NIH Public Access
Author Manuscript

What Makes Group MET Work? A Randomized Controlled Trial of College Student Drinkers in Mandated Alcohol Diversion

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Abstract

Nationally, college drinkers exhibit the highest rates of alcohol consumption and represent the largest percentage of problem drinkers. Group motivational enhancement therapy (GMET) has been found to catalyze problem drinking reductions among college student samples. While research supporting the use of single-session GMET in college samples (general and mandated) is emergent, no studies have evaluated a comprehensive model of the potential active ingredients of this group intervention. College students ($N = 206$; 88% Caucasian; 63% male; M age $= 18.6$) mandated to a university alcohol diversion program were randomly assigned to one of three conditions: the standard-of-care two-session 'Focus on Alcohol Concerns' education group (FAC), a single group motivational enhancement therapy (GMET), or a single Alcohol Information-only control group (AI) to evaluate the role of five putative mediators: readiness to change, self-efficacy, perceived risk, norm estimates, and positive drinking expectancies. At three and six month follow-ups, GMET students demonstrated greater reductions in problem drinking outcomes (drinks per drinking day, hazardous drinking symptoms, and alcohol-related problems). Of the five mediators proposed, only self-efficacy emerged as a significant mediator.

Keywords

Group Motivational Enhancement Therapy; Mandated; College Students; Drinking; Self-Efficacy

Introduction

Nearly 31% of college students meet criteria for alcohol abuse and 6% for alcohol dependence (Knight, et al., 2003). In fact, during the past decade, 18-24 year-olds have had the highest rates of alcohol consumption and problem drinking in the country (DHHS, 1997). Studies show that students who binge drink (consuming four or more drinks per drinking episode for women; and five or more for men) are significantly more likely to have substantial negative alcohol-related consequences, including drinking and driving, physical/sexual assault, serious injury and fatality (e.g., Abbey, 2002; Hingson, Heeren, Winter, & Wechsler, 2005). Moreover, binge drinking does not simply affect the drinker. Rather, it impacts the entire university community, with secondhand effects of drinking leading to increased risk of property damage, sexual assault, and interpersonal victimization (Wechsler, Lee, Nelson, & Kuo, 2002).

To prevent and/or reduce the prevalence and negative consequences of binge drinking, many universities have implemented heightened campus policing, citations for underage alcohol possession and/or consumption, and hefty penalties such as monetary fines, academic probation, and mandatory alcohol education programming (N. P. Barnett & Read, 2005). Studies show that students cited for alcohol-related infractions and mandated to intervention report higher alcohol use (greater percentage of drinking days), greater alcohol-related problems, and poorer academic performance than non-adjudicated college students (Caldwell, 2002; Fromme & Corbin, 2004). As mandated students tend to evidence greater/heavier drinking, this is an ideal group for intervention. In the past decade there has been a surge in intervention studies with mandated students, and many of these have successfully led to reductions in binge drinking and related consequences (e.g., N. P. Barnett, et al., 2004; Borsari & Carey, 2005; Borsari, O'Leary Tevyaw, Barnett, Kahler, & Monti, 2007; Fromme & Corbin, 2004; Harris, Aldea, & Kirkley, 2006; LaBrie, Lamb, Pedersen, & Quinlan, 2006; LaBrie, Thompson, Hutching, Lac, & Buckley, 2007; O'Leary Tevyaw, Borsari, Colby, & Monti, 2007; White, et al., 2006; White, Mun, & Morgan, 2008; White, Mun, Pugh, & Morgan, 2007).

Components of Effective Interventions for College Students

A recent meta-analysis evaluating alcohol abuse interventions with college students indicated that in terms of salient active ingredients, interventions that contained components of motivational interviewing showed greater efficacy in reducing alcohol-related problems in short-term follow-ups (B = 0.21; Carey, Scott-Sheldon, Carey, & DeMartini, 2007). Moreover, Carey and colleagues (2007) found that while students in active intervention conditions evidenced less extreme drinking than those in control conditions, interventions that were presented in person ($B = 0.17$) that included the presentation of normative feedback ($B = 0.17$), feedback on expectancies or motives for drinking ($B = 0.27$), and weighing pros and cons of drinking (frequently also referred to as the "decisional balance exercise"; $B = 0.17$) were the most successful. These components are consistent with the strategy of motivational enhancement therapy (MET; Miller, Zweben, DiClemente, & Rychtarik, 1999), an intervention approach based on the foundation of motivational interviewing (MI; Miller & Rollnick, 2002). Like MI, MET is an empathic, nonjudgmental, and directive way of being with people, which may include discussions of expectancies and motives for drinking, as well as discussions of the potential pros and cons of alcohol consumption. In addition to the fundamental tenets of MI (rolling with resistance, accurate empathy, development of discrepancy, support of self-efficacy), MET consistently includes the provision and discussion of normative feedback (Miller, et al., 1999).

While Carey and colleagues' (2007) meta-analysis found greater support for individual versus group interventions ($B = 0.28$), individual interventions are not always feasible or cost-effective. Moreover, frequently, court-referred or university-based education programs such

as diversion programs for Driving while Under the Influence (DUI) or Minor in Possession (MIP) infractions are provided in a group modality. These are the most common sources of public health alcohol programming and as such, these group programs receive the majority of public funding for alcohol intervention. In addition, while many mandated interventions tend to be comprised of multiple sessions, large reviews have indicated that *brief* interventions have gained the strongest empirical support in effectively treating alcohol use disorders (Miller & Wilbourne, 2002). As brief group MI has the potential to be an efficacious and cost-effective alternative for public health secondary prevention in university and court diversion programs, several studies have begun to evaluate the theoretical and empirical efficacy of group MI/MET approaches with mandated students (e.g., Fromme & Corbin, 2004; LaBrie, et al., 2006; LaBrie, Pedersen, Lamb, & Quinlan, 2007; LaBrie, Thompson, et al., 2007).

Search for the Active Ingredients of Group MI/MET

With varying levels of treatment fidelity in MI/MET interventions, many have called for the identification of the active ingredients that may be driving the efficacy of this intervention in individual (Burke, Arkowitz, & Menchola, 2003; Moyers, et al., 2007), as well as group contexts (LaBrie, Pedersen, et al., 2007). Understanding the active ingredients is critical to determining how to formulate more targeted, efficacious interventions, as well as how to improve interventionist training.

One way of evaluating the active ingredients is through examining intervention mediators and moderators (e.g., Moyers, et al., 2007). However, to date, only four published studies have investigated the influence of posited active ingredients in group MI/MET (GMI/GMET) interventions (Fromme & Corbin, 2004; LaBrie, et al., 2008; Larimer, et al., 2001; Rosenblum, Cleland, Magura, Mahmood, & Kosanke, 2005). While these studies supported the role of social and enhancement motives for drinking as an active ingredient of GMI/GMET interventions, contrary to their predictions, readiness to change drinking, readiness to attend treatment, perceived drinking-related risks, hostility, and coping and conformity motives for drinking did not gain support. Interestingly, even readiness to change—long thought of as one of the most important factors in MI/MET success—has received mixed evidence in college samples (Fromme & Corbin, 2004). And, despite the fundamental role of self-efficacy within this approach (Miller & Rollnick, 2002), we could find no published studies evaluating its role in GMI/GMET interventions.

Potential Mediators of GMET

The foundation of all MI/MET approaches includes rolling with clients' resistance, supporting clients' self-efficacy, developing the perception of discrepancy between clients' current behaviors with short and long-term goals, and conveying accurate empathy (Miller & Rollnick, 2002). However, other factors may be salient to catalyzing college students' responsible drinking behavior. Some studies suggest that increasing perceived risk, decreasing clients' perceptions of the prevalence of drinking in their communities (norm estimates), and decreasing clients' expectancies for positive effects of drinking (positive drinking expectancies), would all theoretically lead to reductions in college student problem drinking. Hypothetically, increasing clients' awareness of actual drinking-related risks, positive and negative outcomes of drinking, and normative drinking levels would lead to decreased consumption of alcohol, decreased experience of alcohol-related problems, and lower alcohol-related risk behavior. While several prior studies have investigated the role of several independently active ingredients, we could find no studies that evaluated an *integrated* model investigating putative active ingredients of this group intervention. A mediational analysis via structural equation modeling (SEM) enables a detailed assessment of how active ingredients may relate to changes in drinking behavior with this high risk, heavy drinking sample. Specifically, we proposed to evaluate a model whereby immediate changes in ingredients

associated with positive GMET outcomes such as, increased readiness to change (e.g., Carey, Henson, Carey, & Maisto, 2007, 2009; Fromme & Corbin, 2004; Maisto, et al., 2001; ProjectMatchResearchGroup, 1997), increased self-efficacy (e.g., Harris, et al., 2006; Miller & Rollnick, 2002; Schulenberg, Wadsworth, & O'Malley, 1996), increased perceived drinking-related risks (e.g., "I am likely to ride with people who drive dangerously when I am drinking;" Fromme, Katz, & D'Amico, 1997), decreased norm estimates (e.g., L. A. Barnett, Far, Mauss, & Miller, 1996; Borsari & Carey, 2005; Larimer, Irvine, Kilmer, & Marlatt, 1997; Walters, Vader, Harris, Field, & Jouriles, 2009; Wood, Capone, Laforge, Erickson, & Brand, 2007), and decreased positive drinking expectancies (Borsari & Carey, 2005; Borsari, et al., 2007; Carey, Henson, et al., 2007; LaBrie, et al., 2006; Oei & Burrow, 2000; Oei & Morawska, 2004) would result in reduced consumption of alcohol, hazardous drinking symptoms, and alcohol-related negative consequences. Given the current support for GMI/GMET with college students (e.g., Fromme & Corbin, 2004; LaBrie, et al., 2008; LaBrie, et al., 2006; LaBrie, Pedersen, et al., 2007; LaBrie, Thompson, et al., 2007; Larimer, et al., 2001; Michael, Curtin, Kirkley, Jones, & Harris, 2006) and the theoretical consonance, as well as the cost-effectiveness of using group approaches with students mandated to alcohol treatment (e.g., Harris, et al., 2006; LaBrie, et al., 2006; LaBrie, Thompson, et al., 2007), it is particularly important to know the active ingredients driving these interventions, and how these ingredients compare across three different interventions.

The objectives of the present study were to test the efficacy of a GMET versus two different mandated alcohol education groups with college students in an alcohol diversion program. Two control conditions were selected, as one was the current mandated alcohol intervention program provided by the university (the standard of care; "Focus on Alcohol Concerns"; FAC; two three-hour group). However, because this intervention was twice as long as the GMET condition (one three-hour group), we also included a third condition, a brief (one three-hour group) alcohol information (AI) condition that was derived from and matched to the FAC condition in terms of content, and matched to the GMET condition in terms of time. It was hypothesized that one, three-hour session of GMET would produce three- and 6-month drinking outcomes superior to both the FAC alcohol education program as well as the brief time-matched AI control session. Based on previous research, it was hypothesized that the GMET would catalyze decreases in problem drinking, operationalized as decreases in drinks per drinking day, hazardous drinking symptoms, and alcohol-related problems. In addition, this study sought to evaluate the strength of five putative active ingredients in GMET, including readiness to change, self-efficacy, perceived risk, norm estimates, and positive drinking expectancies through a mediational model.

Method

Participant Recruitment

With the participating university's institutional review board approval, students were recruited from a large, western university student health center. As part of university policy, students who received a first-offense Minor in Possession (MIP) or Minor Driving under the Influence (minors driving with .02+ BAC) violation were placed on probation for one full semester, completed five hours of community service, and attended required diversion (alcohol education as developed by a university affiliate). Similar to the approach of other mandated student studies (Carey, et al., 2009), students were referred to participation in the research study by alcohol diversion staff. To be included, students had to be over age 18, referred to diversion for an alcohol-related offense, and provide written informed consent agreeing to random assignment to one of the three conditions as well as participation in 3- and 6-month follow-ups. Following the provision of written informed consent, students completed a set of baseline questionnaires.

Participants and Randomization

Of the 225 students who contacted the study to express interest in participating, 206 (92%) students successfully completed the baseline assessment and intervention. The final sample self-identified as 88% Caucasian, 7% Hispanic, Asian, or African-American, and 5% unidentified. The mean age was 18.6 years and 63% of the sample was male, representative of many mandated college student drinking samples (e.g., O'Leary Tevyaw, et al., 2007; White, et al., 2008). Participants were randomly assigned to one of three conditions, either the standard two, three-hour Focus on Alcohol Concerns alcohol-education group (FAC, $n = 80$), one three-hour group motivational enhancement therapy session (GMET, $n = 68$), or one three-hour Alcohol-Information group (AI, $n = 58$). All groups were restricted to four to ten participants. Randomization by the roll of a die occurred after groups were scheduled, 24 hours prior to the group.

Assessment Procedure

At recruitment, participants completed a baseline packet that included demographics, drinking measures, and personality measures. Responses from baseline questionnaires were used to create personal feedback handouts for those in the GMET condition. Immediately upon completion of the group intervention, all participants completed the post-treatment packet of program satisfaction and the putative mediators. At each follow-up, subjects completed outcome measures on drinking, risk-taking behavior, and alcohol-related consequences. Follow-ups were completed via a secured internet web-page at 3-month and 6-months.

Measures

A demographics questionnaire was administered at the initial baseline session to collect information on age, sex, marital status, SES, occupation, income, education, and race/ethnicity.

Problem Drinking Outcomes—We believed that the most salient outcome variables to assess were the three drinking behaviors that had led to (and could continue) to result to students' involvement in alcohol diversion (high quantity and frequency of drinking, hazardous drinking), as well as the experienced negative consequences of alcohol use. Thus, three outcome measures were selected to clearly determine the impact of the interventions across a spectrum of problem drinking behaviors: average amount consumed per drinking occasion, hazardous drinking symptoms, and alcohol-related consequences.

Average Drinks Per Drinking Day (DDD): Alcohol Use History Questionnaire: Similar to the assessment approach of LaBrie and colleagues (e.g., LaBrie, Thompson, et al., 2007), four items were used to comment quantity and frequency of alcohol use during the past three months. This measure yielded data regarding the type of alcohol most frequently consumed, the average number of drinking episodes during the past three months (frequency), the largest amount (quantity) consumed on one occasion, and the average number of drinks per drinking occasion (average drinks per drinking day).

Hazardous Drinking: The Alcohol Use Disorders Identification Test: (AUDIT; Babor, 2006) contains 10 items to assess hazardous drinking symptoms. Recent studies (Kelly, Donovan, Chung, Cook, & Delbridge, 2004) as well as the most recent version of the instrument manual (Babor et al., 2006), have found that a cut score of 10 provides greater specificity in indicating hazardous drinking behaviors and greater likelihood of meeting criteria for alcohol use disorders (AUDs). Reliability for this measure was good in this sample, $\alpha = .85$.

Alcohol-Related Problems: The Rutgers Alcohol Problem Index: (RAPI) is the gold standard measure of alcohol-related problems with late adolescent and college samples (White

& Labouvie, 1989), being the instrument of choice to assess alcohol-related problems across a number of college student studies (e.g., Borsari & Carey, 2000; Carey et al., 2006; 2009; LaBrie et al., 2007, 2008; Walters et al., 2009). Reliability for the RAPI in this sample was high, α = .90.

Proposed Mediators

Readiness to Change: The Stages of Change Readiness and Treatment Eagerness Scale: (SOCRATES; Miller & Tonigan, 1996) evaluated readiness to change immediately post-intervention. The scale has 19-items, using a 5-point Likert scale, with high levels of reliability and validity (Isenhart, 1994; Monti, et al., 1999). Reliability for the SOCRATES for this sample was good, α = .89.

Self-Efficacy: The Drinking Refusal Self-Efficacy Questionnaire: (DRSEQ; Young, Oei, & Crook, 1991) is a 31-item, Likert scale measure that assesses individuals' confidence to resist drinking in three types of situations. The first factor includes Social Pressure Situations (i.e., "when friends are drinking," "at a party;" α=.94). The second includes Emotional Stressors Situations (i.e., "when feeling frustrated," "when feeling down;" α=.95). And, the third includes Opportunistic Drinking Situations, when alcohol is readily available (i.e., "when listening to music," "at home alone;" α = .92).

Perceived Risk: The Perceived Risk Behavior Questionnaire: (P/RBQ; Shaw, Wagner, Arnett, & Aber, 1992) measures perceived drinking-related risk with 22-items, on a Likert scale, by asking respondents to assess risk associated with alcohol-involved behaviors (e.g., "having sex without contraceptives", "destroying property"). Reliability for the P/RBQ in this sample was adequate, α = .83.

Norm Estimates: Similar to the work of Walters and colleagues who evaluated this construct with a single question (2009), this variable was evaluated using a single item commenting perception of peer alcohol use with the question, "How many drinks do most students have when they party?"

Positive Drinking Expectancies: The Positive Drinking Expectancies Scale: (DEQ; Young, Knight, & Oei, 1990) measure evaluates young adults' expectancies for the positive effects of drinking, including tension reduction. Within this sample, reliability for this measure was fair, α = .72.

Treatment Fidelity and Satisfaction

To evaluate treatment fidelity and participant satisfaction with each condition, participants were administered a 12-item questionnaire regarding detailed aspects considered salient and unique to each group process (GMET = "How empathic was the leader?," "The leader helped me feel I could change if I wanted to," "How much time did the group engage in discussion or listen to the lecture?," receipt of personal feedback; FAC and AI = receipt of general information in a lecture format), as well as overall satisfaction with the condition.

Follow-Up Assessment via Internet

Participants completed three- and six-month assessments via a secured, password-protected webpage provided to students. As with other recent college student studies (e.g., LaBrie, et al., 2008; LaBrie, Thompson, et al., 2007), internet follow-ups have been selected as an excellent method to collect follow-up information in a manner that has low demand characteristics, as well as no penalties for providing honest (accurate) information about drinking behavior. To gain the most precise evaluation of behavior during the follow-up periods, the timeframe on

all administered measures was modified to comment the past 3-months (e.g., versus past year). All measures were compiled into a simple forced-choice questionnaire, in the same order as the original baseline questionnaire package. Study staff determined that the internet administration was easy enough to understand that it did not warrant the inclusion of a separate training tutorial. Students were prompted to fill out the online questionnaire via an automated email that informed them that the follow-up was due. In this email, they were provided a link that launched the questionnaire via the internet, as well as a logon password. To prevent duplicated information, students used their student ID and unique study-provided password. If students did not complete the questionnaire in one week, they were given a reminder call by the first author, as well as sent a weekly reminder email until the completion of their assessment, and/or 45 days had past, at which point, the follow-up was considered missed and incomplete. Upon completion of the assessment, the student clicked 'submit' and the assessment was directly sent to the research staff. In addition, while one recent paper found otherwise (Walker & Cosden, 2007), many studies have found that college students' self-reports of drinking are consistently confirmed by collaterals and other knowledgeable sources (Clark & Winters, 2002; Marlatt et al., 1998) and that use of collaterals with college student samples can increase misclassification error (Laforge, Borsari, & Baer, 2005). Thus, for this reason, collateral information was not sought for this study. In addition, due to the anonymity of the internet-based questionnaire, it was hoped that students were more likely to report their drinking candidly.

Participant Compensation

As students became involved in the alcohol diversion program due to an alcohol-related infraction (e.g., drinking on campus, being charged with a minor-in-possession), the university's Judicial Affairs department requested (and was supported by the university institutional review board) that participants not be compensated for the assessment and treatment components of this study. Thus, similar to Carey and colleagues' work with a similar population (2009), participants were only paid for completion of the 3- and 6-month follow-up sessions, for which they were mailed a $15 money-order following completion of each.

Treatment Conditions

Specific written protocols were developed for the GMET, FAC, and AI. Group leaders were trained to follow protocols and employed an administration checklist following each group to verify consistency across groups. For this study, two Master's-level group leaders provided each of the three interventions. One group leader was recruited from the diversion program. She was additionally trained in the administration of the GMET and AI protocols. The other interventionist was the first author, who received training in individual MI/MET interventions by the fourth author, an established researcher of MI/MET interventions and addiction.

Group Motivational Enhancement Therapy (GMET)

The GMET condition consisted of a three-hour group following the MET procedures outlined in previous studies with adolescents (Monti, Barnett, O'Leary, & Colby, 2001) and adapted for a group modality. Specifically, four MET activities were conducted in a group format, involving students writing their replies on a blackboard to enable the entire group to evaluate the responses. First, the group engaged in a group decisional balance paradigm, whereby students were asked to explore the pros and cons of drinking, including experienced and potentially dangerous situations. The group leader relied on MI-consistent approaches (see Moyers, et al., 2007), including reliance on reflections, open-ended questioning, affirmations, and summary statements, with the goal of decreasing resistance, demonstrating accurate empathy, developing discrepancy between ideal and current alcohol use, and supporting self-efficacy (Miller & Rollnick, 2002). Second, during the feedback component of the GMET, in

an MI-consistent manner (meaning, in an open, non-judgmental approach) students were provided personalized feedback handouts including their own self-reported drinking patterns, quantity/frequency rates, BAC levels, and other drug use compared to the national averages. Third, the group leader employed reflections and empathic, open-ended questioning to develop participants' ambivalence regarding current drinking or substance abuse, and to elicit statements for change. Fourth, the group leader engaged the group on a discussion of harm-reduction approaches through encouraging participants to help each other to develop behavioral strategies to alter high-risk drinking, substance abuse, and risk-taking.

Focus on Alcohol Concerns Diversion Program (FAC)

Developed by a university affiliate for alcohol diversion for mandated students, this standard of care condition consisted of two three-hour groups. This previously established treatment protocol was designed to educate students on alcohol and substance abuse, consequences from use, legal policies, and university resources. Additional components of this intervention included: (1) the receipt of an informational FAC handbook, (2) watching brief alcohol-education videos, (3) an alcohol and substance abuse quiz, (4) completing a calendar to estimate total past-year alcohol use, alcohol-related money spent, and other drug and tobacco use, (6) information on STDs, drug use, ways to identify an alcohol or drug problem, (7) an overview of university resources and clinics. Questions and/or incorrect statements about alcohol use were answered or clarified. Unlike the GMET, the group leader did not elicit individualized information or engage in collaborative harm-reduction.

Alcohol Information Group (AI)

The AI group consisted of one three-hour informational group. The group leader provided participants with handouts on the social, behavioral, and biological effects of alcohol and other substance abuse. This followed the FAC handbook, but was in a significantly briefer format (one three-hour session versus two three-hour sessions). In a lecture format, participants received information in the following three domains: legal (campus and state drinking policies) and physiological (impact of alcohol, alcohol poisoning, gender differences in metabolism) consequences of substance abusing behavior. Similar to the FAC intervention, the leader answered questions related directly to alcohol or substance abuse. Different from the FAC condition, participants were not shown videos nor asked to complete in-group assignments. Similar to the FAC and discrepant from the GMET, the group leader did not elicit individualized information or engage in collaborative harm-reduction.

All Conditions

In all conditions, participants were given information on legal requirements for drinking and driving, the FAC handbook, and referred to general information on the physiological impact of alcohol, alcohol poisoning, gender differences in metabolism, information on substance abuse, and information on university resources and clinics.

Results

As a first step in our analyses, the skew and kurtosis of all variables included as either outcomes or mediational variables were examined. No meaningful departures from normality were seen, nor were there extreme outliers in the data.

Success of Randomization

Pretest equivalence of conditions across demographics and baseline measures (e.g., problem drinking, putative mediators) were assessed via individual analyses of variance (ANOVAs); no significant differences were found at baseline, suggesting successful randomization (see

Table 1). Students were randomly assigned to condition via dice-roll. Group sizes ranged from 4 to 10 students and there were a total of 27 groups: 9 FAC groups, 10 GMET groups, and 8 AI groups.

Satisfaction and Validity of Conditions

In terms of satisfaction, across the three groups, 91% of all participants rated their experience as "Good" or "Excellent." Moreover across the three groups, no significant differences emerged in terms of students' satisfaction with group leaders or the quality of the group discussion. In addition, expected differences were found across group content and process. Specifically, GMET participants were significantly more likely than FAC or AI participants to report that they were "given specifics about how much I drink or use drugs compared to peers" [$F(2,192) = 10.48$, $p < .001$] and that the group provided "specific strategies to change my drinking or drug use, if I wanted to" [$F(2,193) = 4.56$, $p < .05$]. AI participants were more likely to rate the group leader as didactic with the leader talking 81% of the time versus 42% for the FAC and 46% for the GMET groups [$F(2,190) = 10.24$, $p < .001$].

Intervention Effects on Putative Mediators at Immediate Post-test

To examine the effects of the efficacy of the interventions on the five putative mediators (e.g., readiness to change, self-efficacy, perceived risk, norm estimates, and positive drinking expectancies), ANCOVA models were estimated where pretest scores were included as covariates for each respective construct. In the event of a significant main effect, alpha inflation of post-hoc comparisons was addressed using the Tukey-Kraemer correction. Evaluating an intervention conducted in groups requires specialized analytical techniques to ensure accurate estimates of intervention effects that account for the clustered nature of the data (Raudenbush & Bryk, 2002). As a first step, and prior to conducting other analyses, the intraclass correlation (ICC or ratio of between group variance to total variance) associated with each mediator and outcome variable was computed. The majority of the ICC values were zero or close to zero and would produce little (if any) inflation of Type I error (Cohen, Cohen, West, & Aiken, 2003), however the values for two of the self-efficacy scales were moderate (.11 and .12), and one larger value of .29 was observed for positive alcohol expectancies. Analyses were thus conducted in a multilevel framework to account for any potential non-independence of observations at the group-level. SAS Proc Mixed was used for all analyses conducted in SAS 9.2 and a complex sample function that is available in MPlus that accounts for non-independence by using a sandwich estimator to adjust standard errors and χ^2 values was used for the mediation model. Pre- and post-test means, along with significance tests for main effects and posthoc pairwise comparisons corrected for alpha-inflation, are presented in Table 2. With regard to missing data, both SAS Proc Mixed and Mplus utilize modern maximum-likelihood (ML) based approaches to the treatment of missing data, allowing all possible datapoints to be utilized in the analyses. Proc Mixed utilizes an EM algorithm for ML estimation of missing values, while Mplus includes the capability to test models using a full information (direct) ML estimator. The ML approach is considered the state of the art for dealing with data that are missing at random, and has been shown to address data that display levels of missingness in line with and even considerably worse than those observed in this study (Enders & Bandalos, 2001; Schafer & Graham, 2002).

In contrast with predictions, analyses of changes indicated that there were no significant intervention effects on readiness to change or norm estimates. However, consistent with predictions, analysis of the three self-efficacy subscales (*social pressure situations, emotional stressor situations, and opportunistic drinking situations*) indicated that *self-efficacy in social pressure situations* evidenced a significant intervention effect. Post hoc comparisons revealed that all means between the three interventions were significantly different from one another, indicating that self-efficacy in social pressure situations was highest for those participants in

the GMET, significantly lower for those in the AI intervention, and lowest for those in the FAC intervention. For *self-efficacy in emotional stressor situations*, there was a marginal intervention effect. Post hoc comparisons showed that self-efficacy in emotional stressor situations was higher in the GMET as compared to the FAC intervention, but neither group was significantly different from the AI intervention. For *self-efficacy in opportunistic drinking situations* there was a significant intervention effect, with post hoc comparisons showing that self-efficacy in opportunistic drinking situations was higher in the GMET as compared to the FAC intervention, but neither group was significantly different from the AI intervention. In terms of <u>perceived risk,</u> analyses revealed a significant intervention effect such that perceived risk was significantly higher in the GMET group as compared to the AI and FAC interventions, and the latter two were not significantly different from one another. In addition, significant intervention effects were seen for <u>positive drinking expectancies.</u> Post hoc comparisons showed significantly lower positive drinking expectancies in the FAC and GMET interventions than in the AI intervention, though the FAC and GMET did not differ from one another.

Attrition Analyses

Similar to other studies of college student drinking (e.g., Carey, et al., 2009; Larimer & Cronce, 2007; Wood, et al., 2007), we achieved an acceptable follow-up rate, with a total of 80% (n=164) of the participants retained at the 3-month follow-up, and 76% (n=157) retained at the 6-month follow-up. Attrition analyses were conducted following the methods of Jurs and Glass (1971), using baseline problem drinking risk status as assessed by average drinks per drinking day (DDD), alcohol-related problems (RAPI), and hazardous drinking symptoms (AUDIT). The 3-month analyses showed no differential attrition by average drinks per drinking day (DDD) or alcohol-related problem scores (RAPI), but that participants with *lower* hazardous drinking symptoms (AUDIT) scores at baseline were more likely to attrit ($p < .05$). However, at 3-months, there were no groupXretention interactions that would indicate differential attrition by condition associated with these risk factors. The 6-month analyses showed that there was no differential attrition by average drinks per drinking day (DDD), alcohol-related problem scores (RAPI), or hazardous drinking symptom scores (AUDIT). However, there was one significant groupXretention interaction ($p<.05$) for average drinks per drinking day (DDD), that indicated differential attrition by condition associated with this risk factors. Specifically, in the AI condition, those who had greater DDD scores (who were heavier drinkers at baseline) were more likely to attrit at the 6-month follow-up. In sum, our generalizability at 3-months is somewhat limited by the preferential loss of lighter drinkers from the study, and our generalizablity at 6-months is somewhat limited by the preferential loss of heavier drinkers from the study. Thus, results should be interpreted in light of these considerations.

Intervention Effects on Behavior at Follow-up

The influence of the interventions on the problem drinking outcomes (e.g., alcohol-related problems; RAPI, hazardous drinking symptoms; AUDIT, average drinks per drinking day; DDD) was explored via the same ANCOVA strategy where pretest scores were included as covariates for each outcome. We estimated one set of models for the 3-month outcomes and one set for the 6-month outcomes using the Tukey-Kraemer corrected post-hoc comparisons in the event of significant main effects. Analyses were again conducted in a multilevel framework in Proc Mixed to account for the clustered nature of the data.

For hazardous drinking symptoms (AUDIT) at 3 months, analyses highlighted a significant intervention effect, supported by a large effect size. Post hoc comparisons indicated that AUDIT scores were significantly lower in the GMET, as compared to both the FAC and the AI interventions (see Table 3). The other two conditions, FAC and AI, were not significantly different from one another. At 6 months, a similar pattern emerged, with a significant intervention effect, again supported by a large effect size. Post hoc comparisons showing

AUDIT scores were significantly lower in the GMET, as compared to both the FAC and the AI interventions. The FAC and AI were not significantly different from one another.

For alcohol-related problems (RAPI) at 3 months, analyses indicated a marginal intervention effect, with a small-medium effect size. Post hoc comparisons indicated that RAPI scores were significantly lower in the GMET intervention as compared to the AI intervention. The FAC was not significantly different from either the GMET or the AI intervention. At 6 months, however, a significant intervention effect emerged, as indicated by a large effect size. Post hoc comparisons showing that RAPI scores were significantly lower in the GMET intervention as compared to both the FAC and the AI. The FAC and AI were not significantly different from one another.

For average drinks per drinking day (DDD) at 3 months, analyses indicated a significant intervention effect, supported by a large effect size. Post hoc comparisons revealed that average drinks per drinking day (DDD) were significantly lower in the GMET, compared to the AI intervention. Similar to the outcomes for the RAPI, the FAC was not significantly different from either the GMET or the AI intervention. The same pattern emerged at 6 months, where a significant intervention effect was evident, supported by a large effect size. Post hoc comparisons showing that average DDD were lower in the GMET intervention as compared to the AI intervention. The FAC intervention was not significantly different from either the GMET or the AI intervention.

Test of the Mediational Model of Intervention Effects

Mediational analyses via path analysis were used to examine the mechanisms by which the interventions had effects on problem drinking outcomes (Baron & Kenny, 1986; Bryan, Aiken, & West, 1996; Bryan, Schmiege, & Broaddus, 2007; West & Aiken, 1997). Mediational analysis determines whether immediate post-treatment changes in readiness to change, self-efficacy, perceived risk, norm estimates, or positive drinking expectancies effectively explain the variance in problem drinking reductions. These analyses involved the formation of two contrast codes that served as exogenous variables in the mediational model. One contrast compared the "active" interventions (FAC, GMET) versus the "control" condition (AI), and the second contrast compared the FAC intervention versus the GMET intervention. These contrasts were orthogonal where, for the first contrast, the AI condition was coded as "-1" and the two active interventions each as "+.5." For the second contrast, the AI condition was coded as "0," the FAC condition was coded as "-.5," and the GMET condition as "+.5." Since there were no differences at baseline on any of the mediators, the variables included in the model were the posttest values on the five proposed mediators (c.f., Bryan et al., 1996; West & Aiken, 1997). Because our self-efficacy measure has three distinct subscales, we estimated the self-efficacy mediator as a latent variable with three indicators (i.e., the three subscales of social pressure, emotional stressors, and opportunistic drinking). To be parsimonious in examining the influence of the interventions and mediators on our outcome, we also estimated latent variables for the 3- and 6-month drinking outcomes. Specifically, problem drinking at each follow-up was estimated as a latent variable with the hazardous drinking symptoms (AUDIT), alcohol-related problems (RAPI), and average drinks per drinking day (DDD) variables as outcomes. Path analyses were utilized to determine whether complete mediation of program effects occurred following similar procedures utilized in prior intervention research (Bryan, et al., 1996; Schmiege, Broaddus, Levin, & Bryan, 2009).

The multi-component theoretical model was estimated in Mplus 5.2. Model fit was assessed with the Comparative Fit Index (CFI; Bentler, 1990), the Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), and the Standardized Root Mean Square Residual (SRMR). Original estimation of the model included all possible correlations among the mediators, though all but one of these were non-significant and negatively impacted the

RMSEA and SRMR, both of which penalize for overfit. Thus, only the significant correlation between the mediators was included [between self-efficacy and perceived risk ($r = .34$, $p<. 001$)]. In addition, due to shared method variance it was necessary to estimate the correlation between the error terms for the RAPI and the DDD variables utilized in the problem drinking outcomes (e.g., correlating the error of the 3-month RAPI with the 6-month RAPI). This model exhibited adequate fit (χ^2 (78, $n=206$) = 169.022, $p<.001$, CFI = .93, RMSEA = .08, SRMR = .06).

As a first pass at whether successful mediation of the effects of the interventions on problem drinking outcomes had been obtained, we estimated four additional models wherein the direct path from one of the contrasts to the 3-month and 6-month outcomes, respectively, was estimated. Satorra and Bentler (2001) provide the derivation of a formula for a scaling factor to adjust the χ^2 difference test for nested models which utilize the ML robust estimator as ours did, and this formula was utilized to compute the 1 degree of freedom Satorra-Bentler scaled χ^2 difference tests of whether the addition of the direct effect significantly improves the fit of the model. Though the tests for direct remaining relationships of the intervention on 6-month outcomes were non-significant, there were significant remaining direct effects from both contrast 1 (GMET and FAC versus AI) to 3-month outcomes, (χ^2 (1, $n=206$) = 8.039, $p<.001$) and from contrast 2 (GMET versus FAC) to 3-month outcomes (χ^2 (1, $n=206$) = 4.43, $p<.05$). These findings suggest that mediation was by no means complete, and there were direct effects of the interventions on problem drinking outcomes that were not accounted for by the mediators tested in this study. Given this evidence, we re-estimated the model including direct paths from the contrasts to the 3-month drinking outcomes. Model fit, not surprisingly, was improved somewhat (χ^2 (76, $n=206$) = 158.774, $p<.001$, CFI = .93, RMSEA = .07, SRMR = .04), and this model appears in Figure 1, along with standardized parameter estimates and significance levels.

To examine whether any mediation did occur through our mediators, we examined the *z*-test for the adaptation of the Sobel (1982) test of the indirect effects implemented in MPlus 5.1. A significant *z*-score is evidence of a significant indirect (i.e., mediated) effect, and thus represents a test of whether the mediated effect is significantly different from zero. MPlus provides both the test of specific indirect effects (e.g., from contrast 1 through self-efficacy and 3-month problem drinking outcomes to 6-month problem drinking outcomes) as well as the overall test of mediation from one exogenous variable to one outcome (e.g., from contrast 1 through ALL mediators to 6-month problem drinking outcomes) computed as the sum of the specific indirect effects. In this model, the overall indirect effects from contrast 1 to both 3-month and 6-month were not significant. However, the overall indirect effect from contrast 2 (GMET versus FAC) to both 3-month ($z=-2.04$, $p<.05$) and 6-month ($z = -1.96$, $p = .05$) behavioral outcomes were significant. Unsurprisingly, for both the 3-month ($z = -2.21$, $p < . 05$) and 6-month cases ($z = -2.19$, $p < .05$), it was the specific indirect effect self-efficacy that was significant. There were no other significant specific indirect effects.

As can be seen in Figure 1, for the first contrast, there was only one significant effect on the mediators. The GMET and FAC conditions resulted in significantly lower positive drinking expectancies as compared to the AI condition. The second contrast demonstrates that, compared with the FAC group, the GMET intervention resulted in significantly higher self-efficacy, significantly higher perceived risk, and significantly lower positive drinking expectancies. In terms of the relationship of the mediators to the outcomes, higher self-efficacy was related to lower levels of problem drinking. In contrast, readiness to change as assessed by the SOCRATES was related to significantly *higher* problem drinking outcomes at follow-up, suggesting that those individuals who identified more of problem with their drinking, in fact, drank more, engaged in more hazardous drinking behavior, and experienced more negative consequences of drinking. Higher norm estimates were related to higher problem

drinking outcomes. Perceived risk and positive drinking expectances were unrelated to problem drinking outcomes. In this analysis, and as indicated by our analysis of mediated effects, the only mediator that was both affected by the interventions and was subsequently related to problem drinking outcomes was the latent construct of self-efficacy.

In sum, the data indicate that (1) both of the active interventions (FAC and GMET) led to a reduction in positive drinking expectancies, (2) compared with the FAC and AI interventions, the GMET produced significant increases in the latent construct of *self-efficacy* (comprised of self-efficacy to refuse drinking across several situations, including social pressure situations, emotionally stressful situations, or opportunistic drinking situations), significant reductions in *positive drinking expectancies*, and significant increases in *risk perception*, and (3) the individuals whom identified that their drinking had caused problems and may be in need of change (*greater readiness to change*), had lower self-efficacy in their ability to refuse drinks (*lower self-efficacy*), and perceived that their peers drank more heavily (*greater norm estimates*), had higher problem drinking outcomes 3 and 6 months later.

Only self-efficacy mediated the effects of the interventions on drinking outcomes. Contrary to expectations, no other significant mediators emerged. Note that these analyses tested for differential effects of interventions on mediators, and as other studies have found (e.g., Del Boca et al., 2004), and as can be seen in Tables 2 and 3, both the mediators and the outcomes evidenced changes over time, such that all participants in these mandated programs reduced negative outcomes over time. Thus, a lack of differential intervention effects does not indicate an absence of change in these variables, simply that the change was not differential by intervention condition. A key finding from this analysis is that there were clearly changes catalyzed by these interventions that influenced problem drinking outcomes, but were not fully captured by the mediators selected in this study.

Discussion

Overview of Findings

The overall pattern of results supported our hypothesis; a brief, group-delivered motivational enhancement therapy intervention (GMET) was superior to alcohol education groups (FAC and AI) traditionally administered in mandated alcohol programs for high-risk college student drinkers. Specifically, at both 3- and 6-month follow-ups, students randomly assigned to one group MET (GMET) session, demonstrated significantly lower problem drinking outcomes, in terms of hazardous drinking symptoms, alcohol-related problems, and average drinks per drinking day, compared with those in an extended alcohol education group (FAC) or a brief information group (AI). These findings support previous studies indicating that GMET is a promising cost-effective treatment for students in mandated alcohol programming (e.g., Fromme & Corbin, 2004; LaBrie, et al., 2006; LaBrie, Pedersen, et al., 2007; LaBrie, Thompson, et al., 2007).

These findings are clinically significant for several reasons. To begin, while some have found that heavier drinkers evidence greater change (LaBrie, Pederson et al., 2007; LaBrie, Thompson et al., 2007), recent work and a large scale meta-analysis have found that higher risk samples demonstrated less change following intervention (e.g., Carey et al., 2007; Mun et al., 2009). Notably, in this study of high-risk drinkers, one session of GMET was able to significantly shift immediate cognitions and perceptions, as well as initiate and sustain significant changes in follow-up drinking behavior. Moreover, the strength of the changes in immediate cognition as well as longer term behavior, were substantive, as supported by substantive large to very large effect sizes found in this study. Comparatively, the strength of the problem drinking outcomes we found were at least three times the size of the average 6-

month outcomes found in a recent meta-analysis (d = 0.22; Carey, Scott-Sheldon et al., 2007; vs. d's = 0.75-0.99 for each of our three 6-month problem drinking outcomes).

In terms of the three problem drinking outcomes, hazardous drinking symptoms, average drinks per drinking day, and alcohol-related problems, there was substantial convergence across the measures and stability of the resulting latent variable. However, a closer examination of the clinical implications of each indicates critical behavioral changes. In terms of average drinks per drinking day (DDD), all three intervention groups initially reported consuming an average of 6 drinks per drinking day, a quantity that surpasses the criteria for binge drinking. However, as supported by large effect sizes, in contrast to the other two groups, throughout the follow-ups, the GMET participants were the only ones to steadily decrease their average quantity of consumption; ending at 6 months with an average of 5.24 drinks per drinking day. In contrast, while not significantly different from the GMET group, the FAC's group average stayed closer to the original 6 (at 5.95), and the AI group's average *increased* to 6.40. While our findings for this outcome are comparable, to slightly higher than, those found in other motivationally-based interventions with mandated students (Carey et al., 2009; LaBrie et al., 2006; LaBrie, Thompson et al., 2007), we believe that the most salient aspect of this finding was that the GMET was uniquely able to catalyze and sustain reductions in quantity of alcohol consumption.

For alcohol-related problems (RAPI), significant differences were not evident until the 6 month point, at which the GMET group significantly outperformed the FAC and AI groups, supported by substantial effect sizes. This finding is consistent with previous research, which has found that reductions in alcohol-related problems tend to emerge later than other problem drinking variables, but persist through longer-term follow-ups (Carey, Scott-Sheldon et al., 2007). Six-month RAPI scores for the GMET group were slightly greater than those found in other motivationally-based interventions with mandated students (e.g., Borsari & Carey, 2005; LaBrie, Thompson et al., 2007), yet, they demonstrated a significant reduction from the start of the study (baseline M = 10.35; 6-month M = 6.22). Like the findings with DDDD, 6-month RAPI scores for students in the FAC and AI groups stayed very close to their baseline levels (FAC baseline M = 9.83, 6-month M = 9.45; AI baseline M = 12.71, 6-month M = 12.24). We believe that the unique ability of the GMET to propel 6-month reductions in alcohol-related problems in a heavy-drinking, mandated sample, with strong effect sizes, indicates the effectiveness of this intervention.

In terms of hazardous drinking symptoms (AUDIT), at 6 months, GMET participants had significantly lower hazardous drinking symptoms than FAC and AI participants (M's = 9.08, 11.46, 12.63, respectively). Notably, while the suggested cut scores for this measure have varied (e.g., 6-8, Aertgeerts, et al., 2000; Kills Small, Simons, & Stricherz, 2007; Kokotailo, et al., 2004; Reinert & Allen, 2007), other studies (Kelly, et al., 2004), as well as the most recent version of the instrument manual (Babor, 2006)have found that a cut score of 10 provides greater specificity in indicating hazardous drinking behaviors and greater likelihood of correctly indicating the presence of alcohol use disorders (AUDs). Thus, one interpretation of the findings is that the GMET group was the only one to progress from hazardous drinking levels at baseline (baseline M scores >10) to non-significant levels at 3-month and 6-month follow ups (M scores<10). However, we believe that the better and stronger interpretation is that, while the other conditions maintained the same level of hazardous drinking symptoms from baseline through 6 months, the GMET group was the only level to significantly reduce their level of hazardous drinking symptoms, evidencing, comparably, the largest effect sizes for this outcome (d's = 1.20, 0.99 at 3- and 6-month, respectively).

Together, across each of these problem drinking factors, the GMET group was the *only* group that showed significant reductions on each outcome. These reductions indicate that participants in GMET groups significantly reduced their average quantity of drinking, hazardous drinking

behavior, and experienced lower levels of alcohol-related consequences; significant concrete behavioral changes that are critical to reducing alcohol-related risk behaviors and associated problems for high-risk drinkers. As noted by Hingson and colleagues (2005) and Carey and colleagues (2005), interventions that can effectively reduce high-risk and hazardous drinking are not only likely to improve the health and future of drinker, but they also are likely to positively impact the institution and the community. Together, these data support that this one session GMET intervention was able to significantly reduce the types of drinking behavior likely to lead to students' involvement in mandated alcohol programming; effectively reducing the target behavior of concern through the 6-month follow-up.

In addition to our findings of with problem drinking outcomes, this study was innovative in its evaluation of an integrated theoretical model of putative mediators with a group motivational enhancement therapy (GMET) intervention. Through this study, we found a significantly more complex relationship than we had anticipated. Compared with the traditional mandated alcohol education program (FAC), students in the GMET evidenced significantly greater self-efficacy, greater perceived risk, and lower positive drinking expectancies. In terms of problem drinking outcomes, only three of our five putative mediators demonstrated significant influence. More specifically, students with higher self-efficacy, lower norm estimates, and lower readiness to change had significantly lower problem drinking outcomes at the follow-ups. However, of these proposed variables, only self-efficacy emerged as a significant mediator of the GMET intervention.

Consistent with the literature on the critical role of self-efficacy in mobilizing and sustaining drinking reductions (Bogenschutz, Tonigan, & Miller, 2006; Collins & Carey, 2007; Moos, 2007; Tate, et al., 2008), and supporting the posited role of self-efficacy in MI/MET interventions (e.g., Miller & Rollnick, 2002), mandated college drinkers who completed a single-session of GMET demonstrated a significantly stronger sense of self-efficacy to refuse drinks across high-risk situations, including social pressure situations, emotionally stressful situations, and opportunistic drinking situations, above and beyond those in the AI and FAC conditions, and those increases in self-efficacy were associated with more positive drinking outcomes three and six months later. One explanation for these findings may be that, unlike students in the other conditions, GMET participants were asked to generate creative ideas about how they would refuse overconsumption in typical college situations. Unlike the other conditions, GMET participants brainstormed *realistic* ways that they could avoid "doing too many shots, chugging, or getting hammered." This collaborative, student-based, evocative process supports the theoretical processes of MI/MET, insofar as it values the students' thoughts, gives the students ownership over their ideas, and highlights their expertise (Feldstein Ewing, Walters, & Baer, under review). Moreover, in contrast with an individual MET intervention, GMET engages the opinions of multiple students, and enables group members to be the "experts" in generating and disseminating plausible problem drinking reduction strategies; helping students who may feel disparaged and judged in other types of interventions to feel like they have something useful and helpful to offer other students in need. In addition, the GMET approach may also provide less-confident students with harm-reduction strategies that are practical, useful, and which may feel more viable (as they are provided by fellow students who have actually experienced similar situations), ultimately enhancing students' sense that should they want to reduce their drinking or associated harms, they would be able to do so. Together, this study supported that GMET discussions which explored the experienced and potential risks of drinking, modeled drink refusal-behavior, and had most (over 50%) of the content generated by the student group members, may have yielded more personally useful information than traditional tutorials on "how alcohol impacts the body" or scare-tactics on alcohol-related student death rates. Universities hoping to reduce alcohol consumption among high-risk drinkers may strongly consider employing MI-based interventions (like GMET), which have a strong focus on bolstering students' self-efficacy.

In contrast with expectations (e.g., Carey, Henson, et al., 2007; Carey, et al., 2009), but consistent with a substantial body of literature (Mun et al., 2009; Walters et al., 2009; Wood et al., 2007), readiness to change showed no intervention effects. Specifically, participants reported increased scores on the SOCRATES across all treatment modalities, and thus this measure did not mediate the superior problem drinking outcomes of the GMET intervention. Surprisingly, higher scores on the SOCRATES (greater readiness to change) were associated with *higher* problem drinking outcomes over time. Items included in the measure represent identification of experienced problem drinking symptoms, such as "I have serious problems with drinking," or "Sometimes I wonder if I am in control of my drinking." Thus, one interpretation of these findings may be that students' ability to recognize that they have experienced problem drinking symptoms does not subsequently translate into their desire or readiness to change. Another possibility is that "true" motivation or readiness to change holds no relationship with behavioral change. However, we believe the most likely possibility is that the SOCRATES did not effectively assess readiness to change drinking behavior in this mandated college sample. Better results may have emerged if we had instead employed a briefer and more effective measure of readiness to change, such as the brief natural language screening measure (Miller & Johnson, 2008), the Readiness to Change Questionnaire (Rollnick et al., 1992), the more comprehensive URICA (DiClemente & Hughes, 1990); or to assess motivation/reasons for drinking (sustain behavior), the Desired Effects of Drinking Scale (Feldstein Ewing, Hendrickson, & Payne, 2008). Future studies will need to use improved assessments of this construct to better understand its potential impact on behavior change.

In addition to catalyzing self-efficacy, the GMET intervention also significantly increased level of perceived risk and decreased positive drinking expectancies. Contrary to expectations, but consistent with prior research (e.g., Borsari & Carey, 2005), these factors were not related to problem drinking outcomes. Many motivational based interventions include discussions aimed at clarifying the harms associated with alcohol use (e.g., Borsari & Carey, 2000; Carey, Carey, Maisto, & Henson, 2006; Carey, et al., 2009; Walters, et al., 2009) and positive expectancies around alcohol use (e.g., Borsari & Carey, 2005; Borsari, et al., 2007; LaBrie, et al., 2006). Frequently, these discussions are included due to the clinical belief that elucidating students' understanding of the potential harms of alcohol use and misperceptions of alcohol expectancies will cause them to reconsider their alcohol use during high risk moments. While the GMET successfully increased risk perception and reduced positive drinking expectancies, the results of this study highlight that shifting these factors do not necessarily lead to different decisions around drinking. Clearly, more research is needed to ascertain how shifts in expectations of the potential harms and benefits of alcohol use may impact drinking behavior.

Finally, while apparently not influenced by the GMET intervention, students with lower norm estimates had significantly better problem drinking outcomes. This finding is slightly more complicated than recent work, which has supported the mediational role of norm estimates in MET outcomes (e.g., Borsari & Carey, 2000; Walters et al., 2009; Wood et al., 2007). However, our findings are consistent with other studies (e.g., Larimer et al., 2001; Carey, Henson et al., 2007) which indicate that this cognitive shift does not necessarily predict behavior change. Many individual and group MI/MET interventions with college students include a discussion of peer norm estimates (e.g., Borsari & Carey, 2005; LaBrie, et al., 2006; Larimer, et al., 2001). However, it is possible that in a group-based context, particularly with mandated students, where students can reference the drinking rates of fellow group members (who in mandated groups have exceptionally high levels of drinking), factual information on "typical" student consumption rates may feel incorrect, distant, and/or irrelevant from their (and their peer's) experience. Rather, as posited by White and colleagues (2008), one of the more salient active components of this intervention process may be the actual arrest incident, with norm estimates potentially shifting as time progresses (White, et al., 2007).

In addition, this study found that the putative mediators accounted for some, but not all of the variance in the model, indicating that these interventions clearly influenced change in other areas that subsequently influenced problem drinking outcomes. Future work must examine additional potential mediators, including the role of the arrest incident (e.g. White et al., 2007), gender (e.g., Carey, Scott-Sheldon et al., 2007; Carey et al., 2009), original consumption levels (Carey, Scott-Sheldon et al., 2007; Labrie, Thompson et al., 2007), and the impact of the assessment process (e.g., Carey et al., 2006).

Limitations and Future Directions

Several limitations should be considered when interpreting the findings. First, data were gathered by self-report and therefore social desirability, self-report biases, and poor-recall could have contributed to measurement error; to minimize this, follow-ups were administered via internet assessments to reduce demand characteristics. Second, similar to other mandated student studies (Carey, et al., 2009), potential participants were referred to participation in the research study by alcohol diversion staff. However, while this study appears comparable to many other mandated college samples (e.g., O'Leary Tevyaw, et al., 2007; White, et al., 2008), it is not possible to determine the representativeness of this sample. Third, as with most emerging adult intervention research (e.g., Borsari & Carey, 2000; Walters, et al., 2009), all data were self-report without biologically verified drinking assessments. Fourth, as with other studies of college student drinkers (e.g., Walters, et al., 2009), our measures varied in terms of length and quality, potentially leading to underestimations of the relationships in this study. Fifth, we did not comment Greek affiliation; future studies would benefit from the inclusion of this demographic question, as salient environmental/peer factors, such as Greek affiliation (e.g., Knight et al., 2002; Park et al., 2008), may influence students' ability to enact and sustain behavior change. Sixth, the pattern of attrition observed may have influenced our model estimations; with the preferential loss of lighter drinkers at 3-months, and a likely underestimation of observed effects at the 6-month time point. Seventh, the degree to which unmeasured group process differences across the groups may be accountable for outcomes is unclear. Specifically, the influence of therapists, groups, and their interactions can have a life of their own, such that the personality of the therapist, their relationships with participants, and/or the relationships of the participant personalities among each other can either facilitate interactions or impede disclosure and diminish quality discussion across all of the different interventions. Our ICCs were very low (the average ICC across all outcomes and mediators was .06) which argues against such group-specific effects, yet differential therapist and group factors may not have been captured quantitatively. Future randomized studies including procedures to record and behaviorally code therapist and group process differences could better measure potential confounds.

Consistent with other recent GMET work (e.g., Schmiege, et al., 2009), self-efficacy emerged as a significant mediator. Given the importance of this construct, future research is needed to understand intervention components that may enhance and strengthen self-efficacy. More generally, further research is clearly needed to evaluate potential meditational variables that underlie the active ingredients in reducing mandated college students' problem drinking behavior, and on the actual mechanisms of GMET's efficacy (e.g., influence of the decisional balance exercise). This study also did not explore potential moderators of GMET's effectiveness, and recent research has demonstrated the importance of individual level variables in predicting response to MI/MET interventions (e.g., personality and/or genetic factors; Feldstein Ewing, LaChance, Bryan, & Hutchison, in press). Without a greater understanding of the salient factors predicting behavior change and of who is most likely to benefit from MI/MET, further refinement of this intervention may prove difficult.

In conclusion, this study supports the effectiveness of a single session group motivational enhancement therapy intervention (GMET) to reduce problem drinking for college students mandated to alcohol treatment. Importantly, quantity of drinking (average drinks per drinking day), hazardous drinking symptoms, and alcohol-related problems showed significant reductions at 3- and 6-month follow-ups, suggesting that a 3-hour group GMET intervention is a viable, brief, efficacious, and low-cost alternative to traditional multiple session alcohol education programs for high-risk student drinkers. While a model of several putative mediators was proposed, only self-efficacy emerged as a significant mediator of the GMET intervention. Further exploration of active ingredients of GMI/MET interventions is necessary to further refine and strengthen outcomes from this intervention approach.

Acknowledgments

References

Abbey A. Alcohol-related sexual assault: A common problem among college students. Journal of Studies on Alcohol 2002;14:118–128.

Aertgeerts B, Buntinx F, Bande-Knops J, Vandermeulen C, Roelants M, Ansoms S, et al. The value of CAGE, CUGE, and AUDIT in screening for alcohol abuse and dependence among college freshman. Alcoholism: Clinical and Experimental Research 2000;24(1):53–57.

Babor, TF.; Higgins-Biddle, JC.; Saunders, JB.; Monteiro, MG. AUDIT: The Alcohol Use Disorders Indentification Test: Guidelines for Use in Primary Care. Vol. 2. The World Health Organization; 2006.

Barnett LA, Far JM, Mauss AL, Miller JA. Changing perceptions of peer norms as a drinking reduction program for college students. Journal of Alcohol and Drug Education 1996;41(2):39–62.

Barnett NP, O'Leary Tevyaw T, Fromme K, Borsari B, Carey KB, Corbin WR, et al. Brief alcohol interventions with mandated or adjudicated college students. Alcoholism: Clinical and experimental research 2004;28(6):966–975.

Barnett NP, Read JP. Mandatory alcohol intervention for alcohol-abusing college students: A systematic review. Journal of Substance Abuse Treatment 2005;29:147–158. [PubMed: 16135343]

Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology 1986;51(6):1173–1182. [PubMed: 3806354]

Bentler PM. Comparative fit indices in structural models. Psychological Bulletin 1990;107(2):238–246. [PubMed: 2320703]

Bogenschutz MP, Tonigan JS, Miller WR. Examining the effects of alcoholism typology and AA attendance on self-efficacy as a mechanism of change. Journal of Studies on Alcohol 2006;67(4):562–567. [PubMed: 16736076]

Borsari B, Carey KB. Effects of a brief motivational intervention with college student drinkers. Journal of Consulting and Clinical Psychology 2000;68(4):728–733. [PubMed: 10965648]

Borsari B, Carey KB. Two brief alcohol interventions for mandated college students. Psychology of Addictive Behaviors 2005;19(3):296–302. [PubMed: 16187809]

Borsari B, O'Leary Tevyaw T, Barnett NP, Kahler CW, Monti PM. Stepped care for mandated college students: A pilot study. The American Journal on Addiction 2007;16:131–137.

Bryan A, Aiken LS, West SG. Increasing condom use: Evaluation of a theory-based intervention to prevent sexually transmitted diseases in young women. Health Psychology 1996;15:371–382. [PubMed: 8891716]

Bryan A, Schmiege SJ, Broaddus MR. Mediational analysis in HIV/AIDS research: estimating multivariate path analytic models in a structural equation modeling framework. AIDS and Behavior 2007;11(3):365–383. [PubMed: 16917669]

Burke BL, Arkowitz H, Menchola M. The efficacy of motivational interviewing: A meta-analysis of controlled clinical trials. Journal of Consulting and Clinical Psychology 2003;71(5):843–861. [PubMed: 14516234]

Caldwell PE. Drinking levels, related problems, and readiness to change in college sample. Alcoholism and Treatment Quarterly 2002;20:1–15.

Carey KB, Carey MP, Maisto SA, Henson JM. Brief motivational interventions for heavy college drinkers: A randomized controlled trial. Journal of Consulting and Clinical Psychology 2006;74(5): 943–954. [PubMed: 17032098]

Carey KB, Henson JM, Carey MP, Maisto SA. Which heavy drinking college students benefit from a brief motivational intervention? Journal of Consulting and Clinical Psychology 2007;75(4):663–669. [PubMed: 17663621]

Carey KB, Henson JM, Carey MP, Maisto SA. Computer versus in-person intervention for students violating campus alcohol policy. Journal of Consulting and Clinical Psychology 2009;77(1):74–87. [PubMed: 19170455]

Carey KB, Scott-Sheldon LAJ, Carey MP, DeMartini KS. Individual-level interventions to reduce college student drinking: A meta-analytic review. Addictive Behaviors 2007;32(11):2469–2494. [PubMed: 17590277]

Clark DB, Winters KC. Measuring risks and outcomes in substance use disorders prevention research. Journal of Consulting and Clinical Psychology 2002;70(6):1207–1223. [PubMed: 12472298]

Collins SE, Carey KB. The theory of planned behavior as a model of heavy episodic drinking among college students. Psychology of Addictive Behaviors 2007;21(4):498–507. [PubMed: 18072832]

Del Boca FK, Darkes J, Greenbaum PE, Goldman MS. Up close and personal: Temporal variability in the drinking of individual college students during their first year. Journal of Consulting and Clinical Psychology 2004;72(2):155–164. [PubMed: 15065951]

DHHS U. Ninth special report to the US Congress on alcohol and health (NIH Publication No 97-4017). 1997

DiClemente CC, Hughes SO. Stages of change profiles in outpatient alcoholism treatment. Journal of Substance Abuse 1990;2(2):217–235. [PubMed: 2136111]

Enders CK, Bandalos DL. The relative performance of full information maximum likelihood extimation for missing data in structural equation models. Structural Equation Modeling 2001;8(3):430–457.

Feldstein Ewing SW, Hendrickson SML, Payne NS. The validity of the Desired Effects of Drinking Scale with a late adolescent sample. Psychology of Addictive Behaviors 2008;22(4):587–591. [PubMed: 19071986]

Feldstein Ewing SW, LaChance HA, Bryan A, Hutchison KE. Do Genetic and Individual Risk Factors Moderate the Efficacy of Motivational Enhancement Therapy? Drinking Outcomes with an Emerging Adult Sample. Addiction Biology. in press.

Feldstein Ewing, SW.; Walters, S.; Baer, JS. Approaching group MI with adolescents and young adults: Strengthening the developmental fit. In: CC, I.; Wagner, KS., editors. Motivational Interviewing in Groups. New York: Guilford; under review

Fromme K, Corbin W. Prevention of heavy drinking and associated negative consequences among mandated and voluntary college students. Journal of Consulting and Clinical Psychology 2004;72 (6):1038–1049. [PubMed: 15612850]

Fromme K, Katz E, D'Amico E. Effects of alcohol intoxication on the perceived consequences of risk-taking. Experimental & Clinical Psychopharmacology 1997;5(1):14–23. [PubMed: 9234035]

Harris RS, Aldea MA, Kirkley DE. A motivational interviewing and common factors approach to change in working with alcohol use and abuse in college students. Professional Psychology: Research and Practice 2006;37(6):614–621.

Hingson R, Heeren T, Winter M, Wechsler H. Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24: Changes from 1998 to 2001. Annual Review of Public Health 2005;26:259–279.

Isenhart CE. Motivational subtypes in an inpatient sample of substance abusers. Addictive Behaviors 1994;19(5):463–475. [PubMed: 7832005]

Jurs SG, Glass GV. Experimental mortality. Journal of Experimental Education 1971;40(1):62–66.

Kelly TM, Donovan JE, Chung T, Cook RL, Delbridge TR. Alcohol use disorders among emergency department-treated older adolescents: A new brief screen (RUFT-Cut) using the AUDIT, CAGE, CRAFFT, and RAPS-QF. Alcoholism: Clinical and Experimental Research 2004;28(5):746–753.

Kills Small NJ, Simons JS, Stricherz M. Assessing criterion validity of the Simple Screening Instrument for Alcohol and Other Drug Abuse (SSI-AOD) in a college population. Addictive Behaviors 2007;32:2425–2431. [PubMed: 17481826]

Knight JR, Wechsler H, Kuo M, Seibring M, Weitzman E, Schuckit MA. Alcohol abuse and dependence among U. S. college sudents. Journal of Studies on Alcohol 2002;63(3):263–270. [PubMed: 12086126]

Knight KM, Bundy C, Morris R, Higgs JF, Jameson RA, Unsworth P, et al. The effects of group motivational interviewing with externalizing conversations for adolescents with Type-I diabetes. Psychology, Health, & Medicine 2003;8(2):149–157.

Kokotailo PK, Egan J, Gangnon R, Brown D, Mundt M, Fleming M. Validity of the Alcohol Use Disorders Identification Test in College Students. Alcoholism: Clinical and Experimental Research 2004;28 (6):914–920.

LaBrie JW, Huchting K, Tawalbeh S, Pedersen ER, Thompson AD, Shelesky K, et al. A randomized motivational enhancement prevention group reduces drinking and alcohol consequences in first-year college women. Psychology of Addictive Behaviors 2008;22(1):149–155. [PubMed: 18298242]

LaBrie JW, Lamb TF, Pedersen ER, Quinlan T. A group motivational interviewing intervention reduces drinking and alcohol-related consequences in adjudicated college students. Journal of College Student Development 2006;47(3):267–280.

LaBrie JW, Pedersen ER, Lamb TF, Quinlan T. A campus-based motivational enhancement group intervention reduces problematic drinking in freshmen male college students. Addictive Behaviors 2007;32:889–901. [PubMed: 16876963]

LaBrie JW, Thompson AD, Hutching K, Lac A, Buckley K. A group motivational interviewing intervention reduces drinking and alcohol-related negative consequences in adjudicated college women. Addictive Behaviors 2007;32(11):2549–2562. [PubMed: 17628347]

Laforge RG, Borsari BE, Baer JS. The utility of collateral informant assessment in college alcohol research: Results from a longitudinal prevention trial. Journal of Studies on Alcohol 2005;66(4):479–487. [PubMed: 16240555]

Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: Individual-focused college drinking prevention strategies 1999-2006. Addictive Behaviors 2007;32:2439–2468. [PubMed: 17604915]

Larimer ME, Irvine DL, Kilmer JR, Marlatt GA. College drinking and the Greek system: Examining the role of perceived norms for high-risk behavior. Journal of College Student Development 1997;38(6): 587–598.

Larimer ME, Turner AP, Anderson BK, Fader JS, Kilmer JR, Palmer RS, et al. Evaluating a brief alcohol intervention with fraternities. Journal of Studies on Alcohol 2001;62(3):370–380. [PubMed: 11414347]

Maisto SA, Conigliaro J, McNeil M, Kraemer K, Conigliaro RL, Kelley ME. Effects of two types of brief intervention and readiness to change on alcohol use in hazardous drinkers. Journal of Studies on Alcohol 2001;62:605–614. [PubMed: 11702799]

Michael KD, Curtin L, Kirkley DE, Jones DL, Harris J, Rafael S. Group-based motivational interviewing for alcohol use among college students: An exploratory study. Professional Psychology: Research and Practice 2006;37(6):629–634.

Miller WR, Johnson WR. A natural language screening measure for motivation to change. Addictive Behaviors 2008;33(9):1177–1182. [PubMed: 18558466]

Miller, WR.; Rollnick, S. Motivational interviewing: Preparing people for change. Vol. 2nd. New York: Guilford Press; 2002.

Miller WR, Tonigan JS. Assessing drinkers' motivations for change: The Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). Psychology of Addictive Behaviors 1996;10(2):81–89.

Miller WR, Wilbourne PL. Mesa Grande: A methodological analysis of clinical trials of treatment for alcohol use disorders. Addiction 2002;97(3):265–277. [PubMed: 11964100]

Miller, WR.; Zweben, a; DiClemente, CC.; Rychtarik, RG. Motivational Enhancement Therapy Manual: A clinical research guide for therapists treating individuals with alcohol abuse and dependence. Rockville, MD: NIAAA/NIH; 1999.

Monti, PM.; Barnett, NP.; O'Leary, TA.; Colby, SM. Motivational enhancement for alcohol-involved adolescents. In: Monti, PM.; Colby, SM.; O'Leary, TA., editors. Adolescents, alcohol, and substance abuse. New York, NY: Guilford Press; 2001.

Monti PM, Colby SM, Barnett NP, Spirito A, Rohsenow DJ, Myers MG, et al. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. Journal of Consulting and Clinical Psychology 1999;67(6):989–994. [PubMed: 10596521]

Moos RH. Theory-based active ingredients of effective treatments for substance use disorders. Drug and Alcohol Dependence 2007;88(23):109–121. [PubMed: 17129682]

Moyers TB, Martin T, Christopher PJ, Houck JM, Tonigan JS, Amrhein PC. Client language as a mediator of motivational interviewing efficacy: Where is the evidence? Alcoholism: Clinical and Experimental Research 2007;31(10):40–47S.

Mun EY, White HR, Morgan TJ. Individual and situational factors that influence the efficacy of personalized feedback substance use interventions for mandated college students. Journal of Consulting and Clinical Psychology 2009;77(1):88–102. [PubMed: 19170456]

O'Leary Tevyaw T, Borsari B, Colby SM, Monti PM. Peer enhancement of a brief motivational intervention with mandated college students. Psychology of Addictive Behaviors 2007;21(1):114–119. [PubMed: 17385961]

Oei TPS, Burrow T. Alcohol expectancy and drinking refusal self-efficacy: A test of specificity theory. Addictive Behaviors 20002000:499–507. [PubMed: 10972442]

Oei TPS, Morawska A. A cognitive model of binge drinking: The influence of alcohol expectancies and drinking refusal self-efficacy. Addictive Behaviors 2004;29(1):159–179. [PubMed: 14667427]

Park A, Sher KJ, Krull JL. Risky drinking in college changes as fraternity/sorority affiliation changes: A person-environment perspective. Psychology of Addictive Behaviors 2008;22(2):219–229. [PubMed: 18540719]

ProjectMatchResearchGroup. Project MATCH secondary a priori hypotheses. Addiction 1997;92(12):1671–1698. [PubMed: 9581001]

Raudenbush, SW.; Bryk, AS. Hierarchical Linear Models. Vol. Second. Thousand Oaks: Sage Publications; 2002.

Reinert DF, Allen JP. The Alcohol Use Disorders Identification Test: An Update of Research Findings. Alcoholism: Clinical and Experimental Research 2007;31(2):185–199.

Rollnick S, Heather N, Gold R, Hall W. Development of a short 'readiness to change' questionnaire for use in brief, opportunistic interventions among excessive drinkers. British Journal of Addiction 1992;87(5):743–754. [PubMed: 1591525]

Rosenblum A, Cleland C, Magura S, Mahmood D, Kosanke N. Moderators of effects of motivational enhancements to cognitive behavioral therapy. The American Journal of Drug and Alcohol Abuse 2005;1:35–58. [PubMed: 15768570]

Satorra A, Bentler PM. A scaled difference chi-squared test statistic for moment structure analysis. Psychometrika 2001;66(4):507–514.

Schafer JL, Graham JW. Missing data: Our view of the state of the art. Psychological Methods 2002;7(2):147–177. [PubMed: 12090408]

Sobel, ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: Leinhardt, S., editor. Sociological Methodology. Washington, DC: American Sociological Association; 1982. 1982. p. 290-312.

Schmiege SJ, Broaddus MR, Levin M, Bryan A. Randomized trial of group interventions to reduce HIV/STD risk and change theoretical mediators among detained adolescents. Journal of Consulting and Clinical Psychology 2009;77(1):38–50. [PubMed: 19170452]

Schulenberg JE, Wadsworth KN, O'Malley PM. Adolescent risk factors for binge drinking during the transition to young adulthood: Variable- and pattern-centered approaches to change. Developmental Psychology 1996;32(4):659–674.

Shaw DS, Wagner EF, Arnett J, Aber MS. The factor structure of the Reckless Behavior Questionnaire. Journal of Youth and Adolescence 1992;21:305–323.

Steiger JH. Structural model evaluation and modification. Multivariate Behavioral Research 1990;25:173–180.

Tate SR, Wu J, McQuaid JR, Cummins K, Shriver C, Krenek M, et al. Comorbidity of substance dependence and depression: Role of life stress and self-efficacy in sustaining abstinence. Psychology of Addictive Behaviors 2008;22(1):47–57. [PubMed: 18298230]

Walker S, Cosden M. Reliability of college student self-reported drinking behavior. Journal of Substance Abuse Treatment 2007;33:405–409. [PubMed: 17499957]

Walters ST, Vader AM, Harris TR, Field CA, Jouriles EN. Dismantling motivational interviewing and feedback for college drinkers: A randomized clinical trial. Journal of Consulting and Clinical Psychology 2009;77(1):64–73. [PubMed: 19170454]

Wechsler H, Lee JE, Nelson TF, Kuo M. Underage college students' drinking behavior, access to alcohol, and the influence of deterrence policies. Journal of American College Health 2002;50(5):223–236. [PubMed: 11990980]

West, SG.; Aiken, LS. Towards understanding individual effects in multiple component prevention programs: Design and analysis strategies. In: Bryant, KJ.; W, Michael; West, Stephen G., editors. The science of Prevention: Methodological advances from alcohol and substance abuse research. Washington, D. C.: American Psychological Association; 1997. p. 167-209.

White HR, Labouvie EW. Towards the assessment of adolescent problem drinking. Journal of Studies on Alcohol 1989;50:30–37. [PubMed: 2927120]

White HR, McMorris BJ, Catalano RF, Fleming CB, Haggerty KP, Abbott RD. Increases in alcohol and marijuana use during the transition out of high school into emerging adulthood: The effects of leaving home, going to college, and high school protective factors. Journal of Studies on Alcohol 2006;67:810–822. [PubMed: 17060997]

White HR, Mun EY, Morgan TJ. Do brief personalized feedback interventions work for mandated students or is it just getting caught that works? Psychology of Addictive Behaviors 2008;22(1):107–116. [PubMed: 18298236]

White HR, Mun EY, Pugh L, Morgan TJ. Long-term effects of brief substance use interventions for mandated college students: Sleeper effects of an in-person personal feedback intervention. Alcoholism: Clinical and experimental research 2007;31(8):1380–1391.

Wood MD, Capone C, Laforge R, Erickson DJ, Brand NH. Brief motivational intervention and alcohol expectancy challenge with heavy drinking college students: A randomized factorial study. Addictive Behaviors 2007;32:2509–2528. [PubMed: 17658696]

Young RM, Knight RG, Oei TPS. The stability of alcohol-related expectancies in social drinking situatinos. Australian Journal of Psychology 1990;42(3):321–330.

Young RM, Oei TPS, Crook G. Development of a drinking self-efficacy questionnaire. Journal of Psychopathology Behavioral Assessment 1991;13(1):1–15.
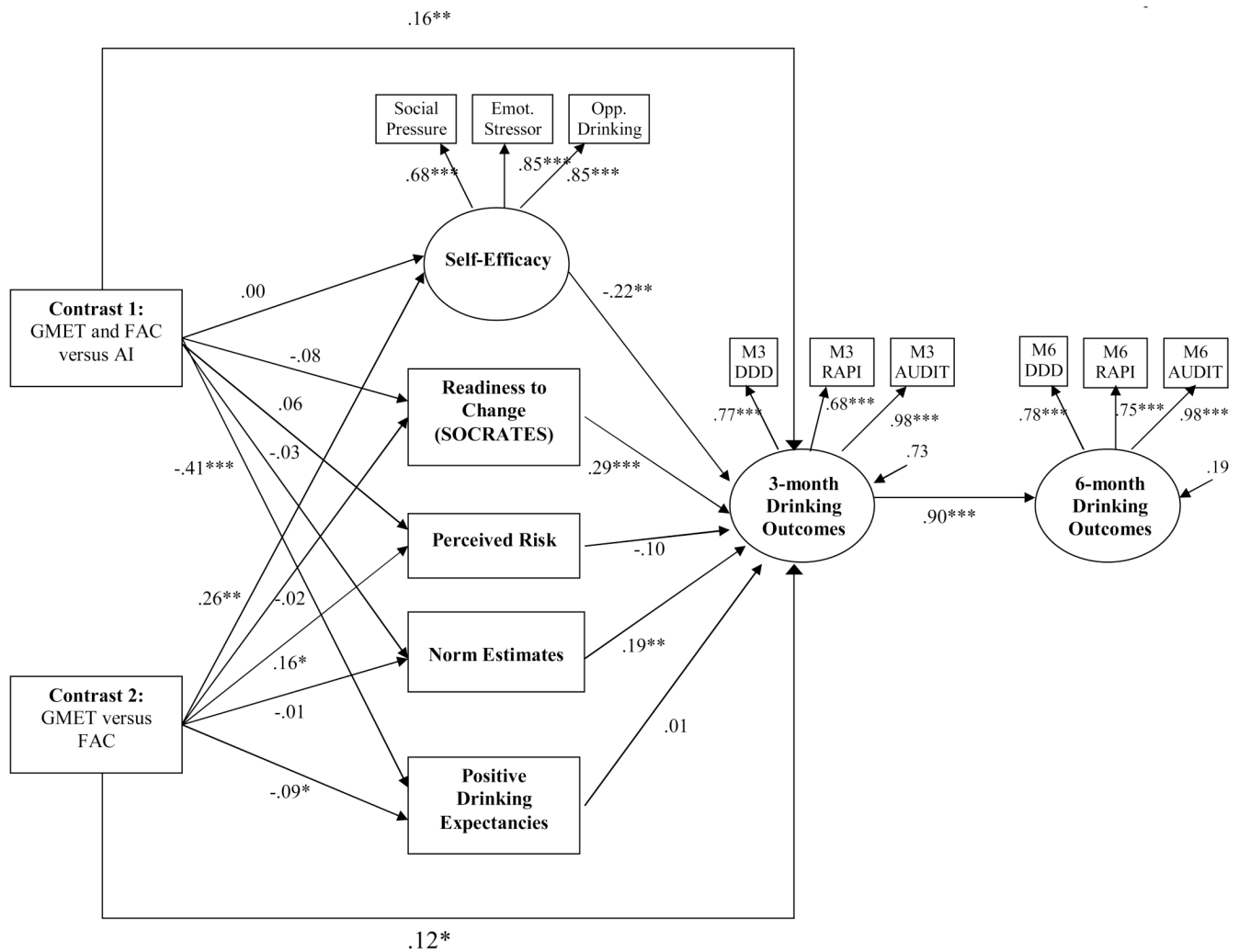
Figure 1.
Model of three- and six-month drinking outcomes among mandated college drinkers for FAC, GMET and AI-control. Contrast 1 compares the FAC and AI control interventions to the GMET intervention, Contrast 2 compare the FAC to the GMET intervention. Coefficients are standardized path coefficients. Overall model fit: χ^2 (76, n=206) = 158.77, $p <$.001, CFI = .93, RMSEA = .07, SRMR = .05. Significance levels for paths: + $p <$ .10, *$p<$.05, **$p<$.01, ***$p<$.001.

Table 1
Baseline Means across Treatment Conditions

Variable[1]	FAC (n = 80)	GMET (n = 68)	AI (n = 58)	Test for Difference
Gender (% male)	62%	64%	63%	$\chi^2(2, n=206)= .08, p=.96$
Age	18.8 (.82)	18.6 (.74)	18.7 (.77)	$F(2,202) = 1.33, p=.27$
Race (% Caucasian)	87%	91%	86%	$\chi^2(8, n=206) = 6.97, p=.54$
Readiness to Change (SOCRATES)	19.6 (7.22)	17.9 (7.03)	21.1 (9.56)	$F(2,202) = 2.51, p=.08$
Self-Efficacy				
Social Pressure Situations	58.1 (16.8)	58.3 (16.9)	57.8 (18.9)	$F(2,203) = .01, p=.98$
Emotional Stressor Situations	58.7 (10.9)	60.1 (12.5)	57.6 (14.2)	$F(2,203) = .65, p=52$
Opportunistic Drinking Situations	49.2 (4.7)	48.7 (7.9)	48.1 (6.9)	$F(2,203) = .48, p=.62$
Perceived Risk	44.8 (5.7)	44.8 (6.8)	43.8 (7.9)	$F(2,203) = .46, p=.63$
Norm Estimates	7.23 (1.97)	7.23 (2.13)	7.16 (2.26)	$F(2,201) = .08, p=.92$
Positive Drinking Expectancies	8.9 (.91)	9.0 (.85)	8.9 (.72)	$F(2,203) = .12, p=.88$
Average Drinks per Drinking Day (DDD)	6.0 (2.25)	6.0 (2.40)	6.2 (2.27)	$F(2,203) = .10, p=.91$
Hazardous Drinking Symptoms (AUDIT)	11.2 (5.1)	10.5 (5.5)	12.2 (5.7)	$F(2,202) = 1.68, p=.19$
Alcohol-Related Problems (RAPI)	9.8 (9.3)	10.3 (11.5)	12.7 (10.9)	$F(2,202) = 1.36, p=.26$

[1]Standard deviations appear in parentheses to the right of means of continuous variables.

Table 2
Baseline to Immediate post-test Means, Standard Deviations, and Significance Test for Group Effects on Putative Mediators

Variable Name GROUP Treatment	Baseline Mean (SD)	Immediate Post[1] Mean (SD)	Test for Group Difference in Adjusted Posttest Means in ANCOVA	Cohen's d for: FAC versus GMET[2] FAC versus AI[2] GMET versus AI[2]
Readiness to Change (SOCRATES)				
FAC	19.61 (7.21)	21.53$_a$ (9.52)		-.27
GMET	17.91 (7.03)	21.18$_a$ (7.32)	$F(2,24)=.23, p=.79$	-.18
AI	21.03 (9.56)	23.04$_a$ (11.79)		.08
Self-Efficacy				
Social Pressure Situations				
FAC	58.07 (16.90)	52.23$_a$ (13.84)		-2.68
GMET	58.30 (16.92)	64.72$_b$ (12.50)	$F(2,24)=21.85, p<.001$	-1.49
AI	57.81 (18.89)	59.91$_c$ (17.48)		1.07
Emotional Stressor Situations				
FAC	58.74 (10.92)	52.23$_a$ (13.84)		-.96
GMET	60.09 (12.51)	64.22$_b$ (12.50)	$F(2,24)=2.73, p=.09$	-.43
AI	57.59 (14.19)	59.91$_{ab}$(17.48)		.48
Opportunistic Drinking Situations				
FAC	49.25 (4.72)	45.70$_a$ (7.78)		-1.25
GMET	48.67 (7.92)	48.49$_b$ (6.54)	$F(2,24)=5.18, p=.01$	-.93
AI	48.15 (6.87)	47.47$_b$ (6.97)		.28
Perceived Risk				
FAC	44.79 (5.73)	44.11$_a$ (5.98)		-1.51
GMET	44.77 (6.81)	46.60$_b$ (6.49)	$F(2,24)=6.88, p<.01$	-.55
AI	43.78 (7.91)	44.43$_s$ (7.66)		.89
Norm Estimates				
FAC	7.31 (1.97)	6.55$_a$ (1.91)		-.01
GMET	7.23 (2.13)	6.50$_a$ (1.81)	$F(2,24)=.28, p=.76$	-.28
AI	7.16 (2.26)	6.65$_a$ (1.60)		-.26
Positive Drinking Expectancies				
FAC	8.95 (0.91)	2.33$_a$ (0.54)		.30
GMET	9.01 (0.85)	2.16$_a$ (0.37)	$F(2,24)=9.95, p<.001$	-1.45
AI	8.97 (0.72)	2.79$_b$ (0.74)		-1.71

[1] Post-test means *not* sharing the same subscript are significantly different at p<.05 or better by the Tukey-Kraemer adjusted pairwise post-hoc test.

[2] Effect size estimate represents an estimate of Cohen's d adjusted for the pretest covariate.

Table 3

Baseline, 3-month, and 6-month means on drinking outcomes

Variable Name GROUP	Baseline Mean (SD)	3-Month Mean (SD)	6-Month Mean (SD)	Test for Group Difference in Adjusted 3- and 6- Month Means in ANCOVA[1]	3-Month Cohen's d for: FAC versus GMET[2] FAC versus AI[2] GMET versus AI[2]	6-Month Cohen's d for: FAC versus GMET[2] FAC versus AI[2] GMET versus AI[2]
Average Drinks per Drinking Day (DDD)						
FAC	6.00 (2.25)	5.91_{ab} (2.10)	5.95_{ab} (2.15)	$F_{3\text{-}month}(2,24)=3.68, p<.05$	.74	.75
GMET	5.98 (2.40)	5.29_{a} (1.84)	5.24_{a} (1.81)		-.42	-.73
AI	6.15 (2.37)	6.12_{b} (2.75)	6.40_{b} (2.71)	$F_{6\text{-}month}(2,24)=5.81, p<.01$	-1.09	-1.39
Hazardous Drinking Symptoms (AUDIT)						
FAC	11.18 (5.06)	11.73_{a} (5.19)	11.46_{a} (5.80)	$F_{3\text{-}month}(2,24)=6.75, p<.01$	1.20	.99
GMET	10.49 (5.50)	9.41_{b} (4.58)	9.08_{b} (4.54)		-.28	-.38
AI	12.23 (5.66)	12.60_{a} (5.48)	12.63_{a} (6.41)	$F_{6\text{-}month}(2,24)=5.31, p=.01$	-1.39	-1.28
Alcohol-Related Problems (RAPI)						
FAC	9.83 (9.30)	8.75_{ab} (6.73)	9.45_{a} (9.56)	$F_{3\text{-}month}(2,24)=3.28, p=.06$	.31	.91
GMET	10.35 (11.49)	8.14_{a} (8.79)	6.22_{b} (7.25)		-.76	-.42
AI	12.71 (10.86)	12.44_{b} (11.46)	12.24_{a} (12.10)	$F_{6\text{-}month}(2,24)=4.91, p<.05$	-1.01	-1.24

[1] Within each follow-up assessment, means *not* sharing the same subscript are significantly different at p<.05 or better by the Tukey-Kraemer adjusted pairwise post-hoc test.

[2] Effect size estimate represents an estimate of Cohen's *d* adjusted for the pretest covariate.