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**Alcohol Expectancies and Social Self Efficacy as Mediators of Differential Intervention
Outcomes for College Hazardous Drinkers with Social Anxiety**

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Abstract

The current study examined the roles of the cognitive factors, positive alcohol expectancies of social anxiety reduction and drink refusal self-efficacy relevant to social situations, in mediating greater decline in alcohol behaviors by the Brief Intervention for Socially Anxious Drinkers (BISAD, $n = 21$) compared to an alcohol psychoeducation ($n = 20$) in a sample of college hazardous drinkers with social anxiety. Mediation analyses conducted using MacKinnon's (2008) procedures indicate that decreased positive alcohol expectancies and increased drink refusal self-efficacy in social situations account for a substantial amount of the variance in treatment outcome as measured by total quantity of alcohol consumption, heavy drinking days in the past month and problems related to alcohol use. The results enhance the understanding of the role cognitive factors play in alcohol treatment outcome, which can in turn improve the efficacy of interventions aimed to reduce hazardous drinking and comorbid social anxiety.

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Chapter 1

Alcohol use and social anxiety disorders can result in significant psychological impairment and financial cost, especially in individuals with comorbid diagnoses (Davidson, Hughes, George, & Blazer, 1993; Hasin, Stinson, Ogburn, & Grant, 2007; Katzelnick & Greist, 2001). Hazardous drinking, which is the combination of heavy drinking and alcohol-related negative consequences, is a significant problem on college campuses (Wechsler, Molnar, Davenport, & Baer, 1999) and frequently occurs among students who report high social anxiety (Tran, Anthenelli, Smith, Corcoran, & Rofey, 2004). Providing concurrent interventions for social anxiety in a college alcohol program is likely to attract many students who may not otherwise participate in an alcohol programs because they are indeed interested in experiencing social anxiety reduction and being more sociable with peers. Targeting a young population at high risk for both disorders may help to prevent their development, which may in turn prevent long-term costs. Knowledge of the mechanisms by which treatment gains are achieved is critical for efficient and timely development of even more efficacious interventions to address the pervasive and consequential problem of hazardous college drinking. This knowledge can allow clinicians to better tailor intervention strategies to meet the needs of college drinkers and possibly improve current interventions for this at-risk population.

Comorbidity of Hazardous Drinking and Social Anxiety

Alcohol use disorders include both alcohol abuse and alcohol dependence that result in significant psychosocial impairment, while social anxiety disorder is characterized by extreme preoccupation with embarrassing oneself in social or performance situations, causing distress in or avoidance of those situations (American Psychiatric Association, 2000). Alcohol use disorders remain widespread and result in significant psychological, social and financial impairment (Hasin,

Stinson, Ogburn, & Grant, 2007). As many as 44% of college students reported heavy drinking in the past two weeks (Wechsler, 2002) and alcohol use disorders specific to this young adult population are associated with significant social impairment such as impaired educational functioning (Aertgeerts & Buntinx, 2002), direct psychological impairment such as increased aggressiveness and indirect financial costs such as injury (Hingson, Heeren, Winter, & Wechsler, 2005). Social anxiety or discomfort is among the common reasons for college drinking (Buckner, Schmidt, & Eggelston, 2006). Social anxiety can compound the psychosocial and financial costs of alcohol use problems, especially among those whose anxiety is chronic and clinically severe therefore prevention efforts are key (Carrigan & Randall, 2003; Morris, Stewart, & Ham, 2005; Kushner, Abrams, & Borchardt, 2000).

An estimated 15-20% of college drinkers reported at least subclinical (moderate) social anxiety and concurrent alcohol use problems (Tran, Anthenelli, Smith, Corcoran, & Rofey, 2004). Thus, it is important to develop interventions that can effectively address both problems in college drinkers, especially since there is evidence that lifetime help-seeking for both alcohol abuse and dependence is low regardless of socioeconomic variables but is positively related to psychiatric comorbidity (Comptom, Thomas, Stinson, & Grant, 2007). Further, Tran et al. (2004) reported that college hazardous drinkers with social anxiety prefer to receive an intervention for their social anxiety more than an intervention for their hazardous drinking. An intervention that addresses both social anxiety and hazardous drinking would attract high-risk drinkers who would not have sought treatment otherwise. Understanding the treatment mediators, mechanisms through which therapeutic interventions can reduce hazardous drinking among socially anxious college drinkers, may be central in facilitating the development of effective alcohol interventions for many undergraduates.

Potential Cognitive Mediators of Alcohol Brief Interventions

In recent years, a number of studies have provided evidence that brief interventions are effective in reducing hazardous drinking in college students (Martens et al., 2007; Saunders et al., 2004; Kypri, Saunders, Gallagher, 2003). In a review of brief interventions, Carey, Carey, Maisto, and Henson, (2006) found that brief interventions combining alcohol assessment and feedback along with motivational enhancement features reduced alcohol consumption and related problems. However, to date only one published research study has addressed the mediators of a brief intervention for college students. Borsari and Carey (2000) conducted a one-session brief intervention with six-week follow-up that closely followed the empirically validated BASICS (*Brief Alcohol Screening and Intervention for College Students*; Dimeff et al., 1999). Dimeff et al.'s BASICS program includes alcohol personalized feedback and motivational interviewing to elicit self-awareness of hazardous drinking behaviors and cognitive factors affecting such drinking behaviors such as positive alcohol expectancies (beliefs of alcohol positive effects) and drink refusal self-efficacy (confidence in one's ability to reduce or abstain from alcohol use). The goal of the intervention is to highlight the discrepancy between the participant's desired alcohol use and their actual use following a harm reduction theoretical model (Marlatt, 1996). Borsari and Carey (2000) found perceptions of typical college drinking norms, but not alcohol expectancies, to mediate the relationship between treatment condition and alcohol use. While these initial results on cognitive mediators are noteworthy, the authors did not investigate drink refusal self-efficacy or focus on those cognitive mediators *specific to social situations*, where heavy drinking typically occurs for college students

Social learning theory, an empirically-supported cognitive-behavioral theory highlights both the situation and personal beliefs in explaining one's alcohol use (Abrams & Niaura, 1987).

Contrary to the traditional psychodynamic view that behavior is driven from intrinsic factors, the basis of social learning theory highlights personal experiences and modeling of others as the foundation of behavior (Maisto, Carey, & Bradizza, 1999). At the basis of this theory are four main factors: *differential reinforcement* (our behavioral consequences are dependent on the context in which the behavior occurs), *vicarious learning* (we learn from observing others' modeling similar behaviors), *cognitive processes* (how we process information from our environment determines our behavior), and *reciprocal determinism* (behavior is determined from the environment and the behavior affects the environment in return) (1999). The crux of this theory is that the environment in which a behavior occurs is critical to examine if investigating why the behavior occurs and how to change it. For example, if a person engages in hazardous drinking in a social setting but does not engage when alone (differential reinforcement) then researchers should investigate what causes risky behavior in that social setting and tailor interventions to address situation specificity.

Social learning theory proposes that alcohol use and abuse result from a combination of high positive alcohol expectancies (expectations of alcohol's positive effects), low negative alcohol expectancies (expectations of alcohol's negative effects), and low drink refusal self-efficacy (confidence in one's ability to refuse alcohol) related to high-risk drinking situations (Abrams & Niaura, 1987). Research by Connor, Gudegou, Young, and Saunders (2007) supports alcohol expectancy models in a pre-dependent population. Further, Kieffer, Cronin, and Fister (2004) report multiple studies indicating alcohol expectancies predict alcohol use. Research also indicates that self-efficacy is a predictor of future alcohol use (Adamson, Sellman, & Frampton, 2009; Maisto, Clifford, Longabaugh, & Beattie, 2002).

Specific to explaining the relationship between social anxiety and alcohol use disorders, many researchers have highlighted the importance of situation specificity. For example, Tran, Haaga, and Chambless (1997) found that among high social anxiety participants, individuals that endorsed positive alcohol expectancies specific to social situations reported increased drinking frequency and quantity compared to those lower on these socially relevant expectancies. However, general alcohol expectancies did not affect reported drinking for those with high social anxiety. In their social cognitive theory, Burke and Stephens (1999) highlight alcohol expectancies and drink refusal self-efficacy specific to social anxiety situations as important cognitive factors moderating the relationship between social anxiety and heavy drinking by college students. It logically follows from theoretical writings by Burke and Stephens (1999) and Abrams and Niaura's (1987) that situation-specific alcohol expectancies and drink refusal self-efficacy may also function as cognitive mediators (third variables that partially or fully account for the effect of the predictor on a dependent variable) in addition to being cognitive moderators (third variables that determine the strength and/or direction of the relationship between a predictor and a dependent variable).

In a recent article on health promotion related to social cognitive means, Bandura (2004) emphasizes the role of knowledge, self-efficacy, and expectations in predicting health behavior. While brief interventions are known to be effective for targeting students, there is little known about how they work specifically in the context in which the problem behavior occurs. For college students, social context is central because most alcohol use, including heavy and hazardous drinking, occurs in social situations (Tran et al., 2004).

The Current Study

Bandura's recent writing on cognitive determinants of health-promoting behaviors reinforces our initial decision to focus on reducing the strength of cognitive factors linking social anxiety to alcohol use when developing the novel *Brief Intervention for Socially Anxious Drinkers* (BISAD), a cognitive-behavioral brief intervention that targets both hazardous drinking and social anxiety. In a pilot randomized clinical trial Tran (2008) found that when administered to hazardous college drinkers with social anxiety, BISAD produced greater reduction in alcohol use and related negative drinking consequences than an alcohol-focused psychoeducation. To address the existing literature gaps on mechanisms of brief alcohol interventions, the current investigation conducted secondary analyses of Tran (2008) study data to test the roles of two situation-specific cognitive factors in mediating greater reduction in hazardous drinking by BISAD compared to an alcohol psychoeducation: (1) positive alcohol expectancies of social anxiety reduction, and (2) drink refusal self-efficacy in situations where others are drinking. Accordingly, the following two hypotheses will be tested:

Hypothesis 1. Reduction in positive alcohol expectancies from pre-treatment through 1-month follow-up will mediate BISAD's greater reduction compared to an alcohol psychoeducation in alcohol use and drinking related problems between pre-treatment and 4-month follow-up.

Hypothesis 2. Increase in drink-refusal self efficacy in social situations from pre-treatment through 1-month follow-up will mediate BISAD's greater reduction compared to an alcohol psychoeducation in alcohol use and drinking related problems between pre-treatment and 4-month follow-up.

Chapter 2

Method

Participants

The current study's sample included 41 undergraduate students (39% female, 18-26 years of age with median age of 19) from two public Midwestern universities who volunteered to participate in a pilot clinical trial comparing two brief alcohol interventions. Descriptive statistics reveal 81% of participants completed at least 2 sessions, 59% completed 1-month follow-up and 54% completed 4-month follow-up assessments. No significant group differences were found on treatment retention. Participants self-identified races included 90.2% white, 7.3% black/African-American, and 2.4% Asian-American. Inclusion criteria were: at least one heavy drinking episode in the past month (4 or more drinks for women and 5 or more for men), occasional to frequent drinking related problems, and subclinical (moderate) social anxiety. These inclusion criteria were determined via a structured clinical interview of diagnostic and statistical manual disorders (DSM; SCID) with a trained BA-level or Master's level assessor and via self report on screening questionnaires (see Measures). Exclusion criteria included a history of substance dependence, schizophrenia, bipolar disorder, organic brain syndrome, mental retardation, unipolar depression, anxiety disorders (other than specific phobias), significant medical illness, pregnancy, suicidality, and homicidality. Participants received the interventions free of charge and were financially compensated at each assessment time point for completing research forms. This study was approved by the local institutional review board and participants were treated in accordance with APA ethical guidelines (American Psychological Association, 2002).

Measures

Participants completed the following self-report measures at pre-treatment and 1-month and 4-month follow-ups. This self-report assessment also included an investigator-designed demographics questionnaire used in prior published studies (Smith & Tran, 2007; Tran et al., 2004).

Alcohol use. Responses on the Alcohol Timeline Follow-back (TLFB; Sobell & Sobell, 1995) assessed total quantity of alcohol consumption and total heavy drinking days in the past month. A heavy day is a day when at least one heavy drinking episode (4 or more drinks per occasion for women and 5 or more drinks per occasion for men) occurred. Recent research indicates this classification of heaving drinking is suitable criterion for DSM-diagnosed alcohol use disorders and supports adding heavy drinking episodes to the current diagnostic criteria (Tulshi, Stinson, & Grant, 2007). Participants record special events and occasions, e.g. friend's birthday, then record days they drank alcohol and how much they drank per occasion. The calendar and self-reported events serve as a memory trigger for drinking alcohol. Sobell et al. (2001) report that the alcohol TLFB displays good reliability and validity in English-speaking alcohol abusers.

Alcohol problems. If a student reported drinking alcohol in the past month, s/he rated on a Likert scale (1 = *none*, 2 = *1-2 times*, 3 = *3-5 times*, 4 = *more than 5 times*) the frequency of 23 alcohol related consequences and problems on the Rutgers Alcohol Problems Index (RAPI; White & Labouvie, 1989). Item scores were summed to yield a composite score ranging from 17.33 to 47. Research has shown that the RAPI displays good internal reliability (Ginzler, Garrett, Baer, & Peterson, 2007; White & Labouvie, 1989, $\alpha = .90$). In addition, White and Labouvie (1989) reported good validity in an adolescent population and Ginzler et al. (2007)

confirmed the measure's good convergent validity with DSM-IV abuse and dependence criteria in an adolescent, homeless sample.

Alcohol expectancies in social evaluative situations. Responses on the Alcohol Expectancies for Social Evaluative Situations (AESES; Bruch, Heimberg, Harvey, McCann, Mahone, & Slavkin, 1992) assessed positive alcohol expectancies relevant to social situations. Responses to 10 true or false questions such as “I think less about saying or doing something embarrassing in front of others when I have had a few drinks” were rated on a Likert scale (1 = *not true at all*, 2 = *a little true*, 3 = *somewhat true*, 4 = *frequently true*, 5 = *very much true*). Item scores were added to yield a total score ranging from 16.33 to 50. The AESES displays good internal reliability (Bruch et al., 1992, Cronbach’s $\alpha = .84-.89$; Tran & Haaga, 2002, $\alpha = .79 - .86$), good test-retest reliability (Tran & Haaga, 2002, $r_s = .78-.87$; Tran, Haaga, & Chambless, 1997, $r = .79$) and moderate to highly correlation with alcohol use (Tran & Haaga, 2002). In support of its construct validity, ASESES correlates more strongly with the Social Assertion subscale of the Alcohol Expectancy Questionnaire (AEQ; Brown, Christiansen, & Goldman, 1987) than its other subscales of specific alcohol expectancies, including the Tension Reduction subscale that measures general tension reduction beliefs such as “I feel like a more happy-go-lucky person when I drink.” (Tran et al., 1997).

Drink refusal self-efficacy relevant to social situations. Each participant's responses on the 12-item Social Pressure subscale of the Drink Refusal Self-Efficacy Questionnaire (DRSEQ-SP; Young, Oei, & Crook, 1991) determined his/her drink refusal self-efficacy level. Responses such as “When someone offers you a drink” were rated on a Likert scale (1= *I am very sure I would drink*, 2 = *I most likely would drink*, 3 = *I probably would drink*, 4 = *I probably would NOT drink*, 5 = *I most likely would NOT drink*, 6 = *I am very sure I would NOT drink*).

Item scores were added to yield a composite score ranging from 0 to 51. Results for DRSEQ-SP demonstrated good test-retest reliability ($r = .84-.93$) and good construct validity, $r = .87-.94$ (Young et al., 1991). Further, low drink refusal self-efficacy in social pressure situations strongly predicted alcohol consumption in a young adult sample (Young et al., 1991).

Structured diagnostic interview. The study coordinators (BA-level research assistant and a clinical psychology doctoral student) conducted most of the Structured Clinical Interviews for DSM-IV Disorders, Non-Patient Version (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 1996) with the participants to determine pertinent lifetime and past month's DSM-IV Axis IV diagnoses; some interviews were also conducted by Master's level counseling psychology therapists when the study coordinators were unavailable. Research indicates that the SCID for DSM IV diagnoses displays good internal reliability and interrater reliability (Maffei et al., 1997) and displays good validity for anxiety and other psychiatric disorders (Aziz & Kenford, 2004; Kranzler, Kadden, Babor, & Tennen, 1996).

Procedure

Screening. Researchers administered a two-step screening procedure. First, the study coordinator conducted a brief phone screening to evaluate general inclusion and exclusion criteria; The PI or the study therapists also screened participants when the study coordinator was unavailable to return the calls within one or two days of the participant's initial phone contact. Next, eligible participants underwent an in-person screening in which they signed two informed consent forms (one before the in-person screening and one before treatment randomization after they qualified for the study), and completed a series of measures. The following screening instruments were completed in the order listed: *Beck Depression Inventory II* (Beck, Steer, & Brown, 1996), *Social Interaction and Anxiety Scale* (SIAS; Mattick & Clarke, 1998), *Alcohol*

Timeline Followback (Sobell & Sobell, 1995), *Rutgers Alcohol Problem Inventory* (White & Labouvie, 1989), and the *Structured Clinical Interview for DSM-IV Disorders, Non-Patient Version* (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 1996). Participants were informed they could withdraw from the study at anytime and participants found to be ineligible (see exclusion criteria under Participants) were referred to appropriate sources, for example, a counseling center.

Outcome and mediator assessment. Participants completed the self-report assessment measures at pre-treatment and 1-month and 4-month follow-ups (see Measures) during individual in-person meetings; those who could not attend the in-person follow-up meetings completed and returned the assessment package by mail.

Study interventions. Three Master's level counselors who were doctoral students in clinical or counseling psychology graduate programs administered the study interventions. Participants were randomly assigned to one of two interventions: a 3-session intervention combining motivational interviewing for hazardous drinking and social anxiety and cognitive-behavioral therapy for social anxiety (*Brief Intervention for Socially Anxious Drinkers*; BISAD) or a 3-session intervention including alcohol psychoeducation and skills training (Extended Alcohol Skills Building and Education Program; EASBEP). Both BISAD and EASEP consist of a psychoeducation component on alcohol use, negative consequences, need for some to moderate alcohol use and providing options for decreased use. However, BISAD is unique in encompassing the following components aimed to reduce hazardous drinking, social anxiety and cognitive factors linking social anxiety to alcohol use: (1) personalized feedback on hazardous drinking and social anxiety behaviors; (2) motivational interviewing primarily to reduce alcohol use and related problems, and as needed, to reduce social anxiety and related behaviors; (3) close

examination of anxiety coping motives for drinking; and (4) cognitive-behavioral strategies (psychoeducation on CBT model of social anxiety, in-session exposure to a feared social situation and cognitive-restructuring of maladaptive evaluation concerns) to enhance participant's coping with social anxiety. Each intervention consisted of three weekly sessions (280 minutes total).

Data analysis. The analyses to test the proposed mediation effects are *a priori* secondary analyses of data from a pilot randomized clinical trial showing greater efficacy of BISAD compared to EASBEP on alcohol outcomes and cognitive mediators (Tran, 2007). There are several decisions researchers must decide prior to conducting mediation analyses such as how to deal with missing data. In order to increase confidence in the treatment efficacy, the most conservative method of data imputation, last observation carried forward (LOCF), was implemented.

As recommended by Kenny (2008), the cognitive mediators were selected to temporally precede the alcohol outcomes. Therefore, change scores were entered into the SAS macro (MacKinnon, 2008) with zeroes indicating no change or missing data. Change scores allow for increased confidence in the temporal events of the examined variables. As is often the case in longitudinal data analysis, the program was written to standardize the dependent variables. Standardization of variables allows for comparison between variables in a given sample because it helps hold invariant changes in units of measurement; along with easy interpretation of results (Richards, 1982). However, it is important to note conversion of standardized scores back to raw scores should precede comparison of scores across different samples. Conversion is key because of changes in the variance of the variables when standardized.

Using the Bauer and Preacher (2006) macro indirect and total model effects were estimated using a form of bootstrapping, maximum likelihood estimation. Bootstrapping involves the generation of numerous samples from the original sample, in this analysis random sampling was limited to 100 times. MacKinnon (2008) explains “the mediated effect estimated from each of these bootstrapping samples is used to form a distribution of the bootstrapped mediated effect estimates, and confidence limits are obtained from the bootstrap distribution” (335).

Chapter 3

Results

Following MacKinnon's (2008) guidelines, a fixed effect single level mediation model was run for each of the six hypothesized models. The first step is confirmation that the predictor variable (treatment condition) is correlated with the hypothesized mediators (change in alcohol expectancies in social evaluative situations and change in drink refusal self-efficacy related to social situations) and to the outcome variables (change in alcohol use and drinking related problems). Table 1 presents these descriptive statistics and bivariate correlations. Also shown is the second step: that the mediator is significantly related to the outcome variable. As required for mediation testing, all correlations are in the expected direction and significant at either $p < .01$ or $p < .05$ with the exception of quantity of alcohol consumed in the past thirty days, $p = .07$, and alcohol related problems, $p = .12$, at 4-month follow-up within the experimental treatment condition.

Table 1

Descriptives and Bivariate Pearson Correlations Among Independent, Mediator, and Dependent Variables in Model for All Participants

Variable	1	2	3	4	5	6	<i>M</i>	<i>SD</i>
1. BISAD (Treatment Condition)	---						0.51	0.51
2. Change in AESES (1 mo.)	0.41**	---					17.83	7.08
3. Change in SPSE (1 mo.)	-0.36*	-0.68**	---				17.50	12.19
4. TLFB HDE (4 mo.)	0.32*	0.44**	-0.53**	---			4.27	3.38
5. TLFB (4 mo.)	0.29	0.38*	-0.56**	0.90**	---		40.46	35.92
6. RAPI (4 mo.)	0.25	0.43**	-0.82**	0.60**	0.63**	---	29.22	7.19

Note: * indicates significant at $p < .05$ and ** indicated significant at $p < .01$, two-tailed.

To investigate these nonsignificant correlations further, paired sample t-tests were conducted and their results revealed that both drinking related problems and alcohol consumption over the past month were significantly reduced from baseline to follow-up,

regardless of treatment condition, see Table 2. Additionally, analyzing each intervention condition separately revealed that those receiving the novel treatment, BISAD, compared to those receiving the alcohol psychoeducation reported consuming fewer alcoholic drinks and experiencing fewer drinking related problems over the past month indicating much of the overall reduction in these variables is due to change among participants in the BISAD condition (Table 2).

Table 2

Paired Sample T-test for Nonsignificantly Correlated Change Variables

Variable	Mean (baseline)	Mean (4 mo.)	Mean Change	SD	<i>t</i> (df)	<i>p</i>
1. TLFB (all participants)	51.04	40.46	10.57	23.17	2.92 (40)	.006
2. RAPI (all participants)	32.49	29.22	3.27	5.65	3.71 (40)	.001
3. TLFB (BISAD participants)	59.76	41.95	17.80	27.86	2.93 (20)	.01
4. TLFB (EASBEP participants)	41.88	38.90	2.98	13.95	.954 (19)	.35
5. RAPI (BISAD participants)	35.38	30.67	4.71	6.40	3.40 (20)	.003
6. RAPI (EASBEP participants)	29.45	27.70	1.75	4.46	1.76 (19)	.10

Note: BISAD: Brief Intervention for Socially Anxious Drinkers. EASBEP = Enhanced Alcohol Skills Building Education Program.

Below, for each model, analyses revealed whether the mediator was correlated with the outcome variable when controlling for the predictor variable (b), treatment condition, in order to demonstrate correlation was not caused by a confounding variable. If the proposed mediator completely mediated the relationship between treatment condition and alcohol outcomes, then the path between treatment and alcohol outcome variables would be zero (indicating complete mediation) when the mediator was controlled for in the equation (c'). Mediation results for each of the proposed predictor, mediator, and outcome variables are shown below.

Pre to 1-month change in alcohol expectancies in social evaluative situations as a mediator between treatment condition and pre to 4-month change in alcohol use and related problems.

Total quantity of alcohol consumption. The difference score for alcohol expectancies in social evaluative situations (predictor variable) was positively associated with quantity of alcohol consumption (outcome variable) and reaching significance, $\beta = .31$, $t(39) = 1.95$, $p = .06$; AIC =

219.2. As shown in Figure 1, change (pre-treatment to 1-month follow-up) in alcohol expectancies partially mediated the relationship between treatment condition and change (pre-treatment to 4-month follow-up) in alcohol quantity. The results indicated a partial mediation effect because once alcohol expectancy (cognitive mediator) was added to the model, the relationship between treatment condition and drinking outcome was reduced from .29 to .16 (the latter shown as c' in the diagram). Bootstrapping results indicate indirect effect was 0.13 and the total effect was 0.29 ($\alpha = .05$, CI = -.003 to .317; CI = -.019 to .587 respectively).

Figure 1. Mediation (indirect) effect accounted for 45% of the total treatment effect on alcohol outcome.

Total heavy drinking days. The difference score for alcohol expectancies in social evaluative situations (predictor variable) was positively associated with heavy drinking days (outcome variable), $\beta = .37$, $t(39) = 2.39$, $p = .02$; AIC = 220.8. Change (pre-treatment to 1-month follow-up) in alcohol expectancies partially mediated the relationship between treatment condition and change (pre-treatment to 4-month follow-up) in total heavy drinking days. The results depicted in Figure 2 indicated a partial mediation effect because once alcohol expectancy (cognitive mediator) was added to the model, the relationship between treatment condition and heavy drinking outcome was reduced from .31 to .16 (the latter shown as c' in the diagram). The indirect effect was 0.15 ($\alpha = .05$, CI = .016 to .347) and the total effect was .32 ($\alpha = .05$, CI = .014 to .613).

Figure 2. Mediation (indirect) effect accounted for 48% of the total treatment effect on alcohol outcome.

Drinking related problems. The difference score for alcohol expectancies in social evaluative situations (predictor variable) was positively associated with drinking related problems (outcome variable), $\beta = .39$, $t(39) = 2.48$, $p = .02$; AIC = 190.4, see Figure 3 for effects. Change (pre-treatment to 1-month follow-up) in alcohol expectancies mediated the relationship between treatment condition and change (pre-treatment to 4-month follow-up) in drinking related problems. Similarly, these results indicate a mediation effect; change in alcohol expectancy (cognitive mediator) affected the relationship between treatment condition and heavy drinking outcome (.24 to .09, the latter shown as c' in the diagram). The indirect effect was 0.16 and the total effect was 0.25 ($\alpha = .05$, CI = .021 to .362; CI = -.061 to .553).

Figure 3. Mediation (indirect) effect accounted for 64% of the total treatment effect on alcohol outcome.

Pre to 1- month change in drink refusal self-efficacy relevant to social situations as a mediator between treatment condition and pre to 4-month change in alcohol use and related problems.

Total quantity of alcohol consumption. The change score for drink refusal self-efficacy relevant to social situations (predictor variable) was negatively associated with total quantity of alcohol consumption (outcome variable), $\beta = -.53$, $t(39) = -3.75$, $p = .0006$; AIC = 219.2. Figure 4 illustrates the full model. Change (pre-treatment to 1-month follow-up) in drink refusal self-efficacy mediated the relationship between treatment condition and change (pre-treatment to 4-month follow-up) in quantity of alcohol consumed. The results indicated a mediation effect because once alcohol expectancy (cognitive mediator) was added to the model, the relationship

between treatment condition and heavy drinking outcome was reduced from .28 to .09 (the latter shown as c' in the diagram). Calculations indicate the indirect effect is 0.19 and the total effect of the model is 0.29 ($\alpha = .05$, CI = .031 to .407; CI = .022 to .580).

Figure 4. Mediation (indirect) effect accounted for 68% of the total treatment effect on alcohol outcome.

Total heavy drinking days. The difference score for drink refusal self-efficacy relevant to social situations (predictor variable) was negatively associated with total heavy drinking (outcome variable), $\beta = -.48$, $t(39) = -3.31$, $p = .002$; AIC = 220.8. For an effects depiction see Figure 5. Change (pre-treatment to 1-month follow-up) in drink refusal self-efficacy mediated the relationship between treatment condition and change (pre-treatment to 4-month follow-up) in heavy drinking days. The results indicated a mediation effect because once alcohol expectancy (cognitive mediator) was added to the model, the relationship between treatment condition and heavy drinking outcome was reduced from .31 to .14 (the latter shown as c' in the diagram). Indirect effect was 0.17 ($\alpha = .05$, CI = .026 to .377) and the total effect was .32 ($\alpha = .05$, CI = .010 to .607).

Figure 5. Mediation (indirect) effect accounted for 55% of the total treatment effect on alcohol outcome.

Drinking related problems. The difference score for drink refusal self-efficacy relevant to social situations (predictor variable) was negatively associated with alcohol related consequences (outcome variable), $\beta = -.84$, $t(39) = -8.62$, $p < .0001$; AIC = 190.4. Change (pre-treatment to 1-month follow-up) in drink refusal self-efficacy mediated the relationship between treatment condition and change (pre-treatment to 4-month follow-up) in frequency of alcohol related problems. As shown in Figure 6, the results indicated a mediation effect because once alcohol expectancy (cognitive mediator) was added to the model, the relationship between treatment condition and drinking related problems was reduced from .24 to -.06 (the latter shown as c' in the diagram). The indirect effect is .30 and the total effect is .25 ($\alpha = .05$, CI = .058 to .570; CI = -.061 to .543).

Figure 6. Mediation (indirect) effect accounted for 1.25% of the total treatment effect on alcohol outcome.

Suppressor variable. Results from the sixth explored model, drink refusal self-efficacy (change from baseline to one month) mediating the relationship between treatment condition and alcohol related problems (change from baseline to 4-month follow-up) indicates there is a rare case of a suppressor variable. A suppressor variable is a variable that increases the predictive validity of another variable when added to a regression equation; therefore, a suppressor variable is determined from its *effects on other variables* in the path (Conger, 1974). Suppression is indicated since drink refusal self-efficacy accounts for more than 100% of the variance in the model (see Figure 6). Amount of variance the mediator accounts for is calculated by dividing the

total effect ($a*b + c' = .30 + -.06 = .24$) by the indirect effect ($a*b = .30$) which would be $.30/.24$.

In traditional suppression, a second independent variable (x_2) is correlated with the first independent variable (x_1), almost independent of the outcome variable (y). As show in Table 1, treatment condition (x_1) is correlated with drink refusal self-efficacy relevant to social situations (x_2). However, treatment condition (x_1) has a low correlation with alcohol related problems (y). Because treatment condition and alcohol related problems are not highly correlated, a researcher may assume that treatment condition could contribute nothing to the regression equation, assuming it is not theoretically of essence. Due to other statistical analyses (e.g., paired sample t-tests) and due to theory interest, exploration of the model continued.

If the relationship between the two independent variables (treatment condition and drink refusal self-efficacy relevant to social situations) is based on a part of x_1 (treatment condition) that is independent of the outcome variable (y ; alcohol related problems) then x_2 (drink refusal self-efficacy) suppresses the unrelated variance in x_1 and increases the multiple correlation (see Figure 6). Then, x_2 (drink refusal self-efficacy) displays a non-zero regression weight as a result of its unexpected contribution (Lutz, 1983).

If, for example, treatment condition and drink refusal self-efficacy relevant to social situations are related by some personality component that is not related to alcohol related problems, then traditional suppression may occur. In this case, it is unknown what factor is contributing to the shared variance between the treatment condition and the drink refusal cognitive variable.

Chapter 4

Discussion

A Brief Intervention for Socially Anxious Drinkers (BISAD) aimed to reduce social anxiety and hazardous drinking was efficacious over an alcohol enhanced psychoeducation for hazardous drinking college students with social anxiety (Tran, 2008). While efficacy of this novel intervention and other brief interventions for college hazardous drinking has been established (Martens et al., 2007; Saunders et al., 2004; Kypri, Saunders, Gallagher, 2003), much less is known about how the interventions influence change, especially in situations where the targeted behaviors typically occur (e.g., social atmospheres). Established social learning theory posits that alcohol use and abuse results from a combination of high positive alcohol expectancies, low negative alcohol expectancies, and low drink refusal self-efficacy related to high-risk drinking situations (Abrams & Niaura, 1987). Employing the social learning theory framework in the context of research highlights the importance of studying these cognitive variables (alcohol expectancies and self-efficacy) specific to situations in which they occur (Tran, Haaga, Chambless, 1997; Burke and Stephens, 1999; Abrams and Niaura's, 1987). Therefore, this study examined alcohol expectancies in social evaluative situations and drink refusal self-efficacy relevant to social situations as possible third variables partially or fully accounting for the effect of treatment condition on alcohol outcomes (alcohol related problems, heavy drinking episodes, and alcohol consumption) from pre-treatment to 4-month follow-up. All examined hypotheses were supported.

Study Findings and Relevant Literature

Change in alcohol expectancies specific to social evaluative situations partially mediated the relationship between treatment condition and change in the amount of alcohol consumed and

total heavy drinking days in the past month. Alcohol expectancies in social evaluative situations accounted for more of the variance, close to complete mediation, between treatment condition and alcohol related problems compared to alcohol quantity and heavy drinking days. Drink refusal self-efficacy relevant to social situations mediated the relationship between treatment condition and total quantity of alcohol consumed and heavy drinking days in the past month. Drink refusal self-efficacy also accounted for the relationship between treatment condition and quantity of alcohol related problems. Interestingly, change in self-efficacy accounted for more than all the variance indicating a possible suppressor effect; this result may be accounted by a suppressor effect of self-efficacy on the relationship between treatment condition and alcohol related problems. Suppression is a rarely reported statistically phenomenon in which the suppressor variable (in this case the change score of drink refusal self-efficacy relevant to social situations) increases the predictive validity of another variable (treatment condition) when the suppressor is added to the regression equation (Conger, 1974). As shown in Table 1, treatment condition is correlated with drink refusal self-efficacy relevant to social situations, but has a low correlation with alcohol related problems. However, in the regression equation, self-efficacy contributed to a seemingly non-existent relationship between treatment condition and alcohol related problems. This may be due to a shared variance (e.g., by a personality component) between treatment condition and drink refusal-self efficacy that was not expected. Caution should be taken in interpreting this mediation effect because there may be possible confounding variance between the predictor and mediator variable.

Current findings are not consistent with Bosari and Carey's (2000) finding that alcohol expectancies did not mediate the relationship between a brief intervention and alcohol use in a sample of college drinkers. There are several potential reasons for the discrepant findings. First,

the study designs differed. BISAD was conducted over three sessions with two follow-up assessments at 1-month and 4-month post-treatment, whereas the empirically supported BASICS (Dimeff et al., 1999) employed in Borsari and Carey's (2009) study was conducted in one session with only one 6-week follow-up. With only one follow-up assessment, Borsari and Carey were unable to measure the change in cognitive variable temporally preceding the reported alcohol outcomes as typically recommended for mediation testing (MacKinnon & Luecken, 2008) and done in our study (pre-1month cognitive change as mediator variable and pre-4month change in alcohol consumption or problems as outcome variable). In addition to differences in treatment intensity and follow-up duration, Borsari and Carey (2000) did not examine alcohol expectancies specific to social situations where heavy drinking typically occurs for college students. Not only are social situations where heavy drinking commonly occurs for undergraduates, cognitive variables specific to social situations are more relevant to hazardous drinkers with comorbid social anxiety and thus likely more impactful on their drinking behaviors. Prior research has demonstrated the need for situation specificity in assessing alcohol use and drinking related alcohol expectancies (Kirchner, Sayette, Cohen, Moreland & Levine, 2006; Tran, Anthenelli, Smith, Corcoran, & Rofey, 2004; Tran, Haaga, & Chambless, 1997). Finally, Borsari and Carey (2000) did not report investigating drink refusal self-efficacy, a proximal determinant of alcohol use proposed by the social learning theory (Abrams & Niaura, 1987) that has received far less attention in research compared to alcohol expectancies, despite the fact that clinical writings often highlight the importance of one's self-efficacy in affecting treatment outcomes (Miller & Rollnick, 2002).

Theoretical Implications

The present findings also have implications for theoretical conceptualization of comorbid substance use and psychiatric disorders, particularly alcohol use disorders (AUD) and social anxiety disorder (SAD). Those with SAD are three times more likely to have an AUD than those in the general population (Grant, Dawson, Stinson, Chou, Dufour, & Pickering, 2004). Among college drinkers, about 15-20% report at least subclinical (moderate) social anxiety and concurrent alcohol use problems (Tran et al., 2004).

While both research and clinical writings support the presence of comorbid alcohol use disorders and social anxiety disorder, there are various conceptualizations of the relationship between these two disorders (Kushner, Abrams, & Borchardt, 2000). There are three primary models: SAD is a causal agent for AUD, AUD is a causal agent for SAD, and shared vulnerabilities for both disorders. The first model, social anxiety causing alcohol use disorders, posits that persons drink to cope with their social anxiety symptoms (Conger, 1956; Khantzian, 1997; Sher & Levenson, 1982). Research supports that persons drink to cope with anxiety (Carrigan & Randall, 2003) and that social anxiety typically precedes the alcohol problem (Tran & Smith, 2007). With assessments conducted at three occasions (baseline, 1-month follow-up, and 4-month follow-up), our study has the appropriate temporal data for mediation analysis and thus well positioned the present results to contribute to the proposed theoretical models. Our predicted findings that change in alcohol expectancies and self-efficacy, variables pertinent to social anxiety, mediated change in all three alcohol outcome indicators bolster support for the proposition that social anxiety plays a causal role on problematic alcohol use.

Kushner, Sher, and Erickson (1999) reported findings from a prospective study that AUD and SAD exhibit a reciprocal relationship over time, rendering support for the first two models

that each disorder acts as a casual agent for the other. Focusing on the second model, some largely posit that anxiety symptoms stem from chronic substance use and/or withdrawal (Kushner, Abrams, & Borchardt, 2000; Schuckit, Hesselbrock, Tipp, Nurnberger, Anthenelli, & Crowe, 1995). It has been observed that engaging in embarrassing behaviors while intoxicated appears to increase sensitivity to negative evaluation in social situations: a central component of social anxiety disorder. However, the specific casual mechanism for AUD leading to SAD is unknown. The third primary model that AUD and SAD have shared vulnerabilities has not been supported by genetic study findings (Tran & Smith, 2007). Although research does show serotonin dysfunction in both disorders (Schuckit et al., 1999), the mechanisms of action by this and other neurotransmitters are not well understood.

Clinical Implications

Larimer and Cronic's (2007) review of the extant literature on individual preventions and treatments for college drinking supports skill based and motivational interventions that integrate personalized feedback. Encompassing these elements BISAD's results show reduced drinking and alcohol related problem behaviors. The current study's findings suggested that alcohol interventions for college hazardous drinkers should target self-efficacy and alcohol expectancies relevant to social situations.

Empirical data from the existing literature point to the need to enhance drink refusal self-efficacy for alcohol users. Among alcohol dependent men and women in inpatient treatment, self-efficacy was found to predict relapse (Greenfield, 2000). In a less intensive program adhering to the harm reduction approach, self-efficacy predicted drinking levels 6 months following program completion (Sitharthan & Kavanagh, 1991). A recent review on studies using mediation to examine the mechanisms affecting the outcomes of Alcoholics Anonymous (AA)

and related twelve step groups also support enhanced self-efficacy as an important mechanism of change (Kelly, Magill, & Stout, 2009). Self-efficacy appears to be an important variable in not only alcohol dependent populations but also in college populations: an investigation of mediators of college drinking found increase in behaviors that enhanced drink refusal self-efficacy decrease alcohol consumption (Cho, 2007).

Similarly, positive alcohol expectancies have a substantial place in alcohol research and theory (Goldman, Del Boca, & Darkes, 1999). In a prospective study on 12-14 year old males and females, by Smith, Goldman, Greenbaum, & Christiansen (1995), greater expectancy for social facilitation was associated with higher drinking levels; and among initial non-drinkers social facilitation expectancies predicted differences in the increase in drinking rates over the two-year study. While research supports positive alcohol expectancies are related to drinking behaviors, a recent meta-analysis of individual alcohol interventions for college students revealed participants receiving the interventions did not show improved self-efficacy or alcohol expectancies compared to controls who did not receive an intervention (Scott-Sheldon, Demartini, Carey, Carey, 2009). Our study's intervention and assessment explicitly focusing on cognitive factors most relevant to the participating drinkers may account for our positive findings which currently stand in contrast to alcohol expectancy results of other well designed clinical trials targeting college drinking.

Strengths, Limitations, and Future Directions

Both limitations and strengths of the current study should be considered in looking forward to future directions. On the one hand employing a young college student sample strengthens prevention efforts; however it also reduces generalizability to non-college drinkers. Additionally, given the pilot nature of the study, the rather small sample size is statistically

problematic. For example, there may be a lack of sufficient power to detect small and moderate treatment effects. A major strength of this study is its novelty in identifying cognitive mediators of a brief intervention, an intervention that is more efficacious than an enhanced alcohol psychoeducation in the given sample. Findings support researchers and clinicians tailoring treatment to focus on reducing positive alcohol expectancies and increasing drink refusal self-efficacy for socially anxious college students engaging in hazardous drinking.

The present findings lend to future research in this area. First and foremost, in order to increase confidence in the current cognitive mediator findings, replication of the intervention with a larger sample size would be beneficial. Also, teasing apart the relationship between drink refusal self-efficacy relevant to social situations and alcohol expectancies in social evaluative situations may also strengthen confidence in the current findings. While beyond the scope of the current study, it will be important to investigate other potential mediators in order to better understand the relationship between treatment condition and alcohol outcomes. As previously mentioned, not only did BISAD differ from the enhanced psychoeducation in directly targeting social anxiety, BISAD also incorporated motivational interviewing. Thus, future investigation of potential mediators of BISAD's treatment effects might include examining change in social anxiety symptoms and putative active ingredients of motivational interviewing. Considering its strengths and limitations, this study provides a better understanding of the role cognitive factors play in treatment outcome, which could in turn improve efficacy and effectiveness of treatments targeted at the prevention of alcohol use disorders and social anxiety.

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