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Nonmedical Prescription Stimulant Use Among a Sample of College Students

Relationship With Psychological Variables

Lisa L. Weyandt
Grace Janusis
Kimberly G. Wilson
Genevieve Verdi
Gregory Paquin
Justin Lopes
Michael Varejao
Crystal Dussault
University of Rhode Island

Objective: To further investigate use and potential misuse of prescription stimulants (e.g., Ritalin, Adderall, Concerta) among a sample of college students and to explore the relationship between psychological variables and nonmedical stimulant use. **Method:** The sample consisted of 390 college students (71.6% female, 28.4% male). Participants were asked to complete five questionnaires concerning demographic information, prescription stimulant use, internal restlessness, sensation seeking, and psychological distress. **Results:** The study findings revealed that, regarding nonprescribed stimulants, 7.5% reported use within the past 30 days; 60% reported knowing students who misused stimulants; and 50% agreed or strongly agreed that prescription stimulants were "easy to get on this campus." Findings further revealed a relationship between stimulant use and degree of psychological distress and internal restlessness. **Conclusions:** Continued research regarding psychological variables, specific group membership (e.g., fraternity, sorority, athletics), and stimulant acquisition is suggested. Effective prevention and education efforts are needed to help address the nonmedical use of prescription stimulants on college campuses. *(J. of Att. Dis. 2009; 13(3) 284-296)*

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Attention-deficit/hyperactivity disorder (ADHD), characterized by deficits in sustained attention, hyperactivity, and impulsivity, is estimated to affect between 3% and 7% of the school age population and 2% and 4% of the adult population (American Psychiatric Association [APA], 2000; Barkley, 2006). Less information exists in the literature pertaining to ADHD in adults, in particular, the college student population. It was previously believed that children with ADHD would outgrow symptoms with the onset of puberty (DuPaul, Guevermont, & Barkley, 1991). Follow-up studies, however, have found that the majority of individuals who are diagnosed with ADHD in childhood continue to display symptoms of the disorder into adulthood (Barkley, Fischer, Smallish, & Fletcher, 2002). Preliminary studies suggest that a significant percentage of college students report symptoms associated with ADHD and that college students with ADHD are at risk for academic difficulties, psychological adjustment difficulties, and problems with internal restlessness (Norvilitis, Ingersoll, Zhang, & Jia, 2008; Rabiner, Anastopoulos, Costello, Hoyle, & Swartzwelder, 2008; Weyandt & DuPaul, 2006; Weyandt et al., 2003).

Treatment of ADHD in college students is similar to treatment of children with ADHD with respect to the use of stimulant medication (e.g., Ritalin, Adderall, Concerta).

According to Wilens, Spencer, and Biederman (1998), stimulant medications are considered the first line of therapy for young adults and the number of adolescents and college students treated with prescription stimulants for ADHD has steadily increased in the past decade. Although a large body of research attests to the effectiveness of prescription stimulants in the treatment of individuals with ADHD, the *nonmedical* prescription use (i.e., use of stimulants that have not been prescribed) of stimulants among the general college student population has become problematic in recent years. For example, Babcock and Byrne (2000) surveyed 1,401 students attending a public, 4-year college in the Northeast regarding nonmedical use of prescription stimulants and found approximately 16% of the students reported that they had taken Ritalin (methylphenidate) for "fun" and 53% reported knowing a student who had taken Ritalin for "fun." Less than 2% (1.8) of the sample currently had a prescription for Ritalin. Similar usage rates have been reported by others (Kroutil et al., 2006; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005; White, Becker-Blease, & Grace-Bishop, 2006), whereas Low and Gendaszek (2002) found that 35.5% of college students from a small New England college reported nonmedical use of prescription stimulants.

The only national survey designed to target nonmedical stimulant use among college students was conducted by McCabe, Knight, Teter, and Wechsler (2005) in which 10,904 randomly selected college students from 119, 4-year colleges were surveyed. Approximately 7% of the students reported using prescription stimulants for nonmedical purposes in their lifetime; 4.1% students, within the past year; and 2.1% students, within the past month. Whether students with valid prescriptions are misusing stimulants is unclear. Sharp and Rosen (2007) found that 18% of the 448 students surveyed in their study reported having used prescription stimulants for nonmedical purposes and 4.8% of the sample held a current prescription for stimulants to treat ADHD; however, a relationship was not found between recreational stimulant use and having a legal prescription.

With regard to knowledge of other students' misuse of prescription stimulants, studies have consistently found that college students report knowing someone who has used stimulants recreationally (Carroll, McLaughlin, & Blake, 2006; Hall, Irwin, Bowman, Frankenberger, & Jewett, 2005). Data are inconsistent with respect to gender differences; however, some studies report higher rates of stimulant misuse among male compared to female college students (Low et al., 2002; McCabe et al., 2005; Teter et al., 2005), while other studies report no significant difference between males and females (Carroll et al., 2006; Hall et al., 2005; Kroutil et al., 2006; McCabe et al., 2005; Sharp & Rosen, 2007; White et al., 2006). In terms of motivating reasons for misusing prescription stimulants, findings indicate the primary reasons students report for using stimulants without a prescription include (a) to help with concentration, attention, and focusing; (b) to improve academic performance; and (c) for recreational purposes (i.e., to stay awake while consuming alcohol or other substances; Arria & Wish, 2005; Hall et al., 2005; Teter et al., 2005; White et al., 2006). Collectively, findings across studies suggest that nonmedical use of stimulants tends to be higher among college students who attend colleges in the Northeast, are White, are members of fraternities or sororities, and who earn lower grade point averages (GPA; Kroutil et al., 2006; McCabe et al., 2005; White et al., 2006). In addition, Barrett, Darredeau, Bordy, and Pihl (2005) found that college students who consistently misuse prescription stimulants for recreational purposes are (a) more likely than their peers to misuse a variety of substances; (b) to combine the use of prescription stimulants with other psychoactive substances; and (c) to report higher rates of intranasal use of stimulants compared to college students who report misusing stimulants exclusively for the purpose of studying. Barrett and colleagues (2005) also found that students who misused stimulants reported having obtained the medication from an acquaintance with a prescription. McCabe and Boyd (2005) also reported that the majority of students who abused prescription stimulants obtained the medication from their peers. It is unclear, however, whether students who began taking stimulants during childhood (grades K-4) are at higher risk for misusing stimulants during college (Arria et al., 2008; Kaloyanides, McCabe, Cranford, & Teter, 2007). Preliminary studies suggest that college students to whom stimulants are prescribed for the first time appear to have significantly higher rates of stimulant misuse as well as rates of alcohol and other drug use (Kaloyanides et al., 2007).

Although research has identified motivating reasons for prescription stimulant misuse among college students, information is virtually nonexistent concerning *psychological* variables that might be related specifically to the misuse of prescription stimulants. Low and Gendaszek (2002) conducted one of the few studies that explored the role of psychological factors in relation to prescription stimulant misuse and found that students who endorsed high ratings on a sensation-seeking measure (Sensation-Seeking Scale; Zuckerman, Eysenck, & Eysenck, 1978) were more likely to use prescription

stimulants, whereas student ratings on a perfectionism scale (Multidimensional Perfectionism Scale; Frost, Marten, Lahart, & Rosenblate, 1990) were not associated with prescription stimulant use. Overall, students who had the highest rate of stimulant misuse were those who endorsed high ratings on both the sensation-seeking measure and the perfectionism scale measures (Low et al., 2002). In addition, Stoops and colleagues found that individuals who scored high on sensation-seeking measures were found to be more sensitive than those who scored low on sensation-seeking measures to the reinforcing effects of using stimulant drugs, suggesting that high sensation-seeking individuals are more vulnerable to stimulant drug misuse.

Although research is lacking concerning how psychological variables may affect rates of stimulant misuse among students with and without ADHD, the literature suggests that college students with ADHD may differ significantly from nonaffected peers on measures of several specific psychological and personality factors. Rabiner et al. (2008), for example, found that first-year students with ADHD at a public university reported more academic concerns and depressive symptoms than peers, with inattentive symptoms emerging as a significant predictor variable. Interestingly, although the students reported higher levels of psychological distress, they indicated levels of satisfaction with their social lives commensurate with peers. It is important to note that the students with ADHD did not report elevated use of alcohol or marijuana as compared to nonaffected peers. In addition, the study did not attempt to assess levels of prescription stimulant misuse among students with ADHD or their peers.

With regard to illicit drug use and psychological variables, Soar, Turner, and Parrott (2006) examined the recreational use of Ecstasy and psychological variables among a sample of adult drug users. Results indicated that Ecstasy users exhibited significantly higher scores on several dimensions of the Brief Symptoms Inventory (BSI; Derogatis & Melisaratos, 1983), including somatization, depression, and anxiety, compared to individuals who reported abstaining from all forms of illegal drugs. Psychological variables related to the misuse of drugs other than stimulants, however, have been assessed more frequently through self-report measures. For example, the BSI has been used to examine psychological distress in populations reporting cocaine, alcohol, and other drug misuse (e.g., Singer et al. 1997) as well as psychiatric symptomology in clinical populations (e.g., schizophrenia) reporting comorbid drug misuse (Baigent, Holme, & Hafener, 1995; Singer, Linares, Ntiri, Henry, & Minnes, 2004).

The BSI has also been used to assess psychiatric symptom amelioration due to the effects of treatment protocols for methamphetamine addiction in a population suspected of containing adults with unidentified childhood ADHD. Jaffe et al. (2005) used the BSI to assess psychiatric symptomology in a sample of individuals in residential treatment for methamphetamine addiction. Results indicated that the portion of the screened sample "presumed" to carry a diagnosis of ADHD (70.6 %) reported significantly higher methamphetamine use and baseline BSI scores prior to treatment. Interestingly, the ADHD group significantly improved regarding psychiatric symptoms after abstaining from methamphetamine use according to follow-up BSI self-reports; however, follow-up neurological tests revealed no improvement for the ADHD group regarding tests of attention.

Regarding symptoms of ADHD, Weyandt et al. (2003) developed the Internal Restlessness Scale (IRS) in response to increasing research supporting the position that the hyperactive component of ADHD may change from externally observed activity in childhood to a more internal, *mental restlessness* in adulthood (Barkley, 1998; Robin, 1998), frequently reported as a common symptom by adults with ADHD (Downey, Stelson, Pomerleau, & Giordani, 1997). Furthermore, the current *Diagnostic and Statistical Manual of Mental Disorders, Fourth edition—text revision* (*DSM-IV-TR*; APA, 2000) qualifies this shift in symptoms from childhood (i.e., "often runs about or climbs excessively . . . " to the adult population as "in adolescents or adults, may be limited to subjective feelings of restlessness" (APA, 2000, p. 84).

Questions remain, however, regarding the degree to which psychological factors such as personality attributes, psychological distress, or internal restlessness are related to nonmedical use of stimulants among college students, as well as academic and demographic factors such as academic performance (GPA), housing, major, age, and ethnicity. Therefore, the purposes of the present study were to (a) further investigate the use and potential misuse of prescription stimulants among a sample of college students attending a state university located in the Northeast region of the United States, and (b) to explore whether psychological variables used in previous research and demographic variables were related to nonmedical use of prescription stimulants among college students. Given that this study was exploratory in nature, specific hypotheses were not advanced.

Method

Participants

The study was conducted at a large public university located in the Northeast region of the United States. A total of 414 college students volunteered to participate; 24 participants were dropped from the analyses due to submission of incomplete questionnaires, yielding a sample of 390 participants, including 255 females and 101 males (34 did not report gender). The majority of the sample (83.3%) was White, with 6.9% African American, 2.7% Asian, and 1.3% American Indian or Alaskan Native, which was representative of the larger student body. Approximately 36% of the sample were freshmen, 23% sophomores, 22% juniors, and 18% seniors. Another 20 students reported having a diagnosis of ADHD. Of the students who reported having a diagnosis of ADHD, 11 of them reported having a prescription for stimulant medication. An additional 7 students reported having a prescription for stimulant medication, although they did not report that they had a diagnosis of ADHD. For analysis purposes, students who reported that they had a diagnosis of ADHD or a prescription for stimulant medication were removed, yielding a final sample size of 363 participants for the primary analyses. Results for ADHD/stimulant group (n = 27) are reported separately.

Procedures

The study was approved by the university's institutional review board. As the study sought to elicit information regarding nonprescription stimulant use on a college campus through survey methods, a convenience sample resulted. To increase the likelihood of a representative sample, participants were recruited by several methods. First, a list of 500 students was randomly generated by enrollment services and an informational e-mail was sent to each of these students encouraging them to participate. Recent university statistics indicated that approximately 55% of matriculating students commute to campus. Flyers advertising the study, therefore, were placed in locations where both commuter students and campus residents would be present. In addition, an information booth was placed in a centrally located student cafeteria near the commuter student lounge to facilitate knowledge of the study to these more transient students. Class announcements were made throughout the psychology department and, to specifically target all majors, members of the research staff made announcements in psychology classes that were required for all students to obtain a bachelor's degree from the university. To ensure representation of campus residents within the Greek system, accounting for approximately 10% of the university population, on-campus television and radio advertisements were created and aired on university stations in dormitories and sorority/fraternity housing. Regardless of the mode of advertisement, all participants were provided with an identical list of designated dates, times, and on-campus locations in which they could participate in the study.

Brief Symptom Inventory

The Brief Symptom Inventory (BSI; Derogatis & Melisaratos, 1983) is a self-report assessment of current psychological symptoms. The BSI was administered in a paper-and-pencil format and consists of 53 items based on a 5-point rating scale (ranging from 0 = *not at all* to 4 = *extremely*). There are nine primary symptom dimensions, three global indices, and a Global Severity Index reflecting total number of symptoms (Derogatis & Melisaratos, 1983). The nine primary symptom dimensions are somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism (Derogatis & Melisaratos, 1983). The BSI is widely used and norms are available for adult nonpatients, adult psychiatric outpatients, adult psychiatric inpatient, and adolescent nonpatients. The test–retest reliability of the BSI ranges from .68 to .91 for the nine subscales, .80 to .90 for the three global scales, and .90 regarding the stability coefficient of the General Severity Index (Derogatis & Melisaratos, 1983).

Internal Restlessness Scale

The Internal Restlessness Scale (IRS; Weyandt et al., 2003) is a self-report instrument designed to measure internal or mental restlessness. The IRS consists of 24 items and is based on a 7-point Likert scale (ranging from 1 = *none of the time* to 7 = *all of the time*). Test–retest reliability for the IRS was .89 over a 4-week time period (Weyandt et al., 2003). Concurrent validity is adequate (Weyandt, Linterman, & Rice, 1995) and factor analysis has revealed a 4-factor structure consisting of internal distractibility, internal restlessness, internal impulsivity, and internal disorganization (Weyandt et al., 2003). Research has found that college students diagnosed with ADHD have scored significantly higher on the IRS than college students who did not have ADHD (Weyandt et al., 2003).

Sensation Seeking Scale-V

The Sensation Seeking Scale (SSS-V; Zuckerman et al., 1978) consists of 40 forced-choice items that measure the amount of stimulation and arousal that someone needs or wants and by assessing how often someone is likely to seek out novel stimuli (Zuckerman, Kolin, Price, & Zoob, 1964). The total score for the measure is the summation of all 40 items. The SSS-V has been found to be highly sensitive in predicting drug use in college students, even more so than the Minnesota Multiphasic Personality Inventory and Millon Alcohol Abuse Scale (MMPI & MCMI; Jaffe & Archer, 1987). Furthermore, the results supported previous findings that males tend to score higher than females and that White respondents tend to score higher than Black respondents on the SSS-V (Jaffe & Archer, 1987). The SSS-V has been reported to demonstrate adequate psychometric properties (Ridgeway & Russell, 1980).

Stimulant Survey Questionnaire

The Stimulant Survey Questionnaire (SSQ) is a 40-item questionnaire that was designed for the present study to measure the use and misuse of prescription stimulant medications in college students as well as knowledge about prescription stimulants. Stimulants in the survey refer to prescription medications, including methylphenidate (Ritalin, Concerta, Metadate) and amphetamine (Adderall, Dexedrine). The survey consists of 30 statements rated on two 5-point Likert scales with Items 1-20 ranging from 1 = *never* to 5 = *always* and Items 21-30 ranging from 1 = *strongly disagree* to 5 = *strongly agree*. The final 10 items (31-40) were presented in a yes/no, forced-choice format. The SSQ was designed to measure self-reported prescription stimulant use, perception of prevalence of prescription use among peers, knowledge of atypical stimulant use among peers, and perception of safety of stimulants.

Given that the SSQ was designed for the present study, psychometric properties of the SSQ were explored (see Table 1). A principal-axis factor analysis was conducted to explore the underlying factor structure of the SSQ. Results suggested four factors that, in combination, accounted for 51.12% of the total variance. The factors were (a) self-reported prescription stimulant use (Factor 1), (b) perception of prevalence of prescription use among peers (Factor 2), (c) knowledge of atypical stimulant use among peers (Factor 3), and (d) perception of safety of stimulants (Factor 4). Factor loadings are listed in Table 1. Results revealed adequate internal consistency with a Cronbach's alpha coefficient of .849 for all 40 items of the SSQ. The internal consistency of the four factors was as follows: Factor 1, Cronbach's alpha coefficient = .923; Factor 2, Cronbach's alpha coefficient = .434; Factor 3, Cronbach's alpha coefficient = .613; and Factor 4, Cronbach's alpha coefficient = .608.

Data were collected in group sessions proctored by graduate and undergraduate psychology students who were aware of the nature of the study and were provided instruction on procedural guidelines to ensure anonymity of participants. Upon arrival, the participants were apprised of the nature of the study, provided an estimated time frame needed to complete the survey, and instructed to place studies in a box provided to further ensure anonymity. After providing anonymous consent, the participants completed questionnaires concerning demographic information, stimulant use (SSQ), internal restlessness (IRS), sensation seeking (SSS-V), and psychological distress (BSI). To minimize potential testing effects, questionnaires were presented in a randomized order. Total time necessary for the completion of the questionnaires varied from approximately 20 to 40 min. Upon completion of the survey, participants were given the opportunity to enter a raffle that consisted of five US$100.00 cash prizes.

Results

Descriptive statistics regarding the demographics of the sample can be found in Table 2. The convenience sample, overall, was representative of the university population. Specifically, race, ethnicity, Greek affiliation, and on-campus versus off-campus residency aligned with university population data. Respondent gender in this sample, however, differed, with females representing 71.6% of those surveyed while accounting for 56.3% of the undergraduate population. Male respondents accounted for 28.4% of those surveyed while representing 43.7% of the university population; another 8.7% of the participants chose not to report gender status.

With regard to prescription stimulant use, 7.5% of the students reported using stimulants without a valid prescription within the past 30 days, 9.3% reported using stimulants but not within the past 12 months, and 72.8% of the participants reported never using stimulants without a physician's prescription. Year in college was not significantly related to stimulant use. Participants who belonged to sororities, $F(1, 365) = 19.94$, $p < .001$, and fraternities, $F(1, 346) = 6.08$, $p < .05$, reported significantly higher ratings on Factor 1 (prescription stimulant use) of the SSQ than students who did not belong to

Table 1
Factor Structure for the Stimulant Survey Questionnaire

	Factor			
Item	1	2	3	4
I have used prescription stimulants for nonmedical purposes.	.768			
I have used prescription stimulants at parties.	.737			
I have used prescription stimulants with alcohol.	.736		–.302	
I have snorted prescription stimulants.	.673			
I have injected prescription stimulants.			–.632	
I have smoked prescription stimulants.			–.616	
I have taken prescription stimulants to focus better in class.	.834			
I have taken prescription stimulants to perform better on tests.	.854			
I have taken prescription stimulants to help me socialize better.	.520		–.395	
I have taken prescription stimulants to help me lose weight.	.528			
I have taken prescription stimulants to perform better in schoolwork.	.861			
I have taken prescription stimulants to feel energetic.	.825			
I have taken prescription stimulants to feel better about myself	.567			
I have taken prescription stimulants to "get high."	.501		–.477	
I have been offered prescription stimulants by other students.	.428	–.419		
I have tried someone else's prescription stimulants.	.758			
I have purchased prescription stimulants from other students.	.746			
I have sold prescription stimulants to other students.	.556			
I have given prescription stimulants to other students.	.581			
I have been pressured into letting someone else have my prescription stimulant medication.				
Prescription stimulants are easy to get on this campus.		–.622		
Prescription stimulants are as easy to get as alcohol.		–.533		
Prescription stimulants are as easy to get as marijuana.		–.569		
Using prescription stimulants occasionally is harmless.	.405			.551
Using prescription stimulants daily is harmless.				.341
Prescription stimulant use on campus is a problem.		–.362		
Prescription stimulants are safer than marijuana.				.770
Prescription stimulants are safer than alcohol.				.721
I feel I am knowledgeable about prescription stimulants.	.405			–.457
I feel I am knowledgeable about the side effects of prescription stimulants.	.341			–.507
I know students who use prescription stimulants at parties.		.754		
I know students who use prescription stimulants with alcohol.		.723		
I know students who use prescription stimulants with other drugs.		.690		
I know students who use prescription stimulants while studying.		.777		
I know students who use prescription stimulants during finals week.		.780		
I know students who use prescription stimulants during tests.		.763		
I know students who snort prescription stimulants.		.517		
I know students who inject prescription stimulants.				
I know students who smoke prescription stimulants.			.685	
I hide my prescription stimulant medication so that no one will take it.		.356	.600	

these organizations. Students who belonged to fraternities also had significantly higher ratings on Factor 4 (perceptions of safety) of the SSQ, $F(1, 354) = 4.71$, $p < .05$. Regarding access to stimulants, 50% of the sample agreed or strongly agreed that prescription stimulants were "easy to get on this campus." The highest ratings regarding reasons for using stimulants were to (a) perform better on schoolwork, (b) perform better on tests, and (c) focus better in class. In terms of acquisition of stimulants, 21.2% of participants indicated they had occasionally been offered prescription stimulants by other students, and 9.8% occasionally or frequently have purchased stimulants from other students. Results also revealed that 1.4% of the sample indicated they had sold stimulants to other students. Of those students who reported having ADHD, 5.3% reported being "occasionally pressured into giving someone else their prescription stimulants" and 45% reported "hiding their prescription stimulants

Table 2
Demographic Characteristics of Participants

Characteristic	*n*	Percentage (%)
Gender	356	
Male	101	28.4
Female	255	71.6
Race	377	
White	314	83.3
African American	26	6.9
Asian	10	2.7
American Indian/Alaskan native	5	1.3
Other	22	5.8
Ethnicity	373	
Non-Hispanic/ Latino	349	93.6
Hispanic or Latino	24	6.4
English is primary spoken language in home	358	92.3
College year	338	
Freshman (less than 30 credits)	121	35.8
Sophomore (30-59 credits)	81	22.6
Junior (60- 89 credits)	74	21.9
Senior (90 or more credits)	62	18.3
Living arrangements	389	
Residence halls	185	47.4
Independent	130	33.3
With parents	46	11.8
Sorority or fraternity	21	5.4
Other	7	1.8
GPA	390	
Cumulative GPA greater than 3.4	88	22.6
Cumulative GPA between 3.0 and 3.4	129	33.1
Cumulative GPA between 2.5 and 2.9	115	29.5
Cumulative GPA less than 2.5	58	14.9
Most frequent majors		
Psychology	91	23.3
Nursing	53	13.6
Undecided	20	5.1
Student characteristics		
Member of a fraternity or sorority	58	14.8
Do not smoke cigarettes	347	89.0
Have never been arrested	355	91.0

Note: $N = 390$. GPA = Grade point average.

so others would not take it." Although direct measures of alcohol and drug use were not obtained, data on dormitory violations specific to alcohol and drug use were collected. Results revealed that 21.3% of the participants had been written up for an alcohol offense in the dormitories. For drug offenses, 2.8% reported being written up in the dormitories. A total of 9% of the participants reported being arrested at least once due to alcohol, drug, and other offenses.

The means, standard deviations, and sample sizes for each of the instruments (IRS, BSI, SSS, and SSQ) are reported in Table 3. Pearson's *r* two-tailed correlations were conducted to explore whether ratings on the SSQ were significantly related to ratings on the remaining instruments (see Table 4). Pearson's *r* correlations revealed total score ratings on three factors of the SSQ and were significantly correlated with the Brief Symptom Inventory (BSI; Factor 1: $r = .356$, $p < .01$; Factor 3: $r = .314$, $p < .01$; Factor 4: $r = .202$, $p < .01$), the IRS (Factor 1: $r = .351$, $p < .01$; Factor 3: $r = .299$, $p < .01$; Factor 4: $r = .148$, $p < .01$), and the Sensation Seeking Scale (Factor 1: $r = .375$, $p < .01$; Factor 3: $r = .283$, $p < .01$; Factor 4: $r = .262$, $p < .01$). These results indicated that students who reported higher ratings on the stimulant survey also reported higher ratings of psychological distress, internal restlessness, and sensation-seeking behavior. The Pearson's *r* correlations for students with ADHD for the total BSI, IRS, SSS, and SSQ differed from the students without ADHD (see Table 5). The only significant scale correlated with the SSQ factors was the SSS for Factors 1 ($r = .678$, $p < .01$) and 4 ($r = .482$, $p < .05$). This result suggests that stimulant use for students with ADHD is not correlated with internal restlessness or psychological stress as it is for students without ADHD.

The Sensation-Seeking Scale (SSS) total score was significantly correlated with the IRS ($r = .278$, $p < .01$) but was not significantly correlated with the BSI. These results suggest that sensation-seeking behaviors are related to internal restlessness but may not be related to psychological distress. The total score on the BSI was also significantly correlated with the total score on the IRS ($r = .615$, $p < .01$). Students who reported higher ratings on psychological distress also provided higher ratings on internal restlessness and stimulant use. The relationship between these variables seems to be multidirectional in nature, as students who provided higher ratings on stimulant use were more likely to provide higher ratings on internal restlessness, psychological distress, and sensation seeking.

To further explore the psychological variables related to stimulant use, Pearson's *r* correlations were performed for each of the nine subscales of the BSI with the four factors of the SSQ. All nine BSI subscales were significantly correlated at least at the .05 significance level (two tailed) with Factors 1, 3 and 4 of the SSQ (see Table 6). Results revealed that psychological variables, particularly those represented in the subscales of the BSI (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) were strongly correlated with prescription stimulant misuse. Likewise, all nine subscales of the BSI were significantly correlated with the IRS. The depression ($r = .127$, $p < .05$), hostility ($r = .170$, $p < .01$),

Table 3
Means and Standard Deviations of ADHD/Non-ADHD on Psychological Variable Measures and Stimulant Use Subscales

	ADHD			Non-ADHD		
Measure	*M*	*SD*	*N*	*M*	*SD*	*N*
IRS	91.35**	22.05	20	75.06**	20.55	331
SSS	18.79	5.90	19	19.36	5.95	334
BSI	54.92*	33.23	19	39.06*	32.17	323
SSQ Factor 1	44.26***	13.08	19	30.53***	10.01	351
SSQ Factor 2	24.78	2.63	19	25.82	3.30	344
SSQ Factor 3	10.50	2.33	18	9.60	1.95	352
SSQ Factor 4	17.35**	2.99	20	14.74**	3.58	359

IRS = Internal Restlessness Scale; SSS = Sensation Seeking Scale; BSI = Behavior Symptoms Index; SSQ = Stimulant Survey Questionnaire.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 4
Intercorrelations Between Psychological Variable Measures and Stimulant Use Among Students Without ADHD

Measure	1	2	3	4	5	6	7
1. IRS	—	.278**	.615**	.351**	.073	.299**	.148**
2. SSS		—	.102	.375**	–.004	.283**	.262**
3. BSI			—	.356**	.053	.314**	.202**
4. SSQ 1				—	–.027	.695**	.554**
5. SSQ 2					—	–.033	.022
6. SSQ 3						—	.272**
7. SSQ 4							—

See note to Table 3.
*$p < .05$.**$p < .01$.

Table 5
Intercorrelations Between Psychological Variable Measures and Stimulant Use Among Students With ADHD

Measure	1	2	3	4	5	6	7
1. IRS	—	.221	.503*	.387	.250	.198	–.031
2. SSS		—	.504*	.678**	–.053	.297	.482*
3. BSI			—	.346	–.258	–.023	.219
4. SSQ 1				—	–.010	–.595**	.544*
5. SSQ 2					—	.256	–.387
6. SSQ 3						—	.473*
7. SSQ 4							—

See note to Table 3.
*$p < .05$.**$p < .01$.

and psychoticism ($r = .147$, $p < .01$) subscales were the only ones that correlated significantly with the SSS. These results suggest that higher levels of sensation seeking are correlated with higher levels of depression, hostility, and psychoticism. The Pearson's *r* correlations for students with ADHD for BSI subscales with the SSQ factors also differed from the students without ADHD (see Table 7). The obsessive–compulsive subscale was significantly correlated with Factor 1 of the SSQ ($r = .522$, $p < .05$) and the hostility subscale was significantly correlated with Factor 3 of the SSQ ($r = .469$, $p < .05$). These results suggest that the use of stimulants by students with ADHD is not correlated with as many indicators of psychological distress as students without ADHD.

To explore whether males and females reported significantly different ratings on instruments designed to assess psychological functioning (IRS, BSI, SSS, and SSQ), a multivariate analysis of variance (MANOVA) was performed. Results were not statistically significant, indicating males and females reported similar ratings on these scales. GPA was negatively associated with total score ratings on three factors of the SSQ (Factor 1: $r = –.208$, $p < .01$; Factor 3: $r = –.141$, $p < .01$; Factor 4: $r = –.208$, $p < .01$), as well as the total score on the SSS ($r = .129$, $p < .05$). However, a relationship was not found between GPA and the BSI or IRS. These results suggest that higher ratings of stimulant use were associated with lower GPAs. Furthermore, higher ratings of sensation seeking were associated with lower GPAs.

With regard to ADHD, approximately 5% of the sample reported having a diagnosis of ADHD, with most of the cases diagnosed during childhood or adolescence. Most students (88%) diagnosed with ADHD reported not knowing the specific subtype of ADHD with which they had been diagnosed. Of those diagnosed with the disorder, 33% reported taking medication for the disorder (e.g., stimulants, nonstimulants, and antidepressants), and nearly 67% indicated they did not take a prescribed medication for the disorder. About 6% of students

Table 6
Intercorrelations Between Psychological Variable Measures, Stimulant Use, and Brief Symptom Inventory (Non-ADHD Sample)

BSI Subscale	IRS	SSS	SSQ 1	SSQ 2	SSQ 3	SSQ 4
Somatization	.502**	.080	.247**	.053	.226**	.173**
Obsession-compulsion	.668**	.107	.289**	–.003	.248**	.166**
Interpersonal sensitivity	.480**	.011	.246**	.036	.222**	.107*
Depression	.535**	.127*	.290**	.036	.306**	.164**
Anxiety	.557**	.071	.354**	.055	.312**	.193**
Hostility	.456**	.170**	.366**	.025	.322**	.207**
Phobic anxiety	.411**	–.019	.228**	.031	.302**	.153**
Paranoid ideation	.486**	.035	.238**	–.013	.246**	.147**
Psychoticism	.520**	.147**	.317**	.027	.281**	.198**

See note to Table 3.
**Correlation significant at the 0.01 level (two-tailed). *Correlation significant at the 0.05 level (two-tailed).

Table 7
Intercorrelations Between Psychological Variable Measures, Stimulant Use, and Brief Symptom Inventory (ADHD Sample)

BSI Subscale	IRS	SSS	SSQ 1	SSQ 2	SSQ 3	SSQ 4
Somatization	.397	.309	.417	–.301	.095	.236
Obsession-compulsion	.674**	.391	.522*	–.259	.157	.311
Interpersonal sensitivity	.143	.075	.079	–.376	–.287	–.074
Depression	.477*	.478*	.316	.063	.246	.102
Anxiety	.576**	.376	.354	–.185	.090	.251
Hostility	.329	.559*	.264	.141	.469*	.151
Phobic Anxiety	.474*	.261	.274	.006	–.069	–.096
Paranoid ideation	.256	.010	–.219	.038	–.371	–.283
Psychoticism	.376	.527*	.128	–.059	–.130	.172

**Correlation significant at the 0.01 level (two-tailed). *Correlation significant at the 0.05 level (two-tailed).

diagnosed with ADHD reported having a coexisting disorder (depression was the most common). Post hoc analyses (ANOVA) were conducted to explore questionnaire ratings of students who reported having and not having ADHD. Results revealed that students with ADHD reported significantly higher ratings on the total score (all 40 items) of the SSQ, $F(1, 346) = 25.4$, $p < .01$. When items indicating legitimate use of prescription stimulants were removed (Items 7, 8, and 11), students with ADHD still rated significantly higher on the SSQ, $F(1, 347) = 9.3$, $p < .01$. ANOVAs revealed that those with ADHD reported significantly higher ratings on Factor 1 (self-reported prescription stimulant use), $F(1, 369) = 32.7$, $p < .001$, and Factor 4 (perception of safety of stimulants on campus), $F(1, 378) = 10.1$, $p < .01$, of the SSQ. ANOVAs also revealed that students who reported having ADHD scored significantly higher on the IRS, $F(1, 348) = 11.6$, $p < .01$, and BSI, $F(1, 338) = 4.2$, $p < .05$. A MANOVA of the subscales of the BSI revealed that there was a significant difference between the students with ADHD and without ADHD, $F(9, 336) = 2.6$, $p < .001$. The students with ADHD rated significantly higher than students without ADHD on somatization, $F(1, 346) = 5.4$, $p < .05$; obsessive-compulsive, $F(1, 346) = 6.9$, $p < .01$); anxiety, $F(1, 346) = 4.3$, $p < .05$; and paranoid ideation, $F(1, 346) = 5.2$, $p < .05$.

Discussion

The present study is the first to focus exclusively on exploring the relationship between psychological variables and prescription stimulant misuse among college students. Findings revealed that college students who reported higher rates of stimulant use also reported a higher degree of psychological distress and internal restlessness as measured by the BSI and IRS, respectively. Although these findings are correlational and not causal

in nature, they do suggest that students who have a high degree of internal or mental restlessness or who are experiencing higher rates of psychological distress may be at greater risk for misusing prescription stimulants. Furthermore, students who reported higher rates of prescription stimulant use and knowledge of atypical stimulant use among peers were more likely to report higher rates of psychological distress related to somatization, obsessions and compulsions, sensitivity, depression, anxiety, hostility, phobia, paranoia, and psychoticism as measured by the BSI. When this information is considered in conjunction with the main reasons students report for using prescription stimulants (i.e., to enhance academic performance) one could postulate that students who experience internal restlessness or psychological distress turn to stimulants to help them focus and concentrate to improve academic performance. Indeed, a negative correlation was found between GPA and stimulant use, although one could also argue that students who are using the stimulants for recreational use (i.e., to stay awake while partying) may be more focused on social activities at the expense of their academic pursuits, which could result in a lower GPA. Of course, it is also possible that the illicit use of prescription stimulants may be causing psychological distress. The present study also found a relationship between stimulant misuse and sensation seeking, results that are consistent with Jaffe and Archer (1987) who found sensation seeking was the most powerful predictor of substance use and abuse among college students.

Interestingly, the psychological variables that significantly correlated with stimulant use differed for students with and without ADHD. Though stimulant use for students without ADHD was significantly correlated with all nine subscales of the BSI, stimulant use for students with ADHD only correlated with the obsessive-compulsive and hostility subscales. One possible explanation for this is that these two groups have different motivations for stimulant use. For example, using stimulants to get high at a party may be associated with different psychological variables than a student taking stimulants to focus in class. It is critical to note, however, that the diagnosis of ADHD was not substantiated in the present study and was based on self-report.

Indeed, the results of the present study are consistent with previous research documenting the misuse of prescription stimulants on college campuses (Carroll et al., 2006; McCabe et al., 2005; Sharp & Rosen, 2007). In the current study, 7.5% of the participants reported using stimulants without a valid prescription within the past 30 days, and 9.3% of the participants reported using stimulants but not within the past 12 months. Collectively, prior studies in conjunction with the present study indicate that misuse of prescription stimulants is a problem on college campuses and an alarming number of students are placing themselves at risk for potential health complications when using stimulants for nonmedical purposes.

With respect to gender differences and stimulant use, the present study did not find a difference between males and females. These results are consistent with Sharp and Rosen (2007), White et al. (2006), and others but are inconsistent with a few studies that have found that male students report higher rates of prescription stimulant misuse than female college students (Low et al., 2002; Teter et al., 2005). Female college students who belonged to a sorority and males who belonged to a fraternity reported significantly higher ratings on the SSQ than students who did not belong to these organizations. It should be emphasized, however, that the percentage of females who were members of sororities (10.8%) and the percentage of males that were members of a fraternity (4.1%) were quite small in this study. Additional studies are needed to explore prescription stimulant misuse among students who are members of the Greek system relative to those who are not members of these organizations.

Regarding access to prescription stimulants, the present findings suggest they are readily available to students. For example, about 50% of the sample agreed or strongly agreed that prescription stimulants were easily obtainable on campus. Unfortunately, many students do not appear to be aware of the potential dangers of stimulants as more than 20% of the sample agreed or strongly agreed that "using prescription stimulants occasionally is harmless." Clearly more education is needed on college campuses about the pharmacological and safety issues related to prescription stimulants.

Similar to previous studies, the current study found that most students reported knowing others who misuse prescription stimulants. In fact, nearly twice the amount of students who indicated personal stimulant use reported knowledge of use by other students. This discrepancy is notable and may indicate a tendency for students to underreport their own use or overestimate the prevalence of stimulant use by peers. If the former explanation of the inconsistency is accurate, students are using stimulants without a prescription at even greater rates than previously estimated. The majority of the sample reported knowing students who use stimulants at parties, with alcohol, with other drugs, while studying, and during tests. These findings are consistent with previous research that has noted the main motivations for misusing stimulants

is to enhance performance and for recreational purposes (White et al., 2006).

In terms of acquisition of stimulants, students reported being offered prescription stimulants by other students, and a significant percentage reported that they had purchased stimulants from other students. Interestingly, only a small percentage of the participants (1.4%) indicated they had sold stimulants occasionally to other students. These results suggest that the source of the prescription stimulants may not necessarily be other students or it may be that students who sell prescription stimulants did not volunteer to participate in the study. Furthermore, stimulants are also known to be traded between friends or in exchange for favors. It may also be that many students are purchasing the stimulants that they use from a relatively small number of students. Nevertheless, the results of the present study suggest one source of prescription stimulants is other students, a finding that is consistent with previous studies (Barrett et al., 2005; McCabe & Boyd, 2005). Additional research is needed to determine where most students are obtaining the prescription stimulants, the cost of the stimulants, and the dose of stimulant that students are taking.

A clear finding that emerged is that most students who misuse stimulants appear to be relying on oral administration. For example, in the present study, 5.0% of the participants reported occasionally snorting stimulants, 2.5% reported occasionally smoking stimulants, and 0.6% reported occasionally injecting stimulants. These findings are lower than rates reported by Teter et al. (2005) who found that 38% of college students reported snorting prescription stimulants. One plausible explanation for these discrepant findings is procedural differences, as a paper-and-pencil format was used in the present study, whereas Teter and colleagues used a web-based survey.

Approximately 5% of the sample reported having a diagnosis of ADHD, with most of the cases diagnosed during childhood or adolescence. Interestingly, over a third of students (36.8%) diagnosed with ADHD did not know the specific subtype of ADHD with which they had been diagnosed. This finding has clear implications for education and self-advocacy for college students with ADHD. The majority of students who reported a diagnosis of ADHD (80%) also indicated they take a prescribed medication for the disorder. However, only 55% of these students reported that they take a prescribed stimulant medication. Additional research is needed to determine whether different classes of medications indicated for use with ADHD are more effective than others in helping students with ADHD succeed specific to the academic demands of college. Furthermore, students with ADHD may have differential levels of symptom severity and subsequent coping skills that may affect overall performance in the college environment. Therefore, more research is needed to specifically examine the academic, psychological, and social performance of college students with documented ADHD. Regarding comorbidity, the majority of students diagnosed with ADHD (75%) indicated that they had not been diagnosed with another psychological disorder. These results are inconsistent with the literature concerning adults with ADHD that suggests that the majority have some type of comorbid disorder (Barkley, 2006). Although the present findings are based on self-report and it is unknown whether these students actually have ADHD, it raises questions about the nature of ADHD in college students. As mentioned previously, very little is known about this population but it is conceivable that college students with ADHD may be less impaired than adults with ADHD who do not pursue higher education.

Results also revealed that those with ADHD reported significantly higher ratings on the factors of the SSQ measuring self-reported prescription stimulant use and the perception of safety of stimulants on campus. Students who reported having ADHD also scored significantly higher on the IRS and BSI. Again, these results need to be tempered in light of the sample size and self-report format but do raise questions about stimulant use among students with ADHD. In addition, the results of the SSQ include responses where students who have ADHD may be using stimulants for prescribed reasons (i.e., for focusing or studying) and thus falsely inflating the significant difference in the total scores on the SSQ. However, after items for prescribed use of prescription stimulants (Items 7, 8, and 11) were removed from the total score on the SSQ for comparison with the non-ADHD group, the students with ADHD still reported significantly higher ratings on the SSQ. Although follow-up studies have found that students who have taken prescription stimulants are at decreased risk for misusing substances compared to those with ADHD who did not take prescription stimulants (Barkley, 1998; Biederman, 2003; Katusic et al., 2005), additional research is needed to explore whether college students with ADHD are at greater or lesser risk for misusing prescription stimulants.

There are several limitations of the present study that should be addressed in future research. Regarding sample characteristics, the sample consisted of students from a single university; therefore, the results may not be representative of college students in general. In addition, of the 356 participants reporting gender, approximately 72% were females and 28% were males, demonstrating a disproportionate number of female participants. Future research should strive to enroll an equivalent number of

male and female participants in order to better analyze any potential gender differences. In addition, the sample consisted mainly of White students, and studies are needed with racially diverse samples and students from other countries. According to Woodworth (2000), the United States consumes the majority of methylphenidate produced in the world; therefore, cross-cultural studies are needed to help determine whether prescription stimulant misuse is rather specific to this country or occurs in among college students throughout the world. With regard to the Greek system, only 4.1% of male students reported belonging to a fraternity and 10.8% of the female students reported belonging to a sorority despite the presence of a Greek system on campus. It remains unknown whether the ratings of students who participated in the study and who belong to fraternities and sororities are representative of most college students who belong to fraternities and sororities. Similarly, information was not collected about participation in athletic programs that would provide additional information about the demographics of students who are at greatest risk for misusing prescription stimulants.

Although the present study did not find a significant difference between male and female students' ratings on the SSQ, previous studies have reported such differences (Low et al., 2002; McCabe et al., 2005; Teter et al., 2005). Additional research is needed to further explore this issue and to determine whether male students and female students differ in the type of stimulant used, amount, and motivation for stimulant use. Future research is also needed to explore the psychometric properties of the SSQ. For example, the internal consistency of Factor 2 (perception of prevalence of prescription use among peers) was low and may be improved by revising specific items of the SSQ. Lastly, three items on the SSQ pertain to legitimate reasons for taking stimulants if a student has ADHD ("I have taken prescription stimulants to focus better in class," "I have taken prescription stimulants to perform better on tests," and "I have taken prescription stimulants to perform better in my school work") and, therefore, may have elevated the ratings of students who reported having this disorder. It is unknown, however, whether the students who reported having ADHD actually had a valid diagnosis of the disorder.

In conclusion, the present study revealed 7.5% of the college student participants reported using nonprescribed stimulants in the past 30 days, and the majority of participants reported knowing students who misuse stimulants. A relationship was also found between stimulant use and degree of psychological distress, internal restlessness, and sensation seeking. Additional research is needed to help identify those who are at greater risk for nonmedical stimulant use and to develop strategies to help prevent the misuse of prescription stimulants among college students. Effective prevention and education efforts are needed to help address the nonmedical use of prescription stimulants on college campuses.

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Lisa L. Weyandt is an Associate Professor at the University of Rhode Island.

Kimberly G. Wilson (BA, University of Rhode Island) is currently enrolled in the School Psychology Master of Science program at the University of Rhode Island.

Grace M. Janusis (MA, University of Rhode Island) is currently enrolled in the School Psychology PhD program at the University of Rhode Island.

Genevieve R. Verdi (MEd, Seton Hall University) is currently enrolled in the School Psychology PhD program at the University of Rhode Island.

Michael T. Varejao (BA, University of Rhode Island) is currently enrolled in the School Psychology Master of Science program at the University of Rhode Island.

Crystal L. Dussault (MA, University of Rhode Island) is currently enrolled in the School Psychology PhD program at the University of Rhode Island.

Gregory Paquin (BA, University of Rhode Island) is currently enrolled the School Psychology PhD program at the University of Rhode Island.

Justin Lopes is an undergraduate student at the University of Rhode Island.