for Ritalin or Adderall completed structured interviews and a battery of questionnaires. **Results**: Analyses revealed that compared to non-misusers, misusers were significantly more likely to report using a greater number of illicit substances, including nicotine, marijuana, cocaine, hallucinogens, and opiates, over the past year. Additionally, compared to non-misusers, misusers were significantly more likely to report greater negative expectancies effects, experience more hyperactivity symptoms, and score higher on a measure of sensation seeking. **Conclusion**: The findings have important implications for future prevention initiatives. In particular, knowledge regarding the extent of misuse in populations with and without prescriptions and variables associated with misuse is essential to the development of effective prevention programs.

Keywords: Adderall, ADHD, prescription stimulant misuse, Ritalin

Recent estimates suggest that attention-deficit hyperactivity disorder (ADHD) occurs in approximately 3% to 7% school-aged children and 5% of adults.[1,2] Psychostimulant prescription medications such as methylphenidate (Ritalin) and amphetamine-dextroamphetamine combination (Adderall) typically constitute the first line of treatment for ADHD.[3] Current estimates suggest that approximately 56% of youths aged 4 to 17 receive these medications for treatment of their ADHD.[1] Not surprisingly, recent studies have documented an increase in the prescription rates of these medications.[4,5] A recent report from the US Drug Enforcement Agency[6] found that methylphenidate was the third most prescribed drug in the United States in 2005. Following the increase in psychostimulant prescriptions,[4] there has also been a concomitant rise in the misuse of these medications.[7–10] For example, a recent survey found that approximately 4.2 million persons aged 12 years or older have reported the nonmedical use of methylphenidate at least once in their lifetime.[11] Although psychostimulant misuse has been examined among various age groups, evidence suggests that it is most prevalent among college students.[12]

Babcock and Byrne[13] conducted one of the first studies examining psychostimulant misuse among a college sample. They administered a survey assessing for the recreational use of Ritalin among college students enrolled at a public liberal arts college. Results showed that among their sample of 283 participants, approximately 16% reported recreational use of methylphenidate and 12.7% reported intranasal use. In a more recent study, Shillington and colleagues[14] investigated the misuse of both Ritalin and Adderall. They recruited a college sample of 1,596 participants enrolled at a large public university in Southern California. Among their participants, 11% reported past year recreational use, and 4% reported past-month misuse. In addition to these and other single-site college-based studies,[7,10,15] several national epidemiological studies[9,16] also provide evidence suggesting that psychostimulant medication misuse may be a problem among college students.

Although these medications generally have a wide margin of safety, when misused they can lead to several negative health consequences, particularly at higher doses administered through insufflation or injection. These consequences include suicidal and homicidal ideation,[17] seizure,[18] and various cardiac complications, such as hypertension, hypotension, tachycardia, palpitations, and dsyrhythmias.[19] Together, these consequences underscore the importance of identifying

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characteristics that may place one at high risk for misusing psychostimulant medication. To date, research has demonstrated that one of the strongest predictors of prescription stimulant misuse among college students is a history of alcohol and illicit drug use. In particular, those who misuse are more likely to report using alcohol,[14] nicotine,[14] marijuana,[9,20] ecstasy,[9] and cocaine.[7,9] Research has also identified other factors associated with psychostimulant misuse. For example, recent findings suggest that expectancy effects may be related to prescription stimulant misuse. In particular, Looby and Earleywine[21] administered a nationwide survey investigating the association between both positive and negative expectancies and prescription stimulant misuse. The results revealed that positive expectancies, but not negative expectancies, predicted frequency of past-month use. Similarly, research has also found a link between the personality construct of sensation seeking and psychostimulant misuse. For example, Low and Gendaszek[22] surveyed a group of college students and found that students who scored high on a measure of sensation seeking were significantly more likely to report the abuse of stimulants, including Ritalin and Adderall.

Recent research investigations have also begun to explore whether the presence of other psychiatric disorders may elevate the risk for psychostimulant misuse. One very important psychiatric disorder that may significantly elevate the risk for psychostimulant misuse is an actual diagnosis of ADHD. More specifically, considerable evidence exists suggesting that individuals with ADHD may be at increased risk for substance use disorders as compared to members of the general population.[23,24] For example, studies have found that compared to individuals without ADHD, individuals with ADHD are significantly more likely to initiate drug use at a younger age and report experimenting with harder drugs (eg, cocaine) at a younger age as well.[23,24] Further, evidence suggests that the risk for drug and alcohol use may vary depending on the ADHD symptoms present (eg, inattention versus hyperactivity-impulsivity). For example, some studies have found that only inattentive symptoms are significantly related to marijuana and nicotine dependence symptoms,[25] whereas other studies have found a significant relationship between hyperactivity/impulsivity symptoms and alcohol use.[26] Together these findings suggest that the examination of psychostimulant misuse among prescribed users is especially warranted, since the vast majority of these medications are prescribed for individuals with ADHD. Despite this, much of the research examining psychostimulant misuse among college students has focused primarily on samples of nonprescribed recreational users. As a result, very little is currently known about the extent of misuse among prescribed users specifically.

To date, only 2 published studies have examined rates of misuse among prescribed users exclusively. Wilens and colleagues[27] conduced one of the first studies examining stimulant diversion and misuse in a sample of adolescents and young adults with ADHD. Although the results demonstrated that participants with ADHD were significantly more likely to divert and misuse their medication compared to individuals receiving similar medications for non-ADHD conditions, the study failed to examine which symptoms of ADHD may be associated with stimulant misuse and diversion. In a second study, Darredeau and colleagues[20] examined patterns and predictors of medication compliance, diversion, and misuse in a sample of adult prescribed methylphenidate users. Although this study found high rates of misuse (29% admitted misusing their medication), the study focused exclusively on a sample of methylphenidate users only. Recent evidence suggests that expanding this work to include participants with prescriptions for Adderall could prove helpful, as evidence suggests that college students appear to abuse Adderall at 3 times the rate of Ritalin.[10] Moreover, as with the Wilens et al[27] study, the latter study did not focus on a sample of college students exclusively, despite evidence suggesting that psychostimulant misuse is most prevalent in this population.[12]

In light of the limited research, the purpose of the present study was to shed further light on the extent of psychostimulant misuse in a sample of college participants with ADHD symptoms and a prescription for Ritalin or Adderall. In particular, this study sought to examine whether the same factors associated with psychostimulant misuse among nonprescribed users may also be related to psychostimualnt misuse among prescribed users with ADHD symptoms. As discussed above, past research has found that a history of drug use, positive expectancy effects, and the personality construct of sensation seeking are associated with an elevated risk for psychostimulant misuse. Therefore, based on the literature, it was hypothesized that compared to non-misusers, misusers would report using a greater number of drugs and alcohol over their lifetime, have more positive expectancy effects, and obtain higher scores on a measure of sensation seeking. Moreover, since previous research has found a link between substance use and type of ADHD symptoms, and since all participants in the current study reported experiencing ADHD symptoms, this study sought to explore whether prescription stimulant misuse also varies depending upon the ADHD symptoms present.

METHODS

Participants

The sample included 20 male and 22 female undergraduate students recruited from introductory psychology classes at a large northeastern university. Participants received either partial fulfillment of psychology research credit or $15 for their participation. The students had a mean age of 20.67 (SD = 4.18). The majority were Caucasian (91%), with 1 participant identifying as Latino and 3 participants identifying as "other/do not wish to provide." Average years of education completed was 12.74 (SD = 3.60). All participants had a current prescription for a prescription stimulant medication.

Measures

Participants were assessed for ADHD symptoms using an 18-item questionnaire based upon the *Diagnostic and*

Statistical Manual of Mental Disorders, Fourth Edition (*DSM-IV*) symptoms for ADHD, which was adapted for use in an adult population.[28] Participants were instructed to report how often they experience each symptom on a 5-point Likert scale that ranged from 0 (Never) to 4 (Very often). In the current study, this questionnaire demonstrated adequate internal consistency, as Cronbach's alpha for the inattention, hyperactivity, and impulsivity scales were .87, .81, and .82, respectively.

Participants completed the 40-item Prescription Stimulant Expectancy Questionnaire (PSEQ) assessing positive and negative expectancy effects specific to prescription stimulant medication.[21] Each question was formatted on a 3-point Likert scale that ranged from 0 (Not at all) to 2 (Very often). Internal consistency in the current study was .90 for positive expectancy effects and .83 for negative expectancy effects.

Finally, all participants also completed Zuckerman's 40-item Sensation Seeking Scale (SSS-V).[29] Participants responded to each statement on a 4-point Likert scale that ranged from 1 (Not true) to 4 (Very true). Internal consistency for the current study was .91.

Procedure

The study was approved by the university's institutional review board. After providing informed consent, participants completed confidential semistructured face-to-face interviews. During the interview, participants provided information about the type of medication they were prescribed, prescribed dosage, age they were first prescribed medication, whether they had ever misused their medication (eg, ever used an alternate route of administration, ever used a higher dose than was prescribed, ever mixed their medication with other drugs or alcohol to feel intoxicated, or ever sold or gave away their medication). All participants also provided information about their lifetime use of several licit and illicit substances, including nicotine, alcohol, marijuana, cocaine, amphetamines, hallucinogens, opiates, and inhalants. After the semistructured interview, all participants completed the above questionnaires.

RESULTS

Forty-five percent of participants reported misusing their medication. Of those who reported misusing their medication, 27.9% reported using an alternative route of administration, 62.8% reported taking a higher dose than recommended, 23.3% reported mixing their medication with other drugs or alcohol to feel intoxicated, and 48.8% reported giving and/or selling their medication. The proportion of men and women was the same for misusers and non-misusers ($\chi^2 = 0.06$, $df = 1$, $p > .05$), as was the proportion of ethnicities ($\chi^2 = 1.07$, $df = 2$, $p > .05$). Similarly, average age was not significantly different between groups ($t[40] = 0.45$, $p > .05$). The majority of participants reported having a prescription for Adderall (69%), whereas the remaining participants were prescribed Ritalin (31%). Additionally, most participants were prescribed extended release capsules (68%), rather than immediate release tablets (32%). No significant differences were found between misusers and non-misusers for type of medication prescribed ($\chi^2 = 1.59$, $df = 1$, $p > .05$) or rate of release ($\chi^2 = 3.65$, $df = 1$, $p > .05$). All participants reported experiencing current symptoms of ADHD.

In line with the hypotheses, significant differences were found between misusers and non-misusers on the SSS Questionnaire ($t[40] = -2.13$, $p < .05$). Inconsistent with the hypothesis, no significant differences were found on the positive expectancy subscale of the PSEQ; however, significant differences were found between misusers and non-misusers on the negative expectancy subscale of the PSEQ ($t[40] = 2.11$, $p < .05$). In terms of the exploratory hypothesis, significant differences were found on the hyperactivity subscale of the ADHD Symptoms Questionnaire only ($t[40] = -2.05$, $p < .05$). Effect size for differences observed on all 3 measures was in the medium to large range (see Table 1). Chi-square tests revealed significant differences in lifetime use of licit and illicit substances between groups. Prescription stimulant misusers were significantly more likely than non-misusers to report lifetime use of nicotine, marijuana, cocaine, hallucinogens, and opiates. The effect sizes for differences in drug use ranged from small to medium (see Table 2).

COMMENT

The present study sought to examine psychostimulant misuse, and to our knowledge, is the first to do so with a college student sample with a prescription for these medications to treat ADHD symptoms. The results suggest that a number of important differences between non-misusers and misusers of prescription stimulants exist. In particular, one of the main

TABLE 1. Comparison of Personality Characteristics of Prescription Stimulant Misusers and Non-misusers

	Misusers			Non-Misusers			
Index	*n*	Mean	*SD*	*n*	Mean	*SD*	*d*
Hyperactivity	19	14.63*	3.67	23	11.65	5.38	.66
Sensation seeking	19	111.53*	19.26	23	97.65	22.34	.67
Negative expectancy effects	19	24.05*	6.94	23	28.17	5.70	.65

*$p < .05$.

TABLE 2. Proportions of Lifetime Illicit Drug Use by Misusers and Non-misusers of Prescription Stimulant Medication ($N = 42$)

Illicit drug	Misusers % reported using	Non-misusers % reported using	χ^2	Φ
Nicotine	94.7	47.8	10.71*	.50
Alcohol	100.0	91.3	1.74	.20
Marijuana	100.0	73.9	5.78*	.37
Cocaine	47.4	13.0	6.01*	.38
Amphetamine	5.3	4.3	0.02	.02
Hallucinogens	57.9	21.7	5.77*	.37
Opiates	26.3	0.0	6.87**	.40
Inhalants	10.5	0.0	2.54	.25

*$p < .05$; **$p < .01$.

factors distinguishing misusers from non-misusers is a history of licit and illicit substance use. For example, compared to non-misusers, misusers were significantly more likely to report the recreational use of nicotine, marijuana, hallucinogens, opiates, and cocaine. The study also found that compared to non-misusers, misusers obtained significantly higher scores on a measure of sensation seeking. This suggests that compared to non-misusers, misusers may be more inclined to take the risk and misuse their prescribed psychostimulants in order to seek out the sensations (eg, euphoria, a "high") that may arise from such misuse.

These findings are consistent with results reported in previous studies,[7,9,14,20,22] which did, however, largely focus on samples of nonprescribed recreational users. In contrast, the present study allowed for an exclusive examination of psychostimulant misuse among prescribed users only. Consistent with the hypothesis, findings suggest that some of the factors associated with nonprescribed psychostimulant misuse may also be relevant to misuse among prescribed users. These findings have a number of important implications for future initiatives aimed at reducing the prevalence of psychostimulant misuse. For example, in the future, professionals involved in the prescription of psychostimulant medications may want to screen for these variables in order to assess the level of risk for misuse; therefore, when necessary, particular caution and careful monitoring can be exerted by these medical professionals.

The current study did also uncover 2 additional novel group differences. First, the study found that relative to non-misusers, misusers obtained significantly higher scores on the hyperactivity dimension of ADHD. As discussed above, research has found that the risk for substance use may vary according to the specific dimensions of ADHD. Although the results of the current study suggest that this may also be true within the context of psychostimulant misuse, future research will need to confirm these results. Second, the study also found that non-misusers reported significantly greater negative expectancies than misusers, meaning that non-misusers expect prescription stimulants to have more negative or unwanted effects than do misusers. Although this was not predicted, because based on previous literature the study hypothesized that there would only be significant differences in positive expectancies, this finding nonetheless has important implications for future prevention initiatives. For example, since non-misusers have greater negative expectancies than misusers, this suggests that prevention efforts may want to focus on the role of expectancies and how they may be modified. In particular, future research will need to examine whether highlighting the negative effects can lead to a reduction in the misuse of stimulant medications.

Limitations

The results of the present study must be considered in light of several methodological limitations in the current research. First, since the majority of the students in the current sample were Caucasian, the present findings may not generalize to other ethnic groups. Second, since the study relied on retrospective self-report as the primary method of assessment, this may have limited the accuracy of the data. Furthermore, it is possible that participants underreported their frequency of prescription stimulant misuse due to the socially undesirable nature of this behavior. Third, since the study assessed the use of only 2 types of psychostimulant medications in the current study, the results may underestimate the extent of psychostimulant misuse among prescription users. Finally, the use of a relatively modest sample size of undergraduate participants may have limited the generalizability of the results. However, it should be noted that despite the smaller sample size, the effect sizes for the measures in the current study were moderate; thus lending further support to the clinical relevance of these measures and their associated implications.

Conclusion

Although considerable evidence exists suggesting that college students are misusing psychostimulant medications, there have been few studies examining the extent of misuse among prescribed users specifically. Moreover, among the few studies that have been conducted, none have examined this phenomenon in a sample of college students exclusively,

despite evidence suggesting that college students are at greatest risk for misusing these medications. Therefore, the present study addresses this gap in the literature and suggests that psychostimulant misuse may not only be a problem among nonprescribed recreational users, but also among prescribed users.

Given the growing body of evidence suggesting an increase in the prevalence of psychostimulant misuse among college age individuals, future research will need to further focus on identifying those at greatest risk. In particular, accurate knowledge regarding the extent of misuse in populations with and without prescriptions and variables associated with misuse will be essential to the development of effective prevention programs.

NOTE

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