A Randomized Clinical Trial Evaluating a Combined Alcohol Intervention for High-Risk College Students*

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ABSTRACT. Objective: The current study is a multisite randomized alcohol prevention trial to evaluate the efficacy of both a parenting handbook intervention and the Brief Alcohol Screening and Intervention for College Students (BASICS) intervention, alone and in combination, in reducing alcohol use and consequences among a high-risk population of matriculating college students (i.e., former high school athletes). **Method:** Students ($n = 1,275$) completed a series of Web-administered measures at baseline (in the summer before starting college) and follow-up (after 10 months). Students were randomized to one of four conditions: parent intervention only, BASICS only, combined (parent and BASICS), and assessment-only control. Intervention efficacy was tested on a number of outcome measures, including peak blood alcohol concentration,

weekly and weekend drinking, and negative consequences. Hypothesized mediators and moderators of intervention effect were tested. **Results:** The overall results revealed that the combined-intervention group had significantly lower alcohol consumption, high-risk drinking, and consequences at 10-month follow-up, compared with the control group, with changes in descriptive and injunctive peer norms mediating intervention effects. **Conclusions:** The findings of the present study suggest that the parent intervention delivered to students before they begin college serves to enhance the efficacy of the BASICS intervention, potentially priming students to respond to the subsequent BASICS session. (*J. Stud. Alcohol Drugs* 70: 555-567, 2009)

THE HIGHEST PROPORTION OF INDIVIDUALS with diagnosable alcohol disorders, heavy drinking, and multiple substance dependencies are in the age range from 18 to 29 years. This age range encompasses more than 92% of all enrolled college students (Cooper, 2002; Dawson et al., 2004; Hingson et al., 2005; Johnston et al., 2006; Wechsler et al., 2002). For some students, excessive alcohol consumption emerges after matriculation to college (Baer, 2002), but, for others, it represents a continuation or escalation of established behavior (O'Malley and Johnston, 2002; Schulenberg and Maggs, 2002). Numerous factors have been shown to influence drinking in college populations (Baer, 2002; Ham and Hope, 2003), including gender and ethnicity (Wechsler et al., 2002), expectancies (Jones et al., 2001; Neighbors et al., 2007), attitudes toward drinking (Turrisi, 1999), peer and parent influences (Neighbors et al., 2007; Wood et al., 2004), environment (Presley et al., 2002), fraternity/sorority membership (Larimer et al., 2001), and athletics (Turrisi et al., 2006b). In comparison with the other factors, athletes

have been relatively underexamined in alcohol interventions. The focus of the present study was to examine a randomized clinical trial evaluating a combined parent- and peer-based alcohol intervention targeting high school athletes as they transitioned to college.

Parent and peer influences on college drinking

Parents and peers represent the two most frequent and most important referents to whom students turn regularly for advice, support, and modeling (American College Health Association, 2005). Research has implicated peer influences on drinking, via perceived drinking norms (descriptive and injunctive), modeling, and alcohol offers (Baer et al., 1991; Borsari and Carey, 2001; Neighbors et al., 2007; Perkins, 2002; Read et al., 2005; Reno et al., 1993; Wood et al., 2001).

Parental influences also have been documented in adolescent and college samples (Chassin and Handley, 2006; Patock-Peckham and Morgan-Lopez, 2006, 2007; Turner et al., 2000; Turrisi et al., 2000; van der Vorst et al., 2006; Wood et al., 2004). Among fraternity and sorority members, parent-child conflict at college entrance was related to heavier drinking and consequences 1 year later (Turner et al., 2000). Furthermore, parental monitoring and knowledge were related to lowered use, fewer problems, and moderated peer influences on drinking (Wood et al., 2004). In addition, parents have been shown to influence students' choice of

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friends (Abar and Turrissi, 2008), which has been related to drinking. Lastly, Turrissi and colleagues (2000) found that, as parent-teen communication decreased, the relationship between alcohol consumption and consequences became stronger.

Athletes as a high-risk group

Heavy drinking tendencies vary across different social groups. Recently, research has begun to focus on student athletes as a high-risk group (Dams-O'Connor et al., 2007; Martens et al., 2006; Turrissi et al., 2006b, 2007). Student athlete alcohol misuse appears to be an exacerbation of patterns established before college (Hildebrand et al., 2001; Wechsler et al., 1997). Studies indicate that high school athletes who discontinue organized sports in college continue to drink similarly to those who continue with sports (Turrissi et al., 2004; Wetherill and Fromme, 2007). However, no large-scale randomized controlled studies have evaluated preventive interventions targeting athletes, although several small-scale studies have shown promise (Gregory, 2001; Marcello et al., 1989; Perkins and Craig, 2006; Thombs and Hamilton, 2002). Those studies were limited, because the lack of controls made it hard to evaluate effects.

Efficacy of interventions for college populations

Although interventions targeting athletes have not been rigorously evaluated, numerous preventive interventions with college students have been shown to be efficacious (see Larimer and Cronce, 2002, 2007). Each approach carries advantages and disadvantages, and the complexity of college drinking requires that it be addressed across multiple modalities, through the integration of diverse empirically validated approaches (National Institute on Alcohol Abuse and Alcoholism, 2007). The present study adopted such a strategy by examining the combined efficacy of two promising approaches in high school athletes transitioning to college, based on the work of Larimer and colleagues (Larimer et al., 2001; Marlatt et al., 1998) and the work of Turrissi and colleagues (Ichiyama et al., 2008; Ray et al., 2006; Turrissi et al., 2001).

Peer-delivered BASICS (Larimer et al., 2001). The Brief Alcohol Screening and Intervention for College Students (BASICS; Dimeff et al., 1999; Marlatt et al., 1998) has been extensively evaluated (Baer et al. 2001; Borsari and Carey, 2000; Carey et al., 2006; Larimer and Cronce, 2007; Wood et al. 2007), designated a Tier I intervention strategy by the National Institute on Alcohol Abuse and Alcoholism (Task Force of the National Advisory Council on Alcohol Abuse and Alcoholism, 2002), and identified as a Substance Abuse and Mental Health Services model program. BASICS is an individually delivered, brief feedback-and-skills intervention. It directly targets peer influences through the provision

of personalized feedback and discussion of alcohol norms, alcohol expectancies, negative consequences, and protective behavioral strategies and skills, delivered in a motivational-enhancement style (i.e., motivational interviewing; Miller and Rollnick, 2002). Research suggests that BASICS can be implemented effectively by peer providers (Fromme and Corbin, 2004; Larimer et al., 2001; O'Leary et al., 2002), with the results of some studies suggesting that peers may enhance the efficacy of BASICS for high-risk populations (Larimer et al., 2001). In addition, research indicates that BASICS is efficacious for both reductions in heavy drinking and for prevention of drinking initiation or escalation (Larimer et al. 2001, 2007; Miller et al., 2001).

To date, no published research has evaluated BASICS with high school or college athletes specifically. In addition, although BASICS has been shown to be efficacious in multiple randomized trials, effects on drinking behavior generally range from small to moderate in magnitude (Carey et al., 2007). Implementing BASICS in the context of other, complementary interventions may improve overall efficacy in comparison with a single-intervention approach.

Parent-based interventions. Until recently, one gap in prevention efforts for college drinking had been parent interventions. Turrissi and colleagues (2001, 2006a) implemented a parent intervention among teens before college. It consisted of strategies for positive parenting, for teaching teens to avoid high-risk drinking, and for increasing alternative nondrinking behaviors (Turrissi et al., 2001). The results indicated lower drinking with the parent intervention, compared with no-treatment controls. Less positive beliefs about drinking mediated the effects of the parent intervention (Turrissi et al., 2006a). Recent research replicated the efficacy of this intervention on a high-risk campus (Ray et al., 2006). Specifically, these prior studies were promising. However, they have been criticized as being limited by small samples, short-term follow-ups, and posttest-only comparison designs. The present study addresses each of these methodological issues.

Rationale for parent, peer, and combined interventions. Both preventive peer-delivered motivational feedback interventions and parent interventions are supported by the existing literature (Larimer and Cronce, 2002, 2007; Turrissi et al., 2001). Yet, to date, no intervention has been developed specifically to address these two divergent types of critical influence concurrently. Although the two interventions have minimal overlap in content (e.g., blood alcohol concentration [BAC]), they are not at odds with each other. The parent intervention contains content on setting limits, reasons for drinking, risks of drinking to get drunk, warning signs of a drinking problem, and riding with a drunk driver. The BASICS intervention covers the participant's drinking, perceived and actual descriptive drinking norms, consequences, and protective strategies. By contrasting the combined parent and peer interventions relative to BASICS-only, parents-only,

and assessment-only controls, we were able to address several novel questions. For example, although both interventions are efficacious in their own right, there were no empirical data to indicate which intervention approach is more efficacious. Furthermore, the present study allowed us to evaluate the combined efficacy of these approaches. We hypothesized that the combined condition would serve to make the messages from these critical referents more credible.

In sum, the present study was designed to integrate these interventions within a high-risk population of high-school athletes transitioning to college. We expected the combined condition, having elements of both intervention approaches, would be efficacious across the range of drinkers. Based on key elements of the interventions as well as prior research, we further hypothesized that perceived descriptive and injunctive norms (Neighbors et al., 2007), beliefs about drinking, and attitudes toward going to a party or bar to get drunk (Turrisi et al., 2006a) would mediate intervention efficacy. Finally, we explored whether gender, campus, and baseline drinking would moderate the observed effects (Lewis and Neighbors, 2006; Presley et al., 2002).

Method

Participants

Participants were randomly selected incoming freshmen ($N = 4,000$) at large public northeastern (site A) and northwestern (site B) universities screened during the summer of 2006. Eligible participants provided consent to participate, completed an online screening assessment, and completed a baseline assessment during the summer before college matriculation. They had participated in high school or club team athletics.

Of the 4,000 participants contacted, 1,796 consented to participate and completed the Web-based screening assessment, yielding a 45% response rate. This rate is consistent with other Web-based studies (Larimer et al., 2007; McCabe et al., 2005; Thombs et al., 2005). Seventy-nine percent of those who completed the screening survey ($n = 1,419$) met athletic-eligibility study-inclusion requirements—slightly higher than in previous studies (Doumas et al., 2007). Of these individuals, 1,275 (90%) completed the baseline assessment and were randomized to one of the four conditions. All procedures were approved by the institutional review board at each site. There were a few procedural differences between sites that resulted from the structuring of the campus calendar, but all analyses revealed no significant site differences.

Measures

Alcohol use. Peak blood alcohol content (peak BAC) was calculated using participants' responses to the question about

maximum drinks consumed on an occasion within the past 30 days and the number of hours they spent drinking on that occasion (Dimeff et al., 1999; Marlatt et al., 1998). BAC was calculated following established guidelines (Dimeff et al., 1999; Matthews and Miller, 1979). Participants also were asked to indicate the number of drinks they consumed on each day of a typical week, using the Daily Drinking Questionnaire (Collins et al., 1985). Responses were summed for the total number of drinks during a typical week. Responses for Friday and Saturday were summed for the total number of drinks consumed on a typical weekend. A standard drink definition was included for all measures (i.e., 12 oz of beer, 10 oz of wine cooler, 4 oz of wine, 1 oz of 100-proof distilled spirits, or 1.25 oz of 80-proof distilled spirits).

Alcohol-related consequences. The 23-item Rutgers Alcohol Problem Index (RAPI; White and Labouvie, 1989) was used to assess alcohol-related consequences within the past 3 months. Participants indicated the number of times they experienced each consequence on a scale from never (0) to more than 10 times (4). Prevalence was coded as the sum of consequences experienced at least once (Martens et al., 2007). Prevalence ranged from 0 to 23 (Cronbach's $\alpha = .848$).

Descriptive drinking norms. Two items from the Core Institute's Campus Assessment of Alcohol and Other Drug Norms were summed to create a composite descriptive-norms variable ($\alpha = .858$; Presley et al., 1996). Participants indicated their perception of the number of occasions that typical college students at their university consumed alcohol and the number of times typical students at their university got drunk within the past year.

Injunctive norms. Injunctive norms were assessed with respect to participants' closest friends (Baer, 1994) and parents (Wood et al., 2004). Participants responded to the question as to how their closest friends would respond (strong disapproval [1] to strong approval [7]) if they drank alcohol every weekend, drank daily, drove a car after drinking, and drank enough to pass out ($\alpha = .710$). Parent approval of alcohol use was measured by asking students how their parents would respond (strongly disapprove [1] to strongly approve [5]) if they drank one or two drinks, three or four drinks, and five or more drinks on one occasion and five or more drinks once or twice each weekend ($\alpha = .897$).

Beliefs about alcohol. Beliefs about alcohol were assessed with four items from past research (Turrisi et al., 2000, 2001) summed to create a composite variable ($\alpha = .837$). Participants were asked to indicate their agreement (strongly disagree [1] to strongly agree [5]) with these statements: "Having a few drinks is a nice way to celebrate," "Drinking makes me feel good," "A few drinks makes it easier to talk to people," and "Alcohol adds fun and excitement to an otherwise boring life."

Attitudes toward drinking. Two items assessing attitudes toward drinking selected from past research (Turrisi, 1999)

were summed to create a composite variable ($\alpha = .871$). Participants were asked to indicate their agreement (strongly disagree [1] to strongly agree [5]) with statements that they feel favorable toward (1) drinking at a bar and (2) going to a party to get drunk.

Screening and recruitment procedure

Students. Participants were randomly selected from the registrar's database of incoming freshmen. At site A, 2,328 students were selected, and at site B 1,672, resulting in a total of 4,000 students. Invitation letters explaining the study, compensation, and procedures and containing a URL and a personal identification number for accessing the survey were mailed to all 4,000 students. An emailed invitation and postcard reminders also were sent. Participants were informed that they would receive \$10 for the screening survey, \$25 for the baseline survey, and \$30 for a follow-up survey. They were to receive a \$5 bonus for completion of any survey within 48 hours. Students also were informed about attending a 1-hour education program and brief evaluation, for which they would receive \$10.

As described previously, 1,275 participants meeting inclusion criteria completed the baseline assessment and were randomized, using a computerized algorithm, to one of four conditions (BASICS only, parent only, combined BASICS and parent, or assessment-only control; see Figure 1). The computerized algorithm used simple randomization, drawing one of four numbers corresponding to the four conditions on a random basis as the participants' data were submitted.

Parents. Following completion of teen baseline and randomization to condition, the parents of all the teens ($n = 1,275$) were invited to participate. The parents were sent a letter explaining the study, a consent form, and a \$10 check and were asked to complete a survey assessing parent-teen communication. The letter informed parents that they would be sent materials to read and evaluate sometime within the next year, for which they would receive \$15. They also were asked to discuss the information with their sons or daughters. A total of 903 parents (70.8%) consented. No differences were observed on teen baseline drinking between parents who consented versus those who did not.

BASICS intervention

Procedure. Participants randomized to participate in a BASICS session, on completion of the baseline assessment, were invited to schedule their meeting either online, by email, or by telephone. Email and phone contacts were made by research assistants. BASICS interventions were 45-60 minutes and were conducted one-on-one with a trained peer facilitator (see the *Training of peer facilitators* section). Sessions were audio-taped to evaluate facilitator adherence, and consent for taping was obtained at study entry.

The facilitator oriented the participant to a computer-generated personalized feedback sheet. Sections covered topics that included the participant's drinking pattern, perceived and actual descriptive norms for drinking, drinking consequences, alcohol caloric consumption (based on reported typical drinking) and hours of exercise required to burn those calories, and protective behavioral strategies the participant had already used. Participants received a copy of the personalized feedback, a personalized wallet-sized BAC card, a tips sheet (including general BASICS information and tips as well as information specific to alcohol and athletic performance), and a resource list of addiction services in the area. Participants who were randomized to, but did not attend, the BASICS session were mailed their session materials, based on research showing both formats to be efficacious (Larimer et al., 2001; Larimer et al., 2007).

Because prior research (Anderson and Larimer, 2002; Larimer et al., 2007, Miller et al., 2001) indicated that BASICS and related interventions are associated with both preventive and harm-reduction outcomes and can be used effectively with abstainers and light drinkers, no significant revisions to the intervention were made based on participants' drinking status. Consistent with the work of Larimer and colleagues (2007), feedback includes norms for the percentage of students who did not drink at all, and BASICS skills tips include support for both nondrinking and moderate-drinking goals.

Training of peer facilitators. BASICS facilitators were trained undergraduate ($n = 18$) or entry-level graduate students ($n = 3$) who had recently participated or were currently participating in competitive athletics. The decision to use peers as facilitators was based on literature indicating similar (Fromme and Corbin, 2004) or better (Larimer et al., 2001) outcomes for peer facilitators, compared with professional facilitators implementing brief motivational alcohol interventions with college students. In addition, athletic peers were selected because of theoretical and empirical support for the influence of similar others on complex social behaviors (of which alcohol use is prototypical; Festinger, 1954; Latane, 1981; Lewis and Neighbors, 2004; Rimal and Real, 2003, 2005).

Facilitators were instructed to wear casual athletic clothing and to use inclusive language (i.e., use of words such as "we" and "us") when referring to alcohol's role in athletic performance, injury recovery, and the like, but they did not otherwise emphasize their athletic participation unless asked by participants. All facilitators were college students and introduced themselves as such at the beginning of the session. Facilitator selection was based on interest, availability, and an interview assessing interpersonal skills and athletic involvement. Participation in the randomized trial was based on the ability to attain initial competency in motivational interviewing and BASICS.

Facilitators were trained by clinical psychologists and counselors specializing in interventions for college student

FIGURE 1. Participant flow diagram; BASICS = Brief Alcohol Screening and Intervention for College Students; NA = not applicable

drinking. Initial training consisted of didactic presentations, written materials, videotapes, and interactive exercises to facilitate review of alcohol-related content and motivational-interviewing strategies (Miller and Rollnick, 2002) that are integral to BASICS (Dimeff et al., 1999; Larimer et al., 2001; Marlatt et al., 1998). This training was presented during workshops and weekly training meetings over 10 weeks. Supplementary materials on the effects of alcohol on sleep, injury recovery, and dehydration relevant to athletic participation also were provided. Facilitators completed homework assignments and in-class exercises and received written feedback regarding biweekly audio-taped role plays. These assignments were coded by trained motivational-interviewing coders and were reviewed for content by the principal investigators. Once adherent, facilitators underwent weekly group and individual supervision led by the investigators.

Fidelity. Peer facilitators were monitored through coding random 20-minute segments of every session, using the Motivational Interviewing Treatment Integrity 2.0 (Moyers et al., 2005) coding system. Motivational Interviewing Treatment Integrity is used for assessing beginning proficiency in motivational interviewing (Moyers et al., 2005) via a 7-point Likert-type scale on global measures of empathy and motivational-interviewing spirit, and specific in-session behavior counts. All facilitators were initially trained to beginning proficiency criteria (5.0) on global scores. Across all sessions, the mean score for facilitator empathy was 4.57 and for motivational-interviewing spirit was 4.49. Facilitators exceeded beginning proficiency criteria on all behavior count ratios.

Parent intervention procedures

Parents randomized to receive the intervention were mailed a handbook during the transition period between their teens' high school graduation and first year in college. The handbook was the same version as used by Turrissi et al. (2001) and is described in depth in that earlier study. The 35-page handbook included an overview of college student drinking, strategies and techniques for communicating effectively with teens, tips on discussing ways to help teens develop assertiveness and resist peer pressure, and in-depth information on teen drinking and how alcohol affects the body.

To ensure that parents read the materials, they were asked to evaluate the handbook by filling out a brief questionnaire, as well as making notes directly on the handbook itself, and then returning both. The questionnaire asked parents to make ratings of how interesting, readable, useful, and effective the material was in each section (0 = not at all, 1 = slightly, 2 = moderately, 3 = quite, and 4 = extremely) and whether they had discussed the materials with their teens. Ratings for each section of the book on each evaluative category were uniformly positive, ranging from 3.16 to 3.67. In addition,

for 21 of the 26 topics covered on drinking, greater than 85% of the parents indicated that they discussed the material with their teens. The mean frequency across topics for the not-at-all discussed option was low (mean [SD] = 11.79% [10.91]). Finally, 84% of the parents recorded positive comments in the margins of the text that were congruent with the evaluative ratings. These data are consistent with those of Turrissi et al. (2001) and provide fidelity evidence that parents read the materials and engaged in conversations with their teens.

Control group procedures

Participants in the assessment-only control group completed all procedures in an identical manner to the BASICS-, parent-, and combined-intervention conditions, except that the BASICS intervention was mailed and the parent intervention was offered after the follow-up.

Follow-up procedure

The follow-up assessment was conducted approximately 10 months after baseline (spring semester). Students received mail and email invitations, a survey URL, a unique personal identification number, and email reminders to access the survey. Survey completions yielded 85.5% ($n = 1,090$) follow-up.

Analytic strategy

First, preliminary analyses were conducted for descriptive statistics, to determine baseline equivalence of the sample, and to deal with missing data, attrition, and outliers. Second, analysis of covariance was used to examine drinking outcome mean differences at follow-up by treatment condition, with baseline drinking and gender controlled for on the intent-to-treat sample. Third, gender and site were explored as moderators of the relationship between intervention group and drinking outcomes, using analyses of covariance. Baseline drinking also was examined as a moderator, conducted in AMOS 7.0 using the logic described by Jaccard and Turrissi (2003).

Lastly, beliefs about alcohol, attitudes toward drinking, descriptive norms, and injunctive norms (for peers and parents) were explored as mediators between intervention efficacy and drinking outcomes at follow-up. The joint significance test of alpha and beta was used to assess mediation, comparing the control condition with the combined condition, based on the work of MacKinnon et al. (2002). MacKinnon and colleagues compared the joint significance test with thirteen other mediation techniques and observed that the joint significance test had the most power and the most conservative Type I error rates.

Bootstrapped regression analyses were used to evaluate the alpha and beta paths, testing the model shown with

AMOS 7.0. The bootstrapping procedure was used because of the nonnormal distribution of our mediators and outcome variables. First, the alpha path, the effect of the program on the hypothesized mediator, was assessed for statistical significance. Second, the beta path was assessed for significance and the effect of the mediator on the outcome, while intervention program effects in the equation were controlled for. If both the α and β paths jointly showed significance at the .05 level, there was evidence for a significant mediating relationship (e.g., being in the control/intervention group affects the outcome variable through changes in the mediating variables; MacKinnon, 1994). The mediated effect is the product of the alpha and beta values ($\alpha\beta$) and provides an estimate of the relative strength of the mediated effects.

Results

Preliminary analyses

Descriptives. Participants (mean = 17.92 [0.39] years) were 44.4% male ($n = 566$) and 55.6% female ($n = 709$); 4.5% identified as Hispanic or Latino(a), 79.8% as white, 10.1% as Asian, 3.7% as multiracial, 2.0% as black or African American, 0.5% as Native Hawaiian or other Pacific Islander, 0.2% as American Indian/Alaskan Native, and 3.2% as other; 0.4% did not identify race/ethnicity. With respect to baseline drinking, means and standard errors for peak BAC, drinks per weekend, drinks per week, and consequences are included in Table 1.

Baseline equivalence of samples. Participants were compared on baseline characteristics, including demographic (ethnicity and gender) and drinking variables across conditions. Pearson's chi-square was used for categorical variables (e.g., ethnicity), whereas analysis of variance was used for continuous variables (peak BAC, drinks per week, drinks

per weekend, consequences). Results indicated no significant differences with respect to ethnicity ($\chi^2 = 15.993$, 18 df, NS; $n = 1,270$), peak BAC ($F = 0.234$, 3/1,271 df, NS), total drinks consumed per week ($F = 0.260$, 3/1,271 df, NS), total drinks consumed per weekend ($F = 0.370$, 3/1,271 df, NS), or number of alcohol-related consequences ($F = 1.024$, 3/1,271 df, NS). At baseline, 85% reported lifetime alcohol consumption, and 53.3% reported experiencing alcohol-related consequences. The latter percentage is higher relative to more general samples of students transitioning from high school to college (Johnston et al., 2006). Finally, a significant difference was observed between conditions for gender ($F = 9.170$, 3/1,275 df, $p < .05$). Although there were more females than males across all conditions, significant differences were observed in the control and BASICS groups. Gender was included as a covariate and also was examined as a moderator in the analyses examining the impact of intervention condition on drinking at follow-up.

Attrition, missing data, and outliers. Analyses were conducted to determine whether there were differences in attrition for the follow-up assessment with respect to baseline demographics, drinking tendencies, and intervention group. Results indicated no significant differences on demographic characteristics (gender, ethnicity), as well as on baseline drinking measures, including peak BAC, drinks per week, drinks per weekend, and number of consequences (all p 's $> .05$). However, the results revealed a small but significant difference in the participant dropout rate among the four intervention conditions ($\chi^2 = 14.00$, 3 df, $p < .01$; $n = 1,275$). The control group had the highest number of follow-up survey completers (89.7%), compared with those in the parent condition (88.3%), the BASICS condition (82.3%), and the combined condition (81.3%). Missing data on our outcome variables (peak BAC, drinks per week, drinks per weekend, and consequences) at baseline and follow-up were

TABLE 1. Means and standard errors for drinking by intervention group: Intent to treat at baseline and follow-up

Outcome	Combined Mean (SE)	BASICS Mean (SE)	Parent Mean (SE)	Control Mean (SE)	F (3/1,270 df)
Peak BAC					
Baseline	0.072 (0.005)	0.074 (0.107)	0.075 (0.114)	0.078 (0.124)	
Follow-up	0.096 ^{a,b} (0.005)	0.107 ^a (0.005)	0.114 (0.005)	0.122 (0.005)	4.856 [†]
Drinks per weekend					
Baseline	3.291 (0.266)	3.127 (0.296)	3.190 (6.683)	3.510 (0.267)	
Follow-up	5.601 ^{a,b} (0.273)	5.818 ^{a,b} (0.303)	6.759 (0.284)	6.649 (0.274)	4.325 [†]
Drinks per week					
Baseline	3.680 (0.313)	3.647 (0.347)	3.626 (0.325)	3.973 (0.314)	
Follow-up	7.266 ^{a,b} (0.353)	7.491 (0.392)	8.537 (0.367)	8.382 (0.354)	3.047*
RAPI count					
Baseline	2.260 (0.174)	2.449 (0.194)	2.066 (0.181)	2.453 (0.175)	
Follow-up	2.839 ^{a,b,c} (0.176)	3.440 (0.196)	3.558 (0.184)	3.489 (0.177)	3.462*

Notes: BASICS = Brief Alcohol Screening and Intervention for College Students; BAC = blood alcohol concentration; RAPI = Rutgers Alcohol Problem Index. ^aIndicates mean difference as compared with control group; ^bindicates mean difference as compared with parent group; ^cindicates mean difference as compared with BASICS group. F = test of mean differences controlling for baseline drinking.

* $p < .05$; $^{\dagger}p < .01$.

trivial within session (less than 1%). As indicated earlier, the amount of missing data as a result of attrition was low (less than 15%). Thus, we subjected all of the drinking variables, as well as the mediator variables (e.g., attitudes and norms), at baseline and follow-up, simultaneously to a maximum likelihood approach (EM [estimate missing] in SPSS), recommended by Schafer and Graham (2002). Finally, based on the recommendations of Tabachnick and Fidell (2001), extreme outliers on all variables having open-ended response options, which were extremely low in frequency (e.g., less than .05%), were rescored to a unit greater than the largest nonoutlying value (e.g., 3.29 standard deviations above the mean) to achieve acceptable levels of skewness and kurtosis in the univariate distributions (e.g., <2 and 4, respectively).

Intervention efficacy

The results indicated a significant treatment effect for all outcome variables of interest: peak BAC ($F = 4.589$, 3/1,270 df, $p < .01$), number of drinks in a typical weekend ($F = 4.643$, 3/1,270 df, $p < .01$), number of drinks in a typical week ($F = 2.806$, 3/1,270 df, $p < .05$), and number of consequences ($F = 3.195$, 3/1,270 df, $p < .05$). Means and standard errors adjusted for baseline drinking are presented in Table 1. Given the four-group study design, Tukey's Honestly Significant Differences mean difference tests were conducted to interpret the nature of the significant treatment effects. Participants randomized to the combined condition reported significantly less drinking and fewer consequences, compared with those in the control group (peak BAC: Cohen's $d = 0.26$; drinks per weekend: $d = 0.20$; drinks per week: $d = 0.16$; RAPI: $d = 0.20$), as well as those in the parent-intervention group (peak BAC: $d = 0.17$; drinks per weekend: $d = 0.18$; drinks per week: $d = 0.14$; RAPI: $d = 0.13$; all p 's < .05).

Participants in the combined group also reported significantly fewer consequences than those randomized to BASICS ($p < .05$, $d = 0.20$). Participants randomized to BASICS reported a significantly lower peak BAC ($d = 0.16$) compared with the control group, significantly fewer drinks per weekend compared with both control ($d = 0.18$) and parent-only ($d = 0.16$) conditions, and significantly fewer drinks per week compared with the parent-only ($d = 0.13$) condition (p 's < .05).

Analyses also were conducted on individuals who met the criteria of completing all phases of the interventions (treatment complete), as follows:

- In the parent-only group, 63% ($n = 199$) of the parents returned the handbook, the evaluation, or both.
- In the BASICS-only group, 53.8% ($n = 149$) of the teens attended BASICS, and 68.2% ($n = 189$) of the parents returned the consent form or the brief survey, yielding 112 (40.4%) participants in this group who met both criteria.

- In the combined group, 53.8% ($n = 184$) of the teens attended BASICS, and 59.9% ($n = 205$) of the parents returned the handbook, the evaluation, or both (59.9%, $n = 205$), yielding 112 (32.7%) participants in this group who met both criteria.
- In the control group, 70% ($n = 238$) of the parents returned the consent form or the brief survey.

No differences in the findings were observed between the intent-to-treat and the treatment-complete samples.

Finally, for participants randomized to the BASICS-only and combined conditions, a set of analyses was conducted to determine whether differences existed between participants who received the BASICS intervention in person versus those who were mailed their intervention materials. Results indicated no differences on all outcome variables of interest (t 's < 1.96, p 's > .05).

Moderators of intervention efficacy

The results indicated no significant group by campus or group by gender interactions. These results also revealed nonsignificant interactions between baseline drinking and interventions for all outcomes.

Mediators of intervention efficacy

Unstandardized regression coefficients for the program on the mediator, the mediator on the outcome, and the mediated effect are in Table 2. The results revealed that descriptive and injunctive peer norms were significant mediators between the intervention and all drinking outcomes. Relative to participants in the control group, those who received both parent

TABLE 2. Path coefficients for program effects on mediators, mediator effects on total drinking, and mediated effects

Variable	Beliefs	Attitudes	Descriptive norms	Injunctive norms: Peer	Injunctive norms: Parent
Peak BAC					
α	-0.190*	-0.127	-0.372†	-0.202*	0.043
β	0.003*	0.016†	0.004*	0.005†	0.000
$\alpha\beta$	-0.001*	-0.002	-0.001*	-0.001*	0.000
Week					
α	-0.190*	-0.127	-0.372†	-0.202*	0.043
β	0.169	1.312†	0.330†	0.436†	-0.244†
$\alpha\beta$	-0.032	-0.167	-0.123*	-0.088*	0.010
Weekend					
α	-0.190*	-0.127	-0.372†	-0.202*	0.043
β	0.106	1.048†	0.274†	0.310†	-0.195†
$\alpha\beta$	-0.020	-0.133	-0.102*	-0.063*	-0.008
RAPI count					
α	-0.190*	-0.127	-0.372†	-0.202*	0.043
β	0.173†	0.413†	0.107*	0.141†	0.003
$\alpha\beta$	-0.033*	-0.052	-0.040*	-0.028*	0.000

Notes: BAC = blood alcohol concentration; RAPI = Rutgers Alcohol Problem Index. α = program effect on mediator; β = mediator effect on outcome; $\alpha\beta$ = mediated effect.

* $p < .05$; † $p < .01$.

and BASICS interventions perceived that typical college students drink less and perceived their peers to be less favorable toward their drinking behaviors, and, in turn, they reported lower peak BAC and fewer drinks per week, weekend, and consequences at follow-up. Alcohol beliefs mediated the relationship between intervention and peak BAC and consequences but not drinks per week or weekends. Attitudes toward drinking and injunctive parent norms did not significantly mediate the relationship between intervention group and drinking outcomes.

Finally, we examined the direct effect of the intervention on each drinking outcome separately, including all mediators in each of the models, to evaluate the strength of the mediated pathway (e.g., partial vs complete mediation). In each instance, we observed nonsignificant direct effects when all mediators were included in the model, suggesting complete mediation (all p 's < .05).

Discussion

Brief motivational interventions such as BASICS (Dimeff et al., 1999) and parent interventions (Turrisi et al., 2001) have shown efficacy in reducing risky drinking among college students (Larimer et al., 2001; Larimer and Crouce, 2002; Marlatt et al., 1998; Turrisi et al., 2001). To date, however, no study had examined the combined effect of these interventions. Additionally, neither intervention had been tested with high school athletes, a group shown to be at risk for excessive alcohol use. The current study consisted of a multisite randomized clinical trial to evaluate efficacy of the parent and BASICS interventions alone and in combination, in reducing alcohol use and consequences among high school athletes during their first year in college. We further evaluated proposed moderators and mediators.

Efficacy of the interventions

As hypothesized, the combined parent and BASICS interventions resulted in significantly lower consumption of alcohol, less high-risk drinking, and fewer consequences at 10-month follow up, compared with controls. Specifically, significant differences were observed for peak BAC, typical weekend drinking, weekly drinking, and consequences in the combined-intervention condition, in comparison with controls and the parent-alone condition. The combined condition also was more effective than BASICS alone in reducing consequences.

The BASICS-alone condition demonstrated an impact on weekend drinking, in comparison with the control and parent-only conditions; and on peak BAC, in comparison with the controls. In contrast to previous studies, the parent-alone intervention did not differ significantly from the control condition on drinking or consequence outcomes. Although the parent-alone intervention has shown efficacy as a universal

intervention (Turrisi et al., 2001) and in high-risk environments (Ichiyama et al., 2008; Ray et al., 2006), this was its first test as selective prevention with a high-risk population. High school athletes have been shown to initiate drinking earlier (Hildebrand et al., 2001), and, as a result, they may not respond to a parent intervention alone. Future research should examine the timing of delivery and whether parents of high school athletes differ from parents of nonathletes on constructs shown to be relevant in prior research (e.g., parent communication; Wood et al., 2004).

The combined effect of the interventions was consistent in reducing drinking and consequences, suggesting that increased dosage of the intervention, different types of information, and multiple modalities of delivery may be beneficial. The results suggest that the parent intervention delivered before college may serve to enhance the efficacy of BASICS, potentially priming students to the subsequent BASICS message. BASICS has the ability to reinforce and add credibility to parents' messages and to provide relevant motivation for individuals who may have established drinking patterns. In addition, the combination of the two interventions provides a consistent message about harmful drinking from two meaningful social influences—parents and peers. Consistent with Social Impact Theory (Latane, 1981), communication of a consistent message through multiple channels may have served to reinforce changes in norms and beliefs about alcohol and changes in drinking.

Importantly, neither gender, campus, nor baseline drinking moderated the effects of the combined intervention. Rather, the combination of these approaches appears to be similarly effective for both men and women and for abstainers and heavy drinkers. Given the relatively low cost and easy implementation of the parent intervention, the findings of the current study strongly suggest that the parent handbook should be used as a routine adjunct to BASICS.

Mediators of intervention efficacy: Beliefs and perceived norms

The combined intervention was designed to target influences on college drinking. In particular, both perceived descriptive norms (through provision of normative feedback) and perceived injunctive norms (through college student peers and parents to implement the interventions) were targeted. Consistent with hypotheses, descriptive and injunctive norms mediated effects of the combined intervention, in comparison with the control group, across all drinking and consequence outcomes. The combined intervention was associated with fewer positive beliefs about alcohol, which mediated peak BAC and negative consequences but not typical weekend drinking or total drinks per week. Thus, it appears that normative perceptions affect typical as well as high-risk drinking, whereas beliefs about alcohol's effects may be central only to heaviest drinking occasions.

Limitations

Although careful consideration was taken to reduce limitations, several do remain. As with any self-report data, biases are always a concern. To promote honest responding, assurances of confidentiality were stated throughout the survey and the consent form, individuals were able to respond via a Web-based survey rather than an in-person interview, and a measure of social desirability was included to evaluate any bias in responding. Consistent with previous research (Laforge et al., 2005), we found no evidence of self-report bias.

A second limitation was the relatively low rate (53.8%) of completion of the in-person BASICS. The session lasted 50-60 minutes, and many students found it difficult to schedule such a session in light of other commitments early in the semester when the study was conducted. Those who could not be scheduled for an in-person session were mailed their BASICS feedback and tips sheets. Mailed feedback has been shown to be efficacious for preventing and reducing drinking in college populations across a 1-year follow-up period (Larimer et al., 2007) and for increasing the likelihood of maintaining abstinence for those students who have not yet initiated drinking.

In addition, several studies have found no differences between written BASICS feedback, compared with in-person BASICS (Murphy et al., 2004; White et al., 2006), although recent data suggest that the in-person BASICS may have advantages over written feedback over a longer follow-up (i.e., 15 months; White et al., 2007). In the current study, the results were similar for the treatment completers (those attending a BASICS session), compared with the intent-to-treat analyses, most likely because everyone randomized to the BASICS-only or the combined condition received mailed feedback if they did not attend a BASICS session. From a sustainability standpoint, universities may consider requiring students to complete the program or offering appealing incentives for an in-person BASICS intervention, or they may choose to focus on mailed feedback as an alternative.

A third limitation is that the quality of intervention delivery by peers may have attenuated efficacy of BASICS. We cannot discount the possibility of larger effects had we used experienced therapists rather than peers, nor can we determine the extent to which the use of athletic peers, compared with college students in general, affected outcomes. Research has shown, however, that interventions provided by peers are comparable to or in some cases better than those provided by professionals (Fromme and Corbin, 2004; Larimer et al., 2001). Although the peers in this study were on average slightly below beginning proficiency on global ratings of empathy and motivational-interviewing spirit, they met criteria on all motivational-interviewing behavior counts, and recent research suggests that in-session behaviors may be more relevant to predicting outcomes than global ratings (Tollison

et al., 2008). Additional research evaluating the relationship between in-session behaviors and drinking outcomes may provide important information regarding how peer-delivered interventions could be improved to augment efficacy.

With respect to replication, we expect that athletic peers may not be necessary for the population of high school athletes, inasmuch as this population is quite broad and may identify sufficiently with college student peers without the additional element of athletic similarity. Future research should evaluate the extent to which identification with or perceived similarity to the provider enhances efficacy of alcohol interventions in college populations.

A fourth potential limitation is that effect sizes might have been larger if the sample had been restricted only to heavy-drinking students. Of note, however, drinking status did not moderate outcomes in the current study, and prior research with in-person brief motivational and skills-based interventions has shown these approaches to be efficacious for preventing initiation and escalation of drinking in addition to reducing heavy drinking (Anderson and Larimer, 2002; Larimer et al., 2007; Miller et al., 2001). Nevertheless, additional research evaluating the combined intervention in individuals screened as heavy drinkers may be warranted.

A fifth limitation is that 61.4% of the parents consented to participate and returned the parent handbook in the parent-only and the combined conditions. This response rate is lower than in Turrissi et al. (2001). In that study, however, the parents verbally consented via the telephone, and all materials were delivered to the parents and were collected from them. In contrast, in the present study the materials were mailed. The person-to-person contact may have increased the parents' motivation to engage in the intervention. Such implementation differences could account for the lower response rates and differences in findings. Future research may benefit from examining different delivery modalities. Nevertheless, we did not observe differences in the results of the intent-to-treat parent conditions versus the results of the treatment-complete parent conditions. It is uncertain whether the procedures we used stimulated spontaneous conversations between parents and teens (mailing parents detailed consent forms indicating the importance of parent communications on college drinking tendencies).

Future directions and conclusions

Although the combined intervention showed promise, the optimal timing and dosage of the intervention remain uncertain. For instance, the parent intervention has demonstrated efficacy in universal contexts, but, with high-risk populations, an increased dosage may be needed and content modified. More work is needed to evaluate whether interventions need tailoring to match levels of risk. For example, abstainers or light drinkers may benefit from the parent intervention and the mailed BASICS rather than the in-person BASICS

session, whereas heavy drinkers may benefit from the parent intervention and the in-person BASICS. Although interventions have shown efficacy and promise in reducing drinking among college students, none have resolved the problem entirely. The combination of efficacious interventions shows some promise in influencing drinking styles for groups and environments of varying risk.

References

- ABAR, C. AND TURRISI, R. How important are parents during the college years? A longitudinal perspective of indirect influences parents yield on their college teens' alcohol use. *Addict. Behav.* **33**: 1360-1368, 2008.
- AMERICAN COLLEGE HEALTH ASSOCIATION. The American College Health Association National College Health Assessment (ACHA-NCHA), Spring 2003 Reference Group Report. *J. Amer. Coll. Hlth* **53**: 199-210, 2005.
- ANDERSON, B.K. AND LARIMER, M.E. Problem drinking and the workplace: An individualized approach to prevention and treatment. *Psychol. Addict. Behav.* **16**: 243-251, 2002.
- BAER, J.S. Effects of college residence on perceived norms for alcohol consumption: An examination of the first year in college. *Psychol. Addict. Behav.* **8**: 43-50, 1994.
- BAER, J.S. Student factors: Understanding individual variation in college drinking. *J. Stud. Alcohol*, Supplement No. 14, pp. 40-53, 2002.
- BAER, J.S., KIVLAHAN, D.R., BLUME, A.W., MCKNIGHT, P., AND MARLATT, G.A. Brief intervention for heavy-drinking college students: 4-year follow-up and natural history. *Amer. J. Publ. Hlth* **91**: 1310-1316, 2001.
- BAER, J.S., STACY, A., AND LARIMER, M. Biases in the perception of drinking norms among college students. *J. Stud. Alcohol* **52**: 580-586, 1991.
- BORSARI, B. AND CAREY, K.B. Effects of a brief motivational intervention with college student drinkers. *J. Cons. Clin. Psychol.* **68**: 728-733, 2000.
- BORSARI, B. AND CAREY, K.B. Peer influences on college drinking: A review of the research. *J. Subst. Abuse* **13**: 391-424, 2001.
- CAREY, K.B., CAREY, M.P., MAISTO, S.A., AND HENSON, J.M. Brief motivational interventions for heavy college drinkers: A randomized clinical trial. *J. Cons. Clin. Psychol.* **74**: 93-95, 2006.
- CAREY, K.B., SCOTT-SHELDON, L.A., CAREY, M.P., AND DEMARTINI, K.S. Individual-level interventions to reduce college student drinking: A meta-analytic review. *Addict. Behav.* **32**: 2469-2494, 2007.
- CHASSIN, L. AND HANDLEY, E.D. Parents and families as contexts for the development of substance use and substance use disorders. *Psychol. Addict. Behav.* **20**: 135-137, 2006.
- COLLINS, R.L., PARKS, G.A., AND MARLATT, G.A. Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *J. Cons. Clin. Psychol.* **53**: 189-200, 1985.
- COOPER, M.L. Alcohol use and risky sexual behavior among college students and youth: Evaluating the evidence. *J. Stud. Alcohol*, Supplement No. 14, pp. 101-117, 2002.
- DAMS-O'CONNOR, K., MARTIN, J.L., AND MARTENS, M.P. Social norms and alcohol consumption among intercollegiate athletes: The role of athlete and nonathlete reference groups. *Addict. Behav.* **32**: 2657-2666, 2007.
- DAWSON, D.A., GRANT, B.F., STINSON, F.S., AND CHOU, P.S. Another look at heavy episodic drinking and alcohol use disorders among college and noncollege youth. *J. Stud. Alcohol* **65**: 477-488, 2004.
- DIMEFF, L.A., BAER, J.S., KIVLAHAN, D.R., AND MARLATT, G.A. Brief alcohol screening and intervention for college students (BASICS): A Harm Reduction Approach. New York: Guilford Press, 1999.
- DOUMAS, D.M., TURRISI, R., COLL, K.M., AND HARALSON, K. High-risk drinking in college athletes and nonathletes across the academic year. *J. Coll. Counsel.* **10**: 163-174, 2007.
- FESTINGER, L. A theory of social comparison processes. *Human Relat.* **7**: 117-140, 1954.
- FROMME, K. AND CORBIN, W. Prevention of heavy drinking and associated negative consequences among mandated and voluntary college students. *J. Cons. Clin. Psychol.* **72**: 1038-1049, 2004.
- GREGORY, B. College Alcohol and Life Skills Study with Student-Athletes, Ph.D. dissertation, Boca Raton, FL: Florida Atlantic University, 2001.
- HAM, L.S. AND HOPE, D.A. Alcohol and anxiety: Subtle and obvious attributes of abuse in adults with social anxiety disorder and panic disorder. *Depress. Anxiety* **18**: 128-139, 2003.
- HILDEBRAND, K.M., JOHNSON, D.J., AND BOGLE, K. Comparison of patterns of alcohol use between high school and college athletes and non-athletes. *Coll. Student J.* **35**: 358-365, 2001.
- HINGSON, R., HEEREN, T., WINTER, M., AND WECHSLER, H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24: Changes from 1998 to 2001. *Annual Rev. Publ. Hlth* **26**: 259-279, 2005.
- ICHIMAYA, M.A., FAIRLIE, A.M., WOOD, M., TURRISI, R., STANGER, L., FRANCIS, D., AND RAY, A.E. A randomized trial of a parent-based intervention with incoming college students. Paper presented at the 31st Annual Scientific Meeting of the Research Society on Alcoholism, Washington, DC, June 28-July 2, 2008.
- JACCARD, J. AND TURRISI, R. Interaction Effects in Multiple Regression, 2nd Edition, Thousand Oaks, CA: Sage, 2003.
- JONES, B.T., CORBIN, W., AND FROMME, K. A review of expectancy theory and alcohol consumption. *Addiction* **96**: 57-72, 2001.
- JOHNSTON, L.D., O'MALLEY, P.M., BACHMAN, J.G., AND SCHULENBERG, J.E. Monitoring the Future: National Results on Adolescent and Drug Use: Overview of Key Findings, 2005, NIH Publication No. 06-5882, Bethesda, MD: National Institute of Drug Abuse, 2006.
- LAForge, R.G., BORSARI, B., AND BAER, J.S. The utility of collateral informant assessment in college alcohol research: Results from a longitudinal prevention trial. *J. Stud. Alcohol* **66**: 479-487, 2005.
- LARIMER, M.E. AND CRONCE, J.M. Identification, prevention, and treatment: A review of individual-focused strategies to reduce problematic alcohol consumption by college students. *J. Stud. Alcohol*, Supplement No. 14, pp. 148-163, 2002.
- LARIMER, M.E. AND CRONCE, J.M. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999-2006. *Addict. Behav.* **32**: 2439-2468, 2007.
- LARIMER, M.E., LEE, C.M., KILMER, J.R., FABIANO, P.M., STARK, C.B., GEISNER, I.M., MALLETT, K.A., LOSTUTTER, T.W., CRONCE, J.M., FEENEY, M., AND NEIGHBORS, C. Personalized mailed feedback for college drinking prevention: A randomized clinical trial. *J. Cons. Clin. Psychol.* **75**: 285-293, 2007.
- LARIMER, M.E., TURNER, A.P., ANDERSON, B.K., FADER, J.S., KILMER, J.R., PALMER, R.S., AND CRONCE, J.M. Evaluating a brief alcohol intervention with fraternities. *J. Stud. Alcohol* **62**: 370-380, 2001.
- LATANE, B. The psychology of social impact. *Amer. Psychol.* **36**: 343-356, 1981.
- LEWIS, M.A. AND NEIGHBORS, C. Gender-specific misperceptions of college student drinking norms. *Psychol. Addict. Behav.* **18**: 334-339, 2004.
- LEWIS, M.A. AND NEIGHBORS, C. Who is the typical college student? Implications for personalized normative feedback intervention. *Addict. Behav.* **31**: 2120-2126, 2006.
- MCCABE, S.E., HUGHES, T.L., BOSTWICK, W., AND BOYD, C.J. Assessment of difference in dimensions of sexual orientation: Implications for substance use research in a college-age population. *J. Stud. Alcohol* **66**: 620-629, 2005.
- MACKINNON, D.P. Analysis of mediating variables in prevention and intervention research. In: CÁZARES, A. AND BEATTY, L.A. (Eds.) Scientific Methods for Prevention Intervention Research. NIDA Research Monograph No. 139, DHHS Publication No. 94-3631, Washington: Government Printing Office, 1994, pp. 127-153.

- MACKINNON, D.P., LOCKWOOD, C.M., HOFFMAN, J.M., WEST, S.G., AND SHEETS, V. A comparison of methods to test mediation and other intervening variable effects. *Psychol. Meth.* **7**: 83-104, 2002.
- MARCELLO, R.J., DANISH, S.J., AND STOLBERG, A.L. An evaluation of strategies developed to prevent substance abuse among student athletes. *Sport Psychol.* **3**: 196-211, 1989.
- MARLATT, G.A., BAER, J.S., KIVLAHAN, D.R., DIMEFF, L.A., LARIMER, M.E., QUIGLEY, L.A., SOMERS, J.M., AND WILLIAMS, E. Screening and brief intervention with high-risk college student drinkers: Results from a 2 year follow-up assessment. *J. Cons. Clin. Psychol.* **66**: 604-615, 1998.
- MARTENS, M.P., DAMS-O'CONNOR, K., AND BECK, N.C. A systematic review of college student-athlete drinking: Prevalence rates, sport-related factors, and interventions. *J. Subst. Abuse Treat.* **31**: 305-316, 2006.
- MARTENS, M.P., NEIGHBORS, C., DAMS-O'CONNOR, K., LEE, C.M., AND LARIMER, M.E. The factor structure of a dichotomously scored Rutgers Alcohol Problem Index. *J. Stud. Alcohol Drugs* **68**: 597-606, 2007.
- MATTHEWS, D.B. AND MILLER, W.R. Estimating blood alcohol concentration: Two computer programs and their applications in therapy and research. *Addict. Behav.* **4**: 55-60, 1979.
- MILLER, E.T., KILMER, J.R., KIM, E.L., WEINGARDT, K.R., AND MARLATT, G.A. Alcohol skills training for college students. In: MONTI, P.M., COLBY, S.M., AND O'LEARY, T.A. (Eds.) *Adolescents, Alcohol and Substance Abuse: Reaching Teens Through Brief Intervention*, New York: Guilford Press, 2001, pp. 183-215.
- MILLER, E.T., TURNER, A.P., AND MARLATT, G.A. The harm reduction approach to the secondary prevention of alcohol problems in adolescents and young adults: Considerations across a developmental spectrum. In: MONTI, P.M., COLBY, S.M., AND O'LEARY, T.A. (Eds.) *Adolescents, Alcohol and Substance Abuse: Reaching Teens Through Brief Intervention*, New York: Guilford Press, 2001, pp. 58-79.
- MILLER, W.R. AND ROLLNICK, S. *Motivational Interviewing: Preparing People to Change*, 2nd Edition, New York: Guilford Press, 2002.
- MOYERS, T.B., MARTIN, T., MANUEL, J.K., HENDRICKSON, S.M.L., AND MILLER, W.R. Assessing competence in the use of motivational interviewing. *J. Subst. Abuse Treat.* **28**: 19-26, 2005.
- MURPHY, J.G., BENSON, T.A., VUCHINICH, R.E., DESKINS, M.M., EAKIN, D., FLOOD, A.M., McDEVITT-MURPHY, M.E., AND TORREALDAY, O. A comparison of personalized feedback for college student drinkers delivered with and without a motivational interview. *J. Stud. Alcohol* **65**: 200-203, 2004.
- NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. *What Colleges Need to Know Now: An Update on College Drinking Research*, NIH Publication No. 07-5010, Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism, 2007.
- NEIGHBORS, C., LEE, C.M., LEWIS, M.A., FOSSOS, N., AND LARIMER, M.E. Are social norms the best predictor of outcomes among heavy drinking college students? *J. Stud. Alcohol Drugs* **68**: 556-565, 2007.
- O'LEARY, T.A., BROWN, S.A., COLBY, S.M., CRONCE, J.M., D'AMICO, E.J., FADER, J.S., GEISNER, I.M., LARIMER, M.E., MAGGS, J.L., MCCRADY, B., PALMER, R.S., SCHULENBERG, J., AND MONTI, P.M. Treating adolescents together or individually? Issues in adolescent substance abuse interventions. *Alcsm Clin. Exp. Res.* **26**: 890-899, 2002.
- O'MALLEY, P.M. AND JOHNSTON, L.D. Epidemiology of alcohol and other drug use among American college students. *J. Stud. Alcohol, Supplement No. 14*, pp. 23-39, 2002.
- PATOCK-PECKHAM, J.A. AND MORGAN-LOPEZ, A.A. College drinking behaviors: Mediation links between parenting styles, impulse control, and alcohol-related outcomes. *Psychol. Addict. Behav.* **20**: 117-125, 2006.
- PATOCK-PECKHAM, J.A. AND MORGAN-LOPEZ, A.A. College drinking behaviors: Mediation links between parenting styles, parental bonds, depression, and alcohol problems. *Psychol. Addict. Behav.* **21**: 297-306, 2007.
- PERKINS, H.W. Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *J. Stud. Alcohol, Supplement No. 14*, pp. 91-100, 2002.
- PERKINS, H.W. AND CRAIG, D.W. A successful social norms campaign to reduce alcohol misuse among college student-athletes. *J. Stud. Alcohol* **67**: 880-889, 2006.
- PRESLEY, C.A., MEILMAN, P.W., AND CASHIN, J.R. *Alcohol and Drugs on American College Campuses: Use, Consequences, and Perceptions of the Campus Environment*, Volume IV: 1992-94, Carbondale, IL: CORE Institute, Southern Illinois University, 1996.
- PRESLEY, C.A., MEILMAN, P.W., AND LEICHLITER, J.S. College factors that influence drinking. *J. Stud. Alcohol, Supplement No. 14*, pp. 82-90, 2002.
- RAY, A.E., TURRISI, R., AND BENTLEY, S. Examination of the efficacy of a parent-based intervention to reduce underage high-risk drinking on a high-risk campus. Poster presented at the 29th Annual Scientific Meeting of the Research Society on Alcoholism, Baltimore, MD, June 23-June 28, 2006.
- READ, J.P., WOOD, M.D., AND CAPONE, C. A prospective investigation of relations between social influences and alcohol involvement during the transition into college. *J. Stud. Alcohol* **66**: 23-34, 2005.
- RENO, R.R., CIALDINI, R.B., AND KALLGREN, C.A. The transsituational influence of social norms. *J. Pers. Social Psychol.* **64**: 104-112, 1993.
- RIMAL, R.N. AND REAL, K. Understanding the influence of perceived norms on behaviors. *Communicat. Theory* **13**: 184-203, 2003.
- RIMAL, R.N. AND REAL, K. How behaviors are influenced by perceived norms: A test of the theory of normative social behavior. *Communicat. Res.* **32**: 389-414, 2005.
- SCHAFER, J.L. AND GRAHAM, J.W. Missing data: Our view of the state of the art. *Psychol. Meth.* **7**: 147-177, 2002.
- SCHULENBERG, J.E. AND MAGGS, J.L. A developmental perspective on alcohol use and heavy drinking during adolescence and the transition to young adulthood. *J. Stud. Alcohol, Supplement No. 14*, pp. 54-70, 2002.
- TABACHNICK, B.G. AND FIDELL, L.S. *Using Multivariate Statistics*, 4th Edition, Boston, MA: Allyn and Bacon, 2001.
- TASK FORCE OF THE NATIONAL ADVISORY COUNCIL ON ALCOHOL ABUSE AND ALCOHOLISM. *A Call to Action: Changing the Culture of Drinking at U.S. Colleges*, NIH Publication No. 02-5010, Bethesda, MD: National Institute on Alcohol Abuse and Alcoholism, 2002.
- THOMBS, D.L. AND HAMILTON, M.J. Effects of a social norm feedback campaign on the drinking norms and behavior of division I student-athletes. *J. Drug Educ.* **32**: 227-244, 2002.
- THOMBS, D.L., RAY-TOMASEK, J., OSBORN, C.J., AND OLDS, R.S. The role of sex-specific normative beliefs in undergraduate alcohol use. *Amer. J. Hlth Behav.* **29**: 342-351, 2005.
- TOLLISON S.J., LEE, C.M., NEIGHBORS, C., NEIL, T.A., OLSON, N.D., AND LARIMER, M.E. Questions and reflections: The use of motivational interviewing microskills in a peer led brief alcohol intervention for college students. *Behav. Ther.* **39**: 183-194, 2008.
- TURNER, A.P., LARIMER, M.E., AND SARASON, I.G. Family risk factors for alcohol-related consequences and poor adjustment in fraternity and sorority members: Exploring the role of parent-child conflict. *J. Stud. Alcohol* **61**: 818-826, 2000.
- TURRISI, R. Cognitive and attitudinal factors in the analysis of alternatives to binge drinking. *J. Appl. Social Psychol.* **29**: 1510-1535, 1999.
- TURRISI, R., JACCARD, J., TAKI, R., DUNNAM, H., AND GRIMES, J. Examination of the short-term efficacy of a parent intervention to reduce college student drinking tendencies. *Psychol. Addict. Behav.* **15**: 366-372, 2001.
- TURRISI, R., JAMES, M., REAVY, R., LARIMER, M., AND KILMER, J. Comparison of patterns in drinking between athletes and non-athletes in high school and college. Paper presented at the 27th Annual Scientific Meeting of the Research Society on Alcoholism, Vancouver, Canada, June 26-June 30, 2004.
- TURRISI, R., MALLETT, K., AND ABAR, C. Mediation factors influencing the efficacy of a parent intervention to reduce college drinking. Paper presented at the International Society on Biomedical Research on Alcohol, 2006 World Congress, Sofitel Wentworth, Sydney, Australia, September 2006a.

- TURRISI, R., MALLET, K.A., MASTROLEO, N.R., AND LARIMER, M.E. Heavy drinking in college students: Who is at risk and what is being done about it? *J. Gen. Psychol.* **133**: 401-420, 2006b.
- TURRISI, R., MASTROLEO, N.R., MALLET, K.A., LARIMER, M.E., AND KILMER, J.R. Examination of the mediational influences of peer norms, environmental influences, and parent communications on heavy drinking tendencies in athletes and nonathletes. *Psychol. Addict. Behav.* **21**: 453-461, 2007.
- TURRISI, R., WIERSMA, K.A., AND HUGHES, K.K. Binge-drinking-related consequences in college students: Role of drinking beliefs and mother-teen communications. *Psychol. Addict. Behav.* **14**: 342-355, 2000.
- VAN DER VORST, H., ENGELS, R.C.M.E., MEEUS, W., AND DEKOVIC, M. Parental attachment, parental control, and early development of alcohol use: A longitudinal study. *Psychol. Addict. Behav.* **20**: 107-116, 2006.
- WECHSLER, H., FULOP, M., PADILLA, A., LEE, H., AND PATRICK, K. Binge drinking among college students: A comparison of California with other states. *J. Amer. Coll. Hlth* **45**: 273-277, 1997.
- WECHSLER, H., LEE, J.E., KUO, M., SEIBRING, M., NELSON, T.F., AND LEE, H. Trends in college binge drinking during a period of increased prevention efforts. *J. Amer. Coll. Hlth* **50**: 203-217, 2002.
- WETHERILL, R.R. AND FROMME, K. Perceived awareness and caring influences alcohol use by high school and college students. *Psychol. Addict. Behav.* **21**: 147-154, 2007.
- WHITE, H.R. AND LABOUVIE, E.W. Towards the assessment of adolescent problem drinking. *J. Stud. Alcohol* **50**: 30-37, 1989.
- WHITE, H.R., MORGAN, T.J., PUGH, L.A., CELINSKA, K., LABOUVIE, E.W., AND PANDINA, R.J. Evaluating two brief substance-use interventions for mandated college students. *J. Stud. Alcohol* **67**: 309-317, 2006.
- WHITE, H.R., MUN, E.Y., PUGH, L., AND MORGAN, T.J. Long-term effects of brief substance use interventions for mandated college students: Sleeper effects of an in-person personal feedback intervention. *Alcsm Clin. Exp. Res.* **31**: 1380-1391, 2007.
- WOOD, M.D., CAPONE, C., LAFORGE, R., ERICKSON, D.J., AND BRAND, N.H. Brief motivational intervention and alcohol expectancy challenge with heavy drinking college students: A randomized factorial study. *Addict. Behav.* **32**: 2509-2528, 2007.
- WOOD, M.D., READ, J.P., MITCHELL, R.E., AND BRAND, N.H. Do parents still matter? Parent and peer influences on alcohol involvement among recent high school graduates. *Psychol. Addict. Behav.* **18**: 19-30, 2004.
- WOOD, M.D., READ, J.P., PALFAI, T.P., AND STEVENSON, J.F. Social influence processes and college student drinking: The mediational role of alcohol outcome expectancies. *J. Stud. Alcohol* **63**: 32-43, 2001.