Published in final edited form as:
Drug Alcohol Depend. 2017 October 01; 179: 167–173. doi:10.1016/j.drugalcdep.2017.06.032.

Social contextual risk factors for stimulant use among adolescent American Indians

Nichea S. Spillane[1], **Lisa Weyandt**[1], **Danielle Oster**[1], and **Hayley Treloar**[2]

[1]Psychology Department, University of Rhode Island, Kingston, RI 02881

[2]Center for Alcohol and Addiction Studies, Brown University, Providence, RI, USA

Abstract

Objective—Stimulants are the most common and efficacious treatment for Attention-Deficit Hyperactivity Disorder (ADHD). We examined the relationship between stimulant misuse and social factors that could be malleable to prevention among American Indian (AI) adolescents.

Method—Participants were AI students (N=3,498) sampled from 33 schools in 11 states. Participants completed the American Drug and Alcohol Survey. A multilevel analytic approach was used to evaluate the effects of participant-level (level 1) variables (i.e., gender, grade, peer, school, family, stimulant prescribed by doctor) on lifetime and current simulant use to 'get high'.

Results—Nearly 7% of our sample had been prescribed stimulants and nearly 6% of the sample reported using stimulants to get high. Age [OR=1.22; 95% CI = 1.09, 1.36, $p<.001$], perception of peer substance use [OR=1.19; 95% CI = 1.14, 1.23, $p<.001$], parental monitoring [OR=.96; 95% CI = 0.92, 1.99, $p=.04$], and stimulants prescribed by a doctor [OR=8.79, 95% CI = 5.86, 13.18, $p<.001$] were associated with ever using stimulants to get high. Perception of peer substance use, [b = 0.09, SE = .02, $p<.001$, 95%CI [0.05, 0.13], and having stimulants prescribed by a doctor, [b = 0.58, SE = .21, p=.006, 95%CI [0.17, 0.99], were associated with frequency of past month use to get high. There was also a significant quadratic effect for parental monitoring, suggesting that low and high levels were associated with increased stimulant use.

Conclusions—Our results suggest a need for prevention efforts to be directed to AI youth who are prescribed stimulants.

Correspondence: Nichea S. Spillane, Ph.D., University of Rhode Island, Department of Psychology, 110 Chaffee Hall, Kingston, RI 02881, Tel: (401) 874-4252, nspillane@uri.edu.

Contributors

The first author (Spillane) guided the statistical analyses, contributed to the manuscript, and guided the choice of study variables. Dr. Weyandt provided expertise in ADHD and assisted with writing the manuscript. Ms. Oster assisted with writing the manuscript. Dr. Treloar took lead on the statistical analyses and wrote appropriate sections. All authors approved of the final manuscript before submission.

Conflict of Interest

The authors have no conflict of interest.

Keywords

American Indian youth; stimulant misuse; social-contextual factors

1. Introduction

Attention deficit hyperactivity disorder (ADHD) is neurobehavioral disorder characterized by clinically significant levels of inattention, hyperactivity, and impulsivity that cause impairment in multiple settings (American Psychiatric Association, 2013). The disorder is estimated to affect approximately 3% to 7% of children and 2.5% of the adult population (American Psychiatric Association, 2013; Simon et al., 2009). Cross culturally, ADHD is found around the world with rates varying significantly across countries (e.g., (Alhraiwil et al., 2015; Benjasuwantep et al., 2002; Gadow et al., 2000; Kanbayashi et al., 1994; Rohde et al., 1999; Schaughency et al., 1994; Zorlu et al., 2015).

Ethnic differences in rates of ADHD have also been noted. Preliminary studies suggest that Asian American children have lower rates of ADHD than other ethnic groups (Nguyen et al., 2004), while African American children have more symptoms of ADHD but lower rates of diagnosis and treatment (Miller et al., 2009). Reports for Hispanic children are inconsistent with some studies reporting that ADHD is more common in Hispanic children than other ethnic groups (e.g., (Arnold et al., 2003) while others report the opposite (e.g., (Cuffe et al., 2005). Studies concerning the prevalence of ADHD among American Indian (AI) children are sparse, however, those that have been conducted suggest lower rates compared to European or African American children (e.g., (Beiser et al., 2000; Costello et al., 1997; Cuffe et al., 2005). For example, Reyes and colleagues (2013) reported that ADHD was less frequently diagnosed in AI (2.7%) children compared to black children (6.8%) and white children (4%), but more frequently when compared to Hispanic (1.6%) and Asian American children (1.3%). Recently, Lefler and colleagues (2015) examined parent and teacher reported ADHD symptoms in 72 AI children and found gender differences in ratings of ADHD symptoms. Specifically, AI boys had significantly higher ratings of ADHD symptomatology than AI girls (Lefler et al., 2015).

Children and adolescents with ADHD often demonstrate academic and behavioral difficulties, including problems remaining seated and focused, disorganization, excessive talking, lower grades, noncompliance and aggression, and are at greater risk for school dropout (Danforth et al., 2016; Mihandoost, 2015). Socially, adolescents with ADHD are at greater risk for substance use and misuse of alcohol, nicotine, and illicit substances (Katusic et al., 2005; Zaso et al., 2015). A variety of treatment approaches are available for ADHD including non-pharmacological and pharmacological approaches (e.g., stimulants, pro-stimulants, anticonvulsants; (Kooij et al., 2010; Weyandt, 2006). Prescription stimulants are the most commonly prescribed medication for ADHD, with Methylphenidate (MPH; e.g., Ritalin, Concerta) and amphetamine (AMP; e.g., Adderall, Dexedrine) prescribed most often (Meijer et al., 2009; Wilens, 2008). When used as prescribed, stimulant medications are safe and effective at improving core ADHD symptoms of inattention, impulsivity, and hyperactivity, as well as improving psychological, cognitive, and social functioning (Adler et al., 2013; Brams et al., 2011; Dupaul et al., 2012; Faraone et al., 2004).

Prescription stimulants are classified as Schedule II medications by the U.S. Food and Drug Administration due to their significant potential for misuse (Kollins, 2003). Indeed, a substantial body of research supports that the misuse of prescription stimulants has soared among college students since the beginning of the century (Babcock and Byrne, 2000; Dussault and Weyandt, 2013; Janusis and Weyandt, 2010; McCabe et al., 2014; Messina et al., 2014; Verdi et al., 2016; Weyandt et al., 2009). A recent meta-analysis by Benson, Flory, Humphreys, and Lee (2015) reported a prevalence rate of 17% for stimulant misuse among college students. Moreover, there is some evidence to suggest adolescents with ADHD may be more likely to misuse their medications compared to other adolescents who were receiving psychotropic medication for other psychological difficulties (Wilens et al., 2006).

According to a nationally representative sample of high school seniors from the Monitoring the Future study, the lifetime prevalence of medical use of prescription stimulants was 9.5% while lifetime nonmedical use of prescription stimulants (i.e., stimulant misuse) was similarly 9.5% (McCabe and West, 2013). Among those that were ever prescribed stimulants, approximately 23% reported medical use prior to their misuse, and about 18% reported misuse prior to medical use (McCabe and West, 2013). Gender differences were not found among these students, however, white students had higher rates of nonmedical use (i.e., stimulant misuse) compared to Hispanics and African-Americans, and correspondingly lower rates of non-use (7.5%, 3.0%, and 1.1%, respectively). Information was not provided regarding AI students, therefore, we know very little about stimulant misuse among this population.

Common motivations for non-prescription use of stimulants among adolescents and young adults include use for recreation (i.e., to get ‘high’) and for cognitive and academic achievement (DeSantis et al., 2010) (Kerley et al., 2015). Specifically, college students who misuse prescription stimulants are more likely to do so while studying (e.g., preparing for exams, writing papers) with the expectation that it will improve their academic performance (Rabiner et al., 2009; Weyandt et al., 2013). Despite this expectation, stimulant misuse has been found to be negatively associated with academic functioning (Benson et al., 2015). In contrast to motivations among college students, recent research with younger teens suggested misuse is driven by factors other than a desire to increase academic productivity (Leon and Martinez, 2017). Taken together, these apparent conflicting results suggest important developmental differences in motivations for non-prescription stimulant use and support the inclusion of younger teens in future research.

As with many health-risk behaviors among youth, parent and peer influences are important predictors of stimulant misuse (see Benson et al., 2015; Donaldson et al., 2015). Indeed, high levels of parental monitoring is associated with reduce risk of prescription stimulant misuse (Rogers and Copley, 2009). Other research implicates both high parental monitoring and low parental warmth as predicting prescription stimulant misuse among younger adolescents (Donaldson et al., 2015). Although considerable research has demonstrated the importance of peers in stimulant misuse (Benson et al., 2015; McCabe and Boyd, 2005), research of ethnic differences in peer-related risk factors is sparse. Extant research on peer modeling for AI youth and substance use has found a strong association between deviant peer behavior and increased risk for substance use during adolescence and early adulthood (Oetting et al., 1998).

The purpose of the present study was to explore the rate of stimulant misuse among an under-investigated group, AI youth. Much of what is known is from investigations in non-diverse samples of college students. This study is particularly important and timely as Gilder and colleagues (2014) recently reported that AIs experience some of the highest rates of stimulant dependence of all ethnic groups in the USA. Although Gilder focused on adults and did not explore rates of stimulant misuse in adolescents, their work underscores the importance of research in this area, especially since they found an earlier age of first stimulant use was predictive of stimulant dependence.

We examined stimulant misuse among AI adolescents in the 7^{th} – 12^{th} grade living on or near reservations. We were interested in the relationship between stimulant misuse and social factors that could be malleable to prevention interventions. Specifically, school performance, parental monitoring, and perception of peer substance use behaviors were selected for our analyses as they have been found to be related to stimulant use in the past with non-Natives ((Benson et al., 2015; Rogers and Copley, 2009) and theorized to be important in Natives in the etiology of substance use (Oetting et al., 1998). In addition, based on previous research with non-natives mentioned above (Wilens et al., 2006), we hypothesized that being prescribed stimulants would be positively related to ever using stimulants and misusing stimulants more frequently.

2. Method

2.1 Participants

Participants for this study were part of an annual survey of AI young people who reside on or near reservations. Schools with ≥20% AI students on or near reservations were identified, stratified by region, and then sampled according to the relative AI population within that region. Six geographic regions in which reservation-based AIs reside were sampled including, Northwest, Northern Plains, Northeast, Southeast, Southern Great Plains, and Southwest. Recruitment in each region was based on 2000 U.S. Census data for designated AI areas to approximate the percentage of AIs residing in each respective region.

Schools were paid $500 for participation and given a report on their survey findings. For the present study, we combined three school years—2009–2010, 2010–2011, and 2011–2012—to obtain a sample with a regional distribution that was more closely aligned with that of the population.

A total of 33 schools were surveyed in 11 states with reservations (Alabama, Arizona, Minnesota, Montana, Nebraska, Nevada, North Dakota, Oregon, South Dakota, Washington, and Wisconsin). Twenty-five of the schools were located within the boundaries of AI reservations, while eight schools enrolled students from nearby reservations. Twenty-eight schools were public schools and five were Bureau of Indian Education schools. Combining data from all schools, the number of completed surveys represented 80% of student enrollment in those schools.

2.2. Procedures

Procedures have been described in detail elsewhere (Stanley et al., 2014). All survey procedures were approved by the University Institutional Review Board (IRB), appropriate tribal authority, and/or school board. Further information about survey procedures can be found in Stanley et al. (2014). Less than one percent of students did not complete the survey due to lack of parental consent.

2.3 Measures

Students were administered The American Drug and Alcohol Survey™, a self-report measure assessing substance use and factors related to substance use. This survey has been adapted for use with AI youth and shown to be reliable and valid (Oetting and Beauvais, 1990) and is listed in the Substance Abuse and Mental Health Services Administration's Measures and Instruments Resource guide (2007). Names and types of substances have been continuously updated to reflect the current substances and nomenclature being used by young people. For our purposes, we used items that asked the following, "have you ever been prescribed stimulants by a doctor?", "have you used stimulants to get high or taken extra doses to get high?", and "have you used stimulants to get high or taken extra doses to get high in the past month?" Response options for the last question were, 0 times, 1–2 times, 3–9 times, 10–19 times, and 20+ times.

2.3.1 School Performance—School performance was measured with 2 questions that assessed what kinds of grades the student received and what kind of student they are. Responses options include "very good, good, not too good, or poor." Coefficient alpha in the current sample was .75.

2.3.2 Perception of Peer Substance Use—Perception of peer substance use was measured with 8 items that assessed the frequency with which their friends engage in substance use behavior including how many of their friends get drunk once in a while and almost every weekend, how many friends get drunk, and use other substances. Coefficient alpha in the current sample was .85.

2.3.3 Parental Monitoring—Peer monitoring was assessed with 8 items that assessed the youth's perception of parents and family knowledge of where the youth is and care about various aspects of youth life. Coefficient alpha in the current sample was .63.

2.4 Data Analysis Plan

A multilevel analytic approach was used to evaluate the effects of gender, age, peer modeling, parental modeling, school performance, and stimulant prescribed by doctor (level 1 variables), as well as region (level 2), on lifetime and current simulant use to 'get high.' Multilevel models accounted for the nesting of participants (level 1) within communities (level 2) and were implemented with SAS 9.3 software (SAS Institute, 2012). First, the GLIMMIX procedure was used to model lifetime stimulant use with a binary distribution (0

= lifetime use not endorsed; 1 = lifetime use endorsed) and logit link function. Parameter estimates were exponentiated so that outcomes for this analysis could be interpreted as odds ratios. Next, only those students who endorsed lifetime stimulant use were selected, and the MIXED procedure was used to model past month frequency of stimulant use as a continuous variable. REML estimation, the between-within method of calculating degrees of freedom, and variance components covariance structure were used for all analyses. Random parameters were nonsignificant for all focal study variables in both models. Residual correlations were specified to account for the nesting of students within communities in the GLIMMIX procedure and a random intercept was specified in the MIXED procedure.

3. Results

3.1 Demographics

Table 1 provides frequencies for demographic variables, sociocultural variables, and outcome variables. Participants included 3,498 students who self-identified as AI. Nearly 7% of the sample had been prescribed stimulants in the past, and of these youth 32% reported using stimulants to get high. Among those who were not prescribed stimulants in the past, only 4% reported using them to get high. In terms of past month use, approximately 4% reported using in the past month.

3.2 Bivariate Relationships

At the bivariate level, school performance, peer modeling, parental monitoring, and having been prescribed stimulants were all related to stimulant misuse (see Table 2). Of interest, school performance and parental monitoring were negatively related to lifetime stimulant misuse, and frequency of past month stimulant misuse. Peer modeling and having ever been prescribed stimulants were both positively related to lifetime stimulant misuse and frequency of past month stimulant misuse.

3.3 Multi-Level Models

A logistic multilevel analysis estimated the log odds of ever using stimulants just to “get high” or taking extra doses of prescribed stimulants just to “get high”. The −2 residual log pseudo likelihood for the null model was 19366.52, generalized χ^2=3342.00. Our next logistic model included *a priori* risk and protective factors (i.e., parental monitoring and peer modeling, school performance, prescribed stimulants) and relevant covariates (i.e., age, gender). The fit of this model was superior to the null model, −2 residual log pseudo likelihood=16907.21, generalized χ^2=2150.87, generalized χ^2/df=0.84. Table 3 reports fixed effects for this model. Most focal variables were significantly related to lifetime stimulant use. Regional differences were shown at the community level, with students from schools in the Upper Great Lakes reporting a three-fold increase in log odds of ever using stimulants to get high, relative to students from schools in the Southwest, , $p < .001$, OR=3.13, 95%CI[1.80,5.42]. Of particular interest at the student level was whether stimulants had ever been prescribed by a doctor for medicinal purposes. Students who reported ever being prescribed stimulants by a doctor were nearly 9 times more likely to have ever used stimulants to get high compared to youth who had not been prescribed stimulants, $p <.001$, OR=8.79, 95%CI[5.86,13.18]. Perception of peer substance use was significantly related to increased stimulant use. Every one-unit increase in our peer modeling measure equated to a 19% increase in the log odds of lifetime recreational stimulant use, , $p < .001$, OR=1.19, 95%CI[1.14,1.23].

In contrast to doctor-prescribed medication, age, and perception of peer substance use, a higher level of parental monitoring was associated with decreased odds of ever using stimulants to "get high". Every one unit increase in our measure of parental monitoring equated to a 4% decrease in the log odds of lifetime recreational stimulant use, , $p = .020$, OR=0.96, 95%CI[0.92,0.99]. School performance was unrelated to recreational stimulant use, p=.250.

Next, the past month frequency of use was estimated among lifetime users. The −2 residual log likelihood for a null (unconditional means) model was 608.5, AIC=610.5, BIC=611.5. Fit statistics suggested an improvement in fit for the full model, −2 residual log likelihood=436.6, AIC=438.6, BIC=439.6. Fixed effect estimates for the full model are shown in Table 4. Perception of peer substance use (i.e., the frequency with which peers engage in substance use), b=0.10, p<.001, 95%CI[0.05,0.14], and having stimulants prescribed by a doctor, b=0.54, p=.011, 95%CI[0.12,0.95], were associated with increased frequency of past month use. There was also a significant positive quadratic effect for frequency of use that indicated a convex curve where higher and lower values of parental monitoring were related to increased frequency of stimulant use, b=0.01, p=.039, 95%CI [0.00,0.01].

4. Discussion

The purpose of the present study was to investigate stimulant misuse among AI adolescents in the 7th–12th grade living on or near reservations. In this study, stimulant misuse was defined by endorsing using stimulants to get high, and did not include using for instrumental reasons, e.g., for academic enhancement. When interpreting findings, it is important to consider that our measure of stimulant misuse was more focused than those from other studies. With that in mind, we found that nearly 6% of the whole sample had misused stimulants (i.e., endorsed using stimulants to get high) and 7% of the entire sample had been prescribed stimulants. Of those who had been prescribed stimulants almost a third of them reported misusing stimulants to get high. Although we did not test a direct comparison, our findings suggest that AI youth may misuse prescription stimulants at greater rates than what is observed in general adolescent samples (e.g., 4.5% in (McCabe et al., 2004).

Consistent with previous research, youth who were prescribed stimulants were approximately 9 times more likely to report ever misusing stimulants to get high and misused prescription stimulants at a higher frequency compared to youth who were not prescribed stimulants (Wilens et al., 2006). These findings are concerning as they suggest that a valid prescription for stimulants may be one of the most pertinent predictive variables of recent and greater frequency of stimulant misuse in AI adolescents. Conceptually, it makes sense that youth with access to stimulants would misuse them more. However, research has also demonstrated that individuals with ADHD symptoms are more likely to take part in greater stimulant misuse (Wilens et al., 2008). Therefore, it may be access to stimulants *and* ADHD symptoms that are most predictive of stimulant misuse. In this study, we did not measure ADHD symptomatology and therefore we do not have diagnostic information on these youth. It is imperative that future research with AI youth examine the effects of ADHD diagnosis and stimulant misuse, given the alarmingly high rates and risk of substance use problems among AI adolescents (Parker-Langley, 2002) (Wallace, 2002). Our findings strongly suggest that AI youth prescribed stimulants should be closely monitored and suggest a need for preventative interventions for stimulant misuse among this demographic.

Results of the present study also revealed significant associations between ever using stimulants to get high and risk and protective factors. A one-year increase in age related to a 24% increase in misusing stimulants. Previous substance use research among AI youth also supports this developmental association. For example, one study reported an increase of approximately 6% in alcohol use from 7th grade to 12th grade (Blum et al., 1992) while another study linked early marijuana use (i.e., 11–12 years) to greater odds of marijuana abuse/dependence in late adolescence (Cheadle and Sittner Hartshorn, 2012). Several other studies have shown that substance use begins early among AI adolescents, and early use is a clear marker of risk for prolonged and problematic use (Novins and Baron, 2004; Whitbeck et al., 2008; Whitesell et al., 2007). Together these findings suggest early intervention/prevention is key to eliminating and reducing these observed substance use disparities.

Peer networks play an important role in risk for substance use among AI youth. Consistent with previous research, our results show that for every one-unit increase in the perception of peer substance use modeling equated to a 18% increase in the odds of endorsing lifetime stimulant use to get high (Oetting et al., 1998). Clearly, prevention programs and interventions should focus on peer relationships, as these represent a modifiable risk factor for stimulant misuse.

Parental monitoring was associated with the odds of ever misusing prescription stimulants, and there was a significant quadratic effect for the frequency of current use. Specifically low levels of parental monitoring were associated with increased odds of ever using stimulants to get high. For frequency of use, both low and high levels of parental monitoring were associated with higher frequency of stimulant use. This suggests that parental monitoring is a protective factor for engaging in stimulant misuse, more generally. Once use is established, low and high levels of parental monitoring are related to greater frequency of using. It may be that once stimulant use has started, parents who have low levels of interest in knowing where and with whom their children are with or are overprotective may lead them to use stimulants at a greater frequency. However, more research is needed to fully understand the nature of this relationship. It is also important to note that our measure of parental monitoring emphasized traditional parental monitoring consisting of rule-setting, monitoring activities, praise for appropriate behavior; and moderate, consistent discipline that enforces defined family rules (Kosterman et al., 2001). However, as researchers have noted, traditional Western views of parenting are different from Indigenous ways of parenting (Whitbeck et al., 2014). Indigenous ways of “parenting” are more likely to include family networks which are often made up of grandparents, aunts, uncles, and sometimes fictive kin (Whitbeck et al., 2014) and therefore “parenting” responsibilities may be spread throughout this network. Consistent with this view of parenting, research has found that the number of people monitoring may be more associated with substance use than Western parental monitoring (Whitbeck et al., 2014). Future research may inquire about how many people are involved in monitoring the child's behavior and the nature of those relationships.

Our hypothesis that school performance would be related to misusing stimulants was not supported. This is consistent with other research with non-AIs that found no relationship between academic strain and stimulant misuse (Leon and Martinez, 2017). This may have been a factor of a restricted range, since most of our students reported that they get good grades and that they are good students.

Finally, our ability to make *a priori* hypotheses about region effects was limited by a lack of prior work. However, in accounting for regional differences in our analyses, the Upper Great Lakes emerged as a region of youth with higher rates of lifetime stimulant use to get high, relative to Southwest. This regional difference is consistent with other research that has shown higher rates of alcohol use, specifically in the Midwest tribal regions (Whitbeck et al., 2006). While we do not believe this finding is spurious, we do believe that replication through further research is important before we can draw any firm conclusions.

4.1 Limitations

The results of this study should be understood within the context of its limitations. First, although this study used a large sample of AI students living on or near reservations, it was not a random sample of all schools on or near reservations. Schools from the Northeast, California, Oklahoma, and Alaska did not participate in the survey and therefore their rates were not reflected in this study. In addition, we do not have diagnostic information on ADHD in the sample. Finally, because this was a school-based sample, this may have underestimated the stimulant use rates among AI youth in general, due to the high AI dropout rate.

5.0 Conclusions

Results from the present study suggest that AI youth are misusing prescription stimulants at similar, if not greater rates than their same-age peers. Having a stimulant prescription and peer modeling of substance use were linked to greater stimulant use. These findings highlight the great need for future stimulant prevention interventions among AI youth. Doctors should take caution when prescribing stimulant-based pharmacotherapy because of their potential for misuse. Future programs should incorporate the empirically supported risk and protective factors for prescription stimulant use in order to provide the most effective interventions.

Acknowledgments

Role of Funding Source

This work was supported by the National Institute on Drug Abuse (NIDA) grant (R01DA03371) and (K08DA029094).

References

Adler LA, Dirks B, Deas PF, Raychaudhuri A, Dauphin MR, Lasser RA, Weisler RH. Lisdexamfetamine dimesylate in adults with attention-deficit/ hyperactivity disorder who report clinically significant impairment in executive function: Results from a randomized, double-blind, placebo-controlled study. J. Clin. Psychiatry. 2013; 74:694–702. [PubMed: 23945447]

Alhraiwil NJ, Ali A, Househ MS, Al-Shehri AM, El-Metwally AA. Systematic review of the epidemiology of attention deficit hyperactivity disorder in Arab countries. Neurosciences (Riyadh). 2015; 20:137–144. [PubMed: 25864066]

American Psychiatric Association. Diagnostic and Statistical Manual of Mental Health Disorders: DSM-5. 5. American Psychiatric Publishing; Washington, DC: 2013.

Arnold LE, Elliot M, Sachs L, Bird H, Kraemer HC, Wells KC, Abikoff HB, Comarda A, Conners CK, Elliott GR, Greenhill LL, Hechtman L, Hindshaw SP, Hoza B, Jensen PS, March JS, Newcorn JH, Pelham WE, Severe JB, Swanson JM, Vitiello B, Wigal T. Effects of ethnicity on treatment attendance, stimulant response/dose, and 14-month outcome in ADHD. J. Consult. Clin. Psychol. 2003; 71:713–727. [PubMed: 12924677]

Babcock Q, Byrne T. Student perceptions of methylphenidate abuse at a public liberal arts college. J. Am. Coll. Health. 2000; 49:143–145. [PubMed: 11125642]

Beiser M, Dion R, Gotowiec A. The structure of attention-deficit and hyperactivity symptoms among native and non-native elementary school children. J. Abnorm. Child Psychol. 2000; 28:425–437. [PubMed: 11100917]

Benjasuwantep B, Ruangdaraganon N, Visudhiphan P. Prevalence and clinical characteristics of attention deficit hyperactivity disorder among primary school students in Bangkok. J. Med. Assoc. Thai. 2002; 85(Suppl. 4):S1232–1240. [PubMed: 12549800]

Benson K, Flory K, Humphreys KL, Lee SS. Misuse of stimulant medication among college students: A comprehensive review and meta-analysis. Clin. Child Fam. Psychol. Rev. 2015; 18:50–76. [PubMed: 25575768]

Blum RW, Harmon B, Harris L, Bergeisen L, Resnick MD. American Indian-- Alaska Native youth health. JAMA. 1992; 267:1637–1644. [PubMed: 1542173]

Brams M, Giblin J, Gasior M, Gao J, Wigal T. Effects of open-label lisdexamfetamine dimesylate on self-reported quality of life in adults with ADHD. Postgrad. Med. 2011; 123:99–108.

Cheadle JE, Sittner Hartshorn KJ. Marijuana use development over the course of adolescence among North American Indigenous youth. Soc. Sci. Res. 2012; 41:1227–1240. [PubMed: 23017929]

Costello EJ, Farmer EM, Angold A, Burns BJ, Erkanli A. Psychiatric disorders among American Indian and white youth in Appalachia: The Great Smoky Mountains Study. Am. J. Public Health. 1997; 87:827–832. [PubMed: 9184514]

Cuffe SP, Moore CG, McKeown RE. Prevalence and correlates of ADHD symptoms in the national health interview survey. J. Atten. Disord. 2005; 9:392–401. [PubMed: 16371662]

Danforth JS, Connor DF, Doerfler LA. The development of comorbid conduct problems in children with ADHD: An example of an integrative developmental psychopathology perspective. J. Atten. Disord. 2016; 20:214–229. [PubMed: 24412971]

DeSantis A, Noar SM, Webb EM. Speeding through the frat house: A qualitative exploration of nonmedical ADHD stimulant use in fraternities. J. Drug Educ. 2010; 40:157–171. [PubMed: 21133329]

Donaldson CD, Nakawaki B, Crano WD. Variations in parental monitoring and predictions of adolescent prescription opioid and stimulant misuse. Addict. Behav. 2015; 45:14–21. [PubMed: 25622102]

Dupaul GJ, Weyandt LL, Rossi JS, Vilardo BA, O'Dell SM, Carson KM, Verdi G, Swentosky A. Double-blind, placebo-controlled, crossover study of the efficacy and safety of lisdexamfetamine dimesylate in college students with ADHD. J. Atten. Disord. 2012; 16:202–220. [PubMed: 22166471]

Dussault CL, Weyandt LL. An examination of prescription stimulant misuse and psychological variables among sorority and fraternity college populations. J. Atten. Disord. 2013; 17:87–97. [PubMed: 22142699]

Faraone SV, Spencer T, Aleardi M, Pagano C, Biederman J. Meta-analysis of the efficacy of methylphenidate for treating adult attention-deficit/hyperactivity disorder. J. Clin. Psychopharmacol. 2004; 24:24–29. [PubMed: 14709943]

Gadow KD, Nolan EE, Litcher L, Carlson GA, Panina N, Golovakha E, Sprafkin J, Bromet EJ. Comparison of attention-deficit/hyperactivity disorder symptom subtypes in Ukrainian schoolchildren. J. Am. Acad. Child Adolesc. Psychiatry. 2000; 39:1520–1527. [PubMed: 11128329]

Gilder DA, Gizer IR, Lau P, Ehlers CL. Stimulant dependence and stimulant-associated psychosis: Clinical characteristics and age of onset in a native American community sample. J. Addict. Med. 2014; 8:241–248. [PubMed: 24755633]

Janusis GM, Weyandt LL. An exploratory study of substance use and misuse among college students with and without ADHD and other disabilities. J. Atten. Disord. 2010; 14:205–215. [PubMed: 20479474]

Kanbayashi Y, Nakata Y, Fujii K, Kita M, Wada K. ADHD-related behavior among non-referred children: Parents' ratings of DSM-III-R symptoms. Child Psychiatry Hum. Dev. 1994; 25:13–29. [PubMed: 7805432]

Katusic SK, Barbaresi WJ, Colligan RC, Weaver AL, Leibson CL, Jacobsen SJ. Psychostimulant treatment and risk for substance abuse among young adults with a history of attention-deficit/hyperactivity disorder: a population-based, birth cohort study. J. Child Adolesc. Psychopharmacol. 2005; 15:764–776. [PubMed: 16262593]

Kerley KR, Copes H, Griffin OH. Middle-class motives for non-medical prescription stimulant use among college students. Deviant Behav. 2015; 36:589–603.

Kollins SH. Comparing the abuse potential of methylphenidate versus other stimulants: A review of available evidence and relevance to the ADHD patient. J. Clin. Psychiatry. 2003; 11(64 Suppl):14–18.

Kooij SJ, Bejerot S, Blackwell A, Caci H, Casas-Brugue M, Carpentier PJ, Edvinsson D, Fayyad J, Foeken K, Fitzgerald M, Gaillac V, Ginsberg Y, Henry C, Krause J, Lensing MB, Manor I, Niederhofer H, Nunes-Filipe C, Ohlmeier MD, Oswald P, Pallanti S, Pehlivanidis A, Ramos-Quiroga JA, Rastam M, Ryffel-Rawak D, Stes S, Asherson P. European consensus statement on diagnosis and treatment of adult ADHD: The European Network Adult ADHD. B.M.C. Psychiatry. 2010; 10:67.

Kosterman R, Hawkins JD, Haggerty KP, Spoth R, Redmond C. Preparing for the drug free years: Session-specific effects of a universal parent-training intervention with rural families. J. Drug Educ. 2001; 31:47–68. [PubMed: 11338965]

Lefler EK, Hartung CM, Bartgis J, Thomas DG. ADHD symptoms in American Indian/Alaska native boys and girls. Am. Indian Alsk. Native Ment. Health Res. 2015; 22:23–40. [PubMed: 26053883]

Leon KS, Martinez DE. To study, to party, or both? Assessing risk factors for non-prescribed stimulant use among middle and high school students. J. Psychoactive Drugs. 2017; 49:22–30. [PubMed: 27918861]

McCabe SE, Boyd CJ. Sources of prescription drugs for illicit use. Addict. Behav. 2005; 30:1342–1350. [PubMed: 16022931]

McCabe SE, Teter CJ, Boyd CJ. The use, misuse and diversion of prescription stimulants among middle and high school students. Subst. Use Misuse. 2004; 39:1095–1116. [PubMed: 15387205]

McCabe SE, West BT. Medical and nonmedical use of prescription stimulants: Results from a national multicohort study. J. Am. Acad. Child Adolesc. Psychiatry. 2013; 52:1272–1280. [PubMed: 24290460]

McCabe SE, West BT, Teter CJ, Boyd CJ. Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. Addict. Behav. 2014; 39:1176–1182. [PubMed: 24727278]

Meijer WM, Faber A, van den Ban E, Tobi H. Current issues around the pharmacotherapy of ADHD in children and adults. Pharm. World Sci. 2009; 31:509–516. [PubMed: 19562500]

Messina BG, Silvestri MM, Diulio AR, Murphy JG, Garza KB, Correia CJ. Alcohol use, impulsivity, and the non-medical use of prescription stimulants among college students. Addict. Behav. 2014; 39:1798–1803. [PubMed: 25123349]

Mihandoost Z. Treatment programs for students with attention deficit hyperactivity disorder: A meta-analysis study. Iran J. Psychiatry Behav. Sci. 2015; 9:e1840. [PubMed: 26576168]

Miller TW, Nigg JT, Miller RL. Attention deficit hyperactivity disorder in African American children: What can be concluded from the past ten years? Clin. Psychol. Rev. 2009; 29:77–86. [PubMed: 19008029]

Nguyen L, Arganza GF, Huang LN, Liao Q, Nguyen HT, Santiago R. Psychiatric diagnoses and clinical characteristics of Asian American youth in children's services. J. Child Family Stud. 2004; 13:483–495.

Novins DK, Baron AE. American Indian substance use: The hazards for substance use initiation and progression for adolescents aged 14 to 20 years. J. Am. Acad. Child Adolesc. Psychiatry. 2004; 43:316–324. [PubMed: 15076265]

Oetting ER, Beauvais F. Adolescent drug use: findings of national and local surveys. J. Consult. Clin. Psychol. 1990; 58:385–394. [PubMed: 2212174]

Oetting ER, Donnermeyer JF, Deffenbacher JL. Primary socialization theory. The influence of the community on drug use and deviance. III. Subst. Use Misuse. 1998; 33:1629–1665. [PubMed: 9680086]

Parker-Langley, L. Alcohol prevention programs among American Indians: Research findings and issues. National Institutes of Health; Bethesda, MD: 2002.

Rabiner DL, Anastopoulos AD, Costello EJ, Hoyle RH, McCabe SE, Swartzwelder HS. Motives and perceived consequences of nonmedical ADHD medication use by college students: Are students treating themselves for attention problems? J. Atten. Disord. 2009; 13:259–270. [PubMed: 18664714]

Rogers PD, Copley L. The nonmedical use of prescription drugs by adolescents. Adolesc. Med. State Art Rev. 2009; 20:1–8. vii. [PubMed: 19492687]

Rohde LA, Biederman J, Busnello EA, Zimmermann H, Schmitz M, Martins S, Tramontina S. ADHD in a school sample of Brazilian adolescents: A study of prevalence, comorbid conditions, and impairments. J. Am. Acad. Child Adolesc. Psychiatry. 1999; 38:716–722. [PubMed: 10361790]

SAS Institute. JMP 10 Basic Analysis and Graphing. SAS Institute; 2012.

Schaughency E, McGee R, Raja SN, Feehan M, Silva PA. Self-reported inattention, impulsivity, and hyperactivity at ages 15 and 18 years in the general population. J. Am. Acad. Child Adolesc. Psychiatry. 1994; 33:173–184. [PubMed: 8150788]

Simon V, Czobor P, Balint S, Meszaros A, Bitter I. Prevalence and correlates of adult attention-deficit hyperactivity disorder: Meta-analysis. Br. J. Psychiatry. 2009; 194:204–211. [PubMed: 19252145]

Stanley LR, Harness SD, Swaim RC, Beauvais F. Rates of substance use of American Indian students in 8th, 10th, and 12th grades living on or near reservations: Update, 2009–2012. Public Health Rep. 2014; 129:156–163. [PubMed: 24587550]

Samsha. , editor. Substance Abuse and Mental Health Services Administration (US). SAMSHA's measures and instruments resource guide. Rockville, MS: 2007.

Verdi G, Weyandt LL, Zavras BM. Non-medical prescription stimulant use in graduate students: Relationship with academic self-efficacy and psychological variables. J. Atten. Disord. 2016; 20:741–753. [PubMed: 24756173]

Wallace JM, Bachman JG, O'Malley PM, Johnson LD, Schulenber JE, Cooper SM. Tobacco, alcohol, and illicit drug use: Racial and ehtnic differences among U.S. high school seniors: 1976–2000. Public Health Rep. 2002; 117:s67–s75. [PubMed: 12435829]

Weyandt, LL. The Physiological Bases of Cognitive and Behavioral Disorders. Routledge; 2006.

Weyandt LL, DuPaul GJ, Verdi G, Rossi JS, Swentosky AJ, Vilardo BS, O'Dell SM, Carson KM. The performance of college students with ADHD: Neuropsychological, academic, and psychological functioning. J. Psychopathol. Behav. Assess. 2013; 35:421–435.

Weyandt LL, Janusis G, Wilson KG, Verdi G, Paquin G, Lopes J, Varejao M, Dussault C. Nonmedical prescription stimulant use among a sample of college students: Relationship with psychological variables. J. Atten. Disord. 2009; 13:284–296. [PubMed: 19767596]

Whitbeck LB, Hoyt D, Johnson K, Chen X. Mental disorders among parents/caretakers of American Indian early adolescents in the Northern Midwest. Soc. Psychiatry Psychiatr. Epidemiol. 2006; 41:632–640. [PubMed: 16779502]

Whitbeck, LB., Sittner Hartshorn, KJ., Walls, ML. Indigenous Adolescent Development. Routledge; New York: 2014.

Whitbeck LB, Yu M, Johnson KD, Hoyt DR, Walls ML. Diagnostic prevalence rates from early to mid-adolescence among indigenous adolescents: First results from a longitudinal study. J. Am. Acad. Child Adolesc. Psychiatry. 2008; 47:890–900. [PubMed: 18596558]

Whitesell NR, Beals J, Mitchell CM, Keane EM, Spicer P, Turner RJ. The relationship of cumulative and proximal adversity to onset of substance dependence symptoms in two American Indian communities. Drug Alcohol Depend. 2007; 91:279–288. [PubMed: 17640829]

Wilens TE. Effects of methylphenidate on the catecholaminergic system in attention-deficit/ hyperactivity disorder. J. Clin. Psychopharmacol. 2008; 28:S46–53. [PubMed: 18480677]

Wilens TE, Adler LA, Adams J, Sgambati S, Rotrosen J, Sawtelle R, Utzinger L, Fusillo S. Misuse and diversion of stimulants prescribed for ADHD: A systematic review of the literature. J. Am. Acad. Child Adolesc. Psychiatry. 2008; 47:21–31. [PubMed: 18174822]

Wilens TE, Gignac M, Swezey A, Monuteaux MC, Biederman J. Characteristics of adolescents and young adults with ADHD who divert or misuse their prescribed medications. J. Am. Acad. Child Adolesc. Psychiatry. 2006; 45:408–414. [PubMed: 16601645]

Zaso MJ, Park A, Antshel KM. Treatments for adolescents with comorbid ADHD and substance use disorder: A systematic review. J. Atten. Disord. 2015; doi: 10.1177/1087054715569280

Zorlu A, Unlu G, Cakaloz B, Zencir M, Buber A, Isildar Y. The prevalence and comorbidity rates of ADHD among school-age children in Turkey. J. Atten. Disord. 2015; doi: 10.1177/1087054715577991

Highlights

- We know very little about stimulant misuse among American Indian (AI) adolescents.
- Being prescribed stimulants increases the likelihood of using misusing stimulants.
- Being prescribed stimulants increase the frequency of past month stimulant use.
- Other important factors included social, contextual factors, peers and family.
- Professionals who prescribe stimulants should be aware of the abuse potential.

Table 1

Descriptive statistics for demographic variables, covariates, sociocultural variables, and lifetime, past 12 month, and past month stimulant use.

	N = 3,498	
	%	M (SD)
Covariates		
Female	49.5	
Age (years):		14.8 (1.7)
Grade:		
7	22.2	
8	20.8	
9	17.2	
10	14.9	
11	14.5	
12	10.4	
Peer Modeling		14.1 (4.5)
Parental Monitoring		26.10 (4.5)
School Performance		6.1 (1.2)
Stimulant use		
Ever prescribed	6.7	
Lifetime use to get high	5.5	
Past month	3.7	
Among Lifetime Users	n = 183	
Past month frequency		
No	52.5	
1 – 2 times	24.6	
3 – 9 times	8.2	
10 – 19 times	6.6	
20+ times	8.2	

Table 2

Correlations among demographic variables, covariates, sociocultural variables, and lifetime and frequency of past month stimulant use.

	1	2	3	4	5	6	7	8
1. Female	--	.04*	.07**	.10**	.16**	−.04*	.00	−.03
2. Grade		--	.07**	.14**	−.00	−.07**	.09**	.08**
3. School performance			--	−.17**	.18**	−.05*	−.08**	−.07**
4. Peer modeling					−.21**	.18**	.26**	.22**
5. Parental monitoring					--	−.09**	−.13**	−.10**
6. Ever prescribed stimulants						--	.36**	.29**
7. Ever use stimulant to get high							--	.54**
8. Past month stimulant use								--

* p <.05,

** p<.01

Table 3

Logistic Multilevel Models Predicting Log Odds of Ever Using Stimulants to Get High

Parameter	***b***	**SE**	***p***	**OR**	**95% CI OR**	
Intercept	− 4.14	0.24	< .001	0.02	(0.01,	0.03)
Age	**0.20**	**0.06**	**< .001**	**1.22**	**(1.09,**	**1.36)**
Peer Modeling	**0.17**	**0.02**	**< .001**	**1.19**	**(1.14,**	**1.23)**
Parental Monitoring	**− 0.04**	**0.02**	**.020**	**0.96**	**(0.92,**	**0.99)**
School Performance	− 0.08	0.07	.250	0.92	(0.80,	1.06)
Region						
Northern Plains	0.16	0.25	.526	1.17	(0.70,	1.95)
Northwest	0.58	0.59	.333	1.79	(0.53,	6.10)
Southeast + Texas	− 0.78	0.80	.342	0.46	(0.09,	2.42)
Upper Great Lakes	**1.14**	**0.27**	**< .001**	**3.13**	**(1.80,**	**5.42)**
Southwest						
Female gender	0.08	0.19	.682	1.08	(0.75,	1.56)
Male gender						
Prescribed by doctor	**2.17**	**0.21**	**< .001**	**8.79**	**(5.86,**	**13.18)**
Not prescribed by doctor						

Note. OR = odds ratio.CI = confidence interval. ORs are exponentiated parameter estimates (b's). Continuous predictors were centered at the grand mean. Models estimate the log odds conditional on the random effects. Bolded typeface indicates fixed effects that were significant at the $p < .05$ level.

Table 4

Multilevel Models Predicting Frequency of Stimulant Use in Past Month to “Get High”.

Parameter	***b***	**SE**	***t***	***p***	**95% CI**	
Intercept	1.40	0.30	4.63	< .001	(0.76,	2.04)
Age	− 0.02	0.07	− 0.28	.780	(− 0.16,	0.12)
Peer Modeling	**0.09**	**0.02**	**4.45**	**< .001**	**(0.05,**	**0.13)**
Parental Monitoring (Linear)	0.02	0.03	0.82	.414	(− 0.03,	0.08)
Parental Monitoring (Quadratic)	**0.01**	**0.00**	**2.09**	**.039**	**(0.00,**	**0.01)**
School Performance	− 0.06	0.07	− 0.79	.433	(− 0.20,	0.09)
Region						
Northern Plains	− 0.59	0.29	− 2.01	.062	(− 1.20,	0.03)
Northwest	− 0.26	0.70	− 0.37	.715	(− 1.76,	1.24)
Southeast + Texas	− 0.74	0.86	− 0.85	.408	(− 2.57,	1.10)
Upper Great Lakes	− 0.24	0.29	− 0.84	.413	(− 0.85,	0.37)
Southwest						
Female gender	0.08	0.20	0.38	.705	(− 0.33,	0.48)
Male gender						
Prescribed by doctor	**0.58**	**0.21**	**2.81**	**.006**	**(0.17,**	**0.99)**
Not prescribed by doctor						

Note. CI = confidence interval. Continuous predictors were centered at the grand mean. Bolded typeface indicates fixed effects that were significant at the $p < .05$ level.