

# Motivational Interventions for Heavy Drinking College Students: Examining the Role of Discrepancy-Related Psychological Processes

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The authors examined the effects of a brief motivational intervention for heavy, episodic alcohol use on discrepancy-related psychological processes. Heavy-drinking college students ( $N = 73$ ) were randomly assigned to a motivationally based intervention (MBI) or an assessment-only control (AC) condition. Cognitive (actual–ideal discrepancy) and affective (2 forms of cognitive dissonance) discrepancy processes were assessed at baseline and immediately following the experimental manipulation. At 6-week follow-up, MBI participants demonstrated significantly greater reductions in problematic drinking than AC participants. Moreover, actual–ideal discrepancy and negative, self-focused dissonance were significantly increased following the intervention (discomfort-related dissonance was not) and were correlated with outcome alcohol involvement. These discrepancy processes did not, however, mediate the relationship between condition and outcome. The findings lend some support to the role of discrepancy enhancement in drinking-related behavior change among college students.

Problematic use of alcohol among college-age young adults remains a serious public health concern (see Hingson, Heeren, Zakocs, Kopstein, & Wechsler, 2002). Approximately 40–45% of college students report that they engage in episodic heavy (“binge”) drinking (e.g., Wechsler, Lee, Kuo, & Lee, 2000), and those who engage in this pattern of consumption are more likely than non-binge-drinkers to experience a range of social, academic, psychological, and health-related problems (see Perkins, 2002). Fortunately, support has recently grown for the efficacy of a variety of brief interventions with this population (see Larimer & Crouse, 2002, for a review). One of the most influential of these brief approaches has been Miller and Rollnick’s (1991, 2002) *motivational interviewing* (MI). MI is a directive, client-centered, nonconfrontational counseling style for increasing substance abusers’ behavioral change motivation that is based on four principles: (a) express empathy, (b) develop a sense of discrepancy between current behavior and broader goals, (c) roll with resistance, and (d) support self-efficacy (Miller & Rollnick, 2002). A number of randomized trials examining MI-based interventions have demonstrated significant reductions in alcohol use (see Dunn, Deroo, & Rivara, 2001). Among college students in particular, motivational interventions have shown significant reductions in a variety of drinking-related indices at 6-week (e.g., Borsari & Carey, 2000), 1-year (e.g., Larimer et al., 2001), and 2-year (e.g., Baer et al., 1992; Marlatt et al., 1998) follow-up periods.

Despite the multiple successes of MI-based approaches, little is known about the mechanisms underlying their effectiveness. Although several dismantling studies have begun to examine which stylistic and technical components are necessary and sufficient to

produce change (e.g., Miller, Benefield, & Tonigan, 1993), the psychological processes through which these brief interventions exert their behavioral effect at outcome have yet to be determined empirically. Borsari and Carey (2000) conducted one of the only studies in this regard. In a randomized, controlled trial with college students, these authors examined the mediational role of two constructs: (a) perceived drinking norms of close friends and typical students and (b) positive and negative expectancies from personal alcohol use. Contrary to their hypotheses, neither changes in perceived drinking norms of friends nor changes in positive or negative alcohol expectancies mediated the relationship between group membership and follow-up drinking. However, estimated weekly drinking of typical students *was* found to mediate this relationship, suggesting that a more accurate perception of other students’ behavior may partially account for the effectiveness of this particular intervention. Nonetheless, the mediators examined in this study were measured at 6-week outcome and not prior to follow-up. Directional causation cannot be assumed from correlations between outcome drinking and mediators, as decreases in alcohol use may very well have led to decreases in perceived drinking norms of typical students. One design strategy that might provide insight into how MI-based approaches work would be to assess cognitive and affective responses directly following the intervention. Though the influence of an intervention may have delayed impact (Marlatt, 1983), assessing immediate responses might capture key psychological processes that occur when students become more aware of the discrepancies between their drinking behavior and important standards and values.

Several psychological theories have been posited to account for behavioral changes observed following motivational interventions. As one of the four guiding principles of MI, discrepancy enhancement is currently viewed as a central mechanism of action of this approach (Miller & Rollnick, 2002). Specifically, Miller and colleagues (e.g., Miller, 1996; Miller & Rollnick, 1991) suggest that MI technique may exert an effect on motivation or behavior through the development of a personal sense of discrepancy re-

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guarding heavy alcohol use, or a deepened, conscious incongruity between one's actual and ideal drinking patterns. Conceptualized as such, actual-ideal drinking discrepancy awareness represents one potential *cognitively* based psychological change process relevant to MI.

Draycott and Dabbs (1998a, 1998b) have focused on the closely related psychological experience of *cognitive dissonance* as an affective consequence of discrepancy enhancement. First described by Festinger (1957), cognitive dissonance generally refers to an unpleasant, driveline state (including both psychological discomfort and physiological arousal) that arises when people simultaneously hold inconsistent cognitions. Research suggests that the specific experience of dissonance as psychological discomfort is motivational in nature as it impels the individual to implement a strategy to reduce this aversive state (Elliot & Devine, 1994). In examining the cognitive and affective processes underlying behavioral change motivation in addiction, Saunders and Wilkinson (1990) referred to this precise state as the "psychological squirm," or a negative affect that presses to be resolved in some way. Thus, with regard to MI, it is thought that such a state of discomfort results from empathically raised awareness of inconsistencies in an individual's ideal and actual drinking-related cognitions and behaviors. Draycott and Dabbs (1998b) proposed that the effective outcomes of MI-based interventions are the result of patients' attempts to decrease their dissonant psychological states by altering their behaviors to be more congruous with their ideal views of themselves. Conceptualized in this way, cognitive dissonance appears to represent an *affectively* based psychological change process.

Efforts to assess cognitive dissonance have historically focused on developing measures of affective discomfort (e.g., feeling uncomfortable, tense, uneasy), in keeping with Festinger's (1957) original conceptualization. However, recent work by Devine and colleagues (Devine, Monteith, Zuwerink, & Elliot, 1991; Elliot & Devine, 1994) suggests that negative, self-focused affects (e.g., feeling guilty, regretful, self-critical) may be particularly important in dissonance-inducing paradigms expressly examining the violation of well-internalized, self-defining standards. For example, investigations of the emotional consequences of hypocrisy-induction paradigms (e.g., evoking prejudicial responses from individuals who passionately hold nonprejudiced values) revealed that subjects with highly internalized values experience guilt-related affects in addition to general discomfort (Devine et al., 1991). Thus, following Aronson's (1968, 1992) reconceptualization of dissonance as rooted in inconsistencies in the self-concept, Elliot and Devine (1994) have suggested that the overall degree of self-relevance of a given threatened cognition may be critical in determining the qualitative nature of the affect experienced. In a related area of theory and research, Higgins (e.g., Higgins, 1987; Higgins, Klein, & Strauman, 1985) has similarly posited that discrepancies in the experience of the self result in differential emotional vulnerabilities that depend on the precise nature of the self-discrepancy. In sum, this work suggests that awareness of inconsistencies in self-defining behaviors and attitudes that is engendered by a motivationally based intervention about alcohol use may particularly tend to produce negative, self-focused emotions (vs. generalized affective discomfort). Research aimed at elucidating the precise quality of this dissonant state as a central

mechanism of change in MI would help clarify both theory and clinical objectives.

The central aims of the present research were to examine (a) the effect of a brief motivationally based intervention for heavy drinking on discrepancy-related psychological processes and (b) whether these discrepancy-related processes mediate the effect of the intervention on college students' drinking. A brief (30-min) motivationally based intervention (MBI) was compared with an assessment-only control group (AC). Treatment condition (MBI vs. AC) was followed by an immediate, postmanipulation assessment of discrepancy processes in efforts to determine whether intervention-mediated discrepancy enhancement might account for decreases in drinking behavior observed at outcome. It was hypothesized that MBI participants would exhibit significantly greater reductions in alcohol involvement (drinks per week, heavy drinking frequency, alcohol-related problems) than participants in the control condition. It was further predicted that the experience of discrepancy-related processes would show significantly greater increases from pre- to postmanipulation in the MBI condition and that such increases would mediate the relationship between study condition and drinking outcomes. Finally, on the basis of research demonstrating the salience of negative, self-focused emotions in dissonance-induction paradigms with highly self-relevant material (Elliot & Devine, 1994), it was expected that enhanced cognitive dissonance as self-focused, negative affect would be most prominently associated with discrepancy processes, treatment condition, and outcome.

## Method

### *Recruitment and Eligibility*

Participants for the present research were recruited from introductory psychology courses in exchange for course credit. The experiment was advertised as a 3-hr, three-session study examining health behaviors (e.g., alcohol use, smoking) and personality traits among college students (age 18 and older). Students were not informed that they would be involved in an "intervention" per se but were told that they might be asked to undergo a one-on-one personal interview/discussion about their drinking. Recruitment lasted only into the first 6 weeks of the fall semester to ensure that all follow-up assessments could be conducted prior to the major holiday and exam periods (which could temporarily alter drinking patterns).

The first 30-min session of the study was open to all students who indicated an interest in the research (317 students were screened in total). Participants completed a set of alcohol screening and baseline personality questionnaires, which were then reviewed individually to determine eligibility for entry into the present study. Based on prior research indicating increased risk for lifetime alcohol use problems among frequent, episodic, heavy drinkers (e.g., Clapper & Lipsitt, 1992), criteria for entry into the present research were as follows: Participants must have consumed five or more alcoholic beverages in a single occasion (four or more for women) an average of once per week or more over the past month. A randomization list for condition assignment was established prior to the start of the study on the basis of a permuted blocks strategy. Participants were assigned to conditions upon arrival at the second session.

### *Participants*

A total of 73 male and female college students participated in the present study. All 73 students who met screening criteria and were invited to take part in the research attended all phases of the study (retention = 100%). The mean age of study participants was 18.58 ( $SD = 0.78$ ; range =

18–21). Ethnic/racial minorities constituted 15.1% of the sample (1.4% American Indian or Alaskan Native, 8.2% Asian or Pacific Islander, 2.7% Hispanic, and 2.8% biracial). The majority of participants were in their first 2 years of college (91%) and female (71%; the limited number of male participants prevented separate statistical analyses by gender). Treatment groups did not significantly differ on any of these demographic variables at baseline. It should be noted that the drinking behavior eligibility criterion led to the selection of participants who were regular drinkers over the past year. The mean score on the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, De La Fuente, & Grant, 1993) was 11.52 ( $SD = 5.00$ ; range = 4–26), indicating that the majority of participants consumed alcohol in ways that put them at risk for harm not only in the past month (as per the current heavy drinking criterion) but also in the past year (88% met the 8+ AUDIT score criterion to be considered a “problem drinker”). Treatment groups also did not differ on baseline AUDIT scores.

### Measures

**Demographics.** Participants were asked a series of basic demographic questions including age, gender, ethnicity, class, height, weight, and residential status.

**Current alcohol consumption.** Total current alcohol consumption (drinks per week) was assessed with the modified Daily Drinking Questionnaire (Dimeff, Baer, Kivlahan, & Marlatt, 1999). The Daily Drinking Questionnaire measures typical drinks consumed and hours spent drinking per day over the past month. Heavy drinking episode frequency was assessed with an open-ended question that asked participants to estimate the total number of times they had consumed five or more drinks (four or more for women) in one occasion in the past month.

**Past year alcohol use patterns.** Past year alcohol use patterns were assessed using the AUDIT (Saunders et al., 1993). The AUDIT is a 10-item screen for hazardous alcohol consumption that has shown good predictive validity for the identification of college student problem drinkers (Fleming, Barry, & MacDonald, 1991). The AUDIT was used merely to characterize the drinking patterns of the participant pool over the past year (not as an outcome measure).

**Alcohol problems.** The Young Adult Alcohol Problems Screening Test (Hurlbut & Sher, 1992) was designed to assess drinking-related negative consequences specifically among college students. This 27-item measure assesses both general consequences of drinking (e.g., driving while intoxicated) and problems more specific to college students (e.g., missing classes). All questions were reworded to assess the experience of problems over the past month, and all items were summed to give a total drinking problem severity score.

**Actual–ideal drinking discrepancy.** This discrepancy-related process was assessed using an actual–ideal discrepancy gauge constructed for the present research. This scale is a single question designed to address the general recognition of a disparity between actual and ideal drinking-related behaviors. By circling a number on a horizontal scale, students rate how close or far their current drinking patterns are from their personal “ideal,” given who they are as a person, their life circumstances, their interests, and their values (0 = *I am now at my ideal*; 10 = *I am extremely far from my ideal*).

**Cognitive dissonance.** This construct was assessed using a modified version of the Dissonance Thermometer (Devine, Tauer, Barron, Elliot, & Vance, 1999; Elliot & Devine, 1994). This scale is a recently developed, 24-item self-report measure that assesses the affective components of cognitive dissonance. The thermometer has been used in attitude and prejudice research and consists of two dissonance subscales: (a) Discomfort, or a generalized feeling of unease that results from a sense of discrepancy (e.g., uncomfortable, bothered), and (b) Negself, or self-focused, negative affects (e.g., guilty, regretful). In addition a third, control subscale consists of positive affect words. Participants are asked to indicate how much each affective adjective describes how they are feeling “right

now” on a 7-point Likert-type scale. Each of the dissonance subscales has demonstrated good internal consistency; the Discomfort and Negself subscales have been specifically found to be associated with dissonance-inducing paradigms (Devine et al., 1999; Elliot & Devine, 1994). Coefficient alphas for each of the subscales in the current study were as follows: Discomfort,  $\alpha = .77$  and  $.86$ ; Negself,  $\alpha = .76$  and  $.89$ , for baseline and postmanipulation, respectively.

**Treatment adherence.** To determine whether the MBI condition reliably differed from the AC condition, a 12-item scale that assesses the major components of a standard motivational intervention was administered. Subscales included (a) *awareness* of personal drinking patterns enhanced (through feedback), (b) *responsibility* for behavior and change emphasized, (c) *change options* offered, (d) *empathy* perceived, and (e) *self-efficacy* encouraged. Participants indicated on a 7-point scale the degree to which they agreed or disagreed with a series of statements, such as “The interviewer made me more aware of my drinking than I was before.” Comparable scales have been used as a measure of MI treatment protocol adherence in recent research (Monti et al., 1999). A modified version of this scale was administered to participants in the control condition to minimize any procedural variations between groups. Specifically, the items were reworded to assess the experience of the MI elements merely during the course of completing the drinking-related questionnaires (e.g., “Completing the questionnaires made me more aware of my drinking than I was before”). For this version, all reworded items captured comparable processes during the control condition except for 2 (out of 4 total) empathy items, for which filler questions were created (the empathy items that were matched for the control condition pertained to the experience of feeling understood and respected by the assessment questions). Another modified version of this 12-item scale was completed by the research interventionist (e.g., “I made the participant more aware of his or her drinking than he or she was before”).

### Procedure

Participants were screened in groups of 10–25 in Session 1. At this session, they were given a copy of the informed consent to review and sign and were then asked to complete a set of alcohol screening and personality questionnaires (lasting 45 min). Those who met study criteria were contacted by phone later that week to schedule Session 2 of the experiment. Upon arrival at the second session, participants were randomized to either the MBI condition or the AC condition. Session 2 (lasting 1.5 hr) entailed a similar format. All participants met individually with the same research interventionist (RI). The RI was a clinical psychology doctoral student of advanced standing with substantial training and experience in MI (including 4-day intensive training in MI and 2 years of experience in conducting MBIs). Throughout the duration of the study, the RI was supervised by a licensed, clinical psychologist trained in MI. Following a brief reorientation to the study, the protocol proceeded in the following order: (a) baseline discrepancy-related assessments, (b) baseline alcohol use questionnaires, (c) experimental manipulation (MBI vs. AC), (d) postmanipulation discrepancy-related assessments, and (e) treatment adherence measures. At the end of this session, the RI scheduled a meeting with each participant for approximately 6 weeks later.<sup>1</sup> The procedure for Session 3 (lasting 45 min)

<sup>1</sup> A follow-up period of 6 weeks was selected, first, because numerous prior outcome studies on brief alcohol interventions have also used a 6-week or less outcome period (e.g., Agostinelli, Brown, & Miller, 1995; Borsari & Carey, 2000; Miller, Sovereign, & Kreege, 1988) and, second, because it was not the central aim of this research to demonstrate significant outcomes in a treatment group versus a control group. Because the main hypotheses addressed in this research regarded a potential mechanism of action of motivational interventions, a follow-up period that was simply long enough for the effects of the intervention to manifest was taken as sufficient.

was identical for MBI and AC participants. To minimize the potential for participant self-presentational biases due to familiarity with and presumed expectations of the RI, a research assistant, who was blind to the study hypotheses and to the assigned treatment condition of participants, conducted all follow-up assessments. The research assistant guided participants through a battery of alcohol use measures and a debriefing phase.

### *MBI Condition*

The MBI used in the present research was adapted from the handbook *Brief Alcohol Screening and Intervention for College Students* (Dimeff et al., 1999). The intervention was limited to 30 min in duration (plus or minus 3 min). All elements of the intervention were delivered in an empathic, nonconfrontational style, following the four basic MI principles (Miller & Rollnick, 2002). Consistent with this original MI model, the intervention consisted of two major phases: (a) building motivation for change and (b) strengthening commitment to change. In the first phase, the RI began a rapport-building discussion with participants by asking open-ended questions about the general role of alcohol in the students' lives, particularly inquiring about the positive and negative effects they experience from drinking. The RI then presented the results obtained from participants' baseline assessment in a feedback form, including their current levels of drinking, normative drinking comparisons, their estimated peak blood alcohol level, and a list of their alcohol-related consequences. Students' reactions to each piece of information reviewed were elicited, reflected, and summarized by the RI using MI strategies (Miller & Rollnick, 2002). The second phase of the interview revolved around standard MI elements for strengthening a commitment to change. With the RI's assistance, participants completed a brief change plan form that provided a framework for identifying drinking-related consequences that they were interested in changing, ways in which to accomplish these goals, and obstacles to change. Students were also given a third handout detailing suggestions for ways of reducing alcohol-related harm.

### *AC Condition*

To control for the passage of time, students in the AC condition were instructed to read non-alcohol-related materials during a 30-min break (a selection of magazines was provided). Otherwise, AC participants underwent baseline and postmanipulation assessments identical to those of MBI participants.

## Results

### *Assessment of Intervention Components*

In order to verify that the elements of a standard motivational intervention were achieved, MBI participants' responses to a series of postintervention MI change process questions were compared with AC participants' responses to a matched series of post-control-period questions. For these analyses, treatment adherence items were grouped into categories according to the intervention processes they were designed to capture (awareness, responsibility, change options, empathy, and self-efficacy).<sup>2</sup> A multivariate analysis of variance revealed a significant omnibus effect of condition on the five simultaneously entered subscales,  $F(5, 67) = 41.36, p < .001$ , indicating that MBI participants agreed to a significantly greater degree than AC participants that the intended intervention elements were accomplished. A series of subsequent univariate analyses of variance examining condition-associated differences in each of the subscales showed comparable findings for each of the components: awareness,  $F(1, 71) = 32.27, p < .001$ ; responsibility,  $F(1, 71) = 8.69, p = .004$ ; change options,

$F(1, 71) = 74.66, p < .001$ ; empathy,  $F(1, 71) = 198.13, p < .001$ ; and self-efficacy,  $F(1, 71) = 21.80, p < .001$ . Examination of the overall means for all assessed components in the MBI condition only (one participant version and one RI version) reveals complementary information regarding the degree to which the standard MI elements were achieved. From the perspective of MBI participants, the mean treatment adherence rating (all 12 items) was 6.11 ( $SD = 0.55$ ) on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). From the RI's perspective, the mean adherence score was 5.67 ( $SD = 0.41$ ). This indicated that, on average, both MBI participants and the RI perceived that the primary elements of a traditional motivational intervention were accomplished.

### *Intervention Effects on Alcohol Use Outcomes*

A series of repeated measures analyses of variance was conducted to determine whether there was a significant effect of study condition (MBI vs. AC) on the primary drinking outcome variables (baseline and follow-up means for these variables as well as analysis of variance results are provided in Table 1). For each analysis, treatment condition served as the between-subjects variable, and drinking behavior served as the two-level (baseline vs. follow-up), within-subject variable. Groups did not significantly differ at baseline on any of the drinking-related variables. A significant main effect of time was observed for each measure of alcohol use, indicating that a significant overall reduction was observed in drinks per week, heavy drinking frequency, and alcohol problems. As expected, a significant Treatment Condition  $\times$  Time interaction effect also was observed for each outcome variable. Namely, a significantly greater decrease in alcohol use patterns was observed for students in the MBI condition in comparison to AC participants.

### *Intervention Effects on Discrepancy-Related Processes*

Intercorrelations among discrepancy-related assessments and alcohol use variables at baseline are provided in Table 2. As with alcohol use assessments, there were no significant differences between treatment conditions in any of the discrepancy processes at baseline.

To determine whether there was a significant difference between conditions (MBI vs. AC) in participants' experiences of discrepancy over the course of the experimental manipulation, a multivariate analysis of covariance was conducted by entering all three postmanipulation discrepancy assessments simultaneously (baseline scores for each of these measures were entered as covariates). Results revealed a significant omnibus effect of condition on these discrepancy-related processes,  $F(3, 66) = 9.11, p < .001$ , indicating that MBI participants experienced a relatively greater degree of postmanipulation cognitive and affective discrepancy enhancement than AC participants. To discern the effect of

<sup>2</sup> As 2 (out of 4) empathy-related items from the MBI participant version of this treatment integrity measure could not be appropriately reworded for the AC condition (e.g., the degree to which the interventionist "listened well" was deemed an irrelevant question to ask or adapt, given that AC participants did not undergo an interview of any kind), these 2 items were removed from the present treatment integrity statistical analyses (as were the corresponding filler questions given in the control condition).

Table 1  
*Baseline and Follow-Up Means for Drinking Outcome Variables by Condition and Repeated Measures Analysis of Variance Statistics*

Variable	Baseline <i>M (SD)</i>	Follow-up <i>M (SD)</i>	Test			
			<i>F</i>	Group	Time	Group × Time interaction
Drinks per week			<i>F</i> (1, 71)	0.26	7.75**	4.17*
MBI	14.58 (6.78)	12.15 (7.19)				
AC	14.43 (8.48)	14.06 (6.74)				
Heavy drinking			<i>F</i> (1, 71)	0.20	13.88***	6.10*
MBI	7.19 (3.21)	5.20 (2.70)				
AC	6.74 (3.66)	6.33 (4.44)				
Alcohol problems			<i>F</i> (1, 71)	0.01	15.18***	12.60**
MBI	15.70 (8.11)	10.03 (8.17)				
AC	13.25 (9.96)	12.99 (12.27)				

*Note.* Drinks per week = mean number of drinks consumed per week over past month; heavy drinking = mean number of heavy drinking episodes over past month; alcohol problems = mean severity of alcohol-related problems over past month; MBI = motivationally based intervention condition; AC = assessment-only control condition.

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

treatment condition on each separate discrepancy process, a series of repeated measures analyses of covariance was conducted next. For these analyses, condition served as the between-subjects variable, and discrepancy served as the two-level (baseline vs. postmanipulation assessments), within-subject variable. Results for the cognitively based discrepancy assessment revealed that the actual-ideal discrepancy gauge showed no main effect of time but did show a significant interaction effect, suggesting that MBI participants experienced relatively greater enhancement of actual-ideal drinking discrepancy than AC participants. Results for affectively based discrepancy assessments revealed that the Discomfort cognitive dissonance subscale showed a significant main effect of time but no interaction effect, whereas the Negself cognitive dissonance subscale showed a significant interaction effect but no main effect of time. It appears that although there was actually an overall decrease in discomfort-related affects across both study conditions, there was a significantly greater increase in negative, self-focused affects in the MBI condition than in the AC condition.

Table 3 provides the baseline means, postmanipulation means, and repeated measures statistics for these assessments.

#### *Partial Correlations Between Discrepancy Processes and Outcome Drinking*

To examine the relation between discrepancy enhancement and outcome alcohol use, partial correlations between postmanipulation discrepancy variables (controlling for baseline scores) and drinking outcome (controlling for baseline drinking) were calculated. To minimize the number of correlations tested, a composite alcohol involvement variable was computed from the highly correlated (average  $r = .65$ ) drinking outcome variables. Alcohol involvement was calculated by converting drinking variables (drinks per week, heavy drinking frequency, and alcohol problems) into  $z$  scores and computing a mean  $z$ -score drinking composite (Wiers, Van Woerden, Smulders, & De Jong, 2002). Results showed that greater actual-ideal drinking discrepancy ( $pr = -.24$ ,

Table 2  
*Intercorrelations Between Alcohol Use Variables and Discrepancy-Related Assessments at Baseline*

Variable	1	2	3	4	5	6
1. Drinks per week	—					
2. Heavy drinking	.74***	—				
3. Alcohol problems	.62***	.61***	—			
4. Actual-ideal	.15	.14	.31**	—		
5. CD-Discomfort	-.04	-.04	.15	.20	—	
6. CD-Negself	-.02	.03	.17	.31**	.64***	—

*Note.* Drinks per week = mean number of drinks consumed per week over past month; heavy drinking = mean number of heavy drinking episodes over past month; alcohol problems = mean severity of alcohol-related problems over past month; actual-ideal = mean discrepancy between actual drinking and ideal drinking patterns; CD-Discomfort = mean cognitive dissonance Discomfort subscale score; CD-negself = mean cognitive dissonance Negself subscale score.

\*\*  $p < .01$ . \*\*\*  $p < .001$ .

Table 3  
*Baseline and Postmanipulation Discrepancy-Related Variable Scores by Condition and Repeated Measures Analysis of Variance Statistics*

Variable	Baseline <i>M (SD)</i>	Post <i>M (SD)</i>	Test			
			<i>F</i>	Group	Time	Group × Time interaction
Actual-ideal						
MBI	2.51 (1.73)	2.86 (1.75)	<i>F</i> (1, 71)	0.96	0.15	5.25*
AC	2.42 (2.02)	2.17 (1.80)				
CD-Discomfort						
MBI	13.86 (5.76)	11.92 (5.71)	<i>F</i> (1, 71)	0.65	5.06*	0.65
AC	12.44 (4.91)	11.53 (5.58)				
CD-Negself						
MBI	10.78 (5.20)	13.32 (6.43)	<i>F</i> (1, 71)	8.24**	2.90	9.34**
AC	9.39 (3.95)	8.67 (4.18)				

*Note.* Actual-ideal = mean discrepancy between actual drinking and ideal drinking patterns; CD-Discomfort = mean cognitive dissonance Discomfort subscale score; CD-Negself = mean cognitive dissonance Negself subscale score; MBI = motivationally based intervention condition; AC = assessment-only control condition; baseline = baseline assessment; post = postmanipulation assessment.

\*  $p < .05$ . \*\*  $p < .01$ .

$p = .04$ ) and a higher Negself subscale score ( $pr = -.28, p = .02$ ) were associated with less alcohol involvement at follow-up, whereas the Discomfort subscale score was not ( $pr = -.08, p = .53$ ).

### Mediational Analyses

Finally, a series of mediational analyses was conducted to determine whether the effect of the MBI on outcome alcohol involvement was mediated by actual-ideal discrepancy or self-focused cognitive dissonance affects. To do this, two sets of hierarchical multiple regression analyses were conducted. For all analyses, condition was rescored using dummy-variable coding (MBI = 1, AC = 0), and the harmful drinking behavior composite score (described above) was used as the outcome alcohol use variable. Consistent with Baron and Kenny (1986), support for a mediational effect among the present variables was considered dependent on three preliminary criteria: (1) a significant relation between treatment condition and the putative discrepancy-related mediator at postmanipulation (controlling for baseline discrepancy), (2) a significant direct relation between treatment condition and outcome harmful drinking behavior (controlling for baseline harmful drinking behavior), and (3) a significant association between the mediating discrepancy-related variable (controlling for baseline discrepancy) and outcome harmful drinking behavior (controlling for baseline harmful drinking) when analyzed in conjunction with the effect of treatment. Baron and Kenny suggest that Criterion 3 will necessarily result in a reduction in the effect of treatment condition (the independent variable) on outcome (the dependent variable), and that "perfect mediation" is shown when the independent variable no longer has an effect when controlling for the mediator. However, for the present analysis, given satisfaction of the above three criteria, a slightly more sensitive procedure would be used for demonstrating the significance of a mediated effect (see MacKinnon, 1994; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Regression analyses examining actual-ideal discrepancy as a potential mediator revealed the following findings. First, treatment condition significantly predicted postmanipulation actual-ideal discrepancy (controlling for baseline actual-ideal discrepancy),  $\beta = .18, p = .01$  (fulfilling Criterion 1). Second, controlling for baseline drinking, treatment condition also significantly predicted outcome alcohol involvement,  $\beta = -.23, p = .001$  (fulfilling Criterion 2). Third, although postmanipulation actual-ideal discrepancy (controlling for baseline actual-ideal discrepancy) was significantly associated with outcome alcohol involvement (controlling for baseline drinking),  $\beta = -.23, sr^2 = .02, p = .047$ , when analyzing the effect of this mediator in conjunction with the effect of treatment condition, the relationship was not significant,  $\beta = -.13, sr^2 = .005, p = .25$  (Criterion 3 not satisfied), whereas the effect of treatment condition remained significant,  $\beta = -.21, sr^2 = .04, p = .003$ . Regression analyses examining negative, self-focused dissonance (Negself) as a potential mediator were comparable: (1) Treatment condition significantly predicted postmanipulation Negself (controlling for baseline Negself),  $\beta = .31, p = .001$ ; (2) treatment condition also significantly predicted outcome alcohol involvement (controlling for baseline drinking),  $\beta = -.23, p = .001$ ; and (3) although postmanipulation Negself (controlling for baseline Negself) was significantly associated with outcome alcohol involvement (controlling for baseline drinking),  $\beta = -.21, sr^2 = .03, p = .02$ , when analyzing the effect of this mediator in conjunction with the effect of condition, the relationship was not significant,  $\beta = -.11, sr^2 = .005, p = .22$  (whereas the effect of treatment condition remained significant,  $\beta = -.21, sr^2 = .04, p = .004$ ). It appears that although negative, self-focused cognitive dissonance affects and discrepancy are significantly related to both treatment condition and outcome alcohol involvement, these variables do not meet criteria for a mediational effect. When analyzed in conjunction with treatment condition, their unique effects on drinking outcome were very small (below 1% of the variance) and the effect of treatment condition on

outcome was relatively unaltered, suggesting that the failure to find significant effects was not due to an overly small sample size.

### *Partial Correlations Between MBI Components and Drinking Outcomes*

In efforts to examine post hoc those psychological processes that might be associated with discrepancy enhancement following an MBI, intervention components were examined in the MBI condition only. Partial correlations were conducted between the five MI components assessed at postintervention and the composite alcohol involvement score (controlling for baseline drinking). Analyses revealed the following partial correlation coefficients: (a) awareness,  $pr = -.36, p = .03$ ; (b) responsibility,  $pr = -.23, p = .17$ ; (c) change options,  $pr = -.25, p = .14$ ; (d) empathy,  $pr = -.34, p = .04$ ; and (e) self-efficacy,  $pr = -.05, p = .75$ . These findings suggest that MBI participants who reported enhanced awareness of their drinking from the intervention and/or a greater sense of perceived empathy from the RI were more likely to show lower levels of alcohol involvement at follow-up. Participants' subjective experiences of the relative focus on personal responsibility for change, change options, and self-efficacy were not significantly associated with outcome in these analyses.

### Discussion

The present study was designed to explore the role of discrepancy-related psychological processes in a motivationally based intervention for heavy drinking in college students. Treatment outcome was first examined, followed by analysis of the influence of three varieties of discrepancy-related psychological processes: (a) actual-ideal drinking discrepancy (a cognitively based conceptualization); (b) cognitive dissonance as generalized, affective discomfort (an affectively based conceptualization); and (c) cognitive dissonance as negative, self-focused affects (an alternative, affectively based conceptualization). It was first found that MBI participants demonstrated significantly greater reductions in alcohol involvement (drinks per week, heavy drinking frequency, alcohol-related problems) than participants in an assessment-only control condition. It is noteworthy that these effects were demonstrated despite the brevity of the current intervention (one 30-min session). This finding alone lends support to the general efficacy of brief, MI-based interventions among heavy drinking college students who are not mandated for treatment.

It was next found that MBI participants showed relatively higher levels of discrepancy-related psychological processes at postmanipulation than AC participants. In particular, when these processes were assessed as (a) cognitive incongruity between one's actual and ideal drinking behavior or (b) negative, self-focused cognitive dissonance affects, treatment condition was significantly associated with discrepancy. Namely, MBI participants showed relatively greater enhancement of actual-ideal discrepancy and negative, self-focused affects than AC participants. By contrast, when these processes were assessed as generalized affective discomfort, treatment condition was not associated with change in discrepancy. Finally, only actual-ideal discrepancy and negative, self-focused dissonance affects (Negself) were significantly correlated with outcome alcohol involvement; discomfort-related dissonance affects were not. The actual-ideal discrepancy and Neg-

self dissonance scales did not, however, mediate the relationship between treatment condition and outcome alcohol involvement. Thus, despite finding that actual-ideal discrepancy and negative, self-focused dissonance affects are significantly increased following an MI-based intervention and are also associated with significant reductions in drinking behavior at follow-up, neither of these discrepancy-related processes accounted for the effect of condition on outcome.

To our knowledge, the present research represents the first effort at examining mechanism of action hypotheses of MI-based approaches by using immediate, postintervention assessments of the mediators of interest. This research design allows further interpretation of the temporal unfolding of the psychological and behavioral events following a motivational intervention and particularly lends modest support to one of the proposed active processes of MI technique. Namely, the findings are consistent with the hypothesis that effective MI-based approaches for college student drinking do enhance discrepancy-related psychological processes in the context of an empathic interview. Support emerged for the role of discrepancy as both a cognitively based assessment of an incongruity between participants' actual and ideal drinking behaviors (Miller, 1983; Miller & Rollnick, 2002) and an affectively based assessment of participants' experiences of cognitive dissonance (Draycott & Dabbs, 1998b). These findings suggest that the affective processes underlying the more commonly embraced mechanism of MI-based approaches, actual-ideal discrepancy, may be particularly important.

The affectively based conceptualization of discrepancy as cognitive dissonance affects yielded two noteworthy findings. First, the present results suggest that there are immediate affective consequences of undergoing a motivational intervention and that they are significantly correlated with reductions in problematic drinking at outcome. Although mediation was not observed for dissonance, suggesting that it is not a *causal* mechanism for MBI-induced change, an increase in dissonance does appear to be a relevant correlated product of MBI along with change in drinking. The likelihood that amplified dissonance about one's drinking behavior plays a role in the behavioral effectiveness of MI suggests that future interventions might be tailored to focus even more specifically and extensively on cognitive dissonance enhancement (Draycott & Dabbs, 1998b). Second, the current results begin to inform the quality of dissonance aroused during and after a motivational intervention. When assessed as a general affective discomfort (e.g., uncomfortable, uneasy), this dissonance variable was unrelated to treatment condition or drinking outcome. However, when assessed as self-focused forms of negative affect (e.g., guilty, self-critical), this variable was significantly associated with both treatment condition and outcome alcohol involvement. It thus appears that self-focused, negative affective elements of cognitive dissonance may be more strongly associated with drinking behavior change following a motivational intervention than generalized affective discomfort. This finding is consistent with the suggestion of Elliot and Devine (1994) that the overall degree of self-relevance of a given threatened cognition may be critical in determining the qualitative nature of the affect experienced. Namely, discrepant cognitions about nonpersonal issues that are easily externalized may produce pure affective discomfort, whereas discrepancies regarding deeply internalized values may produce a range of self-focused, negative emotions.

Finally, post hoc analyses of the standard intervention components in the MBI group yields further information regarding the change processes that might be potentially linked to cognitive and affective discrepancy enhancement in this approach. Specifically, among the five MI ingredients examined, only awareness and empathy emerged as significantly negatively correlated with drinking at follow-up. Namely, raised awareness and perceived empathy among MBI participants were associated with lower levels of alcohol involvement at outcome. Raised awareness might be conceptualized as having a direct relationship to discrepancy-related psychological processes; that is, the more consciously aware students are made of their actual drinking patterns, the more cognitive or affective discrepancy they might feel. Meanwhile, empathy might be viewed as a *prerequisite* condition for discrepancy enhancement to have an effect. For example, negative, self-focused dissonance affects may be motivationally activating only if they arise in the context of an empathically perceived interview. If generated through judgmental confrontation instead, such emotions might quickly evoke defensiveness and have little positive impact on behavior. Although such a conjecture does not hold empathy to be a causal mechanism of action of MI per se, it does imply that empathy might be a necessary condition for discrepancy enhancement to influence outcome drinking patterns. Thus, as it seems unlikely that the effectiveness of MI-based interventions will be most accurately and comprehensively accounted for by a direct mediational effect of any one psychological variable, future research might begin to address this mechanism of action complexity by simultaneously examining a range of potential mediators, moderators, and prerequisite psychological conditions for change. In addition, study designs that include a greater assessment frequency (e.g., during, immediately following, or days, weeks, or months after an intervention) of potential mediators might address the possibility that the MBI-activated process of change entails greater or lesser shifts in multiple variables at different points in time.

Several limitations of the present research design should be acknowledged. First, interpretation of the findings is somewhat limited by the use of a relatively short follow-up period. The 6-week outcome duration was selected primarily on the basis of prior outcome research examining similar interventions (e.g., Borsari & Carey, 2000) and, further, because of the primary conceptualization of this design as a mechanism of action study rather than a treatment outcome study. Nonetheless, the temporal stability of the outcome findings cannot be determined with confidence from a single, 6-week outcome assessment. Second, the use of a convenience sample of undergraduates raises at least two interpretive caveats. Recruitment of students in exchange for course credit may not generalize to other college populations (e.g., heavy drinkers mandated for treatment) or to broader clinical populations (e.g., alcohol-dependent adults). It is also possible that the current recruitment methodology may have resulted in a biased drinking sample; as students voluntarily signed up for a study potentially entailing a "personal discussion about drinking," particularly problematic or unmotivated drinkers may have self-selected out of the subject pool. Third, the reliance on self-report assessments of the drinking outcome variables is another limitation. Although prior research has generally supported the accuracy of self-report measurements of alcohol use (e.g., Maisto, McKay, & Connors, 1990), collateral data to validate self-reports would enhance confidence in

the findings. Finally, as a first step in investigating a mechanism of action hypothesis, the present design used an assessment-only control group rather than an "active" control condition. This design feature tempers interpretation of the findings insofar as it renders it difficult to determine whether behavioral changes associated with the MBI condition are actually specific to motivational interventions. Future research would benefit from comparing the process and outcome of MI-based interventions with other active treatments.

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