Reductions in Drinking and Alcohol-Related Harms Reported by First-Year College Students Taking an Online Alcohol Education Course: A Randomized Trial

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A randomized control trial was conducted at a midsized private university in the Northeast to evaluate the short-term impact of AlcoholEdu for College 8.0, an online alcohol course for first-year students. In September 2007, 1,620 matriculated first-year students were randomly assigned to either a treatment group or an assessment-only control group. Both groups of students completed a baseline survey and knowledge test. Treatment group students finished the course, took a second knowledge test, and 30 days later completed a postintervention survey. Control group students completed the postintervention survey and knowledge test during the same time period. Compared with the control group, treatment group students reported a significantly lower level of alcohol use, fewer negative drinking consequences, and less positive alcohol-related attitudes. AlcoholEdu 8.0 had a positive impact on the first-year students' alcohol-related attitudes, behaviors, and consequences. Additional investigations of online alcohol education courses are warranted.

Student drinking remains a growing social problem on American college campuses. In 2005, an estimated 1,825 students ages 18–24 died from alcohol-related unintentional injuries, compared with 1,440 in 1998 (Hingson, Zha, & Weitzman, 2009). In 2001, approximately 599,000 full-time students attending 4-year institutions were injured because of drinking, 696,000 were hit or assaulted by another drinking college student, and 97,000 were victims of alcohol-related sexual assault (Hingson et al., 2009).

In 2002, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) Task Force on College Drinking issued recommendations for effective prevention (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2002). The task force noted that basic awareness and education programs, although a major part of prevention work on most campuses, had been found to be ineffective when used in isolation (Larimer & Cronce, 2002, 2007). Such efforts include orientation sessions for new students, alcohol awareness weeks, and curriculum infusion, with instructors introducing alcohol-related material into their regular courses (Larimer & Cronce, 2002, 2007).

The Task Force found strong evidence of effectiveness for intervention programs used with students who are problem drinkers. For example, Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999), which is based on a longer, multisession program, the Alcohol Skills Training Program (ASTP; Baer et al., 1992), uses two brief sessions to give students feedback and help them craft a plan to reduce their alcohol consumption. High-risk drinkers who participated in the BASICS program significantly reduced their drinking relative to a control group, a change that persisted even 4 years later (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001).

Recent years have seen the development of several computer-based interventions to reduce college student drinking and its negative consequences (Elliott, Carey, & Bolles, 2008). Most 4-year institutions now provide students with Internet access, making this an ideal channel for implementing individual-level interventions.

Many of these interventions offer the computerized equivalent of a brief motivational interview, with students completing a short survey and then receiving personalized feedback. Feedback for high-risk drinkers is designed to motivate changes in alcohol use patterns (Walters, Miller, & Chiauzzi, 2005). The commercially available program e-CHUG (Electronic Check-Up to Go) is one example. A randomized control trial showed that, after 8 weeks, heavy drinkers who took e-CHUG, compared with an assessment-only control group, showed greater reductions in drinks per week and peak blood alcohol concentration, but not alcohol-related problems. By week 16, however, the assessment-only group reached the same level of improvement (Walters, Vader, & Harris, 2007).

Other computerized interventions are alcohol prevention courses. For example, College Alc covers alcohol knowledge, risky behaviors, and harm prevention strategies. A randomized control trial revealed that, compared with control group students, those taking the course did not report decreased alcohol use after 3 months (Paschall, Bersamin, Fearnow-Kenney, Wyrick, & Currey, 2006). Subsequent analyses showed that College Alc students with a previous drinking history did report greater decreases in heavy drinking and negative alcohol-related consequences. In contrast, students who did not have a previous drinking history reported increased negative consequences (Bersamin, Paschall, Fearnow-Kenney, & Wyrick, 2007).

A more widely used online alcohol education program is AlcoholEdu for College, developed by Outside the Classroom, Inc., which was designed for the entire

population of first-year college students. Intervention prior to matriculation or shortly thereafter is critical, as the first term in college often sets the stage for alcohol abuse patterns that persist during the college years (Reifman & Watson, 2003). Many students begin college with an established pattern of high-risk drinking, but many others initiate excessive alcohol consumption shortly after arriving on campus (Weitzman, Nelson, & Wechsler, 2003).

In 2007, AlcoholEdu for College 8.0 included a baseline knowledge test; a baseline survey of attitudes, behavior, and consequences; four content chapters, with customized pathways based on gender and reported drinking patterns; a course evaluation; a postintervention knowledge test; and a postintervention survey, similar to the baseline survey, which was completed 4–6 weeks after the course. Pedagogical strategies included lecture with synchronized slides, streaming videos, case studies, and interactive exercises for practicing healthy decision-making skills.

AlcoholEdu incorporates key program elements found in successful intervention programs identified by the NIAAA Task Force, but with content suitable for all first-year students, not just problem drinkers. Areas of focus include factors that cause blood alcohol concentration (BAC) to rise rapidly and consequences associated with varying BAC levels (NIAAA, 2000); negative health, safety, and academic consequences of heavy drinking, plus the benefits of abstaining or drinking at safer levels (Perkins, 2002); challenges to positive expectancy beliefs regarding the behavioral, emotional, and cognitive effects of alcohol (Baer, 2002); social and media influences on student alcohol use (Saffer, 2002); accurate student drinking norms, to correct students' exaggerated misperceptions (Perkins, Meilman, Leichliter, Cashlin, & Presley, 1999); current alcohol and drunken driving laws (National Alcohol Beverage Control Association [NABCA], 2008); and cognitive and behavioral strategies for reducing alcohol use and keeping BAC in a safer range (Castro & Foy, 2002; Marlatt, 1998). AlcoholEdu's philosophy is to provide students with the information they need to make informed choices about drinking.

Only two evaluations of AlcoholEdu have been published. One investigator employed an institutional cycle design, involving first-year students from 225 institutions, to assess version 4.0 of the course (Wall, 2007). Students who completed the course randomly were assigned post hoc to a treatment or control group, with the control group's baseline survey assessed against the treatment group's postintervention survey. Compared with the control group, the treatment group reported less frequent heavy drinking (5+ drinks at least once in a 2-week period); less frequent high-risk drinking (playing drinking games, pregaming, choosing a drink with more alcohol), and fewer negative academic consequences (missing class, being unfocused in class, being unprepared for class, missing a deadline, attending class drunk, attending a class hung over).

To evaluate a customized version of AlcoholEdu 4.0, another research team conducted a randomized control trial at a large private university in the Northeast (Croom et al., 2009). On a postintervention survey, students assigned to the treatment group reported playing drinking games less frequently than those assigned to the control group, but there were no other significant differences in attitudes, behavior, or negative alcohol-related consequences. This evaluation has several weaknesses. Foremost, the randomization procedure appears to have failed, as there were several highly significant baseline differences between the treatment and control groups. This problem was compounded by the researchers' failure to employ analysis of covariance (ANCOVA) when examining the postintervention outcomes, a

standard analysis procedure that controls statistically for baseline differences between experimental groups (Wildt & Ahtola, 1978).

The current investigation reports the results of a randomized control trial to evaluate the short-term impact of AlcoholEdu for College 8.0, with students randomly assigned to treatment and assessment-only control groups.

Methods

The study was conducted during the early fall semester of 2007 at a midsized private university in the Northeast. The study procedure was approved by the Institutional Review Boards for both the host university and the University of Scranton.

The study participants were full-time first-year students. All participants had to be over the age of 18 in order to provide informed consent without parental permission. The students were randomly assigned to either the treatment group ($n = 810$), which received AlcoholEdu 8.0, or the assessment-only control group ($n = 810$).

Both experimental groups completed a baseline survey on alcohol-related attitudes, behaviors, and consequences and a knowledge test (September 4–18). The treatment group students went on to take the course and then completed a course evaluation survey and a second knowledge test.

Thirty days later, the treatment group students received an email asking them to finish the course, which included the postintervention survey and a short curriculum review. The control group completed the second knowledge test and the postintervention survey during the same time period (October 9–23).

The university mandated all freshmen to complete the course. The Director of Health Promotion monitored whether students met this requirement and referred violators to the Dean of Students for disciplinary action. Control group students could take the course immediately after the postintervention survey and received instructions to do so by the end of the calendar year.

Although taking the course was mandatory, participating in the study was not. Students could email the lead researcher if they did not want their data included in the study, but none did so. Participating students received a free t-shirt and had their names entered into a raffle for a pair of university basketball tickets and 20 gift cards from two national eateries.

Note that both groups of students may have participated in additional educational programming about alcohol, drugs, sexual health, and sexual assault, including a student orientation session, a first-year experience class, information disseminated by residence hall assistants, and a poster with alcohol facts and tips, which students were encouraged to display in their rooms by the prospect of special prizes.

Knowledge Tests

The baseline knowledge test consisted of 20 multiple choice questions, each with four potential answers. Each student's score was the percentage of questions answered correctly. The test assessed students' knowledge about alcohol, including the standard drink definition; factors that affect BAC; the short- and long-term effects of alcohol on the body; facts about negative consequences, including blackouts and hangovers; danger signs of alcohol poisoning; and prevalence rates for alcohol abstention, high-risk drinking, and alcohol-related sexual assaults. The postintervention

knowledge test included 30 new questions that covered similar content. Again, each student's score was the percentage of questions answered correctly.

Surveys

The baseline survey asked students about their attitudes toward drinking; negative and positive expectancies regarding alcohol use; alcohol-related behaviors, both during high school and currently; negative alcohol consequences; substance use behaviors; future behavioral intentions related to alcohol use; and demographic information (gender, race/ethnicity, U.S. citizenship status, age, college living arrangements, participation in athletics, fraternity/sorority affiliation, employment status, and hours spent per week studying or preparing for class, working at a paid job, and volunteering). The postintervention survey, given 30 days after the course, did not include the questions asking about high school experiences or demographics.

Both the baseline and postintervention surveys asked students to report the average number of drinks they typically have when they drink. The survey also used a calendar-based question for students to report how many drinks they had on each of the past 14 days. A standard drink was defined as a 12-ounce beer, an 8.5-ounce malt beverage, a 12-ounce wine cooler, a 5-ounce glass of wine, or 1.5 ounces of liquor, whether in a mixed drink or as a shot. Their responses were used to create two variables: total number of drinks consumed in the past 2 weeks, and whether students reported one or more occasions of heavy, episodic drinking in the past 2 weeks, defined for men as having five or more drinks, and defined for women as having four or more drinks, on a single occasion one or more times in the past 2 weeks (Wechsler, Dowdall, Davenport, & Rimm, 1995).

Data Confidentiality

Students entered the course using the university's assigned login ID and then used their university e-mail address to create a personal account. The account creation process is protected using SSL encryption. In order to track a student's progress in the course, it is necessary to link the student's personal account number and email address. Importantly, student email addresses are dissociated from survey responses stored in Outside the Classroom's database, which is firewall protected. Accordingly, a student's individual survey responses cannot be traced back to an identifying email address.

Data Analysis

All data analyses were conducted with SPSS Version 16.0 for Windows (SPSS Inc., Chicago, IL). Descriptive statistics were used to develop frequency tables and calculate unadjusted means for both the treatment and control groups. Chi-square tests and one-way analysis of variance (ANOVA) were used to examine possible baseline differences between the two groups. Kruskal-Wallis one-way ANOVA tests were used for missing values analyses to examine student attrition from the study.

Using the baseline survey data, we employed a principal components factor analysis (varimax rotation with Kaiser normalization) to determine whether the items associated with drinking-related behaviors, consequences, and attitudes could

be combined to create composite variables. Nine such variables were created and are described in the Results section. For each variable, Cronbach's alpha coefficients were calculated, and then an average score for the component items was calculated for each student for both the baseline and postintervention surveys.

The impact of the course was assessed using one-way analysis of covariance (ANCOVA). All demographic variables, baseline knowledge (based on the first knowledge test), and baseline drinking outcomes were considered as covariates. Based on those analyses, all ANCOVA analyses reported here controlled for gender, race/ethnicity, baseline knowledge, and baseline alcohol use (total number of drinks consumed in the past 2 weeks). In addition, ANCOVA analyses conducted on each composite variable also controlled for baseline scores on that variable. The reported degrees of freedom vary across these analyses, as students were not compelled to complete all survey items. Note that, when analyzing a constructed composite variable, a student was not included if data for any of the component items were missing. A covariate was retained in the final model if its *p* value was less than .05. Finally, *p* values less than .05 were considered statistically significant.

Results

The treatment group had 760 students who completed the baseline survey; 740 completed the postintervention survey (or 91.4% of the original sample, $n = 810$). The control group had 682 students who completed the baseline survey; 548 completed the postintervention survey (or 67.7% of the original sample, $n = 810$). Of the 1,442 total participants, 54.3% were female, 80.5% were White, 83.6% were age 18, 90.1% lived in a regular on-campus residence hall, 35.8% participated in athletics, and only 5.2% were affiliated with a fraternity or sorority.

Across the two groups combined, there were 150 students who did not complete the postintervention survey, with 137 of those being in the control group. Kruskal-Wallis one-way ANOVA or chi-square tests were used to examine the potential impact of student attrition from the study, with a focus on student alcohol use, the main outcome of interest. In fact, across the two groups combined, students who did not complete the postintervention survey drank *less* at baseline than those who did complete it ($n = 1,288$): (1) total number of drinks consumed in the past 2 weeks, Kruskal-Wallis $\chi^2(1) = 11.71$, $p = .001$; and (2) the proportion of students engaging in heavy, episodic drinking in the past 2 weeks, $\chi^2(1) = 27.90$, $p = .001$.

Importantly, chi-square tests established that there were no statistically significant differences at baseline between the treatment and control group in terms of gender ($p = .136$), race/ethnicity ($p = .272$), or age ($p = .212$). Likewise, one-way ANOVAs showed that there were no statistically significant differences at baseline between the treatment and control groups for baseline knowledge test scores ($p = .345$), total number of drinks consumed in the past 2 weeks ($p = .842$), or the proportion of students engaging in heavy, episodic drinking in the past 2 weeks ($p = .116$).

Knowledge Test

The analysis compared the percentage of questions that students answered correctly on the baseline and postintervention knowledge tests. At baseline, the control group had a mean score of 52.9% (SD = 15.1); the postintervention mean score was 75.6% (SD = 13.4). At baseline, the treatment group had a mean score of 53.6%

(SD = 14.6); the postintervention mean was 77.0% (SD = 12.0). An ANCOVA was conducted, controlling for gender, race/ethnicity, baseline knowledge, and baseline alcohol use (total number of drinks consumed in the past 2 weeks). The treatment group had a significantly higher postintervention knowledge score than the control group, $F (1,1286) = 4.039$, $p = .04$.

Student Alcohol Use

Table 1 shows the unadjusted means for both the treatment and control groups and the ANCOVA results for the two drinking-related outcome measures. All ANCOVA analyses controlled for gender, race/ethnicity, baseline knowledge, and baseline alcohol use (total number of drinks consumed in the past 2 weeks).

Total Number of Drinks Consumed in the Past 2 Weeks
Both groups reported increased drinking on the postintervention survey, but the treatment group reported significantly less alcohol use than the control group.

Heavy, Episodic Drinking in the Past 2 Weeks
There was a similar pattern of results for the proportion of students engaging in heavy, episodic drinking in the past 2 weeks. Both groups saw an increase over time; however, at postintervention the treatment group reported a significantly lower proportion of students engaging in heavy, episodic drinking than the control group.

Alcohol-Related Behaviors, Consequences, and Attitudes

A principal component factor analysis of baseline survey items related to drinking-related behaviors, consequences, and attitudes led to the creation of nine composite variables. Factor loadings are reported below for each component item. Overall, the Cronbach alpha coefficients ranged between 0.61 and 0.91. For each variable, an average score for the component items was calculated for each student for both the baseline and postintervention surveys.

High-Risk Alcohol Behaviors
Both surveys asked, "During the past two weeks, if you were drinking, to what degree did you do the following?" (1 = Never, 7 = Always). The four items loading on this factor were: do shots (.70), start drinking before going out (.68), play drinking games (.63), and choose a drink containing a higher alcohol concentration (.58). The Cronbach alpha was 0.70. At postintervention there was no significant difference between the two experimental groups.

Protective Alcohol Behaviors
This factor involved items with the same question stem. The five items loading on this factor were: think about your BAC in order to reduce the risks or harm associated with alcohol consumption (.76), set a personal limit of how many drinks you will have (.75), keep track of how many drinks you have had (.65), alternate alcoholic drinks with water or other nonalcoholic beverages (.61), and choose a drink containing a lower alcohol concentration (.59). The Cronbach alpha was 0.74. At postintervention there was no significant difference between the two experimental groups.

Table 1. Unadjusted means and analyses of covariance (ANCOVA) for the knowledge test, student alcohol use, and drinking-related behaviors, consequences, and attitudes

Variable[a]	Control group (assessment only)		Treatment group (AlcoholEdu)		ANCOVA[b]	
	Baseline M (SD)	Post-intervention M (SD)	Baseline M (SD)	Post-intervention M (SD)	F-statistic (df,df)	p value
Total number of drinks past 2 weeks[c]	11.59 (14.08)	19.62 (16.71)	11.77 (16.24)	16.04 (17.05)	9.22 (1,824)	.002
Proportion of heavy, episodic drinkers[c,d]	0.34 (0.48)	0.68 (0.47)	0.38 (0.49)	0.57 (0.49)	22.76 (1,709)	.008
High-risk alcohol behaviors[c]	3.90 (1.20)	3.89 (1.28)	4.10 (1.20)	3.96 (1.17)	1.21 (1,399)	ns
Protective alcohol behaviors[e]	4.43 (0.99)	4.03 (1.12)	4.48 (0.95)	4.41 (1.19)	0.27 (1,395)	ns
Responsible alcohol behaviors[e]	5.58 (1.16)	5.48 (1.28)	5.55 (1.20)	5.12 (1.30)	7.36 (1,395)	.006
Drinking-related behavioral consequences[e]	1.57 (0.74)	2.16 (1.09)	1.83 (0.89)	1.48 (1.22)	6.04 (1,675)	.009
Drinking-related psychological consequences[e]	2.23 (1.30)	2.44 (1.41)	2.27 (1.29)	2.50 (1.45)	0.15 (1,395)	ns
Acceptance of others' alcohol use[e]	3.79 (1.45)	4.54 (1.65)	3.63 (1.39)	3.48 (1.63)	9.32 (1,1276)	.002
Acceptance of others' everyday alcohol use[e]	2.57 (1.01)	2.21 (1.15)	2.47 (1.02)	2.22 (1.24)	1.91 (1,1276)	ns
Positive expectancies of alcohol use[e]	4.24 (1.19)	4.01 (1.31)	4.21 (1.22)	3.92 (1.34)	6.76 (1,1271)	.016
Negative expectancies of alcohol use[e]	3.50 (1.21)	3.25 (1.32)	3.76 (1.30)	3.65 (1.37)	1.91 (1,1270)	ns

[a]See the Methods section for definitions of the variables.
[b]Reported degrees of freedom vary, as students were not compelled to complete every survey item. ns = not statistically significant.
[c]ANCOVA controlled for gender, race/ethnicity, baseline knowledge, and baseline alcohol use (total number of drinks consumed in the past 2 weeks).
[d]Controlled for baseline alcohol use by using the proportion of heavy, episodic drinking.
[e]For composite variables, a student was excluded if data for any of the component items were missing. ANCOVA controlled for gender, race/ethnicity, baseline knowledge, baseline alcohol use (total number of drinks consumed in the past 2 weeks), and baseline scores on the variable.

Responsible Drinking Behaviors

This factor also involved items with the same question stem. The three items loading on this factor were: eat food or a meal before drinking (.78), intentionally not eat food or a meal before drinking (−.55), and pace your drinking (.53). The Cronbach alpha was 0.61. ANCOVA indicated a statistically significant difference between the treatment and control groups. Students in both groups reported fewer responsible drinking behaviors over time. Contrary to expectation, however, the treatment group reported larger decreases in responsible drinking behaviors than the control group.

Drinking-Related Behavioral Consequences

The surveys asked, "During the past two weeks, to what degree did the following happen to you when drinking or as a result of your drinking?" (1 = Never, 7 = Always). The 11 items loading on this factor were: drive after or while drinking (.85), intentionally injure others (.78), ride with a driver who had been drinking (.78), miss a class (.78), have unprotected sex (.77), attend a class unprepared (.75), have difficulty concentrating in class (.69), accidentally injure yourself or others (.61), say things that you did not mean that hurt others' feelings (.58), vomit (.52), and be more argumentative (.50). The Cronbach alpha was 0.91. ANCOVA indicated a statistically significant difference between the treatment and control groups. Students in the treatment group reported a postintervention decrease in drinking-related consequences, while students in the control group reported an increase.

Drinking-Related Psychological Consequences

This factor involved items with the same question stem. The four items loading on this factor were: embarrass yourself (.74), have to be prompted to remember something you did (.66), do things you regretted (.63), and not remember things you did or places you went (.61). The Cronbach alpha was 0.86. At postintervention there was no significant difference between the two experimental groups.

Acceptance of Others' Alcohol Use

This composite variable has eight items drawn from multiple questions. First, both surveys asked students to what degree it is acceptable for people to engage in several alcohol use behaviors (1 = Never, 7 = Always). The items loading on this factor were: play drinking games (.80), have a few drinks but not get drunk (.64), drink on weekends but not get drunk (.63), and compete with others on how much alcohol can be consumed (.52). Second, the surveys asked students to what degree they prefer to attend parties/events involving varying degrees of alcohol use (1 = Not at all, 7 = A lot). The two additional items loading on this factor were: most people get drunk (.81) and some people get drunk (.79). Third, the surveys asked, "In comparison to other students on your campus, to what degree are you more or less accepting of the use of alcohol? (1 = Far less accepting, 7 = Far more accepting). This item also loaded on this factor (.72). Finally, the surveys asked, "What proportion of students on your campus do you think share the same views towards alcohol use as you do?" (1 = None, 4 = About half, 7 = All). Note that abstainers or light drinkers would be expected to say that relatively fewer of their peers shared their views. This item also loaded on this factor (.70). The Cronbach alpha was 0.87. ANCOVA indicated a statistically significant difference between the treatment and control groups. Students in the treatment group reported a postintervention decrease in acceptance of

others' alcohol use behaviors, while students in the control group reported an increase.

Acceptance of Others' Everyday Alcohol Use

As noted, both surveys asked to what degree it was acceptable for people to engage in several alcohol use behaviors (1 = Never, 7 = Always). The four items loading on this factor were: drink every day and not get drunk (.75), drink alone (.70), drink on school nights but not get drunk (.67), and get drunk on school nights (.57). The Cronbach alpha was 0.80. At postintervention there was no significant difference between the two experimental groups.

Positive Expectancies of Alcohol Use

Both surveys asked students whether they would be more likely to experience certain effects "under the influence from drinking alcohol" (1 = Strongly disagree, 7 = Strongly agree"). The eight items loading on this factor were: feel less stressed (.72), be outgoing in social situations (.71), feel connected with or close to the people around me (.70), find it easier to express my feelings (.69), feel attractive (.67), pursue someone I am interested in (.64), forget about my problems (.62), and forget about the problems of the world (.61). The Cronbach alpha was 0.88. ANCOVA indicated a statistically significant difference between the treatment and control groups. Both groups reported decreased positive expectancies, but at postintervention the treatment group showed lower positive expectances than the control group.

Negative Expectancies of Alcohol Use

This factor involved items with the same question stem. The 12 items loading on this factor were: do things I wish I hadn't done (.78), be argumentative (.76), feel nauseated or vomit (.71), make sexual decisions that I would regret (.75), be physically aggressive (.72), lose control of my emotions (.71), neglect my academic obligations (.69), forget what I studied (.65), end up with a hangover (.64), be unable to limit my consumption (.65), pursue an opportunity to have sex (.64), and blame my actions on my drinking (.59). The Cronbach alpha was 0.90. At postintervention there was no significant difference between the two experimental groups.

Discussion

Overview

AlcoholEdu for College 8.0 had a positive impact on first-year students' alcohol-related attitudes, behaviors, and consequences.

AlcoholEdu students reported a significantly greater reduction in alcohol use than students in the assessment-only control condition, as measured by student reports of the average number of drinks they typically have when they drink, total number of drinks consumed in the past 2 weeks, and the proportion of students reporting one or more occasions of heavy, episodic drinking in the past 2 weeks.

Looking at the composite variables, AlcoholEdu students were found to be less likely to experience alcohol-related behavioral consequences, less likely to have positive drinking expectancies, and less likely to accept others' alcohol use. Contrary to expectation, the treatment group, not the control group, reported statistically larger decreases in responsible drinking behaviors. No statistically significant differences

were found between the treatment and control groups for five of the composite variables: high-risk alcohol behaviors, protective alcohol behaviors, drinking-related psychological consequences, acceptance of others' everyday alcohol use, and negative expectancies about drinking.

Knowledge Test

AlcoholEdu appeared to have a relatively small, but statistically significant, impact on student knowledge, in contrast to past evaluations (Croom et al., 2009; Wall, 2007). Two mitigating factors should be noted. First, in addition to AlcoholEdu, both groups of students may have received extensive educational programming about alcohol and related subjects during orientation and throughout the fall semester. Second, the two groups completed the postintervention knowledge test at different times: the treatment group did so immediately after finishing the course, while the control group did so about 30 days later, at the same time that both groups completed the postintervention survey. This procedure was followed to minimize the number of times the control group students had to log into the course to complete data collection instruments. Note, however, that these two factors together would serve to equalize exposure to alcohol prevention messaging at the time students completed their postintervention knowledge test, thus driving these results toward the null.

Drinking-Related Attitudes

AlcoholEdu led to substantial changes in drinking-related attitudes. Looking at the unadjusted means for the baseline and postintervention surveys, the control group reported a 19.9% increase for acceptance of others' alcohol use, but the treatment group had a 4.1% *decrease*. Likewise, the control group reported a 5.6% decrease in positive expectancies for alcohol use, while the treatment group reported a 9.2% decrease—a small improvement when looking at the unadjusted means, but one that ANCOVA analysis showed to be statistically significant.

Drinking-Related Behaviors

The impact of AlcoholEdu on students' reported alcohol use was substantial. Again looking at the unadjusted means for the baseline and postintervention surveys, we observe that the control group reported a 69.2% increase in the total number of drinks consumed in the past 2 weeks, while the treatment group reported only a 36.3% increase. Finally, the control group reported a 98.6% increase in the proportion of heavy, episodic drinkers, while the treatment group had only a 50.0% increase. It is common for first-year students to drink more heavily as the fall semester progresses (Del Boca, Darkes, Greenbaum, & Goldman, 2004). Taking AlcoholEdu appears to contain the magnitude of that trend.

The treatment group, not the control group, reported statistically larger decreases in responsible drinking behaviors. The component items for this composite measure were eat food or a meal before drinking, intentionally not eat food or a meal before drinking (reverse scored), and pace your drinking. One explanation is that, because students who took AlcoholEdu reported less alcohol use on the postintervention survey, they would experience fewer drinking occasions that called for these

measures. This might also explain why the treatment and control groups did not differ significantly on the composite variable for protective alcohol behaviors.

Drinking-Related Consequences

Importantly, AlcoholEdu also produced a meaningful reduction in reported negative behavioral consequences due to alcohol use. Looking at the unadjusted means for the baseline and postintervention surveys, we find that the treatment group reported a 18.9% *decrease* for drinking-related behavioral consequences, a composite variable composed of 11 items: drive after or while drinking, ride with a driver who had been drinking, intentionally injure others, accidentally injure yourself or others, have unprotected sex, vomit, miss a class, attend a class unprepared, have difficulty concentrating in class, be more argumentative, and say things that you did not mean that hurt others' feelings. In contrast, the control group reported a 37.7% increase on this measure.

Study Limitations

There are several limitations to the present study that should be noted. First, this randomized control trial was conducted at a single campus—a mid-sized private university in the Northeast. Hence, caution should be exercised when generalizing these results to other groups of first-year college students. Future research should include replications of this study conducted at a wide range of colleges and universities, with the 2007 or later versions of AlcoholEdu for College. Also needed are multisite investigations, with randomization executed at the institutional level (DeJong et al., 2006, 2007).

Another limitation is that the findings reported here are based on student self-report. Using self-report from anonymous or confidential questionnaires is a commonly accepted method in substance use studies with college students, producing population-level data that are generally both valid and reliable (Brener, Collins, & Kann, 1995; Brener et al., 2002; DeJong, 2008; Dowdall & Wechsler, 2002). Moreover, self-report questionnaires are widely used in evaluations of interventions designed to reduce college student alcohol consumption (Croom et al., 2009; Wall, 2007; Wechsler & Nelson, 2008). Even so, we cannot entirely dismiss the possibility that students who took the course reported drinking less due to a reporting bias, essentially providing the desired answer suggested by participation in AlcoholEdu.

AlcoholEdu was delivered online, and most students completed the course in their residence hall. Because randomization was executed at the level of individual students, there was no way to prevent students from discussing the course, knowledge tests, or surveys with one another. The primary concern is the possibility of cross-group contamination, but if such contamination came into play, it would be expected to drive results toward the null, when in fact this study showed AlcoholEdu to have several positive effects.

Finally, the control group experienced much greater attrition than the treatment group. This was surprising, because the control group students had been informed that they were required to take the course, and that they should do so immediately after completing the postintervention survey. A missing values analysis showed that the students who did not complete the postintervention survey actually drank less at baseline than those who did complete it. Recall that each ANCOVA controlled

statistically for baseline alcohol use, as well as gender, race/ethnicity, baseline knowledge, and, for each composite variable, the respective baseline score.

Future Research

Additional studies on AlcoholEdu for College and other online alcohol courses for college students are needed to assess their longer-term impact, to explore their impact on different types of students, and to determine the cognitive and motivational factors that mediate reported changes in drinking behaviors. Moreover, studies are needed to compare the relative efficacy of computer-based interventions to reduce college student drinking. A review published in 2008 found only two such studies—one that compared brief motivational feedback of differing lengths (Saitz et al., 2007), and one that compared gender-neutral and gender-specific personalized normative feedback (Lewis & Neighbors, 2007).

Conclusion

AlcoholEdu for College had a positive impact on first-year students' alcohol-related attitudes, behaviors, and consequences. Even so, an online education course like AlcoholEdu should be viewed as a cornerstone of comprehensive prevention efforts on campus, not as a substitute.

References

Baer, J. S. (2002). Student factors: Understanding individual variation in college drinking. *Journal of Studies on Alcohol Suppl.*, *14*, 40–53.

Baer, J. S., Kivlahan, D. R., Blume, A. W., McKnight, P., & Marlatt, G. A. (2001). Brief intervention for heavy drinking college students: Four-year follow-up and natural history. *American Journal of Public Health*, *91*, 1310–1316.

Baer, J. S., Marlatt, G. A., Kivlahan, D. R., Fromme, K., Larimer, M., & Williams, E. (1992). An experimental test of three methods of alcohol risk reduction with young adults. *Journal of Consulting and Clinical Psychology*, *60*, 974–979.

Bersamin, M., Paschall, M. J., Fearnow-Kenney, M., & Wyrick, D. (2007). Effectiveness of a web-based alcohol-misuse and harm-prevention course among high- and low-risk students. *Journal of American College Health*, *55*, 247–254.

Brener, N. D., Collins, J. L., & Kann, L. (1995). Reliability of the Youth Risk Behavior Survey questionnaire. *American Journal of Epidemiology*, *141*, 575–580.

Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002). Reliability of the 1999 Youth Risk Behavior Survey questionnaire. *Journal of Adolescent Health*, *31*, 336–342.

Castro, R., & Foy, B. (2002). Harm reduction: A promising approach for college health. *Journal of American College Health*, *51*, 89–92.

Croom, K., Lewis, D., Marchell, T., Lesser, M. L., Reyna, V. F., Kubicki-Bedford, L. M., et al. (2009). Impact of an online alcohol education course on behavior and harm for incoming first-year college students: Short term evaluation of a randomized trial. *Journal of American College Health*, *54*, 445–454.

DeJong, W. (2008). *Methods for assessing college student use of alcohol and other drugs*. Washington, DC: U.S. Department of Education, Higher Education Center for Alcohol and Other Drug Abuse and Violence Prevention.

DeJong, W., Schneider, S. K., Towvim, L. G., Murphy, M. J., Doerr, E. E., Simonsen, N. R., et al. (2006). A multisite randomized trial of social norms marketing campaigns to reduce college student drinking. *Journal of Studies on Alcohol.*, *67*, 868–879.

DeJong, W., Schneider, S. K., Towvim, L. G., Murphy, M. J., Doerr, E. E., Simonsen, N. R., et al. (2007). A multisite randomized trial of social norms marketing campaigns to reduce college student drinking: A replication study. *Substance Abuse*, *30*, 127–140.

Del Boca, F. K., Darkes, J., Greenbaum, P. E., & Goldman, M. S. (2004). Up close and personal: Temporal variability in the drinking of individual college students during their first year. *Journal of Consulting and Clinical Psychology*, *72*, 155–164.

Dimeff, L. A., Baer, J. S., Kivlahan, D. R., & Marlatt, G. A. (1999). *Brief alcohol screening and intervention for college students (BASICS): A harm reduction approach*. New York: Guilford Press.

Dowdall, G. W., & Wechsler, H. (2002). Studying college alcohol use: Widening the lens, sharpening the focus. *Journal of Studies on Alcohol Suppl.*, *14*, 14–22.

Elliott, J. C., Carey, K. B., & Bolles, J. R. (2008). Computer-based interventions for college drinking: A qualitative review. *Addictive Behavior*, *33*, 994–1005.

Hingson, R. W., Zha, W., & Weitzman, E. R. (2009). Magnitude of and trends in alcohol-related mortality and morbidity among U.S. college students age 18–24, 1998–2005. *Journal of Studies on Alcohol and Drugs Suppl.*, *16*, 12–20.

Larimer, M., & Cronce, J. (2002). Identification, prevention, and treatment: A review of individual-focused strategies to reduce problematic alcohol consumption by college students. *Journal of Studies on Alcohol Suppl.*, *14*, 148–163.

Larimer, M. E., & Cronce, J. M. (2007). Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999–2006. *Addictive Behavior*, *32*, 2439–2468.

Lewis, M. A., & Neighbors, C. (2007). Optimizing personalized normative feedback: The use of gender-specific referents. *Journal of Studies on Alcohol and Drugs*, *68*, 228–237.

Marlatt, G. (1998). *Harm reduction: Pragmatic strategies for managing high-risk behaviors*. New York: Guilford Press.

National Alcohol Beverage Control Association (NABCA). (2008). *NABCA Survey Book 2008*. Alexandria, VA: Author.

National Institute on Alcohol Abuse and Alcoholism (NIAAA). (2000). *Tenth special report to the U.S. Congress on alcohol and health: Highlights from current research*. Washington, DC: National Institutes of Health.

National Institute on Alcohol Abuse and Alcoholism (NIAAA), Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism. (2002). *A call to action: Changing the culture of drinking at U.S. colleges*. Washington, DC: National Institutes of Health.

Paschall, M. J., Bersamin, M., Fearnow-Kenney, M., Wyrick, D., & Currey, D. (2006). Short-term evaluation of a web-based college alcohol misuse and harm prevention course (College Alc). *Journal of Alcohol and Drug Education*, *50*, 49–65.

Perkins, H. W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol Suppl.*, *14*, 91–100.

Perkins, H. W., Meilman, P. W., Leichliter, J. S., Cashin, J. R., & Presley, C. A. (1999). Misperceptions of the norms for the frequency of alcohol and other drug use on college campuses. *Journal of American College Health*, *47*, 253–258.

Reifman, A., & Watson, W. (2003). High-risk drinking during the first semester of college: Continuation and desistance from high school patterns. *Journal of American College Health*, *52*, 73–81.

Saffer, H. (2002). Alcohol advertising and youth. *Journal of Studies on Alcohol Suppl.*, *14*, 173–181.

Saitz, R., Palfai, T. P., Freedner, N., Winter, M., MacDonald, A., Lu, J., et al. (2007). Screening and brief intervention online for college students: The iHealth study. *Alcohol*, *42*, 28–36.

Wall, A. (2007). Evaluating a health education web site: The case of AlcoholEdu. *Journal of Student Affairs Research and Practice*, *44*, 692–714.

Walters, S. T., Miller, E., & Chiauzzi, E. (2005). Wired for wellness: eInterventions for addressing college drinking. *Journal of Substance Abuse Treatment*, *29*, 139–145.

Walters, S. T., Vader, A. M., & Harris, T. R. (2007). A controlled trial of web-based feedback for heavy drinking college students. *Prevention Science*, *8*, 83–88.

Wechsler, H., Dowdall, G. W., Davenport, A., & Rimm, E. B. (1995). A gender-specific measure of binge drinking among college students. *American Journal of Public Health*, *85*, 982–985.

Wechsler, H., & Nelson, T. F. (2008). What we have learned from the Harvard School of Public Health College Alcohol Study: Focusing attention on college student alcohol consumption and the environmental conditions that promote it. *Journal of Studies on Alcohol and Drugs*, *69*, 481–490.

Weitzman, E. R., Nelson, T. F., & Wechsler, H. (2003). Taking up binge drinking in college: The influences of person, social group, and environment. *Journal of Adolescent Health*, *32*, 26–35.

Wildt, A. R., & Ahtola, O. T. (1978). *Analysis of covariance*. Thousand Oaks, CA: Sage Publications.