

4-2008

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Diana M. Doumas  
*Boise State University*

Elizabeth Hannah  
*Boise State University*



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# Preventing High-Risk Drinking in Youth in the Workplace: A Web-Based Normative Feedback Program

**Diana M. Dumas, Ph.D.**

Department of Counselor Education, Institute of Addiction Studies  
Boise State University, Boise, ID 83725 USA

**Elizabeth Hannah, D.V.M., M.S., M.P.H.**

Department of Community and Environmental Health, Center for Health Policy  
Boise State University, Boise, ID 83725 USA

## Abstract

This study evaluated the efficacy of an alcohol web-based personalized feedback program delivered in the workplace to young adults. Participants ( $N = 124$ ) were randomly assigned to one of three conditions: web-based feedback (WI), web-based feedback plus a 15-minute motivational interviewing session (MI), or a control group. Results indicated participants in the intervention group (WI and MI conditions combined) reported significantly lower levels of drinking than those in the control group at a 30-day follow-up. This was particularly true for participants classified as high-risk drinkers at the baseline assessment. Similar results were found when comparing the WI condition to the control group. No differences were found between the WI and MI conditions, indicating the addition of a 15-minute motivational interviewing session did not increase the efficacy of the web-based feedback program. Findings support the use of web-based feedback as a stand-alone alcohol prevention program for young adults in the workplace.

Key Words: alcohol; computer; online; feedback; prevention

## 1. Introduction

Recent survey data indicates that workplace alcohol use and alcohol-related impairment impact 15% of the U.S. workforce, totaling approximately 19.2 million workers (Frone, 2006). Research also indicates substance abuse is associated with multiple negative workplace outcomes, including absenteeism, accidents, turnover and other sources of productivity losses (Ames, Grube, & Moore, 1997; Blum, Roman, & Martin, 1993; Dawson, 1994; Lehman & Simpson, 1992; Mangione et al., 1999; Newcomb, 1995). Thus, both employees and employers are vulnerable to the negative outcomes associated with employee heavy drinking.

Rates of drug use also show substantial variation by age. According to the 2005 National Survey on Drug Use and Health (NSDUH), the highest rates of illicit drug abuse, heavy alcohol use, and binge drinking occur among young adults ages 18-25 (SAMHSA, 2005). Additionally, although alcohol and drug use declined among youth ages 12 to 17 from 2002-2005, there has been an increase in use in those 18-25 during this timeframe (SAMHSA, 2005).

Although it is often assumed that this high level of substance abuse occurs in the college population, research indicates there is little difference between alcohol use in college and non-college youth (Bingham, Shope, & Tang, 2005). In addition, the transition from school to the labor force represents a high-risk time for substance use (Kandel, 1984; Kandel, Davies, Karus, & Yamauchi, 1986; Kaplan & Liu, 1994). Specific job-related influences associated with problem drinking, including job stressors and participation in work-based drinking networks (Martin, Roman, & Blum, 1996), may pose a particular problem for young adults as they attempt to fit in their new workplace (Batts, Grabill, Galvin, & Schlenger, 2005). Thus, young adults in the workplace represent a high-risk population for heavy drinking that is in need of prevention programming.

In addition, the problem of substance abuse in the workplace will likely increase over the next decade as the youth labor force (ages 16-24) is projected to increase by 3.4 million between 2000 and 2010, more than 10 times the increase of the 1980-1990 period (Bureau of Labor Statistics, 2001). Combined with the projection that the cost of health care will increase relative to the growth of the U.S. economy over the next decade, developing cost-effective, evidence-based substance abuse prevention programming for youth in the workplace is a priority. In addition, using the workplace for the provision of

Correspondence concerning this article should be addressed to Diana M. Dumas, Department of Counselor Education, Boise State University, 1910 University Drive, Boise, ID 83725-1715, USA. Phone: (208) 426-2646. Fax: (208) 426-2046. E-mail: dianadumas@boisestate.edu.

alcohol prevention is important because the workplace is an identifiable setting where a prevention program can be disseminated (Batts, et al., 2005).

A growing body of literature supports the use of brief interventions based on social norming and motivational enhancement models to prevent high-risk drinking (Burke, Arkowitz, & Menchola, 2003; Moyer, Finney, Swearingen, & Vergun, 2002). The social norming approach suggests that giving students accurate feedback about social norms may decrease high-risk drinking (Perkins & Berkowitz, 1986; Perkins, 1997). This theory is based on the idea that young adults greatly over-estimate their peers' alcohol use and attempt to match their drinking to this perception. Thus, the discrepancy between the perceived norms and actual norms may increase drinking.

The motivational enhancement model (Miller & Rollnick, 2002) is a non-confrontational, non-judgmental approach designed to decrease drinking and drinking-related consequences. A central component of motivational enhancement is providing individualized feedback to clients about their alcohol use (Miller & Rollnick, 1991). This feedback typically includes individualized feedback regarding risk-status and normative feedback relative to peers (Larimer et al., 2001; Marlatt et al., 1998). Research suggests prevention programs using motivational enhancement approaches, and brief individualized feedback in particular, are effective in reducing college drinking (Baer, Kivlahan, Blume, & Marlatt, 2001; Borsari & Carey, 2000; Larimer & Crouce, 2002; Marlatt et al., 1998; Murphy et al., 2001) and adult drinking in the workplace (Anderson & Larimer, 2002).

Innovative approaches to implementing brief motivational interventions have also been developed. For example, research indicates using mailed feedback significantly reduces drinking in both college students (Agostinelli, Brown, & Miller, 1995; Collins, Carey, & Sliwinski, 2002; Walters, 2000; Walters, Bennett, & Miller, 2000) and employed adults (Walters & Woodall, 2003). Computer technology has also been used to deliver personalized feedback. Although most of the research in this area is largely descriptive and lacking large randomized control trials (Copeland & Martin, 2004), a growing number of controlled studies indicate electronic feedback is an effective stand-alone strategy for reducing drinking and alcohol-related problems in both heavy drinking college students (Chiauzzi, Green, Lord, Thum, & Goldstein, 2005; Kypri et al., 2004; Neighbors, Larimer, & Lewis, 2004; Walters, Vader, & Harris, in press) and adult problem drinkers (Hester, Squires, & Delaney, 2005), as well as

increasing motivation to change drug use among postpartum women (Ondersma, Chase, Svikis, & Shuster, 2005). In addition, recent reviews of the literature indicate feedback, whether delivered in person, by mail, or electronically, can be an effective strategy to reduce heavy drinking (Walters & Neighbors, 2005).

In addition, a recent review of the literature suggests that there are many advantages to using computer programs to reduce alcohol use in college students (Walters, Miller, & Chiauzzi, 2005). Young adult drinkers may respond better to electronic individualized feedback than to in-person feedback (Larimer & Crouce, 2002; Kypri, Saunders, & Gallagher, 2003; Saunders, Kypri, Walters, Laforge, & Larimer, 2004). While young adults may be skeptical about discussing their drinking with a health practitioner, they are interested in how their drinking compares with the drinking of their peers. Computerized interventions that provide personalized feedback regarding drinking and risk assessment relative to peers appeal to this curiosity and apprehension regarding talking to a professional. Further, a computerized program is well-suited for the workplace as many of the difficulties associated with implementing traditional brief interventions can be reduced by the use of technology (Moyer & Finney, 2005). Specifically, computerized programs reduce the need for training and require minimal financial resources to maintain, reducing the resources required of employers to adopt the program.

In spite of the compelling need to provide substance abuse prevention programs to young adults in the workplace, to date, evidence-based programs based on social norming and motivational enhancement models have not been applied to this population. The aim of the current study is to bridge this gap by examining the efficacy of a web-based personalized feedback program in combination with a counselor-delivered motivational interviewing session and as a stand-alone prevention program. In addition, the majority of research examining computer-based programs has demonstrated efficacy in students or adults identified as heavy drinkers or problem drinkers (Chiauzzi et al., 2005; Cunningham, Humphreys, Koski-Jannes, & Cordingley, 2005; Hester et al., 2005; Kypri et al., 2004; Neighbors et al., 2004). Other studies have demonstrated reductions in drinking are greater in high-risk drinkers than in moderate drinkers (Murphy et al., 2001) and for persistent binge drinkers (Chiauzzi et al., 2005). Thus, we were also interested in examining high-risk drinking as a moderator in the reductions in drinking differences between the intervention and control conditions. To achieve these

aims, we randomly assigned participants into three groups: web-based personalized feedback program alone (WI), web-based personalized feedback program with a 15-minute motivational interviewing session (MI), or the control group. We examined three experimental hypotheses.

First, we predicted that there would be significant differences between the two treatment conditions combined (CI) and the control condition in the amount of change between drinking at baseline and the 30-day follow-up. We also predicted that drinking risk-status would moderate the relationship between treatment condition and changes in drinking from baseline to follow-up, with the greatest reductions in drinking reported by participants in the CI group who were classified as high-risk drinkers.

Second, we predicted that there would be significant differences between the WI condition and control condition in the amount of change in drinking between baseline and 30-day follow-up. Similar to our first hypothesis, we also predicted that drinking risk-status would moderate the relationship between group and changes in alcohol consumption.

Finally, we were interested in examining differences in drinking changes between the MI and WI groups. Although computer-based interventions have the benefit of being less costly to administer and more easily disseminated than face-to-face interventions, it is unclear if adding an in-person motivational component would add to the value of the web-based program. Thus, in addition to examining the efficacy of a web-based personalized feedback program for youth in the workplace, we were also interested in determining if the stand-alone web-based program is as effective as the web-based program paired with an in-person motivational interview. We hypothesized that there would be a significant difference between the MI and WI conditions in the amount of change between drinking at baseline and drinking at the 30-day follow-up, with the MI group reporting greater reductions in drinking than the WI group.

## 2. Method

### 2.1. Participants

Participants were recruited from five local companies in a metropolitan area in the northwest. Human resource departments of local companies with high numbers of employees in the 18-24 age groups were contacted for participation. The purpose of the intervention, the research design, and the logistics of implementing the program were described to the human resources representative of each company. All employees in the targeted age group (18-24) were given an opportunity to participate in the study. Of

423 eligible participants, 196 (46.3%) elected to participate in the study.

Study participants were randomly assigned to one of three study conditions. Sixty (30.6%) were assigned to the web-based intervention, 63 (32.1%) were assigned to the web-based intervention combined with motivational interviewing, and 73 (37.2%) were assigned to the control group. Overall, 124 (63.3%) of the original 196 participants returned for the 30-day follow-up session. There was no difference in attrition across the three groups,  $\chi^2 = 1.84$ ,  $p = .40$ . In addition, a series of independent sample t-tests confirmed there were no differences on any drinking measures between those who completed the study and those who did not.

One hundred forty-four (73%) of the participants were female and 52 (27%) were male. Eighty-seven percent were Caucasian, 12% Hispanic, and 1% other. Seventy-five percent were single, 21% were married, 4% were divorced. All participants were employed and approximately 75% indicated they were currently attending school. All participants were offered either two movie tickets or \$10 for the baseline assessment and an additional movie ticket or \$10 for the follow-up assessment. All participants were treated according to established APA ethical standards.

### 2.2. Measures

All baseline data and follow-up data were entered directly by participants on laptop computers. Several measures of alcohol use and descriptive drinking norms were used. Recommendations by the NIAAA Task Force include assessing patterns of consumption in addition to the average number of drinks consumed and including at least three measures of consumption covering quantity, frequency, and heavy consumption (NIAAA, 2003). We included three measures of alcohol consumption: drinking quantity, peak consumption, and frequency of drinking to intoxication. We also included a measure of binge drinking to identify high-risk drinkers at baseline. These indicators of alcohol consumption are based on widely-used items selected from the literature (e.g., Larimer et al., 2004; Marlatt et al., 1998; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994; Wechsler, Lee, Kuo, & Lee 2000) and have been used to determine changes in drinking patterns in other studies of young adult drinking.

Typical weekend drinking was assessed using a modified version of the Daily Drinking Questionnaire (DDQ, Collins, Parks, & Marlatt, 1985). This item asks participants to indicate how much they typically drink, "Given that it is a typical week, please write the number of drinks you probably would have each day." A response scale is provided for each day of

the week (e.g., Monday\_\_\_\_, Tuesday\_\_\_\_, etc.). Participants were asked to estimate the number of drinks they would have in a typical week for each day of the week. Weekend drinking was calculated by combining reported alcohol for Friday and Saturday. Peak drinking quantity was assessed by an item asking the participants to indicate the number of drinks consumed on the occasion on which they drank the most in the previous month (Marlatt et al., 1998). Frequency of drinking to intoxication was assessed by the question "During the past 30 days (about 1 month), how many times have you gotten drunk, or very high from alcohol?" This item was rated on a 6-point scale with the anchors 0, 1 to 2, 3 to 4, 5 to 6, 7 to 8, or more than 9 times.

We also asked participants to report on the frequency of binge drinking. Following the Harvard School of Public Health College Alcohol Study (CAS), binge drinking was defined as having 5 or more drinks in a row for males (4 or more for females) in the past 2 weeks (Wechsler et al., 1994). This item was used as an indicator of high-risk drinking and was used to create a risk variable, with participants indicating one or more occasions of binge drinking in the past 2 weeks at the baseline assessment classified as high-risk drinkers. The 5/4 binge drinking measure has been widely used and supported as an appropriate threshold to identify high-risk drinkers (Wechsler & Nelson, 2001, 2006) and identified as a dangerous level of drinking (NIAAA, 2004). Using this measure, 65 (31%) participants were classified as high-risk drinkers and 134 (69%) were classified as low-risk drinkers.

### 2.3. Intervention

Study participants were randomly assigned to one of three study conditions: 1) web-based intervention (WI), 2) web-based intervention combined with motivational interviewing (MI), and 3) control group. All participants completed the baseline questionnaires. Those in the WI condition completed the web-based intervention and those in the MI condition completed the web-based intervention and participated in a 15-minute motivational interviewing session to review the feedback. The two interventions are described below.

#### 2.3.1. Web-based intervention (WI)

Participants in the WI condition completed a brief web-based program providing personalized normative feedback about their drinking. This web-based program provides personalized feedback designed to reduce high-risk drinking by providing normative data regarding drinking and the risks associated with drinking. The program is free to the public and is available at <http://notes.camh.net/efeed.nsf/newform> (for a full

description of the program, see Cunningham, Humphreys, & Koski-Jannes, 2000).

The alcohol use assessment takes approximately 15 minutes to complete. The assessment collects basic demographic information and information on alcohol consumption, drinking behavior, and alcohol-related consequences. Individualized graphed feedback is provided immediately in the following domains: A pie chart depicting individual levels of drinking in relation to national peer norms, a summary of the number of days the participant consumed alcohol and number of drinks consumed in the past year, approximate financial cost of drinking in the past year, calories associated with drinking, how quickly the body processes alcohol, risk-status for negative consequences associated with drinking and risk-status for problematic drinking based on the participant's AUDIT score.

Research indicates this web-based program is widely accessed, with approximately 500 hits per month (Cunningham et al., 2000). In addition, of those responding to a survey about the website, 56% indicated they found the feedback very or extremely useful and 53% of problem drinkers said they were surprised by how much more they drank than other people (Cunningham et al., 2000). Further, research examining the efficacy of this website indicates those participating in the website intervention reported a significant decrease in their severity of alcohol related problems, and the benefits were even greater with the addition of a self-help book (Cunningham et al., 2005).

#### 2.3.2. Web-based intervention with motivational interview (MI)

Participants in the MI group completed the same web-based program as those in the WI group. In addition, participants in the MI group also completed a 15-minute in person motivational interview with a Master's level counselor trained in motivational interviewing techniques. The counselor was trained and supervised by the lead author who is a licensed clinical psychologist with significant training and experience using motivational interviewing techniques. The counselor also attended a 2-day workshop led by certified motivational interviewing trainers.

Immediately after completing the web-based program, participants brought their printed feedback to the counselor. The MI session was based on the principles and techniques used in motivational interviewing (Miller & Rollnick, 2002), including expressing empathy, developing a discrepancy, avoiding argumentation, rolling with resistance, and supporting self-efficacy. During the session, the counselor and participant reviewed the personalized feedback, discussing the participant's drinking profile in relation to peer norms and risk of later problems. This feedback was discussed using a non-

confrontational, nonjudgmental, empathic approach with the goal of motivating the participant to reduce high-risk drinking. Although motivational interviewing typically provides both feedback and strategies for change, the focus of the session was on the discussion of the feedback to motivate change, rather than on providing strategies for change. This focus was selected as research indicates that the feedback component of brief motivational interventions is sufficient for changing drinking patterns (Neighbors et al., 2004).

#### 2.4. Procedure

All procedures were completed by participants at their worksites. Members of the research team brought laptop computers to the worksites at both the baseline assessment and the 30-day follow-up assessment. All participants were given consent forms describing the nature of the study, risks and benefits of participation, and information regarding the voluntary nature of participation. Participants provided written informed consent. The Boise State University Institutional Review Board approved all study procedures.

All questionnaires at baseline and follow-up assessments were completed on the laptop computers. During the baseline data collection, all employees created a personal code. This code was re-entered into the database during the follow-up data collection. This code was used to identify pre- and post-intervention responses from each individual, as well as to calculate response rates from baseline to follow-up. All participants completed baseline and follow-up assessments on the laptop computers. Participants in the WI group completed the online intervention immediately following completion of the baseline questionnaires. Participants in the MI group also completed the online intervention and then were taken into a private room to complete the motivational interview with the counselor.

### 3. Results

Means for alcohol consumption measures at baseline and follow-up assessments by risk-status are shown in Table 1. To examine the study hypotheses, repeated measures multivariate analyses of variance (MANOVAs) were used. In the following analyses, the three independent variables were Time (baseline vs follow-up), Group (intervention vs control), and Risk-Status (high-risk vs low-risk). When examining alcohol consumption, three drinking measures were included as dependent variables: quantity of weekend drinking, frequency of drinking to intoxication, and peak consumption. In examining the results of the MANOVAs, we were particularly interested in the Time x Group and Time x Group x Risk-Status

interactions as these interactions test for the difference between baseline and follow-up reports between the intervention and control group and the moderating effect of risk-status.

#### 3.1. Differences between the intervention and control conditions

To examine the first hypotheses, the WI and MI intervention conditions were collapsed into one intervention group (CI) for comparison with the control group. We hypothesized that participants in the CI group would report greater reductions in alcohol consumption than those in the control group, and this would be particularly true for participants classified as high-risk drinkers.

Results of the repeated-measures MANOVA indicated a significant main effect for Time, *Wilks' Lambda* = .87,  $F(3, 115) = 5.75$ ,  $p = .001$ ,  $\eta^2 = .13$ , and significant interaction effects for Time x Group, *Wilks' Lambda* = .91,  $F(3, 115) = 3.74$ ,  $p = .01$ ,  $\eta^2 = .09$ , Time x Risk-Status, *Wilks' Lambda* = .93,  $F(3, 115) = 3.06$ ,  $p = .03$ ,  $\eta^2 = .07$ , and Time x Group x Risk-Status, *Wilks' Lambda* = .92,  $F(3, 115) = 3.44$ ,  $p = .02$ ,  $\eta^2 = .08$ . Follow-up univariate analyses of variance (using a Bonferroni-adjusted  $\alpha$  of .05) revealed a significant Time x Group interaction for weekend drinking,  $F(1, 117) = 9.10$ ,  $p < .01$ ,  $\eta^2 = .07$ ; drinking to intoxication,  $F(1, 117) = 4.67$ ,  $p < .05$ ,  $\eta^2 = .04$ ; and peak consumption,  $F(1, 117) = 5.72$ ,  $p < .05$ ,  $\eta^2 = .05$ . In addition, the Time x Group x Risk-Status interaction was significant for weekend drinking,  $F(1, 117) = 9.06$ ,  $p < .01$ ,  $\eta^2 = .07$  and drinking to intoxication,  $F(1, 117) = 4.59$ ,  $p < .05$ ,  $\eta^2 = .04$ . Although the Time x Group x Risk-Status interaction was not significant for peak consumption,  $F(1, 117) = 3.62$ ,  $p < .06$ ,  $\eta^2 = .03$ , a similar trend was found.

Results confirmed that the decreases in the intervention group were significantly greater than those in the control group for weekend drinking, frequency of drinking to intoxication, and peak consumption. Further, results indicated drinking risk-status moderated the relationship between treatment condition and baseline and follow-up reports of drinking. For participants in the high-risk group, those in the intervention group reported greater reductions in weekend drinking and drinking to intoxication than those in the control condition, whereas changes in drinking for participants in the low-risk group were similar across the intervention and control conditions.

#### 3.2. Differences between the WI and control conditions

To examine the second hypotheses, we compared drinking variables at baseline and follow-up between the WI group and the control group. We hypothesized that participants in the WI group would report greater

reductions in alcohol consumption than those in the control group, and this would be particularly true for participants classified as high-risk drinkers.

Results of the repeated measures MANOVA indicated a significant main effect for time  $Wilks' \Lambda = .83$ ,  $F(3, 74) = 5.21$ ,  $p = .003$ ,  $\eta^2 = .17$  and significant interaction effects for Time x Group,  $Wilks' \Lambda = .85$ ,  $F(3, 74) = 4.23$ ,  $p = .008$ ,  $\eta^2 = .15$ , Time X Risk-Status,  $Wilks' \Lambda = .90$ ,  $F(3, 74) = 2.69$ ,  $p < .02$ ,  $\eta^2 = .10$ , and Time x Group x Risk-Status,  $Wilks' \Lambda = .87$ ,  $F(3, 74) = 3.65$ ,  $p = .02$ ,  $\eta^2 = .13$ . Follow-up univariate analyses of variance (using a Bonferroni-adjusted  $\alpha$  of .05) revealed a significant interaction for Time x Group for weekend drinking,  $F(1, 76) = 12.28$ ,  $p < .001$ ,  $\eta^2 = .14$ ; drinking to intoxication,  $F(1, 76) = 4.05$ ,  $p < .05$ ,  $\eta^2 = .05$ ; and peak consumption,  $F(1, 76) = 7.58$ ,  $p < .01$ ,  $\eta^2 = .09$ . In addition, the Time x Group x Risk-Status interaction was significant for quantity of weekend drinking,  $F(1, 76) = 11.05$ ,  $p < .001$ ,  $\eta^2 = .13$ . Although the Time x Group x Risk-Status interaction was not significant for drinking to intoxication,  $F(1, 76) = 2.95$ , *ns*,  $\eta^2 = .04$  or peak consumption,  $F(1, 76) = 2.77$ , *ns*,  $\eta^2 = .04$ , a similar trend was found.

Results confirmed that the decreases in quantity of weekend drinking, frequency of drinking to intoxication, and peak consumption were significantly greater in the WI group than the control group. Further, results indicated risk-status moderated the relationship between treatment condition and reductions in quantity of weekend drinking. For participants in the high-risk group, those in the WI group reported greater reductions in weekend drinking than those in the control condition, whereas changes in weekend drinking for participants in the low-risk group were similar across the WI and control conditions.

### 3.3. Differences between the WI and MI conditions

To examine the third hypotheses, we compared drinking variables at baseline and follow-up between the WI group and the MI group. We hypothesized that participants in the MI group would report greater changes in drinking than those in the WI group. Contrary to this hypothesis, results of the repeated measures MANOVA indicated no significant differences between the WI and MI groups on any of the alcohol consumption measures. Results suggest that the addition of a counselor-provided 15-minute motivational interviewing session did not increase the efficacy of the web-based personalized feedback.

## 4. Discussion

The aim of this study was to evaluate the efficacy of an alcohol prevention web-based personalized feedback program delivered in the workplace to young adults. This study adds to the growing body of literature supporting the use of web-based personalized normative feedback interventions to reduce high-risk drinking. Although research indicates web-based personalized feedback is effective for young adults on college campuses (Walters et al., 2005; Walters & Neighbors, 2005),

this is the first study to demonstrate the efficacy of this type of program delivered to youth in the workplace setting. Results of this study are particularly important as young adults in the 18-24 year old age group represent a high-risk population for heavy drinking. Coupled with the projection that substance abuse in the workplace will increase over the next decade, it is important to identify cost-effective, evidence-based substance abuse prevention programming for youth in the workplace.

An initial comparison between the two intervention groups combined and the control group indicated that participants receiving either the web-based program alone or in combination with a brief motivational interview reported significant decreases in weekend drinking, drinking to intoxication, and peak drinking compared to those in the control group. Examination of high-risk status as a moderator indicated that participants in the intervention group classified as high-risk drinkers, defined as binge drinking at least once in the past two weeks, reported the greatest decreases in drinking between baseline and the 30-day follow-up assessment. These findings indicate that the program was most effective in reducing drinking for young adults who reported high-risk drinking at the baseline assessment.

In addition to examining differences between the combined intervention groups and the control group, we were interested in whether or not the web-based personalized feedback program would be effective as a stand-alone prevention strategy. To examine this question, we compared changes in drinking in the web-based feedback program to changes in the control group. Results indicated that participants in the web-based feedback group reported significant decreases in weekend drinking, drinking to intoxication, and peak drinking compared to those in the control group. Although similar to the results found with the combined intervention group, examination of risk-status as a moderator indicated that those in the web-based feedback group who were classified as high-risk reported the greatest decrease in weekend drinking only. Risk-status was not a moderator for drinking to intoxication or peak consumption. Examination of the effect sizes indicates that although the Risk-Status x Time x

Group interaction was not significant for drinking to intoxication or peak consumption, the effect sizes for these variables were similar to those in the analyses with the combined intervention groups. Thus, it is likely that this difference in statistical significance is due to sample size variations between the combined intervention groups and the web-based group alone, rather than a difference in the moderating effect of risk-status on changes in drinking variables.

Results of this study are consistent with research conducted on college campuses indicating that web-based personalized normative feedback is effective in reducing heavy drinking in college students. In addition, similar to studies conducted with college students, our findings indicate that for workplace youth, web-based feedback was most effective for high-risk drinkers. In addition, adding a brief motivational interviewing session to review the electronic feedback did not improve the effectiveness of the web-based feedback program. When comparing the efficacy of the web-based feedback alone with the web-based feedback combined with a 15-minute motivational interviewing session, results indicated there were no significant differences in changes in weekend drinking, drinking to intoxication, or peak consumption from baseline to the 30-day follow-up between the two groups. This finding is consistent with research indicating that the impact of feedback is not increased by the addition of a psychoeducational class (Walters et al., 2000), the discussion of feedback in group setting (Walters, 2000), or receiving a motivational interview in addition to feedback (Murphy, et al., 2004; White et al., 2006) in the college student population.

Although this study adds to the literature by demonstrating the efficacy of a workplace-delivered web-based program for decreasing drinking for young adults, there are several limitations. First, only 46% of the eligible employees elected to participate in this study. And, of those participants, only 63% returned for the 30-day follow-up assessment. While selection and attrition are important issues to consider when interpreting findings, we did not find any differences in drinking variables or other characteristics across those who completed the study vs those who did not complete the follow-up assessment. Additionally, attrition rates were similar across the study groups, suggesting that attrition was not related to a specific study condition. Second, participants in this study were primarily Caucasian and approximately 70% of participants were female, thus limiting the generalizability of the results. Third, although a logical programming strategy would be to administer a web-based personalized feedback program to employees at a specific time in their employment (e.g., orientation), we administered the

program at various points in their tenure with the employer. Therefore, it is not clear whether or not study results would generalize to programming for new employee orientation. In addition, although the counselor in this study was trained to provide motivational interviewing, we did not observe the motivational interviewing sessions or formally conduct fidelity monitoring of the motivational interviewing intervention. Finally, although results indicated significant differences in reductions in drinking between participants in the intervention and control groups, the duration of the 30-day follow-up was fairly short. Although effects of web-based personalized feedback programs have been shown to last for up to 6-months in college students (Neighbors et al., 2004) and 12-months in adults (Hester et al., 2005), future research should include examining the efficacy of web-based programs implemented in the workplace for young adults across a longer period of time.

Results of this study have important implications for developing alcohol prevention programs for youth in the workplace. In developing the proposed program, we were interested in addressing several needs related to the prevention of alcohol use in young adults in the workplace. These included tailoring an established model to young adults in the workplace, selecting a program that would be interesting to young adults, decreasing stigma associated with alcohol programming, and selecting a cost-effective program that is easy to disseminate to a large number of employees while requiring few resources from the employer. Although some employers support prevention programming at their workplace, others may be hesitant to devote time and financial resources to a substance abuse prevention program. Thus, providing a program that is brief and cost-effective has the potential to be adopted by employers than a more time-intensive, expensive program.

Many of the difficulties associated with implementing traditional brief interventions can be reduced by the use of technology (Moyer & Finney, 2005). Specifically, web-based programs eliminate the need for training and require minimal financial resources to maintain. In addition, some websites are free, making them cost-effective for employers. In addition, disseminating the program to large numbers of employees is an important factor to consider when designing a prevention program for the workplace. The internet combines attributes of mass communication with interpersonal communication in that it reaches a broad amount of people and can provide individualized feedback (Copeland & Martin, 2004). Thus, web-based programming is ideal for both large companies that may not have the resources



to disseminate prevention programming to large groups of employees, as well as small companies who may not have any resources to allocate to prevention programming.

### Acknowledgements

This research was supported in part by Substance Abuse and Mental Health Services Administration grant number 6UD1SP11106-02-1.

The authors wish to thank Heather Stocker, Marianne King, Heidi Billups, and Janel Allison for their assistance in participant recruitment and data collection.

A limited portion of this manuscript was presented at the American Public Health Association annual conference, November 2006.

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Table 1

Means and Standard Deviations for Alcohol Consumption for Baseline and Follow-up by Risk Status

Condition	Time	Risk-Status		
		Low	High	Total
Weekend Drinking				
Web Only	Baseline	1.20 (1.73)	5.75 (3.76)	2.30 (3.04)
	Follow-Up	0.98 (1.37)	3.06 (2.41)	1.49 (1.87)
Web Plus MI	Baseline	0.72 (0.97)	4.79 (2.54)	2.42 (2.69)
	Follow-Up	0.65 (1.19)	3.59 (2.28)	1.87 (2.25)
Combined	Baseline	0.97 (1.41)	5.10 (2.94)	2.37 (2.83)
	Follow-Up	0.82 (1.29)	3.42 (2.29)	1.70 (2.08)
Control	Baseline	0.82 (1.24)	2.68 (1.94)	1.37 (1.69)
	Follow-Up	0.67 (0.97)	2.82 (2.49)	1.31 (1.84)
Intoxication				
Web Only	Baseline	0.70 (1.22)	3.75 (2.49)	1.44 (2.06)
	Follow-Up	0.48 (1.54)	2.00 (1.41)	0.85 (1.63)
Web Plus MI	Baseline	0.31 (0.62)	4.09 (3.06)	1.88 (2.74)
	Follow-Up	0.31 (0.62)	2.41 (2.25)	1.18 (1.83)
Combined	Baseline	0.51 (0.99)	3.98 (2.84)	1.68 (2.46)
	Follow-Up	0.40 (1.18)	2.28 (2.00)	1.03 (1.74)
Control	Baseline	0.46 (1.18)	2.93 (1.45)	1.19 (1.70)
	Follow-Up	0.35 (0.92)	2.61 (2.57)	1.02 (1.88)
Peak Consumption				
Web Only	Baseline	3.28 (3.81)	10.88 (5.59)	5.12 (5.36)
	Follow-Up	2.24 (2.63)	7.62 (4.60)	3.55 (3.91)
Web Plus MI	Baseline	1.63 (2.72)	9.53 (4.22)	4.90 (5.19)
	Follow-Up	1.54 (2.25)	6.82 (4.59)	3.73 (4.27)
Combined	Baseline	2.47 (3.39)	9.96 (4.62)	5.00 (5.23)
	Follow-Up	1.90 (2.45)	7.08 (4.51)	3.65 (4.09)
Control	Baseline	2.00 (3.32)	9.21 (3.91)	4.15 (4.80)
	Follow-Up	1.76 (2.45)	9.21 (4.61)	3.98 (4.70)