

## Alcohol Interventions for Greek Letter Organizations: A Systematic Review and Meta-Analysis, 1987 to 2014

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**Objective:** This meta-analysis examines the efficacy of interventions to reduce alcohol consumption and related problems among college student members of Greek letter organizations. **Method:** Studies were identified through electronic bibliographic database searches and reviews of reference sections of relevant articles, and studies were included if the study evaluated (a) an individual-level alcohol intervention, (b) sampled fraternity or sorority members, and (c) measured alcohol consumption or problems. Included were 15 studies with 21 separate interventions ( $n = 6,026$ ; 18% women). Independent raters coded sample, design, methodological features, and intervention content. Between- and within-group weighted mean effect sizes were calculated using random-effects models. Potential moderators, determined a priori, examined variability in effect sizes. **Results:** Interventions targeting fraternity or sorority members were not successful in reducing alcohol consumption and related problems relative to controls; however, participants in these interventions did reduce the quantity consumed on specific occasions and the frequency of drinking days from pre- to post-test. Interventions that addressed alcohol expectancies were associated with less alcohol consumption on specific occasions. Interventions that provided moderation strategies and skills-training, identified high-risk situations, or encouraged setting goals were associated with less reduction in the frequency of heavy drinking. **Conclusions:** Extant alcohol interventions show limited efficacy in reducing consumption and problems among fraternity and sorority members. More robust interventions are needed for use with student members of Greek letter organizations.

**Keywords:** Greek letter organizations, fraternities, alcohol, intervention, meta-analysis

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Alcohol use is highly prevalent among U. S. college students, but especially so among members of Greek letter organizations (Turrisi, Mallett, Mastroleo, & Larimer, 2006; Wechsler, Kuh, & Davenport, 2009). Greek letter organizations are social organizations for men (fraternities) or women (sororities) that provide opportunities for leadership, friendship, and community service. These organizations are also known for their secrecy and rituals, hazing, and alcohol use. Drinking is integrated into Greek social functions (e.g., fraternity parties) as well as hazing and pledging

rituals (Borsari, Hustad, & Capone, 2009). Members of Greek letter organizations consume higher quantities of alcohol, report more frequent drinking, and experience more alcohol-related consequences relative to non-Greek peers (Cashin, Presley, & Meilman, 1998; Caudill et al., 2006; Scott-Sheldon, Carey, & Carey, 2008; Turrisi et al., 2006). During the 2014 to 2015 academic year alone, Greek letter organizations made news headlines for several serious alcohol-related consequences (e.g., death of a student, hospitalizations, disseminating inappropriate content via social

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media, sexual assault, racist conduct, and property damage; Panzar, 2015; The Associated Press, 2015a, 2015b). The range of adverse academic, physical, and psychological alcohol-related consequences has raised concerns among other college students, faculty, and college administrators, as well as among community neighbors. These concerns have prompted disciplinary actions by universities or national chapters (e.g., suspension of local chapters). Despite such sanctions, alcohol misuse among members of fraternities and sororities continues to be a serious problem nationwide.

Misuse of alcohol among fraternity and sorority members reflects several determinants, including: (a) *self-selection* of alcohol-using students into peer groups that align with their own patterns of heavy alcohol use (Borsari et al., 2009; McCabe et al., 2005; Park, Sher, & Krull, 2008); (b) *socialization* of pledges, who are immersed in an environment in which alcohol misuse is rewarded, and who adopt behaviors to gain approval (Capone, Wood, Borsari, & Laird, 2007; Cashin et al., 1998); and (c) an *enabling environment* of Greek housing in which alcohol plays a central role (Borsari et al., 2009). Students who live in Greek housing experience more alcohol-related consequences than those who live in dormitories or with parents (Larimer, Anderson, Baer, & Marlatt, 2000; Page & O'Hegarty, 2006). Unlike sororities, which are typically restricted from hosting house parties that serve alcohol, some fraternities allow members to consume large quantities of alcohol under relatively unsupervised conditions (Harford, Wechsler, & Seibring, 2002). Furthermore, non-Greek affiliated students consume more alcohol at Greek functions than at other college events, supporting the view of the enabling environment (Capone et al., 2007).

Members of the Greek system also (d) *misperceive social norms* associated with alcohol use (Borsari & Carey, 2003; Lewis & Neighbors, 2006), such that fraternity members drink more if they perceive their peers to be drinking, and if they perceive peer approval of drinking (Perkins, 2002; Sher, Bartholow, & Nanda, 2001; Trockel, Williams, & Reis, 2003). Norms influence both alcohol consumption and Greek affiliation through selection processes (Capone et al., 2007; Sher et al., 2001). Finally, (e) *alcohol expectancies* (e.g., for improved social skills when drinking (Knee & Neighbors, 2002) also influence drinking behavior among Greek members; those who have positive expectancies report higher consumption and more consequences compared with those with negative expectancies (Cashin et al., 1998).

Fortunately, there are now efficacious interventions to help college students reduce drinking to less hazardous levels (Carey, Scott-Sheldon, Carey, & DeMartini, 2007). Research shows that interventions delivered to heavier drinkers can produce strong and enduring reductions in alcohol consumption (Baer, Kivlahan, Blume, McKnight, & Marlatt, 2001; Henson, Pearson, & Carey, 2015). Prior meta-analyses show that interventions that provide personalized feedback on consumption, problems, or risks are consistently associated with reductions in alcohol consumption (Carey et al., 2007; Scott-Sheldon, Carey, Elliott, Garey, & Carey, 2014). Other intervention components (e.g., moderation strategies, goal setting) have also been shown to be effective at reducing alcohol consumption and problems in the general student population (Larimer & Cronce, 2007; Scott-Sheldon, Terry, Carey, Garey, & Carey, 2012). Despite the benefits of such interventions among college students in the general population, narrative re-

views suggest less efficacy when interventions have been implemented with members of Greek letter organizations (Borsari et al., 2009; Larimer & Cronce, 2007; Turrisi et al., 2006). Interventions delivered to chapter houses have an opportunity to "challenge normative misperceptions in the Greek system" (Borsari et al., 2009) and thus, can result in a reduction in drinking if the intervention is carefully conducted to minimize Greek members' approval of drinking. Given the mixed findings and the growing literature on alcohol interventions for college students, there is need to update the older narrative reviews using meta-analytic methods.

This meta-analysis examines the efficacy of alcohol interventions for reducing alcohol consumption and consequences when administered to members of Greek letter organizations. It is hypothesized that such interventions would be successful relative to control or comparison conditions (between-groups analyses) or baseline levels (within-group analyses). It is also hypothesized that intervention efficacy would be moderated by population subgroup (fraternity vs. sorority), residential status (in Greek housing vs. not), and level of intervention (individual vs. chapter houses); specifically, it is hypothesized that fraternity (vs. sorority) members, residents of Greek housing (vs. other housing), and interventions delivered to chapter houses (vs. individuals) would *reduce* alcohol use and report *fewer* alcohol-related problems after receiving the intervention. These predictions emerge from the fact that the aforementioned characteristics are associated with higher baseline levels of drinking, affording more room for improvement, as well as an opportunity to address drinking in the context in which it frequently occurs (i.e., chapter houses). It is also predicted that prior alcohol use (indicating a *selection* effect) would moderate the intervention outcomes such that students who report higher levels of baseline alcohol use would also benefit more from the intervention. Prior research shows that heavy drinkers who receive an alcohol intervention (vs. controls) benefit more from the intervention, and that observed reductions in alcohol consumption and related consequences persist over time (Baer et al., 2001). It is also predicted that interventions that included personalized feedback on alcohol consumption and challenged alcohol expectancies would be more successful in reducing alcohol consumptions and consequences compared to interventions that did not include these components (Borsari et al., 2009). Finally, exploratory analyses assess whether interventions of longer durations (Johnson, Scott-Sheldon, & Carey, 2010) or with other intervention components (e.g., moderation strategies, goal setting) also reduce alcohol behaviors among Greek members.

## Method

### Overview

This systematic review and meta-analysis was conducted in accordance to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) as outlined by The PRISMA Group (Moher, Liberati, Tetzlaff, & Altman, 2009). The PRISMA checklist is available in the Online Supplemental Materials.

### Eligibility Criteria

Studies were included if they (a) examined an individual- or group-level intervention targeting alcohol use; (b) sampled frater-

nity or sorority members; (c) used a randomized controlled trial (RCT) or a quasi-experimental design that included a control or comparison condition or a single-group design with pre- and posttest measures; (d) measured alcohol outcomes (e.g., quantity of alcohol consumed per week or month, alcohol-related problems); and (e) were available via print or electronic journals, interlibrary loan, or authors (including electronic publications and dissertations) through December 2014. (Only a single unpublished conference report was unavailable.) No language restrictions were applied. Studies were excluded if (a) the study did not focus on alcohol use (e.g., combined substance use); or (b) the study evaluated a mass media or structural-level (e.g., campus-wide social norms intervention) intervention.

### Information Sources and Search Strategy

Studies were identified using: (a) electronic bibliographic databases; (b) database and document repository held by the Substance Use Risk Education (SURE) Team at Brown University (PI: Kate B. Carey) which has accumulated a database of published and unpublished research on alcohol-related interventions for college students; (c) reference sections of relevant articles; (d) scientific journals; and (e) databases of funded research (i.e., NIH RePORTER, ClinicalTrials.gov).

First, electronic reference databases (*PubMed* [1946+], *PsycINFO* [1872+], *ProQuest Dissertations and Theses Full Text* [1973+], *CINAHL* [1981+], *ERIC* [1964+]) were searched using a Boolean search strategy that included the following terms: (*alcohol* OR *drink*\* OR *binge*) AND (*college* OR *university*) AND (*intervention* OR *prevention*) AND (*greek* OR *frat*\* OR *sororit*\* OR “*fraternal organization*” OR “*frat house*” OR *brotherhood* OR *sisterhood*). Because many electronic databases have specific search methods (e.g., Medical Subject Heading [MeSH] terms used in *PubMed* are not used in other databases such as *PsycINFO*), our search strategy was modified to accommodate the search parameters of each database. Electronic bibliographic database searches were conducted twice and finalized in February, 2015 to ensure a complete database of studies available through December, 2014. Second, the SURE database and document repository was searched for interventions sampling fraternity or sorority members. Third, reference sections of relevant articles (including published reviews) were also reviewed. Fourth, the tables of contents of four journals (i.e., *Addiction*, *Addictive Behaviors*, *Health Psychology*, *Journal of Studies on Alcohol and Drugs*) were searched for articles. Finally, databases of funded research (i.e., NIH RePORTER, ClinicalTrials.gov) were searched for any alcohol intervention studies sampling fraternity or sorority members.

### Study Selection

A total of 345 records were retrieved and study abstracts were screened for possible inclusion. Full-text articles of potentially relevant references from relevant articles were retrieved and reviewed to identify studies that met the inclusion criteria. When authors reported details and/or study information across multiple manuscripts, those articles were linked and represented as a single unit and the manuscript reporting the most complete data was selected as primary. When necessary, emails requesting missing

information were sent to the study author(s). Our final sample included 15 studies reporting 21 interventions (Figure 1). Details regarding the study, sample, and intervention characteristics of the included studies are available in Table 1.

### Data Collection and Coding Reliability

Two independent coders extracted study information (e.g., publication year), sample characteristics (e.g., age), design specifics (e.g., recruitment method), and intervention procedures (e.g., number and length of sessions), and components (e.g., personalized feedback) from each study using a data extraction form. Methodological quality was assessed using 14 items (e.g., random assignment).<sup>1</sup> Interrater reliability was assessed for all study, sample, and methodological variables. For the categorical variables, raters agreed on 74% of the judgments (mean Cohen's  $\kappa = 0.44$ ). Reliability for the continuous variables yielded an average intraclass correlation coefficient ( $\rho$ ) of 0.83 across categories (median = 0.98). Disagreements between coders were resolved through discussion.

### Study Outcomes

Study outcomes included assessments of alcohol consumption and/or alcohol-related problems. Measures of consumption included *quantity* consumed per (a) week/month or (b) during specific time periods, drinking days, or events (e.g., weekends, parties; *quantity on specific occasions/days*) and the *frequency* of (c) drinking days or (d) heavy (episodic) drinking. (e) *Alcohol-related problems*, measured most often with a checklist (e.g., Rutgers Alcohol Problem Index; White & Labouvie, 1989), were also included. Most studies (11 out of 15) included assessments of alcohol use ( $n_{\text{studies}} = 4$ : quantity per week/month;  $n_{\text{studies}} = 7$ : quantity on specific occasions/days;  $n_{\text{studies}} = 4$ : frequency of drinking days;  $n_{\text{studies}} = 5$ : frequency of heavy drinking); and eight studies measured alcohol-related problems.

### Effect Size Calculations

Effect sizes ( $d$ ) were calculated by two independent coders based on the standardized mean difference (between-groups) and standardized mean gain (within-groups) (Lipsey & Wilson, 2001). Between-groups effect sizes were calculated as the mean difference between the intervention and the control or comparison group divided by the pooled standard deviation (Cohen, 1998). Within-group effect sizes were calculated for time-related changes within each intervention as the mean difference between the pre- and posttest divided by the standard deviation of the pretest difference score (Morris & DeShon, 2002). Other statistical information (e.g., proportions,  $t$  tests) were used when means and standard deviations were not provided (Johnson & Eagly, 2014). If a study reported dichotomous outcomes (e.g., frequencies), an odds ratio was calculated and transformed to  $d$  using the Cox transformation (Sánchez-Meca, Marín-Martínez, & Chacón-Moscoso, 2003). If an effect size could not be computed (and the relevant data could not

<sup>1</sup> The methodological quality rating form was adapted from validated measures (Jadad et al., 1996; Miller et al., 1995; Miller & Wilbourne, 2002) and is available from the first author.

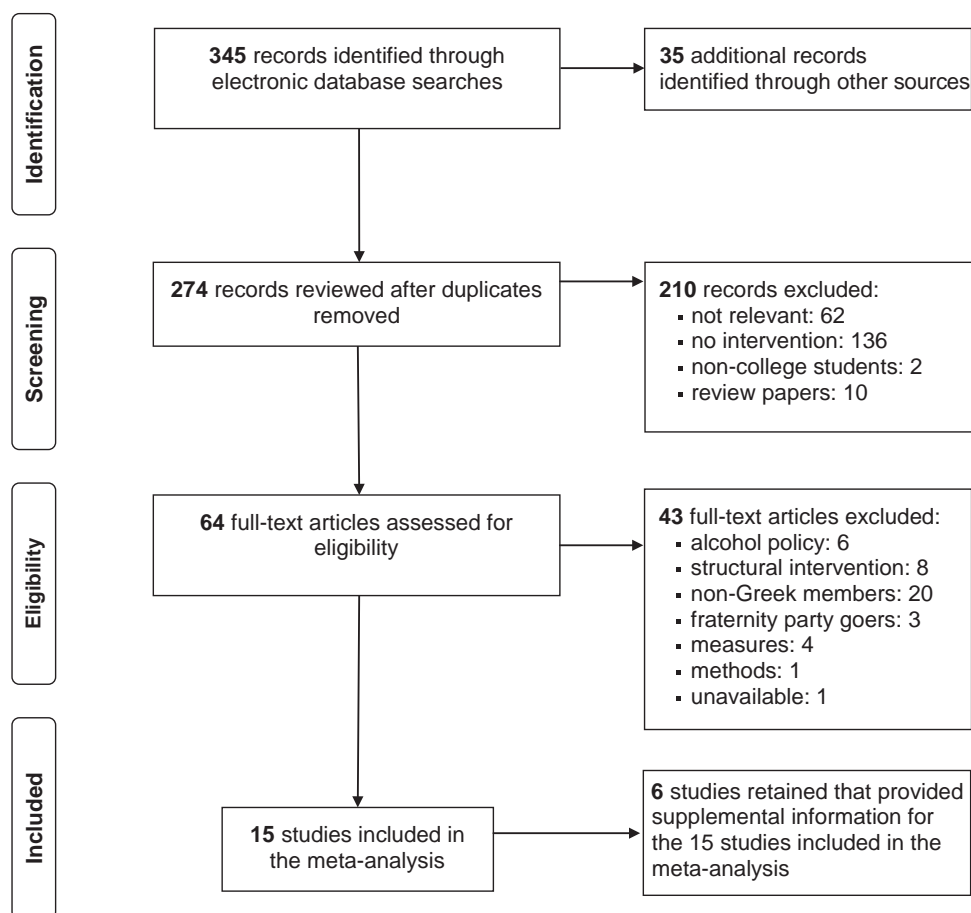


Figure 1. Screening and Selection Procedures.

be obtained from the authors) and the study reported a nonsignificant between- or within-group difference, the effect size was estimated to be zero (Lipsey & Wilson, 2001).

Multiple effect sizes were calculated from individual studies when the study (a) included multiple intervention conditions ( $n_{\text{studies}} = 4$ ); (b) assessed outcomes separated by sex ( $n_{\text{studies}} = 1$ ); (c) measured more than one outcome ( $n_{\text{studies}} = 11$ ); or (d) assessed outcomes at multiple follow-ups ( $n_{\text{studies}} = 4$ ). The following procedures were followed to avoid violating the assumption of independence (Johnson & Eagly, 2014; Lipsey & Wilson, 2001): (a) effect sizes for each intervention and by sex were analyzed separately, (b) statistical analyses were conducted by alcohol outcome, and (c) the last follow-up assessment was used in the analyses. All effect sizes were corrected for sample size (Hedges, 1981). Positive effect sizes indicated that fraternity or sorority members who received an alcohol intervention reported *lower* alcohol consumption and *fewer* alcohol-related problems compared to the control or comparison condition (between-groups analyses) or to their baseline levels (within-group analyses). All effect size calculations were reviewed by the team and discrepancies were resolved through discussion.

### Statistical Analyses

Weighted mean effect sizes ( $d_+$ ) were calculated using random-effects procedures, such that effect sizes were weighted by the

inverse of their random-effects variance (Lipsey & Wilson, 2001). The homogeneity statistic,  $Q$ , was calculated for each outcome. A significant  $Q$  indicates a lack of homogeneity and an inference of heterogeneity. The proportion of the observed dispersion was assessed using the  $I^2$  index and its corresponding 95% uncertainty intervals (Higgins & Thompson, 2002; Ioannidis, Patsopoulos, & Evangelou, 2007). The  $I^2$  index ranges from 0% to 100% with 25%, 50%, and 75%, considered low, moderate, and high levels of observed variance reflecting true differences in effect sizes, respectively (Higgins, Thompson, Deeks, & Altman, 2003).

### Moderator Analyses

To explain variability in effect sizes, moderator analyses were conducted using a modified weighted least squares regression analyses or the meta-analytic analogue to the ANOVA with weights equivalent to the inverse of the variance plus the random variance component for each effect size (Harbord & Higgins, 2008; Hedges, 1994; Lipsey & Wilson, 2001). Analyses examined eight a priori determined moderators of alcohol consumption or problems: sample characteristics (i.e., proportion sorority members, baseline alcohol use measured as drinks per week, resident in Greek housing), intervention content (i.e., personalized feedback, social norms, alcohol expectancies), intervention approach (i.e., individual vs. chapter), and intervention length (i.e., total dose).

Table 1  
 Study, Sample, and Intervention Characteristics for the 15 Studies Included in the Systematic Review and Meta-Analysis

Study	Sample	Location	Design	Comparison group	Intervention details				%MQ
					Delivery	Sessions	Total dose <sup>a</sup>	Description	
Bruce and Keller (2007)	<i>N</i> = 992 (24%)	Charlottesville, VA	Independent Group [Chapter-Level]	WL/NT/AO	GRP	1	45	Discussion emphasizing misperceptions of campus-wide and sorority/fraternity norms, identification of high-risk situations, and alcohol-related problems.	55
Caudill et al. (2006)	<i>N</i> = 3,406 (89% F; 0% F; 95% W; $M_{age} = 20$ )	Multiple U.S. institutions	Independent Group [Chapter-Level]	WL/NT/AO	GRP	1	180	<i>Training for Intervention Procedures (TIPS)</i> : Manual-driven training program emphasizing alcohol-related education, risk-reduction strategies, intervention skills training, and protective behavioral strategies. <i>Training for Intervention Procedures (TIPS) &amp; Booster Sessions</i> : Manual-driven training program emphasizing alcohol-related education, risk-reduction strategies, intervention skills training, and protective behavioral strategies.	70
Far (1998)	<i>N</i> = 350 (71% F; 0% F)	Pullman, WA	Independent Group [Chapter-Level]	WL/NT/AO	GRP	1	45	<i>Norms Correction Condition</i> : Interactive presentation emphasizing alcohol-related education and normative comparisons.	30
Far and Miller (2003)	<i>N</i> = 334 (43% F; 42% F)	Pullman, WA	Single-Group [Chapter-Level]	NA	GRP	1	45	<i>Neutral Treatment Condition</i> : Interactive presentation emphasizing alcohol-related education.	25
Fried and Dunn (2012); Fried (2010)	<i>N</i> = 250 (84% F; 0% F; 79% W; $M_{age} = 20$ )	Orlando, FL	Independent Group [Chapter-Level]	ICM	GRP	1	50	<i>Small Groups Norms Challenging</i> : Interactive peer-led presentation and discussion emphasizing alcohol-use misperceptions, norms correction messages, and protective behavioral strategies.	47

Table 1 (continued)

Study	Sample	Location	Design	Comparison group	Intervention details			%MQ	
					Delivery	Sessions	Total dose <sup>a</sup>		Description
Garvin, Alcorn, and Faulkner (1990); Garvin (1982)	$N = 60$ (5%); 0% F; $M_{\text{age}} = 18$	Hattiesburg, MS	Independent Group [Chapter-Level]	WL/NT/AO	IND	4	169	<i>Behavior Self-Management</i> : Discussion emphasizing alcohol-related education, harm-reduction strategies, and skills training; monitored drinking behavior. <i>Alcohol Education</i> : Viewed materials emphasizing alcohol-related education; monitored drinking behavior.	47
Guydish (1987); Guydish and Greenfield (1990)	$N = 56$ (29%); 0% F	Pullman, WA	Independent Group [Individual-Level]	WL/NT/AO	IND	1	60	Administered self-help manual emphasizing alcohol-related education; recorded daily alcohol intake.	50
Hamm (2012)	$N = 123$ (98%); 0% F	Multiple U.S. institutions	Independent Group [Chapter-Level]	WL/NT/AO	GRP	1	120	<i>Self-Monitoring, Bibliotherapy, and Self-Control Group Training Sessions</i> : Discussion emphasizing alcohol-related education, normative comparisons, harm-reduction strategies, identification of high-risk situations, and goal-setting; administered self-help manual emphasizing alcohol-related education and harm-reduction strategies; recorded daily alcohol intake.	55
Harrington, Brigham, and Clayton (1999); Harrington, Brigham, and Clayton (1997)	$N = 1,345$ (44%); 72% F; 99% W; $M_{\text{age}} = 21$	Multiple U.S. institutions	Independent Group [Chapter-Level]	WL/NT/AO	GRP	NR	480	Discussion emphasizing alcohol-related education, personalized feedback on consumption and problems, normative comparisons, motives for drinking, skills training, and harm-reduction strategies. <i>Talking about Alcohol and Drugs</i> : Intensive protocol-driven program facilitated by trained peers emphasizing alcohol education, risk reduction, and challenging attitudes and perceptions about alcohol.	55
Larimer et al. (2001); O'Leary et al. (2002)	$N = 159$ (25%); 0% F; 82% W; $M_{\text{age}} = 19$	Seattle, WA	Independent Group [Individual-Level]	INFO	IND + GRP	2	120	Discussions emphasizing alcohol-related education, personalized feedback on consumption and problems, AE, normative comparisons, and harm-reduction strategies.	60

(table continues)

Table 1 (continued)

Study	Sample	Location	Design	Comparison group	Intervention details					%MQ
					Delivery	Sessions	Total dose <sup>a</sup>	Description		
Savoy (2007)	N = 258 (45%); 71% F	Lincoln, NE	Independent Group [Chapter-Level]	WL/NT/AO	GRP	NR	NR	<i>Greek Re-evolution</i> : Program that involved individual and group sessions that provided alcohol education, personalized feedback, normative comparisons, skills-training, risk reduction, and leadership training.	30	
Schwartz (1990)	N = 178 (100%); 0% F	Oxford, MS	Independent Group [Chapter-Level]	RCNM	GRP	2	120	<i>Sober Driver Program</i> : Structured designated driver curriculum consisting of alcohol education with a focus on how alcohol affects driving and related consequences, discussion components, risk reduction, and monitoring. <i>Students Against Drunk Driving (SADD) Contract for Life</i> : Structured peer-based contract program emphasizing harm prevention planning and risk reduction. Incorporates alcohol education with a focus on how alcohol affects driving and related consequences, discussion components, and self & peer monitoring.	50	
Sharp (1994)	N = 111 (100%); 0% F	Multiple U.S. institutions	Independent Group [Chapter-Level]	WL/NT/AO	GRP	NR	2,040	<i>Delts Talking about Alcohol, retreat and in-house training program</i> : Discussion emphasizing alcohol-related education, values clarification, and harm-reduction strategies (i.e., low-risk choices). <i>Delts Talking about Alcohol</i> : Discussion emphasizing alcohol-related education, values clarification, and harm-reduction strategies (i.e., low-risk choices).	42	
Thompson (1996)	N = 169	Grand Forks, ND	Independent Group [Chapter-Level]	WL/NT/AO	GRP	3	360	Discussion emphasizing alcohol-related education, values clarification, and harm-reduction strategies (i.e., low-risk choices).	30	
Wilke, Mennicke, Howell, and Magnuson (2014)	N = 196 (71%); 60% F	Tallahassee, FL	Independent Group [Chapter-Level]	WL/NT/AO	IND	1	13	Discussion emphasizing alcohol-related education, personalized feedback on consumption, normative comparisons, risk-reduction strategies, and identification of high-risk situations.	40	

Note. N = number of consenting participants (attrition); F = proportion female; W = proportion White; WL/NT/AO = wait-list/no treatment/assessment only control; INFO = information-only; ICM = irrelevant content, time-matched; RCNM = relevant content, not time matched; IND = individual; GRP = group; %MQ = proportion of methodological quality criteria satisfied; NR = not reported.

<sup>a</sup> Estimated total number of minutes of intervention content excluding measurement.

All analyses were conducted in Stata 13 using published macros (Harbord & Higgins, 2008; Lipsey & Wilson, 2001; StataCorp, 2013).

## Results

### Study and Sample Characteristics

Study, sample, and intervention characteristics for the 15 studies ( $k = 21$  interventions) are provided in Table 2. Studies were published between 1987 and 2014. The samples were recruited at large, public universities in the United States. Of the 8,299 students who consented to participate in the studies, nearly one fifth were women (18%), most were White (89%;  $k = 4$ ), and averaged 20 years of age (range = 18–21;  $k = 5$ ). Of the five studies reporting year in school, 36% were first-year students. Two studies reported student residence: 44% in fraternity or sorority houses, 29% of students lived on-campus, 25% off-campus, and 2% lived with parents. Studies retained an average of 73% of the original samples at follow-ups.

### Control Conditions

Fourteen of the 15 studies in the meta-analysis included a control or comparison condition (see Table 1). Studies most often used a wait-list/assessment-only/no treatment control (79%); 21% used an active comparison condition. The active comparison conditions were most often delivered to a group (100%) in a single session (range = 1 to 2 sessions) of 60 min in length (range = 50 to 60 min). Two of the active comparison conditions included alcohol-related content but were not matched for time and contact (Larimer et al., 2001; Schwartz, 1990).

### Alcohol Intervention Conditions

Theory (e.g., social norms theory) was often used to guide intervention development (67%). Interventions were most often delivered in groups (71%) over a median of a single session (range = 1 to 28) of 50 min in length (range = 1 to 480 min). Most interventions (86%) provided alcohol education (e.g., instruction on estimating blood alcohol concentration), provided strategies for moderating alcohol consumption (52%), and addressed high-risk situations (e.g., parties; 48%). Less than half of the interventions corrected misperceived norms by providing normative feedback (38%), assisted participants in setting goals for reducing drinking (29%), provided participants with any personalized feedback on alcohol behavior (consumption, problems, or risks; 24%), provided alcohol-related skills training (24%), or addressed alcohol outcome expectancies or motives for drinking (19%). The content of the interventions were often targeted to the sample and/or tailored to the recipient (48%; 24% targeted, 19% tailored, 5% targeted and tailored).

### Methodological Quality

Studies satisfied an average of 46% ( $SD = 0.13$ ) of the 14 methodological quality criteria, indicating weak to moderate methodological quality. Most studies used a randomized controlled trial design to randomize individuals or groups to conditions (67%).

Participation anonymity could be ensured in a single study (13%). Less than half of the studies reported using different personnel for intervention and assessment (40%); a single study (13%) reported using study personnel who were blind to group assignment.

All studies used manuals or specific training to standardize the intervention. Most studies assessed alcohol outcomes at baseline (93%). Follow-up assessments typically occurred less than 3 months postintervention (60%); 73% of the samples were retained at follow-up. No study reported obtaining collateral verification or using objective measures to validate self-report of alcohol use. About half of the studies reported participant flow through the study (i.e., withdrawals [38%] and attrition [54%]). Statistical analyses often controlled for baseline or other characteristics (93%). Finally, 33% of studies evaluated the intervention across multiple sites. Methodological quality scores were not associated with any alcohol outcome ( $ps > .22$ ).

### Assessment of Publication Bias

Asymmetries in the distributions of effect sizes, indicating a possible reporting bias (Rosenthal, 1979), are typically examined by inspecting funnel plots and assessing the degree of asymmetry (Begg & Mazumdar, 1994; Egger, Davey Smith, Schneider, & Minder, 1997; Sterne & Egger, 2001). These tests are conducted only for dependent variables with 10 or more studies (Lau, Ioannidis, Terrin, Schmid, & Olkin, 2006). If the funnel plot asymmetry tests suggested publication bias (Begg & Mazumdar, 1994; Egger et al., 1997), trim and fill procedures (Duval & Tweedie, 2000) are recommended to estimate and correct for the possibility of missing studies (based on a rank-based data augmentation procedure). These graphical and statistical tools to test for the possibility of publication bias could not be used in this meta-analysis because none of the outcomes met the minimum threshold for the number of studies (i.e.,  $\geq 10$  studies).

### Overview of the Weighted Mean Effect Sizes

Between-groups analyses were conducted separately for each alcohol outcome at the final postintervention assessment.<sup>2</sup> Outcomes were examined for outliers using box plots prior to data analyses (Emerson & Strenio, 1983). Outliers were removed from the analyses for the specific measure indicated. Table 3 contains the weighted mean effect sizes and homogeneity analyses by outcome measures for the between-groups analyses. Forest plots of the overall weighted mean effect sizes for each alcohol outcome can be found in the Supplemental Digital Content A.

<sup>2</sup> Effect sizes were estimated for two studies (Far, 1998; Guydish, 1987) that were included in four outcomes: (a) quantity per week/month, (b) quantity at specific occasions/days, (c) frequency of heavy drinking, and (d) alcohol-related problems. Consistent with meta-analytic recommendations (Johnson & Eagly, 2014), we conducted analyses with the imputed and complete data for each dependent variable with missing effect size data. The pattern of results (weighted mean effect sizes and homogeneity tests) remained the same with one exception: quantity of alcohol consumed on specific occasions or days (complete case:  $d_{+random} = 0.25$ , 95% CI [0.02, 0.48],  $k = 8$ ; imputed:  $d_{+random} = 0.10$ , 95% CI [-0.10, 0.31],  $k = 7$ ). To retain all possible studies in the analyses, we opted to present the analyses with the imputed cases.



Table 2  
*Study, Sample, and Treatment Characteristics of the 15 Studies (21 Interventions) Included in the Meta-Analysis*

Study characteristics	
Publication year, <i>Mdn</i> (Range)	2002 (1987–2014)
Data collection year, <i>Mdn</i> (Range)	1999 (1980–2011)
Published in journals, %	47
Funded study, %	71
Methodological quality, <i>M%</i> ( <i>SD</i> )	46 (13)
Sample characteristics	
Number of consenting participants	8,299
Retention, <i>M%</i> ( <i>SD</i> )	73 (24)
Age, <i>M</i> ( <i>SD</i> )	20 (1)
Sex, <i>M%</i> ( <i>SD</i> ) women	18 (30)
Ethnicity, <i>M%</i> ( <i>SD</i> ) white	89 (10)
Year in school, <i>M%</i> ( <i>SD</i> ), <i>k</i> = 5	
First	36 (36)
Second	26 (15)
Third	22 (12)
Fourth	14 (10)
Other	2 (4)
Institution characteristics	
Region, number of studies	
U.S. Southeast	6
U.S. Midwest	3
U.S. Northwest	4
Multiple regions	2
Public university, number of studies	13
Size of institution, number of studies	
Medium (5,000–15,000)	1
Large (>15,000)	10
Multiple	2
Design and measurement	
Randomized controlled trial, %	67
Randomized groups	60
Randomized individuals	7
Non-randomized controlled trial, %	27
Provided incentives, %	27
Final follow-up length, %	
<3 months	60
3 to 5 months	13
≥6 months	27
Intervention characteristics	
Dose, <i>Mdn</i> (Range) sessions	1 (1–28)
Minutes per session	50 (1–480)
Delivery method, %	
FTF	81
Computer with FTF Interaction	5
Self-read manual	10
Multiple	5
Type of delivery, %	
Individual	14
Group	71
Both individual and group	14
Group size, <i>Mdn</i> (Range)	15 (10–74)
Group composition, % same-sex	100
Facilitators, <i>Mdn</i> (Range)	1 (0–2)
Type of facilitators, %	
Peers	36
Paraprofessionals	7
Professionals-in-training	21
Paraprofessionals and professionals	7
Peers and professionals	7
Peers, professionals-in-training, and professionals	7
None	14

Intervention components	
Alcohol/BAC education, %	86
Moderation strategies, %	52
Focus on high-risk situations, %	48
Normative comparisons, %	38
Goal-setting, %	29
Personalized feedback, %	24
Skills training, %	24
Challenges to expectancies, %	19
Values clarification, %	14
Decisional-balance exercise, %	5
Writing/journaling, %	5
Provided materials, %	
Generic	24
Tailored	10
Support/Boosters, %	33

Note. FTF = face-to-face; CDI = computer-delivered intervention.

### Impact of Alcohol Interventions Relative to Controls

**Alcohol consumption per week or month.** The quantity of alcohol consumed per week or month was assessed in four studies ( $k = 8$ ). The overall weighted mean effect size was significant for quantity of alcohol consumed per week/month but the mean effect size was in the opposite direction than expected. That is, Greek members who received the alcohol intervention were *more* likely to report consuming alcohol relative to the control participants,  $d_{+random} = -0.09$  (95% CI [-0.17, -0.01]). The hypothesis of homogeneity was supported ( $Q [7] = 8.61, p = .282; I^2 = 19$ ) but uncertainty limits were wide (range = 0 to 61) and exceeded the 50% threshold.

**Alcohol consumed on specific occasions/days.** The quantity of alcohol consumed on specific occasions/days was assessed in six studies ( $k = 8$ ). Box plots revealed one outlier (Thompson, 1996); the effect size was removed from the analysis. No significant difference between the intervention and controls on the quantity of alcohol consumed on specific occasions/days was found. The hypothesis of homogeneity was not supported.

**Frequency of heavy drinking.** The frequency of heavy (episodic) drinking was assessed in four studies ( $k = 7$ ). No significant difference between the intervention and controls on the frequency of heavy drinking was found. The hypothesis of homogeneity was not supported.

**Frequency of drinking days.** The frequency of drinking days was assessed in four studies ( $k = 5$ ). Box plots revealed a single outlier (Fried & Dunn, 2012); the effect size was excluded from the analysis. The intervention and control groups did not differ on the frequency of drinking. The hypothesis of homogeneity was supported ( $Q [4] = 3.42, p = .331; I^2 = 12$ ) but uncertainty limits were wide (range = 0 to 56) and exceeded the 50% threshold.

**Alcohol-related problems.** Eight studies ( $k = 10$ ) measured alcohol-related problems. One outlier was detected and excluded from the analyses (Hamm, 2012). No significant difference between the intervention and control groups was found on alcohol-related problems. The hypothesis of homogeneity was supported ( $Q [9] = 5.64, p = .668; I^2 = 0$ ) but uncertainty limits were wide (range = 0 to 63) and exceeded the 50% threshold.

Table 3  
Weighted Mean Effect Sizes and Homogeneity Statistics for Between-Groups Analyses at the Last Assessment

Outcome	<i>k</i>	$d_{+random}$ [95% CI]	<i>Q</i>	<i>p</i>	$I^2$ [95% CI]
Alcohol consumption					
Quantity per week/month	8	-.09 [-.17, -.01]	8.61	.282	19 [0, 61]
Quantity on specific occasions/days	7	.10 [-.10, .31] <sup>a</sup>	19.37	.004	69 [32, 86]
Frequency of heavy drinking	7	.03 [-.14, .21]	26.05	.000	77 [52, 89]
Frequency of drinking days	4	-.03 [-.25, .19] <sup>a</sup>	3.42	.331	12 [0, 56]
Alcohol-related problems	9	.04 [-0.13, .21] <sup>a</sup>	5.64	.688	0 [0, 63]

*Note.* Weighted mean effect sizes ( $d_{+}$ ) are positive for differences that favor the intervention group relative to the control group. *k* = number of interventions;  $d_{+}$  = weighted mean effect size; CI = confidence interval; *Q* = homogeneity statistic;  $I^2$  = consistency of effect sizes.

<sup>a</sup> A single outlier was detected for the quantity of alcohol used at specific occasions/days (Thompson, 1996), frequency of drinking days (Fried, 2010), and alcohol-related problems (Hamm, 2012). The magnitudes and direction of the weighted mean effect size that included the outlier was consistent with the above results (frequency of drinking days:  $d_{+}$  = .08, 95% CI [-10, .26], *k* = 5; alcohol-related problems:  $d_{+}$  = .07, 95% CI [-.10, .23], *k* = 10) except for the quantity of alcohol consumed at specific occasions/days ( $d_{+}$  = .25, 95% CI [.02, .48], *k* = 8).

### Moderators of Alcohol Consumption and Alcohol-Related Problems

Meta-regression (continuous variables) and the meta-analytic analogue to ANOVA (categorical variables) were conducted to examine a priori moderators of intervention outcomes. Due to study sample size limitations, moderator tests were conducted only for (a) alcohol consumption (quantity per week/month); (b) alcohol consumption (quantity on specific occasions/days); (c) frequency of heavy drinking; and (d) alcohol-related problems. (The frequency of drinking days was assessed in  $\leq 5$  studies and thus was not included in the moderator analyses.) Sample characteristics (proportion sorority members, prior alcohol use, Greek housing), intervention content (personalized feedback, normative comparisons, alcohol expectancies, moderation strategies, identification of high-risk drinking situations, goal-setting, and skills-training), delivery (individual vs. chapter houses), and dose (total number of minutes) were examined as potential moderators of alcohol outcomes. Sample and intervention characteristics with too few (e.g., sorority members, Greek housing) or too many (e.g., personalized feedback, skills-training) cases could not be examined as potential moderators for each outcome. The results of the moderator tests are provided in Table 4.

Significant moderation effects were found only for alcohol consumption (quantity on specific occasions or days) and the heavy drinking frequency. Interventions were more successful in reducing the quantity of alcohol consumed on specific occasions or days if the intervention challenged alcohol-related expectancies ( $Q_B$  [1] = 10.63,  $p$  = .001) or did not identify high-risk drinking situations ( $Q_B$  [1] = 7.04,  $p$  = .008).

Inclusion of several intervention components moderated the success of the interventions to reduce the frequency of heavy drinking but not in the expected direction. That is, interventions that included moderation strategies ( $Q_B$  [1] = 10.83,  $p$  = .001), identification of high-risk drinking situations ( $Q_B$  [1] = 7.04,  $p$  = .008), goal-setting ( $Q_B$  [1] = 19.36,  $p$  < .001), and skills training ( $Q_B$  [1] = 9.80,  $p$  = .002) were *less* successful than control conditions in reducing the frequency of heavy drinking among members of Greek letter organizations. Finally, interventions that

were delivered over shorter (vs. longer) durations were associated with reductions in the frequency of heavy drinking ( $B$  = -0.04,  $\beta$  = -0.76,  $p$  = .053). Follow-up analyses stratified by intervention length indicate that brief interventions (i.e., total dose  $\leq 60$  min;  $d_{+}$  = 0.39, 95% CI [0.13, 0.66], *k* = 2) achieved a significantly larger effect size than longer interventions (i.e., total dose >60 min;  $d_{+}$  = -0.10, 95% CI [-0.17, -0.02], *k* = 5),  $Q_B$  = 12.22,  $p$  < .001.

### Changes From Pre- to Posttest

Within-group analyses were conducted using the nine (out of 15) studies that provided sufficient data for calculating standardized mean-gain effect sizes. Consistent with the between-groups analyses, within-group analyses were stratified by alcohol outcome (Table 5). Box plots revealed a single outlier for alcohol-related problems which was removed from the analyses (see note for Table 5). Members of Greek letter organizations who received an intervention reduced their alcohol consumption behaviors. Within-group changes were found for the quantity of alcohol consumed on specific occasions/days ( $d_{+random}$  = 0.28, 95% CI [7, 50]) and the frequency of drinking days ( $d_{+random}$  = 0.24, 95% CI [9, 39]) from pre- to posttest. Intervention participants did not reduce alcohol-related problems from pre- to posttest. Control participants did not change their alcohol behaviors or alcohol-related problems.

Variations in improvements across intervention and control groups were examined using the between-groups homogeneity test ( $Q_B$ ). Compared with controls, intervention participants reported *less* alcohol consumption (specific occasions/days) and *fewer* drinking days,  $Q_B$  = 5.27,  $p$  = .022 and  $Q_B$  = 5.79,  $p$  = .016, respectively. There were no differences between intervention and control participants on alcohol-related problems (see Table 5).

### Discussion

This meta-analysis is the first to examine the efficacy of alcohol interventions to reduce alcohol consumption and related problems among members of Greek letter organizations. Included were 15 studies that reported on 21 interventions to reduce alcohol use

Table 4  
Moderators of Alcohol Consumption and Alcohol-Related Problems

Moderators	Quantity per week/month			Quantity on specific occasions/ days			Frequency of heavy drinking			Alcohol-related problems		
	k	B (SE)	d <sub>+</sub> [95% CI]	k	B (SE)	d <sub>+</sub> [95% CI]	k	B (SE)	d <sub>+</sub> [95% CI]	k	B (SE)	d <sub>+</sub> [95% CI]
Sample characteristics												
Sorority members, %	8	—	—	6	—	—	7	—	—	8	.16 (.17)	—
Prior alcohol use	3	-.09 (.06)	—	3	.06 (.04)	—	3	-.07 (.02)	—	3	-.01 (.04)	—
Greek housing	—	—	—	—	—	—	—	—	—	—	—	—
Intervention characteristics												
Intervention delivery												
Individual-level	0	—	—	4	—	.07 [-.25, .38]	5	—	.06 [-.19, .31]	5	—	-.14 [-.37, .09]
Chapter-level	7	-.09 [-.17, -.01]	—	3	—	.13 [-.32, .58]	2	—	.00 [-.63, .63]	4	—	.11 [-.01, .23]
Intervention dose	7	-.00 (.00)	—	7	-.00 (.00)	—	7	-.04 (.02)	—	7	-.00 (.00)	—
Intervention content												
Personalized feedback												
Yes	2	.10 [-.18, .39]	—	1	—	.25 [-.36, .87]	0	—	—	4	—	-.05 [-.25, .14]
No	6	-.12 [-.17, -.06]	—	6	—	.06 [-.22, .34]	7	—	.04 [-.14, .21]	5	—	.10 [-.02, .23]
Normative comparisons												
Yes	2	.10 [-.18, .39]	—	3	—	.03 [-.34, .41]	1	—	.00 [-.95, .95]	6	—	.06 [-.09, .21]
No	6	-.12 [-.17, -.06]	—	4	—	.14 [-.20, .47]	6	—	.06 [-.18, .29]	3	—	.06 [-.09, .21]
Alcohol expectancies												
Yes	1	.16 [-.20, .52]	—	2	—	.40 [.18, .62]	1	—	.46 [.17, .75]	2	—	.03 [-.12, .17]
No	7	-.11 [-.17, -.06]	—	5	—	-.09 [-.28, .10]	6	—	-.10 [-.17, -.03]	7	—	.09 [-.06, .25]
Moderation strategies												
Yes	4	-.12 [-.18, -.06]	—	3	—	.13 [-.32, .58]	4	—	-.10 [-.19, -.02]	5	—	-.11 [-.31, .10]
No	4	.08 [-.17, .33]	—	4	—	.07 [-.25, .38]	3	—	.29 [.07, .51]	4	—	.12 [-.01, .25]
Identification of high-risk drinking situations												
Yes	3	-.12 [-.18, -.06]	—	4	—	-.09 [-.31, .13]	5	—	-.10 [-.17, -.02]	6	—	.09 [-.03, .20]
No	5	.09 [-.13, .31]	—	3	—	.35 [.11, .59]	2	—	.39 [.13, .66]	3	—	-.09 [-.35, .17]
Goal-setting												
Yes	3	-.12 [-.18, -.06]	—	2	—	.24 [-.30, .79]	4	—	-.11 [-.18, -.05]	3	—	.10 [-.18, .39]
No	5	.09 [-.13, .31]	—	5	—	.05 [-.24, .33]	3	—	.44 [.20, .67]	6	—	.05 [-.07, .17]
Skills-training												
Yes	4	-.12 [-.18, -.06]	—	0	—	—	2	—	-.11 [-.19, -.02]	2	—	.12 [-.19, .42]
No	4	.08 [-.17, .33]	—	7	—	.10 [-.10, .31]	5	—	.25 [.04, .45]	7	—	.05 [-.06, .16]

Note. Analyses were conducted using meta-regression (continuous variables) and the meta-analytic analogue to the one-way ANOVA (categorical variables) to examine potential moderators of alcohol consumption (quantity consumed per week/month) and alcohol-related problems. All moderator tests were based on random-effects assumptions, using maximum likelihood to estimate the between-study variance. k = number of interventions; d<sub>+</sub> = weighted mean effect size; CI = confidence interval. Statistically significant findings are indicated in bold font.

Table 5  
*Weighted Mean Effect Sizes and Homogeneity Statistics for Within-Groups Analyses at the Last Assessment*

Outcome	Interventions		Controls		$Q_B$	$p$
	$k$	$d_+$ [95% CI]	$k$	$d_+$ [95% CI]		
Alcohol consumption						
Quantity per week/month	1	—	1	—	—	—
Quantity on specific occasions/days	6	<b>.28 [.07, .50]</b>	4	-.10 [-.35, .14]	5.27	.022
Frequency of heavy drinking	1	—	1	—	—	—
Frequency of drinking days	5	<b>.24 [.09, .39]</b>	3	-.04 [-.21, .14]	5.79	.016
Alcohol-related problems	6	.07 [-.06, .21] <sup>a</sup>	7	.01 [-.13, .14]	.52	.469

*Note.* Weighted mean effect sizes ( $d_+$ ), using random-effects assumptions, are positive for reductions in alcohol consumption or alcohol-related problems from pre- to posttest. Analyses used to assess the differences between the intervention and control conditions followed maximum likelihood procedures.  $k$  = number of interventions;  $d_+$  = weighted mean effect size; CI = confidence interval;  $Q_B$  = between-group homogeneity statistic. Bold font indicates significant weighted mean effect sizes (i.e., CI does not include zero). Italics indicate outcomes in which significant differences between the intervention and control conditions were observed (i.e., significant  $Q_B$  value).

<sup>a</sup> A single outlier was detected for alcohol-related problems (Savoy, 2007; men only); the magnitude and direction of the weighted mean effect size that included the outlier was consistent with the above results ( $d_+$  = .04, 95% CI = [-.10, .17],  $k$  = 7).

among 6,026 members of Greek letter organizations. Relative to peers in the control conditions, fraternity and sorority members who participated in alcohol interventions drank no less and reported no fewer alcohol-related problems with one exception: the quantity of alcohol consumed per week or month which was reduced in the control (vs. intervention) group. The within-group analyses, in contrast, provided partial evidence of intervention efficacy. Members of Greek letter organizations who participated in an alcohol intervention reduced their alcohol consumption (i.e., quantity on specific occasions or days and the frequency of drinking days) from pre- to posttest; the magnitude of the effect sizes were small to medium ( $d_+$  = 0.28 and 0.24, respectively). Thus, providing members of Greek letter organizations with an alcohol intervention appears to improve drinking outcomes over time but this improvement does not seem to be superior to results obtained with a control group undergoing assessments and/or receiving an attenuated intervention.

The magnitude of the observed within-group changes is clearly modest but these effects are equivalent to those observed in previous meta-analyses evaluating alcohol-related interventions in general student populations (Carey et al., 2007; Carey, Scott-Sheldon, Elliott, Bolles, & Carey, 2009; Carey, Scott-Sheldon, Elliott, Garey, & Carey, 2012). Thus, with both Greek-affiliated students, and the general student population, there is a need to refine existing interventions to increase their efficacy. To suggest strategies for improving efficacy, several potential moderators of intervention efficacy were explored.

The results of the moderator analyses revealed three important results. First, interventions that addressed alcohol-related expectancies were more effective in reducing the quantity of alcohol consumed on specific occasions or days (e.g., parties, weekend drinking). This finding is important because alcohol consumption is strongly influenced by the positive expectancies associated with consuming alcohol. Greek members with positive expectancies not only report higher consumption levels, but they also report more alcohol-related consequences compared to those with negative expectancies (Cashin et al., 1998). Interventions that challenge

alcohol expectancies have been shown to be efficacious in reducing drinking behaviors in the broader college student population (Scott-Sheldon et al., 2012). Thus, challenging unrealistic alcohol expectancies is recommended for interventions targeted to fraternity and sorority members.

Second, moderator analyses also revealed that some intervention features were counterproductive. Specifically, highlighting the situational risk factors that contribute to drinking and efforts to manage drinking (i.e., moderation strategies, goal-setting, and skills-training) reduced the efficacy of the intervention as measured by the frequency of heavy drinking. This finding highlights the complexities of intervening with Greek-affiliated students. Fraternity and sorority members often drink in situations (e.g., house parties) where they may feel comfortable and in control (Knee & Neighbors, 2002). Furthermore, members often report drinking for extrinsic reasons such as perceptions of greater opportunities for friendship, social engagement, and sexual activity (Cashin et al., 1998). Thus, attempts to manage drinking may be ineffective for fraternity and sorority members if they view alcohol use as a means to achieve their social and sexual goals.

Finally, it appears that briefer interventions tended to be more successful than longer interventions in reducing heavy drinking frequency. Intervention length varied widely but most interventions were delivered in less than 1 hr ( $Mdn$  = 22 min; range = 4 to 78 min). Given that several components were found to be unhelpful, it is likely that longer interventions contained more of these components. This unexpected finding is practical in that briefer interventions take less time from participants and providers, and are likely to be less costly than lengthier interventions. Briefer interventions also have the potential to reach a larger number of students (Larimer, Crounce, Lee, & Kilmer, 2004). Furthermore, fraternity and sorority members may be more likely to attend, and thus benefit from, briefer interventions. These somewhat paradoxical findings are consistent with meta-analyses of health behavior change showing that behavior change was more evident in studies using brief (vs. lengthier) interventions (for a meta-synthesis, see Johnson et al., 2010). Determining which intervention components

are more conducive to brief (vs. lengthier) interventions will be an important area for inquiry.

Notably absent from this meta-analysis are interventions targeted to sorority members. Even though alcohol is prohibited in most sorority houses, sorority members engage in high rates of heavy drinking and experience negative consequences associated with their heavy drinking (Wechsler et al., 2009). In particular, sorority members are four times more likely to be sexually assaulted than nonsorority members; this increased risk has been attributed to higher rates of alcohol consumption by both perpetrators and victims (Minow & Einolf, 2009). Despite this, no interventions were specifically targeted to sorority members whereas 10 studies targeted only fraternity members. Further, only 18% of the participants in the included studies were women. Thus, evaluating interventions targeted specifically to sorority members is an important but neglected area of research.

### Limitations

Six limitations should be considered when interpreting our findings. First, the comprehensiveness of any meta-analysis is limited by the availability of the data; it is important for all investigators to disseminate their results and respond to requests for clarification (Matt & Cook, 2009). Second, self-report remains subject to social and cognitive biases, although researchers often employ methods to minimize this bias (Nederhof, 1985). Third, follow-up intervals tend to be brief limiting the ability to detect sleeper effects. Fourth, the moderator tests were limited by the data available in the primary level studies and thus, key moderators (e.g., Greek housing) could not be fully tested. Fifth, no interventions were targeted to sorority members even though sorority members engage in heavy (episodic) drinking and experience negative consequences associated with heavy drinking. Finally, several studies included in the meta-analysis were underpowered to detect small intervention effects which may have limited our ability find significant between-groups differences (Turner, Bird, & Higgins, 2013).

### Summary and Conclusions

Interventions are only somewhat successful at reducing alcohol use by fraternity and sorority members over time; little evidence was obtained that intervention improved outcomes over active controls. Clearly, intervention refinement is needed. Interventions addressing alcohol expectancies are most likely to reduce the quantity of alcohol consumed and that briefer interventions are more effective at reducing the frequency of heavy drinking.

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