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Factors that Differentiate Prescription Stimulant Misusers from those At-Risk for Misuse: Expectancies, Perceived Safety, and Diversion [post-print]

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Factors that Differentiate Prescription Stimulant Misusers from those At-Risk for Misuse:

Expectancies, Perceived Safety, and Diversion

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Abstract

Background: The non-medical use of prescription stimulants (NMUPS) is one of the most prevalent illicit behaviors on college campuses. While numerous risk factors for NMUPS have been identified, it is unknown how non-using students who meet several risk factors for NMUPS differ from those who have used, which may inform intervention efforts. We expected that users would evidence greater cognitive enhancement and anxiety/arousal expectancies and intentions to use, and lower guilt/dependence expectancies, perceptions of NMUPS-related harm, and academic self-efficacy. **Methods:** Between 2014-2016, students ($N=121$; 65% female) at two demographically dissimilar colleges in the Northeastern and Midwestern United States who reported lifetime NMUPS or endorsed two or more NMUPS risk factors (i.e., recent marijuana use, recent binge drinking, grade point average <3.5 , Greek-life involvement, male gender) reported on their prescription stimulant expectancies; academic self-efficacy; perceived harm of NMUPS; lifetime NMUPS; and intentions for NMUPS in the next six months. **Results:** A MANCOVA showed that at-risk non-users had lower cognitive expectancies, higher guilt/dependence expectancies, and higher anxiety/arousal expectancies compared to users. ANCOVAs and Chi-square tests showed that non-users also perceived NMUPS to be more harmful and were less likely to divert their medication if prescribed. The groups did not differ on academic self-efficacy or total number of risk factors endorsed. However, recent marijuana use was more prevalent in users. **Conclusions:** Targeted preventive interventions for NMUPS should focus on students who are using marijuana and should aim to maintain lower positive and higher negative stimulant expectancies and reaffirm potential NMUPS-related harms.

Keywords: prescription stimulants; expectancies; academic self-efficacy; perceived harm; marijuana use; diversion; college students

Glossary

1. **diversion**: endorsement of selling or giving away one's prescribed stimulant medication
2. **expectancies**: cognitions about a drug's expected effects
3. **non-medical use of prescription stimulants**: the use of prescription stimulants like Adderall, Ritalin, or Concerta without a prescription, or in ways other than prescribed

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Non-medical prescription stimulant use [NMUPS; i.e., the use of prescription stimulants like Adderall, Ritalin, or Concerta without a prescription, or in ways other than prescribed (NIDA, n.d.)] has been increasing in college students (McCabe, West, Teter, & Boyd, 2014), with nearly one-third or more of the student body reporting NMUPS in some studies (Advokat, Guidry, & Martino, 2008; DeSantis, Webb, & Noar, 2008; Garnier-Dykstra, Caldeira, Vincent, O'Grady, & Arria, 2012). Specific motives for use predominantly include cognitive enhancement purposes, such as increasing concentration and alertness, though recreational and appetite-suppression motives also have been reported (Barrett et al., 2005; Kilwein, Goodman, Looby, & De Young, 2016; Low & Gendaszek, 2002; Teter, McCabe, Cranford, Boyd, & Guthrie, 2005). Despite these expected benefits of use, high doses of stimulant medication are linked to higher body temperatures, paranoia, and cardiovascular complications (NIDA, n.d.), and a survey of undergraduates found that over half of students reported experiencing other maladaptive outcomes such as appetite loss, sleep problems, irritability, and headaches at least "sometimes" following use (Rabiner et al., 2009). Furthermore, NMUPS is associated with more frequent illicit drug use (Arria, Caldeira, O'Grady, Vincent, Johnson, & Wish, 2008). For example, McCabe and Teter (2007) found that college students who engaged in NMUPS were over four times more likely than nonusers to engage in polydrug use. These students also were more likely to report drug-related problems, such as engaging in illegal activities to obtain drugs, withdrawal symptoms from other drugs, drug-related medical problems, and drug-related family conflict. Consequently, identification of risk factors for NMUPS among college students is warranted in an effort to decrease these negative consequences.

A recent review of 30 studies on NMUPS highlighted several risk factors for NMUPS, including male gender, Greek-life involvement, lower (<3.5) grade point average (GPA), and heavy drinking and/or marijuana use (see Benson, Flory, Humphreys, & Lee, 2015). Recent research also has identified a host of psychological risk factors that are potentially modifiable through intervention. For example, NMUPS has been associated with executive function deficits (Munro, Weyandt, Marraccini, & Oster, 2017), ADHD symptoms (Benson et al., 2015), depression (Teter, Falone, Cranford, Boyd, & McCabe, 2010), and anxiety (Dussault & Weyandt, 2013; Verdi, Weyandt, & Zavras, 2016).

An additional psychological variable under study that has promise as a target of intervention for NMUPS is expectancy effects (Looby & Earleywine, 2009; 2010; Looby, De Young, & Earleywine, 2013). Expectancies, or cognitions about a drug's expected effects, are known to be influential in the decision to use various substances including alcohol, marijuana, and cocaine (Cox & Klinger, 1988; Goldman, Brown, Christiansen, 1987; Schafer & Brown, 1991); thus, they also should help differentiate at-risk prescription stimulant nonusers from users. Indeed, Looby and Earleywine (2009, 2010) showed that positive cognitive enhancement expectancies (e.g., enhanced focus and concentration) predicted frequency of non-medical use. Similarly, Lookatch, Dunne, and Katz (2012) reported that self-generated positive expectancies (e.g., improved concentration, ability to stay up and study) and more positive evaluations of those effects were associated with a greater likelihood of NMUPS. On the other hand, negative prescription stimulant expectancies, such as concerns about addiction or using these drugs as a "shortcut", were far more common among nonusers (Looby & Earleywine, 2010); nonusers also provided more negative subjective evaluations of self-generated negative expectancies (e.g., feeling jittery) (Lookatch et al., 2012). Interestingly, Looby and Earleywine (2010) found that

expectations for physiological arousal and anxiety were significantly *higher* among recreational users compared to medical users without a history of misuse, suggesting that users anticipate differential negative psychological and physiological effects.. A better understanding of how expectancy effects influence NMUPS, and importantly, how they differ between users and at-risk nonusers, may assist in the development of brief, group-based interventions (e.g., expectancy challenges; Darkes & Goldman, 1993).

Other cognitive and behavioral factors that might differentiate at-risk nonusers from users and that could be targeted in brief group-based interventions with college students include academic self-efficacy, intentions to use, perceived safety of prescription stimulants, and diversion of prescription stimulants. Looby, Beyer, and Zimmerman (2015) found that undergraduate students who were less confident in their ability to handle academic challenges reported a greater likelihood of use, though an association between lower academic self-efficacy and use was not found among a sample of graduate students (Verdi et al., 2016). Further, intentions to use were a robust predictor of NMUPS in three models examining interpersonal, social/contextual, and sociocultural risk factors (Bavarian, Flay, Ketcham, & Smit, 2013). Additionally, both perceived safety of prescription stimulants (Verdi et al., 2016; Weyandt et al., 2009) and medication diversion (e.g., Sepulveda et al., 2011) were associated with NMUPS. Although these constructs have been identified, little research has examined their role in at-risk but non-using students, who are likely targets of preventative intervention.

Accordingly, the current study extended previous research by examining modifiable cognitive and behavioral risk factors of students at-risk for NMUPS compared to those who have progressed to use. Specifically, we sought to determine whether non-using students at-risk for NMUPS could be differentiated from NMUPS users based on their expectancies, perceptions of

NMUPS harm, academic self-efficacy, and intentions to use. Based on prior research, we hypothesized that compared to at risk non-users, users would have higher cognitive enhancement and anxiety/arousal expectancies, lower guilt/dependence expectancies, and greater perceived safety of prescription stimulants. We also expected users to endorse lower academic self-efficacy, stronger intentions to use in the next six months, and a higher prevalence of diverting one's stimulants (if prescribed). The identification of cognitive and behavioral factors that distinguish these groups can direct prevention and intervention efforts (e.g., expectancy challenges, psychoeducation, study skills interventions) to reduce use and associated negative consequences among college students.

Method

Participants and Procedure

Participants were 121 college students (65% female; $M_{age}=20.14$, $SD=1.87$); approximately two-thirds (64%) were enrolled at a small, private college in the Northeast and 36% attended a large, public university in the Midwestern United States. Participants identified primarily (86%) as Caucasian. The remainder identified as: 6% Black/African American; 3% Hispanic/Latino; 2% Asian/Pacific Islander; 2% Other; and 1% American Indian/Native American. Participants were from all class years (31% first-years, 28% sophomores, 17% juniors, and 23% seniors) and 20% endorsed being a member of a Greek organization. The majority of participants (77%) reported a grade point average of a B (i.e., 3.0 on 4.0 scale) or higher. Education levels of the participants' parents were relatively high: 32% of fathers had some graduate school or obtained a graduate degree and 53% had some college or a college degree. Similarly, 29% of mothers had some graduate school or a graduate degree and 58% had some college or a college degree.

Students were recruited via presentations in Psychology courses, flyers posted on campus, and the Introductory Psychology pools at both institutions. Students were provided with a brief description of the study (i.e., “Attitudes about Study Drugs”) and the web address of the screening survey. Interested students completed the brief online screening survey, in which they reported on whether they had ever used stimulants non-medically during their lifetime (or, if they were prescribed, if they had ever used more than was prescribed), gender, GPA, involvement in Greek life, and recent binge drinking (past two weeks) and marijuana use (past month). Students who endorsed lifetime NMUPS, or at least two of five risk factors for NMUPS (i.e., male gender, GPA<3.5, member of Greek life, past month marijuana use, or past two-week binge drinking) were invited by a research assistant via e-mail to participate in small group sessions (see below). Although a host of risk factors for NMUPS have been identified, we focused on the aforementioned demographic risk factors because they have appeared most consistently in the literature on NMUPS (see Benson et al., 2015 for a review). We focused on recent alcohol and cannabis use as well, given the robust findings in the literature linking NMUPS and other substance use (e.g., Arria et al., 2008; McCabe, Knight, Teter, & Wechsler, 2005). We considered students “at-risk” for NMUPS if they possessed two or more of these risk factors, both to be consistent with previous research that utilized this cutoff and recruited a sample with a relatively high incidence rate over six months (Looby, DeYoung, & Earleywine, 2013), and because we expected this threshold would permit the inclusion of a wide range of students, while not overpathologizing one behavior (e.g., binge drinking) or demographic characteristic. A small percentage of students who endorsed NMUPS in the current study (17%) reported only one risk factor or no risk factors; however, given that only 55% of *users* endorsed three or more risk

factors, moving to a higher threshold likely would have excluded numerous students who, ultimately, might engage in NMUPS.

Data for the current study were collected as part of the baseline survey for a larger group-based intervention study. Participants met in small groups (~6 students) in private rooms on campus, with 1-2 college student facilitators, and completed the baseline survey on individual laptop computers, provided they first consented to the study procedures. Participants received course credit, extra credit, or a small monetary payment (\$5) for participating. The Institutional Review Boards at each institution approved the study.

Measures

Expectancies. The 45-item Prescription Stimulant Expectancy Questionnaire II (Looby & Earleywine, 2010) examined positive and negative effects that participants would anticipate if they engaged in NMUPS. The 20-item cognitive enhancement subscale examined expectations for improved focus, concentration, and greater work enjoyment. The 11-item anxiety and arousal subscale inquired about expected adverse physiological effects (e.g., heart racing), and the 5-item guilt and dependence subscale examined concerns about addiction and using stimulants as a “crutch.” We excluded the 9-item social enhancement subscale because it was not relevant to our study’s hypotheses. Previous research on the PSEQ-II showed that the internal consistencies of each of the subscales were fair to excellent and that each scale evidenced good convergent validity with current and intended prescription stimulant misuse (Looby & Earleywine, 2010). Internal consistencies in our study were nearly identical to those obtained by Looby and Earleywine (2010): cognitive enhancement ($\alpha=.95$), anxiety/arousal ($\alpha=.88$), and guilt/dependence ($\alpha=.75$). A five-point response scale was used (1=*never*, 5=*very often*). Mean

scores were calculated for each of the three expectancy scales, respectively; higher mean scores denoted more expected effects in that domain.

Academic self-efficacy. The 14-item study subscale from the Self-Efficacy for Learning Form (Zimmerman & Kitsantas, 2005) assessed students' ability to implement learning strategies (e.g., reword complex definitions), manage distractions and refocus their attention, utilize their study time effectively, and adapt to course preparation challenges. The SELF has demonstrated good predictive validity and excellent reliability in previous research (Zimmerman & Kitsantas, 2005); further, the study subscale of the SELF has demonstrated good reliability in previous research with college students (Looby et al., 2014). Responses ranged from 0=*definitely cannot do it* to 100=*definitely can do it*. We calculated a mean score from the 14 items, with higher mean scores denoting greater academic self-efficacy.

Perceived safety. Two items inquiring about perceived harmlessness of daily or occasional NMUPS from the Stimulant Survey Questionnaire (Weyandt et al., 2009) were averaged to produce a mean perceived safety score. The reliability of this brief scale was somewhat low ($\alpha=.59$), but similar to previous research employing a six-item scale ($\alpha=.61$; Weyandt et al., 2009). A five-point response scale (1=*never*, 5=*always*) was used, with higher mean scores denoting less concern about NMUPS.

Risk factor assessment, ADHD diagnosis, diversion, and intentions. We created a total risk factor score by summing the number of risk factors participants endorsed on the screening survey [i.e., male gender, GPA<3.5, Greek life involvement, marijuana use in the last month, and binge drinking in the past two weeks (i.e., four drinks in two hours for females, five drinks for males)]. We asked whether participants had ever used stimulants without a prescription (or more than was prescribed if they had a prescription) and whether prescribed participants had

ever given away or sold their medication. To assess intentions for NMUPS in the next six months, we adapted a question about intentions to drink from LaBrie, Quinlan, Schiffman, and Earleywine (2005); students responded on a 0 (*definitely no*)-100 (*definitely yes*) scale.

Data Analysis

To determine whether there were differences between students who had used stimulants non-medically and those who had not, we first used a multivariate analysis of covariance (MANCOVA) with the three expectancy variables as outcomes, user status (user vs. nonuser) as the independent variable, and site as a covariate. For the remaining continuous study variables (academic self-efficacy, perceived harmlessness, sum of NMUPS risk factors, intentions to use), we used an analysis of covariance (ANCOVA) for each variable, respectively. We controlled for site in the MANCOVA and ANCOVAs, since preliminary tests showed that participants at the Northeast site endorsed higher academic self-efficacy and more risk factors overall. We report estimated marginal means (EMM), which were adjusted for site.

Since chi-square tests did not reveal any differences between the two sites for the demographic variables or the categorical outcome variables (i.e., binge drinking, marijuana use, students with ADHD diagnosis, diversion), we used chi-square tests to compare users and non-users on these constructs without adjusting for site differences. We used .05 as the alpha level for all statistical tests.

Results

Demographic Characteristics and Risk Factor Endorsement by User Group

More than half of participants ($n=71$; 59%) reported NMUPS at some point in their lifetime and constituted the “user” group. The remainder ($n=50$, 41%) endorsed two or more risk factors, but denied lifetime NMUPS; thus, they were classified as “at-risk nonusers”. Chi-square

tests showed that there were no demographic differences between at-risk non-users and users, with the exception of fewer users reporting involvement in Greek life compared to nonusers [13% vs. 32%; $\chi^2(1,120) = 6.48, p = .01$]. An ANCOVA (controlling for site) showed that the two groups did not differ with respect to the mean number of risk factors they endorsed [$EMM_{non-users}=2.53, SE=0.13$ vs. $EMM_{users}=2.50, SE=0.11$; $F_{(1,118)} = 0.02, p = .886$]. However, chi-square tests showed that users were more likely than nonusers to endorse marijuana use in the past month [30% vs. 58%; $\chi^2(1,121) = 9.09, p = .003$]. Table 1 provides comprehensive demographic information for each group and their endorsement of recent alcohol and marijuana use.

Differences in Expectancies and Perceived Harmlessness

Our findings related to the three expectancy variables and perceived harmlessness largely were consistent with our hypotheses. A MANCOVA showed that, after controlling for site, users endorsed significantly higher cognitive enhancement expectancies, $F_{(1,117)} = 7.29, p = .008, \eta_p^2 = 0.06$, and lower guilt/dependence expectancies, $F_{(1,117)} = 16.38, p < .001, \eta_p^2 = 0.12$, as predicted. Our next hypothesis, namely that users would endorse higher anxiety/arousal expectancies, was not supported; in fact, users reported significantly *lower* expectancies in this domain, $F_{(1,117)} = 9.83, p = .002, \eta_p^2 = 0.08$. As expected, an ANCOVA showed that users were more likely to perceive NMUPS as harmless, $F_{(1,117)} = 14.27, p < .001, \eta_p^2 = 0.11$. Figure 1 displays the means associated with each outcome above by user group.

Differences in Intentions To Use, Diversion, and Academic Self-Efficacy

Consistent with our hypotheses, an ANCOVA showed that users reported greater NMUPS intentions in the next six months, $F_{(1,117)} = 57.35, p < .001, \eta_p^2 = 0.33$, and a chi-square test showed they were more likely to divert their medication (if prescribed): $\chi^2(1,25) = 8.36, p =$

.004. Contrary to our hypothesis, an ANCOVA showed that academic self-efficacy scores did not differ between users and nonusers, $F_{(1,118)} = 1.43$, $p = .234$. Figure 2 displays mean academic self-efficacy scores, mean intentions scores, and the percentage of prescribed students who endorsed diverting stimulant medication by user group.

Discussion

This study sought to provide a nuanced comparison of prescription stimulant users and non-users, focusing on the potentially modifiable cognitive and behavioral risk factors of an at-risk sample. Previous research with large, heterogeneous samples consistently identified several key demographic risk factors (e.g., male gender, GPA), though many of these factors are not amenable to intervention. While more recent research has examined modifiable risk factors (e.g., expectancy effects, self-efficacy), it provides little guidance around how to intervene with students who are at-risk but have not yet initiated NMUPS. The present results add to the literature on risk factors for NMUPS by highlighting potential targets of intervention specifically for college students at-risk for NMUPS initiation.

In the current study, users and at-risk non-users largely were distinguished by their NMUPS-related beliefs and recent marijuana use. Consistent with previous research, users reported greater cognitive enhancement and lower guilt/dependence expectancies (Looby & Earleywine, 2010), greater perceived safety (Weyandt et al., 2009), greater likelihood of diversion (Sepulveda et al., 2011), and stronger intentions to use (Bavarian et al., 2013). Contrary to Looby and Earleywine (2010), users were less likely to endorse anxiety/arousal expectancies, suggesting that concerns about stimulant-related physiological effects may be a *protective* factor among students at-risk. The lack of difference in academic self-efficacy also contradicted previous research with undergraduates (Looby et al., 2015). Since 77% of our

sample reported a lower GPA (< 3.5), and lower GPA and academic self-efficacy were inversely correlated ($r = -.22, p < .05$), academic self-efficacy might have been especially low in our sample, rendering it less able to differentiate user groups.

Combined with prior research, results from the current study provide an outline for the development of a comprehensive targeted intervention for college students at-risk for NMUPS. As group differences in NMUPS-related expectancy effects have now been demonstrated across several studies (e.g., Looby & Earleywine, 2009; 2010), expectancy modification may be a particularly important component, especially related to *both* weakening positive cognitive enhancement expectancies and strengthening negative expectancies. Given that cognitive enhancement expectancies were higher among users, and also that recent research suggests limited prescription stimulant-related cognitive enhancement among healthy adults (e.g., Cropsey et al., 2017; Ilieva, Boland, & Farah, 2013; Marraccini, Weyandt, Rossi, & Gudmundsdottir, 2016; Weyandt et al., 2016), challenging these beliefs may reduce the incidence of NMUPS if students no longer expect substantial benefit from the medication.

Alternatively, providing students with alternate and safer means of enhancing cognition or providing instruction in study skills may assist students in achieving their cognitive enhancement goals. However, it is clear that an effective intervention also must work to strengthen belief in the negative effects of NMUPS, as users in the present study reported weaker negative expectancies and higher perceived safety of use. In prior work, a single randomized-controlled trial of an expectancy challenge intervention focused on weakening cognitive enhancement expectancies for NMUPS successfully modified expectancies but ultimately did not reduce NMUPS initiation (Looby et al., 2013); thus, a more comprehensive intervention that reduces cognitive enhancement expectancies and intensifies guilt/dependence and

anxiety/arousal expectancies may be needed. Students could be encouraged to elaborate on the personal significance of their negative expectancies and how prescription stimulants could endanger their future goals (Steiger, Stoddard, & Pierce, 2017). Indeed, a similar type of intervention reduced risky drinking in college students (LaBrie, Pedersen, Earleywine, & Olsen, 2006). Finally, at-risk students with prescriptions should be advised not to disclose their prescription to peers, thereby reducing their risk of being approached and being exposed to recreational stimulant users. With regard to targeting students who may particularly benefit from preventative intervention, non-users endorsing recent marijuana use should be prioritized, as their substance use may be compromising their academic engagement, making them more prone to seek out stimulants as a “compensatory last ditch attempt to improve grades” (Arria et al., 2017, p. 246). This type of multi-faceted approach may be one way to counteract the rising tide of NMUPS.

Some limitations are of note. Given our modest sample size, we utilized a dichotomous NMUPS measure, which precluded us from making distinctions among students based on different patterns of prescription stimulant misuse (i.e., low vs. high frequency use). Similarly, to ensure a robust sample size of users, we grouped medical misusers (i.e., using more than prescribed when one has a prescription) with recreational users (i.e., using prescription stimulants without a prescription). Future research with a larger sample and a more detailed assessment of prescription stimulant misuse frequency/quantity would allow us to better characterize students across a wider range of use patterns, which ultimately might lead to more targeted interventions that not only prevent NMUPS, but the escalation of use once it has been initiated. Our modest sample size also precluded us from detecting small and small-to-medium

effects (Faul, Erdfelder, Lang, & Buchner, 2007); replicating this study with a larger sample would permit the identification of these effects if they were present.

Other limitations include the fact that our conceptualization of which students were “at-risk” for NMUPS was limited by the five risk factors we selected. Future studies might characterize an “at-risk” group using different NMUPS-related risk factors, establish a more stringent cutoff (e.g., three risk factors), or screen students for specific constellations of risk factors, to ensure that students who are identified are prime candidates for a preventive intervention. Further, because our study was correlational, we cannot assert a causal role between use and patterns of assessed risk factors. For example, it is unknown whether or how users’ expectancies may have changed as a consequence of their use. Future research should employ longitudinal methodology to examine changes in modifiable risk factors as a function of initiating use and progressing to more frequent use. Finally, results from this study were obtained from predominantly White undergraduate students and the sample was heavily female; thus, results may not generalize to male students from more diverse institutions, or to high school or graduate students.

Overall, this study adds to the current research on risk factors for NMUPS and highlights areas of intervention for college students most at risk for engaging in this behavior. Despite the increasing rates of use among college students, little work has been devoted to preventative measures. As positive and negative expectancy effects and perceptions of safety differ between user groups, the efficacy of interventions that modify these beliefs should be examined. Further research into modifiable risk factors for NMUPS is necessary to continue to identify targets of intervention that can be included as components of a comprehensive intervention program.

References

- Advokat, C. D., Guidry, D., & Martino, L. (2008). Licit and illicit use of medications for attention-deficit hyperactivity disorder in undergraduate college students. *Journal of American College Health, 56*(6), 601–606. <https://doi.org/10.3200/JACH.56.6.601-606>
- Arria, A. M., Caldeira, K. M., O’Grady, K. E., Vincent, K. B., Johnson, E. P., & Wish, E. D. (2008). Nonmedical Use of Prescription Stimulants among College Students: Associations with ADHD and Polydrug Use. *Pharmacotherapy, 28*(2), 156–169. <https://doi.org/10.1592/phco.28.2.156>
- Arria, A. M., Caldeira, K. M., Vincent, K. B., O’Grady, K. E., Cimini, M. D., Geisner, I. M., ... Larimer, M. E. (2017). Do college students improve their grades by using prescription stimulants nonmedically? *Addictive Behaviors, 65*, 245–249. <https://doi.org/10.1016/j.addbeh.2016.07.016>
- [Barrett, S. P., Darredeau, C., Bordy, L. E., & Pihl, R. O. \(2005\). Characteristics of methylphenidate misuse in a university student sample. *The Canadian Journal of Psychiatry, 50*, 457-461.](#)
- Bavarian, N., Flay, B. R., Ketcham, P. L., & Smit, E. (2013). Illicit use of prescription stimulants in a college student sample: A theory-guided analysis. *Drug and Alcohol Dependence, 132*(3), 665–673. <https://doi.org/10.1016/j.drugalcdep.2013.04.024>
- Benson, K., Flory, K., Humphreys, K. L., & Lee, S. S. (2015). Misuse of stimulant medication among college students: a comprehensive review and meta-analysis. *Clinical Child and Family Psychology Review, 18*(1), 50–76.
- Cox, W. M., & Klinger, E. (1988). A motivational model of alcohol use. *Journal of Abnormal Psychology, 97*(2), 168–180.

- Cropsey, K. L., Schiavon, S., Hendricks, P. S., Froelich, M., Lentowicz, I., & Fargason, R. (2017). Mixed-amphetamine salts expectancies among college students: Is stimulant induced cognitive enhancement a placebo effect? *Drug and Alcohol Dependence, 178*, 302-309.
- Darkes, J., & Goldman, M. S. (1993). Expectancy challenge and drinking reduction: Experimental evidence for a mediational process. *Journal of Consulting and Clinical Psychology, 61*, 344-353.
- DeSantis, A., Webb, E., & Noar, S. (2008). Illicit use of prescription ADHD medications on a college campus: a multimethodological approach. *Journal of American College Health, 57*(3), 315–323.
- Dussault, C. L., & Weyandt, L. L. (2013). An examination of prescription stimulant misuse and psychological variables among sorority and fraternity college populations. *Journal of Attention Disorders, 17*, 87-97.
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39*, 175-191.
- Fromme, K., Stroot, E. A., & Kaplan, D. (1993). Comprehensive effects of alcohol: Development and psychometric assessment of a new expectancy questionnaire. *Psychological Assessment, 5*(1), 19-26.
- Garnier-Dykstra, L., M., Caldeira, K., M., Vincent, K., B., O'Grady, K., E., & Arria, A., M. (2012). Nonmedical use of prescription stimulants during college: Four-year trends in exposure opportunity, use, motives, and sources. *Journal of American College Health, 60*(3), 226–234. <https://doi.org/10.1080/07448481.2011.589876>

- Goldman, M. S., Brown, S. A., & Christiansen, B. A. (1987). Expectancy theory-thinking about drinking. In H.T. Blane & K.E. Leonard (Eds.), *Psychological Theories of Drinking and Alcoholism* (pp. 181–226). New York: Guilford.
- Ilieva, I., Boland, J., & Farah, M. J. (2013). Objective and subjective cognitive enhancing effects of mixed amphetamine salts in healthy people. *Neuropharmacology*, *64*, 496–505.
<https://doi.org/10.1016/j.neuropharm.2012.07.021>
- Kilwein, T. M., Goodman, E. L., Looby, A., & De Young, K. P. (2016). Nonmedical prescription stimulant use for suppressing appetite and controlling body weight is uniquely associated with more severe eating disorder symptomatology. *International Journal of Eating Disorders*, *49*, 813-816.
- LaBrie, J. W., Pedersen, E. R., Earleywine, M., & Olsen, H. (2006). Reducing heavy drinking in college males with the decisional balance: Analyzing an element of Motivational Interviewing. *Addictive Behaviors*, *31*(2), 254–263.
<https://doi.org/10.1016/j.addbeh.2005.05.001>
- LaBrie, J. W., Quinlan, T., Schiffman, J. E., & Earleywine, M. E. (2005). Performance of alcohol and safer sex change rulers compared with readiness to change questionnaires. *Psychology of Addictive Behaviors*, *19*(1), 112-115.
- Looby, A., Beyer, D. L., & Zimmerman, L. (2015). Non-medical prescription stimulant use: Investigating modifiable risk factors. *Addiction Research & Theory*, *23*(2), 143–147.
- Looby, A., DeYoung, K. P., & Earleywine, M. (2013). Challenging expectancies to prevent nonmedical prescription stimulant use: A randomized, controlled trial. *Drug and Alcohol Dependence*, *132*(1–2), 362–368. <https://doi.org/10.1016/j.drugalcdep.2013.03.003>

- Looby, A., & Earleywine, M. (2009). Prescription stimulant expectancies in recreational and medical users: Results from a preliminary expectancy questionnaire. *Substance Use & Misuse*, 44(11), 1578–1591. <https://doi.org/10.1080/10826080802495120>
- Looby, A., & Earleywine, M. (2010). Psychometric evaluation of a Prescription Stimulant Expectancy Questionnaire. *Experimental and Clinical Psychopharmacology*, 18(4), 375–383. <https://doi.org/10.1037/a0019347>
- Lookatch, S. J., Dunne, E. M., & Katz, E. C. (2012). Predictors of nonmedical use of prescription stimulants. *Journal of Psychoactive Drugs*, 44(1), 86–91.
<https://doi.org/10.1080/02791072.2012.662083>
- Low, K. G., & Gendaszek, A. E. (2002). Illicit use of psychostimulants among college students: a preliminary study. *Psychology, Health & Medicine*, 7, 283-287.
- Marraccini, M. E., Weyandt, L. L., Rossi, J. S., & Gudmundsdottir, B. G. (2016). Neurocognitive enhancement or impairment: A systematic meta-analysis of prescription stimulant effects on processing speed, decision-making, planning, and cognitive perseveration. *Experimental and Clinical Psychopharmacology*, 24, 269-284.
- McCabe, S. E., & Teter, C. J. (2007). Drug use related problems among nonmedical users of prescription stimulants: A web-based survey of college students from a Midwestern university. *Drug and Alcohol Dependence*, 91, 69-76.
- McCabe, S. E., West, B. T., Teter, C. J., & Boyd, C. J. (2014). Trends in medical use, diversion, and nonmedical use of prescription medications among college students from 2003 to 2013: Connecting the dots. *Addictive Behaviors*, 39(7), 1176–1182.

- Munro, B. A., Weyandt, L. L., Marraccini, M. E., & Oster, D. R. (2017). The relationship between nonmedical use of prescription stimulants, executive functioning and academic outcomes. *Addictive Behaviors, 65*, 250-257.
- NIDA. (n.d.). Prescription Stimulant Medications (Amphetamines). Retrieved March 27, 2017, from <https://teens.drugabuse.gov/drug-facts/prescription-stimulant-medications-amphetamines>
- Rabiner, D. L., Anastopoulos, A. D., Costello, E. J., Hoyle, R. H., McCabe, S. E., & Swartzwelder, H. S. (2009). The misuse and diversion of prescribed ADHD medications by college students. *Journal of Attention Disorders, 13*(2), 144–153.
<https://doi.org/10.1177/1087054708320414>
- Schafer, J., & Brown, S. A. (1991). Marijuana and cocaine effect expectancies and drug use patterns. *Journal of Consulting and Clinical Psychology, 59*(4), 558.
- Sepúlveda, D. R., Thomas, L. M., McCabe, S. E., Cranford, J. A., Boyd, C. J., & Teter, C. J. (2011). Misuse of prescribed stimulant medication for ADHD and associated patterns of substance use: Preliminary analysis among college students. *Journal of Pharmacy Practice, 24*(6), 551–560. <https://doi.org/10.1177/0897190011426558>
- Steiger, R. M., Stoddard, S. A., & Pierce, J. (2017). Adolescents' future orientation and nonmedical use of prescription drugs. *Addictive Behaviors, 65*, 269–274.
- Teter, C. J., Falone, A. E., Cranford, J. A., Boyd, C. J., & McCabe, S. E. (2010). Nonmedical use of prescription stimulants and depressed mood among college students: Frequency and routes of administration. *Journal of Substance Abuse Treatment, 38*, 292-298.

- Teter, C. J., McCabe, S. E., Cranford, J. A., Boyd, C. J., & Guthrie, S. K. (2005). Prevalence and motives for illicit use of prescription stimulants in an undergraduate student sample. *Journal of American College Health, 53*, 253-262.
- Verdi, G., Weyandt, L. L., & Zavras, B. M. (2016). Non-medical prescription stimulant use in graduate students: relationship with academic self-efficacy and psychological variables. *Journal of Attention Disorders, 20*, 741-753.
- Weyandt, L. L., Janusis, G., Wilson, K. G., Verdi, G., Paquin, G., Lopes, J., ... Dussault, C. (2009). Nonmedical prescription stimulant use among a sample of college students: Relationship with psychological variables. *Journal of Attention Disorders, 13*(3), 284–296. <https://doi.org/10.1177/1087054709342212>
- Weyandt, L. L., Oster, D. R., Marraccini, M. E., Gudmundsdottir, B. G., Munro, B. A., Rathkey, E. S., & McCallum, A. (2016). Prescription stimulant medication misuse: Where are we and where do we go from here? *Experimental and Clinical Psychopharmacology, 24*, 400-414.
- Zimmerman, B. J., & Kitsantas, A. (2005). Homework practices and academic achievement: The mediating role of self-efficacy and perceived responsibility beliefs. *Contemporary Educational Psychology, 30*(4), 397–417. <https://doi.org/10.1016/j.cedpsych.2005.05.003>

Table 1

Comparison of At-Risk Nonusers and Users on Demographic and Screening Measures

Characteristic	At-Risk Nonusers (n=50)	Users (n=71)	Full sample (N=121)
Gender			
Female	70%	61%	65%
Male	30%	39%	35%
Race/ethnicity ^a			
White/non-Hispanic	86%	86%	86%
African American/Black	8%	4%	6%
American Indian/Native American	0%	1%	1%
Asian/Pacific Islander	4%	1%	2%
Hispanic/Latino/a	2%	4%	3%
Other	0%	3%	2%
Class year ^a			
Freshman	38%	27%	31%
Sophomore	30%	27%	28%
Junior	14%	20%	17%
Senior	18%	27%	23%
Endorsed Greek membership [*]	32%	13%	21%
Type of high school attended			
Private	28%	28%	28%
Public	72%	72%	72%
Grade point average			
<2.50	12%	3%	7%
2.50-2.99	14%	18%	16%
3.00-3.49	50%	52%	51%
≥3.50	24%	27%	26%
ADHD diagnosis	18%	27%	23%
Other substance use			
Binge drinking prior 2 weeks	78%	70%	73%
Past month marijuana use ^{**}	30%	58%	46%
Total number of risk factors (<i>M, SE</i>)	2.53 (0.13)	2.50 (0.11)	2.51 (0.90)

Note. ^aBecause of rounding, percentages add up to less (or more) than 100. Estimated marginal means and standard errors are reported for total number of risk factors; the mean and standard deviation is listed for the full sample.

^{*}*p* = .01

^{**}*p* < .01

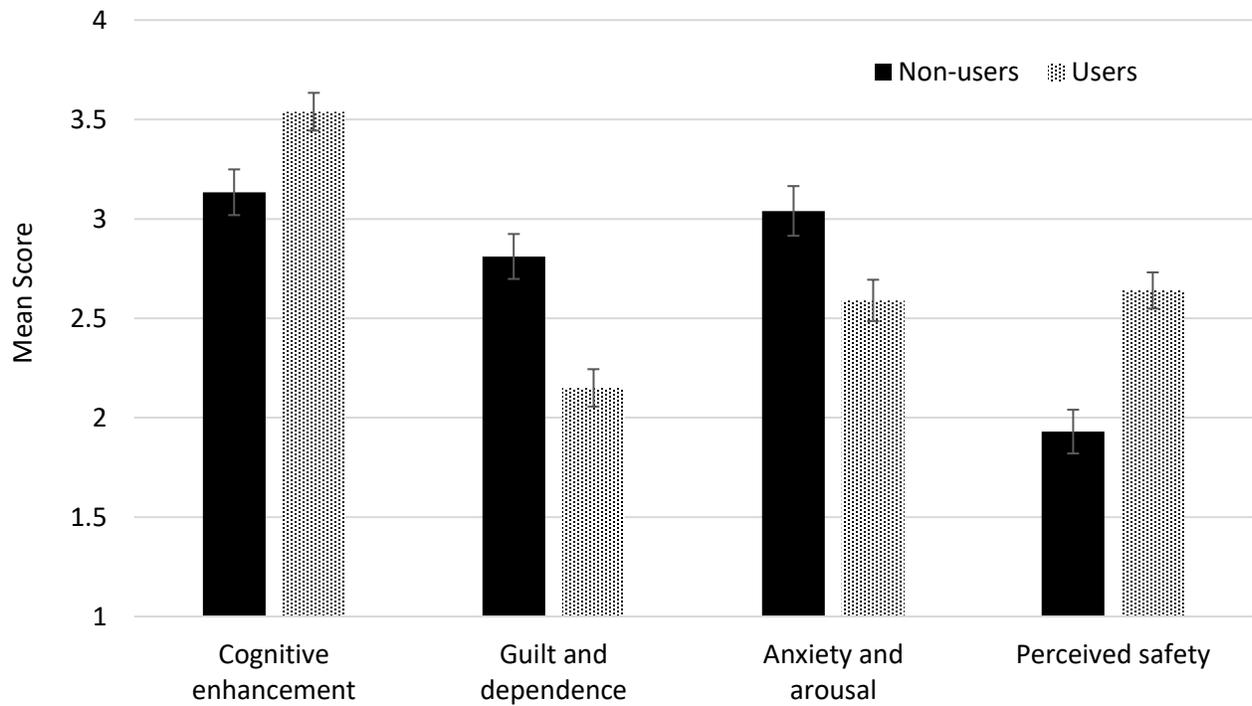


Figure 1. Comparison of at-risk nonusers with users on expectancies and perceived safety of occasional or daily non-medical use. Estimated marginal means are depicted, with standard errors. All $ps < .01$.

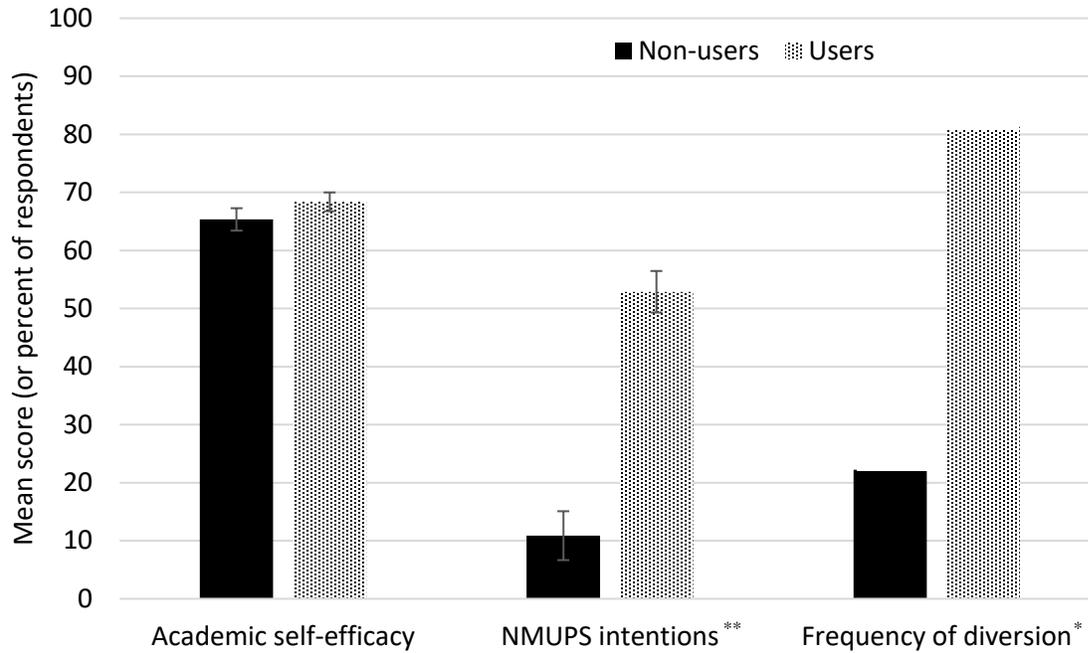


Figure 2. Comparison of at-risk nonusers with users on academic self-efficacy mean score (estimated marginal means with standard errors), NMUPS intentions mean (estimated marginal means with standard errors), and frequency of diversion (percent) among participants with a stimulant prescription.

* $p < .01$, ** $p < .001$