

THE REINFORCING VALUE OF ALCOHOL IN A
DRINKING TO COPE PARADIGM

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Glenna Smith Rousseau

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DISSERTATION ABSTRACT
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The present research was conducted to explore the relationship between negative mood and the reinforcing value of alcohol, while clarifying the role of coping motives. Participants with a history of recent alcohol use (N=44; 72% female, 86% Caucasian, and mean age of 21.9) participated in a laboratory session and were randomly assigned to either a negative (n=22) or neutral (n=22) mood induction condition. A manipulation check confirmed that participants in the negative mood condition, but not the neutral mood condition, displayed a significant increase in negative affect. The Multiple Choice Procedure was used to measure the reinforcing value of alcohol after the mood manipulation. A crossover point at which the participant chooses money over alcohol was used as an index of the reinforcing value of that drug. Regression models employed the MCP crossover point as the dependent variable; mood condition (neutral or negative)

and drinking to cope were entered as predictors. A final model that included an interaction term of the aforementioned predictor variables accounted for 29% of the variance in MCP crossover points, with the interaction term emerging as a significant predictor. These results suggest that the relationship between mood and the reinforcing value of alcohol is moderated by drinking to cope, and help clarify the conditions under which negative mood may lead to changes in the reinforcing value of alcohol. This research also supports the utility of providing coping drinkers with alternative tools for addressing their negative affect.

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TABLE OF CONTENTS

LIST OF TABLES	x
LIST OF FIGURES	xi
I. INTRODUCTION	1
II. METHOD	20
III. RESULTS	31
IV. DISCUSSION	37
V. REFERENCES	49
VI. APPENDIX A	60
VII. APPENDIX B	67

LIST OF TABLES

1. Descriptive Variables Compared by Induction Group.....	61
2. Mood Means Across Group and Time Point	62
3. Regression Analyses of Multiple Choice Crossover Point.....	63
4. Correlations of Alcohol Related Variables	64
5. MCP Means Across Group and DMQ Coping High/Low.....	65
6. Regression Analysis of Craving Total after Mood Induction.....	66

LIST OF FIGURES

1. MCP Crossover Point for High/Low Copers Across Mood Group68

INTRODUCTION

Alcohol and college students

Alcohol use disorders and related problems are not confined to any specific population, but instead are prevalent in people of all socioeconomic, racial, and occupational backgrounds. The presence of these difficulties range from middle school students experimenting with the effects of alcohol to a person who lost his job and home due to alcohol use. In mental health and medical settings, at least 25% of clients are likely to have an alcohol use disorder as part of their presenting problem (McCrary, 2001). Therefore, even those psychologists and mental health workers who do not intend to work with alcohol related issues are faced with exploring the cause of their clients' alcohol use. Additionally, as the age group with highest heavy drinking rate has become young adults (Substance Abuse and Mental Health Services Administration, 2004), greater attention has been placed on prevention rather than rehabilitation. All of these current trends in alcohol consumption have driven the exploration of drinking motives and the growing interest in knowing which reasons to drink are associated with the greatest amount of problems.

In regards to alcohol consumption and related problems, college students increasingly have become a population of interest and concern. According to the 2003 National Survey on Drug Use and Health (Substance Abuse and Mental Health Services

Administration, 2004), young adults aged 18-25 reported the highest rates of binge drinking (five or more drinks on the same occasion at least once in the last 30 days) and heavy drinking (five or more drinks on the same occasion on at least five different days in the past 30 days). Additionally, young adults aged 18 to 22 who were enrolled full-time in college were more likely than their peers who were not enrolled full time (i.e., part-time college students and persons not enrolled in college) to use alcohol and to engage in binge and heavy drinking. Students who engage in binge drinking are at an elevated risk to experience a range of alcohol-related problems, including unsafe sexual practices, injury, driving while intoxicated, and displaying impaired academic performance (Wechsler, Lee, Kuo, & Lee, 2000). Therefore, college students present as a population worthy of further exploration concerning alcohol consumption antecedents.

Models of Alcohol Drinking Motives

The concept of drinking motives has been regarded for many years as a key factor linked to alcohol consumption and related problems. Drinking motives are based on the assumption that people drink in order to attain certain valued outcomes. It also assumes that drinking behavior is motivated by different needs and/or serves different functions, and that specific drinking motives are associated with unique patterns of antecedents and consequences (Cooper, 1994; Cox & Klinger, 1988). For example, coping motives, or drinking to cope, has been linked with people who experience stress. A consequence of drinking to cope with negative affect is an increased risk of heavy consumption and the development of drinking related problems (e.g., Holahan, Moos, Holahan, Cronkite, & Randall, 2001). Thus, drinking motives represent a subjectively derived decisional

framework for alcohol consumption that is based on that individual's personal experience, current environment/situation, and alcohol expectancies.

Expectancies are defined as beliefs about the positive or negative behavioral, emotional, and cognitive effects of alcohol consumption (e.g., Quigley & Marlatt, 1996). They are the individual's perceived likelihood that a particular effect will occur as a result of drinking alcohol. A main difference highlighted between expectancies and motives is that motives are proposed to be a necessary condition for drinking, while expectancies are not (Cooper, 1994; Cox & Klinger, 1988). In regards to expectancies, an individual can have a particular expectancy of what will happen if he/she drinks alcohol, but this individual will not necessarily drink to achieve the expected effect even if he/she has endorsed the presence of this expectancy. Motives, on the other hand, appear to be an integral part of alcohol consumption because the motive drives the decision to drink or not. The roles of motives and expectancies will be explained further through the descriptions of various models of why people drink.

Although the interest in drinking motives dates back many decades (e.g., Cahalan, Cisin, & Crossley, 1969; Riley, Marden, & Liftshitz, 1948), it was not until the 1980's and early 1990's that greater theoretical considerations were made (Cooper, 1994; Cox & Klinger, 1988). Although prior to 1980 there had been many attempts to divide reported reasons for drinking into the two categories of positive and negative reinforcement, it was not until Farber, Khavari, and Douglass (1980) that someone empirically tested the presence of these two factors in the concept of drinking motives. These researchers conducted an exploratory factor analysis on the responses that a sample of alcohol dependent individuals provided to a series of survey items, and two main factors

emerged. Factor 1 represented those individuals who consume alcohol to avoid or escape unpleasant internal or external stimuli. For Factor 2, a theme of obligatory social drinking and positive-reinforcement emerged. Farber and colleagues (1980) also compared these factors with level of consumption as measured by 12 items concerning frequency and quantity of alcohol behaviors. They reported that the individuals high on the avoidance factor were consistently the highest consumers of alcohol. Therefore, these results suggest that when predicting relatively high levels of alcohol intake, an important variable seems to be the extent of negative reinforcement motives. However, with this same sample, positive reinforcement motives did not appear to have a large role in predicting alcohol consumption.

A few years later, Cox and Klinger (1988) wrote a landmark article in the area of drinking motives. They set out to place alcoholic behavior in the context of contemporary theory of motivation and emotion, positing that both of these constructs relate to alcohol use and the life context in which the individual makes choices between drinking and alternative behaviors. Cox and Klinger (1988) suggested that incentive motivation and affective change were greatly related to people's use of alcohol. Positive incentives are those to which the individual is attracted and negative incentives are those to which the person is repelled. In regards to alcohol, a person who is committed to drinking, or in pursuit of the incentive of alcohol, is characterized by a distinctive emotional state from the time they are committed until they consume the alcohol or let go of the idea of drinking at that time. Cox and Klinger (1988) indicated that affective change can be quantitative or qualitative, either changing emotional states or intensifying a particular emotion that is already being experienced. Furthermore, they purported that

affective change is the motivating factor in incentive motivation associated with alcohol use.

The motivational model proposed by Cox and Klinger states that several variables (historical and current) have an impact on a person's motivation to use alcohol and contribute to that person's expectations about the effect that drinking will have on his/her affect. A person decides consciously or unconsciously to consume or not to consume any particular drink of alcohol according to whether or not he or she expects that the positive affective consequences of drinking will outweigh those of not drinking. Various factors help to form expectations of affective change from drinking. These factors include the person's neurochemical reactivity to alcohol, patterns of alcohol use modeled by family members, previous reinforcement associated with alcohol consumption, and the degree to which the current environmental cues signal an occasion for alcohol consumption. Although this theoretical motivational model was well conceptualized, Cox and Klinger (1988) did not directly test the notion that individuals are motivated to drink by positive and negative affect from internal (thoughts and emotions) and external (environmental) stimuli.

In 1988, another model regarding drinking (specifically coping) motives was introduced, and the relationship between motives and expectancies was better defined. Cooper, Russell, and George (1988) integrated expectancies, general coping skills, and the use of alcohol to cope as variables into a conceptual framework. Their model hypothesized that expectancies and general coping skills will make significant independent contributions to the prediction of drinking to cope and, further, that expectancies will moderate the relationship between general copings skills and drinking

to cope. In regards to general coping skills, they utilized emotion-focused coping indexes for their analyses. Hierarchical multiple regression analyses suggested that expectancy and coping variables accounted for more than 20% of the variance in drinking to cope. Also, expectancies made a significant positive contribution to drinking to cope. Drinking to cope, positive expectancies, and general coping indexes accounted for approximately 16% of the variance in alcohol consumption. However, only drinking to cope and positive expectancies made independent contributions to consumption.

The estimates of the above model (Cooper et al., 1988) likely convinced Cooper and colleagues that more attention should be placed on drinking motives in regards to studying alcohol use and related problems. Unfortunately, Cooper and colleagues (1988) utilized a short six-item scale (Polich & Orvis, 1979) to measure the entire construct of drinking motives. As the importance of this construct became realized, Cooper and colleagues (1992) developed a measure to more thoroughly and accurately assess drinking motives. They pointed to studies (e.g., Hull & Young, 1983; Marlatt, Kosturn, & Lang, 1975) as evidence that people can drink in response to stress, and that such drinking can be maintained by negative reinforcement. Additional studies were cited as evidence that drinking after pleasant social manipulations (e.g., Holroyd, 1978; Pihl & Smith, 1983) can be maintained by positive reinforcement. In addition to coping and enhancement motives, Cooper, Russell, Skinner, and Windle (1992) suggested that a third motive that closely resembles drinking to enhance positive affect should be studied more closely. They referred to this construct as social motives. With the addition of this scale, evidence was demonstrated for a goodness of fit for data collected from intercollegiate athletes (Martens, Cox, Beck, & Heppner, 2003).

Thus, when beginning to develop their scale, they attempted to create items that addressed coping, enhancement, and social motives. The researchers (Cooper et al., 1992) began with 21 items that were deemed face valid for the three drinking motives construct. Next, over 300 drinkers from the community completed these items. This data was factor analyzed, resulting in three factors accounting for 65% of the variance. The five items that loaded most highly on each of the three dimensions were retained. The resulting 15-item drinking motives scale was aptly named the Drinking Motives Questionnaire (DMQ). On this measure, respondents rate the frequency of drinking for each of the 15 reasons (items) on a scale from 1 (almost never/never) to 4 (almost always). Using Cronbach's alpha, all three scales, social, coping, and enhancement motives demonstrated adequate internal consistency (.77, .81, .85, respectively). Additionally, their intercorrelations were high enough to suggest an overarching construct, but low enough to indicate separate scales.

Cooper and colleagues (1992) also tested the validity of their new measure on data from over 1,600 drinkers from the community. Three phases of analyses were conducted, beginning with confirmatory factor analysis on the hypothesized three-factor model. A one-factor and a two-factor model were tested as well. The one-factor model was tested to be certain that one over-arching motives construct, or factor, did not better account for the data. The two-factor model was tested because this fit was suggested by Farber and colleagues' (1980) research on positive and negative reinforcement motives. A chi-square difference test indicated that the three-factor model provided a significantly better fit for the data than the remaining two models. Additionally, all items loaded significantly onto their hypothesized factors, suggesting that this measure not only validly

measured the overall construct of drinking motives, but also appropriately tapped into the three scales' constructs (coping, enhancement, and social motives).

Finally, Cooper and colleagues (1992) investigated the role of drinking motives, as measured by the DMQ, as predictors of alcohol use and problems. A series of multiple regression analyses was conducted in which gender, race, age, education, and social desirability were entered on the first step, and the three motive groups were entered as one block on the second step. Results for the individual motives indicated that enhancement motives were the single strongest predictor of quantity and frequency of alcohol use and frequency of drinking until intoxication. However, coping and social motives also made significant independent contributions to these two indicators. Also, coping motives were the strongest independent predictor of three different drinking problem indexes.

In more recent research utilizing the DMQ, Cooper and colleagues (1995) have supported this notion that the quantity of alcohol consumed, drinking to cope, and positive expectancies made significant independent contributions to the prediction of alcohol related problems. Jointly, these variables accounted for more than 20% of the variance in the alcohol abuse/dependence variable. Overall, these results support the notion that expectancies and drinking to cope are linked to alcohol problems. Although many researchers have created measures of drinking motives either on their own or by combining other measures, the DMQ is the only one to be used with any consistency across multiple studies and continues to be used in recent research (Grant, Stewart, & Birch, 2007). Additionally, when various drinking motives models were tested on a

college student sample, the four-factor model of the DMQ provided the best fit of their data (MacLean & Lecci, 2000).

Utilizing the DMQ, coping motives have been previously described as a mediator between a psychological variable and an alcohol variable. Lewis, Hove, Whiteside, Lee, Kirkeby, Oster-Aaland, et al. (2008) examined the relationship between Social Anxiety and problematic drinking. Their results suggested that college students higher in social anxiety consumed less alcohol, but experienced more negative consequences related to drinking. Additionally, they found that the relationship between social anxiety and negative consequences of alcohol consumption was mediated by coping motives.

Negative Affect Induction

Previous studies regarding drinking to cope have begun to highlight the importance between negative mood and drinking behaviors (e.g., Lewis, et al., 2008). In order to study this relationship between negative affect and alcohol consumption behaviors in a laboratory setting, a negative mood induction procedure must be utilized in order to exert control over the independent variable. Generally, observations of natural situations that cause affective reactions might be impractical to set up or unreliable because of lack of experimental control. Therefore, there have been numerous attempts to develop experimental mood induction procedures (MIP) that would induce affective states in participants in a laboratory setting. MIPs have been used extensively in a variety of psychology topic areas to induce a temporary mood state in individuals, including alcohol urges (Streeter, et al., 2002) and drinking motives and expectancies (Birch, Stewart, Wall, McKee, Eisnor, & Theakston, 2004). Because the field of psychology

tends to focus on the abnormal and dysfunctional, most MIP procedures involve inducing a negative affective state and are appropriate for studying the drinking to cope paradigm.

Researchers have utilized a wide variety of mood induction procedures (MIP) in an attempt to find the most effective way to quickly induce an intense, controlled emotional experience that does not last beyond the laboratory setting. After reviewing the literature, Gerrards-Hesse, Spies, and Hesse (1994) proposed several groups of MIPs divided by method of induction. One group identified by these researchers relied on the free mental generation of ideas, named imaginal MIP. In these procedures, the stimuli leading to negative induction are not presented by the researcher, but instead are internally generated by the participant. In the case of imaginal MIPs, for example, participants are instructed to imagine and reexperience situations or events. Although the term “imagination” is used, individuals are not expected to create a story in their mind, but instead encouraged to remember a past event. The current study utilized imaginal MIP because this procedure has produced reliable manipulation, and because the procedure provides some control over the participants’ thought content. For example, musical MIPs consistently manipulate mood, but it does not involve any instruction that guides the participants’ thoughts. While an imaginal procedure does not guarantee complete insight into or control over the participants’ thought content, it provides more guidance than other MIPs.

In regards to affect induction, the mood induction procedure is only part of the task. The other portion involves manipulation check procedures to be certain that the desired effect occurred. These measures of induction results require a baseline measurement to ascertain the participant’s typical or current mood, and a post-induction

measure to indicate the level of change in the individual. In most studies, one of the following three procedures is utilized to measure level of mood induction: assessment of the individual's subjective emotional experience, assessment of physiological state, or researcher observation of overt behavior. Subjective emotional experiences are assessed by informally asking subjects to describe their feelings, by using researcher-constructed rating scales, or by referring to standardized mood measures. The most common of the described procedures for manipulation checks has been the assessment of emotions with researcher-constructed rating scales or standardized mood questionnaires. Obviously, the use of standardized measures is the most reliable and valid because these measures have been standardized across studies and data sets. Of the standardized self-report measures, investigators often utilize the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988).

Once the data for the manipulation check are collected by whichever means, most studies (e.g., Srivastava, Sharma, & Mandal, 2003; Wang, McCarthy, Song, & LaBar, 2005) use cross-sectional data to compare the mean scores of an emotion group to those scores from individuals in a control or neutral condition. Other studies (e.g., Phillips, Smith, & Gilhooly, 2002; Siemar, 2005), instead, compare the means scores of the negative affect group to a positive affect group. The difficulty with this design is that when mean scores differ significantly, it is unclear whether the negative affect induction or positive affect induction, or both, were effective. Thus, comparing the negative group to a neutral condition proves to be more informative.

A variety of studies support the reliability of the imaginal MIP, and offer important practical suggestions for increasing the intensity of the resulting emotion

experience. For example, Holmes and Mathews (2005) tested the importance of imagery when inducing affect by having one group think about a past experience, while the other group of participants was instructed to think about the meaning of a word. The researchers reported that there was a greater increase in state anxiety in the past experience imagery group than the verbal semantic group. Therefore, encouraging individuals to visualize and imagine a negative stimulus appears to intensify the negative affect response beyond simple presentation of a negative stimulus.

A variety of studies has also demonstrated that MIPs can be used to investigate the relationship between negative affect and alcohol-related variables. Pihl and Zacchia (1986) used imaginal MIP to investigate the relationship between alcohol and aggression. They reported a significant change in affect after the induction procedure and indicated that alcohol played a significant role in experiencing more aggression. As noted, other researchers have used various MIP procedures to investigate the relationships between affect and motives to consume alcohol.

Birch and colleagues (2004) presented participants that had completed a motives measure with a ten-minute musical piece that was previously coded as positive or negative and then had them complete a craving questionnaire to assess alcohol expectancies. Significant postinduction affect changes in the intended direction were reported. Thus, participants in the positive affect condition reported more positive emotions, while the negative group reported a greater increase in negative emotions. Additionally, they reported that only individuals who were higher on coping motives reported increased relief expectancies after negative affect induction. A second study demonstrated not only a difference in expectancies after negative mood induction for

drinking to cope individuals, but also a variation in physiology. Colder (2001) presented participants with negative or neutral pictures while physiological measurements were taken. He reported that individuals who had significantly greater physiological responses also indicated that they drank to cope more often than individuals without these higher physiological responses.

These differences exhibited by individuals who reported drinking to cope in a negative affect induction situation (musical) were not extended to two implicit cognitive tasks: Stroop implicit attention task for alcohol stimuli and reward-alcohol implicit associations (Birch et al., 2007). Following exposure to a negative musical mood induction procedure, coping motivated drinkers did not demonstrate a delayed color-naming response for alcohol vs. clothing stimuli as hypothesized by the researchers. In a second experiment, this same drinking to cope sample in the negative mood condition also did not demonstrate faster relief-alcohol than reward-alcohol associations as predicted. However, this unexpected result may be due to the participants associating the alcohol with a reward because they are experiencing the relief as a reward. Therefore, the negligible difference between relief and reward reaction times for coping motives drinkers in a negative mood situation may be due to viewing their feeling relief from distress as a positive experience. A utilization of enhancement words, or terms associated with an increase in positive feelings, instead of “reward” words may have resulted in a significant difference from relief terms in drinking to cope individuals. The reward words in this study were not likely measuring the same construct as is measured by the enhancement subscale of the Drinking Motives Questionnaire.

Induction studies, such as the aforementioned experiments, demonstrate a fairly consistent ability to manipulate mood in a laboratory setting. This established literature regarding induction procedures provides reliability in the exploration of the role of mood in other areas. This induction procedure has been more specifically applied to the drinking to cope literature. The resulting data suggests that individuals who drink to cope respond to negative stimuli with greater relief expectancies from alcohol (Birch et al., 2004) and more physiological arousal (Colder, 2001). However, Birch and colleagues (2007) did not extend these findings of increased relief responses to implicit cognitive stimuli. Due to the concept of “relief” being imbedded in the definition of the drinking to cope paradigm, the current study utilized more behavioral dependent variables to explore negative affect and drinking motives. While these studies have been informative, the current study was the first to use an imaginal MIP to determine how negative affect and drinking motives affects cravings for alcohol and the relative reinforcing value of alcohol.

Alcohol and Choice Behavior

Induced affect has been used to study the effects of affect on alcohol motives and expectancies. However, induction has not been used to assess the impact of affect on more behavioral variables, such as consumption and the reinforcing value of alcohol. Behavioral theories of choice (Vuchinich & Tucker, 1983, 1996) offer a perspective that emphasizes the importance of the relative reinforcing value. These behavioral theories view substance abuse and addiction as an acquired state in which the relative

reinforcement from substance use remains high compared to other available reinforcers, despite the negative physical and psychosocial consequences of continued use (Bickel, Marsch, & Carroll, 2000). Bickel and colleagues (2000) defined relative reinforcing efficacy as a “theoretical construct designed to integrate the diverse phenomena related to the strengthening effects of reinforcement into a more general property of behavior” (p.45). In laboratory settings, the relative reinforcing value (RRV) of drugs is generally measured by the levels of operant responding for a drug, the quantity of the drug and drug-free reinforcer earned or consumed during the session, or the proportional response rate towards drugs (Bickel et al. 2000; Hursh & Winger, 1995; MacKillop & Murphy, 2007). Laboratory studies have utilized RRV procedures to determine the influence of variables such as, pharmacological and environmental manipulations on drug consumption (Bickel, DeGrandpre, & Higgins, 1995; Hursh & Winger, 1995). The current study focused on the effect of the environmental manipulation of mood on alcohol consumption.

To measure the relative reinforcing value of alcohol, the current study utilized a method that provides a choice for a drug versus an alternative reinforcer, specifically the relative reinforcing efficacy of alcohol relative to the reinforcing efficacy of another available non-substance reinforcer (money). These choice procedures that are consistent with the behavioral choice perspective have emerged as common methods of measuring the relative reinforcing value of alcohol (Murphy & MacKillop, 2006, Vuchinich & Tucker, 1983).

Behavioral theories of choice view behavior as arising within a broad environmental context of available reinforcers. Preference for alcohol related choices

involves the availability and utilization of competing alternative reinforcers and the associated environmental constraints (Vuchinich & Tucker, 1996). High rates of alcohol use are most likely in contexts devoid of substance-free sources of reinforcement, and alcohol use will generally decrease if access to alternative reinforcers is increased (Higgins, Heil, & Plebani-Lussier, 2004). Recent studies applying theories of behavioral choice to college student drinking in the natural environment have demonstrated that the frequency, quantity, and negative consequences of alcohol use are inversely related to the amount of reinforcement derived from drug-free activities (e.g., school work, relationships, employment; Correia, Carey, Simons, & Borsari, 2003; Correia, Carey, & Borsari, 2002; Correia, Simons, Carey, & Borsari, 1998); that increases in substance-free activities like exercise can lead to decreases in substance use (Correia, Benson, & Carey, 2005); and that reduced drinking following a brief motivational intervention is associated with an increased proportion of reinforcement being derived from substance-free activities (Murphy, Correia, Colby, & Vuchinich, 2005).

In laboratory-based studies, several variables have been shown to influence alcohol-related choice behaviors, such as the magnitude of the available alcohol reinforcer and the delay associated with the alternative reinforcer (Vuchinich & Tucker, 1983). Magnitude of alcohol-related reinforcement refers to the quantity (e.g., one beer or two beers) or quality of alcohol available. Previous laboratory studies have demonstrated that larger doses of alcohol and higher beverage alcohol concentrations are more reinforcing than lower doses and lower beverage alcohol concentrations (Bigelow, Griffiths, and Liebson, 1977; Griffiths, Bigelow, & Liebson, 1976). Therefore, in regards

to the current study, the option of consuming up to two alcoholic drinks would likely prove more reinforcing than only one drink.

One behavioral choice procedure that has been validated on a college sample is the Multiple Choice Procedure (Little & Correia, 2006). The Multiple Choice Procedure (MCP) provides a measure of the relative reinforcing value of a drug, making it a useful method for testing hypotheses derived from the behavioral choice perspective. The MCP arranges intermittent reinforcement for choice behavior. When used to study preferences for psychoactive substances, the MCP typically arranges a series of discrete choices between a dose of the drug and escalating amounts of money. The value of interest is referred to as the crossover point, which is the monetary value where a participant stops choosing the drug and begins to choose the money (Griffiths, Rush, & Puhala, 1996). The crossover point is viewed as the relative reinforcing value of the drug. After completing the MCP forms, one of the choices is randomly selected and then the chosen option is presented.

To date, the laboratory version of the MCP has been used with cocaine (Jones, Garrett, & Griffiths, 1999; Lile, Stoops, Allen, Glaser, Hays, & Rush, 2004), sedatives-hypnotics (Griffiths, Troisi, Silverman, & Mumford, 1993; Mintzer & Griffiths, 1998), caffeine (Garrett & Griffiths, 1998), nicotine (Griffiths et al., 1996; Jones et al., 1999), marijuana (Greenwald & Stitzer, 2000), MDMA (Tancer & Johnson, 2007) and alcohol (Little & Correia, 2006). Responses to the MCP not only have been shown to be sensitive to environmental stimuli, such as reinforcer magnitude (Griffiths et al., 1996; Jones et al., 1999) and delays associated with alternative reinforcers (Little & Correia, 2006), but also more individual difference variables, such as drug dependence (Garrett &

Griffiths, 1998), and drug deprivation (Griffiths et al., 1996). However, no studies have utilized the MCP to measure the degree to which internal processes, such as affect, influence the reinforcing value of alcohol.

Current study

Presently, there are well-developed literatures in the area of coping motives and negative affect induction and a growing literature for using choice behavior procedures to measure the reinforcing value of alcohol. However, no study to date has combined these areas of research to better understand the drinking to cope paradigm and the role of negative affect on the reinforcing value of alcohol. The purpose of the current study was to inform this area of research in a controlled laboratory setting. To do so, we screened for individuals that were at least 21 years old and drank alcohol at least a four times in the last month. Participants completed a variety of measures during laboratory sessions, including measures of mood and craving. Then, they completed either a negative or neutral mood induction procedure to which they were randomly assigned. Finally, they completed the Multiple Choice Procedure, and a second administration of the craving measure to determine the reinforcing value for alcohol and level of craving after the mood induction procedure. Based on past research in these established literatures, our primary hypothesis was that individuals in the negative affect induction group would report a higher crossover point (when an individual stops choosing alcohol and begins choosing money) on the MCP, thus indicating that negative affect increases the relative reinforcing value of alcohol. We also hypothesized that participants in the negative affect induction group would report higher levels of craving for alcohol. Secondarily, we

posited that further exploration would reveal that individuals that report a greater level of drinking to cope would also report higher cravings, a higher crossover point on the MCP, and that drinking to cope could moderate the relationship between induced mood and the relative reinforcing value of alcohol.

METHOD

Participants

Screening Survey

Participants were 101 undergraduate volunteers from a large public university. This sample consisted of individuals at least 21 years old, with a mean age of 22.4 years old. The survey sample was 65.3% female. The majority of participants were Caucasian (83.2%), although other racial categories were represented in the sample (African American = 15.8%, Asian = 2%, Native American = 2%). Percentages sum to greater than 100% because participants could endorse multiple categories. Participants received one hour of extra credit for completing the survey portion of the study.

Laboratory

In order to complete the laboratory portion of the study, a participant had to report in the survey portion that he/she drank at least four times in the prior 28 days. Additionally, on at least one occasion, the participant needed to have consumed at least the equivalent of two standard alcoholic drinks. These criteria were used to ensure that the participant not only drank in the last month, but had also at some point in that time period consumed the ceiling amount (two drinks) available in the lab portion of the study. Exclusion criteria were participants who were under the age of 21 or who endorsed current use of prescription drugs for physical or psychological ailments. This second

exclusion was enacted to prevent any unforeseen interactions between the prescription drug and alcohol. Of the 101 participants that completed the survey portion of the study, 68 individuals qualified for the laboratory portion. For the laboratory study, 44 of the 68 qualified individuals participated after receiving an invitation via email. In regards to demographics, there were no significant differences between the 44 lab participants and the overall 101 individuals in the survey sample.

Similar to the survey portion, the 44 participants from the laboratory portion of the study were mostly female (72.3%). Also similar to the survey, most participants were Caucasian (86.4%) with other racial categories represented (African American = 13.6%, Asian = 2.3%, and Native American = 2.3%). The mean age of these individuals was 21.9 years old. Of the 44 individuals in the laboratory study, 22 individuals were randomly assigned to the negative affect induction condition, while the remaining 22 participants were placed in the neutral affect condition. There were no significant differences found between the neutral and negative affect groups' demographics, as well as no significant differences on alcohol variables like total number of days drunk in the last 28 days, total number of times binge drinking in the last 28 days, and level of drinking to cope as measured by the Drinking Motives Questionnaire. Please refer to Table 1 for group comparisons.

The 44 lab participants were compared to the 24 that were invited but did not choose to participate. There was a significant difference for gender [$t(66)=2.45, p<.03$] between those who attended a lab session (males=27%) and those who were invited but did not attend a lab session (males=46%). However, there was no significant difference between these two groups for age or any of the alcohol related variables. Participants in

the laboratory session received an additional three hours of extra credit and received up to \$20 or the equivalent of up to two standard drinks (two 12 ounce beers, 10 ounces of wine, or two 1 ounce shots of liquor), depending upon the choices made during the session.

Measures

Demographic questionnaire. Participants completed a brief demographic questionnaire. The questionnaire included gender, age, completed education, affiliation with the Greek system, ethnicity, and current residence (i.e. off campus residence, fraternity or sorority house, living with parents, dormitory, or other). Additionally, participants were asked to list any current medical or psychological difficulties, as well as medication they may currently be prescribed. These questions were used for exclusion purposes.

Alcohol Survey. Portions of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985) were used to assess the average amount of alcohol participants consumed during the four weeks prior to completing the survey. Participants were asked to indicate how much alcohol they consumed on average for each day of the week for the past four weeks and the time period during which the drinks were consumed. Additionally, participants were asked how many of the last 28 days they consumed different types of alcohol as well as the maximum number of drinks consumed during this time period. Finally, participants reported the number of times they engaged in an episode of binge drinking during the last 28 days.

Rutger's Alcohol Problem Index. A modified version of the Rutger's Alcohol Problem Index (RAPI; White & Labouvie, 1989) was used to assess the current frequency of alcohol-related problems. The scale consists of 23 items assessing the frequency with which the participant has experienced specific problems with alcohol over the past four weeks. Ratings are provided on a five-point Likert scale (0=never, 1=1-2 times, 2=3-5 times, 3=6-10 times, 4=more than 10 times). Sample items include: "Missed a day (or part of a day) of school or work; had a fight, argument, or bad feelings with a friend; and kept drinking when you promised yourself not to." The scale was designed for adolescents between the ages of 12 and 21, making it an appropriate measure for use with college students. Previous measures of internal consistency have been adequate ($\alpha = .77-.82$; White & Labouvie, 1989). The Cronbach's alpha was similar for the current study at .80. One month test-retest reliability was also found to be adequate in a college student sample ($\alpha = .72$; Borsari & Carey, 2000). The original RAPI measured the frequency of alcohol-related problems occurring in the previous three months. For purposes of the present study, the RAPI was modified to measure problems during the previous 28 days to align with the amount of time for which drinking frequency and amount was reported.

The Multiple Choice Procedure (MCP). This measure was adapted from Griffiths and colleagues (1993) work with pentobarbital. The MCP has been used in research studies with cocaine (Jones, Garrett, & Griffiths, 1999; Lile et al., 2004), sedatives-hypnotics (Griffiths, Troisi, Silverman, & Mumford, 1993; Mintzer & Griffiths, 1998), caffeine (Garrett & Griffiths, 1998), nicotine (Griffiths et al., 1996; Jones et al., 1999), marijuana (Greenwald & Stitzer, 2000), MDMA (Tancer & Johnson, 2007) and alcohol (Little & Correia, 2006). This version of the MCP contained 40 choices between

varying amounts of money and a set amount of alcohol. As discussed in the introduction, the MCP is sensitive to several parameters, including delay, magnitude, and drug versus placebo. More details regarding the administration of the MCP will follow in the procedures section.

Drinking Motives Questionnaire (DMQ). The DMQ (Cooper, 1994) is a 20-item questionnaire assessing four motives for drinking: coping, enhancement, social, and conformity. The DMQ was administered as part of the survey and prior to the mood manipulation in the laboratory portion in case changes in drinking behaviors have occurred since the survey portion of the study. Each item has a 5-point response option, ranging from 1 (Almost never/never) to 5 (Almost always/always). Participants were instructed to consider all the times they drank alcohol and to indicate how often they drank for each reason. The following are representative items for each motive: coping (“I drink to forget my worries”), enhancement (“I drink to get high”), social (“I drink to be sociable”), and conformity (“I drink so that others won’t kid me about not drinking”). This measure has shown solid psychometric properties in large samples of adolescents and adults (Cooper, 1994; Cooper et al., 1995). More recently, this measure has been utilized in a college population, as well (Simons, Gaher, Correia, 2005; Simons, Correia, & Carey, 2000), and each of the scales have displayed adequate internal reliability in these studies (enhancement = .88, coping = .91, social = .91, and conformity = .72). The only subscale utilized in the current study was the coping scale, which demonstrated an internal consistency of .84.

Desires for Alcohol Measure (DAQ). The DAQ Short-form (Clark, 1994; Love, James, & Wilner, 1998) is designed to measure alcohol cravings and urges. In the present

study, it was used during the survey, as well as in the laboratory portion as a method to determine if there is change after negative mood induction. Thus, in the laboratory, the DAQ was given before and after the mood induction. The DAQ Short-form (Clark, 1994) contains the 14 items from the original version that have the highest loadings for each of the four factors: intentions to drink alcohol, desires to consume alcohol, anticipation of positive outcomes from drinking, and anticipation of relief of negative affect or alcohol withdrawal. This measure is scored on a 7-point Likert scale ranging from 1 (not true at all right now) to 7 (extremely true right now). Therefore, the participants' responses should reflect their current state and any craving shift that occurs during the mood manipulation. Love and colleagues (1998) reported Cronbach's alphas of .95 or higher for each of the DAQ factors. They also suggested that this measure appeared superior to other craving measures in a number of reliability factors, as well as providing a finer distinction between binge and non-binge drinkers and moderate and excessive drinkers (Love et al., 1998). The internal consistency for the current study was slightly lower, but still high with a .87 and .91 at time 1 and time 2, respectively.

Positive and Negative Affect Scale (PANAS). The Positive and Negative Affect Scale (PANAS) consists of two 10-item scales, one measuring positive affect and the other measuring negative affect. Previous alcohol related studies reported that the PANAS retained acceptable internal consistency ($\alpha = .72; .83$) (Colder, 2001; Stein, Goldman, & Del Boca, 2000). The current study demonstrated acceptable internal consistency for the Positive PANAS items at time 1 ($\alpha = .84$) and time 2 ($\alpha = .89$), as well as the Negative PANAS items at time 1 ($\alpha = .76$) and time 2 ($\alpha = .83$). This measure was

used as a manipulation check and to determine the emotional state of the participants before and after the affect induction procedure.

Life Events Checklist (LEC). The LEC includes a list of 17 potentially traumatic events (e.g., sexual assault, physical assault, transportation accident). Participants indicated whether they have experienced each event, have witnessed the event happening to someone else, or have learned about the event happening to someone close to them. Participants were then instructed to think about the event they consider to be the most traumatic and to answer questions addressing DSM-IV-TR Criterion A1, such as whether someone's life was in danger during the event, and Criterion A2, whether they experienced fear, helplessness, or horror during the event. This measure was used to assess the participants' trauma history and provide information regarding events with which they may be coping currently. Thus, the LEC was used to describe the sample and to identify an event that the participant could write about during the mood induction procedure.

Procedure

Survey

Participants were recruited through announcements made during undergraduate psychology and statistics classes and flyers announcing the research opportunity posted in the psychology department. Students were also recruited through the on-line SONA system. Survey packets included an informed consent, the demographic questionnaire, the alcohol survey, Life Events Checklist, Multiple Choice Procedure (survey format),

Drinking Motives Questionnaire, Desires for Alcohol Questionnaire, and the Rutgers Alcohol Problem Index. The packet was administered to groups of participants in a meeting room setting with a researcher present.

Laboratory

Participants for the laboratory sessions were chosen based on their responses to the survey questions. Individuals meeting the inclusion criteria and not having the exclusion criteria described in the Participant Section were emailed via participant-provided contact information within three weeks of submitting the screening packet. They were invited to participate in a single laboratory study in exchange for an additional three extra credit hours. These participants were also informed that the laboratory session may involve the optional consumption of alcohol, and that they may earn up to \$20.

Participants were instructed to abstain from any illicit drug use for the 24 hours preceding their scheduled experimental session and to refrain from alcohol use the day of their session. Each laboratory session consisted of one participant and one experimenter. All laboratory sessions occurred in Thach 108B and 108C, which are both private rooms. The laboratory is equipped with adequate workspace for completing questionnaires and for alcohol administration. Total session time was approximately three hours (one-half hour to complete surveys, affect induction, and Multiple Choice Procedure (MCP), one-half hour to drink any alcohol that is provided through the MCP, and two hours to ensure that all participants have returned to a BAC less than or equal to .002 by the end of the session). The laboratory was equipped with a telephone and a list of emergency phone numbers.

The participants were randomly assigned to the neutral or negative mood induction group prior to their arrival at the laboratory. They were required to provide age verification in the form of a valid driver's license, and were again asked whether they were taking any prescription medication that interacted with alcohol or had used any recreational drugs in the last 24 hours. Female participants were told that they should not participate in the study if think they are or could be pregnant. For safety considerations, all participants were given a breathalyzer test to confirm that they had no alcohol in their system. No participants provided any evidence of recent alcohol use. We used a removable, disposable mouthpiece on the breathalyzer to ensure each participant had a new, sterile one to use.

Eligible participants then read and signed an informed consent form. All participants completed a pre-mood induction packet including the alcohol survey, Drinking Motives Questionnaire (DMQ), Desires for Alcohol Questionnaire (DAQ), the Rutgers's Alcohol Problem Index (RAPI), and Positive and Negative Affect Scale (PANAS). Next, the participants participated in a neutral or negative mood manipulation based on prior random assignment. Individuals in the neutral group completed three lists (fruits, vegetables, trees) for ten minutes to serve as a distraction task from free flowing thought. Participants in the negative mood group were instructed to think about their saddest, most distressing life event reported on Life Events Checklist in their survey questionnaire and make a list of words or phrases that reminds them of this event. After the neutral or negative condition was complete (ten minutes had passed), the participants completed a post mood induction packet, including the PANAS, DAQ, and the Multiple Choice Procedure (MCP).

The MCP asked participants to repeatedly choose between “up to two drinks” of alcohol and 40 escalating monetary values ranging from \$0 to \$20. On the MCP form, participants made 40 discrete choices, and each choice was assigned a number. After filling out the packet, participants were instructed to draw a number from an opaque bag. They received their choice that corresponded with the number drawn (e.g., Choice number 15 is drawn, indicating that the participant received either up to 2 standard drinks or \$7.50. On the MCP form, the participant circled “up to two drinks,” so he/she was offered 2 alcoholic drinks). If the randomly drawn choice indicated alcohol, the participant was given the alcohol immediately, and it was consumed during the session. They were given 30 minutes in which to complete as much of their two alcoholic beverages as they chose. If the choice indicated for the participant to be given money, it also was delivered immediately.

The MCP was administered with the money choice ascending from \$0 to \$20 in 50 cent increments, while the alcohol choice remained at “up to two standard drinks” for each item. The alcohol variable was defined on the MCP survey as “up to two 12 ounce beers, two 5 ounce glasses of wine, or two mixed drinks with each containing 1 ounce of alcohol.” The drinks were provided one at a time, with the participant finishing the first one before the second drink could be provided.

The laboratory was equipped with a sofa and a variety of recreational activities. Participants had access to a television with a DVD player, a computer with Internet access, video games, magazines, and art supplies while they were waiting for the session to end. Snacks and non-alcoholic beverages were available. All participants were required to stay in the lab for at least 2 hours after completing the alcohol. After two

hours, those who consumed alcohol had their blood alcohol content (BAC) tested with a breathalyzer. They were continuously tested every 10 minutes until their blood alcohol levels were at .002 or lower, indicating a negligible amount of alcohol. Additionally, their behavior was monitored for abnormalities that occur after consuming alcohol. There was an Informed Emergency Form to sign and an Emergency Protocol to enact in case they insisted on leaving early. However, no participants left before their BAC returned to an appropriate level. Individuals who received money, not alcohol, were also required to stay for two hours after completing the post-induction forms. This requirement was instituted to ensure that participants would not select money for the sole reason of leaving the laboratory sooner.

Statistical Analyses

Initially, analyses were conducted to determine if mood manipulation had occurred. Independent Sample t-tests were completed to determine differences in mood between the neutral and negative affect induction groups, and Paired Samples t-tests were conducted to measure changes in positive and negative affect from time 1 and time 2. Next, Independent Sample t-tests were run to determine if there was a significant difference between the negative and neutral affect groups for the Multiple Choice Procedure crossover point and craving level. Regression analyses were conducted to determine the role of drinking to cope in variability in the crossover point and craving level. Follow-up t-tests and correlational analyses were completed to determine the nature and direction of these relationships.

RESULTS

Mood Manipulation Check

As noted in the participant section, there were no significant differences between the two mood induction groups (neutral and negative) at baseline (T1) for the Positive (neutral M = 32.72, SD = 5.62; sad M = 29.95, SD = 7.33) or Negative (neutral M = 11.82, SD = 2.44; sad M = 12.95, SD = 3.76) PANAS subscales. To compare the neutral and negative groups post-mood induction (T2), an Independent Samples t-test was conducted for PANAS Positive and Negative subscales. A significant difference was noted between the negative (M=16.77, SD=4.70) and neutral groups (M = 11.45, SD = 1.90) at T2 on the PANAS Negative [$t(42) = -4.92, p = .001$], but not Positive (neutral M = 31.23, SD = 7.09; sad M = 27.27, SD = 8.75) subscale. Mood induction results are reported in Table 2.

Follow-up within subject analyses were conducted to determine changes in positive and negative mood for each induction group between T1 and T2 using a repeated measures ANOVA, with mood group entered as a between-subjects variable and time entered as the within-subjects variable. For the negative emotion items, T1 and T2 scores were significantly different from one another ($F = 12.35, p = .001$), with participants reporting higher scores at T2 (M = 14.11, SD = .54) than T1 (M = 12.39, SD = .48). The analysis including a time by mood group interaction term was also significant ($F = 18.10, p < .001$). A series of within-subjects t-tests was conducted to determine how the mood induction groups differed between the two time periods. Participants in the negative

mood group reported a significant increase on the negative emotion items between T1 (M = 12.95, SD = 3.76) and T2 (M = 16.77, SD = 4.70), [$t(21) = -4.03, p = .001$]. For the neutral mood group, there was no significant difference for negative emotion items (T1 M = 11.82, SD = 2.44; T2 M = 11.45, SD = 1.90) between time points.

For the PANAS positive items, the same repeated measures ANOVA was conducted with mood group as a between-subjects variable and time entered as the within-subjects variable. For the positive emotion items, T1 and T2 scores were significantly different from one another ($F = 7.54, p = .009$), with participants reporting lower scores at T2 (M = 29.25, SD = 1.20) than T1 (M = 31.34, SD = .99). The time by mood group interaction term was not significant. A series of within-subjects t-tests was conducted to more closely examine how the positive mood items changed between the two time periods as a function of mood induction group. There were no significant differences in the sad mood group between T1 (T1 M = 29.95, SD = 7.33) and T2 (T2 M = 27.27, SD = 8.75) or the neutral mood group, between T1 (T1 M = 32.73, SD = 5.62) and T2 (M T2 M = 31.23, SD = 7.09) on the positive emotion items.

Finally, the difference scores were calculated for each participant between T1 and T2 for the two PANAS subscales. These scores were entered as the test variable in an Independent Samples t-test with induction group as the grouping variable. As expected given the above results, there was a significant difference between difference scores for induction groups on the PANAS Negative subscale [$t(42) = 4.25, p < .001$], with more pronounced difference seen in the negative induction group (M = -3.82, SD = 4.45) than in the neutral group (M = .36, SD = 1.22). There was no significant difference between the negative and neutral induction groups on the PANAS Positive subscale (negative M =

2.68, SD = 6.26, neutral M = 1.50, SD = 3.45). Additionally, for the negative mood induction group, the mean difference score for the PANAS Negative subscale was a negative number indicating the expected direction from T1 to T2, an increase in negative affect.

MCP Crossover Point

A series of analyses were conducted to measure the mood manipulation's effect on alcohol related behavior, and more specifically preference for alcohol. The MCP crossover point, or when a participant began choosing money instead of alcohol, was used to measure the reinforcing value of alcohol and served as the dependent variable. Initially, an Independent Samples t-test was conducted and revealed no significant difference between the mean crossover points in the neutral (M = 14.36, SD = 6.91) versus negative (M = 14.36, SD = 8.17) mood group [$t(42) = .00$, $p = 1.00$]. The lack of a significant difference between the two groups led to follow-up analyses designed to explore variables that might impact the relationship between mood manipulation and the reinforcing value of alcohol.

A series of multiple regression analyses, with the MCP crossover point as the dependent variable, were conducted to determine the relative contribution of the affect induction group (neutral or negative) and degree of drinking to cope, as measured by the Drinking Motives Questionnaire (DMQ) coping scale. An initial analysis revealed a significant bivariate relationship between the MCP crossover point and the coping scale of the DMQ ($r = .35$; $p < .03$).

The regression analyses are reported in Table 3. In the first model, the mood-grouping variable and the DMQ coping total were entered as predictors. This model was approaching significance, accounting for 12% of the variance [$F(2, 43) = 2.89, p = .07$], with drinking to cope emerging as a significant independent predictor. Model two included the aforementioned predictor variables, as well as an interaction term of these two variables. Overall, this model accounted for 29% of the variance in the crossover point, [$F(3, 43) = 5.45, p < .01$] with all three variables serving as a significant independent predictor. Thus, the addition of the interaction term resulted in a significant model. These results suggest that drinking to cope moderates the relationship between mood and the reinforcing value of alcohol.

To describe this interaction, a series of bivariate correlations (refer to Table 4) and independent sample t-tests were conducted. Among the negative mood condition participants, the MCP crossover point and DMQ coping total were significantly correlated ($r = .71, p < .001$). The positive correlation supports that drinking to cope is related to the relative reinforcing value of alcohol when a negative mood is induced. However, there was no significant relationship between these two variables within the neutral mood condition ($r = -.03, p = .903$).

Prior to conducting a set of independent samples t-tests, the sample was divided at the midpoint of the DMQ coping subscale to create a high/low drinking to cope variable. Within the neutral condition, a t-test revealed no significant difference for the mean MCP crossover points between the low ($M = 14.18, SD = 8.17$) versus high ($M = 14.55, SD = 5.79$) drinking to cope groups. As would be expected based on the regressions and correlations, a significant difference in MCP crossover points was noted between low (M

= 11.31, SD = 7.20) and high (M = 18.78, SD = 7.77) drinking to cope groups in the negative mood condition [$t(20) = -2.32, p < .05$] (See Figure 1 and Table 5).

Craving

A series of analyses similar to those conducted for the MCP was also completed for a second dependent variable, the craving measure (Desires for Alcohol Measure, DAQ) at T2. An initial Independent Samples t-test was conducted and revealed no significant difference between the craving measure total in the neutral (M = 30.59, SD = 13.95) versus negative (M = 29.14, SD = 15.55) mood group [$t(42) = .33, p = .75$]. Similarly to the MCP crossover point original analysis, the absence of a significant difference between the groups resulted in the exploration of the role of drinking to cope in the relationship between craving and state mood. The bivariate relationship between the drinking to cope and craving measures after the mood induction was significant ($r = .43; p < .01$).

A series of three different multiple regression analyses, with the DAQ total as the dependent variable, was conducted to determine the relative contribution of the affect induction group (neutral or negative) and degree of drinking to cope (Table 6). In the first model, the mood-grouping variable and the DMQ coping total were entered as predictors. This model was significant, accounting for 19% of the variance [$F(2, 43) = 4.69, p < .02$], with drinking to cope emerging as a significant independent predictor. Model two added an interaction term of drinking to cope and mood induction group to the predictor terms. This model also accounted for 19% of the variance in the craving total, [$F(3, 43) = 3.05, p < .04$] with none of the three variables serving as a significant

independent predictor. Due to the independent strength of the drinking to cope variable in the first model, a third regression was conducted using drinking to cope as the only predictor variable. Again, this model accounted for 19% of the variance [$F(1, 43) = 9.60$, $p < .01$]. Thus, the presentation of any variable beyond drinking to cope did not provide any additional predictive ability.

DISCUSSION

The present study was designed to extend the research in the area of mood and preference for alcohol use, as measured by relative reinforcing value and craving, while accounting for drinking motives. To date, no study has combined these three areas of research. Therefore, this section will discuss how the current results integrate into these separate literatures, as well as interpret their combined importance. This section will speak to whether the data is consistent or inconsistent with the hypotheses. The discussion also will address the limitations of the current study and possible future directions and clinical implications for this line of research.

Mood Induction

The current study predicted that the participants in the negative mood condition would report a significant increase in negative affect after the mood manipulation, and that the increase in negative mood would be significantly greater than the increase in negative mood reported by the neutral group. As with prior studies that utilized an imaginal mood induction procedure (e.g., Holmes & Mathews, 2005; Pihl & Zacchia, 1986), the current study found significant postinduction changes in the intended direction as measured by the PANAS (e.g., Stein, Goldman, & Del Boca, 2000). As with most mood induction studies (e.g., Srivastava, Sharma, & Mandal, 2003; Wang et al., 2005), once the manipulation check data was collected, the current study demonstrated affect induction by using cross-sectional data to compare the mean scores of the negative affect

group to those scores from individuals in the neutral condition. However, the current study also established the occurrence of mood induction by conducting within participant analyses of the PANAS between time 1 and time 2. Therefore, the current study demonstrated not only a difference in negative affect level between the two mood groups (negative and neutral), but also a significant increase in negative affect for the individuals in the negative mood group before and after the imaginal induction procedure. These analyses served as a manipulation check, and thus verified that the procedure did in fact provide control over the independent variable. The analyses also provide further evidence that the imaginal mood induction procedure is an effective and efficient tool for manipulating mood in college students.

Multiple Choice Procedure

The current study hypothesized that negative mood induction would affect the reinforcing value of alcohol. However, analyses revealed that mood alone did not significantly change the MCP crossover point, which was nearly identical across the two mood induction groups. Although the relative reinforcing value of alcohol literature has studied the impact of external variables, such as the presence of drug-free reinforcers (Correia et al., 1998) and price of the substance (Murphy & MacKillop, 2006), this literature has yet to examine the role of internal processes, such as mood. Thus, the above hypothesis was based on previous research that suggested a relationship between mood and other alcohol related variables. For example, several theories (e.g., Cox & Klinger, 1988) and correlational studies (e.g., Simons, Gaher, Oliver, Bush, & Palmer, 2005) suggest that negative affect can serve as an antecedent to problematic patterns of

alcohol consumption. However, most laboratory studies examining these two variables addressed the impact of the presence of alcohol on mood, but not how mood impacts preferences for alcohol as with the current study. For example, Pihl and Zacchia (1986) reported that the presence of alcohol played a significant role in the participants experiencing more aggression post mood induction procedure. Davidson, Tiffany, Johnston, Flury, and Li (2003) demonstrated that negative mood was assessed as significantly higher after an alcohol prime had been presented. The lack of an effect in the current finding may suggest that this relationship is not present when the stimuli are reversed and preference for alcohol is measured after a mood induction. Given previous finding, however, it seems more likely that the lack of finding was due to some aspect of the study. For example, it may be that the negative mood produced through the induction procedure was not strong enough to lead to the hypothesized changes in preference for alcohol. It may also be that the MCP is not sensitive enough to detect potential mood-related changes in alcohol preferences. Future research will need to determine the best set of procedures and measures for examining the relationship between mood and a range of alcohol-related variables, including preference for alcohol and related choice behaviors.

Another explanation for the lack of a significant relationship between mood and preference for alcohol may have been the fact that the current study did not separate coping from enhancement drinkers prior to analyses. Unlike the current research, many other studies in this literature (e.g., Grant & Stewart, 2007; Steptoe & Wardle, 1999) have identified the enhancement drinkers and not included them in the negative mood and alcohol variable analyses. However, the current study was interested in examining

the role of mood in the reinforcing value of alcohol for college students in general. Additionally, if the groups had been divided a priori, then the current study could not have examined the predictive ability of drinking to cope due to the relatively small sample size.

Indeed, drinking to cope did emerge as a significant independent predictor of the MCP crossover point. These findings are commensurate with many studies (e.g., Galen, Henderson, & Coover, 2001; Stewart, Zvolensky, & Eifert, 2001) that have demonstrated that an individual's score on the coping motives subscale of the DMQ is significantly associated with level of drinking problems. Most of the studies in the area of coping motives and drinking problems are cross-sectional. However, one study (Holahan et al., 2001) did demonstrate true predictive validity in a 10-year longitudinal study of 421 adults. The baseline drinking to cope score was predictive of drinking related problems at each later time point, supporting the notion that coping motives are a stable construct. The current results are the first to suggest that coping motives are predictive of the reinforcing value of alcohol.

The current study also demonstrated that coping motives is only a significant predictor of MCP crossover points when an interaction term between it and mood is included in the model. Therefore, drinking to cope plays an important role in the relationship between negative affect and the relative reinforcing value of alcohol. The current study defines this role as that of a moderator. Using the parameters defined by Baron and Kenny (1986), three causal paths feed into the MCP crossover point (criterion variable): the coping motives (moderating variable), the mood condition (predictor variable) and the interaction of coping motives and mood. This is the exact description of

the significant model explaining a reasonable amount of variation in the relative reinforcing value of alcohol in the current study. In this current model, the role of coping motives is better described as a moderator than mediator because “unlike the mediator-predictor relation (where the predictor is causally antecedent to the mediator), moderators and predictors are at the same level in regard to their role as causal variables” (Baron & Kenny, 1986; p.1171). Drinking to cope is a stable construct that is present at a constant level, and thus, negative mood cannot serve as a causal antecedent for it.

The role of drinking to cope as a moderator has been cited previously in the literature in regards to daily mood and drinking consumption (Hussong, Galloway, Feagans, 2005). More recently, Martens, Neighbors, Lewis, Lee, Oster-Aaland, and Larimer (2008) collected survey data with a large college sample that demonstrated that coping motives, as well as negative affect, served as moderators between alcohol use and alcohol problems. In concurrence with the present study, these findings support the notion that affect and drinking motives should be screened when conducting alcohol related interventions, as both can increase the relative risk of developing alcohol-related problems at various levels of alcohol consumption.

More studies (e.g., Cantanzaro & Laurent, 2004; Lewis, Hove, Whiteside, Lee, Kirkeby, Oster-Aaland, et al., 2008; Wilkie & Stewart, 2005) have identified coping motives as a mediating factor for alcohol related variable, rather than moderating. One study (Wills, Sandy, Shinar, & Yaeger, 1999) similar to the current research reported that drinking to cope mediated the relationship of affect to substance use. However, their analyses were based solely on survey data of the participants’ mood and alcohol consumption for the past month, not laboratory induced affect and presentation of an

actual alcohol stimulus, as with the present study. Therefore, the current findings' description of drinking to cope as a moderator may be a more accurate representation of the type of relationship that exists in the moment that an individual in a negative mood state decides to drink.

In addition to the possible mediator/moderator differences due to survey versus laboratory data, some of the predominance of a reported mediating role may be due to the theoretical conception of coping motives. Cox and Klinger (1988) defined motives as the "final common pathway to alcohol use" (p. 168). Based on this notion, Cooper, Frone, Russell, and Mudar (1995) proposed a model in which individuals use alcohol to regulate positive and negative emotions. They hypothesized that alcohol expectancies, emotions, and other individual differences are mediated through coping and enhancement motives in determining alcohol problems and use. Thus, researchers that have set out to explore the relationships between emotion and alcohol may have preconceived ideas about the mediating role of coping motives. These notions may preclude them from considering drinking to cope from a moderating standpoint.

Not all research regarding the coping motives construct is in agreement with the current findings. A separate group of studies (e.g., Bradizza, Reifman, & Barnes, 1999; McCarty & Kaye, 1984) has reported incongruent results, suggesting social or enhancement motives play a larger role in drinking related problems. However, these studies based their questionnaires and drinking motives models on different theoretical work, such as Calahan et al. (1969), instead of Farber and colleagues' (1980) original two-factor model on which the DMQ and the studies that support the stronger association between coping motives and drinking problems are based. Therefore, the parent model

of these questionnaires likely plays a role in the assignment of these items to certain subscales and thus, affects which drinking motive is more strongly associated with drinking related problems.

Craving

The regression analyses conducted using craving as the dependent variable indicated that there was not a significant interaction between mood and drinking to cope, but instead coping motives alone proved to be the simplest and equally significant predictor of the craving level. The current study discovered that drinking to cope accounted for a significant amount of variance in craving; however, it did not find that negative affect added any additional information for craving. These findings are incongruous with Willner and colleagues' (1998) report that induction of depressed mood increased participants craving scores. However, this finding was confined to a group of individuals who had not been exposed to an alcohol related cue. Participants who were cued with low-alcohol beer reported no significant increase in craving levels after a depressed mood induction. Although the current study did not place alcohol stimuli directly in front of participants until after craving data was collected, the bottles were visible on a shelf in the same room, and participants had been informed that there was a possibility that they could consume alcohol during the study. Therefore, significant differences in craving between mood groups, as well as from T1 to T2, may not have been noted because the participants had been incidentally cued. This initial subtle cuing may have raised the craving levels to a point where mood did not induce a distinguishable difference.

Additionally, a meta-analytic craving study (Tiffany, Carter, & Singleton, 2000) reported that while alcohol cravings can be manipulated, the autonomic craving effects for alcohol are substantially less robust compared to other substances. These findings suggest that much stronger stimuli may be required to create a noticeable difference in craving for alcohol. In other words, the mood induction procedure and resulting negative affect may not have been strong enough to influence cravings for alcohol. This might be especially true because the current participants were non-problematic drinkers who may not be prone towards experiencing cravings for alcohol. Thus, a behavioral choice measure, such as the MCP, may be more sensitive to detecting mood related shifts in alcohol variables among participants who typically drink to cope with negative affect, suggesting that choices change in the absence of significant craving.

Tiffany and Conklin (2000) support this notion that substance use can operate independently of the processes that control craving. They also posit the concept that craving occurs as an activation of non-automatic processes that are at times activated parallel to automatic substance use sequences. This viewpoint indicates that individuals can consume and abuse alcohol without ever experiencing craving as an involuntary trigger. Surprisingly, in the current research, a choice behavior task appears to provide a better detector of these automatic alcohol processes than a craving measure. Therefore, the alcohol use and abuse literature would benefit from a greater inclusion of choice behavior measures in its research. However, because craving does appear to have the potential in certain situations to provide additional information, measures like the MCP should not be viewed as a replacement of craving measures.

Limitations and Future Directions

One limitation of the current study was the relatively small sample size of 44. However, previous MCP studies have been able to demonstrate effects with similar or smaller samples sizes. For example, dose effects have been shown with cigarettes using 20 participants (Griffiths et al., 1993) and with pentobarbital with 12 participants (Griffiths et al., 1993). Research using the MCP with alcohol (Little & Correia, 2006) has shown that 21 participants were more than enough to detect the delay effect. Additionally, studies using an Imaginal Mood Induction Procedure have reported a significant change in negative affect utilizing 12 (Holmes & Mathews, 2005) and 24 (Pihl & Zacchia, 1986) participants per condition.

Therefore, the present study's N provided sufficient sensitivity for detecting significant affect change and variation on the MCP. However, with a larger number of participants, the data analyses could have included further exploration. Specifically, the regression models could have included additional variables, such as gender or age, measures of alcohol consumption, or measures of negative life events or affective states, that may have impacted either the relative reinforcing value of alcohol or response to the affect induction procedure. For example, heavy drinkers may present a very different pattern of responses than individuals who consume less alcohol. Additionally, with a larger sample size, the moderate responders on the coping motives subscale could have been removed, creating a better representation of "high" and "low" drinking to cope individuals. This could have been accomplished, for example, by selecting participants that were one standard deviation above and below the mean coping score. With the

current size, the sample had to be divided at the median with all the participants included in either the high or low group.

Another limitation was the relative homogeneity of the sample, due in part to utilizing a college sample. Additional mood and choice behavior research should be conducted with individuals of a wider range of demographic characteristics, including older adults and those from more diverse ethnic and cultural backgrounds, as well as individuals with a range of substance abuse and dependence diagnoses. Including participants with and without an alcohol use disorder might be especially relevant when investigating the relationship between mood and cravings for alcohol.

An additional limitation of the current study is the generalizability of this laboratory study to real-life settings in which individuals typically consume alcohol. The laboratory setting was decorated in a manner to resemble a home environment with a couch, television, computer, and video games. Although the current study simulated a home environment, the laboratory was located in a building with classrooms and offices, likely resulting in a sterile environment that was not always conducive to choosing alcohol over money. Even if a more realistic setting is not possible in a laboratory, future research in this area should consider asking the participants about the environment in which they typically consume alcohol. Thus, the researchers would be aware if the simulated environment (living room, bar scene, etc.) was one in which the individual was accustomed to drinking alcohol. For example, a group of studies conducted by Marlatt and colleagues (e.g., Collins et al., 1985) created a bar setting including a socializing element as opposed to a home environment. Conducting research in a range of environments would increase confidences in the results. An additional confound was the

time and day. All laboratory sessions occurred on Monday through Thursday at 4:00 pm, which may not be a typical time for college students to consume alcohol. Future studies should consider conducting this type of research in the evening.

Clinical Implications

The crossover point from the MCP has been shown to be significantly related to frequency and amount of drinking; a survey version has also been related to drinking related problems (Little & Correia, 2006). Scoring high on drinking to cope has also been linked to a greater number of alcohol related difficulties (e.g., Galen et al., 2001; Stewart et al., 2001) and reported to be directly (Holahan et al., 2001) and indirectly (Carey & Correia, 1997) predictive of alcohol use and drinking problems. Thus, individuals who report higher coping drinking or a greater crossover point are also more likely to meet criteria for a substance use disorder.

Interestingly, three Carpenter and Hasin's studies (1998a, 1998b, 1999) supported the notion that drinking to cope predicts alcohol dependence, but not the diagnosis of alcohol abuse. This result is surprising because both diagnoses include persistent social, occupational, or interpersonal problems as a criterion. The main difference between abuse and dependence is that dependence includes the presence of tolerance, withdrawal symptoms, and an acknowledgement of a problem paired with an inability to discontinue drinking (American Psychiatric Association, 2000). It is unclear why the construct of coping motives taps into the distinction between abuse and dependence. Perhaps there is an overarching variable that links dependence and coping motives, such as depression or a lack of sufficient drug-free coping skills.

The aforementioned studies, as well as the majority of research with coping motives, have utilized survey measures of drinking behaviors to determine the predictive role of drinking to cope. However, this study used a choice procedure to investigate the role of drinking motives, making the predictive value of drinking to cope applicable to actual behavior, not simply self-report. Therefore, beyond assessment of alcohol related difficulties, this research may also inform treatment group assignment and future interventions regarding the application of coping skills training or stress management by helping individuals recognize their negative affect triggers (e.g., Longabaugh & Morgenstern, 1999; Park, Cohen, & Murch, 1996). A specialized treatment could be designed to help individuals with this proclivity note subtle increases in their negative affect in order to inform their current alcohol and coping related decisions. Also, by administering a measure of drinking motives, each individual's treatment can be tailored to his/her needs. The current research further extends the implications for the potential treatment utility of incorporating level of coping motives and mood state, especially if this study is replicated and extended to a clinical population.

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APPENDIX A- TABLES

Table 1
 Descriptive Variables Compared by Induction Group

Group	Variable	Statistic	SD	N
Neutral	% Caucasian	90.90		22
	% Female	72.70		22
	Mean Age	22.05	.95	22
	Day Total	13.25	9.93	22
	Binge Total	5.59	4.73	22
Sad	% Caucasian	81.82		22
	% Female	72.70		22
	Mean Age	21.77	1.51	22
	Day Total	11.82	7.24	22
	Binge Total	5.09	3.89	22

Day Total= total number of days an individual consumed alcohol in the last 28 days

Binge Total= total number of times an individual binge drank alcohol in the last 28 days

Table 2
Mood Means Across Group and Time Points

Group	Mood	Mean	SD	N
Both	Positive T1	31.34	.99	44
	Positive T2	29.25	1.20	44
	Negative T1	12.39	.48	44
	Negative T2	14.11	.54	44
Neutral	Positive T1	32.73	5.62	22
	Positive T2	31.23	7.09	22
	Negative T1	11.82	2.44	22
	Negative T2	11.45	1.90	22
Sad	Positive T1	29.95	7.33	22
	Positive T2	27.27	8.75	22
	Negative T1	12.95	3.76	22
	Negative T2	16.77	4.70	22

Table 3
 Regression Analyses of Multiple Choice Procedure Crossover Point

Predictor	B	SE β	β	T	Model R ²
Model 1					.12
Coping	.63	.26	.36	2.40*	
Group	.71	2.18	.05	.33	
Model 2					.29**
Coping	-1.5	.74	-.85	-2.05*	
Group	-13.85	5.15	-.94	-2.69**	
Interaction	1.46	.48	1.51	3.07**	

* $p < .05$

** $p < .01$

Table # 4
Correlations of Alcohol Related Variables

	Mood	MCPCoP	PANASNT	DAQTOT	RAP	DAYTot	Binge
	d	t	2	2	I	t	
Mood Grp (neut/sad)	1	.00	.61*	-.05	.11	-.08	-.06
MCPCOPT		1	.15	.56*	.58*	.47*	.51*
PANASNT 2			1	.19	.28	-.02	.05
DAQTOT2				1	.52*	.30	.54*
RAPI					1	.42*	.73*
DAYTOT						1	.69*
Binge							1

N=44

* $p < .01$

MCPCoPt= Multiple Choice Procedure crossover point

PANASNT2= PANAS Negative Subscale total post-mood induction

DAQTOT2= Craving total post-mood induction

RAPI= total on RAPI, a measure of alcohol related problems

DAYTot= total number of days an individual consumed alcohol in the last 28 days

Binge= total number of times an individual binge drank alcohol in the last 28 days

Table 5
MCP Means Across Group and DMQ Coping High/Low

Group	Coping	Mean	SD	N
Neutral	Low	14.18	8.17	11
	High	14.55	5.79	11
Sad	Low	11.31	7.20	13
	High	18.78	7.77	9

Table 6
Regression Analysis of Craving Total after Mood Induction

Predictor	B	SE β	β	T	Model R ²
Model 1					.19*
Coping Tot	1.50	.49	.43	3.04**	
Group	.24	4.11	.01	.06	
Model 2					.19*
Coping Tot	1.35	1.54	.39	.88	
Group	-.75	10.77	-.03	-.07	
Interaction	.10	1.0	.05	.10	
Model 3					.19**
Coping Tot	1.49	.48	.43	3.10**	

* $p < .05$

** $p < .01$

APPENDIX B- FIGURE

Figure 1

MCP Crossover Point for High/Low Copers Across Mood Group

