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Nonmedical Prescription Stimulant Use Among Girls 10–18 Years of Age: Associations With Other Risky Behavior

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Abstract

Purpose—Little is known about the risk factors for nonmedical use (NMU) of prescription stimulants among adolescent girls. We aimed to measure the association of nonmedical prescription stimulant use with empirically linked risk factors, including weight control behavior (WCB), gambling, and depressed mood, in pre-teen and teenaged girls.

Methods—We assessed the relationship between age and race, gambling, WCB, depressive mood, and nonmedical prescription stimulant use using multivariable logistic regression. The study sample included 5,585 females, aged 10–18 years, recruited via an entertainment venue intercept method in 10 U.S. metropolitan areas as part of the National Monitoring of Adolescent Prescription Stimulants Study (2008–2011).

Results—NMU of prescription stimulants was reported by 6.6% (n = 370) of the sample. In multivariable logistic regression, 1-year increase in age was associated with a 21% (95% confidence interval [CI]: .15, .28) increase in risk for NMU. Whites and other race/ethnicity girls had 2.67 (CI: 1.85, 3.87) and 1.71 (1.11, 2.65) times higher odds for NMU, compared to African-Americans. Depressive mood (adjusted odds ratio: 2.69, CI: 2.04, 5.57) and gambling (adjusted odds ratio: 1.90, 1.23, 2.92) were associated with increased odds for NMU. A dose-response was identified between WCB and NMU, where girls with unhealthy and extreme WCB were over five times more likely to endorse NMU.

Conclusions—We contribute to the literature linking WCB, depression, gambling, and the NMU of prescription stimulants in any population and uniquely do so among girls.

Nonmedical prescription stimulant use among younger Americans is a growing problem. Over 2.4 million Americans reported first NMU of prescription drugs in the past year, with

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one third represented by those aged 12–17 years. Nonmedical use (NMU) of prescription stimulants is high among adolescents aged 12–17 years, with lifetime use ranging from 8.5% to 14.8% and current use from 6.2% to 7.3% [1–4]. Additionally, NMU exceeds medical use of prescription stimulants among college and grade-school aged individuals [4,5].

Study of differences in NMU by sex has focused mainly on college-aged populations, reporting higher rates among males versus females. However, there are studies that indicate that the substance use gender gap is becoming smaller [6]. In fact, in a large sample of adolescents aged 12–17 years (n = 126,764), females had 1.68 and 1.49 times the odds of nonpersistent and persistent NMU of prescription stimulants, respectively, compared to males [7].

NMU of prescription stimulants is associated with the use of other substances. Nonmedical users report higher rates of use of other substances compared to nonusers, including cigarette use (50% vs. 15%), binge drinking (79% vs. 45%), marijuana use (79% vs. 29%), and cocaine and/or ecstasy use (20% vs. 1%) [5,8]. Diversion of prescription stimulants increase with marijuana use [9]. Among those who report past-year NMU of prescription stimulants, 67.9% met diagnostic criteria for past-year substance use disorder of a different substance [8]. NMU of prescription drugs leads to the development of prescription drug abuse and dependence in youth 12–17 years (13.4% in males and 18% in females) [10] and later in life [11].

Mental health problems are also associated with NMU of prescription stimulants. Those who use prescription stimulants nonmedically have 2.3 times the odds of depressed mood, compared to those who do not engage in NMU of prescription stimulants, with a prevalence of 50% among the NMU group [12]. Links between depression and substance use are well known in adults [13] and in adolescent girls [14]. Major depressive episodes are prevalent with rates of about 9% of adolescents increasing to 28% by 19 years of age [15].

Self-induced vomiting is associated with NMU of prescription stimulants among women 18–25 years of age [16,17]. Self-induced vomiting is a type of unhealthy and extreme weight control behavior (WCB). Such behavior is common among girls: fear of gaining weight and distress about weight/shape are endorsed by 63.2% and 33.6% of girls, respectively [18]; 61% of adolescent females report some unhealthy WCB (fasting, eating very little food, using food supplements, skipping meals, or smoking cigarettes to lose or keep from gaining weight) with 17% reporting chronic dieting) [19]; 22% report extreme WCB (self-induced vomiting or using diet pills, diuretics, or laxatives in order to control their weight [19]. Unhealthy and extreme WCBs are correlated with use of other substances, including NMU of psychotherapeutics in young adults [20].

Gambling and eating disorders have been associated with substance use in general [21–23]. Internet gamblers are over three times more likely to use substances in general than non-gamblers [24]. Research also supports the relationship between gambling and increased rate of self-induced vomiting [25] and depression [22,26,27]. Between 36% and 58% of adolescent girls report some type of gambling behavior [28,29]. The link between gambling, eating disorders, and drug use is postulated to be through increased impulsiveness [23].

The National Monitoring of Adolescent Prescription Stimulants Study provides a unique opportunity to assess the relationships between NMU of prescription stimulants, depression, WCB, and gambling among a national sample of adolescent girls aged 10–18 years. We theorized that NMU of prescription stimulants in adolescent girls will be significantly associated with age, race, depressed mood, WCB, and Internet gambling. The aim of this paper was to test these relationships at a bivariate and multivariable level.

Methods

The National Monitoring of Adolescent Prescription Stimulants Study assessed the medical and NMU of prescription stimulants among youth 10–18 years of age via an entertainment venue intercept method in 10 U.S. metropolitan areas (Boston, Cincinnati, Denver, Houston, Los Angeles, New York, Philadelphia, St. Louis, Seattle, and Tampa). Methods including survey development and testing for reliability have been reported; kappas varied from .6 to 1.0 [1]. Adolescents were invited to participate by highly trained rater/interviewers (RIs) at malls, skate parks, movie theaters, and other places where youth congregate. Coordination of RIs was conducted by study coordinators in St. Louis; CHW shifts were scheduled during all weekly and weekend shifts when youth could be expected to be out in the community.

Independent data collection occurred beginning in fall of 2008, followed by a second data collection in spring of 2009, a third in fall of 2010, and a fourth in spring of 2011. Research Interviewers recruited and elicited verbal consent. The Washington University Human Research Protection Office approved this research. Survey completion took approximately 15 minutes; $10 gift cards were given for remuneration. Prescription stimulants elicited included Adderall or Adderall XR, Concerta, Daytrana, and Ritalin (SA or LA). NMU included endorsing use other than by mouth (except for the Daytrana patch), use of more than prescribed, use of someone else's medication, and use "just because," "out of curiosity," or "to get high." Those who endorsed use to lose weight were also considered nonmedical users as this is not a recommended treatment in overweight or obese adolescents [30].

Age was treated as a continuous variable with a range of 10–18 years of age as reported by the participant. Race was collapsed into four categories: white, African-American, Hispanic (if endorsed regardless of other race endorsed), or "other" (due to the limited sample size; Alaska Native, Asian, Pacific Islander, American Indian, Middle Eastern, bi- or multi-racial).

WCB was assessed by type following the taxonomy commonly used in the literature [31,32]. Unhealthy WCB was assessed by answering yes to one of two questions: "Have you ever tried to lose weight by…(1) not eating for a day or two" or (2) "exercising too much." Extreme WCB was assessed by answering yes to either: "Have you ever tried to lose weight by (1) taking pills" and/or (2) "making yourself vomit." WCB was then coded into one variable including the following categories: no WCB, unhealthy WCB only, extreme WCB only, or unhealthy and extreme WCB.

Lifetime Internet gambling, specifically poker games and sports betting, was assessed with one dichotomous yes/no question. Depressed mood was assessed by answering yes to one of two questions: "In the last 12 months, have you had 2 weeks or more when you…" (1) "lost interest in things" and/or (2) "felt down or depressed."

After restricting the sample to girls only (N = 5,706) and deleting cases with missing data (N = 121), our sample size of 11,048 dropped to 5,585. We compared girls who had ever used prescription stimulants nonmedically to girls who had never used stimulants nonmedically, including both girls who had used medically only and girls who had never used stimulants. Using logistic regression, we then tested the fit of a model examining the associations between NMU of stimulants among girls 10–18 years old and several factors selected on our review of the literature and theorized relationships.

Results

The mean age of the total sample of girls was 15.02 years (confidence interval: 14.97, 15.08). Among them, 45% endorsed being white, 19% endorsed being African-American, and 18% endorsed being Hispanic. A majority of the sample, 55%, endorsed depressed mood. One third (34%) reported any WCB and 4.2% endorsed ever gambling on the Internet. The prevalence of NMU of prescription stimulants among girls was 6.6% (n = 370); 93.4% reported no use of stimulants nonmedically. Among those who never used prescription stimulants non-medically, 5.8% (n = 302) used them medically.

Table 1 reports demographic characteristics, WCB, gambling behavior, and depressed mood by NMU groups. Groups differed significantly by the proposed risk factors. Nonmedical prescription stimulant users were slightly older, more likely to be white, more likely to report depressed mood, twice as likely to report gambling on the Internet, and four times more likely to endorse unhealthy and extreme WCB.

After adjusting for other risk factors (Table 2), every increased year of age was associated with a 21% increased risk of lifetime NMU. Caucasian youth were 2.67 times more likely to endorse NMU compared to African-Americans; endorsing depressed mood increased the odds of lifetime NMU of prescription stimulants almost three times. Youth who endorsed gambling were almost two times as likely to endorse NMU compared to those who did not. The behavior most likely to be associated with NMU among young girls was WCBs. Those with both unhealthy and extreme WCB were over five times as likely to endorse NMU of prescription stimulants compared to those without WCB. Unhealthy or extreme behavior only, rather than both, nearly doubled and quadrupled (respectively) the likelihood of NMU compared to no WCB (Table 2).

Discussion

In this entertainment intercept study of 5,585 girls 10–18 years of age, 370 had used prescription stimulants non-medically. Based on the literature, we tested the relationships between the NMU of prescription stimulants and older age, WCB, depression, and Internet gambling in a sample of girls. Each variable was significantly associated, and the association held even when controlling for all others in the model. The odds of NMU increased with age

and was significantly higher among the Caucasian girls. Most studies report similar findings. Not surprisingly, we found that WCB increased the likelihood of NMU of prescription stimulants. It is logical to assume that some young girls used prescription stimulants nonmedically as a nontraditional form of extreme WCB, as traditional WCB and NMU are highly associated in this sample.

Even one symptom of depression was associated with increased NMU. Teter et al. [12] also found that depression and NMU of prescription stimulants are linked. Nattala et al. [33] found that relieving stress and changing mood were the top two motivations for nonmedical prescription sedative and alcohol use among a community-recruited adult population. Here, the temporality of depressed mood was not assessed, so it is unclear if the depressed mood was a result of or a predictor of NMU of stimulants.

We were surprised that the risk of NMU of prescription stimulants increased by so much among the few girls who endorsed Internet gambling. Similar to symptoms of depressed mood, it is possible that the relationship between gambling and NMU is bidirectional. Von Ranson et al. [23] postulated that a link between substance use, gambling, and eating disorders was due to increased impulsivity. Very few studies have been conducted on the use of Internet gambling in any population. Among teens, this behavior is even less understood. This study adds to the small number of studies that highlight the association between these behaviors.

Readers should consider some limitations to the current study. First, studies of disparities in health care show reduced access to medical care in non-white populations, which may lead to lower access to prescription drugs [34]. This reduced access to prescription drugs may inflate the rate of NMU among African-Americans and Hispanics, compared to Caucasians. In minority populations, it is possible that use of stimulants would be medically prescribed if the levels of access were equitable across race/ethnicity. If such a disparity is present in our data, then misclassification of NMU in these populations is possible with medical use being classified as NMU. Second, it is not possible to assess the temporal relationship between NMU and gambling, WCB, and depressed mood. Therefore, it is possible that these associations are bidirectional and that NMU is both a predictor and an outcome of these behaviors. Third, data collection was cross-sectional in nature across different cities and in four waves. We were not powered to include city of enrollment in the current analysis. In terms of analysis by wave, no strong differences in the data have been found by wave, nor are we aware of any historical changes during the four study waves that could be expected to heavily influence findings. Waves of collection were no more than 1 year apart. Finally, the entertainment venue enumeration that we used has been used to find and recruit hard to reach populations [35,36], but to our knowledge, this is its first use among a general youth population. We sampled from likely places where youth congregated, during all times when youth were likely to be present, and we used age and urbanicity quotas in our recruiting; nevertheless, our sample was a convenience sample [1]. As such, it may not be representative of the overall youth population from which it was drawn.

Our findings point to depression, WCB, and Internet gambling as behavioral risks for NMU of prescription stimulants. The link may be due to impulsivity or another factor [23].

Screening for girls with these associated factors should proceed to screening for NMU of prescription stimulants. Girls identified with nonprescription stimulant use should also be screened for WCB, Internet gambling, and depression, all of which have been recommended by pediatric organizations [37] as part of standard comprehensive assessments [38] and are included in the HEEADSSS (Home Environment, Education and employment, Eating, peer-related Activities, Drug, Sexuality, Suicide/depression, and Safety) assessment [39,40]. Better understanding of the relationships between these risky behaviors may help improve health outcomes among young women. Future research should consider predeterminants of behaviors associated with NMU of prescription stimulants. Of particular interest could be impulsive tendencies, social networks, influence of the built environment, and specific subgroups including young girls who use stimulants medically and nonmedically. To our knowledge, there is no comparable analysis regarding behavioral associations of NMU of prescription stimulant use among boys and would be an important area for future research.

Acknowledgments

References

1. Cottler LB, Striley CW, Lasopa SO. Assessing prescription stimulant use, misuse, and diversion among youth 10–18 years of age. Curr Opin Psychiatry. 2013; 25:511–9.

2. Sweeney CT, Sembower MS, Ertischeck MD, et al. Nonmedical use of prescription ADHD stimulants and preexisting patterns of drug abuse. J Addict Dis. 2013; 32:1–10. [PubMed: 23480243]

3. Levine SB, Coupey SM. Nonmedical use of prescription medications: An emerging risk behavior among rural adolescents. J Adolesc Health. 2009; 44:407–9. [PubMed: 19306802]

4. Poulin C. From attention-deficit/hyperactivity disorder to medical stimulant use to the diversion of prescribed stimulants to non-medical stimulant use: Connecting the dots. Addiction. 2006; 102:740–51.

5. McCabe SE, Teter CJ, Boyd CJ. Medical use, illicit use and diversion of prescription stimulant medication. J Psychoactive Drugs. 2006; 38:43–56. [PubMed: 16681175]

6. Schwinn TM, Schinke SP, Noia JD. Preventing drug abuse among adolescent girls: Outcome data from an internet-based intervention. Preventative Sci. 2009; 11:24–32.

7. Nakawaki B, Crano W. Predicting adolescents' persistence, non-persistence, and recent onset of nonmedical use of opioids and stimulants. Addict Behav. 2012; 37:716–21. [PubMed: 22381640]

8. McCabe SE, Cranford JA, West BT. Trends in prescription drug abuse and dependence, co-occurrence with other substance use disorders, and treatment utilization: Results from two national surveys. Addict Behav. 2008; 33:1297–305. [PubMed: 18632211]

9. Lasopa SO, Striley CW, Cottler LB. Diversion of prescription stimulant drugs among 10–18-year-olds. Curr Opin Psychiatry. 2015; 28:292–8. [PubMed: 26001920]

10. National Institute on Drug Abuse. [Accessed June 6, 2013] Research report series: Prescription drugs: Abuse and addiction. 2011. Available at: http://www.drugabuse.gov/sites/default/files/rrprescription.pdf

11. McCabe SE, West BT, Morales M, et al. Does early onset of non-medical use of prescription drugs predict subsequent prescription drug abuse and dependence? Results from a national study. Addiction. 2007; 102:1920–30. [PubMed: 17916222]

12. Teter CJ, Falone AE, Cranford JA, et al. Nonmedical use of prescription stimulants and depressed mood among college students: Frequency and routes of administration. J Subst Abuse Treat. 2010; 38:292–8. [PubMed: 20129754]

13. Compton WM, Cottler LB, Phelps DL, et al. Psychiatric disorders among drug dependent subjects: Are they primary or secondary. Am J Addict. 2000; 9:126–34. [PubMed: 10934574]

14. Marmorstein NR, White H, Chung T, et al. Associations between first use of substances and change in internalizing symptoms among girls: Differences by symptom trajectory and substance use type. J Clin Child Adolesc Psychol. 2010; 39:545–58. [PubMed: 20589565]

15. Clark HK, Ringwalt CL, Shamblen SR. Predicting adolescent substance use: The effects of depressed mood and positive expectancies. Addict Behav. 2011; 36:488–93. [PubMed: 21306830]

16. Piran N, Robinson SR. Associations between disordered eating behaviors and licit and illicit substance use and abuse in a university sample. Addict Behav. 2006a; 31:1761–75. [PubMed: 16448780]

17. Piran N, Robinson S. The association between disordered eating and substance use and abuse in women: A community-based investigation. Women Health. 2006b; 44:1–20.

18. Micali N, Ploubidis G, De Stavola B, et al. Frequency and patterns of eating disorder symptoms in early adolescence. J Adolesc Health. 2013; 54:574–81. [PubMed: 24360247]

19. Eisenberg ME, Neumark-Sztainer D. Friends' dieting and disordered eating behaviors among adolescents five years later: Findings from Project EAT. J Adolesc Health. 2010; 47:67–73. [PubMed: 20547294]

20. Cance JD, Ashley OS, Penne MA. Unhealthy weight control behaviors and MDMA (ecstacy) use among adolescent females. J Adolesc Health. 2005; 37:409.

21. Davison KM, Marshall-Fabien GL, Gondora L. Sex differences and eating disorder risk among psychiatric conditions, compulsive behaviors and substance use in a screened Canadian national sample. Gen Hosp Psychiatry. 2014; 36:411–4. [PubMed: 24856439]

22. Petry NM, Stinson FS, Grant BF. Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the national epidemiology survey on alcohol and related conditions. J Clin Psychiatry. 2005; 66:564–74. [PubMed: 15889941]

23. von Ranson KM, Wallace LM, Holub A, Hodgins DC. Eating disorders, substance use disorders, and impulsiveness among disordered gamblers in a community sample. Eur Eat Disord Rev. 2013; 21:148–54. [PubMed: 23080054]

24. Potenza MN, Wareham JD, Steinberg MA, et al. Correlates of at-risk/problem internet gambling in adolescents. J Am Acad Child Adolesc Psychiatry. 2011; 50:150–69. [PubMed: 21241952]

25. Huang J, Jacobs DF, Derevensky JL, et al. Gambling and health risk behaviors among U.S. college student-athletes: Findings from a national study. J Adolesc Health. 2007; 40:390–7. [PubMed: 17448395]

26. Crockford DN, el-Guebaly N. Psychiatric comorbidity in pathological gambling: A critical review. Can J Psychiatry. 1998; 43:43–50. [PubMed: 9494746]

27. Lee GP, Storr CL, Ialongo NS, Martins SS. Compounded effect of early adolescence depressive symptoms and impulsivity on late adolescence gambling: A longitudinal study. J Adolesc Health. 2011; 48:164–9. [PubMed: 21257115]

28. Lee GP, Storr CL, Ialongo NS, Martins SS. Association between adverse life events and addictive behaviors among male and female adolescents. Am J Addict. 2012; 21:516–23. [PubMed: 23082829]

29. Barnes GM, Welte JW, Hoffman JH, Tidwell MO. Gambling, alcohol, and other substance use among youth in the United States. J Stud Alcohol Drugs. 2009; 70:134–42. [PubMed: 19118402]

30. Spear BA, Barlow SE, Ervin C, et al. Recommendations for treatment of child and adolescent overweight and obesity. Pediatrics. 2007; 120(4)

31. Neumark-Sztainer D, Wall M, Story M, et al. Dieting and unhealthy weight control behaviors during adolescence: Associations with 10-year changes in body mass index. J Adolesc Health. 2012; 50:80–6. [PubMed: 22188838]

32. Quick V, Loth K, Maclehose R, et al. Prevalence of adolescents' self-weighing behaviors and associations with weight-related behaviors and psychological well-being. J Adolesc Health. 2013; 52:738–44. [PubMed: 23433538]

33. Nattala P, Leung KS, Abdallah AB, et al. Motives and simultaneous sedative-alcohol use among past 12-month alcohol and nonmedical sedative users. Am J Drug Alcohol Abuse. 2012; 38:359–64. [PubMed: 22242567]

34. Smedley, BD., Stith, AY., Nelson, AR. Committee on understanding and eliminating racial and ethnic disparities in health care, board on health sciences policy, Institute of Medicine. Unequal treatment: Confronting racial and ethnic disparities in health care. Smedley, BD.Stith, AY., Nelson, AR., editors. Washington, DC: National Academy of Sciences; 2003.

35. Zhao J, Cai WD, Chen L, et al. A comparison of HIV infection and related risks among male sex workers in different venues in Shenzhen, China. AIDS Behav. 2011; 15:635–42. [PubMed: 20711650]

36. Muhib FB, Lin LS, Stueve A, et al. A venue-based method for sampling hard-to-reach populations. Public Health Rep. 2001; 116(Suppl 1):216–22. [PubMed: 11889287]

37. Palfrey, JS., Green, M., editors. Bright futures: Guidelines for health supervision of infants, children and adolescents. 2. Arlington, VA: National Centre for Education in Maternal and Child Health; 2002.

38. Sawyer SM, Bowes G. Adolescence on the health agenda. Lancet. 1999; 354(Suppl 2):SII31–4. [PubMed: 10507258]

39. Goldenring JM, Rosen DS. Getting into adolescent heads: An essential update. Contemp Pediatr. 2004; 21:64–90.

40. Goldenring JM, Cohen E. Getting into adolescent heads. Contemp Pediatr. 1988; 5:75–90.

IMPLICATIONS AND CONTRIBUTION

In this study using an entertainment-intercept recruited sample of adolescent girls aged 10–18 years, increased age, white race, depressive mood, gambling, and weight control behavior were significantly associated with nonmedical use of prescription stimulants. These findings highlight the importance of screening for depression, weight control, gambling, and NMU of prescription stimulants in populations treated for any of these problems.

Table 1

Description of a national adolescent female sample and comparison of characteristics by nonmedical use (NMU) of prescription stimulants

Total sample (n = 5,585)	No NMU use (n = 5,215; 93.4%)	NMU use (n = 370; 6.6%)
Age (mean ± SD) ***	14.96 ± 2.11	15.96 ± 1.66
Race ***		
White	2,292 (44.0)	252 (61.4)
African-American	1,027 (19.7)	36 (9.7)
Hispanic	938 (18.0)	55 (12.7)
Other	963 (18.3)	71 (16.2)
Depressive mood ***		
No	2,436 (46.7)	69 (18.6)
Yes	2,779 (53.3)	301 (81.4)
Gambling ***		
No	5,010 (96.1)	341 (92.2)
Yes	205 (3.9)	29 (7.8)
Weight control behavior ***		
None	3,542 (67.7)	129 (34.9)
Unhealthy only	1,208 (23.1)	102 (27.6)
Extreme only	62 (1.2)	16 (3.5)
Unhealthy and extreme	418 (8.0)	167 (34.0)

SD = standard deviation.

*** $p < .001$.

Table 2

Adjusted odds ratios of selected demographics and risk factors for nonmedical use of prescription stimulants among an adolescent female sample (n = 5,585)

	Adjusted OR	95% CI
Age ***	.21	.15–.28
Race		
African-American	1.00	
White ***	2.67	1.85–3.87
Hispanic	1.28	.81–2.01
Other *	1.71	1.11–2.65
Depressive mood ***		
No	1.00	
Yes	2.69	2.04–3.57
Gambling **		
No	1.00	
Yes	1.90	1.23–2.92
Weight control behavior		
None	1.00	
Unhealthy only ***	1.77	1.34–2.33
Extreme only ***	4.42	2.31–8.46
Unhealthy and extreme ***	5.09	3.85–6.73

OR = odds ratio; 95% CI = 95% confidence interval.

*
$p < .05$,

**
$p < .01$,

***
$p < .001$.