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Drinking Norms, Readiness to Change, and Gender as Moderators of a Combined Alcohol Intervention for First-Year College Students

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Abstract

Introduction: Alcohol interventions targeting college students and their parents have been shown to be efficacious. Little research has examined moderators of intervention efficacy to help tailor interventions for subgroups of students.

Method: This study is a secondary data analysis of readiness to change, drinking norms, and gender as moderators of an efficacious peer- and parent-based intervention (Turrisi et al., 2009). Students (n=680) were randomized to the combined peer and parent intervention (n=342) or assessment-only control (n=338).

Results: The combined intervention reduced peak blood alcohol content (BAC) compared to control. Gender and norms did not moderate the relationship between the intervention and drinking. Significant interactions were found between gender, precontemplation, and intervention.

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Contributors

Authors Turrisi and Larimer designed the study and wrote the protocol. Authors Grossbard, Mastroleo, Geisner, Ray, & Mallett conducted literature searches and provided summaries of previous research studies. Authors Grossbard, Mastroleo, Atkins, and Turrisi conducted the statistical analysis. All authors wrote sections of the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

Conflict of Interest

All authors declare that they have no conflicts of interest.

Students in the combined condition with higher precontemplation had lower weekly drinking compared to those with lower precontemplation. This pattern was also found among men for peak BAC and alcohol-related consequences but not among women, indicating a three-way interaction.

Conclusion: Interventions may need to consider readiness to change and gender to optimize effectiveness.

Keywords

alcohol intervention; college students; moderators; readiness to change; norms

1. Introduction

Heavy drinking and alcohol-related consequences continue to be significant public health problems for college students across the United States. To combat this problem, nationwide efforts have focused on the development and implementation of evidence-based alcohol interventions (American College Health Association, 2007; Turrisi et al., 2006), which have been tested within a variety of college student populations and settings (for reviews see Larimer & Cronce, 2002; 2007). For example, both the Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff et al., 1999), a brief motivational intervention, and parent-based interventions (PBI; Turrisi et al., 1999; Doumas et al., 2013) in the form of a handbook on communication with incoming college students about alcohol have been evaluated in randomized control trials designed to reduce risky drinking with successful results (Baer et al. 2003; Doumas et al., 2013; Larimer et al., 2001; Marlatt et al., 1998; Turrisi et al., 2001; 2009; Wood et al., 2010; 2007; 2004).

In an attempt to strengthen overall intervention effects, researchers have begun to examine the utility of combining interventions (e.g. Wood et al., 2010). For example, a parent-based intervention (PBI) delivered in conjunction with BASICS may be effective in reducing alcohol-related problems (Turrisi et al., 2009). The variation in student responses to alcohol interventions necessitates evaluation of theoretically- and empirically-driven moderators of intervention efficacy, which has only recently been addressed in the literature (Borsari, Magill, Mastroleo, Hustad, O'Leary Tevyaw, Barnett…. Monti, in press; Carey et al., 2006; Dunn et al., 2001; Geisner et al., 2004; Mallett et al., 2010, 2011). Past research has examined a number of moderators of the effectiveness of alcohol interventions on college student drinking with the majority focused on brief motivational interventions (BMI). Specifically, gender, readiness to change, and peer influences on drinking have been examined (see Borsari & Carey, 2000; Borsari et al., 2007; Fromme & Corbin, 2004; Lee et al., 2007; Mastroleo et al., 2011; Murphy et al., 2004; Neighbors et al., 2004). Generally, results have been inconsistent leaving important unanswered questions about the role of these variables in predicting the impact of brief alcohol interventions on drinking behavior.

1.1 Gender

Past studies have found gender to be both a protective and risk factor as it relates to alcohol use in college students post intervention (e.g., Barnett et al., 2007; Borsari et al., in press; Mastroleo et al., 2011). Although several studies generally indicate women are more

responsive to BMI compared to men (Blow et al., 2006; Carey et al., 2009; Murphy et al., 2004), one study did not find gender moderation in drinking outcomes following BMI (Mun et al., 2008). More recently, Mallett and colleagues (2010) examined moderators of a combined peer and parent intervention and found it worked especially well for early initiators (i.e., drank as early adolescents). Mastroleo and colleagues (2011) found gender significantly moderated the relationship between a booster condition and number of drinks per drinking day in the past month. Men who received a booster session reported significantly higher drinks per drinking day than men who did not receive a booster, while there was no effect for women. Finally, Borsari et al (in press) found no moderating effect of gender when comparing BMI and Assessment-only conditions with mandated college students. These mixed results suggest continued exploration of the role gender may play in brief alcohol interventions with college students is warranted, and the way in which it may interact with additional moderators is an important next step towards identifying tailoring approaches for BMIs.

1.2 Readiness to Change

An important catalyst for health behavior change readiness to change (RTC) behavior. RTC has been conceptualized as a continuous process comprised of different stages of change that reflect one's level of motivation to change behavior (Miller & Rollnick, 2002; Prochaska & DiClemente, 1986, 1992). Brief alcohol interventions often target those who lack motivation to change their drinking (precontemplation), or those reporting ambivalence (contemplation), to support engagement in behaviors (action) consistent with changing their drinking. RTC has been recognized as a vital alcohol intervention target (Miller & Rollnick, 2002), and successful approaches aim to increase motivation to change alcohol use (Larimer, Cronce, Lee, & Kilmer, 2004/2005; Larimer & Cronce, 2007, Carey et al., 2007; Kaysen et al., 2009).

Although pretreatment levels of RTC have commonly been examined as a moderator of alcohol intervention effectiveness, results have been mixed (e.g., Carey et al., 2007; Fromme & Corbin, 2004; Maisto et al., 2001; Monti et al., 1999; Mastroleo et al., 2011). Although most studies examining RTC assess an overall level of RTC, limited research has examined specific subscales-Precontemplation, Contemplation, Action-embedded within the Readiness to Change Questionnaire (RTC subscales as documented in: Heather, Rollnick, & Bell, 1993). In one recent study, individuals completing a BASICS session after referral due to a campus alcohol violation were used to examine the role of specific stage designation in post-intervention drinking outcomes (Shealy et al., 2007). Results indicated participants in precontemplation reported less weekly drinking and fewer heavy drinking episodes and alcohol related consequences than individuals in either the contemplation or action stages. However, little is known about the role different stages of change hold for incoming college students in predicting alcohol use and related harm during their first year. Given the centrality of RTC in BMIs, such as BASICS, evaluating whether individual components of RTC moderate intervention effects on drinking among first-year students informs future intervention development and refinement.

1.3 Normative Perceptions of Alcohol Use

Given the social context of college student drinking, normative perceptions of alcohol use have also been identified as key predictors of drinking behaviors. Normative perceptions of other's drinking are often associated with individuals' personal alcohol use, and specific interventions have targeted these beliefs in an effort to reduce problem drinking among college students (Collins et al, 2002; Larimer et al. 2007; Murphy et al. 2004; Neighbors et al., 2004; 2006; Perkins, 2002; Walters, 2000; Walters et al., 2000; Walters & Neighbors, 2005; White, 2006). Fewer studies have examined pre-college descriptive norms (Read et al., 2005; Sher and Rutledge, 2007; Stapenback, et al., 2010), but results suggest similar links to increased drinking.

As a central element of the BASICS intervention, studies have examined the mediational role of descriptive norms in predicting drinking behaviors (e.g., Borsari et al., 2009; Carey et al., 2007; Turrisi et al., 2009; Wood et al., 2010). Yet, there is a lack of research that investigates whether pretreatment descriptive norms moderate intervention effects on subsequent alcohol use. It is possible that interventions designed to correct misperceptions might be more effective for students who report greater misperceptions of drinking norms prior to receiving a BMI. As perceived descriptive norms are significantly correlated with first-year college student alcohol use, determining whether they also moderate interventions with students as they transition to college is essential in identifying potential intervention targets (e.g., Hartzler & Fromme, 2003; Perkins & Craig, 2006; Read et al., 2002; Werner et al., 1992; Wood et al., 2004).

1.4. Gender, Normative Perceptions, and Alcohol Use

What has yet to be examined is how gender and normative perceptions interact among first year college students and the potential implications post-intervention. As noted, given methodological limitations and inconsistencies of findings from prior studies, further examination of gender, RTC and normative perceptions of drinking among first-year college students is needed. The current study is a planned secondary analysis of moderators on the efficacy of a combined (BASICS + PBI) intervention compared to an assessment-only control condition. Based on previous research and the findings of the main outcomes paper (see Turrisi et al., 2009), we expect that baseline levels of 1) readiness to change-precontemplation, contemplation, action- will moderate intervention effects such that those with lower levels of precontemplation, and higher levels of contemplation and action- will benefit greater from the combined intervention, and 2) descriptive drinking norms will moderate intervention effects such that individuals with higher perceived drinking norms will benefit more than those with lower perceived norms. We also conducted exploratory analyses to evaluate both two- and three-way interactions between gender, the other hypothesized moderators, and the intervention.

2. Methods

2.1 Study Design

The participants, recruitment, follow-up procedures, and intervention conditions are presented in the original efficacy study (Turrisi et al., 2009). As the combined intervention

condition was shown to have advantages to the other conditions, we focus here on the moderators of this condition's efficacy compared to control, specifically the extent to which participants' gender, perceived drinking norms, and readiness to change at baseline moderated intervention efficacy. We provide a summary review of procedures and measures used in present analyses.

2.2 Participants

Incoming first-year students (N = 4,000) were randomly selected at two large public universities (East Coast: rural, West Coast: urban) during summer 2006. Forty-five percent (N = 1,796) consented to participate and completed the web-based screening assessment which is consistent with other web studies (McCabe et al., 2005; 2005b; Thombs et al., 2005). There were no differences in gender, age, or ethnicity between responders and non-responders. Of these, 1,275 (71%) completed the baseline assessment and were randomized to condition. The current study sample included students (N =680) randomly assigned to the combined peer-led BASICS plus parent-handbook intervention (n= 342) or assessment control (n = 338). Participants (M =17.92 years, SD =0.39) were 44.4% male (n =566), 55.6% female (n =709); 4.5% identified as Hispanic or Latino(a); 79.8% identified as Caucasian, 10.1% as Asian, 3.7% as Multiracial, 2.0% as African American, 0.5% as Native Hawaiian or Other Pacific Islander, 0.2% as American Indian/Alaskan Native, and 3.2% as Other. The IRBs at both sites approved all procedures.

2.3 Study Procedures

2.3.1 Screening and Recruitment—

Invitation letters explaining the study were mailed to students. An emailed invitation and 3 post card reminders were also sent. Participants received: $10 for screening, $25 for baseline, and $30 for follow-up surveys. Students were informed about attending a one-hour education program and completing a brief evaluation at its conclusion for which they would receive $10. Students were randomized to condition after completing the baseline survey. Those randomized to the combined condition were scheduled for BASICS, and their parents were sent the parent-based intervention (PBI) handbook.

2.3.2 Follow-up Procedure—

Follow-up assessment was conducted 10 months post baseline (spring semester). Students received mail and email invitations, a survey URL, unique PIN, and email reminders to access the survey. Follow-up rate was 85.5%.

2.3.3 Intervention Procedure

BASICS.: Each BASICS session lasted approximately 45–60 minutes and was led, one-on-one, by a trained student facilitator during the fall semester. Participants received personalized feedback that included information on their drinking patterns, perceived and actual peer drinking norms, alcohol expectancies, consequences, and protective behavioral strategies. Facilitators discussed the feedback with participants in a Motivational Interviewing style (MI; Miller & Rollnick, 2002).

PBI.: Parents of students randomized to the combined condition were mailed a 35-page handbook during the summer. The handbook was divided into four sections, and included an

overview of college student drinking, strategies for effective communication, suggestions for helping their teens to resist peer pressure, and educational information on how alcohol affects the body. A letter accompanied the handbook asking parents to read and discuss it with their teens prior to college. Fidelity to the parent intervention was high as they were asked to fill out a questionnaire regarding the handbook and discussions with their kids. For most (21 of the 26 topics) 85% of the parents said that they discussed the materials with their teens, and across all topics less than 12% of parents indicated that they did not discuss the information with their teens (Turrisi et al., 2009).

2.4 Measures

Weekly Alcohol Use.—Participants indicated alcohol consumption on each day of a typical week using the Daily Drinking Questionnaire (DDQ; Collins et al., 1985) and a total number of drinks per week was calculated (Cronbach's α = .71).

Peak Alcohol Consumption.—Peak blood alcohol content (peak BAC) was calculated using participants' maximum drinks consumed and number of hours spent drinking on this peak occasion (Dimeff et al., 1999; Marlatt et al., 1998) following established guidelines (Matthews & Miller, 1979).

Alcohol-related consequences.—The 23-item Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) was used to assess alcohol-consequences within the past 3 months. Prevalence was coded as the sum of consequences experienced at least once (Martens et al., 2007), ranging from 0–23 (Cronbach's α = .87).

Readiness to change.—The Readiness to Change (RTC, Rollnick et al., 1992) scale is a 12-item questionnaire designed to measure one's stage of change in regard to their alcohol use for non-treatment seeking drinkers. Three stages of change were calculated that assessed students' level of: Precontemplation (α = .47), Contemplation (α = .68), and Action (α = .71), with 4 questions per scale. Sample items included "I am happy with the way I drink now" and "I have no concerns about my drinking at this time". A continuous measure of each subscale was used to capture greater variance in levels of motivation to change.

Descriptive drinking norms.—Drinking Norms Rating Form (DNRF; Baer et al., 1991). The DNRF evaluates individual perceived norms (descriptive norms) of alcohol use, parallel in format to the DDQ. Participants estimate the typical drinking patterns of important reference groups (i.e. their friends). Respondents were asked to fill in the number of drinks for each day of the week and all days of the week were averaged to create a DDQ score (Cronbach's α = .78).

Demographics.—Participants were asked to report their gender, height, and weight in order to calculate their peak BAC.

3. Results

3.1 Data Analysis and Descriptive Statistics

SPSS Version 19.0 was used for all data analyses. Means and standard deviations are presented in Table 1. No significant differences were found between groups for baseline drinking measures including peak BAC, drinks per week and number of consequences (all *p*s > .05). Missing data on drinking measures at baseline and follow-up were low (less than 1%), as were missing data due to attrition (less than 15%).

Drinking outcomes were notably skewed and bounded at zero, which is a common distribution for count variables, thus a negative binomial regression model was employed for testing gender, descriptive norms, and readiness to change as moderators of intervention efficacy (see Atkins & Gallop, 2007; Heilbron, 1994; Hilbe, 2007). Negative binomial regression uses a natural log link function, and raw coefficients are typically raised to the base *e* for interpretation. The resulting coefficients are called rate ratios (RR) and describe the percentage increase/decrease in the outcome, and 95% confidence intervals (CI) that exclude 1 are significant at the $p < .05$ level.

A series of negative binomial regressions were conducted for each drinking outcome while controlling for campus and baseline levels. In all analyses, intervention group and gender were dummy coded, and all other continuous predictors were mean centered to facilitate interpretation of parameter estimates (Jaccard & Turrisi, 2003). Given our focus on moderators (gender, perceived norms, RTC) of intervention effects, we highlight results that include two- and three-way interactions between specified moderators and the intervention. Consistent with prior research (Kaysen, et al., 2009), data analyses involving RTC included only current drinkers at baseline as RTC is assessed in the context of one's current drinking patterns. Thus there were 578 current drinkers included in the analyses (85% of total sample).

3.2 Gender and Perceived Drinking Norms

Negative binomial regressions for gender and drinking norms as moderators of intervention efficacy are presented in Table 2. Controlling for baseline drinking, results indicated that gender and perceived drinking norms did not significantly moderate associations between treatment group and drinking outcomes, including weekly drinking, peak BAC and drinking-related consequences (all *p*'s > .05 in the two and three-way interaction terms).

3.3 Gender and Precontemplation

Table 3 shows negative binomial regression analysis of gender and precontemplation as moderators of the intervention efficacy. There was a significant 2-way interaction between Intervention x Precontemplation ($p < .05$). Students in the combined intervention who were higher in baseline Precontemplation had lower weekly alcohol consumption at follow-up compared to those lower in Precontemplation. There was a significant 3-way interaction between Intervention x Precontemplation x Gender ($RR = .865$, $p < .05$). Closer examination revealed that males in the combined intervention who were higher in baseline Precontemplation had lower follow-up peak BAC levels compared to women, with the

opposite pattern observed in the control group. This pattern of results was replicated when examining the 3-way interaction between Intervention x Precontemplation x Gender in predicting alcohol-related consequences as the outcome (RR = .866, p <.05).

3.4 Gender and Contemplation

Gender and contemplation as moderators of intervention efficacy are presented in Table 4. There were no significant effects in the full model for gender, intervention group, or contemplation, although results indicated a significant two-way interaction between gender and contemplation in predicting weekly drinking (RR = .905, p = .01), such that greater levels of contemplation served as a protective factor for weekly drinking among males, but not females. No other significant interactions were found between the intervention, gender, and contemplation in predicting weekly drinking (ps > .05).

We also found a significant 2-way interaction between gender and contemplation in the model predicting peak BAC levels at post-intervention (RR = .920, p < .01). Specifically, greater levels of contemplation were associated with lower peak BAC levels at follow up among males, with the reverse relationship found for females such that higher levels of contemplation were related to higher peak BAC levels. There were no significant two-or three-way interactions between gender, contemplation, and treatment group in predicting peak BAC or consequences at follow-up.

3.5 Gender and Action

Regression results (Table 5) testing gender and action as moderators revealed significant effects for baseline drinking and campus in predicting weekly drinking, although gender, treatment, and action were not uniquely associated with follow-up weekly drinking. There were no significant two-or three-way interactions between gender, action, and treatment group in predicting weekly drinking, peak BAC, or alcohol-related consequences at follow-up (ps > .05).

4. Discussion

The complexity of influences on college student drinking necessitates systematic examination of combined effects of peer- and parent-based intervention approaches since past research has found no one intervention effective for all (Turrisi et al., 2009). This study evaluated gender, readiness to change and perceived drinking norms as moderators of a combined peer and parent-based alcohol intervention targeting first-year college students. Contrary to expectations, findings provide limited support for baseline levels of perceived drinking norms and RTC subscales as moderators of efficacy of a combined peer BASICS and PBI on drinking at the 10-month follow up. Although baseline levels of perceived drinking norms were positively associated with weekly drinking at 10-month follow up, none of the RTC subscales had unique effects on drinking at follow-up. However, the significant 3-way interaction between gender, precontemplation, and intervention suggests the combined parent and peer intervention was most impactful for males higher in precontemplation.

With regard to perceived drinking norms, the intervention was not moderated by perceived descriptive norms at baseline, suggesting this combined intervention may be efficacious across the spectrum of normative perceptions. To our knowledge, the current study is the first to test the moderating effect of perceived drinking norms on drinking outcomes among first-year college students. It is possible that students' perceptions of their friends drinking, as they transition to college, may not be associated with intervention effects on their subsequent alcohol use during their first-year because estimates were taken at baseline (i.e., before students lived on a college campus). Thus, looking at changes in descriptive norms from prematriculation to enrolled student and whether these may moderate intervention efficacy is a next step.

Our results suggesting a moderating effect of gender and RTC warrant further discussion in the context of evidence that suggests female college students tend to respond more favorably to interventions targeting alcohol use (Blow et al., 2006; Carey et al., 2009; Murphy et al., 2004). Our findings suggest that the combined parent and peer intervention may be more suitable for males reporting lower motivation to change their drinking. In contrast, women who are more motivated to change their drinking may respond more favorably to an intervention that matches their stage of change. Similar results were also found in previous studies. In addition, Mastroleo et al. (2011) showed specific effects for gender when completing a booster.

4.1 Limitations

Study limitations include the use of self-report for assessment. While it is possible that social desirability or demand characteristics influenced participants' responses, the confidentiality of participant information was emphasized and students generally provide relatively accurate self-reports of their alcohol and substance use (LaForge, 2005). With regard to the efficacy of BASICS, the quality of the peer-delivered intervention may have limited the moderating effect of baseline levels of readiness to change and perceived norms though the peer providers met criteria on motivational interviewing ratings. Caution should be taken in interpreting our results in light of small effect sizes and response rates, though in line with studies using similar recruiting procedures and no differences in responders and non-responders in known demographic factors, findings may not generalize to others. It is possible that a selection occurred when only 45% of invited participants agreed to take part in the study such that only individuals high in conscientiousness and agreeableness were included in the sample and, therefore, the treatment effect is somewhat confounded by personality features of the sample. As these and other traits were not measured, it is difficult to make causal inferences and caution should be used when interpreting the findings (Antonakis, Bendahan, Jacquart, & Lalive, 2010). We also acknowledge the low Cronbach's alpha score on the precontemplation subscale. One theory is we had a sample of voluntary students that were all not high-risk drinkers, so the participant's precontemplative scales may have had more variability in the responses, which would have resulted in low Cronbach's Alpha scores. More research with a heterogeneous group of college student drinkers may elucidate findings. Future research is needed to further evaluate the predictive validity of continuous RTC subscale scores in association with drinking outcomes among college students.

4.2 Clinical Implications

Our results are noteworthy for prevention and intervention efforts targeting college student drinking. Lewis (2005) noted interventionists can use the level of RTC as a first step in changing alcohol involvement by focusing on helping individuals move through their ambivalence to change. Further, correcting misperceptions of alcohol use may aide in reducing current drinking and related consequences (Lewis, 2005). While the current study tested *a priori* theoretically and empirically supported moderators of intervention efficacy, further research is needed to evaluate other potential moderators (e.g., drinking motives, alcohol expectancies) in order to most effectively target intervention efforts. Further, Mallett et al. (2011) found that parenting style moderated the effects of the combined peer and parent intervention among athletes. Although evaluation of parenting styles was beyond the scope of this study, more in-depth investigations of parent- and college student-specific characteristics is needed.

Study findings indicate a number of future directions to enhance the effectiveness of innovative prevention and intervention programs targeting college student drinking. Individual differences contribute to first-year college students' high-risk drinking behaviors. The current evaluation of readiness to change, drinking norms, and gender is among the initial research initiatives examining how these factors impact the efficacy of peer- and parent-based interventions for first-year students. Results provide preliminary evidence suggesting that future alcohol intervention programs for college students may need to address the dimensions of readiness to change and gender to optimize intervention outcomes. In addition, given differences in both drinking behaviors and intervention responsiveness among college student men and women, gender-specific approaches should be considered in the development of alcohol intervention programs.

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Highlights

- Combining parent and peer interventions shows promise in reducing student drinking
- We examine readiness to change, norms, gender as moderators of intervention efficacy
- Significant two-way and three-way interactions were found

Table 1

Means and standard deviations of weekly drinking, peak BAC, alcohol-related consequences, perceived norms, and readiness to change subscales at baseline by treatment condition

	Combined Intervention	**Control**
	***n* = 342**	***n* = 338**
Drinks per week	3.8 (6.0)	4.1 (6.7)
Peak BAC[a]	.07 (.08)	.08 (.09)
Alcohol-related consequences	2.3 (3.2)	2.5 (3.2)
Perceived drinking norms[b]	8.1 (8.9)	8.5 (10.5)
Precontemplation	13.6 (2.7)	13.4 (2.8)
Contemplation	8.2 (2.9)	8.7 (3.1)
Action	9.6 (3.1)	10.1 (3.5)

Note.

[a]BAC = Blood Alcohol Content;

[b]Perceived drinking norms for closest friends.

Scores for Precontemplation, Contemplation, and Action range from 1 to 20.

No significant differences found for baseline characteristics ($p > .05$).

Table 2.

Negative binomial regression for gender and drinking norms as moderators of intervention efficacy in predicting drinking outcomes.

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Gender[a]	.967	[.753 – 1.243]
Campus[b]	.530***	[.424 – .662]
Baseline Weekly Drinking	1.077***	[1.060 – 1.094]
Perceived Drinking Norms (Friends)	1.055*	[1.009 – 1.103]
Combined Intervention[c]	.807	[.630 – 1.033]
Intervention x Gender	1.046	[.701 – 1.559]
Intervention x Norms	1.020	[.933 – 1.115]
Norms x Gender	1.004	[.929 – 1.086]
Intervention x Norms x Gender	.995	[.879 – 1.127]
Outcome: Peak BAC		
Gender	.847	[.632 – 1.135]
Campus	.617***	[.454 – .762]
Baseline Peak BAC	63.301***	[21.246 – 188.597]
Perceived Drinking Norms (Friends)	1.068**	[1.025 – 1.113]
Combined Intervention	.720**	[.564 – 0.918]
Intervention x Gender	1.052	[.699 – 1.583]
Intervention x Norms	1.011	[.927 – 1.102]
Norms x Gender	1.000	[.931 – 1.073]
Intervention x Norms x Gender	.990	[.885 – 1.108]
Outcome: Alcohol-related Consequences		
Gender	.966	[.748 – 1.249]
Campus	.718**	[.574 – .897]
Baseline Alcohol-related Consequences	1.177***	[1.146 – 1.208]
Perceived Drinking Norms (Friends)	1.059*	[1.011 – 1.107]
Combined Intervention	.782	[.607 – 1.008]
Intervention x Gender	1.047	[.681 – 1.471]

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Intervention x Norms	1.014	[.947 – 1.112]
Norms x Gender	1.010	[.954 – 1.158]
Intervention x Norms x Gender	.996	[.884 – 1.125]

[a] Gender was coded Female=0, Mal =1;

[b] Campus was coded Rural =0, Urban =1;

[c] Intervention was coded 0=Control, 1 =Combined Intervention.

*** $p < .001$.

** $p < .01$.

* $p < .05$.

Table 3.

Negative binomial regression for gender and precontemplation as moderators of intervention efficacy in predicting drinking outcomes.

Outcome: Weekly Drinking	**Rate Ratio**	**95% Confidence Interval**
Gender[a]	1.015	[.809 – 1.273]
Campus[b]	.580***	[.470 – .716]
Baseline Weekly Drinking	1.070***	[1.056 – 1.084]
Precontemplation	.942	[.879 – 1.010]
Combined Intervention[c]	.850	[.677 – 1.067]
Intervention x Gender	1.074	[.756 – 1.526]
Intervention x Precontemplation	1.097*	[1.001 – 1.203]
Precontemplation x Gender	1.044	[.949 – 1.149]
Intervention x Precontemplation x Gender	.891	[.771 – 1.029]
Outcome: Peak BAC		
Gender	.932	[.743 – 1.168]
Campus	.717***	[.590 – .872]
Baseline Peak BAC	32.327***	[12.341 – 84.681]
Precontemplation	.932	[.868 – 1.000]
Combined Intervention	.754**	[.604 – .941]
Intervention x Gender	1.012	[.729 – 1.405]
Intervention x Precontemplation	1.079	[.984 – 1.185]
Precontemplation x Gender	1.092	[.992 – 1.201]
Intervention x Precontemplation x Gender	.865*	[.754 – .993]
Outcome: Alcohol-related Consequences		
Gender	.966	[.748 – 1.249]
Campus	.718**	[.574 – .897]
Baseline Alcohol-related Consequences	1.177***	[1.146 – 1.208]
Precontemplation	.956	[.898 – 1.018]
Combined Intervention	.784	[.609 – 1.009]
Intervention x Gender	1.001	[.681 – 1.471]

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Intervention x Precontemplation	1.045	[.957 – 1.142]
Precontemplation x Gender	1.051	[.954 – 1.158]
Intervention x Precontemplation x Gender	.866*	[.754 – .995]

[a] Gender was coded Female=0, Mal =1;

[b] Campus was coded Rural =0, Urban =1;

[c] Intervention was coded 0=Control, 1 =Combined Intervention.

*** $p < .001$.

** $p < .01$.

* $p < .05$.

Table 4.

Negative binomial regression for gender and contemplation as moderators of intervention efficacy in predicting drinking outcomes.

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Gender[a]	1.046	[.833 – 1.313]
Campus[b]	.581***	[.471 – .717]
Baseline Weekly Drinking	1.070***	[1.056 – 1.084]
Contemplation	1.051	[.988 – 1.119]
Combined Intervention[c]	.835	[.664 – 1.050]
Intervention x Gender	1.017	[.712 – 1.452]
Intervention x Contemplation	.955	[.874 – 1.044]
Contemplation x Gender	.905*	[.836 – .979]
Intervention x Contemplation x Gender	1.118	[.971 – 1.287]
Outcome: Peak BAC		
Gender	.955	[.760 – 1.200]
Campus	729***	[.603 – .881]
Baseline Peak BAC	29.516***	[10.956 – 79.515]
Contemplation	1.032	[.978 – 1.089]
Combined Intervention	.741**	[.589 – .932]
Intervention x Gender	.958	[.683 – 1.345]
Intervention x Contemplation	.982	[.895 – 1.077]
Contemplation x Gender	.920	[.854 – .991]
Intervention x Contemplation x Gender	1.091	[.955 – 1.246]
Outcome: Alcohol-related Consequences		
Gender	.952	[.739 – 1.225]
Campus	.714**	[.569 – .896]
Baseline Alcohol-related Consequences	1.165***	[1.133 – 1.199]
Contemplation	1.037	[.979 – 1.099]
Combined Intervention	.787	[.612 – 1.011]
Intervention x Gender	.972	[.662 – 1.426]

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Intervention x Contemplation	1.009	[.926 – 1.099]
Contemplation x Gender	.959	[.888 – 1.036]
Intervention x Contemplation x Gender	1.034	[.909 – 1.176]

[a]Gender was coded Female=0, Mal =1;

[b]Campus was coded Rural =0, Urban =1;

[c]Intervention was coded 0=Control, 1 =Combined Intervention.

***$p < .001$.

**$p < .01$.

*$p < .05$.

Table 5.

Negative binomial regression for gender and action as moderators of intervention efficacy in predicting drinking outcomes.

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Gender[a]	.989	[.791 – 1.236]
Campus[b]	.570***	[.462 – .702]
Baseline Weekly Drinking	1.071***	[1.057 – 1.084]
Action	.992	[.947 – 1.040]
Combined Intervention[c]	.818	[.646 – 1.035]
Intervention x Gender	1.053	[.742 – 1.496]
Intervention x Action	.972	[.895 – 1.056]
Action x Gender	1.016	[.946 – 1.091]
Intervention x Action x Gender	1.056	[.930 – 1.199]
Outcome: Peak BAC		
Gender	.921	[.737 – 1.152]
Campus		[.595 – .878]
Baseline Peak BAC	31.706***	[12.452 – 80.733]
Action	1.021	[.976 – 1.068]
Combined Intervention	.740**	[.588 – .932]
Intervention x Gender	.991	[.709 – 1.385]
Intervention x Action	.964	[.879 – 1.057]
Action x Gender	.951	[.887 – 1.020]
Intervention x Action x Gender	1.067	[.943 – 1.207]
Outcome: Alcohol-related Consequences		
Gender	.965	[.752 – 1.240]
Campus	.705**	[.561 – .885]
Baseline Alcohol-related Consequences	1.177***	[1.147 – 1.208]
Action	1.037	[.988 – 1.089]
Combined Intervention	.785	[.609 – 1.012]
Intervention x Gender	.962	[.655 – 1.412]
Intervention x Action	.953	[.881 – 1.030]

Outcome: Weekly Drinking	Rate Ratio	95% Confidence Interval
Action x Gender	.956	[.895 – 1.022]
Intervention x Action x Gender	1.083	[.959 – 1.222]

[a] Gender was coded Female=0, Mal =1;

[b] Campus was coded Rural =0, Urban =1;

[c] Intervention was coded 0=Control, 1 =Combined Intervention.

*** $p < .001$.

** $p < .01$.

* $p < .05$.