Nonmedical Use of Over-the-Counter and Prescription Medications among University Students from a Midwest University

THESIS

Presented in Partial Fulfillment of the Requirements for the Degree Master of Science in the Graduate School of The Ohio State University

By
Vi T. Le, B.S.
Graduate Program in Public Health

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Master’s Examination Committee:
Dr. Abigail Norris Turner, Advisor
Dr. Elizabeth Klein
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Abstract

**Background** Nonmedical use of prescription drugs (NMUPD) is a serious public health issue on college campuses due to its effect on morbidity and mortality. Previous studies have explored risk factors associated with NMUPD among college students, but less is known concerning nonmedical use of over-the-counter (OTC) medications.

**Methods** The study population (n=939) was ascertained from a 2011 survey measuring NMUPD and nonmedical use of OTC medications among a random sample of students attending a Midwest university. We used odds ratios (OR) and 95% confidence intervals (CIs) to quantify the association between past-year nonmedical use of OTC medications (never vs. ever) and NMUPD (never vs. ever). Secondary analyses explored the association between the nonmedical use of OTC stimulants and prescription stimulants, OTC sleep aids and prescription central nervous system (CNS) depressants (consisting of sleep aids, tranquilizers, and sedatives), and OTC medications and poly-prescription drug abuse (i.e. abuse of more than one class of prescription medication).

**Results** The majority of respondents were female (59.7%), undergraduates (69.2%), white Caucasian (75.2%), and not affiliated with Greek life (92.2%). Past-year NMUPD was reported by 21.4% of participants while 11.1% reported nonmedical use of any OTC medications. Past-year poly-prescription abuse was reported by 6.1% of participants. Nonmedical use of OTC medications was significantly associated with NMUPD in unadjusted analyses and after adjustment for gender, age, race/ethnicity, and affiliation
with Greek life (adjusted OR [AOR]: 3.37; 95% CI: 2.17, 5.23). When stratified by drug class, nonmedical use of OTC stimulants was associated with prescription stimulant abuse (AOR: 7.27, 95% CI: 3.10, 17.1), and nonmedical use of OTC sleep aids was associated with prescription CNS depressant abuse (AOR: 7.22, 95% CI: 3.34, 15.7). Nonmedical use of OTC medications was also significantly associated with poly-prescription abuse (AOR: 3.81, 95% CI: 2.00, 7.24).

**Conclusion** Nonmedical use of OTC medications is significantly associated with NMUPD, as well as poly-prescription drug abuse. Further studies should focus on the potential conversion from OTC medication abuse to prescription abuse.
Vita

2013............................................................B.S. Biology, The Ohio State University

Fields of Study

Major Field: Public Health
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Chapter 1: Introduction

Prescription drug abuse is the fastest-growing drug problem in the nation [1]. In 2014, 6.5 million people aged 12 or older in the United States were current abusers of prescription drugs [2]. Commonly abused prescription drugs include opioids, stimulants, and central nervous system (CNS) depressants (e.g. sleeping aids, sedatives, and tranquilizers). Abuse of prescription medications, also known as the nonmedical use of prescription drugs (NMUPD), is defined as the use of a prescribed substance without a doctor’s prescription or in a manner other than as directed or prescribed [3, 4]. Some examples of abuse include: taking a higher dose than recommended, taking medication in a different way than directed (e.g. snorting or injecting crushed tablets), using the medication for a purpose other than the intended use (e.g. to get high), or taking medication not legitimately prescribed [3, 5]. NMUPD has contributed negatively to both morbidity and mortality.

Prescription Drug Abuse among College Students

Since the mid-1990s, prevalence of NMUPD has dramatically risen among adolescents and young adults. Between 1993 and 2005, prescription drug abuse among college students rose 343% for opioids, 93% for stimulants, 450% for tranquilizers, and 225% for sedatives [6]. National data suggest stabilization or slight reversal of these NMUPD
trends in recent years among 18 to 25 year olds; however, prescription medication abuse remains a major concern due to its association with negative health outcomes, such as the risk of unintentional drug overdose and dependence [7-9]. In 2014, 34% of deaths among 18 to 25 year olds were due to unintentional poisoning. This is a 24% increase from deaths seen in 2000 [10, 11]. Average age of NMUPD initiation coincides with the traditional college cohort: 21 years old for pain relievers and stimulants and 23 years old for tranquilizers [2]. Curbing initiation of prescription abuse in this population could be highly advantageous for reducing the risks of prescription drug dependence and other long-term consequences.

NMUPD is more prevalent in certain subgroups of the college population [12, 13]. Males, white Caucasians, and affiliation with Greek life are often associated with NMUPD [8, 13-19]. Users of NMUPD often obtain prescription medications from their peers [15, 20], and they are more likely to report simultaneous poly-drug use, such as alcohol, marijuana, and other illicit drugs, compared to non-users [3, 13, 16, 21, 22]. NMUPD is significantly and positively associated with alcohol drinking severity among college students [3, 21, 22]. These predictors remain consistent across all prescription drug classes: stimulants, opioids, and CNS depressants.

Numerous studies have investigated the negative effect of in-college drug involvement on post-college employment status [23, 24]. Results from the College Life Study, a longitudinal study that followed college students annually for six years, suggested that in-
college drug use (including NMUPD) predicted worse post-college employment status [23]. More specifically, persistent drug users, defined as those who used a drug other than marijuana from years one through four in college, had greater odds of unemployment in year six compared to nonusers. The association remained significant after controlling for the confounding effects of socio-demographic variables, fraternity/sorority involvement, college graduation, alcohol consumption, and personality characteristics. While drug use could affect post-employment status, it is also plausible that lack of involvement in college or lack of aspiration to succeed may be more common among drug users compared to nonusers. In turn, these factors could contribute to the low employment among in-college drug users [23]. While there is an association between substance use and lack of post-college employment, the frequency of prescription drug abuse post-college is currently unknown. Heavy drinking and marijuana use tend to decline post-college; however, it is currently unknown if the decline also pertains to NMUPD [16, 25-29]. Future research would benefit from assessing the trajectory of prescription drug abuse post-college, given the high potential for addiction for these drugs.

Prescription Stimulants

Prescription stimulants (e.g. dextroamphetamine, methylphenidate, amphetamine-dextroamphetamine, and dexamphetamine) are often prescribed for the treatment of attention deficit hyperactivity disorder (ADHD). Greater availability of prescription stimulants over the last two decades, as well as the perception of safety and effectiveness, has likely contributed to increased abuse and addiction [30]. An estimated 1.6 million
people 12 years or older were current nonmedical users of stimulants in 2014 [2]. From 2005 to 2010, there was a 340% increase in emergency department visits and a 135% increase in number of adverse drug reactions (ADRs) due to stimulant medications among people aged 18 to 25 years [31]. Side effects of prescription stimulants include: sleep difficulties, headaches, irritability, and depressive symptoms [7]. Moreover, odds of reporting drug-use related problems are higher among nonmedical users of prescription stimulants compared to users of other drugs (e.g. marijuana, cocaine, LSD, heroin, and nonmedical use of prescription sleeping, pain, or sedative/anxiety medication) [7]. More specifically, odds of reporting simultaneous poly-drug use, blackouts or flashbacks, guilt, withdrawal symptoms, and medical problems (e.g. bleeding, convulsions, memory loss) due to drug use are significantly higher among those who were past-year nonmedical users of prescription stimulants compared to those who used other drugs [7, 31]. The higher prevalence of simultaneous poly-drug use among nonmedical users of prescription stimulants may be a contributing factor in the higher odds of drug-related problems in this population [7].

Unlike other illicit prescription drugs, prevalence of nonmedical use of prescription stimulants is higher among college students than among age-matched peers who are not enrolled in college [2, 33]. Some studies suggest that “experimenting” students may use prescription stimulants to get high or to feel better, or to party longer [15, 19]. However, motivation for prescription stimulant use among students predominantly are academic rather than for recreational, experimental, and social purposes [15, 19]. Prescription
stimulants have often been referred to as “study drugs”, and students are more likely to report nonmedical use in order to improve concentration, alertness, test performance, and overall academic performance [19, 34]. Higher prevalence of nonmedical use of prescription stimulants has also been documented at more academically competitive colleges [15]. While cognitive enhancement is a major motive for abusing stimulants, existing data do not support an association between nonmedical use of stimulants and academic achievement. When used by people without ADHD, prescription stimulants promote wakefulness and focus, but they do not directly enhance thinking or learning abilities [35-37]. Moreover, nonmedical use of stimulants is higher among students with lower GPAs [13, 19, 37]. Longitudinal studies assessing change in GPAs among nonmedical users of prescription stimulants may be required in order to parse this relationship. While males have higher prevalence of stimulant abuse, the gender gap for stimulant abuse may be narrowing [15].

Prescription Opioids

Prescription opioids (e.g. hydrocodone, oxycodone, morphine, codeine) are narcotic analgesics prescribed for the treatment of moderate or severe pain [38]. Prescription opioids can induce euphoria when medications are not used as directed [38]. In the general population, nonmedical use of prescription pain relievers has been the largest contributor to the prescription medication epidemic due to the high potential for these medications to lead to abuse and dependence [2]. Since the early 2000s, the increased prevalence in prescription opioids has contributed to a fourfold increase in accidental
overdose [39]. From 2005 to 2011, emergency department visits due to medical complications from the nonmedical use of narcotic painkillers have significantly increased for all age groups except those 12 to 17 [40]. More specifically, deaths due to unintentional overdose of prescription opioids have surpassed deaths from heroin and cocaine combined since 2003 [2, 41]. Currently, it is estimated that 44 people die every day in the United States due to prescription opioid overdose [42].

In 2014, an estimated 2.8% of young adults aged 18 to 25 were current nonmedical users of prescription painkillers [2]. A nationally representative sample of 119 U.S. colleges showed that the 12-month prevalence of nonmedical prescription opioids was roughly 7.3% in 2001 [43]. Nonmedical users of prescription painkillers are more likely to be white, members of Greek organizations, and have lower GPAs compared to non-users [17, 44]. Users also report higher rates of poly-drug use (e.g. marijuana, prescription stimulants, and binge drinking) [17, 22, 45]. More specifically, odds of binge drinking among 18–24 year olds are 4 times higher among those who reported nonmedical use of prescription opioids compared to those who did not [3]. Motives associated with nonmedical use of prescription opioids among college students consist of getting high, experimenting, and reliving pain [8]. One study found that odds of drug-use related problems are lower among those who reported pain relief as their sole reason for use, compared to those who reported other motives [8]. While the relationship between motives and poly-drug use may need further exploration, simultaneous poly-drug use with prescription opioid abuse is of major concern. In 2011, 56% of emergency
department visits involved multiple drugs in conjunction with nonmedical use of prescription painkillers [42]. Higher risks of fatal overdose are seen in people who report simultaneous use of prescription opioids and alcohol compared to those without simultaneous alcohol use [46]. The interaction between alcohol and prescription opioids could result in a slowing of the heart rate and breathing and could advance to coma or death [38]. Overall, nonmedical use of prescription opioids is a major public health concern due to the high rates of poly-drug use in this population and the risk of addiction and accidental overdose associated with opioids [22].

Prescription CNS depressants

CNS depressants, such as prescription sedatives and tranquilizers (e.g. benzodiazepines, barbiturates, and sleeping medications), are often prescribed for anxiety, panic, and sleep disorders. Side effects for CNS depressants can include drowsiness, lowered blood pressure, slowed breathing, and problems with movement or memory, and abuse of CNS depressants can increase risk for dependence and addiction [38]. An estimated 2.1 million people aged 12 years or older abused sedatives and tranquilizers in 2014. Of those, an estimated 472,000 were young adults aged 18 to 25 [2]. The prevalence of abuse in this drug class is consistently lower among college students compared to their non-college peers; however, nonmedical use of CNS depressants is of concern in the college population due to high risk of co-substance abuse among college students [47].

According to the Drug Abuse Warning Network (DAWN), emergency department visits due to benzodiazepines alone were the highest in the 12 to 34 year age group compared to
other age groups from 2005 to 2011. Moreover, the predicted risk of a more serious outcome (hospitalization or death rather than treatment and release) among 12 to 34 year olds increased 37% if benzodiazepine was combined with opioids, 35% for benzodiazepine and alcohol, and 39% for a combination of these three substances [48].

Over-the-Counter Medication Abuse

Due to the greater accessibility of OTC medications compared to prescription medications, the potential for abuse of over-the-counter (OTC) medications is also present in college students. Abuse of OTC medications is defined as: taking a drug for a purpose not intended by the manufacturer (e.g. to get high), taking a drug at a higher dose than recommended, or taking a drug in a route of administration not directed [49]. For example, dextromethorphan (DXM), a cough suppressant, is available in over 140 OTC products and can induce euphoria or hallucinations when abused [50]. In 2006, over 3 million people aged 12 to 25 abused DXM, and a 70% increase in DXM-related emergency room visits was observed between 2004 and 2008 [51]. DXM abuse can result in tolerance, dependence, psychosis, and upon cessation of use, physical withdrawal [52]. Given the negative consequences associated with OTC medications, OTC medications often are perceived as safe [50].

Studies exploring variables predictive of the nonmedical use of OTC medications have been sparse. In the general population, characteristics associated with NMUPD (e.g. race/ethnicity, age, gender) are correlated with nonmedical use of OTC medications [52].
However, a cross-sectional analysis using two U.S. college samples have showed that demographics such as age, race/ethnicity, gender and Greek membership were not significantly associated with OTC abuse [4]. Similar to NMUPD, self-medication is an important motive for nonmedical use of OTC medications. An estimated 69% of respondents reported self-medication of OTC medications in order to sleep, reduce pain, or reduce anxiety as a motive. Moreover, 44% of the sample reported getting high as a motive for the nonmedical use of OTC medications [4].

Trends in poly-drug use are consistent across study populations: abusers of OTC medications tend to report higher simultaneous OTC drug use with alcohol and other prescription medications compared to non-abusers [4, 52]. In the college population, odds of lifetime abuse of OTC medications are higher among those who reported recent use of illicit drugs and NMUPD (such as analgesics, stimulants, anxiolytics, or sedatives) compared to those who do not report illicit drugs and NMUPD [53]. University students who experience difficulty falling asleep have also reported the use of OTC sleep aids in conjunction with alcohol [53]. Simultaneous poly-drug use is of particular concern due to potential impairment of motor and mental performance and risk of overdose and death [53].

OTC medication abuse could increase the chances of involvement in prescription medication abuse. Increased tolerance, as well as cravings, due to OTC medication abuse could increase the desire for a more potent high or a more effective method for self-
medication [54]. The college environment may further facilitate the transition from OTC medication abuse to prescription drug abuse. College is a high-risk environment for substance use, and prescription medications on college campuses are often easily obtained through friends and peers [18, 20]. Moreover, the low perceived risk and high perceived benefits of prescription medication could further promote the progression from OTC medication abuse to prescription medication abuse [15, 54]. Identifying pathways into prescription drug abuse is important given the high prevalence and risks associated with prescription drug abuse among college students.

There has been substantial attention paid to the characteristics of NMUPD among college students, but few existing studies have focused on abuse of OTC medications. Even less is known concerning OTC abuse and the relationship between nonmedical use of OTC medications and NMUPD. Given the ease in accessibility of OTC medications, studies exploring this relationship and assessing the extent of poly-prescription drug abuse could aid in the identification of at-risk populations and could be advantageous in mitigating prescription drug abuse over the long term.

Study Objectives and Hypotheses

The aim of this analysis was to assess the relationship between nonmedical use of OTC medications and NMUPD among university students. We examined the relationship overall and within drug classes. More specifically, we characterized the association between OTC stimulant abuse and prescription stimulant abuse, and separately, between
OTC sleep aid abuse and prescription CNS depressant abuse. Last, we assessed the relationship between any nonmedical use of OTC medications and poly-prescription drug abuse in our sample. Based on the existing literature on NMUPD and associations with risky behaviors such as alcohol and poly-drug use, we hypothesized that we would see a positive association between nonmedical use of OTC medications and NMUPD [4].
Chapter 2: Methods

Data source

Data were collected during Autumn 2011 from a simple random sample of students attending a large university (enrollment ~56,000) in the Midwest region. A total of 5000 randomly-selected undergraduate, professional, and graduate students, 18 years old or older, were recruited to participate in a 10-15 minute anonymous online survey on nonmedical use of prescription and OTC medications. A total of 975 students responded (response rate 19.5%), and 939 (96% of respondents) had non-missing data on nonmedical use of prescription medication in the last year and are included in this analysis. The University’s Institutional Review Board approved the study.

Instrument

Survey questions assessed the frequency, perception, and consequences of NMUPD and OTC medications. The instrument was developed through a collaborative approach involving the Center for the Study of Student Life, the College of Pharmacy, the Student Wellness Center, and Counseling & Consultation Services, and adapted existing instruments that had assessed college students’ behaviors on OTC and prescription medication abuse. We conducted a secondary analysis to explore the association between nonmedical use of OTC medications and NMUPD among university students.
Measurements and Variable Descriptions

Demographics

The survey measured demographic information such as gender, age, race and ethnicity, Greek membership, grade point averages (GPAs), and class rank. We categorized age at survey participation into three groups: 18 and 19, 20 and 21, and ≥ 22 years. Race and ethnicity was dichotomized as “Non-minority” (White) and “Minority” due to the small percentage of African American/Black, American Indian/Alaska Native, Asian, Native Hawaiian/Pacific Islander, Hispanic/Latino(a), Multiracial, and Other race/ethnicity. In order to compare survey respondents to the underlying campus demographics, we obtained campus demographics for students 18 years old or older from the IPEDS Data Center from the National Center for Education Statistics.

Nonmedical use of OTC medications

The frequency of nonmedical use of OTC cough medicines was assessed with the question, “How often do you generally use over-the-counter, non-prescription COUGH MEDICINES (e.g., Robitusin, Coricidin) for non-medication purposes (e.g. to get high or for the feeling they cause)?” Frequency of nonmedical use of OTC sleep aids was assessed with, “How often do you generally use over-the-counter, non-prescription SLEEP AIDS (e.g., Unisom, Sominex) for non-medication purposes (e.g. to get high or for the feeling they cause)?” Frequency for nonmedical use of OTC stimulants was assessed with, “How often do you generally use over-the-counter, non-prescription
STIMULANTS (e.g., NoDoz, Vivarin) for non-medication purposes (e.g. to get high or for the feeling they cause)?” Responses to each of these questions were: never; at least once per year; at least once per quarter; at least once per month; at least once per week; at least once per day; I'd rather not say. Due to the small number of people endorsing nonmedical use of OTC medications for some timeframes, OTC abuse was dichotomized as never vs. ever nonmedical use of any OTC medications in the last year, regardless of drug class. As secondary outcomes, OTC abuse was analyzed separately by drug class (stimulants and sleep aids), and coded as dichotomous variables: never vs. ever nonmedical use in the last year of each OTC drug class.

Nonmedical use of prescription drugs

The frequency of nonmedical use of prescription pain medications was assessed with, “How often do you generally use prescription PAIN MEDICATIONS that were not prescribed for you (e.g. OxyContin, Vicodin, Percodan, Dilaudid, Codeine)?” Similar questions asked about the frequency of nonmedical use of CNS depressants and prescription stimulants (e.g. Ritalin, Adderall, Dexedrine, Concerta). CNS depressants was comprised of prescription sedatives, sleeping medications, or tranquilizers (e.g. Valium, Xanax, Librium, Ativan, Mebaral, Ambien). Possible responses were: never; at least once per year; at least once per quarter, at least once per month, at least once per week; at least once per day; I'd rather not say. Similar to OTC drug abuse, NMUPD was classified as a dichotomous variable: never vs. ever nonmedical use of prescription
medication(s) in the last year. In secondary analyses we examined the association between nonmedical use of OTC and prescription medications by drug class: stimulants and sleep aids. Similar to prior analysis, nonmedical use of OTC stimulants, prescription stimulants, OTC sleep aids, and prescription CNS depressants were separately coded as a series of dichotomous variables: never vs. ever nonmedical use of each drug class. We also assessed the relationship between nonmedical use of OTC medications and poly-prescription drug abuse as a secondary outcome. Respondents who reported nonmedical use of more than one class of prescription medication (poly-prescription abusers) were compared to those who reported never engaging in NMUPD.

Statistical analyses

All statistical analyses were conducted using Stata (StataCorp LP, College Station, TX). In our first model, we conducted a logistic regression analysis to examine the association between any nonmedical use of any OTC medications and any NMUPD in the last year. For secondary analyses by drug class, we first fitted a logistic regression model with nonmedical use of prescription stimulants as a dichotomous outcome and nonmedical use of OTC stimulants as the exposure of interest. We then examined the corresponding association between nonmedical use of OTC sleeping aids and nonmedical use of prescription CNS depressants. Last, we assessed the relationship between nonmedical use of OTC medications and poly-prescription drug abuse. We fitted a logistic regression model with any poly-prescription drug abuse in the last year as the outcome, and any nonmedical use of OTC medications in the last year as the exposure. The referent
outcome group in this analysis was those who reported never engaging in NMUPD. All estimates are adjusted for age, gender, race/ethnicity, and Greek membership. Based on prior research conducted on prescription abuse among university students, we hypothesized that these covariates could confound the association between nonmedical use of OTC and prescription medications.
Chapter 3: Results

Participant characteristics

Respondents were majority female (59.7%) and self-reported white/Caucasian race (75.2%) (Table 1). The remainder were Asian (12.5%), African American/Black (4.3%), Hispanic/Latino(a) (1.8%), American Indian/Alaska Native (0.9%), Native Hawaiian/Pacific Islander (0.2%), multiracial (2.8%), and other racial and ethnic heritage (1.3%). The largest age group was those older than 22 years (46.1%). Members of fraternities or sororities comprised 8% of respondents. Undergraduates comprised a majority of the sample (69.2%), and 86.0% of respondents reported grade point averages (GPA) of 3.00 or higher.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
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<td></td>
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<tr>
<td>Asian</td>
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</table>

Table 1. Characteristics of the study population (N = 939)
Respondents included in our analysis are relatively representative of the underlying population (N = 56,402) in terms of age (Table 2). Survey respondents were more likely to be female and enrolled in a graduate program compared to the underlying population.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Study participants</th>
<th>University students*</th>
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<tr>
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<td>N = 56,402</td>
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<tr>
<td>Gender</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
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<td>59.7</td>
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<td>Age</td>
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<td>Graduate</td>
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<td>24.7</td>
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</table>

* Enrolled students on the main campus, at least 18 years old or older

Table 2. Comparison of survey participants and campus demographics
Nonmedical use of any prescription medications (including pain medications, CNS depressants, and stimulants) in the past year was reported by 21.4% of students, while 11.1% of respondents reported nonmedical use of any OTC medications (including cough medication, stimulants, or sleep aids) (Table 2). Among those who reported engagement in nonmedical use of only one prescription drug, 16.3% responded that they were not able to stop using these types of drugs when they wanted to (Table 3). Moreover, 42.9% of respondents believed that NMUPD had had a positive impact on their grades.

Nonmedical use of more than one prescription drug was reported by 6.1% of respondents. In this sub-sample, 23.2% of respondents reported not being able to stop using these types of medications when they wanted to, 39.3% reported feeling bad or guilty about using these drugs, and 63.6% reported a positive impact on their grades due to NMUPD.

<table>
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<th>Drug Class</th>
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<td>Prescription Stimulants</td>
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<td>2</td>
<td>0.2</td>
</tr>
<tr>
<td>Prescription Pain Medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>100</td>
<td>10.6</td>
</tr>
<tr>
<td>No</td>
<td>838</td>
<td>89.2</td>
</tr>
<tr>
<td>Missing</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Poly-prescription (&gt; one drug class)</td>
<td>57</td>
<td>6.1</td>
</tr>
</tbody>
</table>

Continued

Table 3. Past-year prevalence of nonmedical use of over-the-counter (OTC) and prescription medications
### Table 3 continued

<table>
<thead>
<tr>
<th>Medication Type</th>
<th>Yes</th>
<th>No</th>
<th>Missing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any OTC Medications</td>
<td>105</td>
<td>796</td>
<td>38</td>
</tr>
<tr>
<td>OTC Stimulants</td>
<td>28</td>
<td>883</td>
<td>28</td>
</tr>
<tr>
<td>OTC Sleeping Aids</td>
<td>37</td>
<td>876</td>
<td>26</td>
</tr>
<tr>
<td>OTC Cough Medications</td>
<td>79</td>
<td>828</td>
<td>32</td>
</tr>
</tbody>
</table>

*Central nervous system (CNS) depressants comprise of prescription sedatives, sleeping pills, and tranquilizers

<table>
<thead>
<tr>
<th>Consequences due to NMUPD</th>
<th>Nonmedical use of only one prescription drug</th>
<th>Nonmedical use of poly-prescription drugs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not being able to stop using when wanted to</td>
<td>23 (16.3)</td>
<td>13 (23.2)</td>
</tr>
<tr>
<td>Felt bad or guilt about use</td>
<td>31 (22.0)</td>
<td>22 (39.3)</td>
</tr>
<tr>
<td>Engaged in criminal activity in order to obtain these types of medications</td>
<td>4 (5.0)</td>
<td>4 (7.3)</td>
</tr>
<tr>
<td>Felt that use of these types of medications has had a negative impact on your grades</td>
<td>7 (2.9)</td>
<td>5 (9.1)</td>
</tr>
<tr>
<td>Felt that use of these types of medications has had a positive impact on grades</td>
<td>60 (42.9)</td>
<td>35 (63.6)</td>
</tr>
</tbody>
</table>

Continued

Table 4. Reported consequences among past-year nonmedical users of prescription medications (NMUPD)
Table 4 continued

<table>
<thead>
<tr>
<th></th>
<th>Data are n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Felt that relationships with other people were negatively affected by use of these types of medications</td>
<td>11 (7.9)</td>
</tr>
<tr>
<td>Felt that relationships with other people were positively affected by use of these types of medications</td>
<td>18 (13.0)</td>
</tr>
<tr>
<td>Experienced withdrawal symptoms (felt sick) when stopped using these types of medications</td>
<td>9 (6.5)</td>
</tr>
<tr>
<td>Experienced emotional/psychological problems because of use of these types of medications</td>
<td>11 (7.9)</td>
</tr>
<tr>
<td>Been depressed as a result of use of these types of medications</td>
<td>16 (11.5)</td>
</tr>
</tbody>
</table>

**Primary analysis**

In unadjusted analyses, respondents who reported any nonmedical use of OTC medications in the past year had greater odds of NMUPD, compared to respondents who reported no OTC abuse (unadjusted OR: 3.47, 95% confidence interval [CI]: 2.27, 5.31) (Table 2). After adjustment for gender, age, race/ethnicity, and fraternity/sorority membership, the effect measure was only slightly attenuated (adjusted OR [AOR]: 3.37; 95% CI: 2.17, 5.23) (Table 3).

**Secondary analyses**

Similar associations were seen within drug classes. Respondents who reported
nonmedical use of OTC stimulants in the past year had significantly greater odds of nonmedical use of prescription stimulants (unadjusted OR: 8.62, 95% CI: 3.88, 19.2). Similarly, respondents who reported nonmedical use of OTC sleeping aids had significantly greater odds of nonmedical use of prescription CNS depressants in the last year (unadjusted OR: 7.99, 95% CI: 3.79, 16.8), respectively (Table 2). After adjustment for gender, age, race/ethnicity, and fraternity/sorority membership, both associations remained significantly elevated (AOR for association between nonmedical use of OTC stimulants and nonmedical use of prescription stimulants: 7.28, 95% CI: 3.10, 17.1; AOR for association between nonmedical use of OTC sleeping aids and nonmedical use of prescription CNS depressants: 7.26, 95% CI: 3.34, 15.7).

Our final analysis assessed nonmedical poly-prescription drug abuse. In unadjusted analyses, respondents who reported any nonmedical use of OTC medications in the past year had greater odds of poly-prescription drug abuse, compared to respondents who reported no nonmedical use of OTC medications (unadjusted OR: 4.50, 95% CI: 2.44, 8.30) (Table 4). Nonmedical use of OTC medications in the past year remained significantly associated with poly-prescription drug abuse after adjusting for Greek membership, age, gender, and race/ethnicity. Odds of poly-prescription drug abuse among those who reported any OTC medication abuse were 3.81 (95% CI: 2.00, 7.24) times the odds of poly-prescription drug abuse among students who reported no OTC medication abuse in the last year.
<table>
<thead>
<tr>
<th></th>
<th>Unadjusted OR</th>
<th>95% CI</th>
<th>P-value</th>
<th>Adjusted OR*</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary analysis:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparing any OTC medication abuse vs. any NMUPD</td>
<td>3.47</td>
<td>2.27, 5.31</td>
<td>&lt; 0.001</td>
<td>3.37</td>
<td>2.17, 5.23</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Secondary analysis:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparing OTC stimulant abuse vs. prescription stimulant abuse</td>
<td>8.62</td>
<td>3.88, 19.2</td>
<td>&lt; 0.001</td>
<td>7.27</td>
<td>3.10, 17.1</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Secondary analysis:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparing OTC sleeping aid abuse vs. prescription sedative/tranquilizer/sleeping aid abuse</td>
<td>7.99</td>
<td>3.79, 16.8</td>
<td>&lt; 0.001</td>
<td>7.22</td>
<td>3.34, 15.7</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td><strong>Secondary analysis:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comparing OTC medication abuse vs. poly-prescription abuse</td>
<td>4.50</td>
<td>2.44, 8.30</td>
<td>&lt; 0.001</td>
<td>3.81</td>
<td>2.00, 7.24</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

* Odd ratios (ORs) and confidence intervals (CIs) adjusted for gender, age, race/ethnicity, and Greek membership

Table 5. Associations between over-the-counter (OTC) medication abuse (never vs. ever) and nonmedical use of prescription drugs (NMUPD) (never vs. ever)
Chapter 4: Discussion

Our study represents one of the first examinations of the association between nonmedical use of OTC medications and NMUPD among university students. We found a significant positive association between nonmedical use of OTC medications and NMUPD. The association remained significant after adjusting for sex, race/ethnicity, age, and Greek membership. When stratified by drug class, higher odds of prescription stimulant abuse and CNS depressants were observed in respondents who abused OTC stimulants and sleeping pills, respectively. Although results by drug class yielded positive, significant results, they were imprecise due to the small sample sizes in these secondary analyses.

Past-year OTC abuse was also significantly associated with poly-prescription drug abuse. Compared to abusers of only one prescription medication, a higher proportion of poly-prescription abusers reported negative consequences due to NMUPD, such as not being able to stop NMUPD when desired or feeling bad or guilty about NMUPD. Regardless, a majority of poly-prescription abusers believed that NMUPD had a positive impact on their grades compared to only a minority of abusers of one prescription medication. Only a small proportion of students reported that they engaged in criminal activity in order to obtain these types of medications; however, prescription stimulants and opioids are controlled substances that are illegal to use without a prescription. This disconnect could
be due to the ease in accessibility and the perception of safety in prescription medications on college campuses [18, 20]. Regardless, it highlights the need for continuing education programs concerning NMUPD among college students.

Given the greater accessibility of OTC medications, it is notable that NMUPD was higher than nonmedical use of OTC medications in our study population. While OTC medications might be easier to obtain, accessibility might not be an important factor in determining abuse among college students since prescription medications are also reportedly “easy” to obtain on college campuses [18, 20]. Due to the cross-sectional nature of surveys, it was not possible to determine whether OTC abuse precedes or follows NMUPD. Longitudinal studies are required to assess both temporality and causality between these behaviors and to examine the potential conversion of OTC medication abuse to prescription drug abuse.

Similar to previous studies, the current study emphasizes the importance of simultaneous poly-drug use [4]. Among college students, NMUPD is consistently associated with poly-drug use, including both alcohol and illicit drugs [3, 13, 16, 21, 22]. While studies pertaining to OTC medication abuse are sparse, one study does suggest an association between nonmedical use of OTC medications and illicit drug use [4]. Concomitant nonmedical use of prescription medications and other drugs is of concern due to the high potential for ADRs and drug-drug interactions. Higher risk of fatal overdose has been reported among people who simultaneously abuse opioids and alcohol compared to those
without simultaneous alcohol use [46]. Moreover, risk of hospitalization or death is higher among people who simultaneously abuse prescription benzodiazepine with opioids and alcohol compared to those who solely abuse benzodiazepine [48]. ADRs and drug-drug interactions due to poly-drug use among college students could be exacerbated due to the positive association between OTC medications and NMUPD, as well as poly-prescription drug abuse.

Unfortunately, OTC abuse is not often reported in assessments of poly-drug use or risky behaviors among college students. Assessments of poly-drug use among NMUPD users have mainly focused on alcohol, tobacco, and illicit street drugs. It is plausible that abusers of OTC medications share similar risky and addictive behaviors. Abusers of OTC medications have reported similar motives, such as sensation seeking, which can also drive some nonmedical use of prescription and illicit drugs [4, 55]. Our study provides another example that highlights the importance of OTC abuse in assessing risky behaviors among college students.

Sensitivity of the survey topic and the language used may have promoted underreporting of NMUPD and OTC medication abuse. Many questions only ascertained one characteristic of prescription abuse by asking whether students used prescription medications that were not prescribed for them. However, past year prevalence of NMUPD from a nationally representative sample of U.S. colleges showed that NMUPD fluctuated from 0% to 31% [43]. Our sample falls in the lower end of this spectrum, and
our prevalence of NMUPD is also consistent with other universities in the Midwest [14]. While studies on the nonmedical use of OTC medications are sparse, OTC abuse in our sample is lower than what was reported from samples of college students in Colorado (18.6%) and Virginia (13.0%) [4]. Generalization to other U.S. universities may not be warranted due to the differences in student demographics; however, prevalence of prescription abuse in our sample is consistent with those reported by other U.S. universities.

Conclusion

Our study showed a significant association between past-year OTC, non-prescription medication abuse and NMUPD among university students, and overall, we contribute additional data in a sparse field concerning the nonmedical use of OTC medications in a university student population. Our results emphasize the need for assessments of OTC abuse among university students. Further studies focusing on OTC drug use would be advantageous in assessing causality and the potential conversion from OTC abuse to prescription abuse.
References


Behaviors, 27(3), 832.


