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Interactions between Adaptive Coping and Drinking to Cope in Predicting Naturalistic Drinking and Drinking Following a Lab-Based Psychosocial Stressor

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Abstract

Using alcohol to cope (i.e., coping motivation) and general coping style both are theorized and demonstrated empirically to lead to problematic drinking. In the present study, we sought to examine whether these factors interact to predict alcohol use, both retrospectively reported and in the lab following a stressor task. Social drinkers (N=50, 50% women) received the Trier Social Stress Test (TSST), and then consumed beer under the guise of a taste-test. A Timeline Followback interview to assess past month alcohol use, the Drinking Motives Questionnaire (DMQ), and the COPE (to assess adaptive coping) were administered prior to the laboratory challenge. Multiple regression models were used to examine DMQ coping motives, adaptive coping, and their interaction as predictors of milliliters (mls) of beer consumed in a clinical laboratory setting. The association between coping motives and mls beer was positive at both high and low levels of adaptive coping, but at low levels of adaptive coping, this association was stronger. In contrast, there was no interaction between adaptive coping and coping motives in predicting quantity and frequency of drinking in the prior month. Findings suggest that stronger coping motives for drinking predict greater alcohol consumption following a stress provocation to a greater extent when an individual is lacking in adaptive coping strategies. As both general coping skills and coping motives for alcohol use are responsive to intervention, study of the conditions under which they exert unique and interactive effects is important.

Keywords

alcohol; coping motives; adaptive coping; stress; clinical laboratory; Trier Social Stress Test

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Statement 2: Contributors

Dr. Suzanne Thomas designed the study and wrote the protocol, and both Suzanne Thomas and Jennifer Merrill developed the research question for the present study. Jennifer Merrill conducted literature searches for the research question of interest in the present study, conducted the statistical analysis, and wrote the first draft of the manuscript. Both authors contributed to and have approved the final manuscript.

Statement 3: Conflict of Interest

Both authors declare that they have no conflicts of interest.

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1. Introduction

Alcohol misuse continues to be a public health concern. Point prevalence estimates suggest that about 9% of the U.S. population meet criteria for an alcohol use disorder (Grant, et al., 2004), while lifetime prevalence rates are closer to 20% (Kessler, et al., 2005). Accordingly, understanding the individual and contextual-level factors that contribute to alcohol use is an important endeavor. As reviewed below, several studies have been conducted to examine how drinking motives (why one drinks) and coping styles (how one copes with stress and negative affect) may confer risk for alcohol problems. Both constructs may be modifiable through intervention, making understanding their influence on alcohol use particularly important for prevention efforts. Each of these factors has separate extant literatures, yet by definition these constructs are not independent. It is unclear whether and how coping motivation for drinking and general adaptive coping skills may work together to influence alcohol use. In addition, the influence of these factors on drinking in the context of a negative mood induction has not been well studied. In the present study, we sought to test whether the association between coping motivation for alcohol use and adaptive coping skills interact to predict drinking both in the laboratory following a social stressor task and in a naturalistic environment (past month drinking, retrospectively reported).

1.1. Coping Motives

Motivational models (Cooper, 1994; Cox & Klinger, 1988) highlight drinking for both external and internal (i.e., affective) reasons. Though there are a few different models of alcohol use motivation, all share inclusion of drinking to enhance positive emotions (enhancement motives) and drinking to cope with, or alleviate, negative emotions (coping motives). Other motives, less consistently related to problem drinking in adults include drinking to facilitate social situations (social motives) and to “fit in” (conformity motives).

Of the motive types, coping motives have most consistently been associated with problem drinking. Coping motives have been shown to be associated with alcohol use across multiple samples (Cooper, Russell, Skinner, Frone, & Mudar, 1992; Kassel, Jackson, & Unrod, 2000; Kuntsche, Knibbe, Gmel, & Engels, 2005; Laurent, Catanzaro, & Callan, 1997; Park, Armeli, & Tennen, 2004; Park & Levenson, 2002), and in both cross-sectional (Cooper, 1994; Cooper, Frone, Russell, & Mudar, 1995; Cooper, Russell, & George, 1988; Williams & Clark, 1998; Windle & Windle, 1996) and longitudinal studies (Holahan, Moos, Holahan, Cronkite, & Randall, 2001). However, much of this research examines the influence of coping motives on self-reported drinking behavior, regardless of whether negative affect is activated, and without regard to other individual-difference factors that may make coping motives more or less influential. Thus, there remains a need for research examining the influence of coping motives on drinking behavior (a) in the context of stress and (b) in combination with the influence of other psychosocial factors, such as adaptive coping skills.

1.2. Coping Skills

Coping skills, the specific cognitive activities or behaviors people employ in response to stressors or problems, are grouped into broad categories of coping styles. Several models and types of coping styles have been posited and measured (Skinner, Edge, Altman, & Sherwood, 2003). One of the most widely used measures to assess coping styles is the COPE (Carver, Scheier, & Weintraub, 1989). Some of the skills assessed by this measure can be categorized as useful or adaptive coping skills, while others are less useful or maladaptive.

Adaptive coping often is action oriented (Lazarus, 1991) and involves altering the problem or environment that is causing the distress (Folkman, Lazarus, Dunkel-Schetter, DeLongis,

& Gruen, 1986). Coping skills most commonly identified as adaptive include active coping, planning, suppression of competing activities, restraint coping, positive reinterpretation and growth, acceptance, religion, and seeking out of social support (Litman, 2006). On the other hand, among the types of maladaptive coping, avoidant coping is the most commonly researched. Avoidant coping generally involves removing oneself from experiencing or thinking about a stressful situation (Carver, et al., 1989). Specific types of coping skills typically identified as avoidant include behavioral disengagement, denial, mental disengagement, and substance use (Litman, 2006). In general, whereas adaptive coping strategies predict better health outcomes and less drinking, greater reliance on maladaptive coping styles, and avoidant coping in particular, is associated with greater drinking (Bonin, McCreary, & Sadava, 2000; Cooper, et al., 1995; Cooper, et al., 1988; Cooper, et al., 1992; Willis, Wallston, & Johnson, 2001).

Individuals may lie anywhere on a continuum from low to high levels of adaptive and/or avoidant coping skills. In the present study we were primarily interested in adaptive coping skills, in part because it is these that interventions seek to enhance (Litt, Kadden, & Kabela-Cormier, 2009; Longabaugh & Morgenstern, 1999). Further, theoretically, it is a lack of adaptive coping that most likely interacts with coping motives for alcohol use to predict drinking, as described below.

1.3. Interactive Influences of Coping Motives and Adaptive Coping on Alcohol Use

Theoretically and empirically, both low levels of adaptive coping in general and high coping motives for drinking may independently promote heavy drinking, but it is unclear whether and under what circumstances these two risk factors may interact to predict alcohol use. It has been suggested that one reason coping motives may lead to problem drinking is that individuals who drink to cope may do so because they do not have other more adaptive ways to cope in their repertoire (Cooper, et al., 1995). Similarly, social learning theory models (Abrams & Niaura, 1987; Bandura, 1969; Maisto, Carey, & Bradizza, 1999) and social cognitive models of relapse (Marlatt & Donovan, 2005) suggest that drinking alcohol may occur specifically for individuals with deficits in adaptive modes of coping when they have the desire to reduce negative affect. Following from these theories, a moderational model of their influence would suggest that individual differences in the use of alcohol to cope may be *more or less relevant* for predicting drinking depending on one's level of general adaptive coping skills. The combination of a lack of adaptive coping and coping motives may place individuals at particular risk for heavier drinking – drinking to cope may be more strongly associated with alcohol use among those who have not learned or do not tend to rely on other adaptive coping mechanisms. Though avoidant coping may predict drinking behavior, tending to use a range of avoidant coping strategies is likely less relevant for whether one uses drinking specifically as a coping strategy on any given occasion.

Interactive influences of adaptive coping and coping motives should be most relevant to the context of stress. One key element of social learning theories (Bandura, 1986; Maisto, et al., 1999) is differential reinforcement, a concept that suggests that a behavior may be reinforced in some situations and not others. Individuals who endorse high coping motives for drinking may experience alcohol as a more powerful reinforcer following stress than individuals without such motives for drinking. In turn, coping motivated drinking is a behavior likely reinforced by drinking during those times when the individual actually experienced negative emotions and a subsequent reduction of such emotions following alcohol use. A reliance on alcohol to cope would not be a learned behavior during those times where negative affect is not present. Thus, in a test of whether coping motives predicts increased drinking among individuals who also lack adaptive coping skills, it is important that stress actually is activated. To our knowledge, there have been no empirical

examinations of whether one's general adaptive coping skills may moderate the influence of coping motives on drinking behavior when examining this within the context of stress.

1.4. The Present Study

In the present study, we sought to examine the interaction between coping motives for alcohol use and general adaptive coping strategies in the prediction of alcohol use. Both in-lab alcohol consumption following a stressor task and retrospective reports of alcohol use were measured in a sample of 50 social drinkers. We hypothesized that higher coping motives would predict alcohol use in the lab following stress induction to a greater extent for individuals with low adaptive coping skills. We then examined whether an interaction between coping motives and adaptive coping also would be observed on past month self-reports of both alcohol use quantity and frequency, when stress was not necessarily activated.

2. Material and Methods

2.1. Participants

Data from the present study are drawn from measures collected as part of a separate study (Thomas, Merrill, Von Hofe, & Magid, under review), with the primary purpose of examining interactions among drinking motives, stress induction, and gender. For that study, individuals (N=210) were recruited from the community via advertisements and initially screened over the telephone for major inclusion/exclusion criteria. Inclusion criteria were ages 21–50, alcohol use on between 5 and 15 days in a typical month, average drinks per drinking day (in the past 30 days) between 1 and 4 (5) standard drinks for women (men), and a liking for beer (the beverage to be administered during the taste test). Participants were excluded from participating if they reported current alcohol abuse; lifetime alcohol dependence; abuse or dependence on other drugs, including nicotine; current major Axis I disorders; pregnancy or nursing; or any blood clotting disorder. In addition, drinking motives were assessed during screening by the Drinking Motives Questionnaire (described below), and participants were recruited so as to achieve adequate representation of individuals who did and did not drink primarily for coping motives. One-hundred twelve potentially eligible participants (53% of those phone screened) were invited for an inperson visit to confirm eligibility, and N=100 (50% women) met all eligibility requirements, completed the inperson visit (described below), and provided data for the present study. In the present study we were interested in the interactive influence of coping motives and adaptive coping in the context of stress, and therefore used only the half of the sample (N=50) who received a social stressor task. There were no significant differences in any study variables between the stress and non-stress groups. See Table 1 for sample demographics.

2.2. Inperson Assessment

Potentially eligible participants who were invited for an inperson visit signed an informed consent approved by the institution's review board. Individuals who were ineligible were paid \$20 for their time and dismissed from further assessment. Twelve individuals were excluded following the inperson visit (four for exclusionary alcohol problems; three for participating in another study in which the TSST was used; three failed to schedule their second visit within one month of the consent visit; two had exclusionary Axis I disorders).

During the inperson assessment, participants completed a psychological assessment battery. In addition to those measures of interest described in detail below, several measures were administered to be used for the larger study aims. These included measures of family history of alcohol use disorders, alcohol expectancies, past year life stressors, anxiety sensitivity,

and the severity of symptoms of social phobia, depression, and anxiety. At the end of this visit (1.5 hours), the experimental laboratory session was scheduled for those participants still eligible.

2.2.1. Drinking Motives—The Drinking Motives Questionnaire (DMQ; (Cooper, 1994) was administered during screening and again during the inperson visit; inperson scores were used in analyses. The DMQ is a 20-item self report questionnaire that assesses the relative frequency of alcohol use (on a 4 point scale) for reasons that relate to four different factors – Enhancement, Coping, Social Facilitation, and Conformity Motives. Example Enhancement items include “Because you like the feeling” and “To get high.” Example Coping items include “To forget your worries” and “Because it helps you when you feel depressed or nervous.” Example Social items include “To be sociable” and “To celebrate special occasions with friends.” Example Conformity items include “Because your friends pressure you to drink” and “To be liked.” Though coping motives were of primary interest, subscales for the other three motive types were used as control variables in analytic models given shared variance in general motivation to drink. Item scores were summed to create subscale scores (5 items each). In the present sample, internal reliabilities were $[\alpha] = .70$ for Coping motives, $[\alpha] = .84$ for Enhancement motives, $[\alpha] = .81$ for Social motives, and $[\alpha] = .82$ for Conformity motives.

2.2.2. Coping—Coping skills were measured with the 60-item COPE questionnaire (Carver, et al., 1989). Participants reported how often they used each strategy in general when stressed, on a scale from 1 (I usually don’t do this at all) to 4 (I usually do this a lot). The COPE is comprised of 15 subscales; responses on four items within each subscale are summed to obtain subscale scores. The COPE has good evidence of convergent and discriminant validity as well as moderate to good reliability for each of its subscales. In the present study, our goal was to measure the influence on drinking of the extent to which participants rely on a full range of adaptive coping skills. Therefore, subscales from the COPE that have most commonly been identified as “useful”, “positive” or “adaptive” coping methods (e.g., Carver, et al., 1989; Litman, 2006; Lyne & Roger, 2000) were summed, in order to create a composite adaptive coping score. The subscales included were: active coping (e.g., “I do what has to be done, one step at a time”), planning (e.g., “I make a plan of action”), suppression of competing activities (e.g., “I put aside other activities in order to concentrate on this”), restraint coping (e.g., “I make sure not to make matters worse by acting too soon”), positive reinterpretation and growth (e.g., “I learn something from the experience”), religion (e.g., “I seek God’s help”), acceptance (e.g., “I accept the reality of the fact that it happened”), seeking out of social support – instrumental (e.g., “I try to get advice from someone about what to do”), and seeking out of social support – emotional (e.g., “I try to get emotional support from friends or relatives”). The method of combining these commonly viewed adaptive coping skills into a single scale resulted in good measure reliability: Cronbach’s $\alpha = .87$ (36 items). Avoidant coping was included in the present study as a control variable given associations with alcohol use and in order to isolate the pure influence of adaptive coping skills on the outcome variables. Subscales from the COPE identified as avoidant coping were summed to create a composite. These included behavioral disengagement (e.g., “I just give up trying to reach my goal”), denial (e.g., “I act as though it hasn’t even happened.”), and mental disengagement (e.g., “I daydream about things other than this.”). Though the substance use subscale also has been conceptualized as avoidant, we chose not to include this in our variable given the possibility of criterion contamination, as alcohol use was our outcome variable. Alpha for this measure was .67 (12 items).

2.2.3. Timeline Followback interview (TLFB)—The TLFB interview (Sobell & Sobell, 1992) was used to assess retrospectively reported alcohol use. The term “standard drink”

was operationalized before participants were interviewed regarding the number of drinks they consumed on each day for the previous 30 days. This measure was used to derive the naturalistic drinking outcomes of the present study, which were number of drinking days (NDD; a measure of frequency) and drinks per drinking day (DDD; a measure of average quantity). Though participants were initially screened for levels of drinking between 1 and 4(women)/5(men) drinks per occasion, this more rigorous assessment method revealed slightly higher levels of DDD for some participants (see Table 1).

2.3. Laboratory Challenge

The laboratory session was held within one month of the baseline visit (range=2 to 30 days, $M=16$, $SD=14$). On the day of the laboratory challenge, the individual arrived at 4:30 pm and was given a breath alcohol test, and women provided a urine sample to test for pregnancy (all were negative). To address aims of the larger study, the participant was fitted with a heart rate monitor, saliva collection procedures (for cortisol) were explained, and a baseline assessment of stress reactivity measures was collected.

2.3.1. Trier Social Stress Test, TSST—At 5:00 pm, participants randomized to the no-stress control condition were provided a travel magazine to read. During this time, participants randomized to receive the stressor (those of interest in the present study) were administered the Trier Social Stress Test (Kirschbaum, Pirke, & Hellhammer, 1993), considered the gold standard of standardized psychosocial stressors for eliciting a robust stress response (Dickerson & Kemeny, 2004) and equally effective in men and women (Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004). Briefly, each participant prepared for 5 minutes, with a countdown clock in view, for an impending mock job interview. Following the preparation/anticipation phase, s/he was instructed to speak to an audience of three confederates, who remained non-responsive, about his/her particular qualifications for the position (5:05–5:10pm). At 5:10 pm, the participant was instructed to perform a serial subtraction task to the audience until instructed to stop (5 minutes). In total the TSST was a 15 minute stressor. Each participant randomized to the TSST group was told that his/her performance would be used by the group to rate the degree of his/her introversion and extraversion traits (to reduce expectancies about the true purpose of the TSST). Stress response was measured multiple times with subjective report (level of distress) and objective measures (heart rate, mean arterial pressure, cortisol). All measures of stress confirmed the validity of the TSST as a stressor (Thomas, Merrill, Von Hofe, & Magid, under review).

2.3.2. Taste Test Task Procedure—Following the first post-test stress assessment, the experimenter provided instructions for the taste test, modeled after the procedure used by Marlatt and colleagues (Caudill & Marlatt, 1975). The participant was instructed that two glasses of beer would be provided and (s)he was to taste each beer and determine whether the two beers are identical or different. The participant was told that (s)he could drink as much as is needed to make a decision, but that (s)he must be accurate to receive compensation for this part of the study (\$10).

Following the second post-test stress assessment, the experimenter presented the two glasses of beer, glass A and B (each containing 8 oz. of cold Budweiser beer— for a total of 474 milliliters [mls]). The experimenter informed the participant that (s)he had 10 minutes to complete the task and make a determination about the beers. The experimenter then left the room. At the end of the 10 minutes, the experimenter returned to the room, collected the glasses and left the participant with a sham response sheet (where the subject reported his/her decision). Participants were monitored during the challenge and were not discharged from the challenge until blood alcohol levels dropped below 0.03 mg%. Prior to discharge,

participants were debriefed and paid \$100. The combined contents of glass A and B were measured (in mls) prior to and following the procedure and a difference score was obtained to reflect how much beer was consumed. The primary dependent variable for in-lab drinking in the present study was amount of alcohol consumed (mls).

3. Data Analytic Plan

Multiple regression models were used to examine predictors of mls beer consumed in the laboratory. Predictors included scores on the coping motives subscale of the Drinking Motives Questionnaire, adaptive coping scores, and their interaction. Gender and drinks per drinking day were covaried in the model predicting beer consumption, given that males tend to drink more and in order to account for differences in alcohol consumed in the lab that are a function of one's tendency to drinking heavier in general. In the present study, gender and drinks per drinking day were both significantly correlated with beer consumed in the lab ($ps < .01$). Avoidant coping also was controlled, given the association between this variable and alcohol use in previous work. In addition, scores on the other three motive types (enhancement, social, and conformity) were covaried due to overlap in general motivation to drink, and in order to isolate the specific influence of coping (vs. other) motives.

An additional set of regression models was run to predict naturalistic drinking during the 30 days prior to participating in the clinical laboratory study, in which drinks per drinking day [DDD] and past month number of drinking days [NDD] were outcomes. Again, coping motives, adaptive coping, and their interaction served as substantive predictors; and gender, avoidant coping, and other motive types were controlled.

All interactions were tested following procedures outlined by (Aiken & West, 1991). All independent variables were centered prior to creating interaction terms, and centered variables were included in models to test interactions. When probing interaction effects with simple slopes models, new variables were created to represent high and low values of the proposed moderators by subtracting and adding one standard deviation from each participant's value on the moderator (Aiken & West, 1991). Models probing interactions included the same covariates used in initial models.

4. Results

4.1. Descriptives

Outcome variables were normally distributed. Table 1 presents descriptives. There were no significant differences on demographics or variables of interest between individuals who received the TSST versus those who did not (and were therefore not included in the present study; all $ps > .05$). Table 2 presents bivariate correlations among model variables. Adaptive coping was negatively associated with NDD, DDD and mls beer consumed, while coping motives was not significantly associated with any of the drinking outcomes.

4.2. Predictors of Laboratory Drinking Following Stress Induction

The multiple regression model predicting mls beer consumed revealed a marginally significant negative effect of adaptive coping ($B = -2.695$, $p = .054$), suggesting a trend for higher levels of adaptive coping to be associated with consuming less beer in the lab. In addition, the interaction between adaptive coping and coping motives for drinking on mls beer consumed was marginally significant ($B = -1.565$, $p = .055$), reflecting that the magnitude of the positive association between drinking to cope and beer consumption varied by level of adaptive coping. Because this marginal interaction was both theoretically based and hypothesized *a priori*, it was probed using simple slopes analyses. At high levels of adaptive coping, the association between coping motives and mls beer was $B = 143.793$ ($p = .$

038). At low levels of adaptive coping, the magnitude of the association was stronger ($B = 184.714$, $p = .042$). In other words, higher coping motives for drinking more strongly predict alcohol consumption following a stress provocation when an individual is lacking in adaptive coping strategies relative to others in the sample. This interaction is depicted in Figure 1.

4.3. Naturalistic Drinking

Interactions between adaptive coping and coping motives were non-significant for both naturalistic drinking outcomes (DDD, NDD). There also were no significant main effects of either coping motives or adaptive coping on DDD. In the model predicting NDD, adaptive coping was significant ($B = -.136$, $p = .014$); higher adaptive coping was associated with fewer drinking days.

5. Discussion

In the present study, we found marginal support for the hypothesized interaction between coping motives for drinking and adaptive coping skills on drinking, such that coping motives and in-lab drinking following a stressor were most strongly associated in the context of low adaptive coping skills. This suggests that individuals who use adaptive coping skills less often, or who use a smaller range of adaptive coping skills, may have overlearned patterns of relying on alcohol as a coping mechanism. Thus, when stressed in the lab, these individuals likely drank to alleviate such stress. Even though there is not much opportunity to implement other more adaptive ways of coping in the contrived context of the laboratory, such participants likely have experienced negative reinforcement (i.e., reduction of negative mood) upon drinking in the past, and thus may engage in this behavior more readily than individuals who tend to rely on healthier coping mechanisms.

We did not observe an interaction between coping motives and adaptive coping when predicting retrospectively reported alcohol use - neither quantity (DDD) nor frequency (NDD). That is, outside the lab, regardless of whether participants reported high levels of coping motives or a lack of other, more adaptive coping skills, when these factors were not purposely “activated” by stress, participants may not have necessarily felt the need or desire to drink more or more often to cope. Null results when looking at retrospectively reported quantity and frequency of drinking speak to the utility of not only examining self-reports of alcohol use when interested in the influence of affect-relevant predictors (e.g., coping), but to also examining these predictors in a controlled context in which negative affect is primed.

Findings are consistent with social learning theory (Maisto et al., 1999). The emphasis placed by this theory on a reliance on alcohol to cope that develops in the absence of other coping skills was supported. Results also have important implications for future laboratory studies on stress-induced drinking. Experimental studies conducted to examine stress-related drinking show inconsistent evidence of this phenomenon (Todd, Armeli, & Tennen, 2009). In the parent study from which these data were derived, we too did not observe that stress led to increased drinking in coping versus non-coping motivated drinkers (Thomas, et al., under review). It was only with the follow-up examination in the present study in which coping styles were of interest that stress-related drinking was observed, particularly for those with lower levels of adaptive coping skills. Thus, future studies in this area will be well-served by including a measure and examining *a priori* the influence of coping styles.

In addition to the primary coping motives by adaptive coping interaction effect observed, main effect influences of adaptive coping also were observed in some models. Lower use of adaptive coping skills was associated with more alcohol use in the lab and with more drinking days over the prior 30 day period. These results corroborate other research

indicating that adaptive coping is inversely associated with alcohol use (Cooper, et al., 1988; Willis, et al., 2001).

On the other hand, we did not observe any main effects of *coping motives* on naturalistic or laboratory based drinking in the present study. Reporting that one often drinks to cope with negative emotions did not influence the amount one drank in the lab nor the frequency or typical quantity of use over the past 30 days. Among social drinkers, though coping motives are generally associated with alcohol *problems*, their association with alcohol use is less consistent (Merrill & Read, 2010; Walker, 2008). Interaction effects can help to explain the absence of main effects, by demonstrating contextual conditions or individual level characteristics that influence whether an independent variable predicts a dependent variable (Aiken & West, 1991). In the present study, findings *do* suggest that the predictive value of coping motives, specifically when stress is activated, is greatest when an individual lacks adaptive coping.

An important strength of the present study is the experimental design that allowed us to examine the influence of psychosocial predictors on alcohol use in a controlled laboratory study, specifically following the induction of stress. The stressor task used evoked the desired stress response, as indicated by our manipulation check using both objective (psychophysiological) and subjective measures of stress (Thomas, et al., under review). In addition, the ecologic validity of the taste task procedure was empirically supported—mls beer consumed during the taste test was significantly and positively correlated with participants' drinks per drinking day ($r=.27$, $p=.01$) and drinks per week ($r=.24$, $p=.02$) in the 30 days prior to participating in the study. In addition, we employed stringent statistical tests by controlling for the overlapping variance in all four motive types, the influence of avoidant coping and gender on alcohol use in all models, as well as by controlling for typical drinking when predicting alcohol consumed in the lab. These experimental and statistical strengths allowed a rigorous test that demonstrated contrast in findings when looking at lab-based vs. naturalistic drinking. Examining mood-relevant predictors (e.g., coping) only of retrospectively reported drinking over an extended period of time can result in overlooking the important proximal effect of such variables on drinking behavior.

5.1. Clinical Implications

Not only have general copings skills and coping motives (specific to alcohol use) been shown to explain variability in alcohol use, but they also are responsive to intervention, making the study of their unique and interactive effects significant. Findings suggest that, when under stress, individuals who *both* report coping motives and a lack of adaptive coping skills are apt to drink more than individuals with relatively more adaptive coping skills. Such individuals may need to be prioritized for intervention, and/or may be at particular risk for relapse once in treatment. If enrolled in treatment, focus may be placed on identifying high risk situations in which alcohol is likely to be used as a means to cope and increasing one's use of other more adaptive coping skills (e.g., planning or active coping) as a substitute for alcohol. In line with this suggestion, various types of skills training approaches have been used as treatment for alcohol use disorders (Larimer & Crounse, 2007; Longabaugh & Morgenstern, 1999; Morgenstern & Longabaugh, 2000; Murphy, et al., 2001). In addition, one's beliefs regarding the tension-reduction effects of alcohol may need to be targeted, either through expectancy challenge (Darkes & Goldman, 1998) or perhaps by presenting patients with psychoeducation that tension reduction beliefs do not always map on to actual tension reduction following alcohol use (Merrill, Wardell, & Read, 2009).

5.2. Limitations and Future Directions

There are a number of limitations to the present study. Among these is the small sample size (N=50). However, a sample size of 50 is comparable to other clinical laboratory studies examining the effects of motives and stress on alcohol-related outcomes (N=44–48: Field & Powell, 2007; Grant, Stewart, & Birch, 2007; Rousseau, Irons, & Correia, 2011). Second, the size of the effect of the interaction between coping motives and adaptive coping on beer consumed in the laboratory was small. It is possible that larger effects would be observed in a larger sample. It also is important to keep in mind that participants were provided with a maximum of two beers. More meaningful differences in the amount of alcohol consumed as a function of coping motives at high and low levels of adaptive coping might be observed were participants in their natural environment and/or permitted to drink as much as they liked. Another limitation is that we did not have a measure of alcohol-related consequences in the present study. As mentioned, some research demonstrates that coping motives are associated with alcohol consequences regardless of levels of alcohol use (Magid, MacLean, & Colder, 2007; Merrill & Read, 2010; Read, Wood, Kahler, Maddock, & Palfai, 2003). Findings observed in the present study may or may not map on to interactive effects of these variables on alcohol-related consequences rather than use.

Recent research suggests a five factor model of drinking motives (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007), in which coping with depression and coping with anxiety are unique factors. It is likely that effects of coping motives specific to the experience of anxiety would be more influential on in-lab drinking following a stressor task and perhaps may have demonstrated stronger interactive effects with adaptive coping had these been measured and tested in the present study. Future research may benefit from a more targeted examination of this question. Further, we relied on a stressor task that was social in nature in the present study, and thus findings may not generalize when individuals are under other types of stress. Several other (non-social) stressor tasks have been used in previous experimental research, including arithmetic tasks (e.g., Kajantie & Phillips, 2006) and the Mirror Tracing Persistence Task (Tuttoo, 1971). In addition, some research has employed negative mood inductions designed to elicit sadness rather than stress or anxiety, such as the International Affective Picture System (IAPS; Center for the Psychophysiological Study of Emotion and Attention, 1994; Davis, Rahman, Smith, & Burns, 1995; Lang, 1995). It is possible that coping motives would be more strongly activated by these other types of stressors, or that coping with depression motives (from the five factor model) would more likely be activated following a negative mood induction designed to elicit sad mood. It is also possible that the interaction between coping motives and adaptive coping would differ depending on the specific mood induction used. Future research might benefit from examination of the present research question using alternative experimental tasks.

The experimental design of the present study, including a stress induction, is a significant strength of the present study. Although this allowed us maximal internal validity in our demonstration that coping motives and adaptive coping interact to predict drinking, such a design does not tell us much about this interaction following stress in one's own natural environment. In one study, data collected via daily electronic diaries revealed that some early-day negative moods and subsequent time to drinking were moderated by drinking to cope, but general coping skills were not explored in this study (Todd, et al., 2009). Future work could perhaps use similar daily process designs to examine the role of coping motives, coping skills, and their interaction on drinking following naturally occurring stress.

Finally, some research has looked at specific facets of adaptive coping in the prediction of behavioral outcomes. For example, planning (Britton, 2004; Willis, et al., 2001) and suppression of competing activities (McKee, Hinson, Wall, & Spriel, 1998) have been shown to be associated with less drinking. Our goal in the present study was to examine the

influence of reliance on a range of coping skills thought to be adaptive. Still, future research may benefit from a look at how coping motives interacts with unique facets of coping in the prediction of alcohol use outcomes.

5.3. Conclusion

The present study demonstrates a combined influence of high coping motives and low adaptive coping skills on stress-induced drinking. We observed that individuals reporting greater tendencies to drink to cope with negative affect drank more when under stress if they also lacked other adaptive coping skills, compared to individuals with greater levels of adaptive coping. As both general coping skills and coping motives for alcohol use are responsive to intervention, this study of the conditions under which they exert unique and interactive effects has implications for treatment. In addition, results speak to the need to examine affect-relevant predictors (e.g., coping) in a controlled experimental context in which negative affect is elicited.

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Abbreviations

DDD	Drinks per drinking day
NDD	Number of drinking days
TSST	Trier Social Stress Test
mls	milliliters

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Highlights

- We examine an interaction between coping motives and adaptive coping skills in the prediction of alcohol use in a group of social drinkers who were administered a social stressor task
- Higher coping motives more strongly predict drinking in the lab following a stressor task for individuals with low levels of adaptive coping skills as compared to those with high adaptive coping
- Coping motives and adaptive coping do not interact to predict retrospectively reported alcohol use

Figure 1.

Association between coping motives and beer consumed following a stressor task at low and high levels of adaptive coping. Note: Figure is plotted using low and high values for coping motives that are one standard deviation below the mean and one standard deviation above the mean, respectively.

Table 1

Sample Descriptives. Values reflect Ns for categorical variables and means (SDs) for continuous variable.

	N (%)
Gender	
<i>Female</i>	25 (50)
<i>Male</i>	25 (50)
Race	
<i>Caucasian</i>	45 (90)
<i>African American</i>	3 (6)
<i>Other</i>	2 (4)
Ethnicity	
<i>Hispanic</i>	1 (2)
<i>Non-Hispanic</i>	49 (98)
	M (SD)
Age (21–40 yrs)	25.3 (4.0)
NDD (0–30 days)	13.1 (4.6)
DDD (1.7–13.9 drinks)	4.9 (2.6)
Beer (0–474 mls)	244.8 (136.0)
Adaptive coping (36–144)	96.7 (13.1)
Coping motives (5–20)	7.8 (1.9)

Note: NDD = number of drinking days (past month days on which any alcohol was consumed); DDD = drinks per drinking day (past month average); Beer = total mls beer consumed in laboratory. Values in parentheses following variable names include possible ranges, with the exception of drinks per drinking day and age (for which the actual range is presented).

Table 2

Bivariate Correlations among Model Variables

	1	2	3	4	5
1. NDD	1				
2. DDD	-.01	1			
3. Beer	.18	.37**	1		
4. Adaptive	-.34*	-.28*	-.30*	1	
5. Cope	-.05	.06	.12	.09	1

Note: NDD = Number of drinking days (past 30 days), DDD = Drinks per drinking day, Beer = Total mls beer consumed in laboratory, Adaptive = adaptive coping total score, Cope = Coping motives subscale total;

**
p<.01,

*
p<.05