Published in final edited form as:
J Subst Abuse Treat. 2010 December ; 39(4): 384–390. doi:10.1016/j.jsat.2010.07.001.

Substance Use Patterns Among First-Year College Students: Secondary Effects of a Combined Alcohol Intervention

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Abstract

The current study explored secondary effects of a multi-site randomized alcohol prevention trial on tobacco, marijuana and other illicit drug use among a sample of incoming college students who participated in high school athletics. Students (N = 1275) completed a series of web-administered measures at baseline during the summer before starting college and ten months later. Students were randomized to one of four conditions: a parent-delivered intervention, a brief motivation enhancement intervention (BASICS), a condition combining the parent intervention and BASICS, and assessment only control. A series of ANOVAs evaluating drug use outcomes at the 10-month follow up assessment revealed significant reductions in marijuana use among students who received the combined intervention compared to the BASICS-only and control groups. No other significant differences between treatment conditions were found for tobacco or other illicit drug use. Our findings suggest the potential utility of targeting both alcohol and marijuana use when developing peer and parent-based interventions for students transitioning to college. Clinical implications and future research directions are considered.

Keywords

Substance use; drugs; alcohol; prevention; college students; parents

1. Introduction

The transition from high school to college is a critical developmental period commonly associated with escalations in a range of health-risk behaviors including alcohol, tobacco and illicit drug use (Fromme et al., 2008; White et al., 2006). While national studies indicate 63.1% of college students used alcohol in the past 30 days, 16.6% and 14.5% of students reported past 30-day use of tobacco and marijuana, respectively (American College Health Association, 2009). College students also tend to drink more while smoking cigarettes, are more likely to

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drink on days they smoke, and have higher rates of tobacco and illicit drug use when engaging in heavy episodic drinking (e.g., Midanik et al., 2007). Further, the severity of substance-related consequences is greater for individuals engaging in heavy drinking along with other substance use (e.g., Pape et al., 2009).

Personal feedback interventions (PFIs) based on brief motivational intervention (BMI) targeting problematic drinking among college students have been shown to be efficacious (see Larimer & Cronce, 2002; 2007). Specifically, the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff et al., 1999) has been established as a Tier I intervention by the National Institute on Alcohol Abuse and Alcoholism(NIAAA, 2002) and has been successful in reducing alcohol use in heavy drinking college students (e.g., Larimer et al., 2001; Marlatt et al., 1998). Additionally, emerging evidence suggests the utility of brief interventions in targeting a wider range of substance use, including smoking (McCambridge & Strang, 2004) and marijuana use (D'Amico et al., 2008; Walker et al., 2006). There also exists the potential for alcohol-focused interventions to reduce both the primary behavior of interest (alcohol use), and such secondary health-related behaviors as smoking (e.g., Forsberg et al., 2000) and marijuana use (e.g., Magill et al., 2009). For example, Magill and colleagues (2009) reported reductions in marijuana use following an alcohol BMI among young adults in the emergency department.

Due to the positive associations between heavy drinking patterns, tobacco, and other illicit drug use, consideration of secondary effects of alcohol interventions on substance use are important (McCambridge & Jenkins, 2008). Research has documented both peer and parental influences on college student drinking (e.g., Read et al., 2005; Wood et al., 2001), and preventive peer-delivered BMIs and parent interventions are supported by the existing literature (Larimer & Cronce, 2002; 2007; Turrisi et al., 2001). The purpose of the current investigation was to evaluate secondary effects of a combined parent and peer-based alcohol intervention (Turrisi et al., 2009) on substance use patterns among high-school athletes transitioning to college. As described in Turrisi et al. (2009), evaluation of the combined use of the parent and peer-based interventions on drinking outcomes indicated the combined intervention was efficacious in reducing risky drinking (Turrisi et al., 2009). Additionally, the peer-based intervention had smaller effects than the combined condition on reductions in drinking, and the parent-based intervention alone did not yield significant effects on drinking. However, although evidence suggests high school athletes are at risk for heavy drinking once they transition to college (Turrisi et al., 2004; Wetherill & Fromme, 2007), little is known about other drug use in this population. As the peer and parent-based interventions in the current study were designed to specifically target alcohol use, we conducted exploratory analyses to evaluate whether these interventions, individually or in combination, impacted substance use among students transitioning to college. Given the likelihood students in both the peer and parent interventions received greater exposure to strategies to reduce problematic drinking, we expected their involvement in the combined intervention would result in larger reductions in drug use compared to students in the control group, as well as compared to students in the peer and parent groups exclusively.

2. Method

2.1 Participants and Recruitment

Participants were recruited as part of a longitudinal, multisite study aimed at reducing problematic alcohol use among matriculating college students conducted at both a large, public northeastern university (site A) and a large, public northwestern university (site B) during the summer of 2006. For a more detailed description of the original efficacy study, please refer to Turrisi et al. (2009). Incoming freshmen (N = 4,000) were randomly selected from the registrar's database of incoming students at each site and mailed a letter containing information

about the study and a URL and Personal Identification Number (PIN) to access an online screening survey. All procedures were approved by the Institutional Review Boards at both sites.

Of students providing consent and completing the screening survey (n = 1,803, 45% of those invited to participate), 79% (n = 1,419) reported high school athletic participation (study target population), and 1,275 of the study target population completed the baseline assessment. Following completion of baseline and randomization to condition, parents of teens (N=1,275) were sent a letter explaining the study, a consent form, a $10 check, and asked to complete a survey assessing parent-teen communication. A total of 903 parents (70.8%) consented.

Participants were randomized to one of four intervention conditions: BASICS only, parent only, combined BASICS + parent, or control. Participants also completed a 10-month post-baseline follow up assessment with a retention rate of 86% (*n* = 1096). Compensation for the assessments was as follows: $10 for screening, $25 for the baseline survey, and $35 for the follow-up assessment. Participants who completed the BASICS session were also asked to complete a brief session evaluation for which they received $10.

Participants were 55.6% female (*n* = 709) with 4.5% identified as Hispanic or Latino(a); 79.8% identified as Caucasian, 10.1% Asian, 3.7% Multiracial, 2.0% African American, 0.5% Native Hawaiian or Other Pacific Islander, 0.2% American Indian/Alaskan Native, 3.2% Other and 0.4% did not identify race/ethnicity. These proportions were comparable to the campuses with which respondents were drawn.

2.2 Intervention Procedure

BASICS—BASICS included a 45–60 minute session led by a trained peer facilitator, during which computer-generated motivational feedback based on the participant's baseline assessment was reviewed (Larimer et al., 1998). Feedback components included participant's alcohol use, normative perceptions, expectancy challenge, negative consequences, and protective behavior strategies (Barnett et al., 2007; Larimer et al., 2001; Larimer et al., 2007). Peer counselors presented the information in a motivational interviewing (MI; Miller & Rollnick, 2002) style. Feedback sheets were mailed to participants who were unable to attend the BASICS session (Larimer et al., 2007).

Parent-based intervention (PBI)—Consistent with the parent intervention implemented by Turrisi et al. (2001), parents of participants randomized to PBI were mailed a 35-page handbook during the summer prior to teens' matriculation to college and asked to discuss the information in the handbook with their teen. The handbook included facts about college student drinking, strategies and techniques for communicating with teens in an effective manner, tips on ways to help teens develop assertiveness and resist peer pressure, and in-depth information on how alcohol works on the body. Parents were asked to make notes directly on the handbook materials and to return it by mail. More than 85% of parents reported discussing 21 of the 26 alcohol related topics, while 84% of parents also recorded positive comments throughout the handbook. Similar to the Turrisi et al., (2001) study, this data provide fidelity evidence that parents read the materials and engaged in conversations with their teens.

Combined BASICS and parent intervention—Participants randomized to the combined condition completed both interventions. The parent-based intervention was delivered and completed prior to the students' arrival on campus. The peer-led BASICS intervention was completed once students arrived on campus.

Control group procedures—Participants randomized to the control group were asked to complete all procedures similar to those randomized to the other conditions with the exception

that interventions were mailed and offered following completion of the 10-month follow-up, at the end of the spring semester of their freshman year.

2.3 Measures

Drug use—Items from the Monitoring the Future Survey (Johnston et al., 2008) were administered to assess the use of tobacco, marijuana, LSD, hallucinogens, amphetamines, and steroids. Participants were asked the number of times they used each substance over the past 30-days with responses "zero times", "1–2 times", "3–5 times", "6–9 times", 10–19 times", "20–39 times," and "40 or more times."

Alcohol use—Participants were asked to indicate number of drinks they consumed on each day of a typical week within the past 30 days using the Daily Drinking Questionnaire (DDQ; Collins et al., 1985). Participants' responses were summed for total number of drinks consumed during a typical week. A standard drink definition was included (i.e., 12 oz. beer, 10 oz. wine cooler, 4 oz. wine, 1 oz. 100 proof liquor).

3. Results

3.1 Data Analytic Strategy and Preliminary Analyses

Preliminary analyses were conducted to obtain descriptive statistics for past 30-day baseline and follow-up rates of drug use, and determine baseline equivalence of the sample (see Turrisi et al., 2009). Frequencies of drug use at baseline and 10-month follow up identified an overall reduction in tobacco use with 75.2% reporting no use in the past 30 days (baseline 74.6%). Other drug use (e.g., LSD, hallucinogens, amphetamines and steroids) saw slight, but nonsignificant increases in use at follow-up (all less than 1% change), while students reported an overall increase in marijuana use at follow-up. Specifically, students' non-use of marijuana decreased from 82% to 79%. In comparison to national trends in substance use patterns among students of this age, the current sample reported slightly lower levels of drug use than data reported in the Monitoring the Future Study (Johnston, O'Malley, Bachman, & Schulenberg, 2008). Despite the slight differences in reported use, the sample is representative of individuals matriculating to college. Means and standard deviations for baseline and 10-month follow up drug use are presented in Table 1.

Analysis of variance was used to evaluate mean differences in past 30-day drug use at follow-up by treatment condition, controlling for baseline drug use. Gender and past 30-day average drinks per week were also explored as moderators of the relationship between intervention group and drug use outcomes using ANCOVAs, and we also evaluated group differences in drug use initiation rates at follow up among baseline abstainers.

3.2 Primary Analyses

Intervention Effects on Drug Use—Results of the ANOVAs indicated a significant treatment effect on past 30-day marijuana use at the 10-month follow-up time point, $F(3, 1077) = 2.63$, $p < .05$. Given the four group study design, Tukey's HSD mean difference tests were conducted to interpret the nature of the significant treatment effects. Specifically, students in the BASICS and control groups reported more frequent marijuana use at follow-up compared to students in the combined intervention who showed no change in their marijuana use. No other significant treatment effects were found for any additional drug use outcomes at the 10-month follow-up (all ps $> .05$).

3.3 Secondary Analyses

Moderators of Intervention Effects—Results indicated no significant group by gender interactions, and analyses also revealed non-significant interactions between baseline drinking and intervention effects for all outcomes (all *p*s > .05).

Initiation Rates Following Intervention—We also conducted analyses to determine whether rates of initiation of tobacco, marijuana, and other drug use following the intervention among students who reported no lifetime use at baseline differed based on treatment condition. Chi-square analyses revealed no significant differences in initiation rates across treatment groups for any class of substance use (all *p*s > .05).

4. Discussion

4.1 Key Findings and Clinical Implications

This study sought to determine whether a combined parent and peer alcohol intervention exhibited secondary effects on substance use patterns among incoming college students who participated in high school athletics. Evaluation of treatment group differences in 30-day substance use at the ten-month follow up assessment revealed students who received the combined intervention used marijuana significantly less frequently compared to those receiving

BASICS alone and the control group. Specifically, students in the BASICS and control groups reported more frequent marijuana use at follow-up compared to students in the combined intervention who did not increase their marijuana use. No other significant group differences in drug use at follow-up, including initiation rates among baseline abstainers, were found. Results of additional analyses indicated neither gender nor baseline drinking patterns moderated the secondary intervention effects on substance use patterns at follow up.

While marijuana and other drug use were not specific targets of the peer or parent alcohol interventions, previous research has demonstrated secondary effects of brief alcohol interventions on marijuana use (Magill et al., 2009) and cigarette smoking (Forsberg et al., 2000). Results of the present study are promising in light of the deleterious consequences of problematic alcohol and marijuana use among college student populations (Simons & Carey, 2006). The mechanisms by which marijuana use showed a trend to decrease are unclear since no formal intervention content targeting other drug use was included in either the parent or BASICS intervention. The parent handbook was designed to encourage parents to openly communicate with their teens about alcohol use, which may in turn have led to more extensive conversations about other drug use and related implications. Due to the nature of the peer-led motivational enhancement intervention, peer counselors in the BASICS sessions may have engaged in topics beyond alcohol use in order to meet the needs of individual students. Given the secondary effects were found in the combined parent and BASICS condition, it seems plausible that interventions targeting alcohol and drug use behaviors in transitioning college students requires multiple approaches.

4.2 Limitations and Future Directions

While the current study is the first to our knowledge to document secondary effects of a combined parent and peer intervention on drug use among high school athletes transitioning to college, limitations should be considered. As with any data based on self report, biases are always a concern. However, assurances of confidentiality were stated throughout the survey and consent form, and individuals were able to respond via a web-based survey rather than an in-person interview. A measure of social desirability was included, and consistent with previous research (Laforge et al., 2005), we found no evidence of self-report bias. Next, as the

results are exploratory in nature and the p-value was not adjusted despite the use of multiple tests, we acknowledge this as a limitation of the findings. However, as this is the first known study to explore secondary effects of an alcohol intervention on other substance use we believe the results offer some evidence of the potential dual influence of a brief alcohol intervention with college students. Further, although a potential mediator of substance use reduction may have been reduction in alcohol use, this possibility was not tested in the current study. We are therefore limited in our ability to explore this as a mechanism of change. Future research should more clearly allow for such analyses and interpretation. Additionally, the current secondary analysis did not evaluate intervention processes through which the combined intervention may have influenced marijuana use, and thus results should be considered preliminary. Future research evaluating relationships between in-session behaviors and outcomes would inform how peer delivered interventions could be improved to augment efficacy across a wider range of health-risk behaviors. Additionally, although no significant differences in tobacco use emerged across intervention groups, it is surprising that tobacco use among students in the combined intervention exhibited a trend to increase at the 10-month follow up assessment. It is unclear whether this finding reflects students' use of cigarettes/and/or chewing tobacco, and future studies should include independent assessments of smoking and chewing tobacco. Given the deleterious health consequences of co-occurring alcohol and tobacco use among college students, further research on their co-variation is warranted to inform prevention efforts.

Despite these limitations, it seems promising that a combined intervention focused solely on alcohol use also reduced marijuana use among first-year college students. Results of the current study inform the development and implementation of brief screening and intervention procedures to address alcohol and other substance use among incoming college students. Given high rates of marijuana use and related negative consequences and impact on student success and retention (Montgomery & Hammerlie, 1993; Wood et al., 2000) future interventions may consider a combined focus on alcohol and marijuana use. This may improve intervention effects and have a lasting impact on reduced health risks, behavioral problems, and academic functioning.

Acknowledgments

This research was supported in part by a grant from the National Institute on Alcohol Abuse and Alcoholism R01 AA 12529 awarded to Rob Turrisi.

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Table 1

Means and Standard Deviations for Past 30-day Drug Use by Intervention Group – Intent to Treat at Baseline and Follow-Up

Outcome		Combined (*n* = 342) *M (SE)*	BASICS (*n* = 277) *M (SE)*	Parent (*n* = 316) *M (SE)*	Control (*n* = 340) *M (SE)*	
Tobacco	b	1.48 (1.08)	1.53 (1.25)	1.52 (1.12)	1.59 (1.27)	
	f	1.59 (1.29)	1.54 (1.23)	1.50 (1.12)	1.56 (1.31)	0.99^{ns}
Marijuana	b	1.37 (0.94)	1.34 (0.99)	1.33 (0.84)	1.29 (0.84)	
	f	1.33^{ab} (0.90)	1.52 (1.23)	1.38 (.91)	1.44 (1.09)	2.63^{*}
LSD	b	1.01 (0.16)	1.00 (0.00)	1.01 (0.17)	1.01 (0.11)	
	f	1.00 (0.06)	1.03 (0.34)	1.02 (0.23)	1.00 (0.06)	1.21^{ns}
Hallucinogens	b	1.02 (0.19)	1.00 (0.00)	1.02 (0.23)	1.02 (0.19)	
	f	1.01 (0.10)	1.03 (0.21)	1.03 (0.25)	1.02 (0.14)	0.499^{ns}
Amphetamines	b	1.04 (0.40)	1.03 (0.31)	1.02 (0.24)	1.04 (0.38)	
	f	1.04 (0.34)	1.05 (.030)	1.05 (0.39)	1.05 (0.39)	0.23^{ns}
Steroids	b	1.01 (0.16)	1.00 (0.00)	1.01 (0.17)	1.01 (0.11)	
	f	1.01 (0.12)	1.03 (0.40)	1.03 (0.26)	1.00 (0.00)	0.935^{ns}

Note.*F*test of mean differences controlling for baseline use; ns= non-significant

$^{*}p < .05$.

^{a}Indicates mean difference as compared to control group.

^{b}Indicates mean difference as compared to BASICS group.

Appendix I

CONSORT Table

PAPER SECTION And topic	Item	Description
TITLE & ABSTRACT	1	How participants were allocated to interventions (*e.g.*, "random allocation", "randomized", or "randomly assigned").
INTRODUCTION Background	2	Scientific background and explanation of rationale.
METHODS Participants	3	Eligibility criteria for participants and the settings and locations where the data were collected.
Interventions	4	Precise details of the interventions intended for each group and how and when they were actually administered.
Objectives	5	Specific objectives and hypotheses.
Outcomes	6	Clearly defined primary and secondary outcome measures and, when applicable, any methods used to enhance the quality of measurements (*e.g.*, multiple observations, training of assessors).
Sample size	7	How sample size was determined and, when applicable, explanation of any interim analyses and stopping rules.
Randomization -- Sequence generation	8	Method used to generate the random allocation sequence, including details of any restrictions (*e.g.*, blocking, stratification)
Randomization -- Allocation concealment	9	Method used to implement the random allocation sequence (*e.g.*, numbered containers or central telephone), clarifying whether the sequence was concealed until interventions were assigned.
Randomization -- Implementation	10	Who generated the allocation sequence, who enrolled participants, and who assigned participants to their groups.
Blinding (masking)	11	Whether or not participants, those administering the interventions, and those assessing the outcomes were blinded to group assignment. When relevant, how the success of blinding was evaluated.
Statistical methods	12	Statistical methods used to compare groups for primary outcome(s); Methods for additional analyses, such as subgroup analyses and adjusted analyses.
RESULTS Participant flow	13	Flow of participants through each stage (a diagram is strongly recommended). Specifically, for each group report the numbers of participants randomly assigned, receiving intended treatment, completing the study protocol, and analyzed for the primary outcome. Describe protocol deviations from study as planned, together with reasons.
Recruitment	14	Dates defining the periods of recruitment and follow- up.
Baseline data	15	Baseline demographic and clinical characteristics of each group.
Numbers analyzed	16	Number of participants (denominator) in each group included in each analysis and whether the analysis was by "intention-to-treat". State the results in absolute numbers when feasible (*e.g.*, 10/20, not 50%).
Outcomes and estimation	17	For each primary and secondary outcome, a summary of results for each group, and the estimated effect size and its precision (*e.g.*, 95% confidence interval).
Ancillary analyses	18	Address multiplicity by reporting any other analyses performed, including subgroup analyses and adjusted analyses, indicating those pre-specified and those exploratory.
Adverse events	19	All important adverse events or side effects in each intervention group.
DISCUSSION Interpretation	20	Interpretation of the results, taking into account study hypotheses, sources of potential bias or imprecision and the dangers associated with multiplicity of analyses and outcomes.
Generalizability	21	Generalizability (external validity) of the trial findings.
Overall evidence	22	General interpretation of the results in the context of current evidence.