

Randomized Controlled Trial of Proactive Web-Based Alcohol Screening and Brief Intervention for University Students

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Background: University students drink more heavily than their nonstudent peers and are often unaware that their drinking is risky and exceeds normative levels. We tested the efficacy of a proactive Web-based alcohol screening and brief intervention program.

Methods: A randomized controlled trial was conducted at an Australian university in 2007. Invitations were sent to 13 000 undergraduates (age range, 17-24 years) to complete a Web-based Alcohol Use Disorders Identification Test. Of 7237 students who responded, 2435 scored in the hazardous/harmful range (≥ 8) and were randomized, and 2050 (84%) completed at least 1 follow-up assessment. Intervention was 10 minutes of Web-based motivational assessment and personalized feedback. Controls received only screening. Follow-up assessments were conducted at 1 and 6 months with observers and participants blinded to allocation. Outcome measures were drinking frequency, typical occasion quantity, overall volume, number of personal problems, an academic problems score, prevalence of binge drinking, and prevalence of heavy drinking.

Results: Mean (SD) baseline Alcohol Use Disorders Identification Test scores for control and intervention groups were 14.3 (5.1) and 14.2 (5.1), respectively. After 1 month, participants receiving intervention drank less often (rate ratio [RR], 0.89; 95% confidence interval [CI], 0.83-0.94), smaller quantities per occasion (RR, 0.93; 95% CI, 0.88-0.98), and less alcohol overall (RR, 0.83; 95% CI, 0.78-0.90) than did controls. Differences in alcohol-related harms were nonsignificant. At 6 months, intervention effects persisted for drinking frequency (RR, 0.91; 95% CI, 0.85-0.97) and overall volume (RR, 0.89; 95% CI, 0.82-0.96) but not for other variables.

Conclusion: Proactive Web-based screening and intervention reduces drinking in undergraduates, and such a program could be implemented widely.

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THE PREVALENCE OF UNhealthy alcohol use among young adults (aged 18-24 years) is increasing in many countries.¹⁻⁴ Young people at university have a particularly high prevalence of unhealthy alcohol use⁵ and have been found to drink more heavily^{6,7} and to exhibit more clinically significant alcohol-related problems⁸ than their nonstudent peers. There is extensive literature on interventions to reduce unhealthy alcohol use among university students.^{9,10} Among the most effective strategies is the provision of brief interventions,¹¹ in particular those involving the provision of motivational personalized feedback.¹² Modest reductions in consumption and various alcohol-related problems lasting 3 to 12 months can be achieved with interventions consisting of a few pages of personalized feedback sent to students by mail¹³

or with 15 to 30 minutes of counseling by a psychologist.¹⁴ A recent systematic review of personalized feedback interventions without practitioner contact showed that these interventions are effective in student and general populations.¹²

Increasingly, these personalized feedback interventions are being delivered via the Internet. A narrative review suggested that Web-based motivational feedback for university students is effective, although the research "suffered from significant limitations, particularly small sample sizes, attrition, and lack of appropriate control groups."⁹ A principal limitation is the tendency for trials to be conducted in laboratory conditions, thereby limiting the generalizability of findings to real-world settings.¹⁵

Some trials of Web-based electronic screening and brief intervention (e-SBI) have been conducted in primary health care

services used by university students. In these studies, involving 3 to 5 minutes of Web-based screening and 10 minutes of Web-based personalized feedback, delivered in the health service waiting room, reductions were observed in unhealthy alcohol use of 20% to 30% lasting 6 to 12 months.^{16,17} There was also evidence that Web-based assessment alone produced reductions in drinking and personal, sexual, and legal problems lasting 12 months.¹⁸

A limitation of this approach is that many students do not regularly use university medical services. In a recent US study, a similar e-SBI program was implemented proactively by inviting first-year students to complete an online assessment of their drinking. Fifty-five percent of students completed online screening and were randomized to minimal or more extensive brief intervention.¹⁹ There were reductions in hazardous drinking in both groups after 1 month but no substantial difference between treatment groups. The study illustrates that a large proportion of the student population is willing to complete online screening. Given the nondifferential reduction in unhealthy alcohol use by treatment group, a strong inference about e-SBI's effectiveness in this setting cannot be drawn. Previous evidence of assessment effects¹⁸ suggests that exposure to minimal brief intervention¹⁹ may have blurred the experimental contrast.

Considering the potential reach of a proactive e-SBI approach, there is value in contrasting this intervention with screening alone and in assessing outcomes beyond 1 month. Our aim was to determine the efficacy of a Web-based motivational intervention delivered after screening of a large population of undergraduates, with screening alone as the control.

METHODS

The study was a 2-arm, parallel, randomized controlled trial (**Figure**). We assumed a 50% prevalence of unhealthy alcohol use (Alcohol Use Disorders Identification Test [AUDIT] score ≥ 8) based on New Zealand research,²⁰ there being no comparable estimates for Australia. We produced estimates for a 10% relative reduction (ie, from 50% to 45%) and a 15% relative reduction (ie, from 50% to 42.5%) in the prevalence of unhealthy alcohol use. Assuming a power of 0.80 with $\alpha = 0.05$, 1604 individuals per group were needed to detect a 10% effect and 719 individuals per group to detect a 15% effect. With allowance for 34% attrition at 6 months, between 1089 and 2430 individuals per group were required to detect a 10% to 15% relative risk reduction.

RECRUITMENT

In cooperation with the university administration, we drew a random sample of 13 000 full-time undergraduates aged 17 to 24 years in March 2007 using survey recruitment procedures described in detail elsewhere.^{21,22} In summary, 4 weeks after the start of the first semester, all students were sent a letter by mail, followed by an e-mail containing a hyperlink to a Web questionnaire. Students were informed that the study concerned "the experiences of tertiary students with alcohol, and their views about certain aspects of drinking." Up to 3 reminder e-mails were sent in the following weeks. Students were offered the opportunity to win 1 of 40 A\$100 gift vouchers for participating.

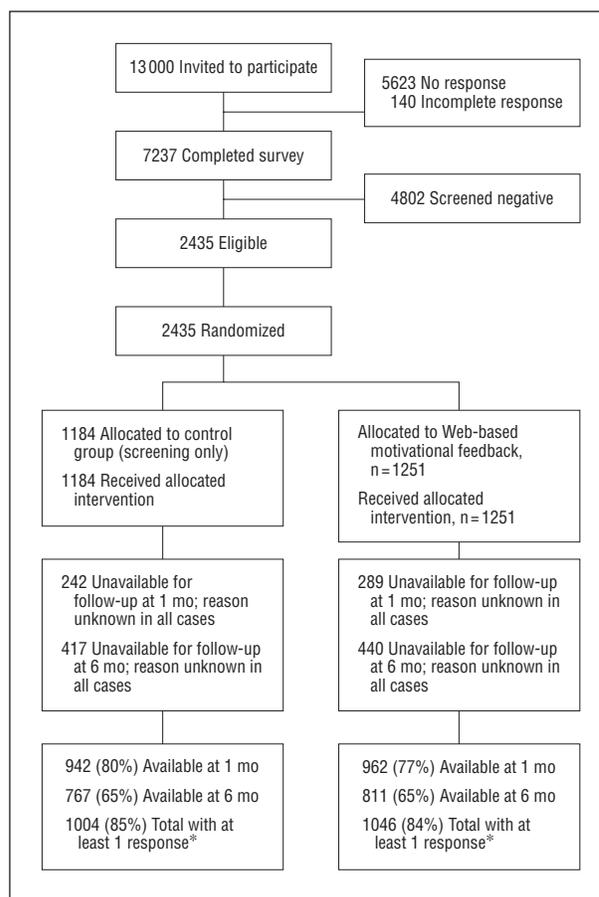


Figure. Trial flowchart. *Analyses using random-effects models incorporated participants with at least 1 postrandomization response. Also, a sensitivity analysis using multiple imputation and random-effects models incorporated all randomized participants in the analysis.

WEB SITE

Respondents visited a Web site called THRIVE (Tertiary Health Research Intervention Via Email), consisting of a branched 7-page online questionnaire with items covering (1) demographics (sex, age, and living arrangement); (2) drinking in the last 12 months (yes/no); (3) AUDIT (10 questions)²³; (4) largest number of standard drinks (10 g of ethanol) consumed on 1 occasion in the last 4 weeks, duration of the drinking episode in hours, and height and weight; (5) secondhand effects (eg, "being pushed, hit, or otherwise assaulted"), with the response options yes, no, or prefer not to answer²⁴; (6) opinions on alcohol beverage labeling²⁵; and (7) smoking history.

The survey instrument and feedback can be accessed at <http://lamp.health.curtin.edu.au/thrive/baselinetest.php>. A process evaluation study showed that university students found THRIVE easy to complete and personally relevant, and most of them said that they would recommend it to a friend.²⁶

RANDOMIZATION AND INTERVENTIONS

Respondents who scored 8 or more on the AUDIT and had exceeded the Australian National Health and Medical Research Council's guideline for acute risk (binge drinking: 4 standard drinks for women, 6 for men) in the last 4 weeks were considered to have screened positive for unhealthy alcohol use. They were randomly assigned by the Web server software to the control group (screening only) or to the intervention group.

The intervention consisted of (1) an AUDIT score with an explanation of the associated health risk and information about how to reduce that risk; (2) an estimated blood alcohol concentration for the respondent's heaviest episode in the previous 4 weeks, with information on the behavioral and physiological sequelae of various blood alcohol concentrations and traffic crash relative risk; (3) estimates of monetary expenditure per month and year; (4) bar graphs comparing episodic and weekly consumption with that of other students of the same age and sex; and (5) hyperlinks for smoking cessation and help with drinking problems. Three more Web pages were presented as options, offering facts about alcohol and tips for reducing the risk of alcohol-related harm as well as providing information about where to find medical help and counseling support. On completion of the 1-month assessment, intervention group participants received additional feedback, comparing drinking levels that they reported at 1 month with those at baseline, a form of booster intervention.¹⁶

Participants were blind to the true nature of the study, which was presented as a series of surveys, in accordance with ethical approval, provided by the research ethics committee of Curtin University, Perth, Australia. Researchers were blind to participants' group allocation.

OUTCOMES AND FOLLOW-UP

One month after the initial assessment, all participants were sent a letter and then an e-mail containing a hyperlink to a Web-based follow-up questionnaire. Included with the letter was a A\$6 sandwich voucher that could be redeemed irrespective of further participation. The 1-month assessment included 3 pages

of questions about (1) drinking (eg, frequency of drinking and number of standard drinks per typical drinking occasion); (2) the Alcohol Problems Scale (APS), a validated 14-item measure of alcohol-related personal, social, sexual, and legal problems (eg, being physically aggressive toward someone while under the influence of alcohol)²⁷; and (3) the Academic Role Expectation and Alcohol Scale (AREAS), a validated 5-item measure (eg, failing to complete assignments because of the effects of alcohol).²⁷ All items had a 4-week reference period. The APS and the AREAS were developed specifically for use with university students. The 6-month assessment included the items used at 1 month as well as questions concerning participants' impressions of the intervention, including ease of completion, utility of the feedback, whether their drinking changed as a consequence, whether they sought support for their drinking, and whether they would recommend the site to a friend.

There were 3 planned primary outcome measures: frequency of drinking (range, 0-28 days), number of standard drinks per typical occasion, and average weekly volume [(28-day frequency × typical quantity)/4]. Secondary outcomes included the APS score (range, 0-14), the AREAS score (range, 0-15), prevalence of binge drinking (for women and men, respectively, >4 and >6 standard drinks on 1 occasion in the preceding 4 weeks), and prevalence of heavy drinking (for women and men, respectively, >14 and >28 standard drinks per week in the preceding 4 weeks). We also examined subjective treatment effects (decrease in drinking vs increase/no change) and whether participants sought help for their drinking (no/yes).

STATISTICAL ANALYSIS

The primary outcomes and the AREAS scores were analyzed with negative binomial regression for panel data using the Stata 10.1 xtnbreg procedure (StataCorp, College Station, Texas).²⁸ The APS scores were analyzed with linear regression after log transformation using xtmixed (StataCorp). For the proportions of students exceeding the Australian National Health and Medical Research Council's drinking guidelines, we used generalized linear mixed models with the xtlogit procedure (StataCorp).^{29,30} All models included a random intercept to account for clustering within participant²⁹ as well as fixed effects for group, follow-up assessment, and their interaction.³¹ The interaction term allowed differences in the intervention effect between follow-up assessments. The results are presented as rate ratios, difference in regression coefficients, and odds ratios, respectively, along with overall tests of intervention with 2 *df*.

Participants were analyzed in the group to which they were randomized (intention to treat), and all participants were followed up regardless of their compliance with the intervention. We describe patterns of missing values and compare those observed and those missing in terms of baseline characteristics. In this study, some participants were missing at the 1 month follow-up assessment, others at 6 months, and some at both time points (no postrandomization data available). We compared baseline AUDIT scores, age, sex, and treatment ob-

Table 1. Demographic Characteristics and Alcohol Use of the Study Groups at Baseline

	Control (n=1184)	Intervention (n=1251)
Women, %	45.5	45.1
Age, mean (SD), y	19.7 (1.8)	19.7 (1.8)
Living arrangement, %		
With a parent or guardian	64.3	66.4
Shared house/student housing	29.7	27.2
Other	5.9	6.3
AUDIT score, mean (SD)	14.3 (5.1)	14.2 (5.1)
Drinking summary data ^a		
Drinks alcohol 2 or more times per week, %	62.2	59.3
No. of standard drinks per typical drinking occasion, mean (SD)	8.5 (4.6)	8.5 (5.2)
Alcohol dependence subscale score, mean (SD) ^b	1.8 (1.8)	1.8 (1.8)

Abbreviation: AUDIT, Alcohol Use Disorders Identification Test.

^aAUDIT items 1 and 2.

^bSum of scores for AUDIT items 4 through 6.

Table 2. Unavailable for Follow-up Analysis

	Missing at 1 mo		Missing at 6 mo		Missing at Both Time Points	
	Control Group (n=242)	Intervention Group (n=289)	Control Group (n=417)	Intervention Group (n=440)	Control Group (n=180)	Intervention Group (n=205)
Women, No. (%)	97 (40)	119 (41)	181 (43)	184 (42)	71 (39)	81 (40)
Age, mean (SD), y	19.8 (1.9)	20.0 (1.9)	19.9 (1.9)	20.0 (1.9)	19.9 (1.9)	20.2 (1.9)
AUDIT score at baseline, mean (SD)	14.6 (5.1)	14.4 (5.2)	14.4 (5.2)	14.2 (5.0)	14.7 (5.2)	13.9 (5.0)

Abbreviation: AUDIT, Alcohol Use Disorders Identification Test.

served at 1 month with those not observed at 1 month, overall, and by treatment group (to assess whether unavailability for follow-up was differential by randomization group). These analyses were repeated for those not observed at 6 months as well as for those not observed at either 1 month or 6 months. While nondifferential missingness of baseline quantities by randomization group does not rule out nonignorable differential missingness, it does provide some reassurance that the unobserved participants do not drastically differ from the observed.

We fit 2 types of models to assess an intention-to-treat hypothesis (randomization effect on outcome). Random-effects models^{29,30} allow the incorporation of all participants with at least 1 follow-up observation. This model will yield unbiased estimates of the treatment effect under the assumption that values are missing at random.³² Also, we carried out a sensitivity analysis using multiple imputation. A chained equation imputation model was fit simultaneously for all outcomes as well as baseline AUDIT score, age, and sex, to create 15 imputed complete data sets.^{33,34} Predictive mean matching was used within the mice/uis routines in Stata while micombine was used to summarize the results.³⁵ Values were imputed for all participants, even for those with no postrandomization data. Because these models do not account for the intervention group, they will tend to attenuate any randomization effect if missingness is missing at random.

RESULTS

SCREENING AND RANDOMIZATION

Participant flow, follow-up rates, and number analyzed are represented in the Figure. Of 13 000 students invited to complete the screening survey, 5623 (43%) did not respond, 140 (1%) provided an incomplete response, and 7237 (56%) completed the screening survey. Of these, 4802 (66%) screened negative and 2435 (34%) screened positive for unhealthy alcohol use and were randomized to the intervention (n=1251) or the control (n=1184) group. The median completion time for the baseline questionnaire was 5.2 minutes (interquartile range, 4.0-7.0 minutes). **Table 1** presents summary data illustrating the profile and equivalence of the 2 study groups at baseline.

FOLLOW-UP ASSESSMENT

At 1 month, data were obtained from 942 participants in the control group (80%), and 962 in the intervention group (77%). At 6 months, data were obtained from 767 participants in the control group (65%) and 811 in the intervention group (65%). A summary of participants who were unavailable for follow-up by treatment group, age, sex, and AUDIT scores is presented in **Table 2**. Baseline AUDIT scores were similar for those who did or did not complete the follow-up assessment at 1 month (mean difference, 0.23 points; 95% confidence interval [CI], -0.26 to 0.72) and 6 months (mean difference, 0.03 points; 95% CI: -0.39 to 0.46). Men were more likely than women to be missing at 1 month ($\chi^2=5.9$; $P=.02$) and 6 months ($\chi^2=3.9$; $P=.05$). Those who dropped out were significantly older than those who continued at 1 month (mean difference, 0.29 years; 95% CI, 0.11 to 0.46) and 6 months (mean difference, 0.32 years; 95% CI, 0.17 to 0.47). The median time to follow-up was 3 days (interquartile range

Table 3. Summary Outcome Data 1 and 6 Months After Intervention^a

Outcome	Median (25th and 75th Percentiles)	
	Control Group	Intervention Group
Frequency of drinking (No. of drinking days)		
1 mo	7 (4-11)	6 (4-10)
6 mo	8 (5-12)	7 (4-12)
Typical occasion quantity (No. of drinks per typical drinking occasion)		
1 mo	6 (4-10)	6 (4-9)
6 mo	6 (4-10)	6 (3-9)
Volume consumed (No. of drinks per week)		
1 mo	10 (6-19)	8 (4-15)
6 mo	11 (6-20)	9 (5-18)
Personal, social, sexual, and legal consequences of episodic heavy drinking (No. of problems; APS score: range, 0-14)		
1 mo	2 (1-4)	2 (1-4)
6 mo	2 (1-4)	2 (1-4)
Consequences related to academic role expectations (AREAS score: range, 0-15)		
1 mo	1 (0-2)	1 (0-2)
6 mo	1 (0-2)	1 (0-2)
Proportion exceeding guidelines for binge drinking (risk of acute harm), % ^b		
1 mo (control group, n=944; intervention group, n=966)	58.6	54.1
6 mo (control group, n=767; intervention group, n=813)	54.5	52.9
Proportion exceeding guidelines for heavy drinking (risk of chronic harm), % ^c		
1 mo (control group, n=944; intervention group, n=966)	22.1	15.1
6 mo (control group, n=767; intervention group, n=813)	25.0	18.7
Subjective treatment effects and help-seeking behavior (assessed at 6 mo only), %		
"As a consequence of THRIVE the amount of alcohol I consume has decreased."	5.8	19.0
"I have sought support to reduce my drinking as a consequence of THRIVE."	2.7	4.9

Abbreviations: APS, Alcohol Problems Scale; AREAS, Academic Role Expectation and Alcohol Scale; THRIVE, Tertiary Health Research Intervention Via Email.

^aAll measures use the preceding 4 weeks as the reference period.

^bAustralian National Health and Medical Research Council: no more than 4 drinks (40 g of ethanol) on any 1 occasion for women, and no more than 6 drinks (60 g of ethanol) on any 1 occasion for men.

^cNo more than 14 drinks (140 g of ethanol) per week for women, and no more than 28 drinks (280 g of ethanol) per week for men.

[IQR], 11 days) in each of the study groups at 1 month. At 6 months, it was 4 days (IQR, 8 days) in the control group and 4 days (IQR, 11 days) in the intervention group.

Table 3 presents summary data for the outcomes at the 1- and 6-month follow-up assessments in each treat-

Table 4. Treatment Effects Based on Random-Effects Models With and Without Imputation for Missing Values

Variable	Treatment Effects	
	RR ^a (95% CI) Intervention/Control	
	Without Multiple Imputation for Missing Values	With Multiple Imputation for Missing Values ^b
Primary outcomes		
Frequency of drinking		
1 mo	0.89 (0.83 to 0.94)	0.90 (0.85 to 0.96)
6 mo	0.91 (0.85 to 0.97)	0.91 (0.86 to 0.96)
Typical occasion quantity		
1 mo	0.93 (0.88 to 0.98)	0.93 (0.88 to 0.99)
6 mo	0.96 (0.91 to 1.02)	0.94 (0.89 to 0.99)
Volume consumed		
1 mo	0.83 (0.78 to 0.90)	0.85 (0.79 to 0.92)
6 mo	0.89 (0.82 to 0.96)	0.86 (0.81 to 0.92)
Secondary outcomes		
Personal, social, sexual, and legal consequences ^c		
1 mo	-0.02 (-0.08 to 0.05)	-0.01 (-0.08 to 0.06)
6 mo	-0.001 (-0.07 to 0.07)	-0.01 (-0.07 to 0.05)
Negative academic consequences		
1 mo	0.94 (0.82 to 1.07)	0.93 (0.80 to 1.07)
6 mo	0.95 (0.82 to 1.09)	0.93 (0.82 to 1.06)
Adjusted Odds Ratio^d		
Odds of binge drinking (risk of acute harm)		
1 mo (control group, n=944; intervention group, n=966)	0.78 (0.58 to 1.04)	0.79 (0.58 to 1.07)
6 mo (control group, n=767; intervention group, n=813)	0.89 (0.65 to 1.22)	0.81 (0.60 to 1.05)
Odds of heavy drinking (risk of chronic harm)		
1 mo (control group, n=944; intervention group, n=966)	0.50 (0.35 to 0.71)	0.63 (0.42 to 0.94)
6 mo (control group, n=767; intervention group, n=813)	0.55 (0.38 to 0.80)	0.65 (0.46 to 0.92)

Abbreviations: CI, confidence interval; RR, rate ratio

^aNegative binomial mixed model adjusted for time and group × time interaction effects.

^bFor participants missing all postrandomization data, values were imputed using multiple imputation.

^cLinear regression coefficients for log-transformed values.

^dGeneralized linear mixed models with the Stata xtlogit procedure (StataCorp, College Station, Texas) adjusted for time, and group × time interaction effects.

ment group and a summary of subjective treatment effects and help-seeking behavior. Intervention group participants were significantly more likely than controls to report subjective treatment effects ($\chi^2=62.9; P<.001$) and help-seeking behavior ($\chi^2=5.2; P=.02$).

Table 4 presents treatment effect ratios for the outcomes at 1 and 6 months, with and without multiple imputation for missing values. At 1 month, relative to controls, participants receiving e-SBI reported a lower frequency of drinking (rate ratio [RR], 0.89; 95% CI, 0.83 to 0.94), fewer drinks per occasion (RR, 0.93; 95% CI, 0.88 to 0.98), and lower total consumption (RR, 0.83; 95% CI, 0.78 to 0.90). The differences in logAPS (RR, -0.02; 95% CI, -0.08 to 0.05) and AREAS score (RR, 0.94; 95% CI, 0.82 to 1.07) were nonsignificant.

At 6 months, the differences in frequency of drinking (RR, 0.91; 95% CI, 0.85 to 0.97) and total consumption (RR, 0.89; 95% CI, 0.82 to 0.96) remained. The other differences favored intervention (ie, risk ratios <1) but were nonsignificant. The *P* values for the tests of intervention with 2 *df* vs control were *P*<.001, *P*=.02, and *P*<.001 for the primary outcomes. They were *P*=.59 and *P*=.87 for the alcohol-related problems measures (APS and AREAS). These results show that there were significant differences between the intervention and control groups for the primary outcomes across both follow-up assessments. Table 4 also in-

cludes treatment effect estimates after imputation for missing values.

There were nonsignificant differences between the intervention and control groups in the proportion who reported binge drinking at both follow-up assessments (Table 4). There were large significant differences in the proportion of participants who exceeded heavy drinking guidelines at 1 month (RR, 0.50; 95% CI, 0.35- 0.71) and 6 months (RR, 0.55; 95% CI, 0.38- 0.80), favoring the intervention. *P* values for the tests of intervention with 2 *df* vs control were *P*=.22 and *P*<.001 for binge and heavy drinking guidelines, respectively.

Interaction terms were fitted in all models to determine whether the efficacy of the intervention varied between the 1- and 6-month follow-up periods. None of them was statistically significant. Interaction term *P* values for the 7 outcomes in Table 4 were 0.47, 0.19, 0.13, 0.87, 0.69, 0.44, and 0.68, respectively.

COMMENT

Heavy drinkers who received the e-SBI drank 17% less alcohol than controls 1 month after screening and 11% less alcohol 6 months after screening. These differences in overall volume consumed were mainly driven by re-

ductions in the frequency of drinking, although there were also small reductions in the amount consumed per drinking episode. There were small nonsignificant differences between groups in the incidence of acute alcohol-related problems. In addition to the direct effects of the intervention, participant self-report after the 6-month follow-up period suggests that the intervention prompted students with unhealthy alcohol use to seek help to moderate their drinking. Despite attenuation in the size of the treatment effect ratios from 1 to 6 months after intervention, fitting of interaction terms in statistical models showed that the efficacy of the intervention did not differ significantly between the follow-up assessments.

Attrition at 1 month (22%) and 6 months (35%) was higher than in previous studies of e-SBI with university students using a primary health care facility (10% and 15%, respectively).²⁰ The difference may reflect less commitment to the study in the absence of a face-to-face interaction with a researcher. Importantly, those students who were unavailable for follow-up were similar across treatment groups with regard to sex, age, and baseline AUDIT score. The sensitivity analysis, using multiple imputation to include all cases in the analyses, produced modest attenuation in treatment effect ratios (Table 4). While these analyses do not rule out possible nonignorable nonresponse as a cause of the results, this explanation is implausible given the nondifferential dropout.

A previous study using a similar e-SBI instrument found evidence of an assessment effect, ie, students with unhealthy alcohol use who received 10 minutes of Web-based assessment of their drinking, in the absence of a feedback intervention, subsequently drank less than a screening-only control group.¹⁸ In the present trial, at the 6-month assessment, 5.8% of control participants endorsed the following statement: "As a consequence of THRIVE the amount of alcohol I consume has decreased." Also, it should be noted that there was a large reduction in the proportion of binge drinkers among controls (from 100% at baseline to 58.6% at 1 month [Table 3]). Regression to the mean will explain some of this difference but probably not all of it. Assessment effects may have occurred and, accordingly, the treatment effect may be underestimated.

Contamination effects may have occurred, given that approximately 1 in 10 of the undergraduate population received the intervention. If those who received the intervention had discussed their feedback with fellow undergraduates, some controls may have inadvertently been exposed to elements of the intervention, which may have biased results toward the null. Social desirability effects, if they occurred, may have biased the results away from the null. In most studies of drinking behavior, the use of objective measures, such as biomarkers, is inappropriate for various reasons, including, in this case, the fact that such measures are not sensitive to the sort of episodic heavy drinking that is characteristic of young persons.³⁶ Accordingly, we had to rely on self-report. Although a number of studies attest to the reliability of self-report of alcohol outcomes in clinical trials,³⁶ it remains possible that persons who received the intervention were inclined to underreport their drinking to a greater extent than were controls.

Overall, the intervention effects were somewhat smaller than those found using the same screening criteria and a similar intervention with university students presenting to a health service in New Zealand.^{16,17} The lack of face-to-face interaction and the taking of the intervention out of a health care setting may have reduced its potency. Nonetheless, there is now evidence that the general approach can be replicated cross-culturally and that it produces significant benefits for modest costs of implementation. Notably, the effect size in this study—an 11% reduction in drinking volume over 6 months—is similar to that reported in a recent systematic review of conventionally delivered primary health care–based brief interventions (13%).³⁵ Given the scale on which proactive e-SBI can be delivered and its acceptability to student drinkers, we can be optimistic that a widespread application of this intervention would produce a benefit in this population group. The e-SBI, a program that is available free for nonprofit purposes, could be extended to other settings, including high schools, general practices, and hospitals.

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