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Challenging expectancies to prevent nonmedical prescription stimulant use: A randomized, controlled trial

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Abstract

Background—College students continue to report nonmedical prescription stimulant use to enhance alertness and concentration. Despite increasing prevalence of this behavior, techniques for preventing or treating it are lacking. An intervention that focuses on challenging positive consequence-oriented beliefs about prescription stimulants may be efficacious in preventing use.

Methods—The current study examined the efficacy of a randomized controlled expectancy challenge intervention to prevent nonmedical prescription stimulant use among 96 at-risk, stimulant-naïve college students (i.e., low grade point average, Greek involvement, binge drinking, cannabis use). Forty-seven participants completed a brief expectancy challenge intervention aimed at modifying positive expectancies for prescription stimulants, to consequently deter initiation of use. The remaining participants received no intervention.

Results—The expectancy challenge successfully modified expectancies related to prescription stimulant effects. Nevertheless, this intervention group and a control group showed comparable rates of nonmedical prescription use at six-month follow-up. However, negative expectancies were significant predictors of reduced odds of future use.

Conclusions—A challenge session appears to modify stimulant-related expectancies, which are related to nonmedical prescription stimulant use. Nevertheless, a more potent challenge or booster sessions might be essential for longer-term changes.

Keywords

nonmedical prescription stimulant use; expectancy effects; expectancy challenge; cognitive enhancement; prevention

1. Introduction

College students frequently engage in nonmedical prescription stimulant use (NPS; e.g., methylphenidate; MPH) to enhance cognitive performance, subjective mood, and arousal (Barrett et al., 2005; Low and Gendaszek, 2002; Teter et al., 2005). Lifetime prevalence rates suggest that 8.5% of Americans over the age of 12 and 12.3% of Americans between

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the ages of 21 and 25 have engaged in NPS (Substance Abuse and Mental Health Services Administration [SAMHSA], 2009). Additionally, past-year prevalence rates as high as 35% have been reported for college students (Wilens et al., 2008). Particularly problematic is that students expect benefits from using prescription stimulants while anticipating very few risks (Arria and Dupont, 2010); however, nonmedical users of prescription stimulant medications are substantially more likely to engage in or experience numerous problematic drug-related behaviors, including simultaneous polydrug use, engaging in illegal activities to obtain drugs, experiencing drug-related medical problems, and experiencing family conflict as a result of use (McCabe and Teter, 2007). Moreover, while little is known about the safety of mixing prescription stimulants with other drugs of abuse, high levels of prescription stimulant use alone may lead to dangerously high body temperature, cardiovascular failure, irregular heartbeat, seizures, or paranoia (National Institute on Drug Abuse, 2009). New reports indicate more than a four-fold increase in emergency room visits related to NPS among young adults aged 18–25 from 2005 to 2010 (SAMHSA, 2013). Recent publications highlight the need to recognize and address the high prevalence rates of NPS and urge healthcare providers, parents, university officials, and law enforcement to take action to discourage and reduce use among college students (Arria and Dupont, 2010; Rosenfield et al., 2011).

There is currently no published research examining prevention or treatment efforts to reduce NPS. Given that college students report engaging in NPS because they expect the medication to improve their concentration and alertness or make them feel high, interventions that focus on challenging these cognitions may be particularly effective. The current research on prescription stimulant-related cognitive enhancements among healthy adults (i.e., those without a diagnosis of Attention-Deficit Hyperactivity Disorder) is inconclusive. A recent review by Smith and Farah (2011) found that the only area of cognition with substantial evidence for an enhancement effect was long-term declarative memory, though effect sizes varied widely according to specific task and study. Other areas of cognition, including working memory and cognitive control, were not found to be reliably enhanced following ingestion of a prescription stimulant. Volkow and colleagues (2004) posit that prescription stimulants may function by enhancing interest and motivation among healthy individuals, rather than functionally enhancing cognitive abilities. It is also possible that some of the reported cognitive enhancement effects from prescription stimulants may truly be placebo effects resulting from positive cognitive enhancement-related expectancy effects.

Expectancy effects are motivationally relevant beliefs about drug-related consequences. Expectancies can reflect both positive and negative outcomes. Alcohol expectancy research reveals that each expectancy dimension is uniquely associated with various aspects of use. For example, the number of positive expectancies and their strength positively correlated with frequency and quantity of alcohol consumption (Brown et al., 1980; Fromme et al., 1993; Goldman et al., 1991). Negative expectancies appear to be more important in the prediction of abstinence and efforts to resist drinking (Jones and McMahon, 1996; Leigh and Stacy, 2004). Recent research has examined expectancy effects for prescription stimulants and obtained similar results; positive expectancies are strongest among users while negative expectancies are strongest among nonusers (Looby and Earleywine, 2010).

Fortunately, expectancy effects appear modifiable, as direct attempts to change alcohol expectancies have decreased drinking (e.g., Goldman et al., 1991). Darkes and Goldman (1993) developed a multisession expectancy challenge procedure designed to undermine participants' existing associations between drinking and expected behavioral outcomes, suggesting that many of alcohol's desired consequences may be placebo effects. The expectancy challenge resulted in significantly weakened positive expectancies for social and

sexual facilitation, along with reduced drinking at a 2-week follow-up. Similar results with longer follow-up periods (e.g., 1 month) appear in other alcohol expectancy challenge studies that were designed to target females (Musher-Eizenman and Kulick, 2003; Wiers and Kummeling, 2004) or that used a single-session brief expectancy challenge intervention (Lau-Barraco and Dunn, 2008). Thus, both expectancies and alcohol use can change from brief and practical expectancy challenge interventions, and these effects may persist for a clinically meaningful period.

Researchers have not applied an expectancy challenge for stimulant drug use. Since numerous studies have confirmed that stimulant expectancies function similarly to alcohol expectancies (e.g., Jaffe and Kilbey, 1994; Looby and Earleywine, 2010, 2011; Schafer and Brown, 1991), an expectancy challenge intervention might alter prescription stimulant expectancies to decrease or prevent nonmedical stimulant use. As the first step in addressing the substantial need to discourage and prevent NPS, the current study examines the efficacy of an expectancy challenge intervention for modifying expectancies and preventing NPS among college students. It was hypothesized that participants randomized to an expectancy challenge would be less likely to initiate NPS during a 6-month follow-up and report weaker positive expectancies compared to participants who did not take part in the challenge. Our research design also allows for prospective examination of expectancy effects as predictors of NPS to understand factors that may increase risk for use among an already high-risk group.

2. Materials and Method

2.1. Participants

Participants were recruited to participate in a 3-session study (i.e., 2 laboratory visits and 1 online follow-up) via flyers posted on a university campus in the Northeastern United States. Interested participants completed a telephone screen to determine eligibility. In order to examine the expectancy challenge as a prevention effort, inclusion criteria required that participants report lifetime nonuse of any prescription stimulant medication, though they also were required to endorse at least two relevant risk factors for NPS. These risk factors included involvement in a fraternity or sorority (McCabe et al., 2005; Shillington et al., 2006), GPA below 3.5 (Teter et al., 2005; McCabe et al., 2006), at least one episode of binge drinking in the past two weeks (Herman-Stahl et al., 2007; McCabe et al., 2005; Shillington et al., 2006), and past-month cannabis use (McCabe et al., 2005). The remaining eligibility criteria included age between 18 to 25 years and current enrollment in college, which are additional risk factors for NPS (Johnston et al., 2005; Kroutil et al., 2006). Further details on recruitment information can be found elsewhere (i.e., Looby and Earleywine, 2011). All participants were provided monetary compensation for their involvement. This study was approved by a local Institutional Review Board and informed consent was obtained from all participants prior to beginning the study.

One hundred and six individuals consented to participate in the study. Ten participants withdrew prior to the intervention (9 participants were not retained for the second laboratory visit and 1 participant was withdrawn due to health reasons), resulting in 96 completers. Fifty-seven participants were male (60%) and participants ranged in age from 18 to 23 ($M = 19.57$, $SD = 1.26$). Average years of education was 13.49 ($SD = 1.07$) and participants were primarily Caucasian (71%). Other ethnicities reported were African American (8%), Hispanic (8%), Asian (4%), mixed race (4%), and Native American (1%). All participants were currently enrolled full-time in a 4-year college.

2.2. Procedure

Eligible participants were informed that their involvement would entail two laboratory visits and completion of an online survey 6 months following their second laboratory visit. The purpose of the laboratory visits was to obtain individualized data on prescription stimulant-related placebo effects to use for an expectancy challenge. All participants completed the Prescription Stimulant Expectancy Questionnaire-II (PSEQ-II; Looby and Earleywine, 2010) at the beginning of their first study visit. The PSEQ-II is a 45-item measure that assesses prescription stimulant expectancy effects along a 3-point Likert scale. It includes two positive expectancy factors (i.e., cognitive enhancement, social enhancement) and two negative expectancy factors (i.e., anxiety and arousal, guilt and dependence). Participants were then randomized to an expectancy challenge (EC) or a control condition. EC participants received what they were told was MPH on one visit and received no medication on the other visit; participants actually ingested a placebo substance rather than active MPH. Control participants did not receive any medication on either visit. During both visits, participants completed questionnaires assessing subjective mood and arousal and a battery of cognitive tasks assessing a wide range of cognitive abilities. Further details regarding these visits are available elsewhere (i.e., Looby and Earleywine, 2011).

At the conclusion of participants' second visit, an expectancy challenge intervention was conducted with the EC participants, who were debriefed and informed of placebo administration. They participated in a 30-minute expectancy challenge to modify prescription stimulant expectancy effects. The challenge predominantly focused on cognitive enhancement expectancies, though it included a broad didactic lecture and discussion on expectancy effects and the potential negative consequences of NPS. Expectancy effects and their role in substance use were explained, including a discussion of relevant research designs (i.e., balanced placebo designs and expectancy challenges). In order to specifically relate expectancy effects to NPS, participants were also informed of recent research suggesting that prescription stimulant medication does not appear to significantly enhance cognitive functioning among healthy individuals, thus indicating the role of expectancies in influencing cognition and attention among healthy individuals who engage in NPS. They were also cautioned of the potential negative medical, legal, and psychological consequences of using non-prescribed stimulant medication. The challenge then directly examined participants' individual subjective reports and cognitive performance under each condition (i.e., placebo MPH or no medication). The purpose was to allow each participant to realize that differences in mood or cognition could only be due to their expectations, since no active drug was ingested. Following the challenge, EC participants again completed the PSEQ-II. Control participants completed the PSEQ-II at the end of their second visit but were not immediately debriefed and did not receive information on expectancy effects.

All participants were contacted by email 6 months after their second visit and asked to complete an online survey regarding NPS over the past 6 months. Participants reported incidence and frequency of NPS, including information on the specific drug used and motivations for use. This survey also reassessed their prescription stimulant-related expectancy effects via the PSEQ-II. After completing this survey, all participants were fully debriefed, provided with information on NPS and expectancy effects, and were encouraged to contact the researchers with any remaining questions.

2.3. Data Analysis

All data were analyzed via SPSS Version 19. Changes in expectancies from baseline (i.e., the start of their first laboratory visit) to post-expectancy challenge (i.e., the end of their second laboratory visit) and the 6-month follow-up across both EC and control groups and

users and non-users were examined with linear mixed effects modeling. Four models were run, one for each of the expectancy factors. Each model included a random intercept to allow individuals to vary about their own individual mean, attributing this variation to sampling error. In addition, models included the fixed effects of time, time² (the quadratic effects of time), experimental condition, whether the individual initiated NPS during the follow-up period, and the following two-way interactions: time by condition, time² by condition, time by use, and time² by use to test whether the effects of the expectancy challenge changed as a function of time and whether expectancies changed differently for those who initiated use compared to those who did not. The quadratic effects of time were included in the model to test for the possibility that changes would occur following the expectancy challenge intervention but not be maintained through the 6-month follow-up. To examine the efficacy of an expectancy challenge on preventing initiation of NPS, a chi-square test was used to determine the proportion of individuals in each group who initiated use during the follow-up period. Finally, four logistic regressions were used to predict NPS at follow-up from baseline expectancies. Statistical significance was evaluated using a cutoff of $p < .05$.

3. Results

Fifty-three participants were initially randomized to each group. Due to attrition, ultimately 47 participants in the experimental group and 49 participants in the control group completed the lab-based visits. These 96 participants were all successfully retained for the remainder of the study and completed the 6-month follow-up. Eighteen participants reported NPS at follow-up. The average length between the participants' last study visit and their follow-up date was 188.44 days ($SD = 10.12$). Groups were not significantly different on any demographic variable (all p s $> .05$) except binge drinking. Participants in the EC condition were more likely to report recent binge drinking ($\chi^2 = 4.00$, $df = 1$, $p = .045$); however, a logistic regression predicting group membership from binge drinking was non-significant (Wald $\chi^2 = .000$, $df = 1$, $p > .05$), with an odds ratio of .000, indicating a very small effect. Demographic information for both conditions is presented in Table 1.

3.1. Effects of the Expectancy Challenge on Expectancies

Changes in expectancy effects over time between groups were examined first as an indicator of the efficacy of the expectancy challenge intervention. The results of the mixed effects models testing the effects of the expectancy challenge on expectancies from baseline through the 6-month follow-up while controlling for whether individuals initiated use during the follow-up period are displayed in Tables 2 and 3. Graphs depicting the raw expectancy data across experimental groups over time are presented in Figure 1.

There was a significant time and time² by condition interaction for Cognitive Enhancement expectancies, indicating that EC participants demonstrated a decrease in the degree to which they endorsed these expectancies from baseline to post-expectancy challenge, whereas the control group did not; however, by the 6-month follow-up, both conditions again endorsed similar levels of Cognitive Enhancement expectancies.

There were no time or time² by condition interactions for Social Enhancement expectancies, nor were there main effects of time or time². However, there was a main effect of condition, indicating EC participants endorsed weaker social enhancement expectancies at all time-points than individuals in the control condition. This parameter remained significant after removing the non-significant interaction terms ($t(96) = -3.52$, $p < .001$).

There were also no time or time² by condition interactions for Anxiety and Arousal expectancies. There were significant main effects of time and time², but no main effect for

condition. After removing the non-significant interaction terms, a significant main effect of condition emerged ($t(96) = -2.05, p = .043$), and the main effects of time and time² remained. These main effects indicate that anxiety and arousal expectancies decreased from baseline to the post-challenge assessment and then increased slightly. Further, the EC condition endorsed weaker anxiety and arousal expectancies than the control group across time.

Finally, there were no time and time² by condition interactions or main effects of time, time², and condition for Guilt and Dependence expectancies. After removing the non-significant interaction terms, main effects of time ($t(192) = -2.18, p = .031$) and time² ($t(192) = 2.14, p = .034$) emerged, but the main effect of condition remained non-significant ($t(96) = -1.54, p = .126$). The main effects of time and time² indicate that participants endorsed weaker guilt and dependence expectancies from baseline to the post-expectancy challenge assessment but then endorsed, on average, slightly stronger guilt and dependence expectancies at the 6-month follow-up.

3.2. Effects of the Expectancy Challenge on Initiation of Use

As expectancy modification should produce changes in drug use, incidence of NPS use at follow-up was analyzed between groups to further examine the efficacy of the expectancy challenge. Nine participants in each group reported initiating NPS during the follow-up period, which was not a significant difference between groups ($\chi^2 = 0.92, df = 1, p = .564$). There were no differences between users and nonusers on any demographic or risk factor indices (all p 's $> .05$). Nearly all individuals (94%) who reported NPS identified cognitive enhancement and assistance studying as their motivation for use. Twenty-two percent of users reported NPS to get high/party and 17% reported mixing prescription stimulants with alcohol or other drugs. Participants primarily reported using Adderall (72%), while 17% reported MPH use. Nearly all participants (90%) reported oral ingestion as their sole route of administration. Thirty-nine percent of users reported believing that they have a diagnosis of ADHD; however, none of the participants acquired a prescription for the medication. Number of times in which participants used a prescription stimulant ranged from 1 to 20 ($M = 5.17, SD = 4.59$), with half of all users reporting use on 4 or fewer occasions.

3.3. Change in Expectancies by User Group

While controlling for experimental group, the relation of using during the follow-up period and expectancy change trajectories were tested in the mixed models described above to examine whether patterns of expectancies differed with use. There were no main effects of use or use by time or time² interactions for cognitive enhancement, social enhancement, or guilt and dependence expectancies (see Tables 2 and 3). There was, however, a main effect of use for anxiety and arousal expectancies, indicating that individuals who initiated NPS during the follow-up period held weaker anxiety and arousal expectancies. After removing the non-significant interaction terms, this main effect remained ($t(96) = -2.40, p = .019$).

3.4. Predicting Use from Baseline Expectancies

Though mixed effects models demonstrated that users held significantly weaker anxiety and arousal expectancies across time, it is important to understand whether these expectancies were in place prior to use. Four logistic regressions predicted use from each of the separate PSEQ-II expectancy factors. Baseline expectancies for cognitive enhancement, social enhancement, and guilt and dependence were not significant predictors of future use (all p 's $> .05$). However, anxiety and arousal expectancies at baseline were a significant predictor of future use (Wald $\chi^2 = 5.73, df = 1, p = .017$). Examination of the odds ratio indicates that for every 1-unit increase in strength of anxiety and arousal expectancies (range = 0 – 22), the odds that a participant engaged in NPS over the follow-up period decreased by 14%. Table 4

displays the logistic regression results for each predictor, including odds ratios and 95% confidence intervals.

4. Discussion

This research is the first to examine prevention of NPS and the first to modify and track expectancies and NPS longitudinally among an at-risk group of college students. Positive cognitive enhancement expectancies were significantly weakened following a brief expectancy challenge intervention. This finding is similar to research on alcohol expectancy challenge interventions that weakened positive expectancies (e.g., Darkes and Goldman, 1993; Lau-Barraco and Dunn, 2008), indicating that prescription stimulant expectancies can be understood and altered to modify use in the same way as alcohol expectancies. The ability to modify cognitive enhancement expectancies is particularly important, especially in light of the finding that nearly all participants who engaged in NPS in this study reported doing so for reasons related to cognitive enhancement. Modifications in cognitive enhancement expectancies were not maintained at 6-month follow-up; however, gains from alcohol expectancy challenge interventions have never been assessed past 2-weeks and 1-month post-intervention. It would be informative to know whether positive prescription stimulant expectancies remain weakened for that same length of time, and if so, whether continued intervention at that point maintains those gains. Though the challenge did not alter the other expectancy factors, it is important to note that the intervention predominantly focused on specifically targeting cognitive enhancement expectancies rather than social enhancement or negative expectancies. Thus, the present intervention was effective in modifying expectancies that were particularly salient to participants, suggesting that additional expectancy factors can likely be modified under similar targeted conditions.

Unfortunately, initiation of NPS did not differ between experimental groups. This study found that among at-risk college students, 19% initiated NPS over a 6-month period. This rate is among the higher levels of prevalence of NPS cited in the literature (e.g., McCabe et al., 2005), though it is exceptionally high as a past-6-month incidence rate. For comparison, the National Surveys on Drug Use and Health found a past-year incidence rate of NPS in 2004 among individuals aged 18–25 to be 1.2% (Colliver et al., 2006), but this was not an at-risk sample. This finding highlights the recent increase in NPS among college students, particularly for Adderall, and the need for prevention and treatment efforts for this population, particularly among individuals who are at high risk for NPS. This result emphasizes the importance of our findings that challenges can alter prescription stimulant expectancies, which might be a prime target of intervention.

Since the expectancy challenge did not significantly alter incidence of use, differences between individuals who used and those who did not were examined to assess expectancy changes between user groups and to elicit predictors of NPS. Surprisingly, positive expectancies did not substantially change over time or differ initially between groups. This result may have been due to a ceiling effect, as all participants initially held strong cognitive enhancement expectancies. Since all participants were at-risk for NPS, this highly homogeneous sample may have failed to produce differences in positive expectancies, even following incidence of NPS, because their similar demographics or experiences may have produced similar patterns of expectancies. Additionally, it is possible that there are several non-users in the study who will use in the near future and hold very similar expectancies as the users, eliminating positive expectancy differences between groups. Examination of changes in prescription stimulant expectancies over longer periods in more heterogeneous samples would be informative.

Examination of expectancies at baseline revealed that stronger negative expectancies about anxiety and arousal were protective against NPS. This expectancy factor includes items related to unpleasant physiological arousal symptoms, such as experiencing racing heart, difficulty calming down, and feeling nervous and edgy. This finding is consistent with previous literature that demonstrates that negative alcohol expectancies predict abstinence (Jones and McMahon, 1996; Leigh and Stacy, 2004) and that negative stimulant expectancies may be particularly important in preventing use (Schafer & Brown, 1991). It is also consistent with research indicating that perceived harmfulness predicts NPS (Arria et al., 2008). However, the other negative expectancy factor of guilt and dependence was not a significant predictor. It is possible that college students do not expect to experience negative affect related to NPS, perhaps due to the legitimate medical uses of MPH. It is also possible that participants may have believed that they had a valid diagnosis of ADHD, which would likely not be associated with guilt or negative affect resultant from using a prescription stimulant. Instead, the belief that one will experience negative physiological symptoms appears to be a more relevant and influential deterrent from engaging in NPS, and should be a focus of intervention in future studies, primarily those focused on prevention.

There are several strengths with respect to this research. This experiment was the first attempt to examine prevention for NPS. Results provide numerous directions for future research, specifically that expectancy modification is possible for prescription stimulants and might prevent or decrease NPS. The study was extremely successful in recruiting participants who were at-risk for NPS, as evidenced by the high incidence rate of NPS at follow-up. It was also extremely successful in retaining participants over the 6-month follow-up period. Data collection via the Internet may be a particularly effective means of retaining subjects over a lengthy follow-up period in future research. This study also recruited a relatively diverse sample in terms of gender and ethnicity. Finally, it is one of only a few studies to examine initiation and predictors of NPS prospectively and the first to do so in an at-risk sample.

The strengths notwithstanding, limitations of this research warrant cautious interpretation. Though this sample is demographically representative of nonmedical prescription stimulant users, this study only assessed a homogeneous group of at-risk college students who did not have prior experience with prescription stimulants. The results may not generalize to high school students, same-aged individuals who are not currently enrolled in college, individuals who are not considered at-risk for NPS, or individuals who have used prescription stimulants. Additionally, this study relied on self-report to determine history of substance use and it is possible that participants may not have been truthful when asked about their experience with prescription stimulants. However, advertisements for this study did not specifically mention prescription stimulant medication in an effort to conceal the purpose of this study and reduce the chance of biased responding during initial screening.

Future research in this area is imperative and should continue to examine the efficacy of expectancy challenges and other prevention and intervention programs for NPS, particularly interventions that target cognitions related to cognitive enhancement and anxiety and arousal symptoms. Future expectancy challenges may need to implement additional intervention sessions, as the current study found that although one 30-minute intervention weakened positive expectancies, it was not sufficient to maintain these gains or prevent NPS. Research should also examine expectancies at more frequent intervals to determine the length of time that gains from the expectancy challenge are maintained. It is important to note that prior expectancy challenges utilized very short follow-up periods and aimed to decrease the frequency of an already established behavior; thus, it is possible that similar expectancy results would have been obtained had the current study employed a shorter follow-up period or assessed symptom reduction rather than incidence of a new behavior.

Importantly, this research revealed that a brief expectancy challenge intervention was responsible for immediately weakening cognitive enhancement expectancies, providing evidence for the utility of this approach, which may be an important component of cognitive therapy for NPS. It also elucidates the importance of including a focus on negative expectancy modification in future studies. An intervention that both challenges expectancies and enhances self-efficacy skills for academic performance may be a particularly effective intervention to be examined in future research, given the widespread use of prescription stimulants to assist with schoolwork.

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Figure 1.

Changes in Prescription Stimulant Expectancy Effects Across Time as a Function of Participating in an Expectancy Challenge Intervention

Note. Graphs depict raw data. Scores on each factor were averaged across the number of items for each factor for ease of direct comparison. Participants in the expectancy challenge condition received the intervention at week 2, indicated by the vertical dashed line.

Table 1

Comparisons of Demographic Indices by Condition

	Experimental: Mean (SD) <i>n</i> = 47	Control: Mean (SD) <i>n</i> = 49
Gender	28 M/19 F	29 M/20 F
Age	19.64 (1.29)	19.51 (1.24)
Years of Education	13.49 (1.08)	13.49 (1.06)
GPA	3.05 (0.48)	3.04 (0.56)
Ethnicity	35 C/3 AA/2 H/3 AS/1 NA/3 M	36 C/5 AA/6 H/1 AS/1 M
Greek Involvement	12.8%	16.3%
Binge Drinking (past 2 weeks)	100% *	91.8%
Marijuana Use (past month)	68.1%	79.6%
Alcohol Abuse	8.5%	10.2%
Alcohol Dependence	23.4%	24.5%
Marijuana Abuse	21.3%	18.4%
Marijuana Dependence	10.6%	18.4%

Note. Gender: M = Male, F = Female. Ethnicity: C = Caucasian, AA = African American, H = Hispanic, AS = Asian, NA = Native American, M = Mixed race. Percentage numbers indicate positive responses.

*
p < .05

Table 2

Linear Mixed Model Results of Expectancy Challenge on Expectancies

Parameter	Cognitive Enhancement					Social Enhancement				
	Estimate	SE	<i>t</i>	<i>df</i>	<i>p</i>	Estimate	SE	<i>t</i>	<i>df</i>	<i>p</i>
Intercept	1.47	0.07	22.17	247.98	<.001	0.79	0.07	11.96	227.64	<.001
Time	0.02	0.04	0.39	192.00	.695	−0.01	0.04	−0.36	192.00	.722
Time ²	−0.001	0.002	−0.52	192.00	.601	0.0004	0.001	0.24	192.00	.813
Condition	−0.07	0.09	−0.75	247.98	.456	−0.26	0.09	−2.94	227.64	.004
Time × Condition	−0.18	0.06	−3.15	192.00	.002	−0.01	0.05	−0.19	192.00	.852
Time ² × Condition	0.01	0.002	3.27	192.00	.001	0.0005	0.002	0.26	192.00	.796
Use	0.07	0.11	0.62	247.98	.535	−0.10	0.11	−0.91	227.64	.363
Time × Use	−0.06	0.07	−0.84	192.00	.402	−0.04	0.07	−0.62	192.00	.537
Time ² × Use	0.002	0.003	0.83	192.00	.408	0.002	0.003	0.76	192.00	.447

Note. Condition was coded 0 for control and 1 for experimental; significance evaluated at a *p*-value of .05, represented by bolded type.

Table 3

Linear Mixed Model Results of Expectancy Challenge on Expectancies

Parameter	Anxiety and Arousal					Guilt and Dependence				
	Estimate	SE	<i>t</i>	<i>df</i>	<i>p</i>	Estimate	SE	<i>t</i>	<i>df</i>	<i>p</i>
Intercept	0.96	0.06	15.64	254.98	<.001	0.74	0.07	9.91	212.51	<.001
Time	−0.11	0.04	−2.73	192.00	.007	−0.04	0.04	−0.91	192.00	.363
Time ²	0.004	0.001	2.66	192.00	.008	0.001	0.002	0.83	192.00	.410
Condition	−0.13	0.08	−1.58	254.98	.116	−0.14	0.10	−1.42	212.51	.158
Time × Condition	−0.01	0.05	−0.24	192.00	.811	−0.06	0.06	−0.99	192.00	.322
Time ² × Condition	0.0006	0.002	0.29	192.00	.775	0.002	0.002	1.14	192.00	.256
Use	−0.27	0.11	−2.57	254.98	.011	−0.07	0.13	−0.52	212.51	.603
Time × Use	0.06	0.07	0.81	192.00	.417	0.01	0.08	0.18	192.00	.860
Time ² × Use	−0.002	0.003	−0.74	192.00	.457	−0.001	0.003	−0.29	192.00	.770

Note. Condition was coded 0 for control and 1 for experimental; significance evaluated at a *p*-value of .05, represented by bolded type.

Table 4

Logistic Regression Analysis Predicting Nonmedical Stimulant Use from Expectancies at Baseline (N = 96)

	<i>B</i>	Wald χ^2	OR (95% CI)
Cognitive Enhancement Expectancies	0.02	0.41	1.02 (0.96 – 1.09)
Anxiety & Arousal Expectancies	−0.15	5.73	0.86 (0.77 – 0.97) *
Social Enhancement Expectancies	−0.07	0.89	0.93 (0.81 – 1.08)
Guilt & Dependence Expectancies	−0.06	0.27	0.95 (0.77 – 1.16)

Note. Nonusers = 0; Users = 1 (indicator variable). OR = odds ratio. CI = confidence interval.

*
 $p < .05$