Alcohol Risk-Reduction Skills Training in a National Fraternity: A Randomized Intervention Trial With Longitudinal Intent-to-Treat Analysis*

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ABSTRACT. Objective: The potential effectiveness of two group-administered social-skills training interventions for reducing high-risk drinking behavior was evaluated through a prospective randomized intervention trial with 3,406 members of a national college fraternity. **Method:** Ninety eight of 99 chapters of a national fraternity were randomly assigned, within three strata, to receive (1) a 3-hour baseline intervention, (2) the same baseline intervention plus two booster sessions, or (3) assessments only. The current article emphasizes a rigorous intent-to-treat analysis model that compares outcomes among members assigned to receive study interventions (vs assessment-only sites) regardless of whether they actually did receive them; it also includes individuals at intervention sites even if they did not participate. This model allows us to address a social policy issue regarding the effect that introducing such an intervention may have in changing the high-risk normative drinking environment of the fraternity itself. **Results:** Frequent heavy drinkers (64.2% of members) assigned to either intervention showed significant reductions at a 6-month follow-up in their frequency of drinking, heavy drinking, and drinking to intoxication; plus, they reported consuming fewer drinks overall. At 12 and 18 months postbaseline, these positive outcomes had largely dissipated. Additionally, there was an increase in drinking among lower-risk members 18 months postbaseline, which may be the result of factors other than differential attrition. **Conclusions:** Findings suggest that introducing such a brief intervention can effectively reduce risky drinking behavior on a short-term basis in high-risk members of a national fraternity. Future studies may wish to focus on strategies for sustaining positive outcomes for longer, plus would benefit, in general, from learning more about mechanisms of change. (*J. Stud. Alcohol Drugs* **68:** 399-409, 2007)

EMPIRICAL FINDINGS DURING THE LAST 50 years have conclusively documented higher levels of alcohol use and related risk behavior in college students than in same-age peers (O'Malley and Johnston, 2002). Heavy drinkers in college also report suffering an array of adverse symptoms and consequences (Hingson et al., 2002; Perkins, 2002; Wechsler et al., 1994, 1998, 2000, 2002), including accidents and injuries when drinking, fights with others, sexual risk behavior, sexual aggression, driving while intoxicated (DWI), and riding with intoxicated drivers. Further, problems such as increased numbers of missed classes and poorer academic performance can affect academic success. Although most students who drink heavily in college do not go on to become problem drinkers later in life, heavy drinking in college does predict problem drinking behavior 10 years later (O'Neill et al., 2001).

Received: June 19, 2006. Revision: December 21, 2006.

*This article is based on research supported by grant R01 AA012532 from the National Institute on Alcohol Abuse and Alcoholism.

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Among college students, fraternity and sorority members have repeatedly been found to exhibit the highest levels of alcohol use and related risk behavior. Collegiate members of fraternities and sororities are more likely than other students to be heavy drinkers and to suffer an array of negative consequences (Bartholow et al., 2003; Cashin et al., 1998; Larimer et al., 2000; Marlatt et al., 1995; Wechsler et al., 1996, 2002). Some speculate that the fraternity environment contributes to heavy alcohol-use levels because it offers easy access to alcohol, promotes drinking to foster socialization, and helps to support the continuation of heavy levels of alcohol use that began in high school (Borsari and Carey, 2003). Attributes of the fraternity environment, including a fixed living environment, value placed on brotherhood, and loyalty to the group, also influence drinking behavior. Paradoxically, these attributes provide prevention researchers with the advantage of an insular setting that controls many factors in the collegiate environment. And, central to the research reported here, the fraternity environment reinforces peer influence.

Since the 1990s, alcohol-prevention efforts have flourished on college and university campuses, including programs targeting high-risk groups such as fraternity/sorority organizations (e.g., Far and Miller, 2003; Larimer et al., 2001). These efforts have included diverse, individually focused approaches (e.g., educational/awareness programs and

cognitive-behavioral interventions) and environmental strategies (e.g., restrictions on the availability of alcohol on campus) that address campus- and community-level influences on student alcohol use (Dowdall and Wechsler, 2002). Individually focused approaches that show promise include brief, skills-based training and motivational interviewing. Although many interventions show significant reductions in students' drinking levels, postintervention drinking amounts still remain high (Larimer and Cronce, 2002). This is especially true for members of fraternity/sorority systems (Larimer et al., 2000).

In addition to brief, individually focused, cognitive-behavioral interventions, programs designed to teach friends and others in the drinker's environment to intervene to reduce a drinker's risk have been studied. For example, programs that teach servers of alcohol how to reduce risk for DWI in their patrons have often been shown to be effective (Russ and Geller, 1987; Saltz, 1997; Saltz and Stanghetta, 1997). Several of these programs are now routinely used by members of the hospitality industry; establishments that train staff become eligible for reductions in the costs of their drinking-related liability insurance. Public programs that promote the use of designated drivers or free taxi rides to reduce a drinker's risk for DWI also try to persuade friends or companions of drinkers to assist in encouraging risk reduction in their friends. For example, a popular theme for promoting risk reduction in drinkers at risk for DWI suggests "friends don't let friends drive drunk."

As important as peers are in the lives of adolescents and young adults, it is surprising that few prevention efforts with college students have examined the potential for peers to engage high-risk drinkers in risk reduction. Although the role of peers in exerting social pressure to drink is well established (Borsari and Carey, 2001; Caudill and Kong, 2001; Curran et al., 1997; Hawkins et al., 1992; Quigley and Collins, 1999), peers can also play a protective role in adolescent and young adult substance-use behavior (Maxwell, 2002). Using the influential power of peer leaders to deliver positive messages has met with some prior success in substance-use preventive interventions (Gottfredson and Wilson, 2003; Mellanby et al., 2000). Despite the potential effectiveness of peer influence models in general, we do not know whether peer-based interventions will reduce risk in friends who already exhibit risky drinking practices.

We know of only one such intervention program designed with college students in mind. Health Communications, Inc., of Arlington, VA, which developed one of the original server training programs for barrooms in the 1980s (e.g., see Russ and Geller, 1987), subsequently developed a college-based intervention training program entitled Training for Intervention Procedures (TIPS) for the University (Health Communications, Inc., 1998). This program teaches participants how to intervene to prevent risk in their friends; it has an advantage over many of the individually focused preventive interventions that have previously been studied with college students in that it is group-administered (with up to 30 participants at a time).

The current study was designed to examine the potential effectiveness of two versions of the TIPS for the University program with college student members of a national fraternity. To achieve this, we employed a three-group design with random assignment of chapters (n = 98 of 99 available chapters; 3,406 students), within suitable study strata, to one of three experimental conditions: (1) a standard intervention group (SI) that received a 3-hour baseline training only; (2) an enhanced intervention group (EI) that received the same baseline training, plus 1.5-hour booster intervention sessions at 5 and 11 months postbaseline; or (3) an assessment-only, or standard practices, control group (SP) that received no active intervention during the study period. Research assessments were conducted at baseline as well as 6, 12, and 18 months later. The current study had two central goals. First, we sought to determine whether introducing the TIPS intervention would be effective overall in reducing high-risk drinking in student members of a national fraternity. More importantly, however, we specifically sought to examine its effectiveness in reducing risky drinking in high-risk drinkers at baseline, as this was the group for whom the intervention was intended. Second, we sought to determine whether adding booster intervention sessions would help to bolster intervention effects or extend positive outcomes.

In addition to benefiting from the inclusion of a national sample of fraternity members with random assignment by chapter to examine these issues, other strengths of the current study include data collection and measurement techniques that enhance student participation levels and disclosure of sensitive information (e.g., audio-enhanced, computer-assisted, self-interviewing procedures and an Alcohol Timeline Followback calendar to detail recent alcohol use); an inclusion of a diversity of alcohol-use measures to permit a comprehensive examination of study effects; and longer-term follow-up assessments than are typical (e.g., see Larimer and Cronce, 2002) to allow for a thorough examination of intervention effects over time. Finally, the current study and related analyses emphasize an intent-to-treat design, which compares sites and individuals who were *assigned* to receive respective study interventions regardless of whether they (as sites or individuals) actually did. An intent-to-treat design allows us to examine the potential impact, from a policy perspective, of introducing such interventions in changing the drinking subculture of the fraternity itself.

Method

Context of the research: The national fraternity

The current study was conducted with a national college fraternity that was one of 32 members of the Fraternity

Executives Association (FEA) at the time of our baseline data collection (FEA, 2002). According to the FEA report, which profiles certain global characteristics of national fraternal organizations, the fraternity included in this study approximated national averages in its number of chapters, members per chapter, number of colonies, proportion of chapters with fraternity housing, and proportion of housing with alcohol-free policies. The national fraternity we selected was also one of two at the time our project began that (1) had expressed an interest in TIPS for the University trainings, (2) had not previously been TIPS trained, and (3) had no other preventive interventions currently planned or recently implemented. Because one of these fraternities had implemented trainings at some of its sites before the current project was funded, the other fraternity was selected for the study.

Study participants

Participants in the study (at baseline) included 3,406 male college students enrolled in 98 (of 99 available) chapters of this national fraternity. One site refused participation. Our total study sample size is based on an 86% response rate at baseline across all participating chapters (or 85% after adjusting for the one site-level refusal). Participating chapters were located in 32 different states throughout the mainland United States. At the time of the baseline interviews, 16.3% of study participants were freshman, 27.8% were sophomores, 27.4% were juniors, 19.9% were seniors, and 8.6% were in their fifth year. Among undergraduates, freshmen comprised the smallest proportion of our sample because some chapters do not admit new pledges until the spring semester. Participant ages ranged from 18 to 30 years, with a mean (SD) age of 20.32 years (1.65). Most students classified themselves as white (95.3%), followed by Asian (2.1%), and black (1.6%). Small numbers classified themselves as American Indian or Alaska native (0.6%) and native Hawaiian or Pacific Islander (0.4%). Approximately 5% were Hispanic or Latino, the majority of whom (63%) also classified themselves as white. Self-reported grade point averages at baseline ranged from 4 (A) to 1 (D), with a mean of 2.98 (0.76).

Randomized study design and strata

A randomized block design, with three study strata, guided the assignment of the 98 available fraternity chapters to one of three experimental conditions. Study strata commonly related to alcohol use, and henceforth variables controlled for, included whether chapters (1) had fraternity housing (n = 75) or not (n = 23), (2) had alcohol-free fraternity housing (i.e., no alcohol use was to be allowed at the fraternity house; n = 18) or did not (n = 80), and (3) had been sanctioned for "problem behavior" in the past 12 months (n = 9) or had not (n = 89). The three experimental conditions included SI and EI groups, and an assessment only, or SP control group condition. After a baseline research assessment, students at SI chapters participated in a 3-hour intervention. Students at EI chapters participated in the same baseline intervention but were also eligible to participate in two 1.5-hour booster intervention sessions that were offered at 5 and 11 months after the baseline intervention. SP chapters participated in assessments only during the 18 months of the investigation. Research assessments, as detailed later, were conducted at baseline and at 6, 12, and 18 months postbaseline.

Additionally, during the several months that transpired between the time of randomly assigning chapters to conditions and the implementation of baseline research assessments, the authors learned that five national chapters were closing or disaffiliating themselves from the national fraternity (all of this occurred before any of the chapters knew about the study). Others were joining and had just been approved to move from the status of technically being considered a "colony" to that of an active chapter. All of this was occurring, as we understand is common, at the beginning of a new school year in the fall of 2000. The five new colonies/chapters were assigned to a condition based on their match on the stratification variables with the five chapters that were closing. When several groups matched, one was randomly chosen.

Data collection procedures

As noted earlier, research assessments were conducted at baseline in fall of 2000 and then again 6, 12, and 18 months later. They were timed to occur at least 30 days after summer break (in the fall) and spring break (in the spring), to avoid any potential anomalies in student drinking practices (e.g., dips or spikes in drinking) that may occur when students are not yet at school (for our fall assessments) or are on spring break (for our spring assessments). This was particularly important because our alcohol-use questions (i.e., the period studied in our Alcohol Timeline Followback calendar) focused on the 4 weeks preceding each assessment. Additionally, to avoid any other potentially contaminating influences of time on alcohol-use behaviors being reported by students in their interviews, chapters were randomly ordered for the assessments (which took place over a 4- to 6-week timeframe, depending on the assessment wave).

Data were collected by project staff through personalized visits to each participating national fraternity chapter, using audio-enhanced, computer-assisted, self-interviewing (A-CASI) procedures. Students completed interviews on personal laptop computers, with headsets (which they were allowed to use if they wished) and touch-screen responding, to ensure that they were all able to complete their

interviews in the utmost privacy. A-CASI procedures, which we found to be very popular with students, have also been shown in a number of prior studies to enhance the validity of personal information provided by respondents (e.g., Perlis et al., 2004; Turner et al., 1998). The A-CASI interviews required between 40 and 60 minutes to complete, and students received $20 as compensation for participating.

Interview content

Project interviews requested information from students regarding the following general content areas: demographic information (namely, age at baseline, year in school, and self-reported grade point averages), students' pre-existing knowledge of the content of the TIPS training materials, alcohol expectancies (Dunn and Goldman, 1996), sensation seeking (Zuckerman, 1994), alcohol use during the last 28 days (described later), and adverse symptoms and consequences from drinking (The Short Index of Problems, Miller et al., 1995; and Rutgers Alcohol Problem Index, White and Labouvie, 1989).

Measuring alcohol use: The Alcohol Timeline Followback calendar. At each data collection wave, study participants completed a computerized version of an Alcohol Timeline Followback calendar (Sobell and Sobell, 1992, 1993) that focused on drinking behavior during the last 28 days. Guided instructions and definitions (e.g., of a standard drink) were provided to ensure accurate completion of the survey. The software we created was designed to mimic the paper-and-pencil version of the instrument, allowing respondents to easily move about the calendar, entering responses consistent with their best recall. Subjects first reviewed a 28-day calendar, which already had special events marked (e.g., Halloween), and they began by entering any special events, functions, parties, or other activities in this time that were personally unique. Detailing these events, and this visual aide, helps interviewees to better recall their experiences during the last 28 days (Sobell and Sobell, 1992). After identifying special events on the 28-day calendar, participants then reported their best estimate of the number of drinks consumed on each day. Unique to our approach, we also asked students to further identify the length of time they took to consume the specified numbers of drinks for each drinking occasion. This information, combined with body weight and known gender, allowed us to calculate estimated blood alcohol concentration (BAC) levels for each drinking occasion (National Highway Traffic Safety Administration, 1994). In combination, our use of the Alcohol Timeline Followback interviewing procedures permitted the construction of a variety of measures of alcohol use for the current study. Measures examined as primary outcome variables for the current article, each of which was based on the last 28 days, included the following: (1) number of drinking days, (2) days consumed five or more drinks, (3) days consumed eight or more drinks, (4) total drinks during the last 28 days, (5) average BAC on drinking days, (6) peak BAC achieved on any one day, and (7) frequent heavy drinking (which characterized those who consumed five or more drinks on at least three occasions in the last 2 weeks as frequent heavy drinkers [FHDs]). The measure "days consumed eight or more drinks" captures the frequency of drinking to intoxication, which we and others (e.g., Lange and Voas, 2001), by extrapolation, have found corresponds in men with a BAC of .10 (r = .92 with this population). At the time of this study, a .10 BAC was the legal definition for intoxication in many American states.

Longitudinal assessment response rates

As noted earlier, 99% of eligible fraternity chapters nationally participated in the study, and 86% of eligible students completed baseline interviews (85% overall; N = 3,406). Response rates in subsequent interviews (at 6, 12, and 18 months postbaseline) ranged from 84% to 89% of eligible respondents (i.e., students who were still registered at their respective colleges, and who remained active members of the fraternity). Central reasons for nonparticipation included being unavailable during the 3-day window in which in-person assessments were conducted (5%), not showing up for scheduled assessments (2%), or refusing to participate (1%).

Study interventions

TIPS for the University. The TIPS for the University program is a one-time, 3-hour, manual-driven, skills-based training program designed to provide participants with the knowledge and skills to (1) know when an alcohol risk-reduction intervention is indicated and (2) effectively intervene to reduce risk in their friends, peers, or drinkers they may not know but who may nevertheless need help. Following the basic tenets of social learning theory (Bandura, 1977, 1986), the TIPS program consists of three modules: (1) an informational module that relies heavily on student and trainer manuals; (2) a skill-building component, using video vignettes, that emphasizes the skills needed to recognize when an intervention is indicated, and the development of interpersonal skills for implementing such an intervention; and (3) a behavioral rehearsal component in which students practice intervention skills they have discussed and observed in the skill-building module. For a detailed description of the program, see TIPS for the University materials (Health Communications, Inc., 1998). For the purposes of the current research, TIPS for the University training was provided at fraternity chapters (in groups of up to 30 participants) in both the SI and EI groups, and immediately after baseline research assessments had been completed. Six of 63 assigned chapters refused available

baseline study interventions. For chapters that participated, 65.4% of students at SI sites and 58.9% of students at EI sites attended baseline interventions.

Booster interventions, which we added for the purposes of the current study, were 1.5 hours in duration and included a review of the informational segment of the baseline TIPS training; more video vignettes, role playing and behavioral rehearsals; and a discussion of why interventions students may have tried since their last training did or did not work. Behavioral rehearsals emphasized how to better deal with challenges when trying to intervene with friends or drinking companions. These interventions were introduced in the EI condition at 5 and 11 months postbaseline. For those assigned to the EI group, 79% of students who participated in the baseline intervention also participated in at least one booster intervention session.

Results

Data analysis was conducted in three stages. In Stage 1, we assessed the success of the randomization process and the effects of longitudinal attrition. In Stage 2, we tested for effects of the TIPS intervention on drinking behavior over time. In Stage 3, we examined high-risk frequent heavy drinking behavior at baseline as a potential moderator of intervention effects. High-risk drinking was considered to be an important moderator of intervention effects because the intervention of interest here was specifically designed to reduce risky drinking behavior in high-risk drinkers.

Stage 1: Assessing the success of the experimental design

It is known that random assignment can fail to achieve group equivalence at baseline on important factors (although this is minimized by large sample sizes). In addition, random assignment procedures may be compromised if attrition rates differ across the experimental conditions. Therefore, the Stage 1 analyses tested for (1) group equivalence at baseline and (2) the presence of nonrandom attrition across groups.

Tests of equivalence across experimental conditions at baseline. Seventeen analyses of variance were run to test for differences in demographic variables (age, year in school, grade point average), scores on the pretest TIPS examination, baseline drinking across the three groups, alcohol expectancies (on five factors derived from Dunn and Goldman, 1996), and on adverse symptoms and consequences from drinking (Miller et al., 1995; White and Labouvie, 1989). Because of the large number of tests, we used a Bonferroni correction and set α at .005 to adjust for a potential inflation of the Type 1 error rate. Only two variables reached statistical significance. Small differences were observed between the EI and SP groups on two baseline drinking measures, specifically, how many days in the last 4 weeks they consumed eight or more alcoholic drinks and the total number of drinks they reported consuming in the last 4 weeks. Those assigned to the EI condition exhibited slightly lower risk levels on these two variables compared with those assigned to the SP condition, but there were no statistically significant differences between the SP and SI groups on any drinking measures. We examined the possible biasing effect of the small EI/SP group differences by including these two baseline drinking variables as covariates in our multivariate analysis. Ultimately, we excluded these covariates from the main model results presented later in this article because the results were unchanged with their inclusion. Finally, and perhaps most importantly, in the multilevel models themselves (see Tables 1 and 2), no baseline differences between groups were found on any drinking variable. Overall, our findings indicate that the randomization was successful in creating comparable groups at baseline and that any small observed differences between the EI and SP groups had a negligible impact on model results. A more detailed profile of the characteristics and drinking behaviors of the national sample can be found in Caudill et al. (2006).

Longitudinal attrition. Using the four-step multivariate attrition analysis method recommended by Goodman and Blum (1996), we tested for the presence of nonrandom sampling, and then examined the extent to which nonrandom missing data affected the means and variances of study variables and the relationships among variables. Overall, our attrition analyses suggested attrition was nonrandom, which affected the means and variances of some of the variables but not the underlying relationships among the variables. To the extent that the patterns of relationships are similar for "attriters" and those who remain in the study, researchers can be more confident in performing longitudinal analyses on data that contain nonrandom attrition (Goodman and Blum, 1996). In this case, however, experimental condition was key among variables related to attrition. Participants assigned to the EI and SI conditions were significantly more likely to drop out than were those assigned to the SP group. This finding suggests that differential attrition could pose a potential threat to the internal validity of the study. This also means that treatment-effect analyses using listwise deletion methods for handling missing data may be biased. Therefore, the analyses in Stage 2 were conducted with longitudinal modeling techniques appropriate for handling missing data because such methods provide a more defensible estimation strategy than do listwise deletion methods.

Stage 2: Gauging the effectiveness of the TIPS intervention on drinking outcomes

Having first determined that the randomization process was successful in creating comparable groups at baseline, we then turned to evaluating the study interventions. In

gauging the effectiveness of study interventions on reducing high-risk drinking behavior, we deliberately preserved the integrity of the randomized experimental design by including in each condition all the participants who were randomized into it, whether or not they actually participated in the intervention. This test of experimental effects provides a conservative, lower bound estimate of the impact of interventions on hypothesized outcomes.

Multilevel or mixed-effects regression models were used to model change on six separate drinking outcomes, each of which had the last 4 weeks as a time reference: (1) number of drinking days, (2) days consumed five or more drinks, (3) days consumed eight or more drinks, (4) total number of drinks consumed, (5) average BAC achieved on drinking occasions, and (6) peak BAC achieved on any one drinking occasion. Mixed-effects regression models take into account nonindependence owing to individual-level repeated measures over time and they allow for a nested data structure (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999). We used SAS PROC MIXED (SAS Institute Inc., Cary, NC) to fit models that examined temporal effects across the six drinking outcomes as a function of condition, testing whether experimental condition accounted for significant variance in the trajectories. This was done by fitting random intercept models that included experimental condition as a Level 2 covariate, coding the experimental group as 1 and the control group as 0. One set of models compared the SI condition with the SP condition, whereas another set of models compared the EI condition with the SP condition. All models assumed normally distributed random effects.

For some participants, drinking outcome variables were available at all four time points, whereas for other participants they were available at fewer time points (owing to factors such as our inclusion of seniors, many of whom graduated after the 6-month follow-up assessments). The mixed-effects regression estimation used in this study is a full-information, maximum likelihood procedure in which missing data are assumed to be "ignorable," conditional on both the model covariates and dependent variables (Raudenbush and Bryk, 2002; Snijders and Bosker, 1999). For inclusion in the analysis, participants' data at a specific time point, including both the dependent variable and all model covariates, must be complete; however, participation in every follow-up assessment wave is not required. The number of repeated observations for a particular individual depends on the number of time points for which complete data are available. In this case, models comparing the SI condition with the SP condition contained 66 sites or Level 3 observations, 2,386 participants or Level 2 observations, and a range of 6,413 to 6,574 repeated measures or Level 1 observations. Models comparing the EI condition with the SP condition contained 63 sites or Level 3 observations, 2,073 participants or Level 2 observations, and a range of 5,504 to 5,646 repeated measures or Level 1 observations for the outcome variables. Level 1 observations varied across models because dependent variables had different missing data patterns.

To address the question of whether study interventions were associated with declines in excessive drinking, we estimated a series of three-level mixed effects regression models that included three dummy-coded time effects to represent the 6-, 12-, and 18-month follow-up information compared with baseline. Models also included a variable representing individuals' year in school at baseline, a dummy variable indicating membership in the SI or EI condition, and Covariate × Time interaction terms. Because the four time points were represented by three dummy-coded time variables, the intercept estimates reflect the SP condition at study entry (i.e., when all time effects and experimental condition variables are 0), and the estimates for each time dummy variable represent the difference between the intercept and that time point. Because of the inclusion of the interaction terms, covariate effects represent differences at study entry, and Covariate × Time interaction terms reflect comparisons between the follow-up time points and study entry for each variable. For example, a significant negative intervention Condition × Time 2 estimate would indicate that at 6 months (postbaseline), individuals in the intervention group had steeper declines in drinking compared with individuals in the SP condition, controlling for year in school. Table 1 presents findings from models comparing the SI condition with the SP group, and Table 2 presents findings comparing the EI condition with the SP group.

In the first comparison conducted, which contrasted the SI condition with the SP group, SI × Time 2 estimates were negatively signed in all cases and showed statistically significant reductions in drinking on four of six outcomes. In other words, participants in the SI group, compared with those in the SP group, showed significantly steeper declines in drinking from baseline to the 6-month follow-up (see Table 1). These effects, all of which are for the preceding 4 weeks, held for number of drinking days, days consumed five or more drinks, days consumed eight or more drinks, and the number of drinks consumed overall. Nonetheless, these positive outcomes dissipated by the 12- and 18-month postbaseline follow-up assessments. Another noteworthy finding in the comparison of the SI and SP groups was that, at 18 months postbaseline, two measures of alcohol use showed a steeper increase from baseline levels in the SI group, relative to SP. Students in SI chapters, relative to those in SP ones, showed a higher rate of increase from baseline to 18 months later, in reports of total drinks consumed in the last 4 weeks and peak BACs when drinking.

In examining comparisons between the EI and the SP groups (see Table 2), it is noteworthy that a similar reduction in drinking, and on all the variables, was evident at 6

TABLE 1. Three-level analysis of the effects of the standard TIPS intervention over time, compared with standard practices condition

Fixed effect	Drinking days Estimate (SE)	≥5 drinks Estimate (SE)	≥8 drinks Estimate (SE)	Total drinks Estimate (SE)	Average BAC Estimate (SE)	Peak BAC Estimate (SE)
Intercept	9.83‡ (0.58)	7.26‡ (0.57)	4.87‡ (0.47)	74.04‡ (5.98)	0.109‡ (0.005)	0.210‡ (0.010)
Time 2, 6 month vs baseline	-0.37 (0.36)	0.12 (0.31)	-0.02 (0.28)	-0.33 (3.53)	-0.001 (0.004)	-0.007 (0.008)
Time 3, 12 month vs baseline	-0.10 (0.47)	0.35 (0.41)	0.71 (0.36)	4.08 (4.64)	0.004 (0.005)	-0.006 (0.010)
Time 4, 18 month vs baseline	-0.49 (0.54)	-0.53 (0.47)	-0.15 (0.42)	-4.37 (5.32)	-0.007 (0.006)	-0.012 (0.011)
Year in school at baseline	0.08 (0.09)	-0.04 (0.08)	-0.02 (0.07)	0.75 (0.94)	-0.005 (0.001)	-0.008‡ (0.002)
Year in School × Time 2	0.03 (0.11)	-0.06 (0.10)	-0.02 (0.09)	-0.94 (1.10)	-0.0004 (0.001)	0.001 (0.002)
Year in School × Time 3	-0.18 (0.13)	-0.20 (0.12)	-0.31* (0.10)	-2.90* (1.31)	-0.001 (0.002)	-0.001 (0.003)
Year in School × Time 4	-0.12 (0.15)	-0.08 (0.13)	-0.22 (0.12)	-2.49 (1.47)	-0.003 (0.002)	-0.006 (0.003)
Standard intervention, vs standard practice	0.88 (0.72)	1.05 (0.72)	1.01 (0.58)	11.93 (7.36)	0.008 (0.006)	0.010 (0.012)
Standard Intervention × Time 2	-0.59* (0.25)	-0.59* (0.22)	-0.53* (0.19)	-5.03* (2.44)	-0.006 (0.003)	-0.007 (0.005)
Standard Intervention × Time 3	0.12 (0.27)	0.26 (0.24)	0.16 (0.21)	0.50 (2.66)	0.0008 (0.003)	0.003 (0.006)
Standard Intervention × Time 4	0.02 (0.29)	0.31 (0.25)	0.44 (0.22)	5.61* (2.82)	0.012 (0.003)	0.020‡ (0.006)
Random effect	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)
Level 1: Individuals	14.09 (0.31)	10.50 (0.23)	8.38 (0.18)	1,294.34 (28.93)	0.0018 (0.00004)	0.006 (0.0001)
Level 2: Individuals within chapters	16.43 (0.67)	13.92 (0.55)	11.75 (0.99)	1,918.05 (75.59)	0.0017 (0.00008)	0.006 (0.0002)
Level 3: Between chapters	7.37 (1.47)	7.60 (1.50)	4.90 (0.99)	774.29 (155.65)	0.0005 (0.00011)	0.002 (0.0004)
Model χ^2	2,792.47‡	3,257.18‡	3,079.96‡	2,985.61‡	2,134.98‡	2,022.81‡
Models with interaction terms: *Moderator analysis* Fixed effect	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
FHD × Standard Intervention	0.96* (0.46)	0.38 (0.39)	0.52 (0.37)	5.97 (4.62)	-0.003 (0.005)	-0.009 (0.009)
FHD × Standard Intervention × Time 2	-1.41* (0.51)	-1.08* (0.44)	-0.91* (0.40)	-11.44* (4.94)	0.002 (0.006)	-0.002 (0.011)
FHD × Standard Intervention × Time 3	0.07 (0.55)	-0.003 (0.47)	-0.36 (0.43)	-2.37 (5.33)	0.006 (0.006)	0.006 (0.012)
FHD × Standard Intervention × Time 4	-1.72* (0.59)	-0.61 (0.50)	-0.71 (0.46)	-5.59 (5.69)	0.01 (0.007)	0.017 (0.012)

Notes: TIPS = Training for Intervention Procedures; BAC = blood alcohol concentration; Est. var. = estimated variance; FHD = frequent heavy drinker at baseline.
*$p < .05$; ‡$p < .001$.

months postbaseline for sites in the EI condition, relative to the SP one, but none of these differences achieved statistical significance as they had for the SI/SP comparison. Also, similar to the SI/SP comparison, iatrogenic effects were evident at 18 months postbaseline where students in EI chapters, compared with those in SP ones, showed steeper increases in alcohol use from baseline to the 18 months postbaseline on five of six variables examined. These included the frequency of consuming five or more or eight or more drinks; the total drinks consumed; the average BAC achieved on drinking occasions; and the peak BAC achieved on any one drinking occasion.

Stage 3: Moderator analyses

Because the intervention of interest here was specifically designed to reduce risk in "high-risk drinkers," we next estimated a second series of models that included frequent heavy drinking at baseline as a moderator effect. For the purpose of these analyses, frequent heavy drinking was defined as consuming five or more drinks on at least three occasions in the last 2 weeks. Of the total sample, 64.2% of students were classified as FHDs. This set of models was identical to the previous set except for the addition of a covariate representing frequent heavy drinking behavior at baseline, associated Covariate × Time interaction terms, and three-way interactions among frequent heavy drinking, experimental condition, and time.

The three-way interaction fixed effects comparing the SI and SP conditions as a function of frequent heavy drinking (presented in the bottom third of Table 1) reveal four statistically significant findings at 6 months postbaseline. For FHDs assigned to the SI group, relative to those in the SP one, there were steeper declines from baseline to 6 months postbaseline for drinking days, days consumed five or more drinks, days consumed eight or more drinks, and for total drinks consumed. Also, there were steeper declines in drinking days between baseline and 18 months postbaseline for SI FHDs, relative to SP ones. Outcomes for the frequencies of consuming five or more drinks, consuming eight or more drinks, and the total drinks consumed still remained negatively signed at 18 months postbaseline but were no longer statistically significant.

A similar pattern of findings is evident in the bottom third of Table 2, where students assigned to the EI condition are compared with those assigned to SP, including frequent heavy drinking as a moderator term. FHDs in the EI group, relative to those in the SP condition, showed steeper

TABLE 2. Three-level analysis of the effects of the enhanced TIPS intervention over time, compared with standard practices condition

Fixed effect	Drinking days Estimate (SE)	≥5 drinks Estimate (SE)	≥8 drinks Estimate (SE)	Total drinks Estimate (SE)	Average BAC Estimate (SE)	Peak BAC Estimate (SE)
Intercept	9.03‡ (0.53)	6.93‡ (0.52)	4.62‡ (0.43)	68.32‡ (5.43)	0.11‡ (0.005)	0.210‡ (0.010)
Time 2, 6 month vs baseline	0.04 (0.40)	0.49 (0.34)	0.51 (0.29)	5.80 (3.58)	0.001 (0.004)	-0.006 (0.008)
Time 3, 12 month vs baseline	-0.23 (0.52)	-0.11 (0.45)	0.53 (0.39)	1.43 (4.77)	0.0005 (0.006)	-0.004 (0.011)
Time 4, 18 month vs baseline	0.08 (0.60)	-0.43 (0.51)	-0.72 (0.44)	-6.39 (5.45)	-0.022‡ (0.007)	-0.032* (0.012)
Year in school at baseline	0.38‡ (0.10)	0.09 (0.09)	0.08 (0.08)	2.86* (0.98)	-0.006‡ (0.001)	-0.007‡ (0.002)
Year in School × Time 2	-0.12 (0.12)	-0.20 (0.11)	-0.22* (0.09)	-3.20* (1.13)	-0.001 (0.001)	0.001 (0.002)
Year in School × Time 3	-0.20 (0.15)	-0.09 (0.13)	-0.28* (0.11)	-2.56 (1.37)	-0.0003 (0.002)	-0.001 (0.003)
Year in School × Time 4	-0.36* (0.17)	-0.14 (0.14)	-0.08 (0.12)	-2.42 (1.52)	0.002 (0.002)	-0.001 (0.003)
Enhanced intervention, vs standard practice	0.10 (0.64)	-0.13 (0.64)	-0.22 (0.52)	-2.73 (6.58)	-0.001 (0.006)	0.001 (0.011)
Enhanced Intervention × Time 2	-0.29 (0.28)	-0.18 (0.24)	-0.18 (0.21)	-0.53 (2.56)	-0.002 (0.003)	-0.005 (0.006)
Enhanced Intervention × Time 3	0.36 (0.31)	0.24 (0.27)	0.22 (0.23)	4.65 (2.82)	0.003 (0.003)	0.005 (0.006)
Enhanced Intervention × Time 4	0.62 (0.33)	0.87* (0.28)	0.99‡ (0.24)	10.40‡ (2.96)	0.010* (0.004)	0.018* (0.007)
Random effect	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)	Est. var. (SE)
Level 1: Individuals	15.75 (0.37)	11.35 (0.27)	8.41 (0.20)	1,232.54 (29.67)	0.0018 (0.00004)	0.006 (0.0002)
Level 2: Individuals within chapters	16.58 (0.74)	14.07 (0.60)	11.69 (0.49)	1,823.99 (76.42)	0.0016 (0.00008)	0.005 (0.0003)
Level 3: Between chapters	5.18 (1.13)	5.48 (1.14)	3.58 (0.76)	568.84 (121.44)	0.0004 (0.0001)	0.002 (0.0004)
Model χ^2	1,961.15‡	2,455.45‡	2,478.12‡	2,429.35‡	1,510.98‡	1,504.75‡
Models with interaction terms: *Moderator analysis* Fixed effect	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)	Estimate (SE)
FHD × Enhanced Intervention	0.04 (0.49)	-0.13 (0.41)	-0.19 (0.38)	-5.37 (4.64)	-0.007 (0.005)	-0.013 (0.010)
FHD × Enhanced Intervention × Time 2	-1.36* (0.57)	-1.22* (0.48)	-0.88* (0.42)	-9.20 (5.09)	-0.0004 (0.006)	-0.002 (0.012)
FHD × Enhanced Intervention × Time 3	-0.24 (0.63)	-0.27 (0.52)	-0.14 (0.46)	3.43 (5.57)	0.009 (0.007)	0.003 (0.012)
FHD × Enhanced Intervention × Time 4	-1.20 (0.66)	-0.63 (0.55)	-0.41 (0.48)	-3.47 (5.88)	0.003 (0.007)	0.005 (0.013)

Notes: TIPS = Training for Intervention Procedures; BAC = blood alcohol concentration; Est. var. = estimated variance; FHD = frequent heavy drinker at baseline.
*$p < .05$; ‡$p < .001$.

declines from baseline to 6 months postbaseline in reported drinking days, days consumed five or more drinks, and days consumed eight or more drinks. Moreover, the three-way interaction at 6 months postbaseline approached statistical significance for total drinks, as we found with the SI/SP comparison. All of these effects dissipated after 6 months. Nonetheless, for most outcomes, our three-way interaction terms did remain negatively signed at 12 and 18 months postbaseline, perhaps suggesting some longer-term trends among high-risk drinkers.

Discussion

First, the central goal for the current study was to determine if introducing a group-based social-skills training program to student members of a national college fraternity would reduce risky drinking behaviors among its members. Second, because the intervention of interest was created with the specific intent of reducing risk in riskier members (whether they attended the trainings or not), we specifically sought to examine its potential for reducing risk in FHDs at baseline (64.2% of members). Introducing study interventions did reduce risky student drinking behaviors overall, but it was evident only at the 6-month follow-up and was statistically significant (on four of six measures) only for the SI versus SP, and not the EI versus SP, comparison. When one examines findings for FHDs, however, both SI/SP and EI/SP comparisons showed significant reductions in risky drinking behaviors. At 6 months postbaseline, FHDs reported drinking less often; consuming five or more and eight or more drinks less often; and, for the SI/SP comparison, consuming fewer drinks overall in the past 4 weeks. Finally, and again with the SI/SP comparison, FHDs still reported fewer drinking days in the past 4 weeks at the 18-month follow-up. Clearly, the current findings show that, 5 months after study interventions were introduced to chapters of the national fraternity, risky drinking behavior in the riskiest of members at baseline was successfully reduced. If one controls for an overall downward trending across all groups over time, total drinks consumed, for example, was approximately 8.5% lower in each intervention group.

The deterioration of effects over time may also be informative in itself. We suspect this finding may be attributable, in part, to our not training new pledges during the first 12 months of the study. Had we done so, we may

have kept students' social systems at the chapter level more fully engaged, thereby sustaining positive outcomes for longer. As noted earlier, most drinking behaviors among FHDs were still negatively signed 17 months after study interventions were introduced. Only future research can adequately address this issue. Future endeavors may also benefit from more thoroughly examining and engaging the social systems of fraternity chapters themselves, such as through the conduct of a social network analysis and respective intervention. It should be noted, however, that other analyses by the investigative team showed (1) risky drinkers at intervention sites were just as likely to attend the group-based trainings as were less risky drinkers (Ginexi et al., submitted for publication), and (2) risk-reduction effects were not stronger for students who attended study interventions than they were for "assigned members" overall (Caudill et al., manuscript in preparation). In sum, findings indicate that future efforts to increase attendance levels in group-administered skills-training programs may not prove as fruitful as would strategies such as training new pledges or adding complementary preventive programming.

An alternative examined here as a prospective means of bolstering positive intervention outcomes, or sustaining them for longer—namely, adding booster sessions to the one-time TIPS trainings—was clearly not effective. Fewer students were willing to attend EI sessions overall (perhaps owing to an increased perceived burden), plus outcomes were similar, but clearly not better, for students at sites assigned to receive booster sessions. Considering the additional cost involved, they were clearly not worth the additional effort. These findings are also consistent with other prevention research with college students, which has similarly concluded that more is not necessarily better (Marlatt et al., 1998).

Another noteworthy finding in the current study was that there appear to be iatrogenic effects among lower-risk members at the 18-month follow-up. These effects are evident in the overall analysis, but they disappear when one examines longitudinal outcomes for FHDs. Because attrition can present formidable challenges for a longitudinal design, in the supplemental article (Caudill et al., manuscript in preparation) where we compare outcomes among members in the SI condition who actually attended trainings versus those in the SP group, we also present extensive propensity modeling work to further control for potential nonresponse patterns in the longitudinal design. Two central, and relevant, findings from this work included (1) treatment effects at 6 months postbaseline for the FHDs were somewhat stronger, and (2) apparent increases in risk in lower-risk drinkers and abstainers at 18 months postbaseline is partly, but not completely, attributable to differential nonresponse/attrition effects within this portion of the sample. After controlling for attrition, we still found an iatrogenic effect at 18 months postbaseline on the number of occasions lower-risk members reported consuming eight or more drinks in the past 4 weeks. Werch and Owen (2002) note that iatrogenic effects in substance-abuse literature appear most often in studies that include socially based alcohol interventions similar to ours (e.g., peer-resistance training). They speculate that this effect may be due to the impact of social influence processes, as lower-risk drinkers spend more time in the presence of higher-risk peers in order to implement such interventions. They also note that augmenting such programs with other complementary interventions, such as normative education, can buffer students from such social influences. Nevertheless, future research on social-skills training programs may indeed benefit from testing the effect of such supplemental and synergistic interventions. In addition, the mechanisms of positive and negative change from these programs could be better elucidated than is typically done or than we have done here.

Finally, it is important for any study to consider its potential limitations. Our national focus, high response rates, and other enhancements have added significantly to the strength of the current study, but we also fully recognize we have examined the effects of several risk-reduction interventions in only *one* national fraternity. This fraternity was comparable to others in every measurable way, but we realize it may still differ on some meaningful characteristics that were not captured. Most important to the current findings is whether our fraternity is representative regarding risky alcohol-use behavior, which is the central topic of interest for this study. In another article that is devoted entirely to profiling baseline alcohol use in members of this national fraternity (Caudill et al., 2006), the authors observe that students reported higher percentages of FHDs than is typical. Moreover, with one exception, overall levels of alcohol use were somewhat higher than previously has been reported for fraternity members. It may be for this reason that this fraternity was interested in alcohol risk-reduction training at the outset of the study. It is our conclusion in that article, however, that because of our high survey response rates (85% nationally) and the general sensitivity of the assessment techniques (e.g., Alcohol Timeline Followback calendars to profile alcohol use) and technology (e.g., A-CASIs), we may actually have had a more representative and forthright sample than usual. This debate aside, let us assume for a moment we have studied a fraternity with riskier members than is "typical." From an empirical perspective, it could be argued that this presented an even more rigorous and ideal test of study interventions. We would like to believe we have studied the most representative sample of fraternity members to date (as suggested in Caudill et al., 2006), but we also acknowledge that we may have selected a particularly challenging group of college drinkers as recipients of the respective interventions. Considering that our study outcomes were positive, this may be a benefit.

Acknowledgments

We gratefully acknowledge the contributions of colleagues Karin Davis, Joe Gertig, Melissa Gutierrez, John Kennedy, Mary Kliesch, Joy Kosman, Sanjeev Sridharan, Anne Worthen, and Nicole Yoshida.

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