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Adolescents' Nonmedical Use and Excessive Medical Use of Prescription Medications and the Identification of Substance Use Subgroups

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Abstract

The purpose of this study was to identify subgroups of adolescents based on their past 12-months use of tobacco, alcohol, marijuana, illicit drugs, and nonmedical use and excessive medical use of prescription medications. A cross-sectional web-based survey of adolescents from two middle-and high-school districts in Southeastern Michigan was conducted. The sample included 2,744 middle-school (7th and 8th grade) and high-school (9th through 12th grade) students. Participants had a mean age of 14.8 years (SD=1.9); 50.4% were female, 64.1% were Caucasian and 30.6% were African-American. Participants completed measures of past 12-months substance use, parental monitoring, parental substance use, and internalizing and externalizing problems. Exploratory latent class analysis (LCA) indicated four classes. The largest class was comprised of participants with low probabilities of using any substances (Low/No Use class), and the smallest class was comprised of participants with relatively high probabilities of using all substances (Multiple Substances class). A third class included participants with high probabilities of using tobacco, alcohol, and marijuana (TAM). The fourth class consisted of participants with relatively high probabilities of alcohol use, nonmedical prescription drug use, and excessive medical use of prescription drugs (ANM). Female gender predicted membership in the ANM and Multiple Substance classes, and parental monitoring, parental substance use problems, internalizing, and externalizing problems uniquely predicted membership in all three high-risk risk classes. Results indicated three high-risk subgroups of adolescents, each characterized by a different pattern of substance use. Two risk groups are characterized by relatively high probabilities of nonmedical use and excessive medical use of prescription medications.

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Contributors

Drs. Boyd and McCabe designed the study and wrote the protocol. Dr. Cranford conducted literature searches and conducted the statistical analysis. Dr. Cranford wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Keywords

nonmedical use prescription medications; excessive medical use prescription medications; adolescent substance use; gender differences; parental influence

1. INTRODUCTION

Nonmedical use of prescription medications (NUPM) is a growing public health concern (Compton & Volkow, 2006; Jones, 2012). Despite declines in some forms of drug use among U.S. teenagers in the previous five years, the use of marijuana, tobacco and controlled medications has either increased or remained relatively high among adolescents (Johnston, O'Malley, Bachman, & Schulenberg, 2012). In 2011, the overall annual rate for nonmedical use of psychotherapeutics by 12–17 year olds in the United States was 7.0% (SAMHSA, 2012). Evidence showed that NUPM and excessive medical use of prescription medications (EXPM) is associated with several adverse outcomes, including psychiatric disorders (Becker, Sullivan, Tetrault, Desai, & Fiellin, 2008) and other substance use and high-risk behaviors (Boyd, Teter, West, & McCabe, 2009; McCabe, West, Teter, & Boyd, 2012).

With few exceptions, most studies have examined adolescent substance use, NUPM, and EXPM with a variable-centered approach. By contrast, person-centered approaches (Manza & Rhoades, 2011) aim to identify distinct subgroups or categories of individuals (Collins & Lanza, 2010). For example, Boyd, Young, Grey, and McCabe (2009) distinguished subtypes of nonmedical prescription drug users based on patterns of and motivations for use. Several other studies have also taken person-centered approaches to NUPM subtypes (Boyd et al., 2009; McCabe et al., 2012).

Identification of common and specific risk factors for adolescent substance use can be facilitated by combining variable- and person-centered approaches. Generally, the risk factors are similar for alcohol, tobacco and other drugs (ATOD), and include personality and family-related variables (Saraceno et al., 2009; van den Bree & Pickworth, 2005). Although there is substantial co-occurrence of NUPM and EXPM with other forms of substance use (Catalano, White, Fleming, & Haggerty, 2011; McCabe et al., 2011), risk factors associated with NUPM and EXPM may be different (e.g., Schepis & Krishnan-Sarin, 2008).

Identification of distinct subgroups based on patterns of ATOD, NUPM, and EXPM might clarify the common and specific risk factors for various patterns of use. Accordingly, the present study sought to identify distinct subgroups of adolescents based on their recent use of ATOD, NUPM, and EXPM. First, we sought to identify distinct subgroups of adolescents based on their recent (i.e., past 12-months) use of ATOD, NUPM, and EXPM. Second, we used a variable-centered approach to test for common and specific risk factors for latent subgroup membership. Finally, based on the consistent observation of gender differences in substance use, we tested the general hypothesis that associations between risk and protective factors and class membership would vary by gender.

2. MATERIALS AND METHOD

2.1. Sample

All 7th – 12th students attending five schools in Southeastern Michigan were invited to participate, and 2,744 respondents completed the survey. Based on American Association for Public Opinion Research guideline #2, the response rate was 61.7%. The final sample consisted of 2,744 secondary school students (50.4% female). Participants' mean age was

14.8 years ($SD = 1.9$). The racial/ethnic distribution of the sample was 64.1% White, 30.6% African American, 3.6% Asian, 1.3% Hispanic and 0.4% from other racial/ethnic categories. High school students (9th–12th grades) made up 65.1% of the sample.

2.2. Measures

Past 12-months nonmedical use of prescription medications (NUPM) was assessed with items asking about frequency of nonmedical use of sleeping, anti-anxiety, stimulant, pain, and addiction medication and asthma inhaler. A single binary variable was created indicating if the participant reported nonmedical use of at least one of the six medications on at least one occasion in the past 12 months.

Past 12-months excessive medical use of prescription medications (EXPM) was assessed by asking those who reported being prescribed a particular medication in the past 12 months about frequency of using too much of their prescribed medication. In addition to the six controlled drug classes noted above, participants were also asked about excessive use of prescribed anti-depressant medication. We calculated a single binary variable indicating if the participant reported excessive medical use of at least one of the seven medications on at least one occasion in the past 12 months.

Alcohol, Tobacco, Marijuana, and Illicit Drug Use were measured with three items from the *Monitoring the Future* study (Johnston et al., 2012). Participants were asked about their frequency of marijuana, cigarette, and alcohol use during the past 12 months. Binary variables were created for any use on at least one occasion in the past 12 months.

Internalizing and externalizing problems were assessed with the *Youth Self-Report* (YSR; Achenbach & Rescorla, 2001). Designed for ages 11–18, the YSR includes 112 items that assess emotional, behavioral, and social problems. In the current sample, coefficient alphas for the internalizing and externalizing scales were .90 and .89, respectively.

Parental Monitoring was assessed with five items from the *Monitoring the Future* study (Johnston et al., 2012) along with an additional item asking about parents' monitoring of computer time. Participants were asked to indicate how often their parents engaged in specific monitoring behaviors during a typical week. Cronbach's alpha for the parental monitoring scale was 0.71.

Parent Substance Use Problems was measured with the 6-item version of the Children of Alcoholics Screening Test (CAST; Jones, 1983). We adapted the CAST items so that they asked about alcohol and drug use.

3. RESULTS

The most prevalent form of past 12-months substance use was alcohol, with about 25% of students reporting at least one occasion of alcohol use in the past 12 months. Prevalence rates for past 12-months tobacco and marijuana use were about the same at approximately 11%. Nonmedical use (about 8%) and excessive medical use (about 6%) of prescription medications had slightly lower prevalence rates than tobacco and marijuana use, and illicit drug use had the lowest past 12-months prevalence at about 2.4%.

3.1. Exploratory Latent Class Analyses

Latent class analyses were conducted with the SAS PROC LCA program (Lanza, Collins, Lemmon, & Schafer, 2007). Results from LCA of past 12-months use of the six substances indicated that, compared to the baseline model ($G^2 = 1781.1$, AIC = 1793.1, BIC = 21828.5), a 4-class solution provided the best fit to the data ($G^2 = 35.1$, AIC = 89.1, BIC =

248.6) and yielded interpretable classes. Item-response probabilities and latent class membership probabilities for all six substance use variables are presented in Table 1. The largest class (76.3%) had zero or very low probabilities of using any substances in the past 12 months (the “Low/No Use Class”). The smallest class (4.2%) included participants with relatively high probabilities of using all substances at least once during the past 12 months (the “Multiple Use Class”). The third class (12.4%) had relatively high probabilities of using three of the six substances (tobacco, alcohol, and marijuana) at least once during the past 12 months (the “TAM Class”). Finally, the fourth class (8.0%) had relatively high probabilities of alcohol use, NUPM, and EXPM in the past 12 months (the “ANM Class”).

3.3. Predictors of Latent Class Membership

We used a latent class with covariates framework (Collins & Lanza, 2010) to examine predictors of latent class membership. Multinomial regression analyses with latent class membership as the dependent variable and the No/Low Use class as the reference group were conducted. As seen in Table 2, being white predicted membership in the Multiple Use class, and female gender was associated with higher odds of membership in the ANM and Multiple Use classes. Parental monitoring and parental substance use problems uniquely predicted lower and higher odds, respectively, of membership in all three risk classes. Results also indicate that internalizing and externalizing problems uniquely predicted lower and higher odds, respectively, of membership in all three risk classes.

As also seen in Table 2, the 2-way interaction between gender and race/ethnicity indicated that females’ higher odds of being in the ANM class were significantly lower among whites compared to non-whites. In addition, the statistically significant gender $\times$ parental substance use problems interaction indicated that the association between parental substance use problems and membership in the Multiple Use class was stronger for females than males. None of the other interaction effects was statistically significant.

4. DISCUSSION

Results from the current study indicate that a) there may be at least three high-risk subgroups of adolescents; and b) two of these risk groups are characterized by relatively high probabilities of NUPM and EXPM. Findings highlight the potential utility of person-centered approaches to the study of NUPM and EXPM, and build on prior work that found evidence for subtypes of nonmedical users (Boyd et al., 2006; Ghandour, Martins, & Chilcoat, 2008; McCabe, Boyd, & Teter, 2009). The present findings add to the work on motivational subtypes by suggesting the presence of distinct subtypes based on a wide range of substance use behaviors. Taken together, these findings support the hypothesis that motivational and behavioral patterns are important elements of subtype membership.

Parental monitoring and substance use were predictive of membership in all three substance use classes. Several studies have found that some adolescents obtain prescription medications from family and friends (Johnston et al., 2012; McCabe, Teter, & Boyd, 2005; Schepis & Krishnan-Sarin, 2009), an indication that the behavior is occurring within some households. The current results suggest that parent-focused interventions might be beneficial even for high-risk families with high levels of parental substance use. In addition, our results are in line with findings showing that externalizing problems are predictive of a wide range of adolescent substance use behaviors (King, Iacono, & McGue, 2004; McCauley et al., 2011). However, we also found that internalizing problems predicted lower odds of membership in the substance use classes. Prior work showed that dimensions of the internalizing spectrum were positively associated with substance use, including NUPM (Hall et al., 2010; Martins et al., 2012; McCauley et al., 2011). Yet, other studies did not find this pattern (Boyd et al., 2009). It may be that our measure does not sufficiently distinguish types

of internalizing problems (e.g., depression, anxiety) that could be differentially associated with class membership.

Current findings are also consistent with previous evidence that girls were more likely to report nonmedical use than boys (Schepis & Krishnan-Sarin, 2008). Our results add to this literature by showing that this gender difference may reflect females' higher odds of membership in two substance use classes characterized by relatively high probabilities of NUPM and EXPM. Importantly, females' risk of being in the ANM class was elevated among non-white girls. The reasons for this are not clear, but the pattern suggests a possible unique intervention target for at-risk, non-white females. Similarly, the effect of parental substance use problems on heightened risk for membership in the Multiple Substances class was elevated among females. This finding is consistent with previous work showing that adolescent females might be more vulnerable than males to parental problem behaviors (Chen & Weitzman, 2005; Coffelt et al., 2006; Morgan, Desai, & Potenza, 2010), and suggests that parent-focused interventions might be particularly beneficial for females.

The prescribed drug classes described here are highly efficacious and many adolescents are prescribed a scheduled medication during their adolescent years. Yet, our results show that nonmedical use and excessive medical use of these medications are indicative of high-risk substance use subtypes. This makes substance use prevention messages more difficult and highlights the importance of balancing such messages so that a) youth who are prescribed medications are not made to feel like drug abusers, yet b) their parents and teachers are vigilant about the abuse risks.

We note some limitations to this investigation. The survey was completed in school, and this may have led to underestimates of problem behavior (Johnston & O'Malley, 1985). Moreover, a nationally representative study is necessary to determine the generalizability of our findings. Nonetheless, this study provides importance evidence for the existence of distinct subtypes of adolescent substance use based on past 12-months use of alcohol, tobacco, marijuana, and illicit drugs, along with excessive medical use and nonmedical use of prescription drugs. Further replication of these subgroups will inform targeted prevention and intervention efforts to reduce the spectrum of adolescent substance use.

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Highlights

- We conducted a web-based survey of substance use among adolescents.
- Results from latent class analyses showed four classes.
- Two groups had higher nonmedical and excessive medical use of prescription drugs.

Table 1

Item-Response Probabilities for Latent Class Membership for Past 12-Months Substance Use at Wave 1

Item	Latent Class Solution			
	Low/No Use Class (76.3%)	Tobacco, Alcohol, Marijuana (TAM) Class (11.5%)	Alcohol, NUPM, EXPM (ANM) Class (8.0%)	Multiple Substances Class (4.2%)
Past 12 months tobacco use	.01	.64	.03	.80
Past 12 months alcohol use	.09	.88	.52	.95
Past 12 months marijuana use	.02	.58	.01	.96
Past 12 months other illicit drug use	.01	.01	.02	.47
Past 12 months nonmedical use of any prescription drug	.03	.05	.34	.33
Past 12 months medical misuse of any prescription drug	.03	.08	.24	.62

Note. NUPM = nonmedical use of prescription medications. EXPM = excessive medical use of prescription medications.

Table 2

Multinomial Regression Analysis of Predictors of Latent Class Membership for Past 12-Months Substance Use at Wave 1

	Latent Class			
	Low/No Use Class	TAM Class	ANM Class	Multiple Use Class
	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)	AOR (95% CI)
Age	—	1.5* (1.4 – 1.6)	1.3* (1.2 – 1.4)	1.7* (1.5 – 1.8)
Ethnicity				
Non-White	—	—	—	—
White	—	1.0 (0.8 – 1.2)	0.9 (0.1 – 1.1)	2.8* (2.0 – 3.8)
Gender				
Male	—	—	—	—
Female	—	0.9 (0.7 – 1.1)	1.9* (1.5 – 2.5)	1.7* (1.2 – 2.3)
Parental Monitoring	—	0.9* (0.8 – 0.99)	0.9* (0.8 – 0.98)	0.8* (0.7 – 0.9)
Parental Substance Use	—	1.1* (1.04 – 1.2)	1.1* (1.01 – 1.2)	1.1* (1.02 – 1.1)
Internalizing	—	.95* (.94 – .97)	.98* (.97 – .99)	.96* (.94 – .97)
Externalizing	—	1.1* (1.09 – 1.2)	1.09* (1.01–1.1)	1.2* (1.1 – 1.2)
Gender × Age	—	1.0 (0.8 – 1.2)	1.04 (0.9 – 1.2)	1.0 (0.8 – 1.1)
Gender × Ethnicity	—	1.1 (0.5 – 2.0)	0.6* (0.3 – 0.9)	1.5 (0.9 – 2.1)
Gender × Parental Monitoring	—	0.9 (0.8 – 1.1)	1.0 (0.9 – 1.2)	1.0 (0.8 – 1.1)
Gender × Parental Substance Use	—	1.1 (0.9 – 1.1)	1.0 (0.8 – 1.2)	1.2* (1.1 – 1.3)
Gender × Internalizing	—	1.01 (.98 – 1.05)	0.97 (.94 – 1.01)	1.0 (0.99 – 1.04)
Gender × Externalizing	—	1.01 (0.97 – 1.05)	1.04 (0.99 – 1.08)	1.0 (.97 – 1.04)

Note. TAM = Tobacco, Alcohol, Marijuana Class. ANM = Alcohol, NUPD, EXPM Class. AOR=odds ratio from multiple multinomial regression analyses. 95% CI = confidence interval. — = reference group.

* $p < .05$.