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Reducing high-risk drinking in mandated college students: Evaluation of two personalized normative feedback interventions

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Abstract

This study evaluated the efficacy of two brief personalized normative feedback interventions aimed at reducing heavy drinking among mandated college students ($N = 135$). Students were randomly assigned to one of two conditions: Web-based assessment with self-guided personalized normative feedback (SWF) or Web-based assessment with counselor-guided personalized normative feedback (CWF). Results indicated that students in the CWF condition reported significantly greater reductions in weekly drinking quantity and binge drinking frequency than those in the SWF group at follow-up ($M = 8$ months). Students in the CWF group also reported significantly greater reductions in estimates of peer drinking from baseline to the follow-up assessment than students in the SWF group. In addition, changes in estimates of peer drinking partially mediated the effect of the intervention on changes in drinking. Results suggest that counselor-guided feedback may be more effective in reducing drinking among mandated students relative to self-guided feedback in the long term. © 2010 Elsevier Inc. All rights reserved.

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1. Introduction

Heavy drinking represents a significant problem on college campuses in the United States, with more than 30% of students meeting criteria for a diagnosis of alcohol abuse (Knight et al., 2002). Although heavy drinking is a problem for college students in general, reviews of the literature have identified mandated students, that is, students who have received a sanction for violating campus alcohol policies, as a high-risk group for heavy drinking relative to the general college population (Larimer & Cronce, 2002, 2007). Studies examining drinking patterns on college campuses indicate that mandated students drink more heavily and report more alcohol-related problems than other college students (see Barnett & Read, 2005). Further, an increase in the number of alcohol-related arrests, the number of students receiving alcohol citations, and the

proportion of students mandated to participate in a postcitation intervention on college campuses have been reported. These statistics underscore the importance of developing effective interventions for mandated college students.

Over the past decade, alcohol prevention and intervention programs have been implemented on college campuses in an effort to reduce heavy drinking. Recent reviews of the literature support the efficacy of brief interventions for reducing heavy drinking among the general college student population (Burke, Arkowitz, & Menchola, 2003; Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Larimer & Cronce, 2007; Moyer, Finney, Swearingen, & Vergun, 2002). Brief motivational interventions typically include personalized normative feedback, such as information about personal drinking patterns and drinking risk status relative to peer drinking normative data (Larimer et al., 2001; Marlatt et al., 1998). Over the past few years, innovative approaches to implementing brief motivational interventions have been developed, with a growing number of controlled studies indicating that Web-based personalized feedback programs are effective in reducing drinking and alcohol-related consequences in college students in both the short term

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and long term (see Carey, Scott-Sheldon, Elliot, Bolles, & Carey, 2009).

Recently, several randomized controlled studies have been conducted examining the efficacy of brief motivational interventions with mandated students. This body of literature generally supports the short-term efficacy of personalized normative feedback interventions for mandated students whether delivered in person (Barnett et al., 2004; Borsari & Carey, 2005; White et al., 2006), by mail (White et al., 2006), or online (Dumas, McKinley, & Book, 2009; Dumas, Workman, Smith, & Navarro, in press). Results of studies with longer follow-up periods, however, are mixed. For example, in a 12-month follow-up study comparing a one-session brief motivational interview (BMI) with an educational CD (Alcohol 101), mandated students in the BMI group reported a decrease in number of drinks consumed per drinking occasion relative to students in the Alcohol 101 group, but these students also reported an increase in drinking frequency relative to those in the Alcohol 101 group (Barnett, Murphy, Colby, & Monti, 2007). In a similar study, results of a 12-month follow-up study comparing BMI to Alcohol 101 indicated all drinking measures were similar to baseline levels, with no differences between the groups (Carey, Henson, Carey, & Maisto, 2009). In contrast, in a large-scale study comparing BASICS (Dimeff, Baer, Kivlahan, & Marlatt, 1999) delivered across two sessions either as in-person motivational feedback or in a written feedback condition, results of a 15-month follow-up indicated that mandated students reduced their drinking and alcohol-related problems from the baseline assessment, and this reduction was accounted for by the students in the in-person motivational feedback session (White, Mun, Pugh, & Morgan, 2007). The authors suggest that although their initial findings demonstrated no differences between in-person and written feedback at 3 months, there may be a “sleeper effect” that favors the in-person feedback over the long term.

Research indicates that personalized normative feedback interventions, whether delivered in person, by mail, or online, are effective in reducing high-risk drinking among mandated students in the short term. In contrast, the most promising approach for follow-up periods beyond 6 months appears to be personalized feedback delivered in an in-person motivational interview (MI). For example, the “sleeper effect” findings reported by White et al. (2007) indicate that feedback delivered in an MI may be more effective in the long run than mailed feedback. It is unclear whether a similar effect would be found with in-person feedback versus self-guided Web-based feedback following a computerized assessment. Computerized assessment has the advantage of providing feedback that can be delivered immediately to students once they complete the assessment rather than with the typical 1-week lag that occurs with interview and paper–pen assessments. In addition, students may become more engaged in computerized feedback due to the interactive

nature of the medium relative to mailed feedback. One of the reasons this is important is that normative feedback is intended to change student overestimations of peer drinking. Therefore, it is essential that students attend to and process the normative drinking information.

Several social explanations for the high rates of drinking found in the college population have been proposed. Of these, peer influence has gained attention in the literature as an important social variable that may be related to the elevated levels of drinking among both the general college student population and among mandated students. According to the social norming theory (Perkins, 2002), college students overestimate the amount of alcohol their peers consume, and this overestimation leads to participation in heavy drinking as students attempt to match their drinking levels to their perceptions of peer alcohol use. Research confirms that college students typically overestimate the amount of alcohol use among their peers (Baer, Stacy, & Larimer, 1991; Borsari & Carey, 2001). In addition, research indicates that interventions that provide normative feedback about peer drinking are associated with reductions in alcohol consumption and that changes in estimates of peer drinking mediate the intervention effects on the reductions in drinking (Neighbors, Larimer, & Lewis, 2004; Walters, Vader, & Harris, 2007); that is, receiving normative feedback is associated with a reduction in students’ perceptions of peer drinking norms that are, in turn, related to subsequent decreases in drinking behavior. Similar results have been found with mandated students, indicating that mandated students overestimate the amount of alcohol their peers use, and normative feedback is associated with reductions in estimates of peer drinking, which, in turn, mediate intervention effects (Dumas et al., 2009).

The aim of this study is to extend the literature by examining the efficacy of self-guided feedback relative to counselor-guided feedback following a computerized assessment in reducing heavy drinking and alcohol-related problems in mandated college students. We were also interested in relative changes in estimates of peer drinking and whether these changes would mediate intervention effects on drinking. To achieve these aims, we randomly assigned mandated college students to one of two conditions: computerized assessment with self-guided Web-based personalized normative feedback (SWF) or computerized assessment with counselor-guided Web-based personalized normative feedback (CWF). The following hypotheses were examined: (a) mandated students receiving CWF will report greater reductions in drinking and alcohol-related problems compared with those in the self-guided condition; (b) mandated students will estimate typical student drinking to be higher than their own drinking; (c) mandated students in the CWF group will reduce estimates of peer drinking norms more than those in the SWF condition; and (d) changes in peer drinking estimates will mediate the effect of the intervention on changes in drinking.

2. Method

2.1. Participants

One-hundred forty-two students were referred to the University Counseling Services by Residence Life (87%) and the Office of Student Rights and Responsibilities (13%) for violating the university alcohol policy from fall 2007 to fall 2008. University alcohol policy violations included possession, consumption, or distribution of alcoholic beverages. Of these mandated students, 135 (70% male, 30% female) chose to participate in the study. Students were not offered compensation for the baseline assessment but were given \$20 for participation in the follow-up. Students who elected not to participate completed the same procedures as study participants, but their data were not used for research purposes. All participants were treated according to established American Psychological Association ethical standards, and the university institutional review board approved all research procedures.

Ages of the students ranged from 18 to 24 ($M = 19.07$, $SD = 1.01$). Most of the students were Caucasian (84%), with 4.0% African American, 3.0% Hispanic, 3.0% Asian American, 1.5% Native American, and 4.5% other. Students were primarily freshmen (59.4%) and sophomores (29.3%), with 10.5% juniors and 0.8% seniors. Participants were randomly assigned to either the SWF or the CWF condition using a computer-generated random numbers table. Eighty-one students (60%) were assigned to the SWF condition, and 54 students (40%) were assigned to the CWF condition. Although we anticipated a result closer to 50% in each group, that was not the case with the table that was generated. Chi-square analyses and t tests confirmed there were no significant differences in any of the demographic or baseline drinking variables between the groups.

2.2. Measures

2.2.1. Alcohol consumption

We included three measures of alcohol consumption: weekly drinking quantity, binge drinking frequency, and peak alcohol consumption. Typical quantity of weekly drinking was assessed using a modified version of the Daily Drinking Questionnaire (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____). Weekly drinking quantity was calculated by combining reports for the 7 days of the week. Frequency of binge drinking was assessed by an item asking participants to indicate how often they drank five or more drinks in a row for males (four or more for females) in the past 2 weeks (Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). Peak alcohol consumption was assessed by an item asking participants to indicate the number of

drinks consumed on the occasion on which they drank the most the previous month.

2.2.2. Alcohol-related consequences

Alcohol-related consequences were assessed using the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989). The RAPI is a 23-item self-administered screening tool used to measure adolescent problem drinking. Participants were asked the number of times in the past 30 days they experienced each of 23 negative consequences as a result of drinking. Responses were measured on a 5-point scale ranging from *never* to *more than 10 times*. A total consequence score was created by summing the 23 items. The RAPI assesses both traditional physical consequences (e.g., tolerance, withdrawal symptoms, physical dependency) and consequences presumed to occur at higher rates in a college student population (e.g., missing school, not doing homework, going to school drunk). The RAPI has good internal consistency (Neal & Carey, 2004) and test–retest reliability (Miller et al., 2002).

2.2.3. Perceived peer drinking norms

Three estimates of peer drinking were selected to parallel the above drinking measures. Weekly drinking estimates for typical college students were assessed using the Drinking Norms Rating Form (Baer et al., 1991). Participants were asked to estimate the number of drinks they believed a typical college student would have in a typical week for each day of the week, “Given that it is a typical week, please write the number of drinks you believe a typical college student probably would have each day.” A response scale is provided for each day of the week (e.g., Monday____, Tuesday____). Weekly estimates of typical college student drinking were each calculated by combining the reported estimates for the 7 days of the week. Frequency of binge drinking estimates were assessed by an item asking participants to indicate how often they believe a typical college student drank five or more drinks in a row for males (four or more for females) in the past 2 weeks (Wechsler et al., 1994). Estimates of peak alcohol consumption were assessed by an item asking the participants to indicate the number of drinks a typical college student consumed on the occasion on which they drank the most in the previous month.

2.3. Intervention

Mandated students were randomly assigned to one of two interventions: (a) a computerized assessment with SWF or (b) a computerized assessment with CWF. All participants completed the baseline questionnaires and the computerized assessment. While at counseling services, those in the SWF condition reviewed the Web-based feedback on their own, and those in the CWF condition reviewed the Web-based feedback with an advanced Master’s in Counseling graduate student trained in

motivational interviewing techniques. The two interventions are described below.

2.3.1. SWF intervention

Participants in the SWF condition were directed to take e-CHUG, a National Association of Student Personnel Administrators (NASPA) recognized, evidenced-based, online alcohol intervention and personalized feedback tool developed by counselors and psychologists at San Diego State University. This brief Web-based program is designed to reduce high-risk drinking by providing personalized feedback and normative data regarding drinking and the risks associated with drinking. The program is commercially available and is managed by the San Diego State University Research Foundation. Further details about the program, procedures and costs for subscribing to the program, and supporting research are provided on the program Web site (<http://www.e-chug.com/>). The program is customized for the participating university, including providing normative data for the specific university population, referrals for the local community, and designing the Web site using university colors and logos.

The personalized feedback program takes approximately 30 minutes to complete. Students first complete an online assessment. This assessment consists of basic demographic information (e.g., gender, age, weight, living situation, class standing) and information on alcohol consumption, drinking behavior, and alcohol-related consequences. Immediately following the assessment, individualized graphed feedback is provided in the following domains: Summary of quantity and frequency of drinking including graphical feedback such as the number of cheeseburgers that are equivalent to alcohol calories consumed, graphical comparison of one's own drinking to U.S. adult and college drinking norms, estimated risk status for negative consequences associated with drinking and risk status for problematic drinking based on the participant's Alcohol Use Disorder Identification Test (AUDIT) score, genetic risk, tolerance, approximate financial cost of drinking in the past year, normative feedback comparing one's perception of peer drinking to actual university drinking normative data, and referral information for local agencies. Students in the SWF condition were monitored to ensure they reviewed the feedback.

2.3.2. CWF intervention

Participants in the CWF group completed the same Web-based program (e-CHUG) as those in the SWF group. In addition, participants in the CWF group reviewed their feedback in an MI with one of four advanced Master's in Counseling graduate students trained in motivational interviewing techniques. The counselors were trained and supervised by the lead author, who is a licensed clinical psychologist with significant training and experience using motivational interviewing techniques. The training included specific readings on MI strategies, demonstration of techniques, and role-plays using MI strategies as part of a larger

counseling skills course. Counselors demonstrated proficiency in interviewing skills through videotape. The counselors were provided a research manual that included guidelines for the semistructure MI. The counselors also attended local workshops on motivational interviewing for additional training.

Immediately after completing the Web-based program, participants reviewed their feedback with the student counselor. The counselor-guided feedback 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 nonconfrontational, 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 may be sufficient for changing drinking patterns (Neighbors et al., 2004).

2.4. Procedure

All baseline assessment and intervention procedures were completed at the University Counseling Services. Mandated students received instructions for scheduling an appointment from the source of referral and were scheduled within 2 weeks of the policy violation. During the appointment, participants were informed of the nature of the study, the risks and benefits of participation, and the voluntary nature of participation. Questionnaires at baseline were completed in a pen-and-paper format. During the baseline data collection, students were assigned a personal code. This code was used to identify pre- and postintervention responses from each student and to calculate response rates from baseline to follow-up assessments. Participants completed baseline questionnaires and either the SWF or the CWF program. The average appointment length ranged from 30 to 60 minutes ($M = 40.5$, $SD = 5.2$). An independent sample t test revealed significant differences in length of appointment between the SWF condition ($M = 42.7$, $SD = 4.7$) and the CWF condition ($M = 39.0$, $SD = 4.9$), $t(133) = -4.38$, $p < .001$. Students were provided a referral to Counseling Services either for ongoing alcohol-related problems or for future issues or concerns.

All study participants were sent an e-mail one semester after their original appointment inviting them to participate in a follow-up survey. Participants were contacted up to three times by e-mail and one time by telephone, reminding them to participate. Participants were provided informed consent and the online survey within the e-mail. The online survey

covered the same drinking measures as the baseline assessment. The survey took approximately 10 minutes to complete. Participants were paid \$20 for participation. Students who did not respond were invited to participate again during the next wave of e-mail surveys. This resulted in a few students completing surveys up to 12 months after their initial sanction, with an average length of 8 months ($SD = 2.84$ months) between baseline and follow-up assessments.

3. Results

3.1. Attrition

Of the 135 participants, 83 (61.5%) completed the follow-up assessment. There was no difference in the rate of attrition across the two intervention groups, $\chi^2 = 1.15$, $p = .19$. In addition, a series of chi-square and t tests revealed no differences in demographic variables or in any of the drinking variables between the participants who completed the study and those who did not, with the exception of binge drinking frequency. Participants who completed the study reported a higher frequency of binge drinking ($M = 1.45$, $SD = 1.51$) than those who did not complete the study ($M = 0.89$, $SD = 1.26$), $t(133) = 2.26$, $p < .05$.

3.2. Statistical analyses

We first examined the data for extreme cases that might impact the results of the analyses. *Outliers* were defined as those that were more than 3.3 standard deviations from the mean on any of the drinking measures at baseline. Rather than eliminating outliers from the analyses, outliers at each time point were adjusted to 3.3 standard deviations above the mean (Tabachnick & Fidell, 2001) for weekly drinking, binge drinking, peak alcohol consumption, and alcohol-related consequences. None of the peer estimate variables needed to be adjusted. Next, we conducted preliminary analyses to determine whether semester of enrollment, counselor, time between baseline and follow-up assessments, or length of appointment were associated with outcomes. None of these variables were associated with any of the outcome variables with the exception of a significant correlation between time between baseline and follow-up assessments and alcohol-related consequences. Therefore, we included time between assessments as a covariate in the alcohol-related consequences analyses.

3.3. Intervention effects on alcohol consumption and alcohol-related consequences

To examine whether students in the CWF group would report significantly greater reductions in drinking and alcohol-related consequences relative to those in the SWF group at the follow-up, a series of repeated-measures analyses of variance (ANOVAs) were conducted. The two

independent variables in the analysis were time (baseline, follow-up) and group (SWF, CWF). The four drinking measures included as dependent variables were quantity of weekly drinking, binge drinking frequency, peak alcohol consumption, and alcohol-related consequences.

Means for alcohol consumption and consequences at baseline and the follow-up assessment are shown in Table 1. Results of the repeated-measures ANOVAs indicated a significant interaction effect for Time \times Group for weekly drinking quantity, Wilks' $\Lambda = .94$, $F(1, 81) = 4.94$, $p < .03$, $\eta^2 = .06$, and binge drinking frequency, Wilks' $\Lambda = .95$, $F(1, 81) = 3.91$, $p < .05$, $\eta^2 = .05$. As predicted, for weekly drinking and binge drinking, mandated students in the SWF reported significantly higher levels of drinking than those in the CWF condition (see Fig. 1). Results were not significant for peak alcohol consumption, Wilks' $\Lambda = .99$, $F(1, 81) = 0.72$, $p = .40$, $\eta^2 = .01$, or alcohol-related problems, Wilks' $\Lambda = .99$, $F(1, 81) = 0.80$, $p < .38$, $\eta^2 = .01$.

Examination of the means in Table 1 indicates that mandated students in the CWF group reduced their weekly drinking quantity by an average of two drinks per week at the follow-up (approximately 17% reduction in quantity) as compared with an increase of three drinks per week in the SWF group (an 34% increase). Mandated students in the SWF group increased their binge drinking frequency by one episode on average (approximately 90% increase in frequency) as compared with no change in the CWF group. Although not statistically significant, mandated students in the CWF group reduced their peak alcohol consumption by 14% and alcohol-related consequences by 10% compared with no change and an increase of 14%, respectively, in the SWF group.

3.4. Perception of peer drinking norms

3.4.1. Overestimation of peer drinking

Baseline reports for self and typical college student drinking indicated that mandated students reported drinking

Table 1
Means and standard deviations for drinking variables and alcohol-related problems

Variable	Baseline		Follow-up	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Weekly drinking quantity				
SWF ^a	8.94	8.17	11.91	10.62
CWF ^b	11.81	9.67	9.89	10.86
Binge drinking frequency				
SWF	1.23	1.40	2.34	2.37
CWF	1.64	1.61	1.81	2.03
Peak alcohol consumption				
SWF	9.91	6.40	9.81	6.67
CWF	10.75	6.32	9.34	6.89
Alcohol-related consequences				
SWF	3.46	3.37	4.04	5.72
CWF	5.07	6.42	4.54	5.54

^a $n = 47$.

^b $n = 36$.

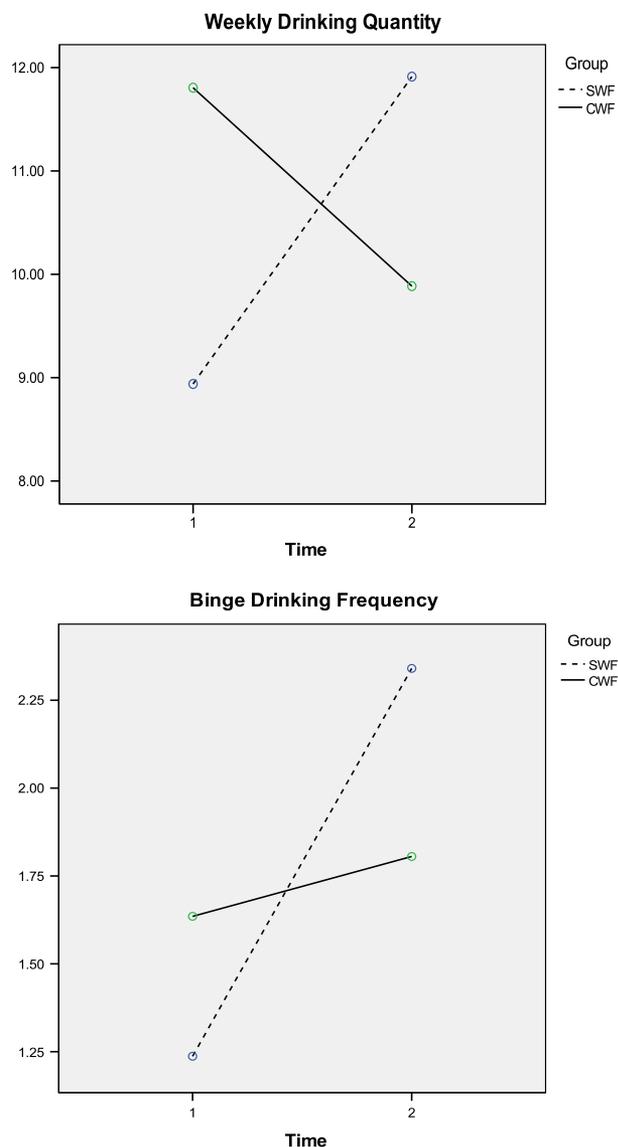


Fig. 1. Changes in drinking variables by intervention.

fewer drinks per week ($M = 9.46$, $SD = 8.55$) than they estimated a typical college student drinks ($M = 15.51$, $SD = 9.11$), reported fewer episodes of binge drinking ($M = 1.22$, $SD = 1.43$) than they estimated for a typical college student ($M = 2.89$, $SD = 1.78$), and reported lower peak consumption ($M = 9.66$, $SD = 6.08$) than estimated for a typical college student ($M = 11.57$, $SD = 9.93$). Results of paired t tests indicated a significant differences between self-report and report of a typical college student weekly drinking, $t(135) = -6.61$, $p < .001$; binge drinking, $t(135) = -9.12$, $p < .001$; and peak alcohol consumption, $t(135) = -2.09$, $p < .04$. As predicted, results indicate that the mandated students in this sample overestimated levels of college student drinking relative to their own drinking at the baseline assessment.

3.4.2. Intervention effects on changes in estimates of peer drinking

To examine differences in estimates of peer drinking from baseline to the follow-up, we conducted a series of repeated-measures ANOVAs. The two independent variables in the analysis were time (baseline, follow-up) and group (SWF, CWF). The dependent variables were the estimated weekly drinking quantity, binge drinking frequency, and peak alcohol consumption for a typical college student. Means and standard deviations for estimates of peer drinking variables at baseline and the follow-up assessment by study condition are shown in Table 2. Results of the repeated-measures ANOVAs indicated a significant interaction effect for Time \times Group for estimates of peer weekly drinking, Wilks' $\Lambda = .95$, $F(1, 81) = 4.34$, $p = .02$, $\eta^2 = .08$, and binge drinking, Wilks' $\Lambda = .94$, $F(1, 81) = 5.42$, $p = .02$, $\eta^2 = .06$, indicating a significant reduction in peer weekly drinking and binge drinking estimates for mandated students in the CWF group as compared with those in the SWF group (see Fig. 2). For peak alcohol consumption, however, only the main effect for time was significant, Wilks' $\Lambda = .94$, $F(1, 81) = 5.27$, $p = .02$, $\eta^2 = .06$, indicating a significant reduction in estimates of peer peak alcohol consumption for both intervention groups.

3.5. Estimates of peer drinking as a mediator of the effect of the intervention on changes in drinking

We next conducted a series of hierarchical regression analyses to examine whether the effect of the intervention on weekly drinking and binge drinking could be explained by the change in estimates of peer drinking. Following Baron and Kenny (1986), separate regression analyses were conducted to determine whether the intervention was significantly associated with changes in estimates of peer drinking, whether changes in estimates of peer drinking predicted changes in drinking, and whether the effect of the intervention on drinking was accounted for by changes in peer drinking estimates. A one-tailed Sobel test of significance was then used to determine whether the

Table 2
Means and standard deviations for estimates of peer drinking

Variable	Baseline		Follow-up	
	M	SD	M	SD
Weekly drinking quantity				
SWF ^a	15.11	8.10	14.60	9.19
CWF ^b	15.94	10.25	10.66	5.89
Binge drinking frequency				
SWF	2.74	1.47	2.87	2.32
CWF	3.14	1.94	2.11	1.60
Peak alcohol consumption				
SWF	9.91	6.40	9.81	6.67
CWF	10.75	6.32	9.34	6.89

^a $n = 47$.

^b $n = 36$.

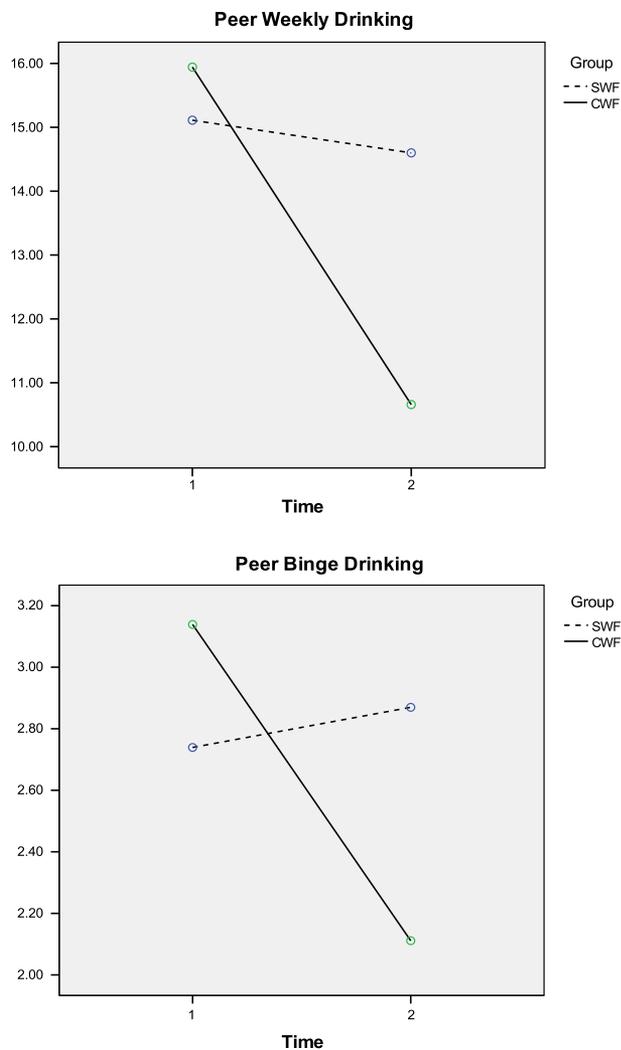


Fig. 2. Changes in estimates of peer drinking by intervention.

mediation effects were significant (MacKinnon, Warsi, & Dwyer, 1995). Change scores from baseline to the follow-up were calculated for estimates of peer drinking and self-drinking. Mediation analyses were conducted for weekly drinking and binge drinking as Intervention × Group effect was significant for these variables in the ANOVA analyses.

Results of a series of regression analyses indicated that changes in estimates of peer weekly drinking partially mediated the relationship between the effect of the intervention and changes in weekly drinking. Specifically, the intervention predicted changes in estimates of peer weekly drinking ($\beta = .23, p < .04$), and estimates of peer weekly drinking predicted changes in weekly drinking ($\beta = .27, p < .02$). In the final regression, the intervention predicted changes in weekly drinking, and the effect of the intervention on changes in weekly drinking was no longer significant after controlling for the effect of changes in estimates of peer weekly drinking (see Table 3). Results of the one-tailed Sobel test approached significance (Sobel test statistic = $-1.45, p = .07$), indicating partial mediation.

Table 3

Regression analyses for change in estimates of peer weekly drinking as a mediator on the effect of the intervention on changes in self weekly drinking

Variable	B	SE	β
Step 1			
Intervention	4.91	3.24	.24*
Step 2			
Intervention	3.87	2.26	.19
Δ peer drinking estimates	0.22	0.11	.22*

Note. $R^2 = .10, p < .02$.

* $p < .05$.

Similarly, results of a series of regression analyses indicated that changes in estimates of peer binge drinking partially mediated the relationship between the effect of the intervention and changes in binge drinking. Specifically, the intervention predicted changes in estimates of peer binge drinking ($\beta = .22, p < .05$) and estimates of peer binge drinking predicted changes in binge drinking ($\beta = .29, p < .001$). In the final regression, the intervention predicted changes in binge drinking, and the effect of the intervention on changes in binge drinking was no longer significant after controlling for the effect of changes in estimates of peer binge drinking (see Table 4). Results of the one-tailed Sobel test approached significance (Sobel test statistic = $-1.54, p = .06$), indicating partial mediation.

4. Discussion

This study extends the literature by examining the efficacy of SWF generated from a computerized assessment program relative to CWF at a long-term follow-up. Findings from this study support the use of computerized assessment coupled with Web-based feedback and suggest that in the long term, counselor-guided feedback may be more effective than self-guided feedback for mandated students.

Results of this study confirmed the hypothesis that the reductions in weekly drinking quantity and binge drinking frequency in the CWF condition would be significantly greater than reductions in the SWF condition. Mandated students in the CWF group reported a 17% reduction in weekly drinking quantity compared with a 34% increase in the SWF group. Similarly, those in the CWF group reported

Table 4

Regression analyses for change in estimates of peer binge drinking as a mediator on the effect of the intervention on changes in self binge drinking

Variable	B	SE	β
Step 1			
Intervention	0.96	0.49	.22*
Step 2			
Intervention	0.68	0.49	.15
Δ peer drinking estimates	0.24	0.11	.25*

Note. $R^2 = .10, p < .02$.

* $p < .05$.

no change in binge drinking frequency compared with a 90% increase in the SWF group. These findings are consistent with research indicating brief interventions providing in-person normative feedback are effective for mandated students (Barnett et al., 2004; Borsari & Carey, 2005; White et al., 2007). Although results were not significant for peak alcohol consumption or alcohol-related consequences, those in the CWF group reported a 14% reduction in peak alcohol consumption compared with no change in the SWF group, and a 10% reduction in reported alcohol-related consequences compared with a 14% increase in the SWF group.

Findings are also consistent with research indicating in-person feedback is more effective in the long term than mailed feedback for mandated students (White et al., 2007). Coupled with prior research indicating self-guided Web-based feedback is effective in the short term (Dumas et al., 2009; Dumas et al., in press), results are consistent with the “sleeper effect” described by White et al., suggesting that although self-guided Web-based feedback may be effective in the short term, counselor-guided feedback may be more effective with mandated students when drinking is assessed in the long term.

Results of this study also indicated that mandated students estimated that typical college students drink more than their own self-reported drinking. The direction and magnitude of the means were consistent with research indicating college students generally believe their peers drink more than they do (Baer et al., 1991; Borsari & Carey, 2001) and that mandated students also believe typical college students drink more relative to their own drinking (Dumas et al., 2009). This is particularly interesting in light of the fact that mandated students are sanctioned for receiving a campus alcohol policy violation. Despite their involvement in alcohol consumption resulting in a sanction, these students still believe that a typical student drinks more they drink themselves.

Findings also supported the hypothesis that mandated students receiving CWF would adjust their beliefs about peer drinking downward relative to those in the self-guided feedback condition. Results also indicated changes in estimates of typical college student drinking from baseline to the follow-up partially mediated the effect of the intervention on changes in weekly drinking quantity and binge drinking frequency. That is, the effects of the intervention were partially accounted for by the changes in estimates of peer drinking. Although estimates of peer drinking and one’s own drinking were reported at the same time, results of the mediation analysis suggest that the CWF intervention contributed to a reduction in estimates of peer drinking, which, in turn, contributed to a reduction in drinking quantity. These findings are consistent with previous research on Web-based feedback programs indicating the effect of the intervention on reductions in drinking are mediated by reductions in estimates of peer drinking for college students in general (Neighbors et al., 2004; Walters

et al., 2007) and mandated students in particular (Dumas et al., 2009).

It is interesting to note that although both groups received accurate information about typical college student drinking, students in the counselor-guided feedback condition reported a greater change in normative perceptions than those in the self-guided feedback condition. One possibility is that students in the counselor-guided feedback condition may have internalized this normative information more than those in the self-guided condition, as they had the opportunity to discuss this information, verify that the information was valid, and process the normative data. Other possibilities include a greater focus on the material, receiving feedback in both written and verbal formats, and receiving counselor feedback that may have been adjusted selectively for the particular student. Alternatively, students may have perceived the intervention and presented information to be more important when reviewed with a counselor.

Although this study adds to the literature by demonstrating the efficacy of counselor-guided personalized feedback relative to self-guided feedback for decreasing drinking among mandated college students at a long-term follow-up, there are several limitations. First, the attrition rate in this study limits the generalizability of the results. Of the 135 students who participated at baseline, only 61.5% completed the follow-up assessment. Attrition rates, however, were similar across study conditions, suggesting attrition was not related to the particular study condition. Because attrition resulted in a smaller sample size, statistical power was decreased, potentially impacting our ability to detect significant differences between the two intervention groups on the peak alcohol consumption and alcohol-related consequences measures. In addition, because of the primarily Caucasian composition of the sample, generalizability of the results may be limited to this population. Second, information in this study was obtained through self-report. Self-reported alcohol use is, however, common practice in studies evaluating interventions for mandated students. Although self-report potentially leads to biased or distorted reporting, college students may not be motivated to misrepresent their alcohol use, as heavy drinking is perceived to be normal in the college setting (Borsari & Muellerleile, 2009). Further, results of a recent meta-analysis support this usage, indicating that the reliability of self-reported drinking in college students is good, with little bias reported between participant and collateral reports (Borsari & Muellerleile, 2009). Third, because students completed an assessment prior to the intervention, the issue of repeated assessment and possible reactivity should be considered. Although it is possible that the efficacy of the intervention is in some way related to reactivity to the initial assessment, we are less concerned about reactivity, as it was controlled for across study conditions. Next, although the counselors in this study were 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 this study followed a randomized controlled design with two intervention groups, we did not have a true no-treatment control group due to ethical considerations. Without a no-treatment control group, it is unclear how the increases in drinking seen in students in the self-guided feedback group would have compared with students receiving no intervention. Future research with a wait-list control group would be beneficial, although ethical concerns make this difficult to achieve, particularly in studies examining long-term effects.

Nonetheless, results of this study have important implications for developing early intervention programs for mandated college students. Despite intervention efforts, mandated students remain a high-risk population for drinking and drinking-related problems on college campuses. In addition, although personalized normative feedback programs are more effective than educational programs in decreasing alcohol use in the college student population (Larimer & Cronce, 2002, 2007), group lecture-based alcohol education is still a common practice used in intervention programming. This common practice may be the result of the limited amount of outcome studies examining individual brief motivational interventions in the literature. Alternatively, cost may be a factor in selecting both group formats and educational formats for early intervention programs over two-session BASICS programs. Results of this study suggest that providing Web-based normative feedback with counselor-guided feedback is a promising strategy for the reduction of high-risk drinking in the mandated student population. Although counselor-guided feedback is more costly than self-guided feedback, the one-session format including Web-based assessment and counselor-guided feedback examined in this study is less costly than a two-session BASICS format.

The brief intervention used in this study may be used as an intervention for mandated college students as described in this study. In addition, treatment providers may use Web-based personalized feedback programs such as e-CHUG with their individual clients in other mandated settings. Although mandated clients may be hesitant to report alcohol-related issues to therapists or other treatment providers, they may be more willing to complete an online program in between counseling sessions. Clients may then bring their feedback into the counseling session to discuss with their therapist, who may then use motivational interviewing strategies to help mandated clients make better choices about drinking.

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