Impact of an Online Alcohol Education Course on Behavior and Harm for Incoming First-Year College Students: Short-Term Evaluation of a Randomized Trial

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Abstract. Objective: The authors assessed short-term effectiveness of a Web-based alcohol education program on entering freshmen. **Participants**: 3,216 incoming first-year students were randomized to a control or intervention group. **Methods**: Controls completed a survey and knowledge test the summer before college; 4 to 6 weeks after arrival on campus, they completed a follow-up survey of behaviors and harms followed by an invitation to complete the online course. Intervention students completed the precourse survey and test, the online course, and final exam *prior* to coming to campus. This was followed by a survey 4 to 6 weeks after arrival on campus. **Results**: Although the intervention group showed significantly higher alcohol-related postcourse knowledge compared to the control group, protective behavior, risk-related behavior, high-risk drinking, and alcohol-related harm did not favor the intervention group, with the sole exception of playing drinking games. **Conclusions**: Alcohol knowledge alone was insufficient to mitigate alcohol-related high-risk behaviors in this student population.

Keywords: alcohol, alcohol prevention, college students, drinking, high-risk drinking

Alcohol is one of the most widely used drugs in the United States.[1] In the mid-1980s, the misuse of alcohol by college students came to the forefront as a major public health issue in the United States.[2–4,5] Approximately 30% of college students meet the clinical definition of alcohol abuse compared with 4.7% of the general US population.[6,7] Multiple national studies suggest that more than 40% of college students have engaged in recent high-risk drinking, defined as 5 or more drinks in one sitting, in the past 2 weeks.[8,9] High-risk drinking has been correlated with negative outcomes for students, including poor academic performance, problems with friends and family members, injuries, overdoses, high-risk sexual behavior, and death.[10] Hingson et al concluded that an estimated 1,700 college students die annually from unintentional alcohol-related injuries.[11] Despite intensive prevention efforts, the levels of high-risk drinking have remained unchanged at best in recent years, with some data suggesting increasing levels of alcohol-related morbidity and mortality among ages 18 to 24 years.[12]

Given the high rate of significant alcohol-related problems in this population, effective prevention strategies aimed at changing the behavior of college students are urgently needed.[13] Numerous approaches have been developed that seek to mitigate heavy drinking among students on college campuses.[2,14–19] For example, the use of personalized normative feedback in the context of brief interpersonal interventions has been repeatedly shown to be effective in reducing drinking rates and the associated negative consequences among high-risk drinkers.[20–24] By contrast, widely used educational strategies that focus on providing students with information regarding the dangers and harm associated with alcohol use and abuse appear to be ineffective when used in isolation.[25,26] The effectiveness of using an information-based approach in combination with interactive activities afforded by Web-based technology has not been well-studied. It is possible that this interactive Web-based approach to education may lead to outcomes previously not achieved when information was delivered through other media such as brochures and lectures.

Web-based alcohol education and prevention programs offer the opportunity to expose large numbers of students to potentially life-saving information. Commercially available courses take 1 to 3 hours to complete and are interactive

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to varying degrees, with stream video clips, graphics, and online assignments. There is also general alcohol education content, and harm-reduction strategies for those students who choose to drink as well as information on drinking norms among college students. Despite widespread adoption of these products, little is known about their impact on student behavior. In the absence of empirical support for such programs, many institutions have purchased them on the basis that they are perceived to be "best practices" employed by many of their peers.

The few studies on Web-based alcohol programs delivered to students during the academic year have reported varying effects on alcohol-related behavior and harm.[19,27,28] A retrospective evaluation of AlcoholEdu (2003–2004 Edition) based cross-sectional secondary data obtained from fraternity and sorority members' responses to a survey found that at 4 to 6 weeks following course completion, the intervention group participants experienced fewer episodes of heavy drinking and negative consequences than the control group.[39] The differences in high-risk drinking and negative consequences were maintained through most of the year, although over a 7-month period, there was a steady rise in drinking and related harm among students in both groups. Notably, the intervention effect held for two negative consequences among males and females, whereas lower levels of high-risk drinking maintained statistical significance only for female participants.

To date, no studies have evaluated the impact of a Web-based program on incoming first-year students who participate in the program during the summer prior to their first year of college. This transition period from high school to college is associated with a dramatic shift in attitudes and behavior regarding alcohol use.[29] Specifically, there is a significant increase in alcohol use upon entering college, sometimes referred to as the "college effect." Institutions of higher education commonly require incoming first-year students to complete Web-based programs in the hope that doing so will reduce the predictable increase in high-risk drinking that occurs during the first weeks of exposure to the college environment.

This investigation is the first randomized prospective study of the commercial alcohol education program AlcoholEdu for College administered to an entire class of first-year students. Three types of primary health outcome variables were assessed: drinking prevalence, behavior, and harm.

METHODS

Funding and Approval

This study was carried out with approval of the Cornell University Institutional Review Board for Human Participants. This research study was funded internally by the College of Human Ecology at Cornell University. None of the investigators had any relationship with Outside the Classroom Inc. during the time that the study was conducted. Timothy Marchell is now a consultant with Outside the Classroom on their mental health–related products.

Participants

Study participants were incoming first-year students at a mid-sized, rural, elite, private university in the Northeast. The undergraduate student body was approximately 50% women and 27% minority students. In addition, about 13% of the students were Pell Grant recipients (whose family annual income is generally under $40,000).

Study Overview

AlcoholEdu for College consists of a pretest of alcohol knowledge, a precourse survey on drinking behavior, attitudes, and demographics, followed by an interactive alcohol education course. To pass the course, students must complete a postcourse knowledge exam with a grade of ≥ 65% correct. Approximately 30 to 45 days after the course is completed, students are expected to complete a postcourse survey similar to the precourse survey.

In June 2006, all incoming first-year students were randomly assigned to either an intervention (n = 1,608) or control (n = 1,608) group (see Figure 1). In mid-July, students in the intervention and control groups received a letter, mailed to their home address, detailing the expectations for completing the online program. Both groups also received printed materials highlighting the university's alcohol policy. Students in the intervention group were expected to complete the precourse knowledge test, the precourse survey, the Web-based course, and the postcourse examination prior to arrival on campus. The control group participants were expected to complete only the precourse knowledge test and the precourse survey prior to coming to campus. Approximately 1 month after arrival on campus, both groups were expected to complete the postcourse survey of behavior and harm. The control group was then invited to complete the online course during the academic year. Students who completed the course by a specific date were eligible to enter a lottery to win 3 college sporting event tickets. The number of students in each group completing the study was 938 for the intervention group and 979 for the control group, with equivalent response rates of 58.3% and 60.9%, respectively.

A number of primary outcome variables were assessed, including the prevalence of (1) alcohol use, (2) high-risk behavior, (3) protective behavior, and (4) harm experienced. The level of knowledge based upon pre- and postcourse examination grades was also considered to be a primary variable.

Statistical Analysis

Although this was a randomized trial, comparability of the 2 groups was investigated by comparing the 2 groups with respect to demographic and prerandomization alcohol-related variables. Knowledge test scores (continuous variables) were compared using the student t test. Ordinal-level outcomes measured with the response choices "not at all," "some of the time, " "most of the time," and "all of the time," were collapsed to the binary variables No (not at all) or Yes (all other response categories). Binary variables were analyzed using the Pearson chi-square test. Outcomes were analyzed in the

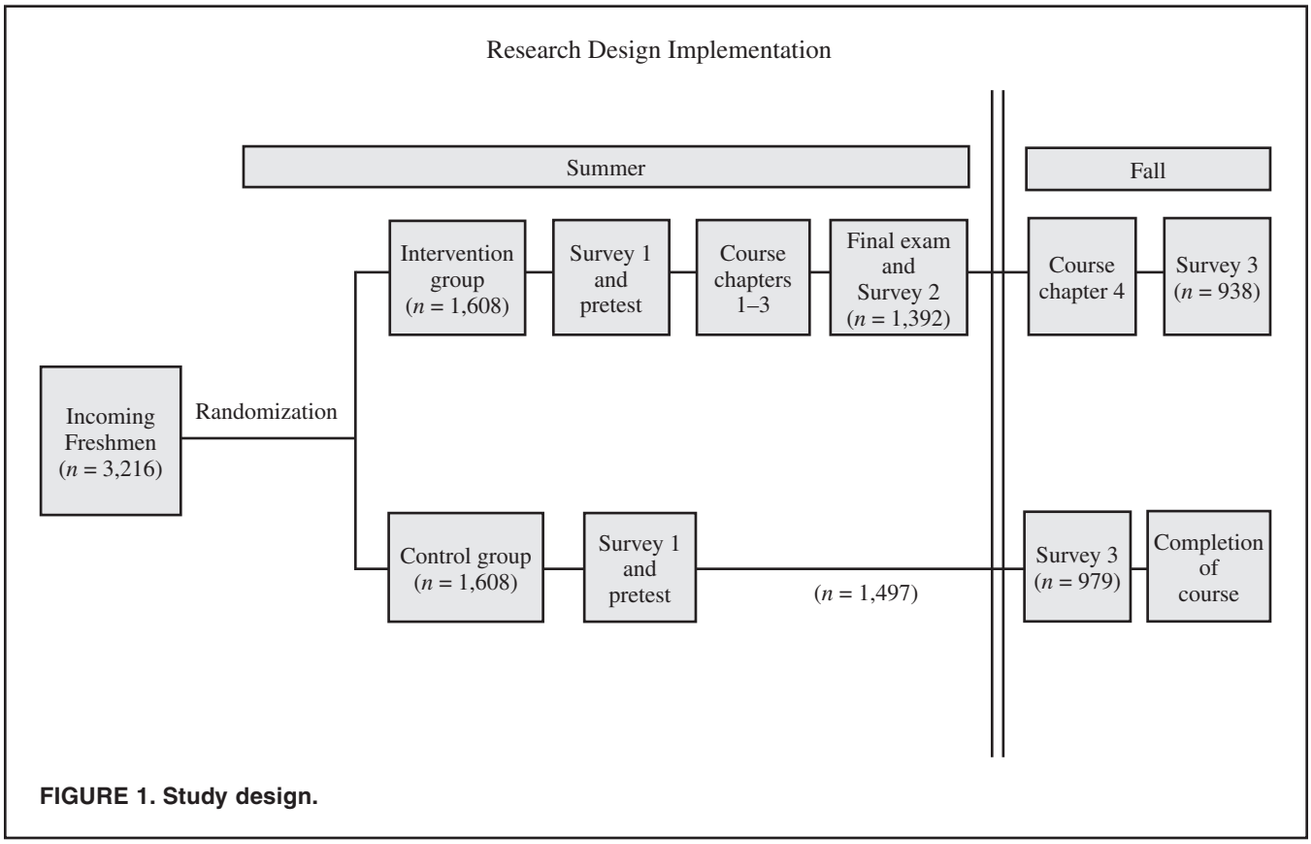

FIGURE 1. Study design.

context of repeated measures models, where an outcome was observed at pre- and postintervention. The "between subjects" grouping factor was treatment group (control, intervention). The single continuous outcome, number of drinks in the past 2 weeks, was analyzed using repeated measures analysis of variance. The binary outcomes (eg, shots, chugging, hangover, memory loss, etc) were analyzed using the generalized linear model for repeated binary outcomes. In both sets of analyses, interest focused on the Group × Time interaction to determine whether any observed pre- to postchanges varied according to intervention group. These analyses were carried out using the statistical analysis software (SAS) PROC GLM and PROC GENMOD, respectively. The outcomes analyses were carried out in 3 different ways, depending on whether or not a participant was a drinker pre- or postintervention. The first set of analyses included all the study participants, regardless of their drinking patterns. The second set of analyses included the participants who had reported any episode of drinking in the 2-week period prior completion of the precourse survey, regardless of whether they were or were not drinkers postintervention. The third set included only those participants who were not drinkers in the 2 weeks before taking the course but reported drinking during the follow-up period. The purpose of these 2 sub-analyses was to determine whether the intervention was more effective in mitigating alcohol use and related harm among participants who tended to not drink before coming to college and/or among participants who definitely drank before coming to college. The same results were observed when analyses were carried out with an adjustment for race, gender, and demographic baseline differences such as self-perceived alcohol-related knowledge. Results were considered statistically significant if $p < .05$. Summary statistics are presented as proportions or as means and standard deviations (*SD*).

RESULTS

Background and Demographics

The background and demographics of the control and intervention groups are shown in Table 1. Although the groups were similar across most variables, the control group reported a significantly higher prevalence of (1) parental discussions concerning alcohol ($p = .0048$), (2) alcohol-related education in high school ($p < .0001$), and (3) self-rated alcohol-related knowledge ($p < .0001$). Although there were also differences in self-reported stages of change ($p = .0123$), there was no monotonic pattern that correlated with the hypotheses that were tested. All outcome variables were examined as a function of the background variables above to detect any interactions and potential biases between the randomized groups. No significant interactions with any of these variables were observed. In addition, the observed outcome measures suggested that the differences between the randomized groups did not confound the results of the study.

Knowledge

Despite the higher level of self-reported knowledge in the control group, the precourse examination scores were similar for both groups ($M = 73.3$, $SD = 9.9$ vs $M = 74.0$, $SD = 8.7$ for control vs. intervention, respectively; see Table 2). However,

TABLE 1. Background and Demographics of Study Participants (*N* = 1,906)

Variable	Control group Frequency	Control group %	Intervention group Frequency	Intervention group %
Total respondents	970	100.0	936	100.0
Sex				
Male	479	47.7	491	50.6
Female	490	52.4	446	49.4
Race/Ethnicity				
White	607	62.6	586	62.6
Asian	239	24.6	235	25.1
Hispanic	66	6.8	50	5.3
African American	36	3.7	44	4.7
Other	22	2.3	21	2.2
Age (y)				
17	180	18.6	180	19.3
18	725	74.9	701	74.9
19+	63	6.5	54	5.8
Parental alcohol discussions*				
Yes, extended/frequent talks	386	39.9	320	34.4
Yes, only once/briefly	385	39.8	360	38.7
No, wasn't comfortable	25	2.6	27	2.9
No, they never brought it up	172	17.8	223	24.0
High school alcohol education**				
1-None at all	18	1.9	29	3.1
2-Little	115	11.9	179	19.2
3-Moderate amount	398	41.2	470	50.5
4-Some	267	27.7	179	19.2
5-A lot	167	17.3	74	8.0
Self-rating alcohol knowledge***				
1-Know very little	6	0.6	14	1.5
2-Know little	31	3.2	63	6.8
3-Know moderate amount	336	34.7	519	55.8
4-Know some	407	42.1	265	28.5
5-Know very much	188	19.4	70	7.5
Stages of change****				
Abstain	452	46.8	422	45.5
See no need to change	305	31.6	267	28.8
Think about drinking healthier	55	5.7	75	8.1
Ready to drink healthier	47	4.9	73	7.9
Trying to drink healthier	107	11.1	91	9.8

*$p = .0048$. **$p < .0001$. ***$p < .0001$. ****$p = .0123$ for control vs intervention group, respectively.

TABLE 2. Pre- and Postintervention Knowledge Test Scores of Study Participants

Participants	*n*	Control group test scores: Pre *M*	Control group test scores: Pre *SD*	Control group test scores: Post *M*	Control group test scores: Post *SD*	Intervention group test scores: Pre *M*	Intervention group test scores: Pre *SD*	Intervention group test scores: Post *M*	Intervention group test scores: Post *SD*
All student participants*	1,891	73.3	9.9	83.2	12.8	74.0	8.7	88.4	6.2
Students who drank 2 weeks preintervention**	749	74.1	9.2	82.6	16.2	75.3	8.3	88.4	6.0
Nondrinkers preintervention who were drinkers postintervention***	391	74.5	8.4	83.0	15.0	73.5	9.1	87.1	6.9

Note. All *p* values correspond to test of Group × Time interaction.
*$p < .0001$. **$p < .0001$. ***$p = .0024$.

students in the intervention group (who were required to complete the course during the summer before college) performed significantly better on the final knowledge examination as compared with the control group who completed the course during the first semester of the academic year (M = 83.2, SD = 12.8 vs M = 88.4, SD = 6.2 for control and intervention groups, respectively; $p < .0001$).

Drinking Prevalence and Drinking Levels

The number of students who drank increased considerably during the transition to college; 749 of 1,891 students (39.6%) were drinkers at the beginning of the study. At the time of the postintervention survey, 55.1% of students were drinkers. Among all 1,891 students, the mean number of drinks in the past 2 weeks poststudy was M = 8.4 (SD = 13.3) and M = 8.6 (SD = 14.7) for control and intervention groups, respectively (see Table 3). (Note that the large SDs correspond to the observation that there were some students for whom the reported number of drinks consumed was large [ie, outliers]). When this analysis was restricted to the 749 students who reported drinking prestudy, the number of drinks in the past 2 weeks poststudy was M = 15.8 (SD = 16.3) and M = 16.8 (SD = 17.3) for control and intervention groups, respectively. For the 391 students who were nondrinkers prestudy, but drinkers poststudy, the means were 10.1 (SD = 10.3) and 9.5 (SD = 14.3), respectively. None of these results were statistically significant.

Risk Behavior, Protective Behavior, and Harm

Twenty variables were examined pre- and poststudy in the control and intervention groups. When all 1,891 students were included in the analysis, the AlcoholEdu intervention had little impact on the behavior of first-year students or the harm associated with alcohol use (see Table 4). The "college effect" was apparent in both groups, as drinking and high-risk behaviors increased during the transition to college. Protective behavior decreased and alcohol-associated harm increased in students in both arms of the study. Two significant differences were observed between the control and intervention groups. With regard to "playing drinking games," approximately 20% of students in both groups played drinking games at the beginning of the study. In the follow-up survey, students who had received the intervention had a lower tendency to play drinking games than their control counterparts (33.2% vs 39.3%, intervention vs. control group, respectively, $p = .0146$). However, students who had received the intervention also had a higher likelihood of failure to use safe sex practices ($p = .0056$).

When the analysis was restricted to those 749 students who were "drinkers" prior to the intervention, 4 significant differences were observed (see Table 5). Students who had received the intervention had a lower tendency to play drinking games ($p = .0325$). However, the intervention group had a higher prevalence of failure to use safe sex practices ($p = .0087$), higher rates of choosing a drink with more alcohol ($p = .0191$), and an increased prevalence of experiencing a hangover ($p = .0012$). Finally, when the analysis was performed on only those 391 students who were nondrinkers prestudy and drinkers poststudy, there were no significant differences between the 2 groups with respect to any of the behavioral variables (see Table 6).

COMMENT

Underage drinking is a pressing public health issue among adolescents nationally and globally.[1–5] Adolescence is a protracted period of time during which many health-related developmental milestones occur. These and other factors result in higher vulnerability of adolescents to the use of alcohol and other drugs. Alcohol use disorders have their highest prevalence in the aged 18- to 22-years group.[30,31] Alcohol prevention is extremely challenging in the college or university setting. Freshmen are particularly vulnerable to misuse of alcohol during their early days of coming to campus. The reasons for this are many. First-year students may be away from home and parental supervision for the first time; they may have a need to fit in and be accepted by their peers; or they may lack knowledge concerning the potential harmful effects of alcohol. They may also exhibit greater anxiety associated with unfamiliar social and academic environments and have a distorted perception of peer use and abuse of alcohol. Other contributing factors may include the mix of underage and of-age individuals

TABLE 3. Pre- and Postintervention Drinking Frequencies, as Measured by Mean Number of Drinks in Previous 2 Weeks

		Control Group				Intervention Group			
		Pre		Post		Pre		Post	
Participants	*n*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
All student participants	1,891	3.9	8.7	8.4	13.3	4.5	10.1	8.6	14.7
Students who drank 2 weeks preintervention	749	10.0	11.6	15.8	16.3	11.3	13.4	16.8	17.3
Nondrinkers preintervention who were drinkers postintervention	391	—	—	10.1	10.3	—	—	9.5	14.3

Note. All p values correspond to test of Group × Time interaction.

TABLE 4. Repeated Measures Analysis of Pre- and Postintervention Behaviors and Harms in All Participants (*N* = 1,891), in Percentages

	Control group (n = 962)		Intervention group (n = 929)	
Variable	Pre	Post	Pre	Post
Risky behavior (in the past 2 weeks)				
Did shots	19.1	33.2	19.0	32.4
Chugged alcohol	13.3	29.2	13.9	29.7
Played drinking games*	20.2	39.3	20.3	33.2
Chose a drink with more alcohol	16.9	26.7	15.4	29.0
Skipped a meal to get drunk faster	2.2	2.9	2.8	5.5
Started drinking before going out	8.5	24.1	8.6	24.2
Engaged in one episode high-risk drinking (≥ 5 drinks per sitting)	14.1	27.8	17.2	28.6
Engaged in ≥ 3 episodes high-risk drinking (≥ 5 per sitting)	3.3	14.5	5.0	14.5
Protective Behavior (in the past 2 weeks)				
Chose drink with less alcohol	21.5	31.3	20.6	28.3
Paced drinking	32.2	46.0	35.2	44.8
Alternated alcohol with nonalcoholic drinks	23.4	28.5	24.9	27.1
Ate meal or snack before drinking	34.1	44.3	35.2	42.1
Drank less because of medication	5.0	9.3	5.3	8.6
Harm (in the past 2 weeks)				
Hangover	11.9	16.7	10.4	17.7
Regrets	7.9	14.4	8.0	16.9
Memory loss	5.2	9.6	5.2	12.2
Needed prompt to remember	8.0	15.3	10.7	16.8
One-night stand	2.1	5.7	1.2	6.0
Failed to use safe sex practices**	1.4	1.8	0.4	3.1
Regret sexual experiences	2.3	7.1	1.6	8.3

Note. All p values correspond to test of Group × Time interaction.
*p = .0146. **p = .0056.

on campus, potential easy access to alcohol in local communities on- and off-campus; prevalence of Greek life; and mixed messages they receive from parents (and inadvertently from some college administrators) that excessive consumption of alcohol is a "rite of passage" for college students.

The issue of underage drinking takes on an even greater urgency in the face of emerging scientific evidence indicating that prolonged exposure to alcohol during adolescence may have long-term negative consequences on brain development and cognitive function.[32–34] Recent studies in animal models and humans strongly suggest that alcohol consumption during adolescence can negatively impact the neuronal remodeling that occurs during late teens and early 20s as individuals progress from adolescence to adulthood. Weissenborn and Duka showed that acute administration of alcohol to college-aged social drinkers impaired pattern and spatial recognition and that students who were high-risk drinkers performed worse on those tasks compared to nonbinge drinkers, despite the fact that the test was administered only under acute exposure conditions.[34] Recent anatomical magnetic resonance imaging (MRI) studies of pediatric and adolescent individuals also point to the significant remodeling that occurs during this crucial maturation period.[35–38] Excessive drinking during the college years may have long-term, persistent, negative impacts on physical and mental health that only manifest themselves at later stages in life. Genetic and environmental factors such as ingestion of alcohol influence an individual's lifetime risk for misuse and abuse of alcohol. It is therefore imperative that colleges and universities take their mission to curb underage drinking seriously.

Alcohol prevention strategies must be multipronged and involve a coordinated effort among parents, schools, communities, and policy makers. The 2007 "Surgeon General's Call to Action to Prevent Underage Drinking" refers to the term "scaffolding" in its attempt to integrate multiple levels and points of entry to alcohol abuse prevention. Moreover, it is important to identify the developmental stages of maturation and to contextualize prevention strategies in developmentally appropriate and culturally sensitive contexts.[5] A number of approaches have been used to mitigate drinking on college campuses with varying degrees of success.[2,14–26] These include: (1) a social norms approach to providing knowledge concerning peer drinking patterns, (2) individualized feedback strategies, (3) harm prevention strategies, (4) environmental controls, and (5) community interventions.

TABLE 5. Repeated Measures Analysis of Pre- and Postintervention Behaviors and Harms, Restricted to Students Who Drank During the 2-Week Period Prior to Intervention (*N* = 749), in Percentages

	Control group (*n* = 375)		Intervention group (*n* = 374)	
Variable	Pre	Post	Pre	Post
Risky behavior (in the past 2 weeks)				
Did shots	48.9	55.8	46.9	55.5
Chugged alcohol	34.1	53.4	34.7	57.1
Played drinking games*	51.9	67.2	50.7	57.3
Chose a drink with more alcohol**	43.1	47.1	38.4	52.3
Skipped a meal to get drunk faster	5.6	5.6	6.9	10.7
Started drinking before going out	21.7	47.1	21.3	48.0
Engaged in one episode high-risk drinking (≥ 5 per sitting)	36.0	50.3	42.9	54.9
Engaged in ≥ 3 episodes high-risk drinking (≥ 5 per sitting)	8.5	29.1	12.3	31.5
Protective behavior (in the past 2 weeks)				
Chose drink with less alcohol	55.3	47.9	50.9	42.9
Paced drinking	82.5	69.6	87.5	71.5
Alternated alcohol with non-alcoholic drinks	60.1	45.8	61.9	43.5
Ate meal or snack before drinking	87.6	71.2	87.5	67.2
Drank less because of medication	13.0	14.6	13.1	14.4
Harm (in the past 2 weeks)				
Hangover***	30.4	30.2	26.1	35.7
Regrets	20.1	24.9	19.7	31.5
Memory loss	13.2	18.0	12.8	23.7
Needed prompt to remember	20.4	29.9	26.4	32.5
One-night stand	5.3	9.5	2.9	11.2
Failed to use safe sex practices****	3.4	3.4	1.1	5.6
Regret sexual experiences	5.8	13.0	4.0	16.3

Note. All *p* values correspond to test of Group × Time interaction.
*$p = .0325$. **$p = .0191$. ***$p = .0012$. ****$p = .0087$.

Web-based alcohol education and prevention programs have been increasingly used as one of the primary tools to provide information and feedback to students regarding their use and misuse of alcohol to mitigate high-risk behavior and harm and to increase protective behavior. Despite their widespread use, few rigorous studies on large numbers of students have been conducted to determine the efficacies of such approaches.[13] The studies that have been conducted have shown modest impacts at best.[27,28]

AlcoholEdu for College is used by colleges and universities, but to date, there have been no prospective randomized studies to determine its efficacy in reducing problem drinking. The program's goal is to increase students' knowledge about alcohol and to alter attitudes and behavior related to alcohol use.

The present investigation is the first randomized *prospective* controlled delay treatment study of AlcoholEdu. The current study examined the experience of first-year students who participated in the course in 2006 to determine whether the course met its objectives, and whether it did so any better than simply providing students with written material concerning the University's alcohol policy.

The 2006 edition of AlcoholEdu did not appear to significantly affect many of the targeted behavioral outcomes. Protective behavior, risk-related behavior, high-risk drinking, and alcohol-related harm did not appreciably favor the intervention group, with the sole exception of playing drinking games. For some comparisons, risk-related behavior, such as failure to use safe-sex practices, and negative outcomes, such as hangovers, were greater in the intervention group as compared with the control group. In sum, the pervasive result across a variety of behavioral outcomes was the finding that there was no significant difference between the intervention and control groups.

Potential Study Bias

Several potentially confounding factors were identified. Because the intervention group had to make a significantly greater time investment (ie, ~2–3 hr) using the AlcoholEdu program prior to their arrival on campus compared with the control group (~20 minutes), one may have expected a greater number of control participants compared with intervention participants. The groups demonstrated virtually identical log-on rates (AlcoholEdu 95.2% vs Control 95.0%).

TABLE 6. Repeated Measures Analysis of Pre- and Postintervention Behaviors and Harms, Restricted to Students Who Did Not Drink Prior to Intervention and were Drinking After the Intervention (*N* = 391), in Percentages

Variable	Control group (*n* = 211)	Intervention group (*n* = 180)
Risky behavior (in the past 2 weeks)		
Did shots	51.2	51.7
Chugged alcohol	37.4	34.4
Played drinking games	58.8	51.7
Chose a drink with more alcohol	37.4	40.6
Skipped a meal to get drunk faster	3.3	6.1
Started drinking before going out	25.6	25.0
Engaged in one episode high-risk drinking (≥ 5 per sitting)	36.5	33.3
Engaged in ≥ 3 episodes high-risk drinking (≥ 5 per sitting)	13.7	9.4
Protective behavior (in the past 2 weeks)		
Chose drink with less alcohol	56.9	56.7
Paced drinking	84.8	82.2
Alternated alcohol with nonalcoholic drinks	47.9	49.4
Ate meal or snack before drinking	74.4	77.2
Drank less because of medication	16.1	14.4
Harm (in the past 2 weeks)		
Hangover	22.3	16.7
Regrets	20.9	21.7
Memory loss	11.4	13.3
Needed prompt to remember	16.1	18.9
One-night stand	9.0	7.8
Failed to use safe sex practices	1.9	4.4
Regret sexual experiences	9.0	8.9

The intervention group (AlcoholEdu), however, had a lower completion rate for the first part of the study (AlcoholEdu 84% vs Control 92.0%). Possible reasons for this initial differential attrition (subsequent attrition was equivalent across groups) could be that the length of AlcoholEdu was a deterrent to completion of the course or heavy drinkers were less likely to complete an alcohol prevention course. An analysis of the intervention group students who logged on but did not complete the course revealed no major differences in average number of drinks, high-risk drinking rates, or alcohol-related behaviors compared to the intervention and control study groups (data not shown). Once participants completed the first portion of the study, the 2 groups had nearly identical rates for completing the follow up. The patterns of drinking, behavior and harm associated with alcohol use in this student body were similar to national trends. However, because the present study was conducted at only 1 university, caution must be exercised in generalizing the present results to colleges and universities nationwide.

Implications

Despite limited empirical support for the effectiveness of various Web-based alcohol education and prevention programs, many institutions have adopted these curriculum products for incoming first-year students, because they are perceived to be a "best practice" approach to reducing alcohol-related risks among students. Although the present study found that AlcoholEdu led to an increase in knowledge, the results did not support the course's ultimate goal of reducing alcohol-related high-risk behavior or harm. Institutions considering the use of AlcoholEdu or other Web-based courses should consider several points in relation to these findings. It is important to understand that the prevention field is in a relatively early phase in terms of our understanding of what combination of variables influence drinking-related behavior. It is reasonable to speculate that certain forms of knowledge about alcohol may ultimately contribute to a reduction in harmful behavior. The current study demonstrates the efficacy of using a Web program to increase a particular domain of alcohol-related knowledge among students on a population basis, but knowledge acquisition alone appears to be insufficient to achieve short-term behavioral change.

The present study evaluated the use of AlcoholEdu in a single academic year (2006–2007). It is important to note that the company that developed AlcoholEdu, Outside the Classroom Inc., continually revises its product; therefore, the version of AlcoholEdu that will be available to colleges and universities in the future may not be identical to the one used in the current investigation. Consequently, this study presents a snapshot view of the evolution of Web-based

alcohol education programs. One challenge that companies face is to adapt strategies shown to be effective in interpersonal formats, such as BASICS (Brief Alcohol Screening and Intervention for College Students), to improve the efficacy of Web-based formats.[20–24]

Although the present findings are derived from a single campus, the rates of alcohol consumption among these students tend to be consistent with the averages found in national studies. Future research aimed at exploring causal mechanisms and comparing outcomes of college student alcohol education programs is warranted. Moreover, it remains to be determined how such educational interventions may interact with other strategies, such as environmental management approaches, particularly over longer periods of time, suggesting the need for longer term evaluation studies of online programs.

Future Directions

Given the limited efficacy of educational programs in changing behavior as noted in this study and others, future research should examine the degree to which the impact of educational interventions may be enhanced through interaction with other strategies, such as environmental management approaches, over longer periods of time. Moreover, the lack of efficacy of many alcohol prevention education programs makes it imperative that scientists re-evaluate the theoretical bases of these programs. It is well-known that risk perceptions may be either positively or negatively correlated with risk-taking behavior.[40] Recent studies suggest that the way in which information is presented, cued, and processed may be crucial in determining whether the outcome favors less or greater risk-taking behavior. Evidence from Reyna and other investigators suggest, that adolescents process and weigh risks very differently from adults.[41,42] Contrary to popular belief, adolescents do not appear to view themselves as invulnerable; many adolescents overestimate dangers associated with risky behaviors. Thus, prevention education programs aimed at educating adolescents regarding accurate levels of risks and norms may backfire, as they may decrease the perception of risk among those who already overestimate their vulnerability. As adolescents progress toward adulthood, the level of risky behavior decreases and appears to be based increasingly on understanding the gist of a risky behavior, rather than on a computational, deliberative process. Future studies should examine how alcohol-related behaviors and harms may be altered based how information is provided and perceived among adolescents and young adults.

NOTE

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