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The Drinker's Check-up: 12-month outcomes of a controlled clinical trial of a stand-alone software program for problem drinkers

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Abstract

Sixty-one problem drinkers were randomly assigned to either immediate treatment or a 4-week wait-list control group. Treatment consisted of a computer-based brief motivational intervention, the Drinker's Check-up (DCU). Outcomes strongly support the experimental hypotheses and long-term effectiveness of the treatment. Overall, participants reduced the quantity and frequency of drinking by 50%, and had similar reductions in alcohol-related problems that were sustained through 12-month follow-up. The DCU seems to be effective in enhancing problem drinkers' motivation for change. © 2005 Elsevier Inc. All rights reserved.

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1. Introduction

In the past decade there has been substantial interest in brief motivational interventions (BMI) aimed at reducing problem drinking. BMIs have been evaluated in a number of diverse clinical settings including general clinical practice, mail order, self-help programs, emergency rooms, inpatient medical programs, and as a prelude to inpatient or outpatient substance abuse treatment (see Zweben, Rose, Stout, & Zywiak, 2003 for review). As a result, there is a large body of evidence supporting the effectiveness of BMIs with a range of problem drinkers from those at risk of developing problems to those with severe dependence (Miller, Wilbourne, & Hettema, 2003).

Researchers also have been evaluating innovative ways of delivering BMIs. Agostinelli, Brown, and Miller (1995) reported that personalized feedback significantly reduced consumption in a population of heavy drinking college students relative to controls. Interestingly, this intervention was not conducted face-to-face, but through the mail. This suggests that feedback about drinking, given in an individualized, non-threatening manner, is a promising approach even when the format does not involve a face-to-face encounter.

Walters (2000) and Walters, Bennett, & Miller, (2000) replicated Agostinelli's findings with college students and also with working adults (Walters & Woodall, 2003). Continuing to evolve this protocol, Walters and colleagues have recently developed a web-based version of their protocol called the e-CHUG (electronic Checkup to Go) and are currently beginning a clinical trial of its effectiveness (S. Walters, personal communication, October 25, 2004).

Others have investigated the use of computers as well. Dimeff (1997) randomly assigned heavy-drinking students seen in a college health center setting to one of two groups. The experimental group received a computer-based assessment along with personalized feedback. Feedback of the results were also reviewed and discussed with the student by his or her primary care physician. The control group participated in assessments only, without personalized feedback. At 4-week follow-up the experimental group

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demonstrated moderate to large treatment effects for reduced quantity/frequency of drinking ($d = .81$) and consequences ($d = .54$). Reviewing these outcomes, Larimer and Cronce (2002, p. 155) concluded that "use of a computer-generated feedback in a health care setting may be a viable option for prevention of alcohol misuse."

Given the efficacy of treatment-oriented software (see Barr Taylor & Luce, 2003 for a review) and of BMIs, we decided to develop a computer-based BMI, the Drinker's Check-up (DCU), described below. To provide flexibility in how it is used, we developed both a Windows program for use by therapists and clinics and a web application for use by the general public (www.drinkerscheckup.com). Both applications offer the same features for problem drinkers. As with other BMIs, the DCU can be used as a stand-alone intervention, or as a prelude to alcohol treatment.

We also created the Follow-up Drinker's Check-up (FDCU) as a supplement to the DCU Windows program. A therapist can use the FDCU to conduct follow-ups and to automate data collection at one, two, or three points following treatment. Using a sophisticated reporting module, therapists can use the FDCU to evaluate the effectiveness of the DCU, any additional alcohol-related treatments, and/or their overall treatment program.

The current article concerns an effectiveness trial of the DCU (Windows version) as a stand-alone intervention. We randomly assigned problem drinkers from the community to either an Immediate Treatment group, or to a 4-week Delayed Treatment group. There were two experimental hypotheses. First, we predicted that there would be significant differences between the Immediate and Delayed groups in the amount of change between baseline and 4 weeks (the first follow-up after the Immediate group had received the DCU) on drinking variables. However, between 4 and 8 weeks (the first follow-up after the Delayed treatment group has used the DCU), we expected greater change in the Delayed group than in the Immediate group. Thus, over the first two follow-up time periods, the change in drinking should depend on the Treatment condition. Second, reductions in drinking and alcohol-related problems were expected in both groups from pretreatment (baseline) to the 12-month follow-up.

2. Method

2.1. Subjects

Participants were recruited through media ads drawing from the same southwestern metropolitan population as previous BMI studies conducted by Miller and colleagues at The University of New Mexico.

One hundred-forty one individuals were successfully screened on the phone. Eighty-three completed an in-person screening and signed an informed consent form. Of the 58 who did not come for an in-person screening, one decided to enroll in another clinical trial and one realized that she would not be available for follow-ups out to 12 months. Of the remaining 56 individuals, 54 did not attend their in-person screening appointment and did not return or calls to reschedule, and two failed to attend two or more in-person screening appointments and we dropped them from the study. During the in-person screening, four were excluded for medical reasons, two did not have significant others (SO) who could corroborate their self-report of their drinking, and one was younger than 21, our minimum age. No others were excluded. After signing their informed consent, 15 failed to present for their baseline assessment and were considered dropped and replaced. All but two of these were in the 4-week wait list control condition. Also, those who signed the informed consent form but dropped out before the baseline assessment had a somewhat higher score on the Alcohol Use Disorders Inventory Test ($M = 22.75$) than those who completed the baseline assessment ($M = 19.46$).

Of the final sample size of 61, 35 (57%) were randomly assigned to the Immediate group, while 26 (43%) were randomly assigned to the Delayed group. Overall, 50 (82%) of the 61 participants were successfully followed up at 12 months. Of the 11 participants that did not complete the study, six asked to be dropped and five were lost to follow-up. There was no difference in attrition between the two groups (17% and 19% for Immediate and Delayed groups, respectively, at 12 months).

Thirty-two (52%) were male with a mean age of 46.1 (*SD* 13.8) and 29 (48%) were female with a mean age of 45.2 (*SD* 9.4) years old. Seventy-nine percent were Caucasian, 13% Hispanic (Latino(a) or Mexican American), 5% Native American, and 3% other. Forty-eight percent were married, 31% were separated, and 21% were single. Mean educational level was 15.3 (*SD* 2.3) years.

For the current study, we specifically sought participants with heterogeneous backgrounds in an effort to represent the broad spectrum of problem drinkers seen in the general population. Consequently, the inclusion criteria were minimal: A minimum score of 8 on the Alcohol Use Disorders Inventory Test (AUDIT; Babor, de la Fuente, Saunders, & Grant, 1992); an eighth-grade reading level; minimum age of 21; and the availability of a willing SO who could corroborate the participant's self-report of drinking. Individuals with AUDIT scores of 8 or more were considered to have at least a mild level of problems related to their drinking. Exclusion criteria were: self-report of current treatment for alcohol problems; the presence of a severe, *uncontrolled* thought disorder (measured by clinical interview); and the presence of a medical condition for which the continued use of alcohol would be contraindicated (assessed through 11 medical history questions asked during the screening). This latter condition was included because participants could choose a goal of moderation rather than abstinence. No participants were excluded because of an uncontrolled thought disorder.

All participants were offered $40 compensation for the baseline and each follow-up assessment. Significant others were paid $20 for each baseline and follow-up interview. All participants were treated according to established APA ethical standards.

2.2. Measures and treatment

Participants were screened and assessed with the following instruments:

2.2.1. Screening for alcohol problems

Screening was addressed using the AUDIT (Babor et al., 1992). The AUDIT is a widely used 10-item brief screen for alcohol problems. Individuals with scores of 8 or more are considered to be "at-risk" for problems related to the use of alcohol. Examples of scale items include "How often do you have six or more drinks on one occasion?" and "Have you or someone else been injured as a result of your drinking?" The AUDIT demonstrates both acceptable test-retest and internal consistency reliability (Reinert & Allen, 2002).

2.2.2. Screening for reading level

Whenever reading level was in question, based on our clinical judgment during the screening, we administered the Slossen Oral Reading Test (Slossen & Nicholson, 1990).

2.2.3. Quantity/frequency of drinking

The DCU contains the Brief Drinker's Profile (BDP; Miller & Marlatt, 1987) which measures quantity/frequency of drinking in the previous month. The BDP allows for the assessment of established drinking patterns and associated quantity/frequency of use over the lifetime, and past 30 days using an interview format. The interview begins by covering elements of drinking and family history of drinking (age of first drink, age when drinking first became a problem, relatives with alcohol-related problems, etc.). It then proceeds to assess current drinking patterns (steady vs. periodic), history of DWI or DUI, and other drug use. Specifically, the BDP provides the following quantity/frequency feedback: For steady drinkers, the total number of standard drinks per week consumed, how this compares to other U.S. adults of the same gender (in percentile), estimated peak BAC in a typical week of drinking, and estimated peak blood alcohol concentration (BAC) on the heaviest drinking occasion in the past month. Episodic drinkers (those who drink less often than once a week or do not have a typical pattern of drinking) received similar BAC feedback and feedback on the frequency of heavy drinking episodes in the previous month. The BDP has demonstrated acceptable inter-rater test-retest reliability, and both content and criterion validity (Miller & Marlatt, 1984a, 1984b).

For purposes of the current study, the BDP had to be converted into a self-report format to allow for automated administration in the computerized DCU. While the BDP was initially developed and tested as an interview-based assessment, its use as a self-report instrument in the current study resulted in drinking data that were comparable both in terms of trend and magnitude of effect with data collected using the Form-90 Interview (Miller, 1996). This finding offers support for the convergent validity of the computerized self-report version of the BDP contained within the DCU, and test-retest reliability of the BDP in the DCU is well within acceptable limits (Squires & Hester, 2002).

Despite the utility of the BDP for the use in the DCU, we concluded that the averaging method of the BDP (30-day estimates are based on extrapolation of drinking data reported for a typical week or typical episodes), which is more than adequate for stand-alone applications, was insufficient for the demands of data collection in our clinical trial. Therefore, despite obvious overlap with the BDP, we added the Form-90, because it provides a more fine-grained assessment of quantity/frequency of drinking data. The Form-90 is a face-to-face, structured, retrospective interview for drinking and related behaviors (Miller, 1996). It yields quantitative data including: (1) quantity and frequency of alcohol and other drug use; (2) specific drinking patterns; (3) related socioeconomic variables such as hospitalizations and incarcerations; (4) medications taken; (5) work and living situations; (6) attendance of support groups; and (7) sessions with a therapist. The Form-90 was administered by either the Principal Investigator or one of two trained and supervised Research Assistants. We used the Form-90 for the baseline and 12-month follow-ups, and also modified it to accommodate the 30-day periods for the 4 and 8-week follow-ups.

2.2.4. Consequences, dependence, and motivation

The DCU software also assesses alcohol-related problems, symptoms of dependence, and motivation for change. The Drinker Inventory of Consequences (DrInC; Miller et al., 1995) is a 50-item scale that evaluates lifetime and recent (3-month) alcohol-related consequences in areas such as interpersonal and intrapersonal functioning, physical health, social responsibility, and impulse control. Depending on specific subscale scores, the quality of consequences range along a continuum from "very low" to "very high" based on normative data from Project MATCH (Project Match Research Group, 1993). Due to significant gender differences between males and females on some items in the normative sample, scores are interpreted according to gender-specific norms. Examples of scale items include, "I have felt guilty or ashamed because of my drinking" (intrapersonal), "My physical health has been harmed by my drinking" (physical), and "When drinking, my social life has been more enjoyable" (social; reverse-scored). The DrInC demonstrates acceptable test-retest reliability both at the subscale, and full-scale (total lifetime/total recent) levels. There is also evidence of convergent validity with other measures of alcohol consumption.

Symptoms of dependence were measured with the Severity of Alcohol Dependence Questionnaire for community

samples (SADQ-C; Stockwell et al., 1994). The SADQ-C is a 22-item scale that evaluates symptoms of physical withdrawal, affective withdrawal, withdrawal relief drinking, alcohol consumption, and rapidity of reinstatement within general health settings. The maximum score on the SADQ-C is 60, though anything over 30 is generally indicative of severe alcohol dependence. Another area of interest in addition to dependence that the SADQ-C assesses is the degree to which an individual is experiencing impaired control over drinking. Items from the SADQ-C include "When I started drinking alcohol I found it hard to stop until I was fairly drunk" and "The day after drinking alcohol, I had a very strong craving for an alcoholic drink when I awoke." The SADQ-C demonstrates adequate test-retest reliability, and there is evidence supporting construct, content, and criterion validity as well.

Finally, motivation for change was assessed using the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES; Miller & Tonigan, 1996). The SOCRATES is a 19-item scale based on three factor-analytically derived subscales representing recognition of a problem (alcohol in this case), ambivalence about change, and taking steps to change. Selection of scale items was guided by the conceptual framework of stages of change proposed by Prochaska and DiClemente (1982, 1984, 1985, 1986). However, the three subscales mentioned above are purported by Miller and Tonigan (1996) to represent motivational dimensions that underlie the stages of change. Example items from the SOCRATES include "I am a problem drinker" (recognition) and "I am working hard to change my drinking" (taking steps). The SOCRATES demonstrates acceptable test-retest and internal consistency reliability.

2.3. Treatment: the DCU and the FDCU

Aside from the Form-90, participants completed all of these measures within the DCU program at the time of the intervention, and the FDCU at follow-up. Here is a detailed description of the two programs:

2.4. The Drinker's Check-up

The Drinker's Check-up consists of integrated Assessment, Feedback, and Decision Making modules. The target population spans the range of problem drinking from at-risk drinkers (e.g., binge-drinking college students) to individuals with alcohol dependence.

2.4.1. Assessment Module

The program begins with a screening with the AUDIT prior to registration. Though redundant with the in-person screening, the AUDIT is built into the program for future stand-alone use. Based on Project MATCH data, feedback is provided on whether the subject scored low, medium, high, or very high in terms of their risk, consumption, and alcohol-related consequences. Individuals who scored at-risk or higher (8+) on the AUDIT are advised that they might benefit from using the program and are invited to proceed. Registration was then necessary to personalize the program's interactive responses to the user. Registration *requires* the user's first name, a password, gender, height, and weight. The latter are used to calculate peak BAC in the Feedback Module. The entire program (Assessment, Feedback, and Decision Making) took, on average, 90 min to complete, and participants were free to take breaks as needed.

Once participants completed the registration process, the Assessment Module was prefaced with an initial Decisional Balance exercise. In face-to-face brief motivational interventions, a decisional balance is often used as a way to acknowledge ambivalence that may be present in individuals with alcohol problems when they consider changing. The decisional balance exercise compares the "good things and the not-so-good things" (Miller & Rollnick, 1992) of drinking. Acknowledging that there are things about drinking that the individual likes (the "good things") makes it easier for them to consider and explore the consequences of their drinking (the "not so good things"). In this exercise, participants chose from lists of positive and negative things about drinking and/or entered their own item. When they submitted the information, it was saved and brought up later in the Decision Making Module.

On the main page of the Assessment Module was a list of questionnaires that participants could choose to take. These included the BDP, the DrInC, the SADQ-C, and the SOCRATES. Each of these scales demonstrates both acceptable levels of test-retest reliability and construct and criterion validity. Internal consistency and reliability also has been established as acceptable for the AUDIT, DrInC, and SOCRATES.

2.4.2. Feedback Module

The Feedback Module had the most potential for generating resistance and defensiveness in participants because they often received information that was discrepant with their views of their drinking. For instance, in face-to-face brief motivational intervention feedback sessions it is common for clients to express disbelief when told how their drinking compares to the overall U.S. adult population. Minimizing resistance requires a delicate balance: responding empathically to their reactions, while not dismissing or invalidating the results. We did this by providing a number of automatic links to different forms where the program can respond to the most common reactions. Here is an example of the program's response to a user reacting to his or her quantity/frequency feedback by indicating that the results are "higher than I expected:"

It can be surprising and (for some) discouraging to see that they fall higher on the alcohol use scale than they expected. Some people think there might be a mistake in the way results are calculated. (Feel free to review your answers in

the BDP questionnaire.) Remember that you are being compared to other men for the entire U.S. adult population. Also, it is not uncommon for people to socialize with others who drink the same as—or more—than they do. Think about which, if any, of these reactions apply to you.

We also anticipated discrepancies between feedback from different instruments (e.g., heavy drinking compared to the general population but low levels of problems relative to individuals in treatment) and provided links to appropriate responses.

In structuring the feedback process we initially had a menu of options from which the individual could choose to receive feedback on a particular topic (e.g., *How Much I Drink*). However, feedback from an early focus group suggested a more structured feedback option. As a result, we created a "Guided Tour" option on the main feedback page that led the user through feedback specific to each of the assessment instruments they had taken.

2.4.3. Decision Making Module

Once participants completed the Feedback Module, they began the Decision Making Module. This module started with Rollnick's "Readiness Ruler." The Readiness Ruler was presented as a slide bar control with a pointer that participants clicked and dragged along a continuum from "Not at all Ready" to "Really Ready to Change." The program then branched depending on where the individual indicated he or she is in considering change. If the individual is "Not at all Ready" and has taken all the assessment instruments, then he or she was given the option of printing their feedback summary and the lists they created in the program (e.g., the initial Decisional Balance exercise) or viewing the Project MATCH pamphlet *Alcohol and You* before exiting the program. If the participant was "Unsure," the program proceeded with a second, more detailed Decisional Balance exercise. If the individual was "Really Ready to Change," the program skipped this second Decisional Balance exercise and proceeded directly with negotiating goals of change and helping the user develop a change plan.

2.4.4. The Decisional Balance Exercise

This exercise asked participants to list those concerns or consequences (from the feedback they had received) and to add them to their list of "reasons for changing" that was originally labeled the "not so good things" about their drinking. These reasons *for* changing were compared to what participants liked about his or her drinking (the "good things" from the initial decisional balance exercise). This process resulted in a two-column form that contrasted the *reasons for changing* vs. the *reasons for not changing*. The program then asked the user to rank order of the importance of each item in each column. The participant was then asked to consider whether the reasons for changing outweighed the reasons for not changing. Once completed, the program again asked the individual to decide whether he or she was ready to change. If the individual was still undecided, the program respectfully asked the participant to consider what he or she has learned in the program and to talk about it with his or her therapist, if appropriate. It also asked the user to consider a series of questions found to be related to long-term sobriety (Fletcher, 2001). If the participant still decided not to change, he or she was offered the same exit option discussed in the previous paragraph. If, however, the decision to change was made, the program then proceeded with negotiating goals of change.

2.4.5. Negotiating goals of change

Consistent with the FRAMES components of brief motivational interventions, participants were offered a menu of options for both how they might change their drinking and how they could accomplish that goal. Although abstinence was suggested as the safest way to avoid alcohol-related problems, it is often a goal rejected by individuals with less severe alcohol-related problems. In addition, empirical data show that moderate drinking may be an achievable goal for such drinkers. Therefore, an exploration of this goal was appropriate. If the individual chose moderation as a goal of change, the program offered to take him or her through a section that defined moderate drinking, contraindications to it, and an offer to take the Michigan Alcoholism Screening Test (MAST; Selzer, 1971) to determine their chances of success with moderation. We included the MAST because of its ability to predict long-term success with moderate drinking (Miller et al., 1995).

2.4.6. Developing alternatives and a plan of change

Once participants chose a goal of change, the program offered to help them figure out how they would achieve and maintain those changes. This section began with a variation of the New Roads exercise (Miller & Pechacek, 1987) and then proceeded to the Change Plan worksheet used in Project MATCH. At the end of the program the program provided them with a link to resources on our web site (www.behaviortherapy.com/selfhelpresources.htm). This page includes links to: (1) a list of therapists who work with clients seeking to moderate their drinking; (2) Moderation Management (www.moderation.org) and Self Management and Recovery Training (www.smartrecovery.org); and (3) to other self-help materials. Lastly, once participants completed the program, whether or not they had chosen to change, a summary of each of the worksheets and feedback from all completed assessments were automatically printed so that they would have a hard-copy reference to their work. The DCU program took about 90 min to complete.

2.5. The Follow-up Drinker's Check-up

When participants returned for follow-up evaluations for the current study, they were first interviewed with either the Form-90 or Form-30 as discussed above. They then completed remaining assessments using the FDCU. Unlike

the DCU, however, the FDCU only included follow-up assessment functions and did not allow users to revisit the feedback and decision making modules. The FDCU contains the same assessments as the DCU but not all assessments are given at each time period. For instance while the BDP can be given every 4 weeks, the DrInC asks about consequences in the previous 3 months and the SADQ-C in the last 6 months. The AUDIT can only be re-administered every 12 months. The FDCU is for follow-up data collection and allows treatment providers or administrators to evaluate client outcomes.

3. Study design and procedure

3.1. Rationale

We chose a wait-list control design so that all participants would have the opportunity to receive the intervention. We chose 4 weeks as the wait-list time because this seemed to represent the best compromise: meaningfully comparing the initial between-groups effect, while not asking control participants to wait too long for the intervention. Because other BMI studies have found that participants tend to change their drinking immediately following delivery of an intervention, this maximized our ability to detect the true effect of the program (see Burke, Arkowitz, & Dunn, 2002 for a review.) Within this design, the Immediate Treatment group was assessed and received the DCU intervention at "Time 0" or true baseline, while participants in the delayed treatment group were neither assessed, nor received the intervention until "Time 1," 4 weeks after enrolling in the study. Therefore, evaluation of drinking data during this 4-week period allowed us to compare the initial efficacy of the program as mentioned above. One of the disadvantages of the design, however, is the risk that the Delayed group would no longer be comparable to the Immediate group when those participants received the intervention because they had waited 4 weeks.

3.2. Timeline and procedure

Table 1 illustrates the timeline for the study. Once potential participants were successfully screened and agreed to participate, they were randomized to either the Immediate or Delayed Treatment group using the Permuted Blocks Randomization Procedure (Maxwell & Delaney, 2004, pp. 448–452) that balanced groups on gender, ethnicity, and AUDIT score (defined as high or low based on Project MATCH data). Individuals in the Immediate Treatment group received the intervention at Time 0. As mentioned above, their Time 1 4-week follow-up assessed the initial impact of the DCU program.

One reason why the Delayed Treatment group was not assessed at all until 4 weeks was to avoid the potential for assessment effects that might have affected outcome independent of treatment. We conducted the 4-week assessment Form-30 to assess drinking from Time 0 to Time 1, then used the Form-90 to retrospectively assess their drinking for the 90 days preceding entry into the study. This provided pre-treatment data for a period of time comparable to that for the Immediate group. After we assessed the Delayed Treatment group with the Form-30 and Form-90, they then received the intervention (at Time 1, 4 weeks).

All participants were followed up at Time 2, 8 weeks. This was the first post-intervention assessment for the Delayed Treatment group. Overall, the Immediate group was followed up at 4 weeks, 8 weeks, and 12 months, while the Delayed group was followed up at 8 weeks and 12 months. We would have scheduled more follow-ups between 8 weeks and 12 months but were prevented from doing so by budget limitations. The distal assessment at 12 months allowed us to examine relatively longer-term outcomes of the DCU across both groups. There are three reasons to conduct a 12-month follow-up. First, there is consensus among clinical researchers that a 12-month follow-up is the minimum length of time necessary to examine enduring treatment effects (Miller et al., 2003). Second, relapse curves following substance abuse treatment indicate that the majority of relapses occur within the first 12 months. Third, beyond 12 months, environmental factors assume increasing influence in outcomes (Moos, Finney, & Cronkite, 1990). To corroborate the participant's self-report of drinking, collateral report was obtained from SOs who were interviewed at the baseline assessment and at each follow-up point with the collateral version of the Form-90.

With respect to individual participants, the DCU intervention immediately followed administration of the baseline (Time 0 for Immediate and Time 1 for Delayed) Form-90 interview. Participants were seated at a computer desk located in one of our clinic offices where the program was

Table 1
Timeline for study design and assessments

Group	Pre-treatment (90 days)	Time 0	Time 1, 4 weeks	Time 2, 8 weeks	Time 3, 12 months
Immediate	←	Baseline Form 90 & DCU	Follow-up 1 Form 30 & FDCU	Follow-up 2 Form 30 & FDCU	Follow-up 3 Form 90 & FDCU
Delayed		←	Form 30 (Time 0-1) Retrospective Assess. Form 90 (90 days pre Time 0), & DCU	Follow-up 1 Form 30 & FDCU	Follow-up 2 Form 90 & FDCU
	←				

already launched and on the screen. They were free to ask questions if they got confused or lost in the program. A research assistant sat in the room while participants used the program. Total therapist contact time during the intervention was usually less than 10 min. Participants took, on average, 90 min to complete the program. During follow-up appointments participants were first asked to complete the Form-30 or Form-90 (depending on the follow-up), then to complete the rest of the assessment in the FDCU.

4. Results

4.1. Primary dependent variables and analytic strategy

Because the Form-90 provided measures of drinking for both groups of subjects at all four time periods, summary measures from this instrument were viewed as the primary dependent variables. The disadvantage of this instrument was that data were available on fewer subjects at 12 months than in the DCU data. We have more follow-up data in the FDCU because we were able to collect this data from 13 participants by mailing and receiving back from them hard copies of the paper and pencil versions of the computerized instruments. These participants were not available by phone for us to conduct an interview using the Form-90. Data from the Form-90 and DCU, respectively, were available for 61 and 35 (DCU Immediate group only) clients at baseline, 60 and 61 at 4 weeks, 54 and 55 at 8 weeks, and 36 and 49 at 12 months, respectively. We supplemented analyses of Form-90 drinking data with DCU/FDCU data, which also included measures of consequences from the DrInC and AUDIT, motivation from the SOCRATES, and dependence from the SADQ-C.

Three drinking measures from the Form-90 were of interest: Average Drinks per day (averaged over the entire assessment period), Drinks per Drinking Day, and Average peak BAC level. (All Drinks are Standard Ethanol Content drinks.) The decline over time was substantial on these variables. Using the 35 subjects for whom Form-90 data were available at all four time points, means and *SD*s following the same subjects over time are shown in Table 2.

Because these measures of drinking were highly positively skewed (skewness statistics ranged from 1.09 to 2.91), we log transformed them to reduce skewness (skewness of log variables ranged from 0.003 to 1.95). Data on the log-transformed variables also are shown in Table 2. Treating the experiment as a doubly multivariate design (i.e., simultaneously analyzing the three measures via multivariate analysis of variance and using the multivariate approach to repeated measures; cf. Tabachnick & Fidell, 1989, p. 472ff.), 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 decline 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, $F < 1$.

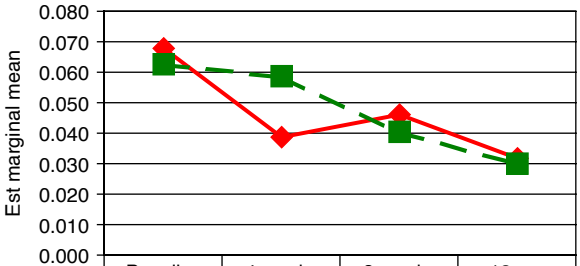
Given the change between baseline and 4 weeks in the Immediate group was expected to be greater than that in the Delayed condition, and the change between 4 weeks and 8 weeks in the Delayed group was expected to be greater than that in the Immediate group, the primary test of the experimental hypotheses for the differential impact of the DCU intervention was a test of the Group × Time interaction over the first three time periods. Again treating this as a doubly multivariate design but focusing on the first three time periods, the overall test of the Treatment × Time interaction was significant, $F(6,43) = 2.667$, $p = 0.027$. The general pattern of how the dependent variables changed as a function of Treatment and Time is illustrated in Fig. 1 for a representative dependent variable, average peak BAC. The multivariate effects were corroborated by separate analyses of the primary dependent variables.

4.2. Univariate analyses of Form-90 measures

A test of the effect of Time on log Average Drinks/Day using the multivariate approach to repeated measures was highly significant, $F(3,30) = 10.35$, $p < 0.001$. The mean

Table 2
Means and (SDs) on Form 90 and Form 30 drinking measures at four time points

	Group	Baseline	4 weeks	8 weeks	12 months
Average Drinks (SEC) 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	.174 (.107)	.096 (.087)	.118 (.126)	.078 (.058)
	Delayed	.161 (.132)	.149 (.106)	.100 (.079)	.073 (.063)
log Average Drinks (SEC) per Day in assessment period	Immediate	.737 (.268)	.464 (.308)	.434 (.282)	.394 (.288)
	Delayed	.751 (.240)	.654 (.232)	.570 (.306)	.453 (.288)
log Drinks per Drinking Day	Immediate	.924 (.247)	.753 (.249)	.786 (.292)	.744 (.234)
	Delayed	.789 (.162)	.791 (.178)	.732 (.189)	.661 (.213)
log Average peak BAC	Immediate	.068 (.038)	.039 (.033)	.046 (.046)	.032 (.023)
	Delayed	.062 (.047)	.059 (.040)	.040 (.031)	.030 (.025)



	Baseline	4 weeks	8 weeks	12 mo
Immediate	0.068	0.039	0.046	0.032
Delayed	0.062	0.059	0.040	0.030

Fig. 1. Log of average peak BAC as a function of Treatment and Time.

drinking levels as shown in Table 2 had essentially been cut in half by 8 weeks and declined further by 12 months. The pattern of change over time within groups indicates the Immediate group declined more than the Delayed over the first two assessments, and the Delayed group declined more than the Immediate group between the second and third assessments, as predicted. The test of the hypothesis of a Treatment × Time interaction during these first three times was significant, $F(2, 51) = 4.24$, $p = 0.020$. Tests of interaction contrasts (using a Bonferroni-adjusted α of 0.025) confirmed that the improvement of the Immediate group between 0 and 4 weeks was significantly greater than that in the Delayed condition, $F(1,52) = 8.62$, $p = 0.005$. However, the improvement of the Delayed group between 4 and 8 weeks was not significantly greater than that in the Immediate group, $F(1,52) = 0.17$, $p > 0.5$.

Findings using the other Form-90 drinking outcome measures were similar. Only four of the 35 clients having complete Form-90 data reported being abstinent at one of the four assessment periods. Thus, measures of number of drinks per drinking day were analyzed for 31 subjects. The decline in this variable over time was highly significant, $F(1,27) = 12.62$, $p < 0.001$. The test of the Treatment by Time interaction over the first three time periods was again significant, $F(2,47) = 3.71$, $p = 0.032$. Tests of interaction contrasts again indicated greater change in the Immediate than the Delayed group over the first 4 weeks, $F(1,48) = 7.18$, $p = 0.010$. There was a trend toward greater change in the Delayed than the Immediate group between 4 and 8 weeks, but the test did not reach significance, $F(1,48) = 3.20$, $p = 0.080$.

The measure of change over time on log Average peak BAC (Fig. 1) was significant, $F(3,31) = 7.99$, $p < 0.001$. The test of the Treatment × Time interaction over the first three time periods was marginal, $F(2,51) = 2.94$, $p = 0.062$. However, tests of contrasts indicated that the decline in the Immediate group between baseline and 4 weeks was greater than that in the Delayed condition, $F(1,52) = 5.83$, $p = 0.019$. The comparison of change in the two groups from 4 to 8 weeks, although in the predicted direction, was non-significant, $F(1,52) = 1.45$, $p = 0.233$.

4.3. Effect sizes

Using Cohen's *d*, measures of effect size were computed to characterize within-group change over time. On each of the three primary dependent variables, the effect size for the change in the group receiving treatment in a given time period (the Immediate group during the 0 to 4 week period and the Delayed group during the 4 to 8 week period) was greater than the effect seen in the non-treated group during that period. However, the magnitude of the difference between groups was substantially greater in the initial time period. The mean effect size for the Immediate group, averaging over dependent variables, was .93 as compared to .21 in the Delayed group for the Baseline to 4 week period, whereas the mean effect size for the Delayed group was .32 while that for the Immediate group was .04 in the 4 week to 8 week period. Remarkably, continued improvement was observed in both groups in the months following treatment. The mean effect size for change between 8 weeks and 12 months was .23 in the Immediate group and .41, in the Delayed group. As a result, when baseline measures were compared to those at 12 months, the overall effect sizes were 1.05 in the Immediate group and .93 in the Delayed group. Thus, the final effect sizes exceeded Cohen's cutoff for a large effect (Maxwell & Delaney, 2004) and were of comparable size in the two conditions.

4.4. Analyses of DCU data

The DCU data also included drinking measures as well as measures of consequences of drinking, motivation, and dependence. Means pre-treatment (Baseline for Immediate group, and 4 Weeks for Delayed group) are shown in Table 3 along with results of matched-pairs *t*-tests on these variables. All results were significant at $\alpha = 0.05$ for both the Immediate group and the Delayed group, with the one exception of the lack of decline in the Delayed group in Ambivalence as assessed by the SOCRATES. More importantly, the magnitude of the effects on the drinking variables, using this larger sample ($N = 50$) of clients than was available for the primary analyses, was comparable to that reported in Table 3 for the Form 90 data. Specifically, the average effect size across the drinks and BAC variables for the Immediate group for change from Baseline to 12 months was 1.23 for the BDP as compared to 1.20 on the Form 90, and for the Delayed group was .78 on the BDP as compared to .87 on the Form 90.

4.5. Attrition

As mentioned previously about 20% of clients (11 of 61) were not available for the 12-month follow-up. In addition, 14 clients who completed the DCU at 12 months did not complete the Form 90. Comparisons of these two categories

Table 3
Means on other assessment module variables pre-treatment and at 12 months and results of *t* tests of change

Group	Variable	Pre-treatment	12 months	*t*	*p*
Immediate (n = 29)	AUDIT	19.8	11.1	6.16	.001
	BDP Average Drinks (SECs) per Day	6.28	2.35	3.47	.002
	BDP Average peak BAC	.193	.069	5.20	.001
	DrInC Recent Total Conseq.	26.4	11.1	5.40	.001
	SADQ-C	6.2	2.9	4.05	.001
	SOCRATES Ambivalence	15.2	12.1	4.12	.001
	SOCRATES Taking Steps	25.4	29.7	-2.2	.038
Delayed (n = 21)	AUDIT	19.5	12.0	5.28	.001
	BDP Average Drinks (SECs) per Day	4.35	2.60	2.92	.008
	BDP Average peak BAC	.161	.075	3.37	.003
	DrInC Recent Total Conseq.	29.7	15.5	3.73	.001
	SADQ-C	5.7	2.4	2.73	.013
	SOCRATES Ambivalence	15.1	15.3	-0.20	.846
	SOCRATES Taking Steps	24.9	30.8	-2.68	.014

of drop outs with others on 30 continuous intake variables revealed no significant differences. One indicator of risk for dropping out was having reported a DWI arrest at some time prior to enrollment in the study. Of the four subjects who reported a prior arrest at intake, three were not available for either the DCU or Form 90 at 12 months (Fisher's exact $p = 0.010$).

4.6. Prediction of relative improvement

A number of intake variables were predictive of the percent reduction in drinking achieved by an individual. In general, the more severe the drinking problem at intake, particularly in terms of interpersonal consequences of drinking, the greater was the improvement seen at 12 months. For example, the Lifetime Interpersonal Consequences subscale of the DrInC correlated .49 with percentage reduction in drinking (on the log Average Drink measure), $p = 0.015$.

4.7. Corroboration of self-report of drinking

Significant others corroborated the pattern of self-reported drinking. Correlations with self-reports ranged over the four time periods from .40 to .72 on log drinks per drinking day and from .53 to .80 on percent days non-abstinent, $p < 0.01$. Tests of the effects of time and treatment were also similar. For example, on log drinks per drinking day, the critical interaction of time with treatment over the first three time periods was significant, $F(2,33) = 3.80$, $p = 0.033$, with the change from pre to 4 weeks being greater for Immediate than Delayed clients, $F(1,34) = 4.49$, $p = 0.041$, and the change from 4 to 8 weeks being significantly greater for Delayed than Immediate clients, $F(1,34) = 5.75$, $p = 0.022$. Effect size measures computed from reports by collaterals were approximately 90% as large as those reported by participants.

4.8. Other treatments received during follow-up

By the 12-month follow-up, 28 participants had either received some counseling for emotional/psychological problems and/or alcohol problems ($n = 23$) and/or had attended Alcoholics Anonymous (AA; $n = 9$) during at least one of the follow-ups. There was no difference in seeking additional treatments between the Immediate ($n = 15$) and the Delayed group ($n = 13$) nor in how frequently they received such support between their receiving the intervention and their first follow-up ($n = 9$ and 8, respectively). With the exception of two participants who reported near daily AA attendance at 12 months, most who attended AA did so, on average, once every 9 days. Professional treatment also was of relatively low intensity. Fifteen reported receiving treatment at only one follow-up point. Excluding two high users of treatment, 21 participants reported receiving treatment, on average, once every 12 days during the 4 and 8-week follow-ups and once every 22 days during the 12-month follow-up. Only one participant went to inpatient alcohol treatment.

5. Discussion

Overall, the drinking outcome measures supported the experimental hypotheses. The Immediate Treatment group significantly reduced their drinking in the first 4 weeks following use of the DCU. While waiting, the Delayed group reduced their drinking by only a fraction of that shown by the Immediate group (Cohen's effect size $d = .21$ and .93, respectively). Four weeks after the Delayed group had used the DCU, their drinking declined, but not significantly. We have observed similar short-term effects in a wait-list control group from a previous randomized clinical trial of a moderation training program for heavy drinkers (Hester & Delaney, 1997), and this finding has occurred in other studies as well (Miller, Benefield, & Tonigan, 1993; Miller, Yahne, Moyers, Martinez, & Pirritano, M. (2004). If delaying treatment results in poorer outcomes, the implication may be to provide at least some type of initial intervention to get people moving when they have at least some momentum for change. For treatment programs with waiting lists, providing a brief motivational intervention early on in the admission process

may be helpful even if the individuals have to subsequently wait before beginning a more formalized course of treatment.

Both groups continued to reduce their drinking after the 8-week follow-up and 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, declined by 50% by the 12-month follow-up. Measures of alcohol-related consequences and dependence showed comparable declines over time.

We were surprised to observe the continued declines in drinking from the 8-week to the 12-month follow-up. It is common to see at least some increase in drinking from short-term to long-term follow-ups. However, participants in the current trial continued to reduce their drinking by 17-31%, depending on the measure, from the 8-week to the 12-month follow-up (See Table 2). The mechanism for this continued increase in the benefits of the program is unclear. Perhaps using a computer program as an intervention results in clients perceiving themselves as having more internal control and thus as possessing the self-efficacy to continue reducing their drinking after completing it. Another explanation is that participants used some of the self-help resources the DCU linked them to after using the DCU. We did not, however, monitor such usage. Participants did seek some additional assistance via self-help groups and professional treatment but this is also seen in other studies of brief motivational interventions where decreases in drinking show some deterioration over time.

We also consider the seeking of additional help as a measure of success. These participants were not actively changing their drinking prior to using the DCU, but were taking steps to change during follow-up. Some did so without additional assistance, while others did so by seeking out counseling and self-help group participation.

In the area of motivation for change (as measured by the SOCRATES), participants in the Immediate group had reduced Ambivalence scores and increased scores on Taking steps to change at the 12-month follow-up. These changes are in the expected direction. The delayed group also had increased scores on Taking steps to change at the 12-month follow-up but their Ambivalence scores were unchanged from baseline which was unexpected. Clearly drinkers can maintain some degree of ambivalence, even when they are taking steps to change, but we would expect to see at least reduction in ambivalence. This lack of change in Ambivalence scores could be because: (1) the SOCRATES does not adequately capture the complexities of the construct of ambivalence; (2) people can decide to change their drinking even though they continue to be ambivalent about doing so; or (3) some combination of these two. This issue warrants additional research.

Our computer-based DCU was modeled after the original Drinker's Check-up developed by Miller, Sovereign, and Krege, (1988) that was delivered via face-to-face contact. Outcomes from our computer-based DCU compare favorably to their earlier studies of the DCU delivered via face-to-face contact (for a review, see Burke et al., 2002). The comparability of these outcomes is enhanced by the fact that both their studies and our study recruited problem drinkers from the same community. Given the relatively small amount of therapist time involved in administering the DCU and the clinically significant reductions in drinking, the DCU appears to be highly cost-effective. While we did not specifically measure the costs involved in the provision of the intervention, the amount of research assistant interaction with each participant in the DCU was brief. In this era of ever increasing healthcare costs, having a tool such as the DCU could contribute to a reduction in the rise of these costs.

There are several limitations in this study. First, our 12-month follow-up rate (in the DCU dataset) was only 82%. While we did not find differences in baseline characteristics between those subjects who were lost or refused to follow-up vs. those successfully followed up, other outcome research has indicated that those lost to follow-up are more likely to have less favorable outcomes. Second, the sample we recruited was not a treatment seeking population. While the level of drinking and consequences at baseline was significant, they were not seeking treatment, *per se.* They also had sufficient initial motivation to contact us by responding to a newspaper ad. Third, this was an effectiveness study, not an efficacy study. We did not control for other treatments that participants might have undertaken *following* their interaction with the DCU. However, the additional treatment some participants received was of relatively low intensity. Fourth, the resources available for this study did not allow us to directly compare the DCU to other BMIs.

This study contributes to the growing body of research in BMIs and computer-based interventions. The evidence of effectiveness of computer-based BMIs highlights the question of the critical elements of BMIs. Dismantling studies are needed that can systematically address this question.

We also would like to see the DCU/FDCU evaluated with a variety of treatment populations. To this end we offer the DCU/FDCU programs to researchers who are interested in evaluating them in randomized clinical trials.

Finally, we did not have an assessment-only condition to examine the impact of the assessment alone. However, this would have presented ethical problems as the participants in this study were seeking some assistance and we had a reasonable expectation that our DCU would motivate participants to reduce their drinking.

To disseminate this BMI to the general population of problem drinkers, we have developed a web application that parallels the Windows version of the DCU at www.drinkerscheckup.com. Although it does not have a follow-up component, we note that the baseline characteristics of those using the online version are strikingly similar to the baseline characteristics of participants in this study.

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References

Agostinelli, G., Brown, J. M., & Miller, W. R. (1995). Effects of normative feedback on consumption among heavy drinking college students. *Journal of Drug Education*, *25*, 31–40.

Babor, T. F., de la Fuente, J. R., Saunders, J., & Grant, M. (1992). *AUDIT: The Alcohol Use Disorders Identification Test: Guidelines for use on primary health care*. Geneva, Switzerland: World Health Organization.

Barr Taylor, C., & Luce, K. H. (2003). Computer- and Internet-based psychotherapy interventions. *Current Directions in Psychological Science*, *12*, 18–22.

Burke, B. L., Arkowitz, H., & Dunn, C. (2002). The efficacy of motivational interviewing and its adaptations: What we know so far. In W. R. Miller & S. Rollnick. *Motivational interviewing: Preparing people to change* (2nd ed., pp. 217–250). New York: Guilford Press.

Dimeff, L. A. (1997). Brief intervention for heavy and hazardous college drinkers in a student primary health care setting. Ph.D. dissertation, Seattle, WA: University of Washington.

Fletcher, A. M. (2001). *Sober for good: New solutions to drinking problems—advice from those who have succeeded*. New York: Houghton Mifflin.

Hester, R. K., & Delaney, H. D. (1997). Behavioral Self-Control Program for Windows: Results of a controlled clinical trial. *Journal of Consulting and Clinical Psychology*, *65*, 685–693.

Larimer, M. E., & Cronce, J. M. (2002). Identification, prevention, and treatment: A review of individual-focused strategies to reduce problematic alcohol consumption by college students. *Journal of Studies on Alcohol*, *63* (Suppl 14), 148–163.

Maxwell, S. E., & Delaney, H. D. (2004). *Designing experiments and analyzing data: A model comparison perspective* (2nd ed.). Mahwah, NJ: Lawrence Erlbaum Associates.

Miller, W. R. (1996). *Form 90: A structured assessment interview for drinking and related behaviors.* Project MATCH Monograph Series Volume 5. NIH Publication No. 96–4004. Rockville, MD: National Institute of Alcohol Abuse and Alcoholism.

Miller, W. R., Benefield, R. G., & Tonigan, J. S. (1993). Enhancing motivation for change in problem drinking: A controlled comparison of two therapist styles. *Journal of Consulting and Clinical Psychology*, *61*, 455–461.

Miller, W. R., & Marlatt, G. A. (1984a). *Comprehensive Drinker Profile Manual Supplement for use with the Brief Drinker Profile, Follow up Drinker Profile, Collateral Interview Form*. Odessa, FL: Psychological Assessment Resources.

Miller, W. R., & Marlatt, G. A. (1984b). *Manual for the Comprehensive Drinker Profile*. Odessa, FL: Psychological Assessment Resources.

Miller, W. R., & Marlatt, G. A. (1987). *Manual supplement for the Brief Drinker Profile, Follow-up Drinker Profile, and Collateral Interview Form*. Odessa, FL: Psychological Assessment Resources. Now in public domain and available at. http://casaa.unm.edu/inst/forms/BDP.pdf.

Miller, W. R., & Pechacek, T. F. (1987). New Roads: Assessing and treating alcohol dependence. *Journal of Substance Abuse Treatment*, *4*, 73–77.

Miller, W. R., & Rollnick, S. (1992). *Motivational interviewing: Preparing people to change addictive behavior.* New York, NY: Guilford.

Miller, W. R., Sovereign, R. G., & Krege, B. (1988). Motivational interviewing with problem drinkers II: The Drinker's Check-up as a preventive intervention. *Behavioural Psychotherapy*, *16*, 251–268.

Miller, W. R., & Tonigan, J. S. (1996). Assessing drinkers' motivation for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). *Psychology of Addictive Behaviors*, *10*, 81–89.

Miller, W. R., Tonigan, J. S., & Longabaugh, R. (1995). *The Drinker Inventory of Consequences (DrInC): An instrument for assessing adverse consequences of alcohol abuse. Test manual.* Project MATCH Monograph Series Volume 4. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism.

Miller, W. R., Wilbourne, P. L., & Hettema, J. E. (2003). What works? A summary of alcohol treatment outcome research. In R. K. Hester & W. R. Miller (Eds.), *Handbook of alcoholism treatment approaches: Effective alternatives* (3rd ed., pp. 13–63). Boston: Allyn & Bacon.

Miller, W. R., Yahne, C. E., Moyers, T. B., Martinez, J., & Pirritano, M. (2004). A randomized trial of methods to help clinicians learn motivational interviewing. *Journal of Consulting and Clinical Psychology*, *72*, 1050–1062.

Moos, R. H., Finney, J. W., & Cronkite, R. C. (1990). *Alcoholism treatment: Context, process, and outcome*. New York: Oxford University Press.

Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research, and Practice*, *19*, 276–288.

Prochaska, J. O., & DiClemente, C. C. (1984). *The transtheoretical approach: Crossing traditional boundaries of therapy.* Homewood, IL: Dow Jones/Irwin.

Prochaska, J. O., & DiClemente, C. C. (1985). Processes and stages of change in smoking, weight control, and psychological distress. In S. Schiffman & T. Wills (Eds.), *Coping and substance abuse* (pp. 319–345). New York: Academic Press.

Prochaska, J. O., & DiClemente, C. C. (1986). Toward a comprehensive model of change. In W. R. Miller & N. Heather (Eds.), *Treating addictive behaviors: Processes of change* (pp. 3–27). New York: Plenum Press.

Project MATCH Research Group. (1993). Rationale and methods for a multi-site clinical trial matching patients to alcoholism treatment. *Alcoholism: Clinical and Experimental Research*, *17*, 1130–1145.

Reinert, D. F., & Allen, J. P. (2002). The Alcohol Use Disorders Identification Test: A review of recent research. *Alcoholism: Clinical and Experimental Research*, *26*, 272–279.

Selzer, M. L. (1971). The Michigan alcoholism screening test: the quest for a new diagnostic instrument. *American Journal of Psychiatry*, *127*, 1653–1658.

Slossen, R. L., & Nicholson, C. L. (1990). *Slossen Oral Reading Test: SORT-R Manual*. East Aurora, NY: Slossen Publications, Inc.

Squires, D. D., & Hester, R. K. (2002). Development of a computer-based brief intervention for drinkers: The increasing role for computers in the assessment and treatment of addictive behaviors. *The Behavior Therapist*, *25*, 59–65.

Stockwell, T., Sitharthan, T., McGrath, D., & Lang, E. (1994). The measurement of alcohol dependence and impaired control in community samples. *Addiction*, *89*, 167–174.

Tabachnick, B. G., & Fidell, L. S. (1989). *Using multivariate statistics* (2nd ed.). New York: HarperCollins.

Walters, S. T. (2000). In praise of feedback: An effective intervention for college students who are heavy drinkers. *Journal of American College Health*, *48*, 235–238.

Walters, S. T., Bennett, M. E., & Miller, J. E. (2000). Reducing alcohol use in college students: A controlled trial of two brief interventions. *Journal of Drug Education*, *30*, 361–372.

Walters, S. T., & Woodall, W. G. (2003). Mailed feedback reduces consumption among moderate drinkers who are employed. *Prevention Science*, *4*, 287–294.

Zweben, A., Rose, S. J., Stout, R. L., & Zywiak, W. H. (2003). Case monitoring and motivational style brief interventions. In R. K. Hester & W. R. Miller (Eds.), *Handbook of alcoholism treatment approaches: Effective alternatives* (3rd ed., pp. 133–130). Boston, MA: Allyn & Bacon.