

Feedback-Based Alcohol Interventions for Mandated Students: An Effectiveness Study of Three Modalities

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The present study used a randomized clinical trial design to examine the effectiveness of personalized alcohol feedback delivered individually, in a group and via computer on alcohol use and related negative consequences in a sample of 173 college students referred for alcohol-related violations. Findings revealed statistically significant reductions in alcohol use and related harms for the individually delivered intervention, with significant reductions in alcohol-related harms for the electronically delivered intervention. No statistically significant results were found for the group-delivered intervention or between groups, and a main effect of time was noted for all outcome variables. This study adds to the literature by being the first randomized clinical trial to include analyses of an empirically supported individually delivered personalized alcohol feedback intervention with more cost-effective group-delivered and electronically delivered feedback formats within a single research design, by expanding the range of participant drinking habits reported at baseline to include all drinking levels and not solely those classified as 'heavy drinking' and by providing anonymity pre-intervention and post-intervention given the potential demand characteristics to underreport illegal and/or illicit behaviours in this vulnerable population. Copyright © 2012 John Wiley & Sons, Ltd.

Key Practitioner Message:

- Personalized alcohol feedback delivered in a one-on-one, face-to-face format serves to decrease both alcohol use and harms in mandated college students.
- The use of web-delivered personalized alcohol feedback may be clinically useful when working with a mandated student population to reduce alcohol-related harms.
- Personalized alcohol feedback delivered in a group setting may not be indicated for use with a mandated student population as it does not demonstrate decreases in either alcohol use or harms, possibly because of the normalization of deviant behaviour.

Keywords: Alcohol Intervention, Electronic Intervention, Personalized Feedback, Mandated Students, Randomized Clinical Trial, Brief Motivational Interventions

INTRODUCTION

College Student Alcohol Use and Related Consequences

The Substance Abuse and Mental Health Services Administration reports that young adults aged 18–25 years show the highest prevalence of problem drinking (2006). Among this age group, rates of current and binge drinking (defined as a blood alcohol concentration of 0.08 g% achieved in 2 h) rank highest, as does the likelihood of

having met criteria for alcohol abuse and dependence (NIAAA, 2007; SAMHSA, 2006). College student alcohol use in particular is linked to a variety of serious consequences, with more than 696 000 individuals assaulted by a student peer who had been drinking and more than 1700 student deaths each year from injuries related to alcohol use (Hingson, Heeren, Winter, & Wechsler, 2005). In fact, the National Survey on Drug Use and Health reports that college students are more likely than their non-student cohorts to engage in high-risk drinking behaviour and to drive while under the influence of alcohol (SAMHSA, 2006). Given this information, college students are not only placing themselves at a greater risk for harmful alcohol consequences but are also elevating the risk for their peers and surrounding community as well.

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Interventions for College Students

The high-risk nature of college student drinking has created the need to develop effective alcohol prevention and intervention programmes tailored specifically for use with college student populations (see Larimer, Cronce, Lee, & Kilmer, 2004 for a review). One such programme is the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff, Baer, Kivlahan, & Marlatt, 1999): a two-session individually delivered intervention specifically developed for use with college students that incorporates motivational enhancement (see Miller & Rollnick, 2002) and cognitive-behavioural skills training and has garnered substantial empirical support (e.g., Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Murphy et al., 2001; White et al., 2006). Several studies evaluating BASICS in high-risk college student samples have demonstrated reductions in both alcohol consumption and related negative consequences (Dimeff et al., 1999; Murphy et al., 2001), with results lasting as long as 4 years post-intervention (Baer et al., 2001).

Although effective and supported by research, the high cost of providing an individually delivered alcohol intervention has led institutions of higher education to utilize group programmes. CHOICES (Parks & Woodford, 2005) is one such programme that is modelled after the BASICS and includes many of the same elements (i.e., cognitive-behavioural skills training, psychoeducation, harm-reduction principles), with the addition of an interactive journal to encourage participant engagement. Prior studies implementing CHOICES have done so in a college classroom setting, with some finding that the programme may improve descriptive drinking norms (Henry, Lange, & Wilson, 2004; Wilson, Henry, & Lange, 2005).

Murphy and colleagues (2004) examined the effectiveness of providing a specific BASICS component, personalized feedback (PF), on the reduction of alcohol use. PF provides detailed information related to alcohol (e.g., quantity and frequency of use, comparison of use to a referent norm group, risk factors) tailored from an individual's self-report data. The study compared the provision of PF within the context of a BASICS motivational interview to feedback delivered as a stand-alone intervention. Comparison of feedback provided with and without a one-on-one motivational interview revealed comparable reductions in alcohol consumption, supporting the continued search for more cost-effective interventions that incorporate feedback as an intervention component.

Interventions that utilize feedback have demonstrated significant reductions in alcohol consumption (see Riper et al., 2009 for a meta-analytic review), with several studies having implemented PF as a stand-alone alcohol intervention effectively (Agostinelli, Brown, & Miller, 1995; Collins, Carey, & Sliwinski, 2002; Walters, 2000). A review

by Walters & Neighbors (2005) of feedback interventions in college student samples found feedback to be effective in reducing alcohol consumption whether delivered face-to-face, by mail, or via computer. In fact, Kypri et al. (2003) report that college students prefer to use electronic methods of receiving alcohol screening and feedback to individually delivered interventions similar in content. Additionally, employing electronic methods has been found to increase the likelihood of intervention utilization, as well as the reporting of undesirable behaviours (McCabe, Boyd, Couper, & D'Arcy, 2002; Turner, Ku, Rogers, Lindberg, & Pleck, 1998), with research finding no significant differences between data collected electronically versus more traditional paper-and-pencil methods (Kypri, Gallagher, & Cashell-Smith, 2004; McCabe et al., 2002; Miller et al., 2002).

A web-based intervention called the 'eCHECKUP TO GO' (e-CHUG; Moyer, Rikard, Van Sickle, Walters, & Wilson, 2004) incorporates several of the aforementioned elements found to be effective in reducing college student alcohol use. This brief, web-based, commercially available assessment and feedback tool uses motivational enhancement strategies to provide detailed normative and risk factor alcohol information personalized to each individual (Walters, Miller, & Chiauuzzi, 2005). A self-administered intervention that requires only 15–30 min to complete, the e-CHUG eliminates the need for face-to-face contact with a provider while disseminating the content found in the most successful brief PF interventions. Randomized trials conducted with the e-CHUG have demonstrated significant reductions in alcohol consumption (Steiner, Woodall, & Yeagley, 2005; Walters, Vader, & Harris, 2007).

Mandated College Students

Although the BASICS and stand-alone feedback interventions such as the e-CHUG have garnered empirical support for use with heavy-drinking college students, relatively few studies have included individuals who have violated campus alcohol policies, a specific subpopulation known as 'mandated', 'sanctioned' or 'judicially referred' students, in their investigations. Research comparing sanctioned versus non-sanctioned students has highlighted the need for heightened concern. A study by Caldwell (2002) comparing the alcohol consumption habits of mandated versus non-mandated students found that individuals who are sanctioned for alcohol violations tend to be heavier drinkers and more frequent alcohol abusers than their non-mandated counterparts. Additional investigations have found that mandated students also experience a greater number of alcohol-related problems than non-mandated students (Barnett et al., 2004),

supporting prior research that college students who violate alcohol policies not only engage in riskier alcohol use but also exhibit increased problems related to their use as well (Flynn & Brown, 1991; O'Hare, 1997).

Recent attempts at improving the extant literature of mandated student interventions have focused on the implementation of brief motivational interventions (e.g., Borsari & Carey, 2005; Fromme & Corbin, 2004; White *et al.*, 2006). Although the investigations to date vary in terms of modality (individual versus group, individual versus electronic), quantity of sessions (one versus two) and length of intervention (from less than 1 h to 4 h), the literature is clearly supportive of interventions that utilize a motivational enhancement approach and incorporate cognitive-behavioural skills training and personalized drinking feedback. In a comprehensive review of the mandated student literature, Barnett and Read (2005) identified specific strategies future investigations should use to fill key gaps in the knowledge base regarding effective mandated student interventions. Of particular importance were the inclusion of 'referred students regardless of risk level', as well as evaluations comparing the 'efficacy of different intervention formats' (p. 156).

The Present Study

Although research supports the provision of interventions such as the BASICS, face-to-face formats are not optimal for reaching large numbers of students and are costly to deliver. Fortunately, stand-alone feedback interventions also are supported by the research, are cost-effective and can be disseminated easily to an entire college student population. No study to date has examined the relative effectiveness of all three commonly used intervention formats in a single research design. The current examination addressed this issue by providing participants with individualized feedback within individual, group and electronic formats while adding to the literature by including a range of risk levels and drinking habits, from light-drinking through heavy alcohol use—not those solely defined as 'heavy drinking'. Additionally, this investigation is the first to provide participants with anonymity at both baseline and 3-month follow-up in an effort to minimize potential demand characteristics associated with adjudication.

Drawing from the existing literature, we hypothesized *a priori* that participants in all three conditions would exhibit comparable reductions in alcohol consumption post-intervention as evidenced by decreases in average and peak blood alcohol content (BAC) levels, as well as peak number of drinks consumed in one sitting as reported at follow-up. We also hypothesized that participants in all three conditions would exhibit comparable

reductions in negative alcohol-related consequences post-intervention as evidenced by a decrease in the total number of consequences reported at follow-up.

METHOD

Participants

Two-hundred and sixty-nine participants were recruited successfully from a large open-enrollment state university in the southeastern United States. Of those recruited, 91 did not meet the inclusion criteria for further analyses given that they did not report alcohol consumption at baseline. Although mandated for an alcohol violation, several reasons could have accounted for this finding, including the act of getting caught itself (see Hustad *et al.*, 2011; White, Young, & Morgan, 2008), that some violations were not for actual drinking but rather for being in the presence of alcohol while under the age of 21 years (e.g., being at a dorm party where alcohol was present but the individual was not drinking) and that despite assurances of anonymity, individuals were still hesitant to report drinking given that they were referred for a mandated alcohol assessment/intervention. Therefore, the present study examined the resulting 173 undergraduate students who were mandated to an alcohol intervention and met inclusion criteria for this study. The sample consisted of 57% men ($n = 98$) and ranged in age from 18 to 25 years, with a mean age of 18.77 ($SD = 1.08$). See Table 1 for additional sample characteristics.

Screening Measures

Screening Questionnaire

A screening instrument was developed to identify factors related to problematic and high-risk drinking and consisted of the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), assessing for alcohol dependence as defined by the Diagnostic and Statistical Manual, Fourth Edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) and inquiring about participation in prior, as well as current substance-abuse treatment. The AUDIT is a widely used 10-item screening instrument that assesses hazardous drinking patterns by asking respondents to report drinking quantity and frequency, alcohol harms and symptoms of alcohol dependence. Total scores range from 0 to 40 and are broken down into four 'risk' zones (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001). When used with college students, the AUDIT has demonstrated internal consistency ranging from 0.77 (Neal & Carey, 2004) to 0.80 (Fleming, Barry, & MacDonald, 1991), with several studies having used the AUDIT with mandated

Table 1. Participant demographics by intervention condition

	Individual intervention		Group intervention		Electronic intervention		Overall sample
		<i>n</i>		<i>n</i>		<i>n</i>	<i>n</i>
Age	18.79 (1.12)	53	18.79 (1.23)	72	18.71 (0.74)	48	173
Sex							
Male	66%	35	57%	41	46%	22	98
Female	34%	18	43%	31	54%	26	75
Race							
Non-Hispanic/Latino(a)	94%	50	90%	65	92%	44	159
Hispanic/Latino(a)	6%	3	10%	7	8%	4	14
Ethnicity							
American Indian/Alaska native	0%	0	0%	0	4%	2	2
Asian	4%	2	3%	2	4%	2	6
Black	6%	3	1%	1	7%	3	7
White	83%	44	86%	62	75%	36	142
Other/prefer not to respond	7%	4	10%	7	10%	5	16
Class standing							
Freshman	72%	38	65%	47	71%	34	119
Sophomore	13%	7	24%	17	25%	12	36
Junior	7.5%	4	7%	5	4%	2	11
Senior	7.5%	4	4%	3	0%	0	7
Type of residence							
On-campus residence Hall	51%	27	47%	34	58%	28	89
Fraternity/sorority house	0%	0	3%	2	0%	0	2
University-affiliated off-campus	19%	10	22%	16	17%	8	34
Off-campus without parents	24.5%	13	25%	18	23%	11	42
Off-campus with parents	3.5%	2	1.5%	1	0%	0	3
Other	2%	1	1.5%	1	2%	1	3

students in particular (Barnett *et al.*, 2004; Borsari & Carey, 2005; O'Hare, 1997).

Study Measures

Demographics Questionnaire

Participants were asked to provide general demographic information such as their age, sex, race, ethnicity, class standing and type of housing.

Alcohol Timeline Followback

Alcohol consumption was measured using the Alcohol Timeline Followback procedure (TLFB; Sobell & Sobell, 1992). Respondents were provided with the definition of a 'standard alcoholic drink' and used assisted recall techniques to indicate the number of drinks consumed during each drinking occasion for the previous 4-week period. The TLFB provides detailed alcohol information such as peak and average BAC levels, peak number of standard drinks consumed per week and typical pattern of drinking (e.g., steady, binge) by using the number of standard drinks consumed, as well as the time over which they were consumed, to calculate accurate BAC levels. The TLFB is a well-established measure with good reliability and validity (Sobell, Brown, Leo, & Sobell, 1996; Sobell & Sobell, 1992).

Blood Alcohol Content

Blood alcohol content was calculated using the same formula employed in a previous study with mandated students (Borsari & Carey, 2005):

$$BAC = [(consumption/2) \times (GC/weight)] - (0.016 \times \text{hours})$$

where consumption is the number of standard alcohol drinks consumed in one drinking session, hours is the number of hours over which drinks were consumed, weight is weight in pounds and GC is gender constant (9.0 for women, 7.5 for men).

Negative Alcohol-Related Consequences Questionnaire

The 23-item Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) was the primary instrument used to assess alcohol-related harms as it has demonstrated good internal consistency with adolescents (White & Labouvie, 1989) and with college student populations specifically (Borsari & Carey, 2000; Neal & Carey, 2004). In the standard version, answer choices range from 'never' (0) to 'more than 10 times' (4), but because this study sought to obtain more detailed information regarding the harms mandated students may experience as a result of alcohol use, answer choices were modified such

that respondents were asked to provide the actual number of times each harm occurred during the previous 30 days. An additional eight items were included from the Drinker Inventory of Consequences (Forcehimes, Tonigan, & Miller, 2007) to represent harms for which mandated students are typically referred for services but which are not included on the RAPI (i.e., drinking and driving). The total negative alcohol-related consequences score was obtained by adding the number of times each harm was experienced.

The Motivational Interviewing Treatment Integrity Code

The most recent version of the Motivational Interviewing Treatment Integrity Code (MITI v. 3.0; Moyers, Martin, Manuel, Miller, & Ernst, 2007) was used to assess fidelity to motivational interviewing (MI) using a coding system that is comprised of six global scales (Evocation, Collaboration, Autonomy/Support, Direction, Empathy and MI Spirit). Global scale ratings are derived by having trained raters select from among a five-point Likert scale ranging from 'low' (1) to 'high' (5) on each dimension, with the exception of the MI Spirit score, which is derived by taking the average of Evocation, Collaboration and Autonomy/Support ratings.

Intervention Conditions

Brief Alcohol Screening and Intervention for College Students

The BASICS (Dimeff *et al.*, 1999) is an individualized alcohol assessment and feedback intervention for college students that is designed for delivery in two 50-min sessions and includes cognitive-behavioural skills training, motivational enhancement and PF. In the current study, intervention providers met with participants for an initial session to introduce the BASICS using a motivational enhancement approach and to gather assessment data that served as the PF information provided to each participant during the subsequent session. PF included information about alcohol consumption, perceived drinking norms, alcohol-related problems, alcohol expectancies and alcohol-related protective factors. Moderation training (e.g., setting limits, monitoring drinking and managing drinking situations) also was included as part of the intervention.

CHOICES

CHOICES (Parks & Woodford, 2005) is a group alcohol intervention modelled after the BASICS intervention. A group intervention was selected for comparison in this study given that it is often a preferred modality across colleges and universities for students who incur alcohol-related infractions because of ease of dissemination and reduced cost over individualized interventions. CHOICES

uses a motivational enhancement framework to incorporate cognitive-behavioural skills training, psychoeducation and harm-reduction principles delivered in the span of 120 min. In CHOICES, each participant is provided with a journal that illustrates intervention content to encourage an interactive journaling process meant to increase the level of participant engagement. In addition to the standard CHOICES protocol, this study provided each participant with the identical personalized alcohol feedback information used in the BASICS condition to maximize its similarity to the BASICS intervention content.

eCHECKUP TO GO

The e-CHUG (Moyer *et al.*, 2004) is an electronically delivered alcohol intervention that utilizes social norms feedback theory and motivational enhancement principles to motivate students to reduce their alcohol consumption via brief assessment of alcohol-related behaviours and beliefs such as typical alcohol consumption, level of alcohol tolerance, family history of alcohol-related problems and perceived drinking norms. The e-CHUG provides immediate PF by using the information obtained during the brief self-assessment.

Procedure

Intervention Provider Training

Prior to the delivery of individual and group alcohol interventions, clinical psychology doctoral students underwent 40 h of didactic training, as well as an additional 20 h of experiential training. The principal investigator, who was certified as an intervention trainer, conducted the didactic sessions. The didactic portion of provider training included information about alcohol (e.g., standard drink equivalents and BAC), MI (e.g., principles and techniques), the BASICS intervention (e.g., content, structure and drink monitoring cards), the CHOICES intervention (e.g., journal content and group dynamics), PF (e.g., content and how to deliver feedback) and general office policies and procedures (e.g., schedules and record keeping). Experiential training consisted of providers conducting mock sessions with undergraduate research assistants playing the role of 'mandated' students. All sessions were videotaped, and each provider role-played sessions one and two of the BASICS intervention, as well as facilitated a CHOICES group. The principal investigator reviewed all practice sessions, assessed for competence using the MITI code and verified intervention content with a structured checklist tailored to each condition. The principal investigator provided individualized feedback on the basis of intervention provider proficiency, and sessions were scheduled with study participants only once proficiency had been met. In an effort to address possible intervention 'drift', weekly supervision sessions were

held with providers that included discussions centred on MI principles (e.g., techniques providers were using on the basis of their client's current stage of change), intervention content and addressing questions that may have surfaced during intervention delivery.

MITI Code V. 3.0 Rater Training

A total of three independent raters, two senior-level undergraduate psychology research assistants and one first-year clinical psychology doctoral student, were trained by the principal investigator in using the MITI protocol as suggested in the MITI, (see Miller, Rollnick, & Moyers, 1998).

Study Procedures

After the approval to conduct this investigation was obtained from the Institutional Review Board of the university at which it was conducted, participants who were at least 18 years of age were recruited from alcohol-related violation referrals to the university alcohol and other drug counselling centre. Violations included those incurred on-campus (e.g., possession of an alcoholic beverage while under the age of 21 years, being visibly intoxicated on alcohol while under the age of 21 years), as well as off-campus (e.g., legal citation for possession of an alcoholic beverage while under the age of 21 years, being charged with driving while under the influence of alcohol). Participants first completed an initial session with a clinical psychology doctoral student who administered the screening questionnaire. Participants were deemed ineligible to participate if they met criteria for Alcohol Dependence as delineated in the DSM-IV-TR (2000), fell into the highest risk category (Zone 4) on the AUDIT by scoring a 20 or higher and/or endorsed previous or current substance-abuse treatment for alcohol. Screeners reviewed the purpose and procedures of the study with those screened eligible to participate and informed those who agreed to be a part of the research study that although they were receiving alcohol screening and intervention services, they reserved the right not to respond to the 3-month follow-up survey online.

Participants were informed that there were no foreseeable risks involved with participation, that they maintained the right to withdraw from the study at any time without penalty and that they would receive full reimbursement of the \$45.00 fee paid initially to receive services upon completion of the 3-month follow-up questionnaire as incentive for participation. In addition, participants in the individual and group conditions were informed that their session would be audiotaped for assessment of intervention integrity. Screeners informed participants that audiotapes would not contain their full name, would be stored in a locked file cabinet separate from study materials, would be accessed by the principal

investigator only and would be used solely for the purpose of rating intervention providers.

After a student agreed in writing to participate in the study by signing the informed consent form, they were assigned randomly to one of the three intervention conditions using a computer-generated randomized number list and asked to complete the anonymous baseline questionnaire online via a secure web server. All participants completed baseline measures alone in a room dedicated for this purpose. Surveys were linked from baseline to follow-up using a unique participant-generated code that could not be tied to their identity to ensure anonymity. The only way to link baseline and follow-up data, therefore, was to have participants who completed both pre-intervention and post-intervention measures provide their unique code at follow-up. For this reason, it was not possible to conduct intention-to-treat analyses, but the present study implemented this particular design focused on anonymity in an effort to decrease socially desirable responding.

To generate the PF report utilized during the second session of the individual and group interventions, participants assigned to those conditions were asked to complete a confidential paper-and-pencil self-report packet comprised of a different set of measures than those completed online but that assessed similar behaviours, beliefs and constructs. The paper-and-pencil packet included the assessment of alcohol-related behaviours and beliefs such as typical weekly consumption, peak 30-day consumption, protective behaviours, expectancies, perceived norms and readiness to change. After the completion of indicated measures, participants were scheduled to return to the centre for participation in their respective feedback intervention. Following participation in their respective intervention, participants were asked to complete the anonymous online follow-up questionnaire at 3 months post-intervention via an email reminder. Upon completion of the 3-month follow-up questionnaire, participants were debriefed as to the nature of the study in writing and were reimbursed the initial \$45.00 fee. To maintain anonymity when seeking reimbursement at 3-month follow-up, participants provided their unique ID number verbally to an administrative assistant who verified completion using a list of ID numbers eligible for reimbursement.

RESULTS

Adherence to Motivational Interviewing

A total of 94 sessions (*individual* = 67, *group* = 27) were audiotaped for MI adherence. Of those audiotapes, 9 contained no audio and 11 were inaudible. The remaining 74 audiotapes were pooled, and a random sample of 33 (45%) were selected for rating. Per the MITI Code v. 3.0

instructions, 20-min segments were selected at random from each audiotape for coding. All 20-min segments were transcribed, and each segment was coded twice by independent raters trained in the MITI scoring protocol. Analyses indicated that all six global scales exceeded 'beginner' standards and met criteria for 'competence' as defined by the MITI, with mean scores above 4 on the five-point Likert scale.

Baseline Differences

Chi-square analyses were conducted on discrete participant characteristics of sex, race, ethnicity, class standing and type of residence at baseline across treatment conditions. No significant differences were found. A univariate analysis of variance was conducted to examine alcohol-related harms, which yielded no significant differences. A multivariate analysis of variance was used to examine all dependent variables measuring alcohol use (i.e., average and peak BAC, peak number of drinks consumed in one sitting) and indicated a significant difference among intervention groups at baseline for average BAC [$F(2, 174) = 3.159, p = 0.045$]. Given this finding, subsequent analyses examining between-group drinking changes for average BAC accounted for this difference as noted below. All alcohol-related variables were assessed using 3 (individual, group, and electronic intervention) \times 2 (pre-intervention, 3-month follow-up) mixed-model analyses of variance.

Negative Alcohol-Related Consequences

Results revealed a significant main effect of time [$F(1, 165) = 10.460, p < 0.001$]. Simple effect tests indicated significant reductions in alcohol-related harms from pre-intervention to post-intervention in the individual [$F(1, 165) = 7.308, p = 0.008$; within-group (WG) effect size (Cohen's d) = 0.41] and electronic [$F(1, 165) = 7.214, p = 0.008$; WG effect size (Cohen's d) = 0.40] conditions, with participants experiencing an average decrease in harms of 8.92 and 9.04, respectively (see Table 2). No significant condition by time interaction was found [$F(1, 165) = 3.027, p = 0.051$]. Results were not significant for the group condition (see Figure 1).

Average Blood Alcohol Content over a 4-Week Period

Average BAC was calculated using the following formula: *Average BAC* = (average weekly BAC / no. of drinking weeks) where average weekly BAC is the sum of all BACs over 1 week divided by the number of drinking occasions in that week and no. of drinking weeks is the number of weeks containing at least one drinking occasion. Because

of significant baseline differences across conditions for average BAC, a univariate analysis of covariance was performed with baseline average BAC levels as the covariate to examine potential differences at post-intervention across groups. No significant between-group differences were found. A significant main effect of time was noted [$F(1, 166) = 4.129, p = 0.044$], with further simple effects analyses that indicated trends toward significant reductions in average BAC pre-intervention to post-intervention for the individual [$F(1, 166) = 3.561, p = 0.061$; WG effect size (Cohen's d) = 0.29] and group [$F(1, 166) = 3.791, p = 0.053$; WG effect size (Cohen's d) = 0.23] conditions (see Figure 2). No significant condition by time interaction was found [$F(1, 166) = 0.934, p = 0.395$].

Peak Blood Alcohol Content over a 4-Week Period

Peak BAC was determined by selecting the single highest BAC reached during the 4-week period. A significant main effect of time was found for peak BAC [$F(1, 166) = 5.098, p = 0.025$], with reductions pre-intervention to post-intervention in the individual condition [$F(1, 166) = 6.304, p = 0.013$; WG effect size (Cohen's d) = 0.45]. Participants in the individual condition experienced an average decrease in peak BAC of 0.03 or the approximate equivalent of consuming one standard alcoholic drink. No significant condition by time interaction was found [$F(1, 166) = 1.642, p = 0.197$]. It was noted that decreases in the group condition approached significance [$F(1, 166) = 3.770, p = 0.054$; WG effect size (Cohen's d) = 0.23]. Results for the electronic condition were not significant (see Figure 3).

Peak Number of Drinks Consumed in One Sitting over a 4-Week Period

Analyses indicated a significant main effect of time for peak number of drinks consumed in one sitting [$F(1, 166) = 4.517, p = 0.035$], with significant reductions pre-intervention to post-intervention in the individual condition [$F(1, 166) = 7.079, p = 0.009$; WG effect size (Cohen's d) = 0.33]. Participants in the individual condition experienced an average decrease of 1.5 standard alcoholic drinks consumed during a single drinking occasion. No significant condition by time interaction was found [$F(1, 166) = 1.930, p = 0.148$]. Results for the group and electronic conditions were not significant (see Figure 4 and Table 2).

DISCUSSION

The present study sought to contribute meaningful information to the growing body of literature concerning brief alcohol interventions for mandated student populations.

Table 2. Unadjusted means and standard deviations for measures of alcohol use and negative alcohol-related consequences at baseline and 3-month follow-up

Measure	Individual intervention (<i>n</i> = 53)		Group intervention (<i>n</i> = 72)		Electronic intervention (<i>n</i> = 48)	
	Baseline	Follow-up	Baseline	Follow-up	Baseline	Follow-up
Average BAC	0.061 (0.047)	0.048 (0.041)	0.073 (0.051)	0.062 (0.050)	0.050 (0.044)	0.050 (0.051)
Peak BAC	0.112 (0.093)	0.082 (0.070)*	0.125 (0.088)	0.105 (0.083)	0.092 (0.094)	0.096 (0.099)
Peak number of drinks consumed in one sitting	7.02 (5.00)	5.49 (4.23)**	7.46 (4.53)	6.73 (4.88)	6.38 (4.03)	6.55 (5.41)
Negative alcohol-related consequences	21.26 (23.19)	12.33 (20.11)**	17.87 (22.30)	18.00 (27.01)	19.00 (23.85)	9.18 (17.44)**

BAC = blood alcohol content.

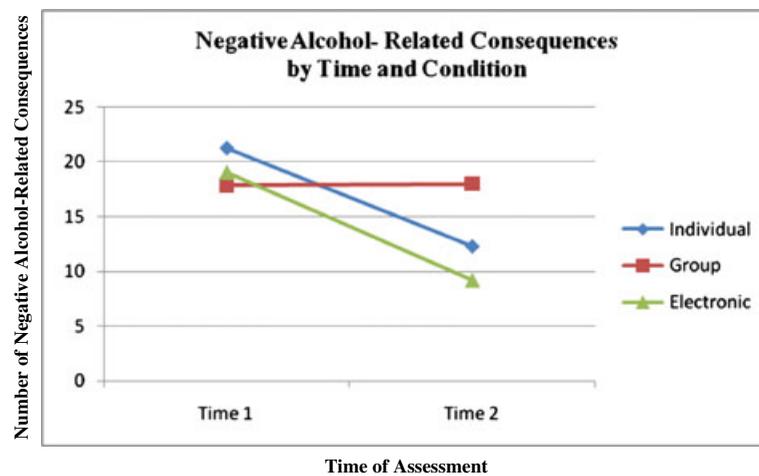
p* < 0.05. *p* < 0.01.

Figure 1. Unadjusted mean number of negative alcohol-related consequences at (1) baseline and (2) 3-month follow-up

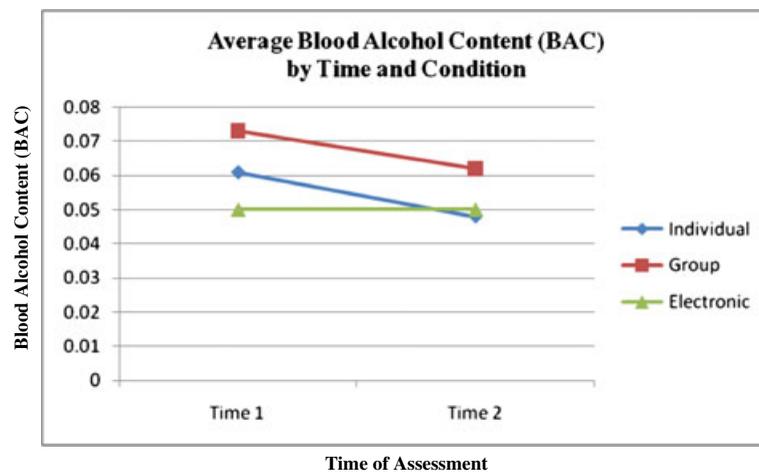


Figure 2. Unadjusted means for average blood alcohol content at (1) baseline and (2) 3-month follow-up

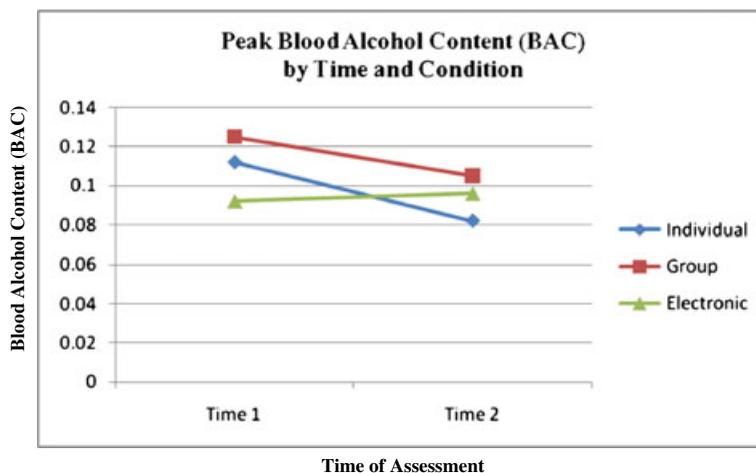


Figure 3. Unadjusted means for peak blood alcohol content at (1) baseline and (2) 3-month follow-up

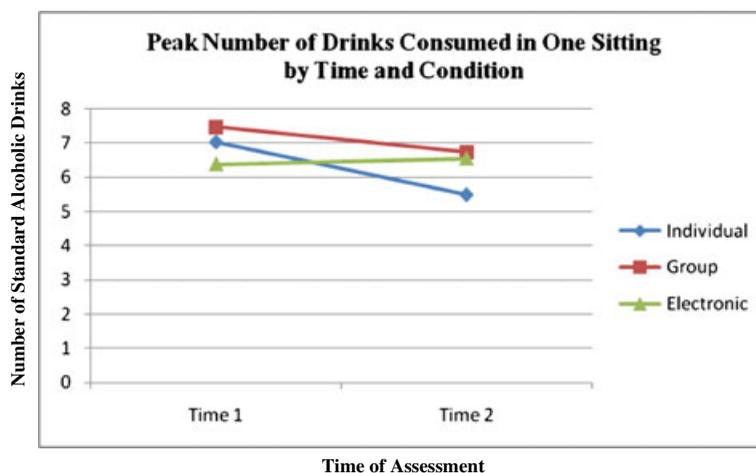


Figure 4. Unadjusted peak number of drinks consumed in one sitting at (1) baseline and (2) 3-month follow-up

This is the first RCT to compare an individually delivered personalized alcohol feedback intervention that is well supported (Dimeff *et al.*, 1999), with more cost-effective group-delivered and electronically delivered feedback formats within a single research design. Despite the typical convention of including only ‘heavy’ drinking college students in brief intervention studies (i.e., Borsari & Carey, 2005; Fromme & Corbin, 2004), the present investigation expanded the range of drinking habits reported at baseline to include, e.g., participants whose average drinks per week fell below one standard drink, to those who averaged 25 drinks per week. Additionally, given the potential demand characteristics to underreport illegal and/or illicit behaviours, this is the first study to our knowledge that provided mandated participants with anonymity.

The first aim of the present study was to examine the effectiveness of each feedback intervention format on the reduction of alcohol use. We hypothesized that all three interventions would significantly decrease alcohol consumption, which was not supported. Participant alcohol use was assessed using several drinking variables in an effort to obtain a more specific understanding of alcohol use patterns. Examination of average and peak BAC and the peak number of drinks consumed in one sitting revealed that feedback delivered individually in a face-to-face format is effective in decreasing alcohol use—specifically alcohol consumed in larger amounts. The individual intervention produced significant reductions in the highest number of drinks consumed during a single drinking occasion, as well as peak BAC. These findings are consistent with extant research that supports

the use of brief motivational interventions with college students (i.e., Baer *et al.*, 2001; Borsari & Carey, 2005; Murphy *et al.*, 2004) and points to the utility of this format in reducing more hazardous drinking habits. Despite what may seem as modest decreases in peak BAC (0.03) and drinks consumed (1.5 standard alcoholic drinks), such reductions can mean the difference between a driving under the influence charge or moving from a BAC that produces a sense of 'relaxation' to one of 'impaired' judgement. Although statistical significance was not achieved, there was a trend toward a significant reduction of alcohol use for the individual and group conditions on average BAC and for the group condition on peak BAC. No significant alcohol use decreases were found for the electronic intervention. Our findings are in line with previous research that compared the group and electronic interventions used in the present study, and also failed to find significant between-group differences on alcohol consumption (e.g., Henry *et al.*, 2004; Wilson *et al.*, 2005).

One reason for the differential treatment effects on alcohol reduction may be found in the PF content of the electronic condition. Both the individual and group conditions were derived from the efficacious Alcohol Skills Training Program (Fromme, Marlatt, Baer, & Kivlahan, 1994) and contain specific harm-reduction drinking strategies aimed at managing alcohol use effectively (e.g., alternating alcoholic drinks with non-alcoholic drinks, pacing and spacing drinks), whereas the version of the electronic condition used in this study did not. A meta-analytic review examining alcohol interventions in college student populations (Carey, Scott-Sheldon, Carey, & DeMartini, 2007) supports the present findings, citing risk-reduction strategies such as those provided in the individual and group conditions, as factors that contribute to students engaging in 'less-extreme drinking behaviour' (p. 2487). Our findings are also consistent with those of Walters and colleagues (2009), who found that a face-to-face intervention that included both MI and PF was superior to a computer-delivered feedback-only intervention in the reduction of alcohol use (Walters, Vader, Harris, Field, & Jouriles, 2009). Also, because the individual and group interventions were conducted in a face-to-face format, it was possible to confirm that the provision of feedback and discussion of report contents (e.g., BAC, tolerance and comparison of own drinking to others) occurred during every feedback session. The very nature of the remote feedback delivery in the electronic condition precludes the verification that participants reviewed their PF reports at the time of the intervention.

Because of the greater likelihood of mandated students experiencing harms associated with alcohol use when compared with their non-mandated peers (Caldwell, 2002; LaBrie, Tawalbeh, & Earleywine, 2006), the second aim was to examine the impact of feedback interventions on negative alcohol-related consequences. We

hypothesized that all three feedback interventions would reduce alcohol-related harms; however, this hypothesis was not supported. Significant reductions in harms were noted solely in the individual and electronic conditions. The present findings are consistent with previous research (e.g., Baer *et al.*, 2001) that the individual brief motivational feedback intervention reduces both alcohol use and alcohol-related harms—a finding that is not surprising given the widespread use and research of the BASICS intervention within college student populations. What is interesting, however, is the positive impact of the electronic intervention on the reduction of alcohol-related harms, given the lack of significant reductions in drinking. A study examining the independent and collective roles of PF and MI found similar results, with students exhibiting reductions in the amount of negative consequences experienced related to alcohol use, without concomitant reductions in drinking (Juarez, Walters, Daugherty, & Radi, 2006).

Further examination of the content included in the electronic feedback intervention may shed light on the decrease in alcohol harms despite the absence of drinking changes. First, although topics concerning drinking (e.g., BAC, tolerance) were present in the web-based feedback report, there were no specific 'tips' or strategies focused on reducing alcohol consumption. In fact, the feedback report provided participants personalized information related to alcohol use in an objective, factual and non-judgmental manner, steering clear of direct attempts to modify drinking behaviour, which is consistent with MI principles (Miller & Rollnick, 2002). Second, closer inspection of the web-based feedback report revealed specific references to the number and type of alcohol-related consequences a participant had experienced, with an additional chart that detailed statistics related to drinking and driving. Moreover, although the electronically generated feedback did not present participants with harm-reduction drinking strategies, it did provide harm-reduction drinking and driving strategies by offering specific referral information when a designated driver is needed (e.g., the university-sponsored taxi cab programme). It is possible that similar to offering participants drinking strategies, providing them with safer drinking and driving strategies served to decrease the occurrence of those specific types of alcohol-related incidents, which in turn led to the observed significant decreases in harms.

The use of identical feedback reports in the individual and group conditions was implemented to maximize intervention similarity despite differences in delivery format and yet a discrepancy in negative alcohol-related harms was observed. Although perplexing, moderator analyses conducted in the aforementioned meta-analytic review (Carey *et al.*, 2007) bolster the findings in the present study. The review concluded that interventions

that incorporate MI, normative drinking comparisons, feedback on expectancies and a decisional balance exercise (all of which are included in this investigation's feedback report), and are delivered in an individual format outperform those delivered in a group format on the reduction of harms (Carey *et al.*, 2007). Additionally, a comprehensive review of 'peer contagion' (i.e., influence of peers resulting in null or iatrogenic intervention effects) within adolescent populations highlighted the potential for group interventions conducted with deviant youth to dampen positive intervention outcomes at best and foster negative effects at worst (Dishion & Dodge, 2005). Mandated students who have been sanctioned by the university and/or the law are by virtue of their offence(s) considered 'deviant' from their non-adjudicated peers—a finding that is supported by data that mandated students experience higher rates of harms (Caldwell, 2002; Flynn & Brown, 1991; LaBrie *et al.*, 2006). Furthermore, the group intervention in the present study was implemented as a 'selected prevention strategy', or one geared towards high-risk youth in an effort to prevent the worsening of target behaviours. According to Dishion and Dodge (2005), using a group intervention in such a population can be particularly problematic when the group includes adolescents who are 'moderately deviant or are still developing deviant behaviour patterns' because of peer contagion effects (p. 396). The grouping of youth who have engaged in deviant behaviour may serve to normalize the experience, contributing to the absence of positive behaviour change. Lastly, it is also possible that expected reductions in problem behaviours were not demonstrated in the group condition because the intervention utilized in this study (see Parks & Woodford, 2005) was originally developed for use as a primary prevention strategy and not a selected prevention strategy geared towards known at-risk youth.

The present study offers valuable new information to the existing literature regarding alcohol interventions that target mandated college student populations. The very use of underutilized methodological techniques that add to this study's strengths, however, also contribute to some of its limitations. First, the decision to employ an RCT of three active interventions allowed for the comparison of varying delivery formats on the effectiveness of personalized alcohol feedback within one research design. The comparison of three active treatments, however, cannot rule out the effect of time or the sanction itself on the modification of behaviour—although the use of a no-treatment control or wait-list condition would have introduced ethical problems given the high-risk nature of this particular population. Studies attempting to untangle the impact of the citation from actual intervention effects have found reductions in drinking, albeit modest ones (Hustad *et al.*, 2011; White

et al., 2008). The present study expands upon such findings by employing anonymity to reduce the likelihood of desirable responding at follow-up. Given that participants were assured anonymity at baseline and follow-up, however, intention-to-treat analyses were unable to be conducted, resulting in the inability to assess possible patterns of attrition.

Second, the use of a 3-month follow-up assessment limits the ability to determine the long-term impact of these interventions. A recent study by Carey *et al.* (2011) comparing a face-to-face brief motivational intervention to computer-delivered interventions demonstrates the importance of employing longer follow-up assessments with mandated students, as intervention effects may not only decay over time, as a function of intervention modality. Lastly, although initial recruitment efforts met the guidelines of a total sample size of 252, or 84 participants per condition as set forth by the *a priori* power analysis (GPOWER; Erdfelder, Faul, & Buchner, 1996), the loss of participants at follow-up, coupled with participants failing to endorse any alcohol use during the baseline assessment, resulted in a sample size smaller than the one suggested. The ability of the present study to detect changes in drinking and harms despite these limitations, however, speaks to the encouraging findings this examination provides.

Future investigations focused on improving services for mandated college students would benefit from replicating the findings of this study using an anonymous data collection design while increasing the recruitment of students who report drinking behaviour following the incident. Extending the follow-up period of these interventions with mandated students would also contribute to our understanding of the longer-term effects these interventions may have (see Carey *et al.*, 2011). Given the high cost of delivering face-to-face services, a cost-effectiveness analysis (see Kaplan & Frosch, 2005, for a review) would inform institutions of higher education looking to maximize clinical gains. Lastly, the reduction in higher drinking levels (i.e., peak BAC) within intervention conditions that incorporated harm-reduction drinking strategies points to the utility of measuring these behaviours in future investigations. Although a recent study by Larimer and colleagues (2007) using feedback with embedded drinking strategies found a mediating effect of protective drinking behaviours on alcohol use, the study was not conducted on mandated students. The one study to date that has examined the mediational relationship of protective behaviours on drinking in mandated students (Barnett, Murphy, Colby, & Monti, 2007) did not incorporate a control group with which to compare their findings. In sum, although the present study contributes to the mandated student literature, there is still much work that can be accomplished.

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