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## Incident-Specific and Individual Level Moderators of Brief Intervention Effects with Mandated College Students

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### Abstract

Brief Motivational Interventions (BMI) and Computer-delivered interventions (CDI) have been successful in reducing drinking behaviors with mandated college students. However, research examining moderators of intervention effects have found mixed results. The current study sought to replicate and extend the research on moderators of intervention efficacy with mandated students. Baseline alcohol-related problems, readiness to change, gender, incident consequences, and participant responses to the event (personal attributions about the incident, aversiveness of the incident) were examined as moderators of intervention and booster condition efficacy on alcohol use and problems. Mandated students ( $N = 225$ ) were randomized to complete either a BMI or CDI (Alcohol 101; Century Council, 1998), with or without a 1-month booster session, following a campus alcohol sanction. Outcomes were measured 3 months after baseline. Attributions moderated intervention condition such that participants low in personal attributions for their incident showed significantly less drinking following a CDI than a BMI. Men and individuals who reported low incident aversiveness showed higher drinks per occasion after receiving a booster, while individuals high in alcohol-related problems reported fewer heavy drinking days after completing a booster session. Findings suggest that identifying specific characteristics related to the precipitating event may inform intervention approaches in this high-risk population, however additional research is needed to offer concrete guidance to practitioners in the field.

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College students who receive campus alcohol violations are at higher risk for alcohol-related problems than other students (Caldwell, 2002; O'Hare, 1997), and on most college campuses sanctions for these students include mandatory intervention to reduce heavy drinking and associated harm. As alcohol-related sanctions on college campuses increase annually (Porter, 2006) and college budgets shrink, it becomes increasingly important to identify the most effective interventions for this high-risk group of young adults. Different modalities such as computer-delivered, web-delivered, and self-administered interventions are being tested and may be appropriate and even preferred for some students. For example, counselor-administered individual Brief Motivational Interventions (BMIs) have reduced alcohol consumption and alcohol-related problems relative to comparison conditions (e.g., computer-delivered, written feedback; Borsari & Carey, 2005, Carey et al., 2006; White et al., 2007), but in some cases equivalent effects have been found in lower-cost comparison conditions (Barnett et al., 2007; White et al., 2006). Moreover, there is growing evidence

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<sup>1</sup>We considered combining the dependent variables into a composite variable to reduce the number of statistical tests. However, in the original trial we found opposite results when different outcomes were evaluated, so combining these dependent variables into one composite might obscure moderator effects.

that particular characteristics of students and their circumstances may help determine the optimal intervention for students who come to the attention of campus authorities.

Gender and problem drinking history have been investigated as moderators of intervention effects with mandated students across several studies. Carey and colleagues found that gender moderated intervention efficacy with mandated students; women showed greater response to a BMI vs. a Computer-delivered intervention (CDI), whereas men showed no intervention group differences (Carey, Henson, Carey, & Maisto, 2009). This indication that women may be more responsive to particular interventions has been reflected in other research with nonmandated samples (Blow et al., 2006; Murphy et al., 2004), but Mun, White, and Morgan (2009) did not find gender moderation when BMI was compared to written feedback. Mun and colleagues did find that number of prior alcohol-related problems moderated intervention outcomes, such that BMI with personalized written feedback was more effective than written feedback alone with students who identified more baseline alcohol-related problems. However, Carey et al. (2009) considered a different indicator of alcohol-related risk (Alcohol Use Disorders Identification Test [AUDIT] of 10 or higher) but did not find moderation effects.

Although gender and drinking problems are important to examine as they relate to intervention effects for mandated students, students who receive these interventions also have experienced a specific identifiable and recent event that prompted their referral or sanction. The circumstances of the precipitating event (i.e., the alcohol-related consequences experienced in the incident) and individual reactions to the incident may influence intervention effectiveness. In the only study to evaluate incident circumstances as a moderator, Mun et al. (2009) investigated the seriousness of the precipitating incident and found mandated students who were involved in a serious incident (ones that included medical or police attention) were more likely to be classified as improved on heavy episodic drinking and alcohol problems following a BMI than following written feedback.

In addition to event seriousness, there is evidence that having had a recent alcohol-related incident precipitates cognitive and affective reactions that may interact with the intervention. Two such state variables, personal attributions (i.e., feeling responsible) about the incident, and perceived aversiveness of the incident have been found to be positively related to motivation to change following a specific incident (Barnett et al., 2006; Longabaugh et al., 1995), and may be a contributing factor to intervention effectiveness. These reactions have not been evaluated as moderators of intervention with mandated students, but a study conducted with 18–24 year old emergency department (ED) patients found that patients who had lower attributions for alcohol use as the reason for their ED visit benefitted more from a counselor-based BMI than a written feedback condition (Barnett et al., 2010). Patients who had higher attributions about the role of alcohol in their event showed no outcome difference between BMI and written feedback. One interpretation of this finding is that patients who attributed their event to alcohol perceived greater salience of the event and were more motivated to change, and were subsequently able to benefit from either intervention. In contrast, those with lower alcohol attributions seemed to require a more intensive and interactive intervention to show behavior change.

The importance of the negative affect generated by an alcohol-related event has been investigated in three studies; in all three a negative affective reaction to a precipitating alcohol-related incident was associated with greater motivation to change drinking (Barnett et al., 2002; Barnett et al., 2006; Longabaugh et al., 2005). Further, Barnett et al. (2010) found aversiveness of the event did not moderate response to BMI vs. written feedback in a sample of young adults in an emergency room. Since that sample was not mandated to intervention, and such mandates can generate considerable negative response from students

(Palmer, 2004), evaluation of aversiveness as a possible moderator in mandated student samples is warranted.

A final characteristic that has been evaluated as a moderator of intervention efficacy in mandated students and other populations is readiness to change alcohol use. In the studies with mandated students described above (Carey et al., 2009; Mun et al., 2009), neither found that baseline readiness to change moderated intervention outcomes. However, in ED patients, readiness to change moderated intervention outcomes, such that patients with lower readiness to change benefitted more from BMI when compared to a written feedback condition, whereas patients with higher readiness did not show intervention group differences (Barnett et al., 2010). Given the importance of readiness to change as a central construct in Motivational Interviewing (MI; Miller & Rollnick, 2002) theory, defined as a client-centered, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence” (Miller & Rollnick, 2002, p. 25), it is important to evaluate its influence on brief intervention efficacy.

The few studies with mandated students that have evaluated moderators have contained one-contact interventions. In the only study to investigate whether an additional (booster) session improved outcomes (Barnett et al, 2007), no main effects of booster condition were detected. Barnett and colleagues (2007) suggested the 25-minute booster may have been too short, or that the timing of the booster (1-month post intervention) was not optimal, however, it is possible that individual and event-related characteristics would identify students who could benefit from additional intervention. Therefore, examining moderators of the booster session might provide information that could lead to a targeted or stepped care approach to the use of these sessions.

The objective of this study was to replicate previous findings related to baseline alcohol-related problems, readiness to change, and gender as moderators of two commonly used intervention approaches with mandated college students. Further, the goal was to extend research to examine whether individual responses to a sanctioning incident (incident consequences, attributions, aversiveness) moderate the efficacy of different intervention approaches, and whether they moderate the efficacy of booster sessions. Data were from a randomized controlled trial that compared a BMI to a CDI condition (Alcohol 101), after which participants were randomly assigned to a 1-month booster session (Barnett et al., 2007). The original trial included a 1-year follow up, but because the relative influence of any individual single-event contextual factor (including incident-related variables, treatment, and their interactions) is likely to diminish over time, examining the specific roles of moderators at the earliest follow-up time point offers the opportunity to identify characteristics important for short-term drinking reductions. Therefore, our moderation analyses focused on 3-month outcomes. Findings from the original study identified a significant main effect of time at 3-months with a reduction in number of drinking days and heavy drinking days in the past month for both conditions, but no between group differences. No reductions in alcohol related problems were found for either group. Finally, the main effect of booster condition, 2-way interactions with booster, and 3-way interactions were all not significant.

We expected that 1) students with a higher number of alcohol problems, lower number of incident consequences, lower alcohol attributions, lower event aversiveness, and lower readiness to change would show greater response following a BMI relative to those completing a CDI; 2) gender would moderate intervention effects with women reducing drinking following a BMI relative to those completing a CDI, whereas men would not show differential treatment effects. This is the first study exploring moderators and their relationship to completing a booster session, but for the same reasons we would expect those

with lower response to the event would benefit from the opportunity to engage with a counselor in a BMI, we expect that those with lower incident consequences, lower alcohol attributions, lower event aversiveness, and lower readiness to change would show greater benefit from a booster session relative to no booster.

## Method

### Participants

Undergraduate college students at a private university in New England were invited to participate in the study following medical evaluation for intoxication or a disciplinary hearing for alcohol-related behavior. Participation was a voluntary alternative to meeting individually with a university health educator. Of 348 eligible students, 227 (65%) were enrolled in the study. One participant withdrew prior to randomization, and one was removed from the trial due to concerns about the participant's mental health.

### Procedures

For the baseline assessment, counselors administered questions about the alcohol-related incident that precipitated the educational referral and administered the Timeline Followback measure. The remaining measures were self-administered by the participant. After assessment participants were randomly assigned to a counselor-delivered BMI ( $n = 112$ ) or CDI ( $n = 113$ ) condition (a 45-minute session with Alcohol 101; Century Council, 1998). Following intervention, half in each condition ( $n = 58$  in both BMI and CDI) were randomized to receive 1-month booster sessions in the same format as their baseline condition.

### Intervention Conditions

**Brief Motivational Intervention**—The BMI was conducted using MI principles as described by Miller and Rollnick (2002). Counselors were eight master's or Ph.D. level clinicians who received 30 hours of MI training followed by weekly supervision on MI and protocol adherence. The intervention session had four components (introduction and review of alcohol incident, assessing motivation, enhancing motivation, establishing goals). Counselors reviewed the participant's incident that resulted in the referral, explored pros and cons of alcohol use, and discussed the drinking attitudes of friends and parents. Personalized graphic feedback was provided in an effort to enhance motivation to change drinking behaviors. Feedback reports are graphic representations of survey responses. In the current study feedback included: summary of drinking and consequences experienced in the incident; comparison of the participant's alcohol use vs. age- and gender-based national norms; estimated past-month average and peak blood alcohol concentration (BAC); alcohol-related consequences; and participant alcohol related risks. The final pages of the feedback report listed personalized strategies for reducing alcohol use. For participants interested in making changes in their drinking, counselors elicited ideas and discussed alternatives to current practices (see Barnett et al., 2007 for further description of the BMI). Average time of BMI sessions was 50.19 minutes ( $SD = 9.4$ ).

Intervention fidelity was measured by two independent raters (Intraclass correlation scores ranging from .55 to .88), using an intervention checklist to identify adherence session component completion and the Motivational Interviewing Treatment Integrity 2.0 (MITI; Moyers, Martin, Manuel, Hendrickson, & Miller, 2005) for adherence to MI. The intervention fidelity checklist was evaluated on a 1 (below expectations) to 3 (above expectations) scale, while the MITI was evaluated using a 1 (low) to 7 (high) scale to evaluate MI Empathy and Spirit. Mean scores for completion of the intervention components was 2.04 ( $SD = .22$ ) with 75–100% of expected components being

administered. MI scores for Empathy and Spirit each exceeded 6, meaning an established level of competence (Moyers et al., 2005).

**Computer-delivered intervention (CDI)**—The CDI consisted of an individual session with Alcohol 101 (Century Council, 1998). Although initial Alcohol 101 programs consisted of only educational information, the version used in the current study included a self-directed interactive program on CD-ROM. Specifically, the program presents a “virtual party” with different “rooms,” including a virtual bar where the user can enter different drink types and consumption speed to see the effects on blood alcohol concentration (BAC). Additional video clips, testimonials about alcohol-related consequences, and multiple-choice questions about alcohol and its effects also are presented as the user chooses different elements of the program. At the completion of the program, normative feedback is presented about drinking patterns and perceptions of peer drinking. Participants randomized to the CDI condition were directed to a private computer, given instructions on how to use the program, and required to spend 45 minutes using the program.

### Booster Condition

Participants assigned to the booster condition returned 1 month after baseline for an additional 25-minute session. The BMI booster consisted of a review of the baseline session and what had occurred since that session, including progress towards goals and the need to adjust or set new goals. CDI booster participants used the Alcohol 101 program for 25 minutes after receiving guidance about how to navigate to elements they had not previously seen.

### Follow-Up

Three-month follow-up assessments were conducted by a research assistant who was blind to intervention and booster conditions. Participants were paid \$25 for this assessment.

### Outcome Measures

**Alcohol use**—An interviewer-administered 30-day Timeline Followback (TLFB; Sobell & Sobell, 1995) was used to collect recent drinking reports, with a standard drink defined as 12 oz. beer, 4 oz. wine, or 1.25 oz. liquor. Baseline drinking was collected for 30 days prior to the referral incident. For each day, number of standard drinks was recorded. Computations for number of heavy drinking days (5 or more drinks for males, 4 or more drinks for females) and average number of drinks per drinking day were derived from this measure.

**Alcohol problems**—The Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut & Sher, 1992) is a 27-item measure that assesses alcohol problems. Items were dichotomized and summed for a total score ( $\alpha = .78$ ).

### Moderators

**Alcohol problems**—The 27-item, dichotomized YAAPST (Hurlbut & Sher, 1992) also was examined as a moderator.

**Incident consequences**—The YAAPST measure was adapted to measure consequences that occurred in the precipitating event. Participants were asked whether each consequence occurred “on the day of, or because of your incident.” Items were summed to reflect the total number of incident consequences experienced, which was used as an index of incident severity ( $\alpha = .62$ ).

**Attributions about alcohol in the event**—Three items were used to assess participant attributions and responsibility for the precipitating incident. Items were: “To what extent do you believe your alcohol consumption was responsible for this incident?”, “To what extent was the incident your own fault?”, and “To what extent do you believe your own risk-taking behavior was responsible for this incident?” (adapted from Longabaugh et al., 2005 and Barnett et al., 2006). Items were scored on a 7-point scale from 1 (not at all) to 7 (extremely or totally) and summed to create a single index of personal attributions ( $\alpha = .71$ ).

**Aversiveness**—Three items were used to assess the aversiveness of the incident resulting in the referral for educational intervention. Items were: “To what extent has this incident upset you?”, “When thinking about this incident, how badly do you feel about it?”, and “How unpleasant has this incident been for you?” (Barnett et al., 2006; Longabaugh et al., 2005). Items were scored on a 7-point scale from 1 (not at all) to 7 (extremely or totally) and summed to create a single index of aversiveness ( $\alpha = .89$ ).

**Readiness to change**—Readiness to change was measured using the Contemplation Ladder (Biener & Abrams, 1991), originally designed to measure motivation to change smoking, and later modified to assess motivation to change alcohol use (Becker et al., 1996). This instrument contains an image of a ladder and reads, “Each rung of this ladder represents where a person might be in thinking about changing their drinking. Select the number that best represents where you are now.” Response options are from 0 to 10 and the anchors are 0 (“no thought of changing”), 3 (“think I need to consider changing someday”), 5 (“think I should change, but not quite ready”), 8 (“starting to think about how to change my drinking patterns”), and 10 (“taking action to change [e.g., cutting down]”).

## Data Analyses

Analyses were conducted on three outcomes (number of heavy drinking days, drinks per drinking day, alcohol-related problems score) at the 3-month follow-up. The dichotomous moderator (gender) was evaluated using ANOVA with males coded as 0. Multiple regression was used to examine continuous moderators based on the work of Holmbeck (2002). First, moderator variables (incident consequences, attributions, aversiveness, and readiness to change) were centered to facilitate interpretation of parameter estimates. Second, product terms were computed between intervention group (BMI and CDI) and the mean centered moderator variables for assessment of the influence of interaction effects. Finally, the outcome variables were regressed onto all three terms (group, mean-centered moderator, and group by moderator product term) while controlling for the baseline level of the dependent variable. Following significant interactions of continuous moderators, the simple slopes of the moderator at one standard deviation above and below the mean were evaluated within intervention groups (Aiken & West, 1991). For all analyses, CDI was coded as 0. The same analytic approach was used to assess moderation of the booster condition. Identical analyses were then conducted for booster conditions with the booster group coded as 0. One variable (number of heavy drinking days) had a nonnormal distribution so was square-root transformed for analyses.

## Results

In total, 213 participants (94.7%; BMI = 107, CDI = 106) completed the follow-up and were included in analyses. Preliminary analyses found no baseline differences between CDI and BMI and booster groups on any moderators or outcome variables (see Table 1). Correlations among the individual moderator variables ranged from  $r = .01$  to  $r = .26$ . Significant results of the three outcomes for each moderator are presented below, separately for intervention and booster factors.



### Intervention Condition (BMI vs. CDI)

**Alcohol-Related Problems**—Regression results for drinks per drinking day revealed that the total model accounted for 25.4% of the variance,  $F(4,171) = 14.58, p < .05$ . The interaction between intervention group and alcohol-related problems was significant ( $\beta = .28, p < .05, \Delta r^2 = .02$ ). Further examination revealed no significant group differences for participants at low ( $\beta = -0.11, ns$ ) and high ( $\beta = 0.14, ns$ ) baseline alcohol-related problems.

**Attributions about Alcohol in the Event**—Regression results for heavy drinking days revealed that the total model accounted for 32.6% of the variance,  $F(4,204) = 24.68, p < .001$ . The interaction between intervention group and attributions was significant ( $\beta = -.22, p < .05, \Delta r^2 = .02$ ). Simple slopes analyses showed that for participants low in attribution, those who received CDI had a significantly lower number of heavy drinking days at follow up than those completing the BMI ( $\beta = 0.16, p < .05$ ) (Figure 1, Panel A). The intervention group difference for participants high in attribution was not significant ( $\beta = -0.11, ns$ ).

Attributions also significantly moderated the relationship between intervention group and number of drinks per drinking day; the full model accounted for 25% of the variance,  $F(4,171) = 14.25, p < .001$ . The interaction between intervention group and attribution was significant ( $\beta = -.23, p < .05, \Delta r^2 = .03$ ) (Figure 1, Panel B). Further examination showed no significant intervention group differences for participants at either low ( $\beta = 0.17, ns$ ) or high attribution ( $\beta = -0.15, ns$ ), although the value for low attribution approached significance ( $p < .08$ ). Moderator interactions for the third dependent variable, alcohol problems, were not significant.

The four other moderators of intervention condition that were explored: incident consequences, aversiveness, readiness to change and gender were not significant for any of the three outcomes tested.

### Booster Condition

**Alcohol-Related Problems**—In regression analyses investigating alcohol-related problems as a moderator of the effect of booster condition on number of heavy drinking days, the full model accounted for 29.5% of the variance,  $F(4,204) = 21.24, p < .05$ . The interaction between intervention group and alcohol-related problems was significant ( $\beta = .28, p < .05, \Delta r^2 = .02$ ). Follow-up tests showed that for participants high in alcohol-related problems, those in the booster condition reported a statistically significant lower number of heavy drinking days per month than those in the no-booster condition ( $\beta = 0.24, p < .01$ ) (see Figure 2). For participants low in alcohol-related problems, there were no significant differences between those who received a booster and those that did not ( $\beta = -0.01, ns$ ). Moderator interactions were not significant for the other two outcomes: number of drinks per drinking day and alcohol problems.

**Aversiveness of the Event**—Aversiveness significantly moderated the relationship between booster condition and number of drinks per drinking day; the full model accounted for 25.6% of the variance,  $F(4,171) = 14.70, p < .001$ . The interaction term for aversiveness and booster condition was significant ( $\beta = -.20, p < .05, \Delta r^2 = .03$ ). Follow-up tests showed that for participants low in aversiveness, those who received a booster reported a statistically significant higher number of drinks per drinking day than those who did not complete a booster session ( $\beta = 0.57, p < .05$ ). The booster group difference for participants high in aversiveness was not significant ( $\beta = -0.09, ns$ ) (see Figure 3). Moderator interactions were not significant for the other two outcomes: number of heavy drinking days and alcohol problems.

**Gender**—Gender significantly moderated the relationship between booster condition and number of drinks per drinking day in the past month,  $F(1, 175) = 6.11, p < .05$ . Follow-up tests showed men who received a booster had significantly higher drinks per drinking day than men who did not receive a booster,  $F(1, 175) = 7.83, p < .01$  (see Figure 4). Women did not show this difference between booster conditions. Moderator interactions were not significant for the other two outcomes: number of heavy drinking days and alcohol problems.

The three other moderators explored: number of incident consequences, attributions, and readiness to change were not significant for any of the three outcomes tested.

## Discussion

Mandated students have a host of experiences related to their precipitating events, and we established that students' reactions to the experiences are relevant for intervention efficacy. Students who had low personal attribution about their precipitating event benefitted to a greater extent from a computer-based compared to a counselor-based intervention. The intervention group differences reflected a difference in about 1.5 heavy drinking days per month. Although the simple slopes for the drinks per drinking day outcome were not significant for either low or high attributions, the direction of the interaction on this second outcome was consistent with the heavy drinking days outcome. These findings for attribution were the opposite of what we expected to find; based on our prior work with young adults (Barnett et al., 2010) we thought that individuals with lower attributions about alcohol would fare best in BMI, not CDI. The mandated nature of our intervention may have created circumstances that influenced the effect of the attribution/intervention interaction. It is possible, for example, that students who felt little responsibility for their incident were not invested in the required session, and may have felt irritated by the mandate or defensive about their behavior (Fromme & Corbin, 2004; Palmer, 2004) and as a result may have been more aggravated by the interpersonal demands of the BMI and less able to benefit from it. The BMI also included a focus on the precipitating event which may have been alienating for these students, whereas they may have been able to accept the self-directed CDI which contained no reference to the event or sanction. As a construct, the cognitive evaluation of personal responsibility and the importance of alcohol for a critical event are evidently relevant for intervention planning and selection, though work to further understand its directional influence is needed.

Constructs that moderated the effects of the booster factor were different from those that moderated intervention condition efficacy. Consistent with our expectations, among individuals who had a higher number of alcohol-related problems, those who received a booster reported significantly fewer heavy drinking days than those who did not receive the booster. Identifying individuals who have experienced a high number of alcohol-related problems at baseline and providing a tailored intervention approach that includes a booster may impact a particular high-risk drinking pattern.

We determined that gender moderated the efficacy of booster condition, but contrary to our expectations, men showed a much poorer response following booster, and no difference was noted for women. Our findings offer additional support for the initial outcomes study (Barnett et al., 2007) in which we determined that adding a booster session offered no added value with mandated students. Indeed, it appears that required booster sessions are not necessary for women and are contraindicated for men. However, because booster assignment was random and not based on student preference, counselor judgment, or any other clinical indication (severity, session outcome) regarding clinical utility, our findings do not speak to the potential utility of offering optional booster sessions at the discretion of the



student or the counselor. Moreover, given this finding is not supported by a theoretical model, we caution the interpretation of the iatrogenic effect of booster interventions with male mandated students. Of further note is that gender did not moderate intervention condition effects between the BMI and CDI, indicating no differential response to the intervention conditions for men and women.

Another finding that was contrary to our expectations was that individuals who reported lower incident aversiveness appear to consume more alcohol per occasion when they received a booster. It appears therefore, that students who had a more muted emotional reaction to their event are not helped by additional intervention and non-elective boosters do not appear to be recommended for this group. Those who had a stronger negative reaction may benefit from additional contact to adequately address their reaction, although the difference between conditions was not large or significant. Similar to the gender by booster results, we caution interpretation of these findings. The overall lack of treatment effect associated with the booster session may be related to the fact that these mandated students had, at that point, experienced at least two recent events that increased the salience of their drinking (the event resulting in the mandate and the initial session). These events resulted in drinking reductions for many students and may have reduced the relative salience of the booster sessions.

Two of our putative moderators (readiness to change and incident consequences) were not significant for any outcome. The lack of moderation for a central construct of motivational interviewing is now very consistent across samples of mandated students, having been found in multiple studies (see also Carey et al., 2009; Fromme & Corbin, 2004; Mun et al., 2009), and using three different measures of readiness/motivation. It is possible that the available measures of readiness to change are not adequate for college students (Carey & Hester, 2005). It is also possible that readiness is difficult to measure in students who recently experienced an alcohol incident, especially since these students often report having already changed prior to intervention (Barnett et al., 2004).

There are important differences between moderator analyses findings and the original outcomes. First, two of our significant moderator findings were found on an outcome (number of heavy drinking days) that did not show intervention group differences in the original outcome study (Barnett et al., 2007). Second, moderation of intervention condition was detected at 3 months when there were no significant effects of intervention condition in our original study at 3 months. Finally, two of our moderators, gender and aversiveness, only interacted with the booster factor, for which we found no main effects in the original trial. These differences from the original outcomes suggest that short-term effects may be more driven by individual differences and reactions to events. Findings also reflect the importance of including multiple outcomes and evaluating moderation effects when initial main effects are not significant.

Similar to the findings in the main outcomes study, there were no significant moderator findings for reported alcohol problems at 3-months. As past research has identified changes in alcohol related problems at longer term follow ups (e.g., 12-months; Carey et al., 2009), it may be the ability to identify changes in alcohol related problems necessitate a longer follow-up period. This may also hold true for moderators of alcohol related problems as well.

## Limitations

While the current study is the first to our knowledge to examine moderators specific to the referring incident with a mandated student population, limitations should be considered. Some of our significant interactions were rather small in magnitude and not followed by

significant simple slopes findings. Some of our findings were unexpected, and in light of the small effect sizes and the number of tests we conducted, should be interpreted cautiously due to the possibility of Type I error. Regarding examination of the incident-consequences items, we acknowledge that due to the wording of the question there is a chance the participant may have been reporting on a consequence that happened earlier in the day, unrelated to the referral incident. Although this is likely a rare occurrence, this finding should be interpreted cautiously. Also, given the internal consistency reliability value was somewhat low, we further caution interpretation of this finding. We did not study more complex interactions (e.g. between drinking severity, event reactions, and intervention), as these would require larger samples. Only short-term outcomes were included to avoid a larger number of statistical tests and because we expected that moderation effects would be more evident at the first follow up. The sample had a high number of medical transport cases, which may not be representative of other college campus mandated student populations. Further, policies for sanctioning students and mandating them to counseling differ across campuses; our results may not generalize to campuses with other approaches.

## Conclusions

These results underscore the importance of understanding the circumstances of precipitating events and individual reactions to those events, and to identify the best ways to incorporate this information into intervention design. Some college campuses have hundreds of students each year who receive alcohol violations or medical intervention for intoxication. Given limited resources, it is critical that colleges and health centers that treat these young adults identify the most efficient and effective way to respond to these events. Although counselor-delivered BMIs have been effective across different populations, and are recommended for high-risk college students (NIAAA, 2002), the results of this and several other studies suggest there are apparently subpopulations of students for whom other intervention approaches are as, or even more, effective (Carey et al., 2009; Mun et al., 2009). More specifically, we have now found in two trials with young adults that circumstances prior to the intervention can influence intervention efficacy (see also Barnett et al., 2010).

As evidence-based computerized and self-administered interventions are adopted and shown to be adequate alternatives to person-based counseling, the development of simple triaging rules will help make the application of intervention more cost-effective. Although there is a considerable literature that indicates “treatment matching” using individual characteristics may not be recommended (Project MATCH Research Group, 1997; 1998), our study adds the additional information about a precipitating event and the student’s reaction to it; assigning individuals to intervention based on these characteristics may be reasonable. When our findings are considered, it appears that (lower) perceived responsibility identify students who fare better if they receive CDI. An engaging and empirically-based computerized intervention may be the optimal intervention for an individual who is not feeling personally responsible for the incident but is required to attend an intervention. Further, use of a booster session may be especially important for individuals higher in alcohol-related problems, but would not be recommended as a matter of course for men or those who have a muted emotional response to their event. The implementation of such a system would take careful consideration, but might reduce the number of additional resources needed to address all mandated cases. The current findings offer initial suggestions for cost-efficient strategies to reduce drinking behaviors in students at the highest levels of risk.

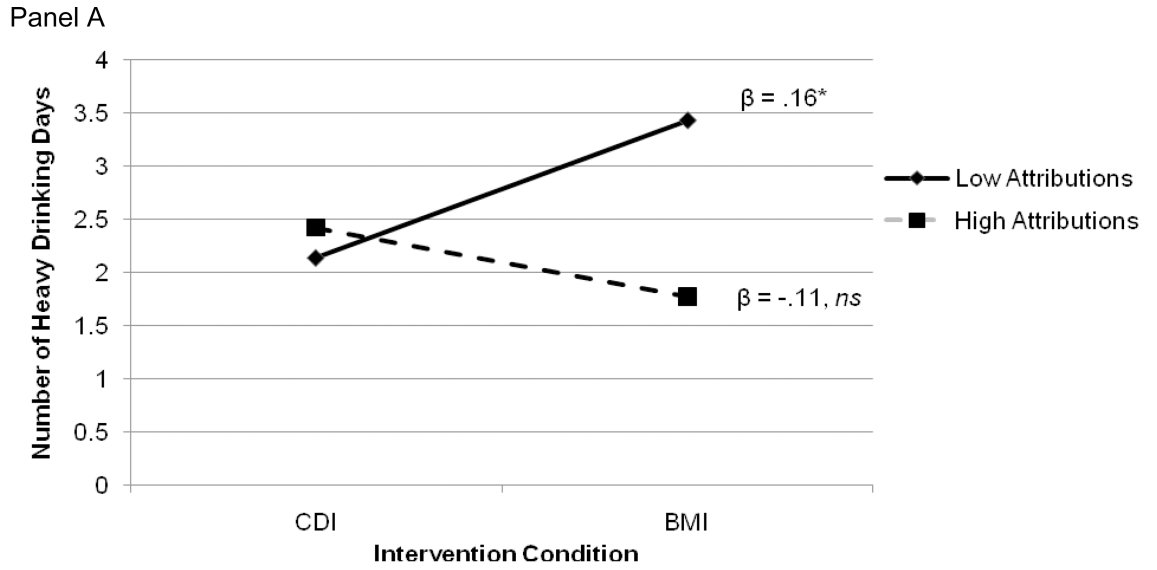
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## References

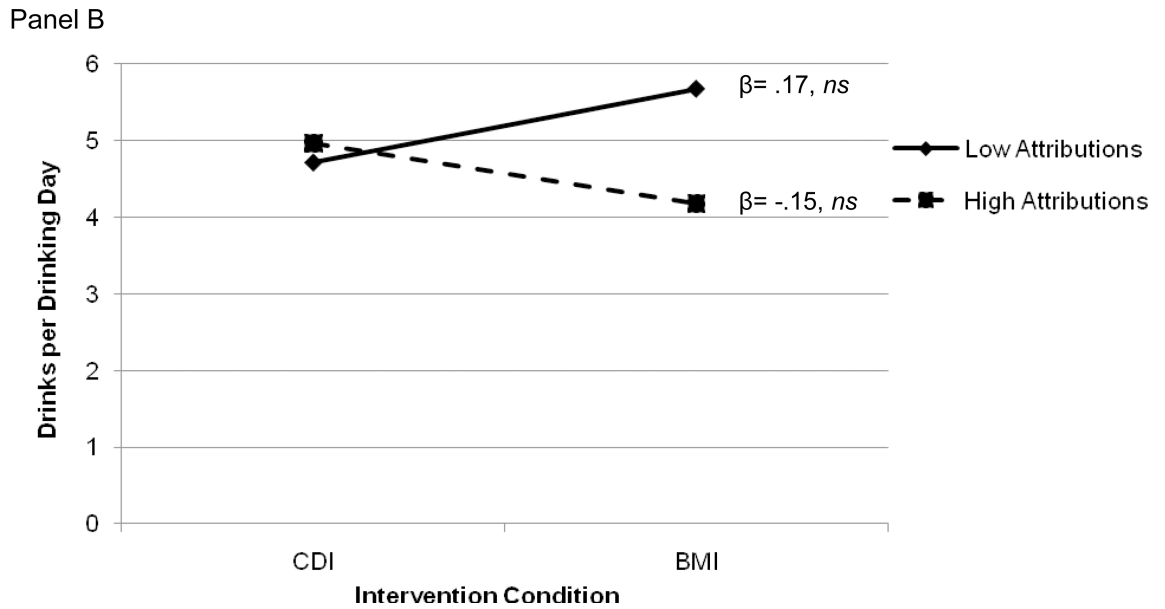
- Aiken, LS.; West, SG. Multiple regression: Testing and interpreting interactions. Thousand Oaks: Sage; 1991.
- Barnett NP, Apodaca TR, Magill M, Colby SM, Gwaltney CJ, Rohsenow DJ, et al. Moderators and mediators of two brief interventions for alcohol in the Emergency Room. *Addiction*. 2010; 105:452–465. [PubMed: 20402989]
- Barnett NP, Goldstein AL, Murphy JG, Colby SM, Monti PM. "I'll never drink like that again": Characteristics of alcohol-related incidents and predictors of motivation to change in college students. *Journal of Studies on Alcohol*. 2006; 67(5):754–763. [PubMed: 16847545]
- Barnett NP, Lebeau-Craven R, O'Leary TA, Colby SM, Rohsenow DJ, Monti PM, et al. Predictors of motivation to change after medical treatment for drinking-related events in adolescents. *Psychol Addict Behav*. 2002; 16(2):106–112. [PubMed: 12079248]
- Barnett NP, Murphy JG, Colby SM, Monti PM. Efficacy of counselor vs. computer-delivered intervention with mandated college students. *Addictive Behaviors*. 2007; 32(11):2529–2548. [PubMed: 17707594]
- Bersamin M, Paschall MJ, Fearnow-Kenney M, Wyrick D. Effectiveness of a Web-based alcohol-misuse and harm-prevention course among high- and low-risk students. *Journal of American College Health*. 2007; 55(4):247–254. [PubMed: 17319331]
- Borsari B, Carey KB. Two brief alcohol interventions for mandated college students. *Psychol Addict Behav*. 2005; 19(3):296–302. [PubMed: 16187809]
- Caldwell PE. Drinking levels, related problems and readiness to change in a college sample. *Alcoholism Quarterly*. 2002; 20(2):1–15.
- Carey KB, Carey MP, Maisto SA, Henson JM. Brief motivational interventions for heavy college drinkers: A randomized controlled trial. *Journal of Consulting and Clinical Psychology*. 2006; 74(5):943–954. [PubMed: 17032098]
- Carey KB, Henson JM, Carey MP, Maisto SA. Which heavy drinking college students benefit from a brief motivational intervention? *Journal of Consulting and Clinical Psychology*. 2007; 75(4):663–669. [PubMed: 17663621]
- Carey KB, Henson JM, Carey MP, Maisto SA. Computer versus in-person intervention for students violating campus alcohol policy. *Journal of Consulting and Clinical Psychology*. 2009; 77(1):74–87. [PubMed: 19170455]
- Carey KB, Hester RK. Rethinking readiness-to-change for at-risk college drinkers. *The Addictions Newsletter Summer*. 2005:6–8.
- Century Council. Alcohol 101 (Interactive CD-ROM Program). 1998. from [www.centurycouncil.org](http://www.centurycouncil.org)
- Donohue B, Allen DN, Maurer A, Ozols J, DeStefano G. A Controlled Evaluation of Two Prevention Programs in Reducing Alcohol Use Among College Students at Low and High Risk for Alcohol Related Problems. *Journal of Alcohol and Drug Education*. 2004; 48(1):13–33.
- Fromme K, Corbin W. Prevention of heavy drinking and associated negative consequences among mandated and voluntary college students. *Journal of Consulting and Clinical Psychology*. 2004; 72(6):1038–1049. [PubMed: 15612850]
- Holmbeck GN. Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. *Journal of Pediatric Psychology*. 2002; 27(1):87–96. [PubMed: 11726683]
- Hurlbut SC, Sher KJ. Assessing alcohol problems in college students. *Journal of American College Health*. 1992; 41(2):49–58. [PubMed: 1460173]
- Longabaugh R, Minugh PA, Nirenberg TD, Clifford PR, Becker B, Woolard R. Injury as a motivator to reduce drinking. *Academic Emergency Medicine*. 1995; 2:817–825. [PubMed: 7584769]
- Maisto SA, Conigliaro J, McNeil M, Kraemer K, Conigliaro RL, Kelley ME. Effects of two types of brief intervention and readiness to change on alcohol use in hazardous drinkers. *Journal of Studies on Alcohol*. 2001; 62(5):605–614. [PubMed: 11702799]
- Miller, WR.; Rollnick, S. Motivational interviewing: Preparing people to change addictive behavior. 2nd ed. New York: Guilford; 2002.

- Monti PM, Colby SM, Barnett NP, Spirito A, Rohsenow DJ, Myers M, et al. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *Journal of Consulting and Clinical Psychology*. 1999; 67(6):989–994. [PubMed: 10596521]
- Morgan TJ, White HR, Mun EY. Changes in drinking before a mandated brief intervention with college students. *Journal of Studies on Alcohol and Drugs*. 2008; 69:286–290.
- Mun EY, White HR, Morgan TJ. Individual and situational factors that influence the efficacy of personalized feedback substance use interventions for mandated college students. *Journal of Clinical and Consulting Psychology*. 2009; 77:88–102.
- Murphy JG, Benson TA, Vuchinich RE, Deskins MM, Eakin D, Flood AM, et al. A comparison of personalized feedback for college student drinkers delivered with and without a motivational interview. *Journal of Studies on Alcohol*. 2004; 65:200–203. [PubMed: 15151350]
- National Institute on Alcohol Abuse and Alcoholism. Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism. A call to action: Changing the culture of drinking at US colleges. NIH Publication No. 02-5010. o. Document Number). 2002.
- O'Hare TM. Measuring problem drinking in first time offenders. *Journal of Substance Abuse Treatment*. 1997; 14(4):383–387. [PubMed: 9368216]
- Palmer, RS. Unpublished dissertation. University of Washington; 2004. Efficacy of the alcohol skills training program in mandated and nonmandated heavy drinking college students.
- Porter, JR. Campus arrests for drinking and other offenses jumped sharply in 2004, data show [Daily news article]. *The Chronicle of Higher Education*. 2006 Oct 18. Available from <http://chronicle.com/>
- Project MATCH Research Group. Matching Alcoholism Treatments to Client Heterogeneity: Project MATCH posttreatment drinking outcomes. *Journal of Studies on Alcohol*. 1997; 58(1):7–29. [PubMed: 8979210]
- Project MATCH Research Group. Matching alcoholism treatments to client heterogeneity: Project MATCH three-year drinking outcomes. *Alcoholism, Clinical and Experimental Research*. 1998; 22:1300–1311.
- Sobell, LC.; Sobell, MB. *Alcohol Timeline Followback users' manual*. Toronto, Canada: Addiction Research Foundation; 1995.
- Turrisi R, Larimer ME, Mallett KA, Kilmer JR, Ray AE, Mastroleo NR, et al. A randomized clinical trial evaluating a combined intervention for high-risk students. *Journal of Studies on Alcohol and Drugs*. 2009; 70:555–567. [PubMed: 19515296]
- Walton MA, Goldstein AL, Chermack ST, McCammon RJ, Cunningham RM, Barry KL, et al. Brief alcohol intervention in the emergency department: moderators of effectiveness. *J Stud Alcohol Drugs*. 2008; 69(4):550–560. [PubMed: 18612571]
- White HR. Reduction of alcohol-related harm on United States college campuses: The use of personal feedback interventions. *International Journal of Drug Policy*. 2006; 17:310–319.
- White HR, Mun EY, Pugh L, Morgan TJ. Long-term effects of brief substance use interventions for mandated college students: Sleeper effects of an in-person personal feedback intervention. *Alcoholism: Clinical and Experimental Research*. 2007; 31(8):1380–1391.



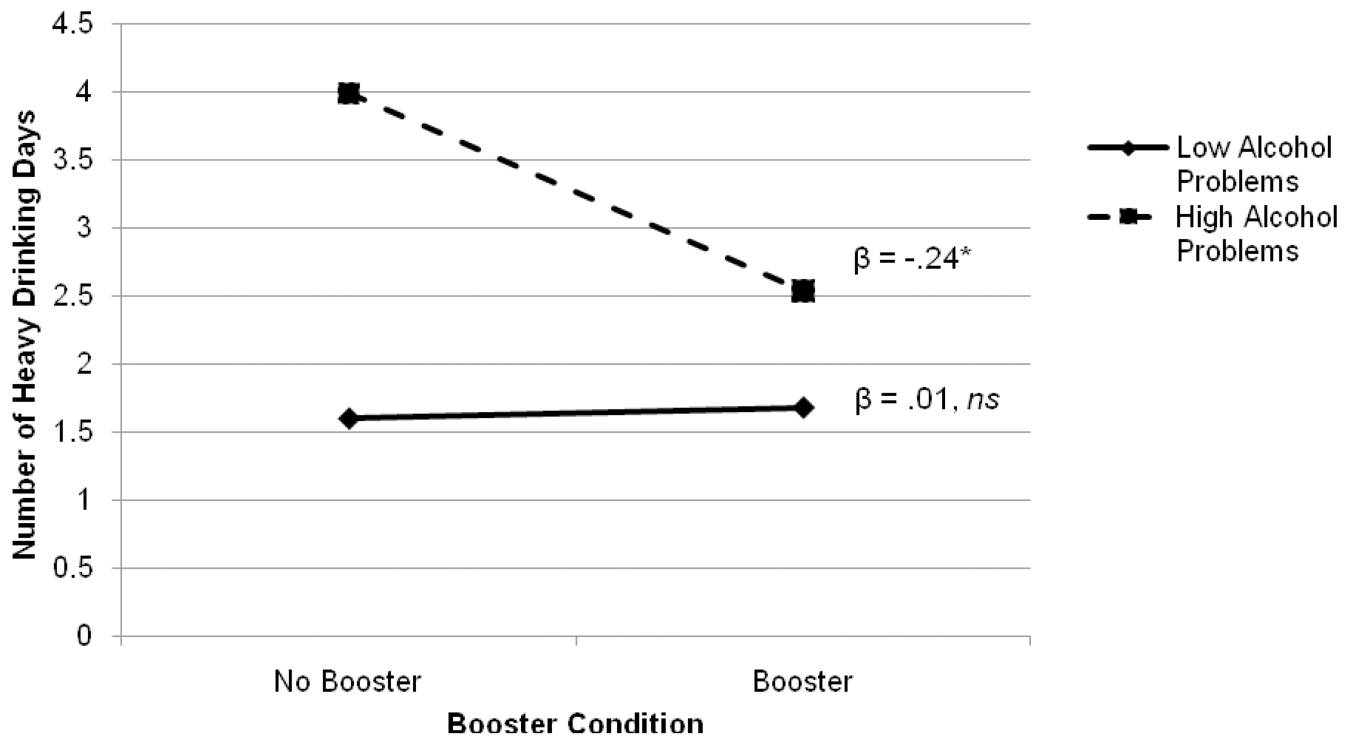
Note. Number of heavy drinking days was transformed for statistical analyses, but original values are presented in the figure for interpretability.

\* $p < .05$ .



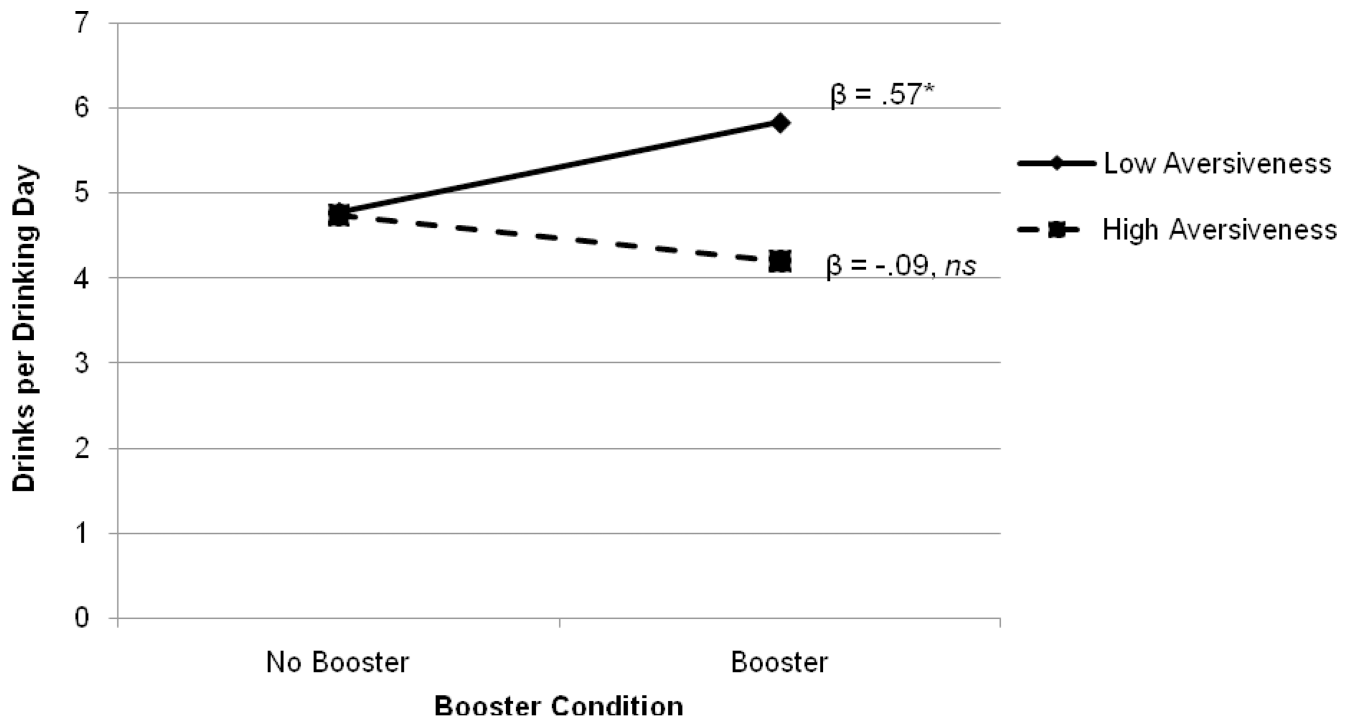
**Figure 1.** Attributions as a moderator of intervention condition on past month number of heavy drinking days (Panel A) and drinks per drinking day (Panel B)





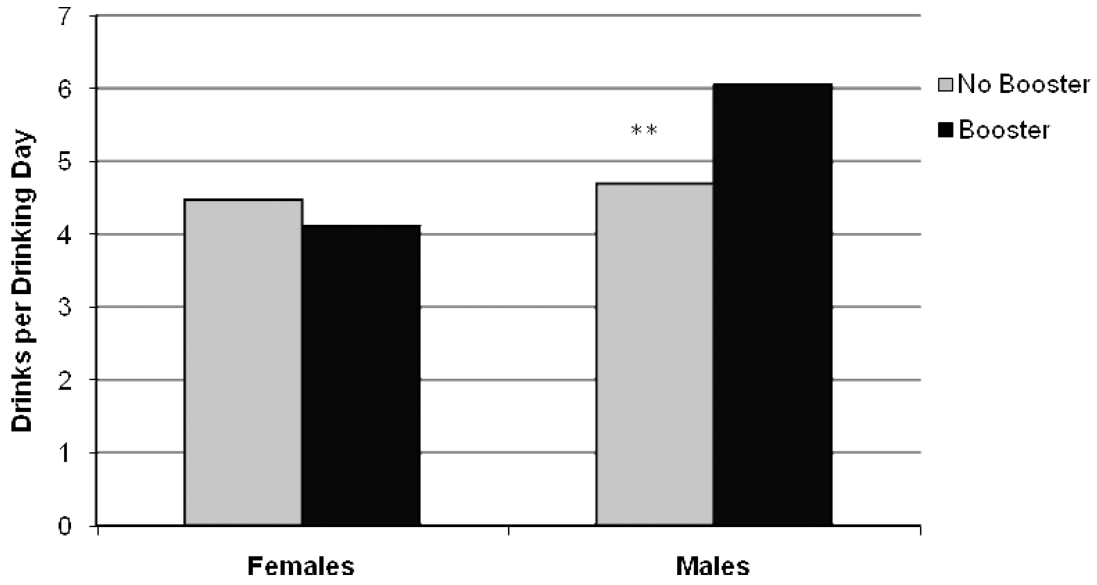
\*  $p < .01$

**Figure 2.** Alcohol-related problems as a moderator of booster condition on past month number of heavy drinking days



\* $p < .05$ .

**Figure 3.**  
Aversiveness as a moderator of booster condition on drinks per drinking day



Note. Means were adjusted for baseline values of the dependent variable. Within the (received) booster condition, there was a statistically significant difference between males and females ( $p < .001$ ). Within the no booster condition the difference between males and females was not significant.

\*\* $p < .01$

**Figure 4.**

Gender as moderator of booster condition on number of drinks per drinking day

**Table 1**  
Means, standard deviations, of intervention and booster group differences at baseline (N = 213)

	<b>BMI</b> <i>M (SD)</i>	<b>CDI</b> <i>M (SD)</i>	<b>Statistic</b>	<b>No Booster</b> <i>M (SD)</i>	<b>Booster</b> <i>M (SD)</i>	<b>Statistic</b>
<u>Moderators</u>						
Gender (% male)	49.5%	48.2%	.04	49.1%	50.9%	.04
Incident Consequences	2.70 (1.95)	2.46 (1.70)	.93	2.61 (2.1)	2.56 (1.55)	.03
Attributions	16.63 (4.25)	17.09 (4.17)	.66	16.78 (4.25)	16.94 (4.18)	.08
Aversiveness	12.63 (4.84)	11.96 (4.38)	1.18	12.51 (4.66)	12.10 (4.59)	.46
<u>Outcomes</u>						
No. of Heavy Drinking Days	3.06 (4.30)	3.57 (4.33)	.76	3.23 (3.64)	3.39 (4.88)	.08
No. of Drinks per Drinking Day	5.11 (2.61)	4.71 (2.50)	1.33	4.71 (1.98)	5.10 (2.99)	1.22
Alcohol Problems	5.94 (2.99)	5.43 (2.91)	1.66	5.66 (2.74)	5.71 (3.16)	.01

Note. Statistics are chi-square for the categorical moderator and ANOVA for continuous moderators and outcomes. All intervention and booster group differences were non-significant.