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Randomized Controlled Trial of a Spring Break Intervention to Reduce High-Risk Drinking

Christine M. Lee[1], **Clayton Neighbors**[2], **Melissa A. Lewis**[1], **Debra Kaysen**[1], **Angela Mittmann**[1], **Irene M. Geisner**[1], **David C. Atkins**[1], **Cheng Zheng**[3], **Lisa A. Garberson**[1], **Jason R. Kilmer**[1,4], and **Mary E. Larimer**[1]

[1]Department of Psychiatry and Behavioral Sciences, University of Washington

[2]Department of Psychology, University of Houston

[3]Department of Biostatistics, University of Washington

[4]Health and Wellness, Division of Student Life, University of Washington

Abstract

Objective—While recent studies have documented high-risk drinking occurring during Spring Break (SB), particularly on SB trips with friends, published intervention studies are few. The present study evaluated the efficacy of Event Specific Prevention (ESP) strategies for reducing SB drinking among college students, compared to general prevention strategies and an assessment-only control group, as well as evaluated inclusion of peers in interventions and mode of intervention delivery (in-person vs. web).

Method—Participants included 783 undergraduates (56.1% women, average age 20.5) intending to go on a SB trip with friends as well as to drink heavily on at least one day of SB. Participants completed assessments prior to SB and were randomized to one of five intervention conditions: SB in-person BASICS, SB web BASICS, SB in-person BASICS with friend, SB web BASICS with friend, general BASICS, or an attention control condition. Follow-up assessment was completed one week after SB.

Results—While the SB web BASICS (with and without friends) and general BASICS interventions were not effective at reducing SB drinking, results indicated significant intervention effects for SB in-person BASICS in reducing SB drinking, particularly on trip days. Follow-up analyses indicated change in descriptive norms mediated treatment effect and reductions in drinking, while SB drinking intentions and positive expectancies did not.

Conclusions—Overall, results suggest an in-person SB-specific intervention is effective at reducing SB drinking, especially during trips. In contrast, interventions that contain non-SB related content, are web-based, or seek to involve friends may be less effective at reducing SB drinking.

Please send correspondence concerning this article to Christine M. Lee, Department of Psychiatry and Behavioral Sciences, University of Washington, Box 354944, Seattle, WA 98195. leecm@uw.edu.

Keywords

Alcohol; alcohol-related problems; college students; event-specific drinking; event-specific prevention; Spring Break

While many efficacious alcohol prevention strategies for college students exist (for reviews see Carey, Scott-Sheldon, Carey, & DeMartini, 2007; Larimer & Cronce, 2002, 2007), there is still a need to examine ways to further advance preventative interventions especially in high-risk contexts. Recently researchers have started to evaluate Event Specific Prevention strategies (ESP; Neighbors, Lee, Lewis, Fossos, & Walter, 2009; Neighbors et al., 2007), a novel approach to prevention that applies and adapts what has been learned from general prevention efforts to known high-risk drinking periods (e.g., 21st birthday celebrations, specific sporting events; Neighbors et al., 2007). The present study is among the first to conduct an empirical evaluation of an ESP intervention in comparison to general prevention efforts or assessment-only control for high-risk Spring Break (SB) drinking.

Spring Break has been identified as one of the peak drinking occasions for college students (Del Boca, Darkes, Greenbaum, & Goldman, 2004; Greenbaum, Del Boca, Darkes, Wang, & Goldman, 2005; Neighbors et al., 2011). Several studies with college samples have found high rates of drinking during this week (e.g., Goldman, Greenbaum, Darkes, Brandon, & Del Boca, 2011; Sönmez et al., 2006), and these rates (along with related increased risk of negative consequences) are true of students who are typically light drinkers (Greenbaum et al., 2005; Lee, Lewis, & Neighbors, 2009). Furthermore, students report experiencing several alcohol-related consequences associated with their SB drinking (Patrick, Morgan, Maggs, & Lefkowitz, 2010), even after controlling for typical and SB drinking (Lee et al., 2009). Recent studies have found that going on a SB trip, especially with friends, may put students at greater risk for drinking and related problems (Grekin, Sher, & Krull; 2007; Lee, Maggs, & Rankin, 2006).

While SB is clearly a known high-risk time for problematic drinking, little research has examined preventative interventions focused specifically on SB. Colleges often have SB alcohol education programming, however formal interventions in the published research regarding reducing risk during SB are rare (Neighbors et al., 2007). Studies that focused on SB drinking prevention have not formally evaluated an intervention and its impact on SB drinking, rather these studies evaluated the completion of daily diaries for drinking or student educational booths (Cronin, 1990; Snyder & Misera, 2008).

Evolution of Event Specific Prevention

The Brief Alcohol Screening and Intervention for College Students (BASICS) program has been found to be an efficacious intervention for reducing college student drinking (e.g., Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Marlatt et al., 1998), and it has been identified as a tier-one intervention (i.e., an intervention with strong research supporting efficacy with college students) by the National Institute onAlcohol Abuse and Alcoholism (2002). More recently, findings have documented the efficacy of BASICS feedback, as well as other personalized feedback interventions, when delivered via the web on reducing

college student drinking (e.g., Doumas, McKinley, & Book, 2009; Neighbors et al., 2009, 2010, 2011; Riper et al., 2008). While both in-person and web-based modes of delivery have been shown to be efficacious (for reviews see Carey et al., 2007; Larimer & Cronce, 2007; Walters & Neighbors, 2005), research has yet to determine if one mode of delivery is more efficacious than the other at reducing general college student drinking or whether these types of interventions may reduce drinking among college students during high-risk events. A recent study conducted by Neighbors et al. (2012) evaluated mode of intervention delivery of personalized feedback based on BASICS for 21st birthday drinking (including in-person, web, and assessment only control groups); however, findings were inconclusive in showing a clear benefit of a particular mode, as each mode of intervention was efficacious in reducing some drinking outcome. Importantly, this study found that BASICS-based feedback interventions are efficacious in reducing drinking and consequences among students celebrating turning 21. Although this finding shows promise for BASICS to be utilized for event specific intervention, further research is needed to examine findings across other known windows of risk, as not all drinking holidays and events are alike.

Mediators of Intervention Efficacy

Intentions

The ESP approach to prevention is theoretically grounded in part in the Theory of Reasoned Action (Ajzen & Fishbein, 1980) and the Theory of Planned Behavior (Ajzen, 1991) which suggest that behavioral intentions are among the strongest predictors of planned behavior, and changing intentions is associated with changing behaviors. Several meta-analyses have supported this link (e.g., Albarracin, Johnson, Fishbein, & Muellerleile, 2001; Armitage & Conner, 2001). Focusing on specific events, Brister, Wetherill, and Fromme (2010) found that a majority of students consumed more than they intended to during their 21st birthday celebration, and that having more peers at the celebration contributed to drinking more than planned. The present SB intervention was designed to reduce overall SB drinking intentions. Each component of the personalized feedback was framed to highlight each student's intended SB drinking and associated behaviors with the goal of allowing the student to reflect how his or her intentions may be consistent or inconsistent with their desired experiences. We hypothesized that drinking intentions would be a mediator of intervention efficacy, that is by reducing SB drinking intentions, actual SB drinking would be lower.

Social Norms

Social learning theory (Bandura, 1977), and its later extension social cognitive theory (Bandura, 1986), is a commonly cited theoretical explanation as to why normative perceptions influence drinking behavior (Lewis, Neighbors, Lindgren, Buckingham, & Hoang (2010). Social learning theory suggests that the decision to drink is often made within the context of perceived peer drinking behavior such that the acquisition or maintenance of drinking behavior occurs through observing drinking or communication about drinking with others (Bandura, 1986). College students have consistently been found to overestimate the extent to which their peers drink alcohol both in general and on specific events (e.g., Borsari & Carey, 2003; Neighbors, Oster-Aaland, Bergstrom, & Lewis, 2006). Brief interventions with students often consist of components aimed at reducing these misperceptions, by

providing normative information as to the actual prevalence of alcohol use among college students and contrasting this with their perceptions of students' use. Reductions in normative misperceptions have been associated with reduced drinking (e.g., Borsari & Carey, 2000; Lewis & Neighbors, 2007; Neighbors, Larimer, & Lewis, 2004). Neighbors et al. (2009) found that reductions in perceived drinking norms associated with 21st birthdays mediated the efficacy of a web-based personalized feedback intervention for reducing 21st birthday drinking. In the present investigation, we include a component contrasting student's intended SB drinking with his or her perceived norms and actual campus rates of SB drinking. We hypothesized that changes in perceived SB drinking norms would therefore mediate intervention efficacy.

Alcohol Expectancies

In addition to addressing social influences, interventions for college student drinking often include components related to alcohol expectancies (e.g., Baer, 2002; Darkes, Greenbaum, & Goldman, 2004; Jones, Oeltmann, Wilson, Brener, & Hill, 2001). Alcohol expectancy outcome theory (e.g., Jones, Corbin, & Fromme, 2001) proposes that drinking behavior is explained by the expectation of reinforcing and/or punishing effects from alcohol. These expected or anticipated outcomes of alcohol can be learned from direct and indirect experience (Bandura, 1977, 1986). Specifically, alcohol expectancies are the specific positive or negative beliefs an individual has about the cognitive, behavioral, and affective effects alcohol will have on him or her (Leigh, 1989). For example, the decision to drink may partly be driven by the belief that alcohol will result in certain desirable consequences, such as relief from tension or enhancement of mood. Thus, if an individual's expectations regarding alcohol's positive effects could be reduced via intervention, it is hypothesized that subsequent alcohol use would also be lowered. Successful modification of positive alcohol expectancies, whether through experimental procedures or discussion, has been found to reduce risks of subsequent heavy drinking (e.g., Cruz & Dunn, 2003; Darkes & Goldman, 1993). Some research has shown that college students' positive expectancies are strongly related to alcohol use, while negative expectancies do not uniquely predict use (e.g., Jones, Corbin, & Fromme, 2001). The present SB intervention had a component focused on challenging positive alcohol expectancies by contrasting one's own expectancies with findings from balanced alcohol/placebo designs and therefore we hypothesized changes in positive expectancies would mediate intervention efficacy.

Use of Friends in Brief Interventions

Because high-risk drinking is particularly problematic for students who go on a SB trip with friends (Grekin et al., 2007), it seems fruitful to examine ways in which friends could be included in ESP efforts. A long tradition of research has found that friends have both direct (e.g., offers to drink; Wood, Read, Palfai, & Stevenson 2001) and indirect (e.g., modeling, and normative perceptions) influences on peer drinking (e.g., Baer, Stacy, & Larimer, 1991; Collins, Parks, & Marlatt, 1985; Wood et al., 2001). Yet most college alcohol prevention efforts do not actively include friends (Carey et al., 2007; Larimer & Cronce, 2007). Research with adults has shown the utility of incorporating friends and significant others into alcohol interventions (e.g., Copello, Templeton, & Velleman, 2006; Longabaugh,

Wirtz, Zweben, & Stout, 1998; McCrady, Epstein, Cook, Jensen, & Hildebrandt, 2009), and some research has examined the inclusion of friends in interventions (i.e., recruiting the friends to administer/support each other) with college students (O'Leary et al., 2002; O'Leary Tevyaw, Borsari, Colby, & Monti, 2007). Recent research evaluating ESP for 21st birthday drinking suggests that asking friends nominated by participants turning 21 to participate in a study that provides online information about how to help the celebrant stay safe while celebrating his or her birthday may help to reduce alcohol use and consequences relative to assessment-only control (Neighbors et al., 2012); however, the results are not entirely conclusive and more research is needed in this area. It should also be noted that the social climate of SB is different from 21st birthdays, as on birthdays the target is one person, whereas friends who go on a trip together are all at high risk. Thus, there is a need for evaluating the efficacy of including friends in an intervention focusing on SB. In the present research, friends were provided with the same web-based personalized feedback about their own drinking prior to SB that participants received, however the purpose of the present study was not to examine the impact of the intervention on friend's individual drinking, but rather the impact of the intervention on the participant's own drinking.

The Present Study

The present study was designed to test a SB-specific intervention compared to general preventative efforts (i.e., those not focused on a specific event, e.g., BASICS) and to an assessment-only control group in reducing SB drinking and negative consequences. Furthermore, this study examines the impact of incorporating friends in ESP for reducing SB drinking behavior. We aimed to determine if intervening with friends would impact participant's behavior over and above providing personalized feedback to the participant. First, we expected that all interventions would result in less drinking behavior compared with control. Second, we had expectations regarding three specific contrasts: 1) We expected that SB BASICS delivered via the web and in-person would be more efficacious in reducing SB drinking behavior relative to general BASICS. 2) We expected the in-person intervention to be more efficacious at reducing SB drinking behavior compared to the web-based intervention. 3) We further expected that SB BASICS (both in-person and web) would be more efficacious with the addition of a friend who received web-based personalized feedback relative to those without the friend addition. Finally, we expected that changes in intentions, norms, and positive expectancies would mediate intervention effects.

Method

Participants

Participant flow through the study is presented in Figure 1. Participants for the present trial included 783 undergraduate college students going on a SB trip with plans to engage in heavy drinking during Spring Break 2010 and 2011. Demographic characteristics included 56.1% women, average age was 20.5 (*SD* = 1.33). The sample was composed of 67.6% Caucasian, 19.9% Asian or Pacific Islander, and 12.5% other. Class standings were 7.1% freshmen, 20.4% sophomores, 29.3% juniors, and 43% seniors. Participants identified Friends who were intending to go on the SB trip or who were to be visited by the Participant and were asked to provide contact information. Outcome analyses focused on alcohol use of

the participants during SB. All study procedures were approved by the university IRB and a federal Certificate of Confidentiality was obtained from the National Institutes of Health. There were no adverse events reported.

Procedure

Recruitment—Approximately eight weeks prior to SB, 11,462 randomly selected undergraduate students at a large public university in the northwest United States between the ages of 18 and 25 were invited through U.S. mail and email to participate in an online screening survey about SB intentions. SB occurred between winter and spring academic quarters. Students were recruited in two cohorts spanning Spring Break 2010 and 2011. Interested students logged on to the study website, viewed an online consent form and were asked to complete a brief 15 minute screening survey about upcoming SB activities. Those who consented and met screening criteria for the longitudinal trial were invited for further participation. Eligibility criteria for the trial included: 1) intentions to go on a vacation or leisure trip with one or more friends on at least one day during SB, 2) intentions to consume 4 (for women) or 5 (for men) or more drinks on at least one day of SB, and 3) listing and providing contact information for at least one friend who would be going on a SB trip with them or with whom they would be visiting. Participants had two weeks to complete the screening survey. Of the 11,462 total students invited, 4,164 (36.3%) completed the screening survey and 824 (19.8%) met eligibility criteria. Overall response rates may appear low because a greater than expected percentage of participants met eligibility criteria and recruitment closed when 411 (Cohort A) and 413 (Cohort B) participants were recruited during each of the two cohorts.

Approximately five weeks prior to SB, 783 participants (95% of those invited) completed a 40-45 minute baseline survey about their alcohol use and other intended behaviors during SB. In-person and web-based interventions were conducted after completion of the baseline survey and individual procedures are described below. Participants randomized to intervention conditions completed a post-intervention assessment after receiving the in-person or online intervention. Participants randomized to the control condition received an email containing a link to a survey asking their satisfaction with the prior assessments. All participants completed a post-SB assessment one week after SB. Approximately 93.1% of students completed the one-week follow-up assessment (with six additional participants logging on and completing a portion of the follow-up assessment). Participants were paid $10 for completion of screening, $30 for baseline, $10 for post-intervention assessment, and $30 for the one-week post-SB assessment. There were significant differences in the receipt of interventions, with in-person interventions having a significantly lower completion rate (64%) compared to web-based interventions (98%; $\chi^2(df = 1) = 69.6$, $p < .01$). Likelihood of having one-week follow-up data differed by condition. There was variability in follow-up completion rates, which ranged from 87% to 98%, $\chi^2(df = 5) = 21.2$, $p < .01$. Figure 1 includes specific follow-up rates by condition.

Randomization

The design for the present study is a 2 (SB BASICS In-person or Web-based) × 2 (Friend [FI] or No Friend) + 1 (General BASICS) + 1 (Control) design. Upon completion of the

screening survey, participants were automatically randomized to one of six conditions: SB BASICS, SB WEBBASICS, SB BASICS + FI, SB WEBBASICS + FI, GENERAL BASICS, or CONTROL. Randomization was stratified by gender and drinking severity (light/medium and heavy) as follows: Females: less than 8 drinks; 8 or more drinks, and Males: less than 10 drinks; 10 or more drinks. This randomization ensured equivalence of groups on key baseline characteristics that are known to be related to the outcomes.

Friends

Five weeks prior to participants' SB, friends identified by participants in the SB BASICS + FI and SB WEBBASICS + FI conditions were contacted via email and telephone. Attempts were made to recruit up to two friends per participant. The email stated that his/her friend (i.e., the participant) named them as a good friend with whom they would be going on a trip during SB. Interested friends were directed to an online consent form. Once friends indicated consent, they were directed to an online survey similar to the baseline survey for participants. The information from the survey was utilized in the feedback presented to friends as described below. After viewing the online feedback, friends completed a post-feedback assessment, as well as a one-week post-SB assessment. Friends were compensated at a rate of $20 for initial assessment, $10 for post-feedback assessment, and $20 for one-week post-SB follow-up. Friends were sent an email prior to the participant's SB.

A total of 1,507 friends were listed by the 783 participants who screened in to the study and completed baseline. Across the group of 260 participants randomized to friend conditions who completed baseline, 450 friends were invited and 272 friends (60.4%) provided consent for participation and completed the initial survey. Of the 129 participants in the SB BASICS + FI condition, 94 (72.9%) had at least one friend complete the initial survey (n = 135 friends). Of the 131 participants in the SB WEBBASICS + FI condition, 98 (74.8%) had at least one friend complete the initial survey (n =137 friends). Neither the number of overall friends recruited nor the proportion of participants with at least one friend recruited differed significantly by condition. Limited demographic information was collected from friends. Demographic characteristics of friends were broadly similar to participants, with 49.0% women, 72.2% Caucasian, 16.2% Asian or Pacific Islander, and 11.6% Other. Friends were not required to be students, and as a result, 8.8% of friends were non-students. Of those 272 friends who consented to participate, 254 actually logged in to view the online feedback intervention (93.4%), and the majority of these friends (n = 242) also completed a post-intervention survey, which immediately followed the online feedback.

Conditions

SB BASICS—Participants scheduled in-person sessions up to two days prior to SB and received reminder emails the day before the session. The SB BASICS one-hour session with a trained facilitator was conducted in a Motivational Interviewing (Miller & Rollnick, 2002) style, which is described in detail in the BASICS manual (Dimeff, Baer, Kivlahan, & Marlatt, 1999), with adaptations for SB specific content. One of the main goals of the intervention was to reduce SB drinking intentions by having the participants reflect on their intentions while being presented effects associated with that level of drinking. Personalized feedback regarding intended SB drinking quantity, frequency, peak alcohol consumption,

and estimated BAC was reviewed. Factors affecting BAC were also discussed in reference to explaining participants' risk for intoxication based on intentions to drink during SB. Participants' anticipated SB consequences along with the consequences that others who drank at their intended levels have experienced were reviewed non-judgmentally. Other goals of the intervention were to reduce participants' perceived social norms and alcohol expectancies. Participants' intended drinking rates and planned sexual activity while drinking during SB were compared to their estimates of typical student norms (alcohol and sex) and to the actual norms over SB for students from their campus. Alcohol expectancies, placebo effects, and biphasic effects of alcohol were discussed. Positive expectancies were discussed in the context of findings from studies of balanced alcohol/placebo designs. Participants reviewed alternatives to alcohol use during SB and were given a copy of their graphic feedback with tips and a personalized BAC card to take home.

SB WEBBASICS—The SB WEBBASICS intervention consisted of the same feedback and tip components as the SB BASICS in-person intervention, but was presented in a web-compatible format. Participants assigned to this condition were emailed a link to their feedback and were able to view the feedback online as often as they chose and were able to print the feedback if desired.

General BASICS—Participants in the general BASICS (Dimeff et al., 1999) condition received the intervention at the same time as the other conditions (1-28 days before SB). The general BASICS feedback interview consisted of a one-hour intervention based on the information provided during the baseline assessment and did not include content specifically related to SB, nor did it address intended drinking or information regarding sexual behavior.

Friend Intervention (FI)—Friends of participants randomized to SB BASICS + FI and SB WEBBASICS + FI were recruited, consented, and assessed as described in the Friends section above. In-person facilitators were blind as to whether participants they met with were randomized to the friend condition.

Assessment-only Control—Participants randomized to the control group only received assessments.

Selection, Training, and Supervision of Intervention Facilitators

Trained facilitators provided the feedback interventions and included three individuals with PhDs in Clinical Psychology; six PhD Clinical Psychology graduate students; three Masters of Social Work students; and eight post-baccalaureate students. All facilitators attended a two-day BASICS workshop led by Ph.D. psychologists. The training included didactic information, motivational interviewing principles, and practice exercises in small group role plays. Each interviewer watched videotaped sessions, participated in supervised practice, completed a role-play session and at least one pilot case to demonstrate competency through coding for adherence, and review by a Licensed Clinical Psychologist who provided detailed feedback. Adherence and competence measures were designed to assess warmth, empathy, an interpersonal communication style consistent with Motivational Interviewing (MI: Miller and Rollnick, 2002), knowledge of the intervention, and qualities shown to be important to

effective peer-counseling (Forrest, Strange, & Oakley, 2002; Jemmott, Jemmot, & Fong, 1998). Weekly group supervision further ensured adherence.

Monitoring of adherence/competence—All in-person interventions (SB Specific and General) sessions were video-taped and rated for adherence and competence by trained coders supervised by the investigators. Sessions were rated using the Motivational Interviewing Treatment Integrity system (MITI; Moyers, Martin, Manuel, Hendrickson, & Miller, 2005) by a team of seven supervised graduate and undergraduate students for interviewer global ratings (empathy, MI spirit) as well as behaviors (MI adherent and non-adherent statements, open and closed questions, and simple and complex reflections). Inter-rater reliability for coders was high (Intraclass correlations' ranged from .86 - .96) for a majority of the behavioral counts and global codes. Facilitator adherence for each of the global codes exceeded competency criteria (Empathy, $M = 5.32$, $SD = .57$ and Spirit, $M = 5.29$, $SD = .62$).

Online Feedback Participation and Satisfaction

The majority of participants and friends in the web feedback conditions logged in and viewed feedback. Specifically, 97% of the SB WEBBASICS participants and 98% of the SB WEB BASICS + FI participants logged in to view the feedback. Of the 129 SB BASICS + FI participants, 91 (70.5%) had at least one friend view feedback ($n = 128$ friends). Of the 131 participants in the SB WEBBASICS + FI condition, 93 (71.0%) had at least one friend view feedback ($n = 126$ friends). A total of 92% of friends assigned to SB WEBBASICS + FI and 95% of friends assigned to SB BASICS + FI logged in to their feedback after the initial survey.

Measures

Measures included in the present analyses of intervention efficacy included intended and actual alcohol consumption, intended and actual estimated blood alcohol content (eBAC), and alcohol-related consequences during SB. Assessment of participants' travel activities on each day of SB was also included.

Spring Break drinking intentions—A modified version of the Daily Drinking Questionnaire (DDQ; Collins et al., 1985; Dimeff et al., 1999) was used to assess the number of drinks participants intended to consume on each of the 10 days of SB, and the number of hours they intended to drink on each day. *Intended eBAC* was assessed using a modification of the Widmark formula (Brick, 2006; Watson, Watson, & Batt, 1981) based on the number of drinks, time of consumption, gender and weight. Estimated BACs above .50 were recoded to .50.

Spring Break drinking—The measure of SB drinking in the one-week post SB survey mirrored the measure of intended drinking but with participants reporting their actual drinking rather than intentions. For each of the 10 days, *number of drinks* was scored as the number of standard drinks participants reported drinking on that day. e*BAC* was calculated using a modified version of the Widmark formula described above (Brick, 2006; Watson et al., 1981).

Spring Break drinking norms—SB drinking norms mirrored the measure of SB drinking intentions and SB drinking. Participants were asked to estimate the average number of drinks consumed by other students for each of the 10 days of SB. Scores reflect the perceived number of drinks consumed during SB by the typical student.

Spring Break positive expectancies—SB expectancies were assessed using a modified version of the Comprehensive Effects of Alcohol questionnaire (CEOA; Fromme, Stroot, & Kaplan, 1993). Instructions were modified to focus on expected effects of drinking during SB (α=.84 at baseline, α=.88 at post-intervention).

Spring Break trips with friends—Participants were asked to indicate where they spent and with whom they spent each day of SB. Each day of SB was categorized as to whether participants had selected being on a vacation/leisure trip *and* with friends (note that participants may have spent time with other people as well). SB Trip day was defined as a day on which participants were on a trip and spent time with friends, and was coded as 1. All other days were coded as 0.

SB alcohol-related consequences—Consequences were assessed with 12 items. Eleven items (e.g., had a hangover, threw up from drinking, passed out from drinking, drove a car after drinking, unprotected sex) were taken or adapted from the Young Adult Alcohol Problems Screening Test (YAAPST; Hurlbut & Sher, 1992) or the Young Adult Alcohol Consequences Questionnaire (YAACQ; Read, Kahler, Strong & Colder, 2006). Items were selected based on a content review of the YAAPST and YAACQ. Selected items were those deemed by investigators to be most relevant to SB drinking, e.g., academic consequences and chronic consequences (e.g., dependence symptoms) seemed less specifically relevant to SB. An additional alcohol-related problem (i.e., injuring oneself) was added. Participants were asked to report which items they had experienced during each day of SB (range 0-12 items per day). For each of the 10 days, *number of consequences* was scored as the number of problems participants reported having occurred on that day (α=.64 averaged across the 10 days).

Data Analyses

Analyses evaluating treatment differences focused on three SB outcomes: a) total number of standard drinks, b) estimated blood alcohol content (eBAC), and c) total number of drinking-related consequences. The primary focus of the study was on SB drinking while on a trip with friends. However, only 507 of the 783 randomized participants (64.7%) reported spending one or more days on a trip during SB. To be conservative, an initial intent-to-treat analysis examined all available data from all participants, regardless of trip status, and a secondary analysis examined data collected on days for which the participant indicated they were on a trip. Each of the three outcomes was analyzed in two ways: a) repeated measures of data collected during the 10 days of SB, and b) peak values for each outcome. These two sets of outcomes characterize overall drinking during SB as well as the most intense drinking episode.

Each of our outcomes represents a count or rate of drinking (or consequences) and therefore has a skewed distribution bounded at zero. Thus, the present analyses used a quasi-Poisson generalized linear model (see, e.g., Atkins & Gallop, 2007; Hilbe, 2011) and, for the repeated measures outcome, a generalized estimating equation (GEE; Liang & Zeger, 1986) extension of the quasi-Poisson model was used.[1]

All models included gender and intentions for drinking and drinking-related consequences at baseline as covariates. Our primary regression models took the following form:

$$E[\,Outcome_{SpringBreak}]=b_0+b_1(Outcome_{intended})+b_2(Gender)+b_{3-7}(Tx) \quad (1)$$

That is, the outcome during SB was modeled by the participant's intended outcome (e.g., intended total drinks during SB), gender, and five dummy-coded treatment contrasts that compared each active treatment to the control condition. The intentions covariate was centered around its mean, and gender was coded women = 0, men = 1. Hypotheses also called for contrasts of different conditions (e.g., in-person conditions would have better outcomes than web-based conditions), and these were tested using weighted contrasts of the specific coefficients involved (Fox, 2008).

A rate ratio (RR) of one indicates no effect, and RRs smaller or larger than one indicate the percentage reductions or increases in the outcome, respectively. Initial analyses adhered to the intent-to-treat (ITT) principle and analyzed all available data treating individuals as randomized, regardless of treatment received. Treatment noncompliance was explored in secondary sensitivity analyses; however, substantive results were identical with ITT analyses, and hence only ITT results are reported below. All analyses were done in R v2.12.0 (R Development Core Team, 2010) and made use of the GEE package (Carey, 2011). Finally, three variables were considered as potential mediators of treatment effects: drinking norms, intentions, and positive expectancies. Each of these was assessed immediately following the intervention and prior to SB. Mediation analyses used the traditional “causal steps” approach of Baron and Kenny (1986) and all covariates previously used were included in mediation analyses.[2]

Results

Descriptive Results

Table 1 presents means and standard deviations by condition for each of the outcome variables (number of drinks, eBAC, and consequences) for average and peak levels. Data are presented for baseline, all days during SB, and trip days during SB. Baseline values were reported prior to SB and represent participants' intended drinking. Values for “All days”

[1]The standard Poisson regression model is a model for discrete outcomes, which would not be appropriate for eBAC. However, the quasi-Poisson model does not assume an underlying Poisson probability model but simply specifies estimating functions for the mean and variance. We considered alternative models for eBAC (e.g., linear model, or linear model with transformed outcome), but the quasi-Poisson model appeared to provide a good fit and also allows the same statistical model to be used for all outcomes.

[2]The traditional approach to mediation used here must make strong assumptions to justify causal claims of mediation; in particular, it must make the assumption that there are no unmeasured confounders influencing the mediator's association with the outcome. Newer approaches can relax these assumptions (Ten Have et al., 2007) but have not yet been extended to non-normal and clustered data such as those in the present study.

represent participants' drinking over the 10 days of SB, regardless of whether or not they were on SB trips during those days. “Trip day” values represent participants' drinking on the days of SB during which they were on SB trips, which was the primary focus of the study. Across conditions, intended values for drinking tended to be higher than the actual amount of drinking reported across all days but lower than the amount consumed on trip days. This pattern of findings suggests that students may overestimate how much they are going to drink during the entire 10 days but underestimate the amount they are going to drink on SB trips. However, direct comparisons between intended drinking and drinking on trip days should be made with caution because all participants did not go on trips.

ITT Regression Analyses

Rate ratios (RR) and 95% CI for RR based on quasi-Poisson models are reported in Table 2 for all six outcomes (i.e., total drinks, eBAC, and consequences for all available SB days as well as peak day). Intended drinking during SB was included as a covariate in all models. The intercept RR is the model based average drinking rate for women in the control condition, whereas men are predicted to be 46% higher. In examining treatment differences across outcomes, SB BASICS condition participants reported significantly less drinking relative to control (RR = 0.84). However, this was the only significant intervention effect using all data, although RRs for intervention conditions were typically less than one, indicative of reduced drinking and consequences. Planned contrasts among the coefficients in Table 2 showed that SB specific conditions were not significantly different from the general BASICS condition (all *p*s > .30). Similarly, there was no evidence for differential effectiveness of treatment conditions by inclusion of friends (all *p*s > .28) or in-person vs. web (all *p*s > .20).

Regression Analyses of Drinking on Trip Days

Regression results are reported in Table 3 for all six outcomes based on days when participants reported being on trips. After adjusting for intended drinking during SB and gender, only SB BASICS participants were significantly lower than control participants in overall SB drinking during trip days. The RR of 0.75 indicates that SB BASICS participants drank approximately 25% less than control participants. A similar RR was also found for SB BASICS with eBAC, though the *p*-value was just over the traditional .05 cutoff. No significant treatment differences were found for the consequences outcome. Generally similar findings were found for the peak variables. SB BASICS participants reported significantly less peak drinking and lower peak eBAC on SB trip days relative to control (again with 22%-26% reductions), and no significant differences were found for the consequences outcome. In addition, participants in the SB WEBBASICS with friends condition reported reduced drinking ($p = .13$) and lower eBAC ($p = .07$) on SB trip days relative to control, though neither comparison crossed the traditional .05 cutoff. Planned contrasts showed that there were trends toward SB specific intervention conditions having better outcomes than general BASICS for drinking-related consequences (daily consequences: RR = 0.77, 95% CI [0.59, 1.01], p =.06; peak consequences: RR = 0.83, 95% CI [0.68, 1.02], p =.08). There were no significant differences between SB specific and general BASICS for total drinks or eBAC. There were no significant treatment differences due to friend inclusion (all *p*s > .20) or in-person vs. web (all *p*s > .35).

Mediation

Mediation analyses focused primarily on SB BASICS using data collected on trip days, as this was the one treatment condition with a significant main effect for both total (or peak) drinks and eBAC. Focusing on descriptive norms and total drinks, SB BASICS was strongly related to descriptive norms (RR = 0.47, 95% CI [0.38, 0.58]), and the direct effect of SB BASICS (in a model including the mediator) was reduced 48% and non-significant (RR = 0.87, 95% CI [0.65, 1.17]). Moreover, descriptive norms were strongly related to total drinks on trip days (RR = 1.08, 95% CI [1.03, 1.13]).[3] Similar results were found for eBAC, peak drinks, and peak eBAC on trip days. In each case, descriptive norms were strongly related to the outcome, and direct effects of treatment (i.e., c' path in mediation literature or SB BASICS coefficient in presence of mediator) were reduced between 23% and 32% and non-significant. Finally, it is interesting to note that SB BASICS did not have a significant impact on consequences and that descriptive norms were unrelated to consequences (RR = 1.03, 95% CI [0.94, 1.13]).

Neither of the other proposed mediators were found to mediate the treatment effects of SB BASICS. With drinking intentions (re-assessed after the intervention), treatment was not significantly related to the mediator (all *p*s > .15) and consequently there was little to no reduction of the total to direct estimates of SB BASICS. Similarly, SB BASICS did not have a significant impact on positive expectancies (all *p*s > .90).

Discussion

Results revealed that the in-person SB specific intervention without the friend component was the only intervention that had consistent effects in reducing SB drinking relative to control, and primarily when focusing specifically on days in which participants were on SB trips. Specifically, the in-person SB intervention was associated with fewer drinks consumed and lower eBACs over all days and on the peak drinking day when participants were on a SB trip with friends. The only other intervention effect which approached statistical significance was the web-delivered SB intervention with friends in reducing peak eBAC on trip days. No effects were evident for the in-person intervention with friends or the web-delivered intervention without friends. Nor were any effects observed for the general BASICS intervention. Moreover, no effects were found in reducing alcohol-related consequences. In addition, we did not find significant effects in testing contrasts between SB specific interventions and general BASICS; between in-person versus web interventions; nor between interventions with versus without friends. In sum, we found relatively good support for an in-person SB specific feedback intervention in reducing SB drinking during trip days but not when it included a web-based friend component. We did not find support for other interventions. In evaluating mediators of the in-person SB specific feedback intervention, we found good support for changes in SB drinking norms leading to reductions in drinking but no support for changes in drinking intentions or in changes in positive expectancies.

[3]To enhance interpretability, descriptive norms was divided by 10. Hence, the interpretation of the RR for descriptive norms as a mediator is for a 10 point change.

The present study is significant in that it is one of the first comprehensive evaluations of a SB specific intervention of which we are aware. One previous study evaluated the effects of reporting SB drinking intentions on SB alcohol-related consequences (Cronin, 1996) and another considered the effects of educational information on knowledge and perceived usefulness (Snyder & Misera, 2008). The identification of SB as one of the higher risk periods for drinking among college students (Neighbors et al., 2011) underscores the importance of identifying empirically supported targeted interventions.

One question raised by these findings is why the in-person SB specific intervention was the only one of the interventions to have consistent findings relative to control. One possibility is that some of the discussion which took place in the in-person intervention was not duplicated in the web interventions. Specifically, some of the discussion focused on participants' goals for SB (e.g., to party, to relax, to have fun with friends, to visit new places) and the extent to which alcohol fit with these goals. It is unclear why the in-person SB intervention was not effective in reducing drinking when participants were randomized to the friend component. It is possible that friends for some participants may have served as iatrogenic agents, which may have counteracted the effects of the in-person intervention. Further, approximately 30% of participants randomized to the friend conditions did not end up having a friend participate. Additionally, examining reports from the post-SB assessment, it was often reported that the friends who participants intended to spend their SB with did not end up going on a trip with the participant. More work will be needed to look at potential variability in friends' influence on SB drinking.

Another question that is important to consider is why there were no effects of the general BASICS intervention on any of the drinking outcomes. Students may think about SB as a unique window of time during which normal precautions and regulations related to alcohol have limited relevance. This may be particularly true in the context of traditional SB trips where friends travel together to exotic destinations with the explicit intention of consuming alcohol. Being away from home provides some degree of anonymity. Furthermore, SB may be a “time out” where typical drinking norms or previous typical drinking experiences and expectations are not considered relevant. This may also explain the disconnect between the intent to treat results and the results which focused only on days where participants were on SB trips. The in-person SB specific feedback intervention was associated with significant effects on multiple outcomes during trip days but only on total drinks over SB in the intent to treat analyses.

Limitations

The current study had several limitations. First, some participants did not complete their assigned intervention, which also likely weakened effects, and we had differences in intervention completion rates, most noticeable between in-person and web-based interventions. Interventions occurred the month prior to SB, which coincides with the end of the academic quarter and final examinations. Thus, it was difficult for many students to find time to attend in-person sessions during this period, and this may also have reduced the extent to which participants attended to the web-based intervention materials during viewing. All participants were retained in primary analyses based on their assigned

condition, whether or not they completed the intervention. Thus, results likely reflect a conservative estimate of effects for those who completed all aspects of the interventions. There were several points at which we may have lost power to detect intervention effects, based on whether intervention participants attended or viewed feedback, those randomized to friend conditions actually had friends participate, and whether they actually went on a SB trip. While a majority of participants in the friend conditions went on trips (69%); received the intervention (82%); had a friend receive the intervention (71%) and had a friend with them on SB (82%); only 35% met all of these criteria in combination. Further, our measure of consequences only included twelve items, with some items having low base rates (e.g., only 2 individuals reported getting arrested during the 10 days), thus our null findings with consequences may have been a result of not measuring adequate SB consequences.

Other limitations include the recruitment and testing effects of the friend intervention. In the present study, all students were able to nominate friends; however, only students randomized to the two friend conditions had their friends invited. Future research should include nominated friends from *all* participants, conduct random assignment to conditions, and then collect information from *all* friends, regardless of condition, to determine if changes in friend's intentions or behaviors are associated with participant's behavior change. Further, in this study the number of friends actually recruited ranged from 0-2 for each student randomized to Friend conditions. Analyses were based on ITT at the friend and participant level. We did not control for whether the friend actually saw the materials or the number of friends who may have been invited. Future research will need to explore these factors, as well as examine other characteristics of friendships (e.g., supportiveness, closeness) that may be important.

It must be noted that the sample included only those students who intended to go on a SB trip with identifiable friends prior to SB and who intended to drink heavily at least once during SB. While drinking during SB trips with friends is particularly problematic (Grekin et al., 2007; Lee et al., 2009), it is not clear how results might generalize to other students. Other limitations include the considerable variability in location, context, and duration of SB trips which may have impacted alcohol use and efficacy of interventions. These factors likely affected availability of alcohol, as well as the extent to which alcohol use or “partying” was a key feature of the trip. Future research is needed to better understand the impact of destination context on intervention efficacy for SB drinking. As approximately one third of the participants did not go on the intended SB trip, future research could examine the optimal timing for identifying when SB plans are finalized and more opportune for intervention.

Clinical implications

Results suggest that a brief motivational intervention tailored to specific goals and consequences associated with SB can reduce both typical and peak alcohol consumption and eBAC during SB trips. Focusing on SB trips as a high-risk context and implementing tailored interventions prior to departure for those planning such trips may be a viable prevention strategy on college campuses. In contrast to prior research on 21st birthday drinking, general BASICS (not tailored specifically to SB) did not have a preventive effect

on SB drinking. Thus, the addition of tailored content may be necessary. Introducing alternative SB activities, such as school-sponsored trips, humanitarian activities, or on-campus recreational alternatives may reduce students' likelihood to go on SB leisure trips with friends.

The current study found no effects on consequences for any intervention condition, despite having the tailored in-person intervention reduce both average and peak consumption and eBAC during these trips. This suggests a need to better understand factors other than eBAC which increase the likelihood of experiencing negative consequences during SB trips.

Future directions

Future research is needed to evaluate generalizability of SB interventions to other high risk drinking events (e.g., other trips, holidays). Another potential future direction would be to evaluate aspects of friend involvement that might enhance or detract from drinking prevention programs. In the present research the friends received an independent intervention, were not present for the participant intervention, and there was no connection made between the participant and friend interventions. Future research might further consider more active involvement of friends within participants' interventions. Moreover, there may be complex dynamics related to friend behavior, knowledge of receipt of intervention, and/or other possible variables which were not assessed in the present study. Given the importance of friends in influencing alcohol use, it is critical to improve our understanding of how friends can help reduce harmful drinking within their social networks.

Finally, the current intervention involved a variety of components, some of which were based on existing efficacious general interventions and others of which were developed specifically to address the SB drinking context. It is not clear the extent to which specific intervention components enhance or detract from efficacy of these multi-component interventions, thus research is needed to disentangle intervention components.

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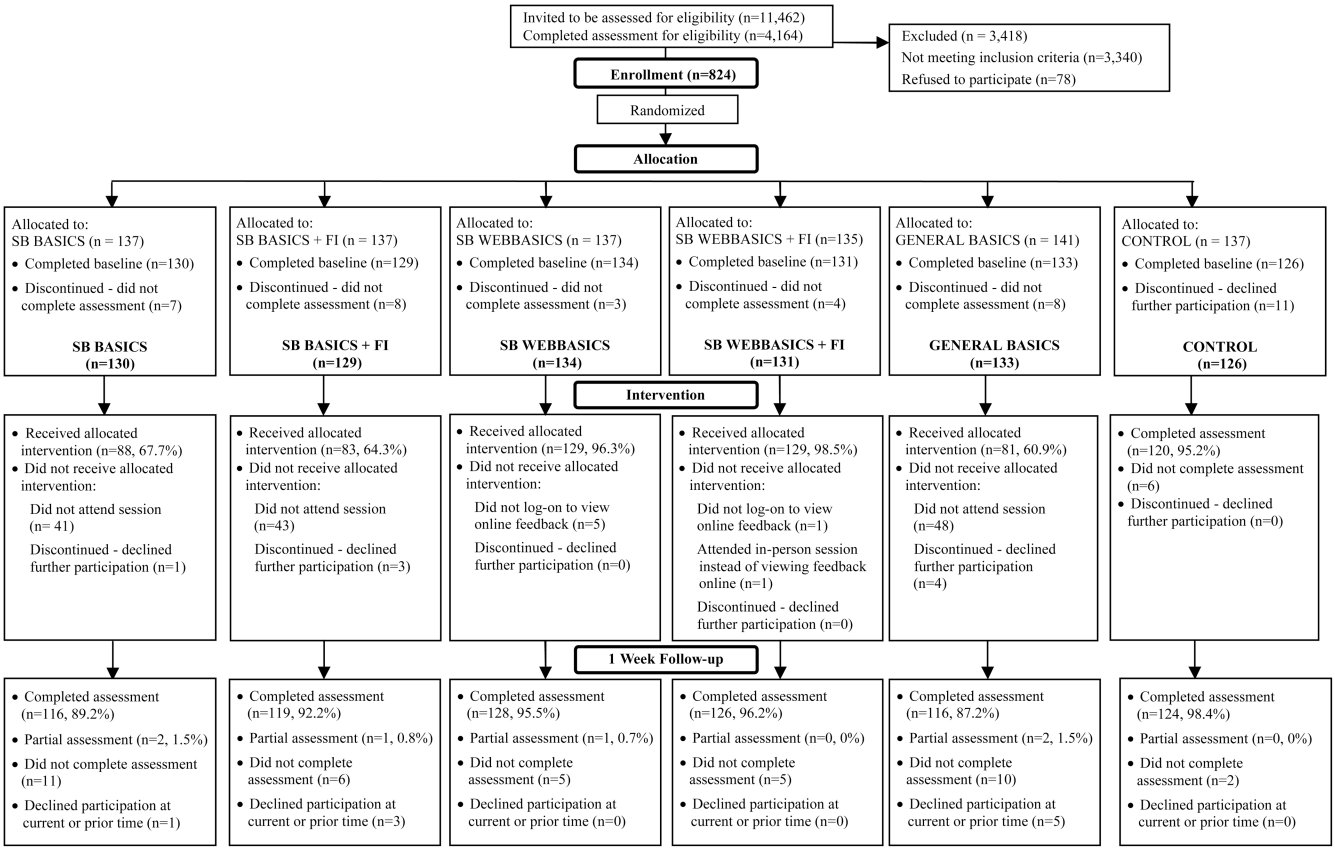

Figure 1.
Participant Flow.

Table 1

Descriptive Statistics for Spring Break-Related Outcomes

		Average Daily Number Of Drinks	Average Daily eBAC	Average Daily Consequences	Peak Day Number Of Drinks	Peak Day eBAC	Peak Day Consequences
Condition	**Time**	***M (SD)***	***M (SD)***	***M (SD)***	***M (SD)***	***M (SD)***	***M (SD)***
Control	Baseline	3.86 (4.26)	.058 (0.077)	1.07 (0.56)	7.99 (3.97)	.135 (.082)	1.07 (0.56)
	All days	3.01 (4.42)	.049 (0.076)	0.59 (1.16)	7.83 (4.66)	.143 (.089)	1.88 (1.80)
	Trip days	5.32 (6.00)	.080 (0.094)	0.97 (1.44)	9.48 (5.53)	.167 (.092)	2.17 (1.82)
General Basics	Baseline	3.90 (4.19)	.059 (0.075)	1.11 (0.59)	8.43 (3.88)	.141 (.079)	1.11 (0.59)
	All days	2.80 (4.13)	.046 (0.080)	0.50 (1.04)	7.76 (4.77)	.142 (.105)	1.91 (1.60)
	Trip day	5.74 (5.17)	.100 (0.105)	1.20 (1.48)	9.50 (5.03)	.179 (.114)	2.54 (1.86)
SB BASICS + FI	Baseline	3.75 (4.07)	.058 (0.078)	0.98 (0.49)	8.09 (3.70)	.142 (.086)	0.98 (0.49)
	All days	3.07 (4.32)	.051 (0.079)	0.44 (1.06)	8.07 (4.78)	.149 (.093)	1.59 (1.60)
	Trip day	5.88 (5.52)	.095 (0.102)	0.88 (1.55)	10.14 (5.64)	.176 (.107)	1.88 (1.97)
SB BASICS	Baseline	3.87 (4.46)	.055 (0.072)	0.97 (0.46)	8.31 (4.15)	.135 (.075)	0.97 (0.46)
	All days	2.67 (3.88)	.042 (0.069)	0.42 (0.95)	7.41 (5.02)	.132 (.097)	1.58 (1.59)
	Trip day	4.02 (4.38)	.063 (0.078)	0.61 (1.10)	7.33 (4.59)	.124 (.082)	1.40 (1.48)
SB WEBBASICS + FI	Baseline	3.97 (4.20)	.060 (0.078)	1.02 (0.52)	8.09 (3.81)	.140 (.077)	1.02 (0.52)
	All days	2.95 (4.51)	.046 (0.079)	0.45 (0.98)	7.44 (4.69)	.127 (.091)	1.68 (1.66)
	Trip day	5.20 (6.05)	.080 (0.106)	0.74 (1.31)	8.24 (5.74)	.136 (.105)	1.57 (1.79)
SB WEBBASICS	Baseline	4.29 (4.78)	.063 (0.082)	1.05 (0.48)	8.57 (4.32)	.142 (.083)	1.05 (0.48)
	All days	2.92 (4.52)	.045 (0.076)	0.48 (0.99)	8.17 (5.46)	.144 (.096)	1.76 (1.63)
	Trip day	5.94 (5.99)	.090 (0.103)	0.94 (1.32)	9.84 (6.52)	.164 (.111)	2.08 (1.82)

Note. Baseline = intentions prior to spring break; All days = actual report post-SB for all 10 days of spring break; Trip day= actual report post-SB for days spent on a vacation/leisure trip; eBAC = estimated blood alcohol content; Peak = highest number of drinks consumed on a single day. Participants by condition with outcome data range from 116-129. Participants reporting going on an actual SB trip by condition range from 73-91, thus Trip day estimates come from a subset of participants.

Table 2

Intent to Treat (ITT) Regression Results [with 95% Confidence Intervals] for Treatment Differences in Primary Outcomes During 10 Days of Spring Break.

	Average Daily Number Of Drinks	Average Daily eBAC	Average Daily Consequences	Peak Day Number Of Drinks	Peak Day eBAC	Peak Day Consequences
	RR [CI]	RR [CI]	RR [CI]	RR [CI]	RR [CI]	RR [CI]
(Intercept)	2.16***	0.04***	0.44***	6.95***	0.13***	1.65***
	[1.91, 2.45]	[0.03, 0.05]	[0.37, 0.54]	[6.37, 7.59]	[0.12, 0.15]	[1.40, 1.95]
Intended Drinks	1.12***	78.98***	3.33***	1.08***	46.42***	2.32***
	[1.11, 1.13]	[141.24, 551.01]	[2.89, 3.83]	[1.07, 1.09]	[25.34, 85.02]	[2.06, 2.62]
Male	1.46***	1.21***	0.96	1.22***	1.06	0.93
	[1.31, 1.62]	[1.06, 1.38]	[0.81, 1.13]	[1.12, 1.32]	[0.97, 1.17]	[0.82, 1.06]
General Basics	0.96	0.94	0.94	0.97	0.97	1.05
	[0.80, 1.15]	[0.72, 1.23]	[0.73, 1.22]	[0.86, 1.10]	[0.82, 1.16]	[0.85, 1.30]
SB BASICS + FI	1.05	1.05	0.90	1.03	1.04	0.95
	[0.89, 1.26]	[0.85, 1.31]	[0.68, 1.21]	[0.92, 1.17]	[0.89, 1.20]	[0.76, 1.19]
SB BASICS	0.84*	0.83^{t}	0.89	0.90	0.92	0.96
	[0.70, 1.00]	[0.66, 1.04]	[0.67, 1.17]	[0.79, 1.03]	[0.78, 1.08]	[0.76, 1.21]
SB WEBBASICS + FI	0.92	0.89	0.90	0.93	0.88	1.00
	[0.77, 1.09]	[0.71, 1.13]	[0.68, 1.19]	[0.83, 1.05]	[0.75, 1.03]	[0.79, 1.26]
SB WEBBASICS	0.89	0.84	0.87	0.95	0.96	0.97
	[0.75, 1.05]	[0.68, 1.04]	[0.66, 1.14]	[0.85, 1.07]	[0.83, 1.10]	[0.78, 1.19]

Note. $^{t}p \leq 0.10$

* $p \leq 0.05$

** $p \leq 0.01$

*** $p \leq 0.001$

RR = Rate ratio; CI = confidence interval; eBAC = estimated blood alcohol content. Peak = highest number of drinks consumed on a single day of spring break.

Table 3

Secondary Regression Results for Treatment Differences on Primary Outcomes During Spring Break Trip Days

	Average Trip Day Number of Drinks	Average Trip Day eBAC	Average Trip Day Consequences	Peak Trip Day Number of Drinks	Peak Trip Day eBAC	Peak Trip Day Consequences
	RR [CI]	RR [CI]	RR [CI]	RR [CI]	RR [CI]	RR [CI]
(Intercept)	3.56***	0.06***	0.69**	7.36***	0.14***	1.75***
	[3.04, 4.18]	[0.05, 0.08]	[0.53, 0.89]	[6.51, 8.31]	[0.12, 0.17]	[1.36, 2.24]
Intended Drinks	1.07***	22.52***	3.00***	1.08***	42.39***	2.38***
	[1.05, 1.08]	[8.97, 56.55]	[2.49, 3.61]	[1.06, 1.09]	[19.45, 92.42]	[1.98, 2.85]
Male	1.50***	1.19*	0.88	1.21***	1.05	0.78*
	[1.31, 1.71]	[1.01, 1.39]	[0.69, 1.11]	[1.08, 1.35]	[0.92, 1.19]	[0.64, 0.95]
General Basics	1.12	1.20	1.27	1.04	1.04	1.14
N = 80	[0.92, 1.36]	[0.92, 1.57]	[0.91, 1.77]	[0.88, 1.22]	[0.81, 1.33]	[0.85, 1.53]
SB BASICS + FI	1.09	1.15	0.94	1.02	1.00	0.87
N = 88	[0.89, 1.34]	[0.89, 1.49]	[0.64, 1.39]	[0.87, 1.21]	[0.81, 1.23]	[0.85, 1.53]
SB BASICS	0.75*	0.76ᵗ	0.87	0.78**	0.74**	0.84
N = 73	[0.59, 0.95]	[0.57, 1.01]	[0.56, 1.35]	[0.65, 0.93]	[0.59, 0.92]	[0.57, 1.24]
SB WEBBASICS + FI	0.90	0.96	1.05	0.88	0.82ᵗ	0.93
N = 87	[0.72, 1.13]	[0.72, 1.28]	[0.73, 1.53]	[0.74, 1.04]	[0.66, 1.02]	[0.67, 1.29]
SB WEBBASICS	1.00	1.01	1.03	0.92	0.90	0.93
N = 91	[0.81, 1.23]	[0.78, 1.31]	[0.73, 1.46]	[0.79, 1.08]	[0.74, 1.11]	[0.68, 1.28]

Note. ᵗ$p \leq 0.10$

*$p \leq 0.05$

**$p \leq 0.01$

***$p \leq 0.001$

Trip day= any SB days spent on a vacation/leisure trip; RR = Rate ratio; CI = confidence interval; eBAC = estimated blood alcohol content; Peak = highest number of drinks consumed on a single day. *N* for particpants reporting any trip day in control condition = 88.