

Demon Rum: High-Tech Solutions to an Age-Old Problem

Scott T. Walters, Reid K. Hester, Emil Chiauzzi, and Elizabeth Miller

This article summarizes the proceedings of a symposium at the 2004 Research Society on Alcoholism Meeting in Vancouver, British Columbia, Canada, organized and chaired by Scott T. Walters. The purpose of the symposium was to describe several brief motivational interventions offered via the Internet, including the evidence for web-based interventions, applications and contexts in which such approaches are being used, and directions for future research. Walters provided an overview and introduction to the topic and discussed the e-CHUG (www.e-chug.com) and e-TOKE (www.e-toke.com) feedback interventions for college alcohol and marijuana prevention, including the contexts in which they are being used and ways they are being integrated with other campus prevention efforts. Dr. Hester presented 12-month results from a controlled trial of the Drinker's Check-up (www.drinkerscheckup.com), an intervention for adult problem drinkers that is available both as a Windows and as an Internet application. Dr. Chiauzzi described the development and testing of My Student Body (www.mystudentbody.com), a tailored drinking prevention web site for college students. Finally, Dr. Miller addressed the use of online assessment and feedback to reduce drinking, including the history of web-based interventions and their likely future and the potential limitations of such approaches.

Key Words: Computer, Internet, Alcohol, Brief Intervention, Prevention

USE OF THE Internet has risen sharply over the past decade, to a point at which more than half of the U.S. population now has in-home access. The proportion is even higher (62%) among households with children under the age of 18 (U.S. Department of Commerce, 2002). From a public health perspective, one of most important uses of the Internet is to access health information. Eighty percent of U.S. Internet users have used the Internet to access health information, with women and better-educated people being more likely on average to access information (Pew Internet & American Life Project, 2003). The continuing popularity of "e-health" interventions is due to a number of factors: the low per-person cost of dissemination (Green and Fost, 1997; Havas et al., 1995); the ability to deliver accurate, current, and confidential information (Science Panel on Interactive Communication and Health, 1999); the ease of data collection and ability to tailor responses to individual

characteristics (Cloud and Peacock, 2001; Green and Fost, 1997; Rhodes et al., 2003); and the availability of interpersonal and group transactions [e.g., listservs, chat rooms (Atkinson and Gold, 2002)].

Within the domain of online health interventions, a subset of programs target alcohol reduction with brief motivational feedback, information, or advice. In-person brief motivational interventions (BMIs) are among the most empirically supported approaches to reducing alcohol use and have proved effective across a range of populations and settings (Miller et al., 2003; Moyer et al., 2002). Thus, it is no surprise that there has been tremendous interest in translating BMIs to computer and Internet applications. Unfortunately, the quality of such online applications has proved to be extremely variable. This symposium describes several alcohol interventions that are offered via the Internet and that are based on the BMI model, including the evidence for web-based interventions, applications and contexts in which such approaches are being used, and directions for future research.

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THE DRINKER'S CHECK-UP

Reid K. Hester

This section describes the Drinker's Check-up (DCU) intervention and presents the results of a randomized, controlled efficacy trial. The DCU is a computer program modeled after the original face-to-face DCU developed by Miller et al. (1988). The DCU consists of an introduction and screening, modules for assessment, individualized feed-

Table 1. Means (SDs) on Form 90 and Form 30 Drinking Measures at Four Time Points

Group	Baseline	4 weeks	8 weeks	12 months
Average drinks (SECs) per day in assessment period				
Immediate	5.69 (5.44)	2.71 (2.84)	2.31 (2.23)	2.07 (2.19)
Delayed	5.64 (4.66)	4.13 (2.61)	3.56 (2.80)	2.50 (2.58)
Drinks per drinking day				
Immediate	8.84 (6.36)	5.64 (4.09)	6.66 (6.12)	5.50 (4.63)
Delayed	5.57 (2.55)	5.66 (2.60)	4.86 (2.40)	4.14 (2.72)
Average peak BAC				
Immediate	0.174 (0.107)	0.096 (0.087)	0.118 (0.126)	0.078 (0.058)
Delayed	0.161 (0.132)	0.149 (0.106)	0.100 (0.079)	0.073 (0.063)
Log average drinks (SECs) per day in assessment period				
Immediate	0.737 (0.268)	0.464 (0.308)	0.434 (0.282)	0.394 (0.288)
Delayed	0.751 (0.240)	0.654 (0.232)	0.570 (0.306)	0.453 (0.288)
Log drinks per drinking day				
Immediate	0.924 (0.247)	0.753 (0.249)	0.786 (0.292)	0.744 (0.234)
Delayed	0.789 (0.162)	0.791 (0.178)	0.732 (0.189)	0.661 (0.213)
Log average peak BAC				
Immediate	0.068 (0.038)	0.039 (0.033)	0.046 (0.046)	0.032 (0.023)
Delayed	0.062 (0.047)	0.059 (0.040)	0.040 (0.031)	0.030 (0.025)

BAC, blood alcohol concentration.

back, and motivational enhancement exercises. For instance, in the “Looking at Your Drinking” module, users receive a comprehensive assessment of their drinking, risk factors, alcohol-related consequences, symptoms of dependence, and motivation for change. In “Getting Feedback,” users receive detailed, individualized feedback based on their assessment data. In the “Deciding What to Do” module, the DCU helps users resolve ambivalence about whether to change. If a decision is made to change, then the program helps users decide whether to abstain or to moderate their drinking, develop alternatives to heavy drinking based on a functional analysis, and create a “Change Plan” similar to that used in the Motivational Enhancement Therapy arm of Project MATCH (Miller et al., 1995). (See Squires and Hester, 2004, for a more detailed description of the program and its follow-up component, the Follow-up Drinker’s Check-up.)

Methods

We randomly assigned 61 problem drinkers [Alcohol Use Disorders Identification Test (AUDIT) scores >7] to receive the DCU either immediately (experimental group) or after a 4-week waiting period (control group). Our hypotheses were that (1) there would be significant differences in terms of drinking between the immediate and delayed groups between baseline and a 4 week follow-up; (2) between 4 and 8 weeks (the first follow-up after the delayed treatment group has used the DCU), there would be greater changes in the Delayed group than in the immediate group; and (3) reductions in drinking and related problems would be evident in both groups from pretreatment (baseline) to the 12-month follow-up.

Participants A total of 141 individuals were screened over the telephone. Of these, 83 completed an in-person screening and signed an informed consent form. Twenty-two failed to present for their baseline assessment and were dropped. Of the final sample size of 61, 35 (57%) were

randomized to the immediate group and 26 (43%) were randomized to the delayed group.

Twenty nine (48%) participants were female, with a mean age of 45.2 (SD 9.4). Men had a mean age of 46.1 (SD 13.8). Seventy-nine percent were white, 13% were Hispanic [Latino(a) or Mexican American], 5% were Native American, and 3% were of other ethnicities. Forty-eight percent were married, 31% were separated, and 21% were single. The average educational level was 15.3 (SD 2.3) years.

Assessments and Follow-ups. Baseline and follow-up data included the Form 90 for detailed quantity/frequency drinking information, the AUDIT, the Brief Drinker’s Profile, the Drinker’s Inventory of Consequences, the Severity of Alcohol Dependence-Community Sample, and the Stages of Change Readiness and Treatment Eagerness Scale. Follow-ups occurred at 4 weeks, 8 weeks, and 12 months. At 12 months, 80% of participants completed the DCU but only 57% completed the Form 90. We were able to achieve a higher follow-up rate with the DCU because some participants participated in the 12-month follow-up only by mailing in paper-and-pencil versions of the DCU assessments.

Results

Table 1 presents baseline and follow-up drinking data from the Form 90. For a detailed presentation of results, see Hester et al. (2005).

Because measures of drinking were highly skewed (ranging from 1.09 to 2.91), we used a log transformation (skewness of log variables ranged from 0.003 to 1.95). These data also are shown in Table 1. Treating the experiment as a doubly multivariate design (i.e., simultaneously analyzing the three measures and using the multivariate approach to repeated measures), the multivariate test of time was highly significant [$F(9,21) = 6.637, p < 0.001$]. Follow-up multivariate tests of contrasts between adjacent time periods indicated that the overall decline (i.e., for the entire sam-

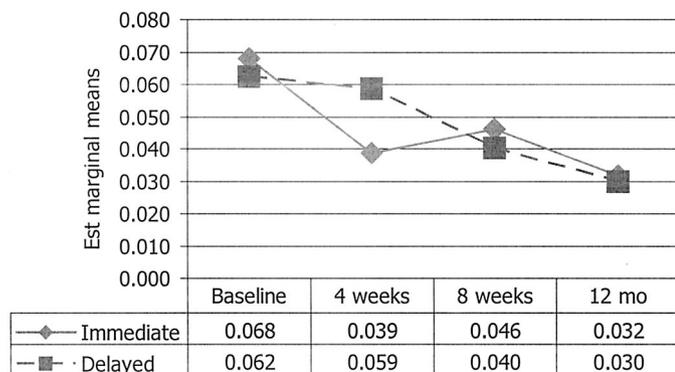


Fig. 1. Log of average peak blood alcohol concentration as a function of treatment and time.

ple) in drinking levels from baseline to 4 weeks was significant [$F(3,27) = 3.30, p = 0.035$], as was the overall decline from 8 weeks to 12 months [$F(3,27) = 3.31, p = 0.035$]. Overall change from 4 to 8 weeks was not significant ($F < 1$).

The primary test of the hypotheses for the differential impact of the DCU was a test of the group \times time interaction over the first three time periods. We expected a change in drinking over the first period that would favor the immediate group, a change during the second period that would favor the delayed group, and an overall decline over the three periods for both groups. Using a doubly multivariate design and focusing on the three periods, the overall test of the treatment \times time interaction was significant [$F(6,43) = 2.667, p = 0.027$]. The general pattern is illustrated in Fig. 1 for a representative dependent variable, average peak blood alcohol concentration. The multivariate effects were corroborated by separate analyses of the primary dependent variables.

Effect Sizes. Using Cohen's d , effect sizes were computed to characterize within-group change over time (see Table 2). On each of the three primary dependent variables, the effect size for change in the group that received treatment was greater than the effect seen in the nontreated group during that period. However, the magnitude of the difference between groups was substantially greater in the initial period. Averaging over dependent variables, the mean effect sizes for the first time period were 0.93 and 0.21 for the immediate and delayed groups, respectively. Mean effect sizes for the second time period were 0.32 and 0.04 for the delayed and immediate groups, respectively. Remarkably, both groups continued to improve in the months after treatment. The mean effect sizes for change between 8 and 12 months were 0.23 in the immediate group and 0.41 in the delayed group. As a result, when baseline and 12-month measures were compared, the overall effect sizes were 1.05 in the immediate group and 0.93 in the delayed group. These overall effect sizes exceeded Cohen's cutoff for a large effect (Maxwell and Delaney, 2004) and were of comparable size in the two conditions.

Discussion

The drinking outcome measures supported the experimental hypotheses. The immediate group significantly reduced their drinking in the 4 weeks after their use of the DCU. During this period, the delayed group reduced their drinking only a fraction of the reduction shown by the immediate group (Cohen's effect size $d = 0.21$ and 0.93 , respectively). However, at the 8-week follow-up, after the delayed group had used the DCU, their drinking had declined substantially and the two groups did not differ at the 12-month follow-up. Drinking as measured by an average of the three quantity/frequency measures of the Form 90 had declined by 50% by the 12-month follow-up. Measures of alcohol-related consequences and dependence showed similar declines over time.

Overall, the results of this study suggest that this computer application can be effective at reducing the consumption of a group of problem drinkers. In fact, outcomes from this study compare favorably to earlier studies of the DCU delivered via face-to-face contact (see Burke et al., 2002, for a review). Further research includes evaluating the DCU in other treatment populations. To this end, we offer the DCU to other researchers who are interested in evaluating it in additional controlled trials. We have also developed a web application that parallels the Windows version of the DCU at <http://www.drinkerscheckup.com>. Although it does not have a follow-up component, the baseline characteristics of those who have used the online version thus far are similar to the baseline characteristics of participants in this efficacy study.

APPLICATIONS OF THE E-CHUG IN REDUCING COLLEGE DRINKING

Scott T. Walters

Despite the proliferation of prevention and intervention programs targeted at college drinking, consumption and consequences continue at a high rate (Hingson et al., 2002; Wechsler et al., 2002). The most widely used education programs (e.g., alcohol awareness weeks) seem to have little effect on drinking, whereas less popular programs (e.g., skills-building, brief motivational interventions) seem to have better empirical support (Larimer and Crouce, 2002; Walters and Bennett, 2000). One promising trend is the emergence of motivational feedback interventions, which provide students with individualized information regarding alcohol consumption and risk factors, a comparison with college norms, and advice to moderate drinking. In addition to the studies suggesting that feedback can be effective when used as an adjunct to an individual motivational interview (e.g., Borsari and Carey, 2000; Larimer et al., 2001; Marlatt et al., 1998), other studies have shown that, under some circumstances, feedback alone can reduce drinking (Collins et al., 2002; Neighbors et al., 2004; Walters, 2000). On the basis of this logic, this section

Table 2. Effect Sizes for Within-Group Changes

Dependent variable	Baseline vs. 4 weeks	Baseline vs. 8 weeks	Baseline vs. 12 months	4 weeks vs. 8 weeks	4 weeks vs. 12 months	8 weeks vs. 12 months
Log average drinks						
Immediate	1.12	1.32	1.23	0.15	0.24	0.14
Delayed	0.27	0.47	1.24	0.23	0.88	0.49
Log drinks per drinking day						
Immediate	0.78	0.70	0.75	-0.02	0.04	0.16
Delayed	0.15	0.58	0.68	0.45	0.67	0.36
Log average BAC						
Immediate	0.89	0.79	1.16	-0.02	0.24	0.40
Delayed	0.22	0.47	0.87	0.29	0.86	0.37
Mean over dependent variables						
Immediate	0.93	0.94	1.05	0.04	0.17	0.23
Delayed	0.21	0.51	0.93	0.32	0.80	0.41
Overall Mean	0.57	0.72	0.99	0.18	0.49	0.32

provides an overview and describes two recent program evaluations of the electronic Check-up to Go (e-CHUG), a commercially available motivational feedback program for college students.

Drawing on social norms and motivational interviewing theories, the e-CHUG (www.e-chug.com) delivers personalized feedback about consumption, risk factors, and comparisons with college drinking norms. The e-CHUG is the web-based version of the Check-Up to Go (CHUG) mailed feedback instrument, which has shown efficacy in trials with college (Walters, 2000; Walters et al., 2000) and adult (Walters and Woodall, 2003) drinkers. The e-CHUG, which is customized to the local campus, includes feedback that is thought to be particularly motivating to college students: (1) a quantity/frequency summary of drinking behavior (i.e., standard drinks consumed in the last month, peak blood alcohol concentration, caloric intake “cheeseburger” equivalent); (2) comparison with U.S. adult and campus-specific college norms; (3) estimated level of risk (e.g., AUDIT score, genetic risk, tolerance); (4) amount of money spent on alcohol per year and percentage of income; (5) number of cigarettes smoked per month; and (6) explanation, advice, and local referral information.

As a stand-alone intervention, the e-CHUG has been implemented in a variety of campus settings: (1) freshman orientation classes; (2) students who are referred for campus alcohol violations; (3) waiting rooms of student service facilities; (4) outreach to high-risk groups, such as fraternities, sororities, and athletes; (5) part of alcohol awareness day and general prevention efforts; and (6) as an adjunct to other individual and group counseling programs.

Two recent program evaluations offer preliminary evidence that the e-CHUG may compare favorably to another, more lengthy prevention program and may increase the impact when added to educational or skills-based prevention efforts. In one trial (Lange and Atkinson, unpublished), e-CHUG alone was compared with e-CHUG plus the CHOICES interactive journaling program. Marketed by the Change Companies, the CHOICES program uses a workbook to structure, guide, and personalize a facilitated group review of the core components of the Alcohol Skills Training Program (Baer et al., 1992). Using a quasi-

experimental design, 138 freshman orientation students completed pretest measures and were randomized by class to receive the e-CHUG with or without the addition of the CHOICES program. The CHOICES participants completed a workbook and attended a 50-min workshop and discussion delivered by an undergraduate peer educator. Both groups were expected to complete the e-CHUG as part of a class requirement; however, no data on actual e-CHUG completion were collected. At 4 weeks, 100 students were recontacted successfully. χ^2 analyses yielded no significant demographic differences between the two groups. In terms of knowledge transfer, students who received the CHOICES intervention showed significantly improved knowledge about campus alcohol norms. In terms of consumption, there was a significant reduction in both groups as measured by total number of drinks for a typical Thursday, Friday, and Saturday. The number of drinks during the *heaviest* episode over the past month did not change significantly for either group.

In a second trial (Lange et al., unpublished), the e-CHUG was tested as an added component to the CHOICES self-guided workbook or the Alcohol 101 CD-ROM program. Alcohol 101 is a widely disseminated computer program that includes information about alcohol's effects on the body, role play scenarios for managing risky environments, and information about the consequences of drinking and driving. A total of 190 freshman orientation students were randomly assigned to complete the CHOICES self-guided workbook and group or the Alcohol 101 CD-ROM in a group format. Half of the students in each condition were also randomized to complete the e-CHUG. At a 4-week follow-up, whether the students received CHOICES or Alcohol 101, there was a marked decrease in drinking when they also completed the e-CHUG. That is, regardless of curriculum, those who also completed the e-CHUG reported fewer drinks and fewer drinks per drinking hour [$F(1, 109) = 9.495, p < 0.01$] than those who did not complete the e-CHUG. Current directions include a large-scale, randomized efficacy trial of the e-CHUG, collaborating with other interventions to increase their overall effectiveness, tailoring the e-CHUG to specific high-risk populations (e.g., Greek-affiliated stu-

dents, athletes), and targeting other substances of abuse (e.g., marijuana-specific version at www.e-toke.com).

MYSTUDENTBODY.COM (ALCOHOL): A HIGH-RISK DRINKING PREVENTION WEB SITE FOR COLLEGE STUDENTS

Emil Chiauzzi

This section describes MyStudentBody.com (MSB), a college student health web site with modules for alcohol prevention, tobacco cessation, sexually transmitted disease prevention, stress management, nutrition, and drug use prevention. Student users have the option of viewing the web site as an anonymous user or of registering as a user and accessing the log-in page. The program is database driven, allowing for aggregate data collection and regular updating of information. MSB (Alcohol) is composed of the following areas.

Rate Myself

The program begins with a series of self-assessments related to alcohol expectancies, risks, consequences, and effects, which help to tailor the web site to the user. The assessments are brief (5–10 questions each) and can be finished in 15 to 20 min. Students then can view and print tailored, motivational feedback reports for each completed assessment. In addition, as the student completes the assessments, relevant content in other areas is tagged with yellow icons. On the basis of the assessment, these icons highlight potentially relevant content, e.g., a student who indicates that he or she lacks social support would find a highlighted article on expanding social networks. Student responses to each assessment are saved in the web site database and can be updated in future visits.

Updated Areas

MSB (Alcohol) contains three sections that are updated on a weekly basis with current information: (1) Student Voices, which contains interactive (Flash/audio) personal accounts from students who have dealt with alcohol-related situations; (2) Ask the Expert, which contains student questions answered by a college alcohol expert; and (3) College News, which contains news about health-related issues that are relevant to college students.

Topic Pages

The topic pages include (1) Liquid Logic, which focuses on how alcohol affects the mind and the body; (2) Risky Routes, which focuses on how alcohol can be associated with high-risk behavior (e.g., impaired driving, high-risk sexual behavior); (3) Social Scenes, which addresses coping with the social aspects of drinking and college life; and (4) Trouble Brewing, which addresses the signs that indicate problematic drinking. Each of these areas includes articles, strategies, interactive tools, and printable PDF fact cards.

Resources MSB (Alcohol) includes campus medical and counseling contacts for students who seek direct or immediate assistance. MSB (Alcohol) also includes a glossary of key alcohol-related terms, relevant links, and hotlines.

Description of Field Trial

We evaluated MSB (Alcohol) in a randomized, controlled field trial, comparing it with a text-only web site with basic alcohol information. The clinical trial involved 265 students from five colleges and universities. All students in the study fulfilled the criteria for “binge” drinking (i.e., consuming five or more drinks for men or for or more for women in the previous 2 weeks). We measured drinking patterns (typical quantity and frequency, peak consumption, special occasion use), alcohol-related problems, and readiness to change at baseline, postintervention (~1 month after baseline), and 3 months postintervention. Compared with a control group that received standard online text-based information about high-risk drinking, we hypothesized that the MSB (Alcohol) group would evidence (1) significantly less alcohol use (as measured by typical quantity and frequency; peak consumption; and a composite score composed of average consumption, binge episodes, and maximum drinks consumed on a drinking day in the past week) and (2) a decrease in alcohol-related problems. Recent studies have demonstrated that female college students may experience more severe effects as a result of their own and others’ alcohol use (Center on Addiction and Substance Abuse, 2003). Female individuals also seem to progress from use to abuse at a faster rate than male individuals and show the largest increases in drinking in the transition from high school to college (Center on Addiction and Substance Abuse, 2003). As a result, we looked specifically at the intervention effect with sex as a moderator.

Results

Both groups decreased over time in terms of quantity and frequency of typical drinking, frequency of binge drinking episodes, and the quantity consumed during special occasions. Although students in both groups significantly reduced their drinking from baseline to follow-up, MSB (Alcohol) students evidenced a significantly greater reduction in peak consumption of alcohol (maximum number of drinks consumed on a drinking day). The composite drinking behavior outcome revealed an overall increase (i.e., worsening) in drinking indicators over time but also suggested a quadratic trend favoring MSB (Alcohol). Initially, the MSB (Alcohol) group decreased (i.e., improved) their composite drinking behavior from baseline to postassessment, whereas the control group continued to worsen. By follow up, however, the MSB (Alcohol) group’s composite drinking score resembled that of the control groups’ elevated follow-up drinking composite score. Compared with the control web site, the MSB (Alcohol) web site was

Table 3. Study Findings Comparing MSB (Alcohol) With a Control Alcohol Education Web Site

Outcome	Effect and <i>F</i> value	<i>p</i> Value/partial η^2	Finding
Maximum no. of drinks consumed on a drinking day in past week	Repeated measures quadratic effect: time by condition $F(1,208) = 6.28$	0.013 0.029	MSB decreases maximum consumption sooner than controls and maintains decrease through follow-up
Alcohol drinking behavior composite	Repeated measures quadratic effect: time by condition $F(1,206) = 3.23$	0.074 0.015	MSB delays increase in composite score drinking compared with controls
Change in total quantity of alcohol consumed on special occasions ^a	ANCOVA condition by sex $F(1,171) = 4.28$	0.04 0.025	Women in MSB reported 32.5 fewer drinks at special occasions in the previous 3 months compared with 18.9 for women in the control
Change in total no. of binge-drinking episodes during special occasions ^a	ANCOVA condition by sex $F(1,172) = 3.08$	0.08 0.018	Women in MSB reported 2.6 fewer binge-drinking episodes during special occasions in the previous 3 months compared with 1.4 fewer for women in the control
RAPI scores at follow up ^a	ANCOVA condition by sex $F(1,212) = 4.00$	0.047 0.019	Lower RAPI ^b scores among women in MSB than women in the control

^a Covariate = baseline value.

^b Rutgers Alcohol Problem Index.

especially effective for women, as they significantly reduced their peak consumption (binge episodes during special occasions), total consumption (drinks during special occasions), and negative consequences related to drinking. Among students who reported some drinking at follow-up ($n = 178$; 67%), there were notable differences between the two groups. Students in the MSB (Alcohol) group who continued to drink experienced a more rapid decrease in average consumption [average drinks per drinking day, $F(1,171) = 8.18$, quadratic effect, $p = 0.005$, partial $\eta^2 = 0.046$] and peak consumption [maximum number of drinks per drinking day, $F(1,171) = 8.2$, quadratic effect, $p = 0.005$, partial $\eta^2 = 0.046$] than their control group counterparts. These decreases were maintained throughout the follow-up period. In an exploratory analysis based on baseline motivational stage, there was evidence that low-motivation drinkers who visited the MSB (Alcohol) web site reduced their daily drinking at a significantly faster rate than those in the control condition [$F(1,82) = 3.9$, quadratic effect, $p = 0.05$, partial $\eta^2 = 0.045$]. Main study results are summarized in Table 3.

Discussion

The results of this field trial are promising. Students who received this brief intervention reported a more rapid rate of decrease in consumption, as compared with a control group. The superior outcomes with female MSB (Alcohol) participants may reflect a tendency toward greater responsiveness to brief alcohol interventions. Another recent study found that college women decreased their high-risk alcohol use in response to a brief intervention (printed feedback reports) at a significantly greater rate than their male peers (Saunders et al., 2004). In addition, Internet surveys suggest that female individuals may be more active health information seekers than men (Pew Internet & American Life Project, 2003). The finding that low-

motivation users significantly reduced their average consumption relative to the control group is important, as this group may be less likely to seek out services through other means. Overall, this study provides evidence that MSB (Alcohol) may be an effective brief intervention for college students, particularly for women and low-motivation drinkers.

ONLINE ASSESSMENT AND FEEDBACK: EFFECTIVENESS, EFFICIENCY, AND EMPIRICAL PERSPECTIVES

Elizabeth Miller

Distinguishing between online assessment and feedback may be important in understanding differences between online BMIs for alcohol use. Online assessment typically refers to questions about a respondent's attitudes, beliefs, thoughts, actions, or other characteristics via structured questionnaires. This may include individual questions, diary forms, tracking information, and/or other items based on multiple branching patterns. There are two formats of online feedback based on delivery method: feedback via online education tools or via online assessment. Feedback that is delivered from an online education tool is typically derived from a limited number of questions with little or no branching patterns. Feedback in this model is "canned," that is, not individualized on the basis of response. Feedback via the online assessment may include many more questions, have a more sophisticated branching pattern, and thus provide more individualized information. Both types of feedback have the potential to provide tailored feedback; however, online education programs do not seem to be focused on that aspect currently.

Historically, feedback about drinking attitudes or behavior was delivered to an individual via a face-to-face counseling session. With the advancement of computer technology and the Internet, however, the time lag that existed

Table 4. Characteristics of Feedback Formats

	Face-to-face	Mailed	Computerized	Web-based
Controlled environment	X		X	X
Broad, global access				X
Individualized feedback	X	X	X	X
Real-time updating of normative information			*	X
Immediate availability	X		X	X
Accessible for delayed viewing	*	X	*	X
Privacy	*	X	X	X
Security	X		X	X
Increase honest reporting			X	X
Expensive	X	*		
Cost-effective use of resources			X	X

between assessment and feedback has become much more streamlined. Mailed feedback arose as a cost-effective and alternative solution for delivering feedback. More recently, computerized assessments and algorithms have given the option of providing individualized information immediately upon submission of the data. However, there are limitations to this approach, including potentially limited access to computers and the necessary software programs.

Table 4 summarizes the characteristics of various assessment and feedback methods, where “X” indicates a clear association and “*” indicates a partial fit. A cursory glance suggests that there may be a number of advantages to the web-based assessment and feedback format. However, it is important to remember that the advantages and considerations associated with each method will vary on the basis of the sample and the context. In general, college students seem to be an ideal population for web-based assessments and feedback given their access, technical savvy, comfort in using the Internet for health-related purposes, and the general real-time culture that they experience on an everyday basis. There is also evidence that computer and paper assessments may produce comparable data in this population (Miller et al., 2002). However, depending on the context, another method may be more appropriate. For example, in a clinical setting, where high-risk behaviors such as suicidality are being assessed and feedback is being offered on the basis of this information, it may be preferable to conduct an online assessment followed by a face-to-face review of the feedback.

At this time, the only thing that we know for sure is that change occurs. We have less information about the relative contributions of the assessment and feedback components, as well as what kind of feedback is most effective for whom. In terms of assessment, self-monitoring has a history in the alcohol literature of being an intervention in and of itself (Watson and Thorpe, 1993), and there is some evidence that assessment alone may produce behavior change (Miller, 2000). In terms of feedback, although we have some understanding that discrepant information may motivate change (Kanfer, 1970), in practice, most feedback studies have included a number of variables, such as drinking demography, normative comparisons, risk factors, and personal cost. Thus, it is difficult to say what the “active”

feedback ingredients might be. Other questions remain about the behavior change process associated with alcohol use and related consequences. How does change occur? What are the mechanisms of change associated with assessment and/or feedback? Does the feedback delivery method have an impact on the likelihood of change? Does immediate feedback have a more dramatic effect than feedback that is mailed a week later? Does the presentation of the feedback in a professional, colorful, graphical form have a greater impact? Does the inclusion of normative information have an impact? The answers to these questions will allow us to better tailor our responses to the needs of various users and to disseminate more efficiently evidence-based approaches. There are a wealth of opportunities given clear direction.

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