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The lexical decision task and implicit alcohol cognitions : a better measure for predicting alcohol use in women?

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THE LEXICAL DECISION TASK AND IMPLICIT ALCOHOL COGNITIONS: A BETTER MEASURE FOR PREDICTING ALCOHOL USE IN WOMEN?

BY

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B.A., Psychology, Williams College, 2006

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Science
Psychology

The University of New Mexico
Albuquerque, New Mexico

August, 2009

DEDICATION

I dedicate this work to my family without whom I could not have achieved the successes of my life thus far and to my friends without whom I could not have enjoyed them so thoroughly. Especially, this is for my mother and father. Their love and support are my rock and foundation, their belief in me is my inspiration.

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ABSTRACT

Research on the etiology of alcohol use disorders has focused increasingly on how the beliefs people have about alcohol influence their motivation to drink. Implicit alcohol expectancies, or beliefs about alcohol which exist outside of conscious awareness in the form of memory associations, are thought to uniquely affect drinking behavior. Research also has indicated that there may be a distinctive relationship between negative reinforcement and alcohol use in women. However, the most common measures used to examine implicit alcohol cognitions may be insufficient to examine associations involving negative reinforcement. The current study utilized the Lexical Decision Task (LDT) to examine the relationship between implicit alcohol cognitions and reported drinking in a sample of college women. Seventy-eight female participants completed a LDT including alcohol- and emotion-words, measures of explicit alcohol expectancies, and a measure of drinking behavior at baseline and after two months. Strong associations between negative emotion-words and alcohol-words (as measured by the LDT) were

found to predict drinking at follow up, and to account for unique variance in drinking beyond the contribution of explicit measures. In addition, women who reported heavier drinking in response to social conflict on an explicit measure showed stronger priming of alcohol words by negative emotion words, thus implying that the LDT may tap into implicit cognitions related to alcohol use as a method of coping. These findings suggest that the LDT is sensitive to negative-reinforcement associations in a way that other measures are not.

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Introduction

The Center for Disease control reports over 20,000 alcohol-related deaths each year, not including accidents and homicides. Around 1,700 of these deaths are of college students between the ages of 18 and 24 (CDC, 2006). Alcohol abuse is a serious problem in America which endangers the health and well-being of alcohol-abusing individuals and the community at large. In order to more effectively prevent and treat alcohol use disorders, researchers attempt to understand the mechanisms which initiate and maintain problem drinking, and the factors which differentiate problem drinkers from social drinkers.

Historically the vast majority of alcohol studies have focused on men. This is problematic, in part because research has shown that women drink for different reasons than men, and have unique risks factors and treatment needs (Beckman, 1994; Blum, Nielsen, & Riggs, 1998; Wiener & Stemmed, 1993; Wilsnack, 1991; 1995). Furthermore, in recent years the age of onset of alcohol use has decreased for women, increasing their risk for alcohol abuse and dependence as well as co-morbid disorders and life problems (Mohler-Kuo, Dowdall, Koss, & Wechsler, 2004). Thus, focused research on the etiology of women's drinking is merited (Gomberg & Nirenberg 1993; Wilsnack, Wilsnack, & Klassen, 1984).

Many factors contribute to problem drinking in general, including past drinking habits, demographic variables, and beliefs about the effects of alcohol and the consequences of drinking (Leigh, 1989; Leigh & Stacy, 1993; Wiers, Woerden, Smulders, & de Jong; 2002). Both consciously-recognized beliefs about alcohol, as well as unconscious associations in memory between alcohol and positive outcomes, have

been shown to predict a great deal of the variance in drinking outcomes (Goldman, Del Boca, & Darkes, 1999). Implicit cognitions have been targeted to investigate people's beliefs about alcohol (Birch et al., 2004; Weirs et al., 2002a; Zack, Paulos, Fragopolous, & MacLeod, 2003; Zack, Toneatto, & MacLeod, 1999). Implicit cognitions are defined as thoughts which are automatic, involuntary, or unconscious (Bargh, 1992; Wiers & Stacy, 2006). The current study measured implicit cognitions about alcohol in women by using the lexical decision task, which is a well-respected implicit task with great potential utility in the field of alcohol research.

Alcohol Outcome Expectancies

Alcohol research over the past two decades has focused increasingly on understanding people's motivations for using alcohol, the formation of these motivations, and the manner in which they interact with other factors in the development and maintenance of alcohol-related problems (Cooper, Frone, Russel, & Mudar, 1995; Stewart, Hall, Wilkie, & Birch, 2002; Wiers et al., 2002a; 2002b). Individuals' reasons for drinking are highly related to, if not indistinguishable from, their beliefs about what the consequences of drinking will be (Cooper et al., 1995). People's beliefs and expectations about the effects alcohol will have on their moods, emotions, and behaviors are important factors in their drinking decisions, and have often been studied under the construct of alcohol outcome expectancies (Leigh, 1989).

Alcohol outcome expectancies have been shown to influence behavior above and beyond the pharmacological effects of alcohol (Marlatt, Demming, & Reid, 1973). In this 2 x 2 design, participants are given drinks which either contain alcohol or no alcohol, and are instructed that they have received either alcohol or no alcohol (Marlatt,

Demming, & Reid, 1973). Interestingly, those who receive non-alcoholic drinks but are instructed that they have received alcohol have been found to behave differently than those who do not receive alcohol and are instructed that they have not received alcohol. For example, ratings of risky situations (Pumphrey-Gordon & Gross, 2007), attractiveness of the opposite sex (Neave, Tsang, & Heather, 2008), self-ratings of physiological reactivity (Mckay & Schare, 1999), and anxiety (Schippers, DeBoer, Van Der Staak, & Cox, 1997), are more similar to those of participants who have actually received alcohol than those who neither received nor were instructed that they had received alcohol. This well-established body of findings suggests that beliefs about what effects alcohol should have (alcohol expectancies) influence behavior beyond the pharmacological effects of alcohol.

Specific kinds of alcohol outcome expectancies have been found to be highly predictive of actual drinking. People are *more* likely to drink if they believe that doing so will have a positive effect (Leigh & Stacy, 1993; Smith, Goldman, & Greenbaum, 1995; Wiers, Hoogeveen, Sergeant, & Gunning, 1997; Wiers et al., 2002), and are *less* likely to drink if they hold negative expectancies; the belief that adverse consequences will result from alcohol use (Fromme, Stroot, & Kaplan, 1993). Positive alcohol outcomes can take the form of positive reinforcement, such as perceived enhancement of social competence or increased positive emotion, or negative reinforcement, such as removal of social inhibition or the regulation of negative emotions (Cox & Klinger, 1988, 1990).

Heavy or problem drinkers in particular report that they use alcohol to regulate their emotions (Cooper, 1994; Cooper et al., 1995). Drinking to cope with emotions is associated with worse drinking outcomes than is drinking in social situations or for other

reasons (Carrigan, Samoulk, & Stewart, 1998; Cooper, 1994; Cooper, Russel, Skinner, & Windle, 1992; Kushner, Abrams, & Buchardt, 2000). In sum, the expectation of positive outcomes (especially those related to emotions and mood) from the consumption of alcohol is one of the most important factors in the formation and maintenance of potentially problematic alcohol use.

Drinking for the purpose of emotional regulation may be especially problematic in females. Women have been shown to use substances in response to emotional turmoil more than men do (McKee et al., 2003; Miranda et al., 2002; Willner, et al., 1998; Zlovensky et al., 2008). Some research has shown that women who attribute negative consequences to anxiety symptoms (i.e., those who have high "anxiety sensitivity") are more likely to report drinking in an effort to cope than women who do not (Zack et al. 2003). In addition, females with high anxiety sensitivity were more likely to drink in negatively reinforcing situations, while this pattern did not hold true for males (Zack et al., 2003). Since drinking as a method of emotional coping is associated with later life alcohol use disorders and related complications (Kushner et al., 200; Novak et al., 2000), the investigation of negatively reinforcing outcome expectancies may be principally important in the study of female drinkers.

Alcohol Expectancies and Implicit Cognitions

Although the majority of studies on alcohol outcome expectancies have used self-report measures to assess people's beliefs about drinking (Goldman et al., 1999; Jones, Corbin, & Fromme, 200; Wiers et al., 2002a; 2002b), there are generally recognized weaknesses of self-report instruments including self-presentation bias and demand characteristics. Additionally, several theories on the etiology of alcohol use disorders,

such as the memory association and implicit cognition theories (Stacy et al., 1994; Stacy, 1997), suggest that self-report measures may be insufficient to assess important kinds of alcohol-related cognitions.

The first of these etiological theories, the memory association theory of addictive behaviors (Stacy, Leigh, & Weingardt, 1994), asserts that people differ in the strength of their associations between various behaviors (e.g., alcohol use) and outcomes (e.g., relaxation, fun, or relief). A strong association between a behavior and an outcome may mean that when the outcome is desired, the behavior spontaneously comes to mind (Stacy, 1997). Easy accessibility of a concept in memory is thought to give it more power to influence subsequent behaviors and motor responses (Fazio & Williams, 1986; Tiffany, 1990). By this logic, if drinking alcohol is strongly associated with positive outcomes in an individual's memory, then drinking behavior is more likely to occur when these outcomes are contemplated (Stacy, 1997). According to implicit cognition theory, these associations may be created through repeated experience with alcohol (Stacy, 1997; Wiers et al., 2002a; 2002b) or learned through the social environment.

Theories about implicit memory associations help to explain certain salient features of addiction. Addictive behaviors of all kinds are somewhat unique in that they often involve the continuation of the addictive behavior despite negative consequences *and* despite the conscious recognition of these negative outcomes on the part of the addicted person (Robinson & Berridge, 2003; Wiers & Stacy, 2006). In fact, it is not uncommon for drug or alcohol abusers to perceive their own behavior as impulsive or out of control, and to feel significant ambivalence about their addictive behavior (Wiers & Stacy, 2006). Such observational evidence suggests that there may be cognitions

involved in the maintenance of addictive behaviors which are normally outside of conscious awareness.

Measures of Implicit Cognitions

Implicit measures are instruments which assess beliefs, attitudes, or cognitions even though participants are unaware that the belief is being measured, have no or only partial conscious access to the cognition, or have no control over the measurement outcome (Fazio & Olson, 2003; Roediger, 1990; Weirs & Stacy, 2006). These are contrasted with explicit measures, like questionnaires, which ask directly about beliefs. Implicit measures are thought to be important in alcohol research because cognitions outside a person's conscious awareness or control may help to maintain addictive behaviors (Goldman et al., 1999; Stacy, 1997; Tiffany, 1990).

Several kinds of implicit tasks have been used to assess beliefs about alcohol, including the Stroop task (Stewart, Hall, Wilkie, & Birch, 2002), free association of words (Stacy, 1997), various semantic priming tasks (Zack et al., 1999), and more recently, categorization tasks like the Implicit Association Test (IAT; Wiers et al., 2002b). Such implicit tasks have been found to correlate with explicit measures of alcohol outcome expectancies (Wiers et al., 2002a; 2002b; Wiers & Stacy, 2006). However, implicit measures of alcohol associations also account for separate and unique variance in drinking outcomes. Specifically, they predict actual drinking above and beyond the following variables: past drinking experience, explicit alcohol cognitions, and demographics (Ames & Stacy, 1998; Jajodia & Earlywine, 2003; Zack et al., 1999). For example, one study found that although "coping-motivated" drinkers reported more use of alcohol to decrease negative emotions, on an implicit (Stroop) task these same

participants showed associations between alcohol and both negative *and* positive emotions (Stewart et al., 2002). Findings like these imply that implicit tasks are indeed tapping into cognitions which are not measured by traditional self-report measures.

Important contributions have been established recently with the use of the IAT, a categorization task in which response keys represent two categories each, and participants are asked to categorize words or images which appear on the screen. For example, in a test of associations between alcohol and emotion concepts, one key might represent "positive things or alcohol" and the other key might represent "negative things or soda". The categories which the response keys represent are switched over the course of the trials, and interference in categorization of items as represented by delayed response time is seen to be reflective of incompatibility of categorical concepts (i.e., "negative things or alcohol"; Wiers et al., 2002b).

The IAT has demonstrated differences in conceptual interference between heavy and light drinkers on several dimensions. The study by Wiers and colleagues showed that, similar to results obtained through explicit measures (Goldman et al., 1999; Rather & Goldman, 1994; Rather, Goldman, Roerich, & Brannick, 1992), the IAT task revealed that heavy and light drinkers were distinguished by an increased association in heavy drinkers between alcohol and its arousing effects and in light drinkers between alcohol and its sedating effects (Weirs, et al., 2002b). However, unlike data gathered using explicit measures, performance on the IAT indicated that both heavy and light drinkers had some degree of negative implicit cognitions about alcohol. Heavy drinkers had weaker negative implicit cognitions about alcohol, and much stronger positive cognitions than light drinkers. This indicates that implicit measures can reveal important points of

difference between light drinkers and potential problem drinkers. The fact that the IAT revealed some negative cognitions which were not reported explicitly by heavy drinkers shows that this may be an important tool for exploring emotion-related alcohol cognitions.

Although the IAT has been correlated with and predictive of drinking in both male and female college students (Jajodia & Earlywine, 2006), one recent study discovered that the IAT's predictive utility differed for men and women. Specifically, while only positive expectancies were predictive of drinking in men (and negative expectancies were unrelated to men's drinking behavior), increased negative expectancies were more predictive of decreased drinking in women (Thush & Wiers, 2007). This implies that implicit cognitions may have a unique relationship to alcohol use in women.

Limitations of Common Implicit Measures

The IAT (Greenwald, McGhee, & Schwarts, 1998) and other implicit measures have offered important preliminary insight into the memory associations that may help to maintain detrimental drinking behavior. An understanding of how implicit cognitions influence addictive behavior in qualitatively different ways from explicit cognitions seems essential to the continued study of alcohol abuse. However, the primary methods which have been and continue to be used to measure alcohol-related cognitions implicitly may be less than ideal for investigating the constructs of most interest to clinical scientists for several reasons.

First, the IAT and free word-association type tasks (e.g., fill in the blank) may not tap into cognitions which are truly outside participants' conscious awareness. Memory associations involving implicit processes may reflect underlying patterns of learning

based on experience or social reinforcement. Once established, these associations may influence behavior in ways that do not require the intervention of conscious control (Robinson & Berridge, 2003; Wiers & Stacy, 2006). Such associations should therefore be measured with instruments which tap unconscious in addition to conscious processes. By their very nature, free association tasks and the IAT do not fully disguise the topic of interest, and thus participants may guess the construct under investigation. If this occurred it could potentially lead to the same kinds of response biases which endanger the validity of self-report measures (Fiedler & Bleumke, 2005). One study showed that scores on the IAT could be faked when participants were instructed to bias their responses in a given direction (Fiedler & Bleumke, 2005).

In addition, the IAT in particular has been criticized for its dualistic categorical structure. In other words, the IAT may not measure the strength of implicit associations in memory, but only the individual salience of each category (De Houwer, 2002). Differences in response times between tasks in the IAT also have been attributed to the possible effects of task switching (Mierke & Klauer, 2003). Furthermore, associations at the categorical level may be made based on culturally-salient assessments rather than personally-held, internalized beliefs (DeHouwer, 2002; Govan & Williams, 2004; Olson & Fazio, 2004). Finally, unless the IAT is modified to decrease the bipolarity of categories (Jajodia & Earlywine, 2003) it will continue to ignore the possibility of ambivalence in cognitions about alcohol; a key aspect of the conceptualization of addictive behavior (Conner & Sparks, 2002). Because of these limitations, it seems prudent to attempt the investigation of alcohol-related implicit cognitions with a task which appears better suited to the nature of addiction.

The Lexical Decision Task and the Current Study

The lexical decision task has long been used in cognitive science to examine implicit associations between words and concepts in memory. It falls into a class of measures which uses semantic priming as its basis. Arguably, this may be the only kind of implicit measure that directly assesses associative memory networks (Gawronski & Bodenhause, 2005). In the lexical decision task, participants are asked to make a decision about whether target words are actual English words or English-like non-words. Each target word is preceded by an English prime word. Response times to the word/non-word classification of English target words have been shown to be faster when they are preceded by conceptually or semantically-related primes. For example, the response time to classify "nurse" as a word would be faster if it were preceded by the related prime "doctor" than by the unrelated prime "chair" (Meyer & Schvaneveldt, 1976).

This task is thought to tap underlying memory associations between concepts which may not be accessible through introspection (McNamara, 1992). Given that it is presented as a word classification task, the construct under investigation is disguised by the design of the task. Therefore it should be less likely that participants would guess the purpose of the lexical decision task than it would be for them to guess the purpose of the IAT or Stroop design. Also, because this task measures the strength of association between the meanings of words, rather than between words and category concepts, it may be less prone to the influences of socially-learned categories and category exemplars than the IAT (De Houwer, 2001; 2002; Wiers & Stacy, 2006, ch.6 & 7), and it may more directly measure the memory associations of most interest in addiction research.

The lexical decision task has been used to measure the strength of associations between affect and alcohol concepts in psychiatric patients (Zack et al., 1999; 2003) and college students (Austin & Smith, 2008). For college students, heavier drinking during conflict situations was correlated with stronger associations between alcohol and anxiety words on the lexical decision task (Austin & Smith, 2008). This finding coincides with research by Zack and colleagues which found a strong association between negative affect words and alcohol words in self-reported coping-motivated drinkers with high psychiatric distress (Zack et al., 1999). Studies by these two teams of researchers are some of the few to date that have used the lexical decision task for the purpose of investigating associations in memory between emotion and alcohol concepts.

The purpose of the current study was to test the utility of the lexical decision task as a predictive measure of future drinking behavior in college-age women. Due to the strongly supported relationship between drinking for the purpose of emotional regulation and poorer alcohol-related outcomes (Carrigan et al., 1998; Cooper, 1994; Cooper et al., 1992; Kushner et al., 2000), and given that associations between emotion and alcohol predict heavier drinking when measured through both implicit and explicit means (Rather et al., 1992; Stacy, 1997; Wiers et al., 2002a; 2002b), the current study focused on associations between alcohol words and emotion words. English words and English-like non-words were drawn from previous similar studies (Austin & Smith, 2008; Zack et al., 1999). The emotion words category was comprised of both negative and positive emotion words, as both have been shown to be salient in distinguishing between heavy/problem- and light/social-drinkers on both implicit and explicit measures (Wiers et al., 2002b). Unlike the Austin and Smith study, the current study used a visual presentation of the

lexical decision task, rather than an auditory presentation (2008). The study by Zack and colleagues also used a visual presentation of the task, but focused on psychiatric patients, while the current study included a college sample (1999).

Female college student participants with a wide range of past drinking experience (from those with no previous experience to heavy drinkers) were given a lexical decision task comprised of alcohol and emotion words for the laboratory segment in this study. A baseline measure of their drinking was utilized at this time as well, and an online version of the measure was administered two months later. It was hypothesized that faster response times to emotion-alcohol words pairs on the lexical decision task (LDT) would predict heavier drinking at the two month follow-up. In addition, the predictive validity of the LDT response times above and beyond the predictive utility of both the participants' reported drinking at baseline and explicit measures of their alcohol use was evaluated. This appeared to be the first study to use the LDT to predict actual drinking

Method

Participants

Eighty female participants over the age of 18 were recruited from psychology classes at the University of New Mexico. Participants were recruited via in-class announcements and through the department research website. Students who had learned English as a second language (Izura & Ellis, 2002; Keatley, Spinks, & de Gelder, 1994) or who had dyslexia (Miller-Shaul & Breznitz, 2004) were pre-screened out of participation via the recruitment announcement due to concerns about potential interference with performance on the lexical decision task. Two enrolled participants who completed the laboratory segment of the study were excluded from all analyses because their response times on the lexical decision task were considered invalid (over 20% over 2000 ms; see Austin & Smith, 2008; DeMoor & Brysbeart, 2000; Zack et al., 1999; 2003). Thus, the final sample size was 78.

For these 78 participants, 38.46% (N = 30) identified as Caucasian/White (non-Hispanic), 33.34% (N = 26) identified as Hispanic or Latina, 7.6% (N = 6) identified as Native American/Alaskan Native, 3.8% (N = 3) identified as African-American, 2.5% (N=2) identified as Arab-American, 2.5% (N = 2) identified as Asian, and 11.5% (N = 9) identified as Other (unspecified) or of Mixed Heritage. No effects of ethnicity were observed in the analyses. The average age of participants was 19.4 years (SD=.86; range = 25 – 18). Participants had between one semester and 4.5 years in college, and the majority were college freshmen (52.5%) and sophomores (37%). There were no categorical differences in reported drinking between class years. Average household

income for participants was $35,000 - $50,000 per year. There were no significant correlations found between any of the demographic variables and reported drinking.

For their participation in the laboratory segment, individuals received research credit toward a class grade. Sixty-seven participants (85.9%) completed the 2-month follow-up. For completing the follow-up assessment, participants received either additional research credit (N=19) or $5 (N=5). Forty-three participants completed the follow up but opted out of compensation via email.

Apparatus

The E-Prime™ software package was used to create the program for stimuli presentation and to record responses. Stimuli were presented on a PC monitor. Participants sat approximately 1.5 feet away from the 20 inch monitor. Stimuli consisted of white upper-case word/non-word letter strings (36 pt Arial font) on a black background for easy reading. Prime stimuli and target stimuli were presented in the center of the screen. Lexical decision responses to the target stimuli were made by pressing the "H" key for "non-word" and the "G" key for "word". Bright stickers labeled "non-word" and "word" were affixed to the appropriate keys to ensure that they were clearly identified, and to ensure that there was minimal confusion about response keys during the procedure (Zack et al., 1999).

Measures

Demographic Questionnaire. Constructed exclusively for this study, this questionnaire (Appendix A) includes items for reporting age, ethnic background, year in college, and household or parental income (if a dependent). One item confirmed that English was the primary language for all participants. This questionnaire also asks

participants about the age of their first drinking experience, and the age of their first "binge" (i.e., four or more drinks).

The Structured Clinical Interview for the DSM-IV (SCID; First, McQueen, & Pincus, 1996). This semi-structured interview is used for diagnosing the DSM-IV disorders. Only the section of the SCID relating to alcohol use disorders was used for this study. To better characterize the sample, the number of participants who were diagnosable (either currently or over their lifetime) as alcohol abusive or alcohol dependent was determined. This measure has been found to be valid and reliable for evaluating the presence or absence of DSM-IV substance use disorders (S'brana et al., 2003).

The Alcohol Expectancies Questionnaire-Revised (AEQ-R; Brown, 1980). This questionnaire contains both positive expectancies ("Drinking makes me feel good") and negative expectancies ("Drinking increases male aggressiveness"). Questions have been found to load onto six factors relating to alcohol use: global positive changes ("I feel more creative when I've been drinking"), sexual enhancement ("After a few drinks I am more sexually responsive"), social and physical pleasure ("Alcohol adds a certain warmth to social occasions"), social assertiveness ("When I've been drinking it's easier for me to open up and share my feelings"), relaxation and tension reduction ("If I am tense or anxious having a few drinks makes me feel better"), and arousal and aggression ("I feel powerful when I drink, as if I can really influence others to do what I want") (Goldman et al., 1997). Participants mark either "1" for "agree" or "0" for "disagree" on each of the 68 items. For the purposes of this study, this questionnaire was used to assess positive and negative outcome expectancies. Measures like the AEQ which examine both arousal and

relaxation expectancies have been found to distinguish between heavy and light drinkers (Wiers et al., 2002b). The AEQ has been found to have adequate reliability, r>.6 (Brown et al., 1987), and research indicates a consistent relationship between alcohol expectancies as measured by this questionnaire and alcohol consumption (Brown, Christiansen, & Goldman, 1987; Goldman, Greenbaum, & Darkes, 1997; Appendix B).

Inventory of Drinking Situations (IDS-42; Annis, Graham, & Davis, 1987). This 42-item scale measures the contextual correlates of heavy drinking in participants; namely, the social, emotional and physical situations in which participants commonly drink. Participants endorse statements about the situations in which they drink alcohol (e.g., "When I had an argument with a friend") on a four point Likert scale: 1 = "Never", 2 = "Rarely", 3 = "Frequently", and 4 = "Always". The IDS-42 consists of three major categories of drinking situations: negatively reinforcing situations (subscales: social conflict, unpleasant emotions, physical discomfort), positively reinforcing situations (subscales: pleasant times with others, social pressure to drink, positive emotions), and temptation situations (subscales: testing personal control, urges/temptations). Total scores on this measure range from 0-100 with higher scores on each subscale representing heavier drinking in the specified types of situations (Carrigan et al., 1998). The IDS-42 has been found to have high internal consistency (Stewart et al., 2000) and good convergent and discriminate validity (Carrigan et al., 1998; Stewart et al., 2000). This explicit measure was used to determine the self-reported situations in which participants usually drink alcohol (see Appendix C).

Timeline FollowBack (TLFB; Sobell & Sobell, 1990). The TLFB is a grid-calendar on which participants are asked to indicate the number and type of alcoholic

drinks they consumed on each day for the past month (and up to 12 months). Participants are asked to recall any special events or occasions which occurred during the time period being assessed in order to aid their recall of alcohol use. The TLFB has been found to have high reliability, $r > .85$ (Sobell et al., 1996), and to be a valid assessment of alcohol use when participants are given assurance of confidentiality (Sobell & Sobell, 1990).

The TLFB was the primary measure of alcohol use in this study, and was administered at the lab session and at follow up. The number of drinking days, maximum number of drinks consumed in one episode, and total amount of alcohol consumed over the past month were recorded. For the laboratory segment of the study, the TLFB was filled out by the participant with the aid of the experimenter. For the follow-up, the computerized Timeline Followback (Sobell et al., 1996) was adapted by the experimenter to serve as an interactive online calendar with step-by-step instructions, and was hosted on a private server exclusively for the follow-up portion of this study. Participants were asked to login with a participant number, and their drinking data for the previous 30 days were saved and sent directly to a server that was maintained by the experimenter. The TFLB has been validated for self-administration by participants and has been found to be valid when administered by computer (Sobell et al., 1996). This measure has been used to record alcohol use in studies investigating the correlation between alcohol use and explicit and implicit cognitions (Wiers et al., 2002a; see Appendix D).

Stimuli and Design

All stimuli were presented on a PC screen (see Apparatus section). All words were drawn from the word list validated by Zack and colleagues (1999) and utilized by Austin and Smith (2008). Half of all primes were followed by an English-like nonword,

and half were followed by an English word. Prime-target pairs for "word" trials were presented in random order from the following seven sets of real-word pairs: (1) negative emotion –alcohol (e.g., *nervous-ale*), (2) positive emotion—alcohol (*happy-beer*), (3) negative emotion—neutral (*worry-room*), (4) positive emotion—neutral (*excited-closet*), (5) neutral-related neutral (*couch-chair*), (6) neutral—unrelated neutral (*senator-door*), and (7) neutral—alcohol (*kitchen-wine*).

Each alcohol word was paired with an emotion-related prime and also with a neutral prime at some point in each participant's trials. This procedure was used both due to the paucity of alcohol words, and so that each alcohol word could serve as its own baseline control (Austin & Smith, 2008; Zack et al., 1999). Related and unrelated neutral prime-target pairs were used as baseline measures for response times for all participants, and were compared to all other trial types to assess level of association of concepts. All word pairs had been matched for length and frequency in the English language (Zack et al., 1999), because differences in activation can depend on how often a word appears in print (Scarborough, Cortese, & Scarborough, 1977). The complete list of words from which practice and trial pairs were drawn consisted of 526 English words and 160 non-words (Austin & Smith, 2008; Zack et al., 1999; 2003). Non-words for this study were constructed by replacing phonemes of words from the English-word target list in order to create non-words pronounceable by an English speaker (e.g., "protade"; Zack et al., 1999). The list of word - word and word - non-word pairs presented to each participant was randomly selected from the entire list so that each participant received each non-alcohol target word only once (De Moor, Verguts, & Brysbaert, 2005). Each word pair was seen an equal number of times across participants. (Appendix E).

Procedure

As noted, participants were recruited via the Psychology Department Research Website (http://unmpsych.sona-systems.com/) and in-class announcements. They signed up online for a study called "Language, Emotion, and Cognition". At the time of recruitment potential participants were informed that the study consisted of one laboratory session and one online follow-up task at eight weeks. They were asked *not* to sign up for the initial laboratory segment if they did not wish to participate in the follow-up.

Upon arriving at the laboratory, participants were informed that they were going to participate in a study about words and memory, and were given a consent form (Appendix F) and the opportunity to ask questions. They were asked to confirm that English was their primary language and that they have never been diagnosed with dyslexia. No participants were excluded at the laboratory session based on these criteria.

Participants were then seated at the PC and the experimenter began the program. It opened with instructions on how to complete the lexical decision task. The experimenter reviewed these instructions once the participants had read them onscreen. Participants were informed that they would see a word presented on the screen which would be followed shortly by a second word or English-like non-word. Participants were instructed to use the appropriately marked buttons to classify the second word as either a real English word or a non-word. They began the practice round of trials once the experimenter left the room. The practice trial consisted of 10 word - word or word - non-word pairs drawn at random from the complete list. The practice trial pairs were then removed from that participant's possible list of trial pairs. Participants who were able to

complete 8 of 10 practice trials correctly were prompted by the program to proceed to the test trials. Four participants required a second attempt at the practice procedure, but all were able to complete 8 of 10 trials after two attempts.

The test trials consisted of 335 word pairs, half of which contained a non-word. These trials were administered in five blocks of 67 pairs, with a one-minute break in between each set of trials. The prime was presented for 750 ms, followed by a plus sign screen for 1000 ms. The target word was presented until a response was made (Zack et al., 1999). When participants completed all 335 trials the program ended with a message thanking them and asking them to let the experimenter know they were finished. The experimenter then asked participants if they had any theories regarding the purpose of the study. This allowed the experimenter to assess whether the focus of the lexical decision task was disguised adequately. No participants reported being aware of the purpose of the task.

Next, participants were debriefed and told that the study was about alcohol use. They were then asked to fill out the demographic questionnaire, the AEQ, and with the assistance of the experimenter the TLFB. The alcohol subscale of the SCID was administered. Participants then were asked if they would be willing to complete the follow-up drinking assessment in eight weeks. All 80 participants agreed to do so, and each one provided their email address. Finally, participants were thanked and had their names entered for class credit.

At eight weeks after the initial laboratory segment, participants were contacted by email and asked to complete the follow-up task. The email included a link to the website where the online questionnaire was hosted, and instructions regarding how to complete it,

security information for the website, and contact information for the experimenter. Both the instructions and the questionnaire were posted on the website as well. Participants used a participant number to log into the website. Their name was only associated with their number for the purpose of giving payment or class credit. Participants had a two-week window in which to complete the follow-up online drinking questionnaire. Upon completing the follow-up or after the two-week window has elapsed, participants were sent a debriefing form (Appendix G) which detailed the nature of the study and offered references for further reading.

Results

Preliminary Analyses

The average number of drinks reported by the 78 participants at the laboratory session was 13.43 over the preceding month (*SD* = 23.37), or .45 drinks per day. Of those participants who completed both the laboratory segment and the follow-up (N=67), 22 (32.80%) were non-drinkers (reported zero drinks at both time-periods), while 45 (67.16%) reported at least one drink at either the laboratory segment or follow-up. The total number of drinks reported at follow-up averaged 13.70 (*SD* = 23.60), or .46 drinks per day for the 30 day period. Out of those participants who reported at least one drink (henceforth "drinkers"), the average number of drinks over the previous month reported at follow-up was 14.17 (*SD* = 24.59), or .47 drinks per day. For the total sample of drinkers, the average age of first drink was 17.40 years of age (*SD* = 2.24), and the average age of first binge (for those individuals who reported ever having four or more drinks in one sitting) was 18.2 (*SD* = 1.90; see Table 1). For drinkers who completed the follow-up, average age of first drink was 15.44 (*SD* = 2.22), while age of first binge was 16.49 (*SD* = 2.24). Age of first drink and binge were not significantly correlated with reported drinking or any other measure.

Of the total sample (N = 78), 16 women (20.5%) met criteria for alcohol abuse (lifetime), and 12 of those 16 (15.4% of the total) met criteria for alcohol abuse (current). Five of the total sample (6.4%) met criteria for alcohol dependence (lifetime) and 3 of those 5 (3.8% of the total) met criteria for alcohol dependence (current). Of those who completed the follow-up (N=67), 13 (19.4%) met criteria for alcohol abuse (lifetime) and of those, 7 (10.4% of the total) met criteria for alcohol abuse (current). Five of those who

completed follow-up 5 (7.5%) met criteria for alcohol dependence (lifetime), while 3 of those met criteria for alcohol dependence current (4.5% of the total; Table 1). This is similar to the findings of a study by Knight and colleagues which found, in a broad survey, that 5% of U.S. college females are diagnosable with alcohol dependence, and 31% are diagnosable with alcohol abuse disorder (Knight, Weschler, Kuo, Siebring, Weitzman, & Shuckit, 2002). The mean scores on explicit and implicit measures of alcohol expectancies for drinkers and non-drinkers can be found in Table 2.

For the total sample (N = 78), demographic variables had no significant correlation with either drinking outcomes or performance on the lexical decision task. Differences in demographic variables and drinking behavior between those who did and did not complete the follow up were conducted. Two-way ANOVAs revealed no significant differences between those participants who completed the follow-up and those who did not.

Planned Analyses of Priming Task and Questionnaire Data

The lexical decision task: validity and priming variable. The planned analyses included only the 67 participants who completed the follow-up. First, the validity of the lexical decision task was examined. The mean error response rate for real words on the lexical decision task was 5.3%, which is a low-to-average rate of error for this task (DeMoor & Brysbeart, 2000; Zack et al., 2003). Response times that were at least two standard deviations above or below a participant's own mean were excluded (DeMoor & Brysbeart, 2000). This resulted in a respectable 5.7% of the total responses being excluded.

In order to evaluate the strength of priming for emotion-alcohol prime-target pairs, a score was created by subtracting individual response times for emotion-alcohol pairs from response times for neutral-alcohol pairs. The mean of these differences per participant was calculated. This score represents the difference for each subject in response times to emotion- and neutral-alcohol word pairs (Austin & Smith, 2008; Zack et al., 1999; 2003). The greater the difference between these two means for each participant, the larger the priming effect of emotion words on alcohol words. This score will be referred to as Emotion-Alcohol Priming.

Correlations between explicit measures. Two-tailed Pearson Correlations between all measures were conducted in order to examine the relationship between measures used (See Table 3). To begin with, one would expect that explicit measures of alcohol outcome expectancies (i.e., AEQ and IDS-42) would be correlated with each other, and this was the case in the current study for the AEQ and the IDS total score (r=.570, p<01). For valid measures, one would also expect to find drinking at baseline to be correlated with drinking at follow-up. In line with this, the measure most highly correlated with reported alcohol consumption at follow-up (as measured by the online TLFB) was the participant's reported alcohol consumption at the laboratory segment (as measured by the TLFB; r=.759, p< .01). Specifically, the more individuals drank at baseline, the more they reported drinking at follow-up.

Correlations between measures also offer a preliminary idea of how each measure is related to reported drinking at baseline and follow-up, and how they should be entered into the multiple linear regression model. The Alcohol Expectancies Questionnaire (AEQ) was correlated with reported drinking at the laboratory segment (r=.332, p<.01),

but was not significantly correlated at follow-up. So, more positive alcohol expectancies were correlated with reported drinking at baseline but not at follow-up.

"Conflict" subscale of IDS-42 and reported drinking. The total score on the Inventory of Drinking Situations (IDS-42) was not significantly correlated with any other measure except the total AEQ score (r=.507, p<.01), and yet the "conflict" subscale of the IDS-42 was significantly correlated with reported drinking at follow-up (r=.246, p<.05) and with Emotion-Alcohol Priming (r=.252, p<.05). The "conflict" subscale of the IDS-42 was the only subscale significantly correlated with reported drinking and with the implicit measure (Table 2). Since this subscale was significantly correlated with drinking and Emotion-Alcohol Priming whereas the total score was not, the "conflict" subscale alone was used in further analyses.

Prediction of drinking at follow-up. Emotion-Alcohol Priming was moderately correlated with reported drinking at baseline (r=.223, p<.05) and at follow-up (r=.234, p<.05; Table 2). This seems to indicate that there was a relationship between performance on the LDT (Emotion-Alcohol Priming) and reported drinking.

In order to test the hypothesis that performance on the LDT could predict reported drinking at follow-up, linear multiple linear regression analyses were conducted. When entered as the sole independent variable, performance on the LDT accounted for a small (R^2 = .055) and yet significant amount of the variance (β = .234, p <.05).

When a multiple linear regression model including participants' reported drinking at baseline (laboratory TLFB), the explicit measures (AEQ & IDS-42 – conflict subscale), and Emotion-Alcohol Priming was tested, the majority of variance was accounted for (R^2 = .961). The initial TLFB score was the strongest predictor of the TLFB

score at follow-up in this model, $\beta = .971$, $p < .01$. On its own, the TLFB score at time 1 accounted for a great deal of the variance ($R^2 = .759$), however, the model which included the implicit and explicit measures of alcohol expectancy added significantly to the model ($\Delta R^2 = .212$). AEQ score predicted unique variance in drinking at follow-up $\beta = .098$, $p < .01$, but the IDS-42 "conflict" score did not predict significant variance in this model. Emotion-Alcohol Priming did not account for significant variance in reported drinking at follow-up in this larger model. This suggests that reported drinking at baseline and the explicit measures account for the majority of variance in drinking at follow-up. Thus, the hypothesis that performance on the lexical decision task would predict drinking at follow-up above and beyond other measures was not supported.

Post Hoc Analyses

Because the IDS-42 "conflict" subscale was specifically correlated with Emotion-Alcohol Priming and with reported drinking at baseline and follow up, it appeared that priming associated with negative reinforcement might be important to examine further. Therefore, a score was constructed in which the positive emotion word pairs were removed from the Emotion Priming score. Only negative-alcohol pairs (e.g., "sad-whiskey") were included in this score, henceforth referred to as "Negative-Alcohol Priming". The Negative-Alcohol Priming construct equals response times for neutral-alcohol words pairs (e.g., "house-blitzed") minus response times for negative emotion-alcohol word pairs (e.g., "guilt-beer").

The IDS-42 "conflict" subscale was also correlated with Negative-Alcohol Priming (r=.275, p<.05). This is consistent with the idea that those who report drinking

for negative reinforcement, especially in social conflict situations, may have associations between negative emotions and alcohol than.

In a multiple linear regression, the Negative-Alcohol Priming variable alone predicted a significant amount of the variance in TLFB scores at follow-up, $\beta = .318$, $p<.05$. In addition, when this variable was added to a model including drinking at baseline (TLFB) and the explicit measures (AEQ and IDS-42 conflict subscale), the majority of variance in drinking at follow-up was accounted for ($R^2 = .970$), and the effect of priming remained significant, $\beta = .114$, $p<.05$ (Table 4). Although the change in R^2 between this model and the model which included Emotion-Alcohol priming was small ($\Delta R^2 = .09$), the effect of priming remained significant in this model. This suggests that Negative-Alcohol Priming was a stronger predictor of reported drinking than was Emotion-Alcohol Priming (which had negative *and* positive valence words included). It appears that priming by negative emotions may be an important factor in alcohol use for this sample.

Discussion

Emotion-Alcohol Priming and Alcohol Use

The primary focus of the current study was to examine whether performance on the lexical decision task could predict reported drinking after two months. Participants who showed a strong priming effect for alcohol-words preceded by emotion-word primes were expected to drink more at follow-up than those who showed less priming. Although the priming effect was correlated with reported drinking and actually predicted drinking at follow up when examined as the sole predictor variable, this effect became nonsignificant when explicit measures and reported initial drinking were included in the model. Therefore, the hypothesis that Emotion-Alcohol Priming would predict drinking at follow-up beyond the contribution of other measures was not supported.

Interestingly, *Negative*-Alcohol Priming accounted for significant variance in drinking at follow-up, even when explicit measures and reported initial drinking were included. Thus, associations between negative emotion words and alcohol words may have been more salient in the prediction of actual alcohol use than associations between general emotion words (including both positive and negative emotions) and alcohol. Priming by negative emotion words decreased response times to alcohol words, and was correlated with and predictive of drinking. This is generally consistent with the finding that the "conflict" subscale of the IDS was more highly correlated with reported drinking and with the priming effect than were other measures. More specifically, it is possible that the women in this sample often drank for negative reinforcement (as indicated by the salience of the IDS "conflict" subscale). Because of this, negative-emotion words may

have primed alcohol-words in a way that was strongly related to and predictive of actual drinking behavior.

The finding that Negative-Alcohol priming predicted drinking at follow-up and was correlated with the "conflict" subscale of IDS-42, is consistent with previously examined patterns of drinking, reinforcement, and alcohol expectancies. Heavy-drinking women may be more likely than light drinkers to drink in response to social conflict or for anxiety reduction (Austin & Smith, 2008; Mohler et al., 2004; Zack et al., 2003). The memory association theory of alcohol use suggests that emotional states which are often paired with drinking behavior become strongly associated with alcohol in memory (Stacy, Leigh, & Weingardt, 1994). These strong associations may bring alcohol use more easily to mind when negative emotional states are experienced (Stacy, 1997), and thus perpetuate the cycle of drinking for negative reinforcement (Fazio & Williams, 1986; Tiffany, 1990). Given that many women use substances for coping-related reasons (McKee et al., 2003; Miranda et al., 2002; Willner, et al., 1998; Zack, et al., 2003; Zlovensky et al., 2008), strong associations between negative emotional states and alcohol use may be solidified (Austin & Smith, 2008).

The link between negative emotions and drinking is supported by the fact that although the *total* Inventory of Drinking Situations score was not significantly correlated with reported drinking at baseline or follow-up, the conflict subscale of this measure was both significantly correlated with alcohol use and was uniquely correlated with response latencies for negative emotion-alcohol word pairs. This suggests that women in this sample were more likely to drink when experiencing social conflict. This supports a similar finding by Austin and Smith (2008) which showed that women who drank in

response to social conflict showed increased priming of alcohol-words preceded by anxiety-words. The relationship between drinking in social conflict situations and Negative-Alcohol Priming (IDS-42 "conflict" subscale and Negative-Alcohol Priming) is consistent with the idea that repeated drinking in negative reinforcement situations may lead to memory associations between alcohol and negative emotions in women.

Negative Reinforcement as a Positive Outcome Expectancy

The finding that stronger *Negative*-Alcohol Priming is associated with heavier alcohol use may, at first glance, seem to conflict with earlier research. Several studies have shown correlations between reported drinking and positive implicit alcohol expectancies (Weirs et al., 2002a; b; Wiers & Stacy, 2006). One recent study using the IAT as an implicit measure found that positive associations about alcohol predicted drinking in college students (Jajodia & Earlywine, 2006). Other studies have shown that heavy drinkers, especially men, have strong memory associations between alcohol and positive, arousing emotions (Wiers et al., 2002 a; b). So why should negative-emotion words prime alcohol words and predict drinking in the current study?

Negative implicit associations have a complex relationship to drinking behavior which these previous studies may have been ill-suited to measure (Leigh, 1989). In particular, the ostensible conflict between the results of the above studies and the current design may be due to two key factors: 1) the sole use of the IAT in the previous designs; and 2) the current study's use of a female sample. In terms of the IAT, this procedure may not be able to fully capture negative reinforcement expectancies. Negative reinforcement is the removal of aversive stimuli (like unpleasant emotions). In other words, negative emotional reinforcement is a positive outcome. The expectation that

alcohol will remove unpleasant emotions is a positive expectancy. Drinking during negative emotional states (like sadness) in order to alleviate distress may increase memory associations between negative emotions and alcohol use. Although the outcome expectancy (emotional regulation) is positive, for those individuals who drink for negative reinforcement, alcohol cognitions may be primed by negative emotional states.

Importantly, given that the IAT examines positive and negative valence in a dualistic fashion (De Houwer, 2002; DeHouwer et al., 2004) it may not capture associations which have negative emotional valence but represent a positive outcome. For example, a quick response to an alcohol word when "alcohol" and "negative things" (like sadness) are in the same IAT category would be coded as a negative implicit expectancy. In reality, it could represent an expectancy of negative reinforcement (i.e., a positive alcohol expectancy). Thus, the current study's use of the non-dualistic lexical decision task may elucidate the nature of implicit alcohol expectancies for negative reinforcement in a way that previous studies could not.

In addition, the current study's use of a female sample may account for apparent discord between previous research and the current findings. As noted, women may be more likely than men to drink for the purpose of negative reinforcement (Catanzaro & Greenwood, 1994). Although some have argued that positive (but not negative) outcome expectancies predict drinking behavior (Fromme, et. al., 1993), this pattern may be different in women. For example, one recent study found that whereas implicit positive expectancies predicted prospective binge drinking in both genders, negative implicit expectancies were only predictive for females. Specifically, female drinkers and female abstainers differed in the strength of their negative implicit expectancies (Thush & Weirs,

2007). Thus, the use of a female sample may partially account for the current findings that negative-emotion – alcohol priming (Negative-Alcohol Priming) was more predictive of drinking than emotion-alcohol priming with its inclusion of positive emotion words.

Explicit and Implicit Expectancies and Alcohol Use

The Alcohol Expectancy Questionnaire measured various kinds of positive outcome expectancies involving both positive and negative reinforcement. This measure was correlated with reported drinking at both the laboratory session and follow-up, and with the overall emotion-alcohol priming score (Emotion-Alcohol Priming). This seems to indicate that positive explicit expectancies are also necessary for understanding alcohol use, and supports previous findings in this area (Cooper et al., 1995; Leigh & Stacy, 1993; Smith, Goldman, & Greenbaum, 1995; Wiers, Hoogeveen, Sergeant, & Gunning, 1997; Wiers et al., 2002). Both positive and negative reinforcement are important factors for predicting drinking in women. However, in the current study, positive reinforcement was more salient when measured explicitly. The fact that the AEQ and the Negative-Alcohol Priming score accounted for unique variance in reported drinking at follow-up also suggests that implicit associations may be essential for understanding and predicting alcohol use in addition to explicit expectancies.

Reported drinking in social conflict situations was uniquely related to Negative-Alcohol Priming, and to reported drinking in this sample. The pattern of association between Negative-Alcohol Priming, drinking during times of social conflict (IDS-42 "conflict" subscale), and participants' reported drinking behavior seems to be supportive of social-cognitive theories of alcohol misuse, as well as a memory-association model. It

has been suggested that heavy drinkers and those who abuse alcohol may lack appropriate social problem-solving skills, especially related to social conflict (Dijkstra, Sweeney, & Gebhardt, 2001; Dreer, Ronan, Ronan, Dush, & Elliot, 2004; MacKay, Donovan, & Marlatt, 1991). In other words, heavy drinkers may use alcohol as a method for coping with social distress, thereby making alcohol a negative reinforcer in times of social conflict. Repeated pairings of negative reinforcement with alcohol use may lead to the creation of memory associations which potentiate alcohol cognitions when social conflict occurs.

The idea that drinking in negative reinforcement situations may lead to the creation of memory associations, which may in turn play a role in future drinking behavior, lends support to Tiffany's cognitive model of drug urges and use (1990). This model states that contextual cues associated with prior use prime drug use concepts automatically (Tiffany, 1990). This model has been supported by several studies which show relationships between memory associations and substance urges or use (Carrigan, 1998; Jajodia & Earlywine, 2006; Newlin & Strubler, 2007; Posy, 2008). The environmental factors, including emotions, which tend to surround drinking for an individual, become cues for engaging in alcohol use.

The relationship between the IDS "conflict" subscale and Negative Alcohol-Priming also supports the idea that for those who drink for emotional coping reasons, emotional stimuli automatically prime alcohol concepts. The fact that the implicit measure was predictive of alcohol use suggests that these primed concepts do, in fact, influence drinking behavior. Since Negative-Alcohol Priming predicted variance in reported drinking at follow-up separate from the explicit measures, it may be that, as

predicted by Tiffany's model (1990), some memory cues associated with drinking are triggered automatically.

Treatment Implications

This study is one of only a few to begin to investigate the predictive validity of implicit tasks for alcohol use behaviors. If some memory associations between drinking and emotions are unconscious, involuntary, or normally inaccessible to clients (as indicated by discrepancies between explicit and implicit measures), an understanding of implicit associations could provide insight in therapy. If implicit measures are utilized, therapists may be able to supplement the client's explicitly-stated triggers for drinking by referring to implicit memory associations. Cognitive behavioral therapies which focus first on recognizing thoughts which precede use (and then teach the client to intervene at different stages of the decision to drink) may be particularly able to utilize implicit measures. Furthermore, coping skills training can be used to teach clients alternative methods for dealing with uncomfortable thoughts which commonly result in drinking. In addition, since the cognitive model suggests that implicit associations are acquired through repeated paired experiences of behaviors (drinking) and cues (emotional states or social contexts), behavioral therapies for alcohol use which promote periods of abstinence (like the Community Reinforcement Approach; Hunt & Azrin, 1973; Meyers & Smith, 1995) may be effective in altering such cognitions. Periods of abstinence are thought to allow increased experiences in the absence of alcohol so that reinforcement and contextual cues may be paired with non-drinking behaviors (Smith, Meyers, & Miller, 2001). Further investigation may reveal the utility of such an approach for altering implicit alcohol cognitions.

Limitations and Future Research

This study provides support for the idea that implicit measures may be effective for the prediction of drinking behaviors, and moreover, that the lexical decision task may be a good measure for examining the relationship of negative reinforcement expectancies and alcohol use in women. Although this relationship may be more relevant for female drinkers (Austin & Smith, 2008; Catanzaro & Greenwood, 1994; Weirs et al., 2002a; b; Wilsnack, 1991; 1995), future research might investigate whether there are truly gender differences in the predictive utility of the lexical decision task, or in the relationship between explicit and implicit emotion and alcohol-related cognitions.

One should always consider the fact that although it is more difficult for participants to filter or control responses on implicit measures, it *is* possible (DeHouwer et al., 2004). However, no participants in the current study reported being aware of the purpose of the lexical decision task at the laboratory session. Furthermore, the average response latencies for each subject were well within the normal range for the visually-administered lexical decision task (De Moor & Brysbeart, 2000; Grayson, 2003). Consequently the lexical decision task as used in this study appears to have been valid.

Another consideration is that a community sample might have had a wider range and longer history of drinking experiences than a college sample, and thus potentially could have provided more insight into how implicit associations manifest in a more representative sample of drinking patterns. Nonetheless, given the prevalence and severity of college drinking problems (CDC, 2006; Knight et al., 2002), this population merited investigation in its own right. Future research with college students might utilize follow-up periods longer than 2 months. Finally, a more detailed measure of demographic

history and alcohol use could allow for a closer examination of the potential relationship between levels and frequency of intoxication and learning history to memory associations.

In summary, this study provides some support for use of implicit measures like the lexical decision task in the prediction of alcohol use in women. It also suggests that the lexical decision task might be particularly appropriate for examining implicit alcohol cognitions related to negative reinforcement and alcohol. Despite the limitations of this study and gaps in knowledge in the area of implicit alcohol cognitions, these results support the idea that implicit alcohol cognitions should not only be further investigated, but taken into account in future models of alcohol use and treatment.

Table 1. ***Participants' Drinking Habits at Baseline and Follow-Up***

	Original Sample (n=78)				Follow-Up (n=67)			
	M	*SD*	Max	Min	*M*	*SD*	Max	Min
Reported Drinks	31.43	23.37	121	0	13.70	23.60	124	0
Age of 1st Drink	17.40	2.24	21	9	15.44	2.22	21	9
	Alcohol Abuse (N=16)				Alcohol Abuse(n=13)			
Reported Drinks	27.06	11.09	47	13	27.50	14.06	48	10
Age of 1st Drink	16.91	2.72	20	12	16.70	2.70	20	10
	Alcohol Dependence (N=5)				Alcohol Dependence(n=5)			
Reported Drinks	76.80	38.91	121	0	27.50	14.06	48	0
Age of 1st Drink	13.91	3.56	18	9	----	----	----	----

Participants(%)	Original Sample (n=78)	Follow-up (n=67)
Abuse (Lifetime)	20.50	19.40
Abuse (Current)	15.40	10.44
Dependence (Lifetime)	6.41	7.46
Dependence (Current)	3.80	4.47
Non-Drinkers	__	32.8

Note. "Reported Drinks" in the above data reflects drinks reported by participants in the 30 days prior to the laboratory session and to follow-up. Abuse and dependence reflect % of participants who met criteria on the research- SCID during the laboratory session. All data is reported for the total sample and for those who completed the follow-up. "Non-drinkers" were defined as participants who reported 0 drinks both at baseline and follow-up. Means between the original sample and follow-up sample did not differ significantly.

Table 2. ***Means for Implicit and Explicit Alcohol Expectancy Measures***

	Total (N=78)		Drinkers		Non-Drinkers	
Measures	*M*	*SD*	*M*	*SD*	*M*	*SD*
IDS-42	69.61	25.71	83.27	22.41	31.60	4.78
AEQ	23.38	15.45	37.25	12.85	13.65	3.91
EmoAlcPriming	1.12	26.28	81.91	25.19	-12.86	21.92
NegAlc Priming	6.65	35.10	110.11	26.81	-66.91	31.05

Note. This data reflects the means and standard deviations of scores on explicit and explicit measures of alcohol outcome expectancies. The mean scores for Inventory of Drinking Situations (IDS-42) and the Alcohol Expectancy Questionnaire (AEQ) represent the mean standard scores for participants on those measures. Emotion-Alcohol Priming (EmoAlc Priming) represents the mean difference between response times for emotion-alcohol word pairs and neutral-alcohol word pairs on the Lexical Decision task in milliseconds. Negative Alcohol Priming (NegAlc Priming) represents the mean difference between negative emotion-alcohol word pairs and neutral-alcohol word pairs in milliseconds.

Table 3. ***Pearson Correlations Between Measures***

Measures	(n=67)				
	EmoAlc-Priming	TLFB(baseline)	TLFB(follow-up)	IDS-42	AEQ
EmoAlc-Priming	1.00	.223*	.234*	.112	.165
TLFB(baseline)	---	1.00	.759**	.075	.332**
TLFB (follow-up)	---	---	1.00	.124	.212
IDS-42	---	---	---	1.00	.570**
IDS-42 (conflict)	.252*	.218	.246*	.689**	.214

** $p < .01$, * $p < .05$

Note. This data reflects the correlations between measures. TLFB refers to the Timeline Follow Back which measured drinking over the past 30 days at baseline and follow-up. Emotion-Alcohol Priming refers to the difference between response times for emotion-alcohol and neutral-alcohol word pairs on the Lexical Decision Task. The Alcohol Expectancies Questionnaire (AEQ) and the Inventory of Drinking Situations (IDS-42) were measures of explicit alcohol cognitions. IDS(conflict) refers to the "conflict" subscale of the IDS-42.

Table 4. ***Best Multiple Linear Regression Model***

Predictor	β	$t(67)$	p
Timeline Follow Back (Baseline)	.971	39.73	<.01
Inventory of Drinking Situations "conflict"	.050	1.66	*n.s.*
Alcohol Expectancy Questionnaire	.097	3.56	<.05
Negative-Alcohol Priming	.114	4.98	<.05
Model: $R = .985$ $R^2 = .970$ Adjusted $R^2 = .967$ $p<.05$			

Note. This data reflects the correlations between measures. TLFB refers to the Timeline Follow Back which measured drinking over the past 30 days at baseline and follow-up. Emotion-Alcohol Priming refers to the difference between response times for emotion-alcohol and neutral-alcohol word pairs on the Lexical Decision Task. The Alcohol Expectancies Questionnaire (AEQ) and the Inventory of Drinking Situations (IDS-42) were measures of explicit alcohol cognitions. IDS(conflict) refers to the "conflict" subscale of the IDS-42.

Appendices

Appendix A

Demographic Questionnaire

Participant Number: Home Phone:

Age: Cell Phone:
Gender: UNM email:
Other email:

1) How do you classify your ethnic background?
___Caucasian/White (non-Hispanic)
___African-American
___Native-American/Alaskan Native
___Asian/Pacific Islander
___Hispanic/Latino-New Mexican
___Hispanic/Latino-Mexican
___Hispanic/Latino-Other
___Other (please specify)_____

2) Is English your primary language? (y/n) _____

3) Have you ever been diagnosed with dyslexia? (y/n)_____

4) Please indicate your current year in college or the highest level of education you have completed:
___Freshman (or first year)
___Sophomore (or second year)
___Junior (or third year)
___Senior (or fourth year)
___College Graduate
___Master's Degree (MA/MS)
___Doctoral Degree (Phd.)
___Professional Degree (MD, JD, etc.)
___Other (please specify)_____

5) Please estimate your household income (or your parent's household income if you are considered a dependent):
___less than $20,000 per year
___$20,0000-$35,000 per year
___$35,000-$50,000 per year
___$50,000-$75,000 per year
___greater than $75,000 per year
___I prefer not to respond

6) How old were you when you had your first full alcoholic drink (i.e., one glass of wine, one bottle or can of beer, or one shot of hard alcohol)_____

7) How old were you when you had your first binge drinking experience (four or more drinks in a short time period if you are female, five or more drinks if you are male)_____

Thank you for completing this questionnaire! Please let the experimenter know that you are finished.

Appendix B

reaLife

Alcohol Expectancy Questionnaire

reaLife

Alcohol Expectancy Questionnaire

This is a questionnaire about the effects of alcohol. Read each statement carefully and respond according to your own personal feelings, thoughts, and beliefs about alcohol **now**. We are interested in what **you** think about alcohol, regardless of what other people might think.

If you think that the statement is true, or mostly true, or true some of the time, then mark the number 1, for "AGREE", on your scantron sheet. If you think the statement is false, or mostly false, then mark the number 0, for "DISAGREE" on your scantron sheet. When the statements refer to drinking alcohol, you may think in terms of drinking any alcoholic beverage, such as beer, wine, whiskey, liquor, rum, scotch, vodka, gin, or various alcoholic mixed drinks. Whether or not you have had actual drinking experiences yourself, **you are to answer in terms of your beliefs about alcohol**. It is important that you respond to **every question**.

PLEASE BE HONEST. REMEMBER, YOUR ANSWERS ARE CONFIDENTIAL.

RESPOND TO THESE ITEMS ACCORDING TO WHAT YOU PERSONALLY

BELIEVE TO BE TRUE ABOUT ALCOHOL

PUT ALL RESPONSES ON YOUR SCANTRON SHEET:

0=DISAGREE 1=AGREE

1. Some alcohol has a pleasant, cleansing, tingly taste.
2. Drinking adds a certain warmth to social occasions.
3. When I'm drinking, it is easier to open up and express my feelings.
4. Time passes quickly when I'm drinking.
5. Drinking makes me feel flushed.
6. I feel powerful when I drink, as if I can really influence others to do what I want.
7. Drinking gives me more confidence in myself.
8. Drinking makes me feel good.
9. I feel more creative after I've been drinking.
10. Having a few drinks is a nice way to celebrate special occasions.
11. When I'm drinking I feel freer to be myself and do whatever I want.
12. Drinking makes it easier to concentrate on the good feelings I have at the time.
13. Alcohol allows me to be more assertive.

14. When I feel "high" from drinking, everything seems to feel better.
15. I find that conversing with members of the opposite sex is easier for me after I've had a few drinks.
16. Drinking is pleasurable because it's enjoyable to join in with people who are enjoying themselves.
17. I like the taste of some alcoholic beverages.
18. If I'm feeling restricted in any way, a few drinks make me feel better.
19. Men are friendlier when they drink.
20. After a few drinks, it is easier to pick a fight.
21. If I have a couple of drinks, it is easier to express my feelings.
22. Alcohol makes me need less attention from others than I usually do.
23. After a few drinks, I feel more self-reliant than usual.
24. After a few drinks, I don't worry as much about what other people think of me.
25. When drinking, I do not consider myself totally accountable or responsible for my behavior.
26. Alcohol enables me to have a better time at parties.
27. Drinking makes the future seem brighter.
28. I often feel sexier after I've had a couple of drinks.
29. I drink when I'm feeling mad.
30. Drinking alone or with one other person makes me feel calm and serene.
31. After a few drinks, I feel brave and more capable of fighting.
32. Drinking can make me more satisfied with myself.
33. My feelings of isolation and alienation decrease when I drink.
34. Alcohol helps me sleep better.
35. I'm a better lover after a few drinks.
36. Alcohol decreases muscular tension.
37. Alcohol makes me worry less.
38. A few drinks makes it easier to talk to people.
39. After a few drinks I am usually in a better mood.
40. Alcohol seems like magic.

41. Women can have orgasms more easily if they've been drinking.
42. Drinking helps get me out of a depressed mood.
43. After I've had a couple of drinks, I feel I'm more of a caring, sharing person.
44. Alcohol decreases my feelings of guilt about not working.
45. I feel more coordinated after I drink.
46. Alcohol makes me more interesting.
47. A few drinks makes me feel less shy.
48. Alcohol enables me to fall asleep more easily.
49. If I'm feeling afraid, alcohol decreases my fears.
50. Alcohol can act as an anesthetic, that is, it can deaden pain.
51. I enjoy having sex more if I've had some alcohol.
52. I am more romantic when I drink.
53. I feel more masculine/feminine after a few drinks.
54. Alcohol makes me feel better physically.
55. Sometimes when I drink alone or with one other person it is easy to feel cozy and romantic.
56. I feel like more of a happy-go-lucky person when I drink.
57. Drinking makes get togethers more fun.
58. Alcohol makes it easier to forget bad feelings.
59. After a few drinks, I am more sexually responsive.
60. If I'm cold, having a few drinks will give me a sense of warmth.
61. It is easier to act on my feelings after I've had a few drinks.
62. I can discuss or argue a point more forcefully after I've had a drink or two.
63. A drink or two makes the humorous side of me come out.
64. Alcohol makes me more outspoken or opinionated.
65. Drinking increases female aggressiveness.
66. A couple of drinks makes me more aroused or physiologically excited.
67. At times, drinking is like permission to forget problems.
68. If I am tense or anxious, having a few drinks makes me feel better.

Appendix C

IDS-42

	I DRANK HEAVILY			
	Never	Rarely	Sometimes	Almost Always
1. When I felt I had let myself down	1	2	3	4
2. When I had trouble sleeping	1	2	3	4
3. When I felt confident and relaxed	1	2	3	4
4. When I convinced myself that I was a new person and could take a few drinks	1	2	3	4
5. When I remembered how good it tasted	1	2	3	4
6. When I had an argument with a friend	1	2	3	4
7. When I was out with friends and they stopped at a bar for a drink	1	2	3	4
8. When I wanted to heighten my sexual enjoyment	1	2	3	4
9. When other people didn't seem to like me	1	2	3	4
10. When there were fights at home	1	2	3	4
11. When I was relaxed with a good friend and wanted to have a good time	1	2	3	4
12. When I was afraid that things weren't going to work out	1	2	3	4
13. When I felt drowsy and wanted to stay alert	1	2	3	4
14. When everything was going well	1	2	3	4
15. When I wondered about my self-control over alcohol and felt like having a drink to try it out	1	2	3	4
16. When I passed by a liquor store	1	2	3	4

Appendix C (continued).

	Never	Rarely	Sometimes	Almost Always
17. When I felt uneasy in the presence of someone	1	2	3	4
18. When I was at a party and other people were drinking	1	2	3	4
19. When I wanted to feel closer to someone I liked	1	2	3	4
20. When other people interfered with my plans	1	2	3	4
21. When there were problems with people at work	1	2	3	4
22. When I was enjoying myself at a party and wanted to feel even better	1	2	3	4
23. When I was angry at the ways things had turned out	1	2	3	4
24. When I felt nauseous	1	2	3	4
25. When I felt satisfied with something I had done	1	2	3	4
26. When I started to think that just one drink could cause no harm	1	2	3	4
27. When I unexpectedly found a bottle of my favorite booze	1	2	3	4
28. When someone criticized me	1	2	3	4
29. When I was in a restaurant and the people with me ordered drinks	1	2	3	4
30. When I was out “on the town” and wanted to increase my enjoyment	1	2	3	4
31. When pressure built up at work because of the demands of my supervisor	1	2	3	4

Appendix C (continued).

	Never	Rarely	Sometimes	Almost Always
32. When other people treated me unfairly	1	2	3	4
33. When I felt confused about what I should do	1	2	3	4
34. When my stomach felt like it was tied in knots	1	2	3	4
35. When something good happened and I felt like celebrating	1	2	3	4
36. When I wanted to prove to myself that I could take a few drinks without becoming drunk	1	2	3	4
37. When I suddenly had an urge to drink	1	2	3	4
38. When other people around me made me tense	1	2	3	4
39. When I met a friend and he/she suggested we have a drink together	1	2	3	4
40. When I wanted to celebrate with a friend	1	2	3	4
41. When I felt under a lot of pressure from family members at home	1	2	3	4
42. When I was not getting along well with others at work	1	2	3	4

Appendix D

Timeline Followback (TLFB)

DY MO YR
DATE OF ADMINISTRATION

TIMELINE FOLLOWBACK (TLFB) CALENDAR

Name: _____ Age: _____ . Gender: _____

Interviewer Instructions:

Complete Start Date and the End Date (yesterday).

Start Date: DY MO YR

End Date: DY MO YR

Total Days in TLFB Interval: _____

Check (✓) appropriate box and complete corresponding information:

☐ Timeline Followback for Alcohol

BAC: _____

Weight: _____

Occasionally, people engage in morning drinking to avoid withdrawal symptoms from the previous night's drinking. For shift workers this refers to drinking immediately upon waking. Drinking upon waking to avoid withdrawal symptoms is known as "relief drinking."

Have you engaged in relief drinking during the timeline interval?

☐ Yes ☐ No

☐ Timeline Followback for Cigarettes

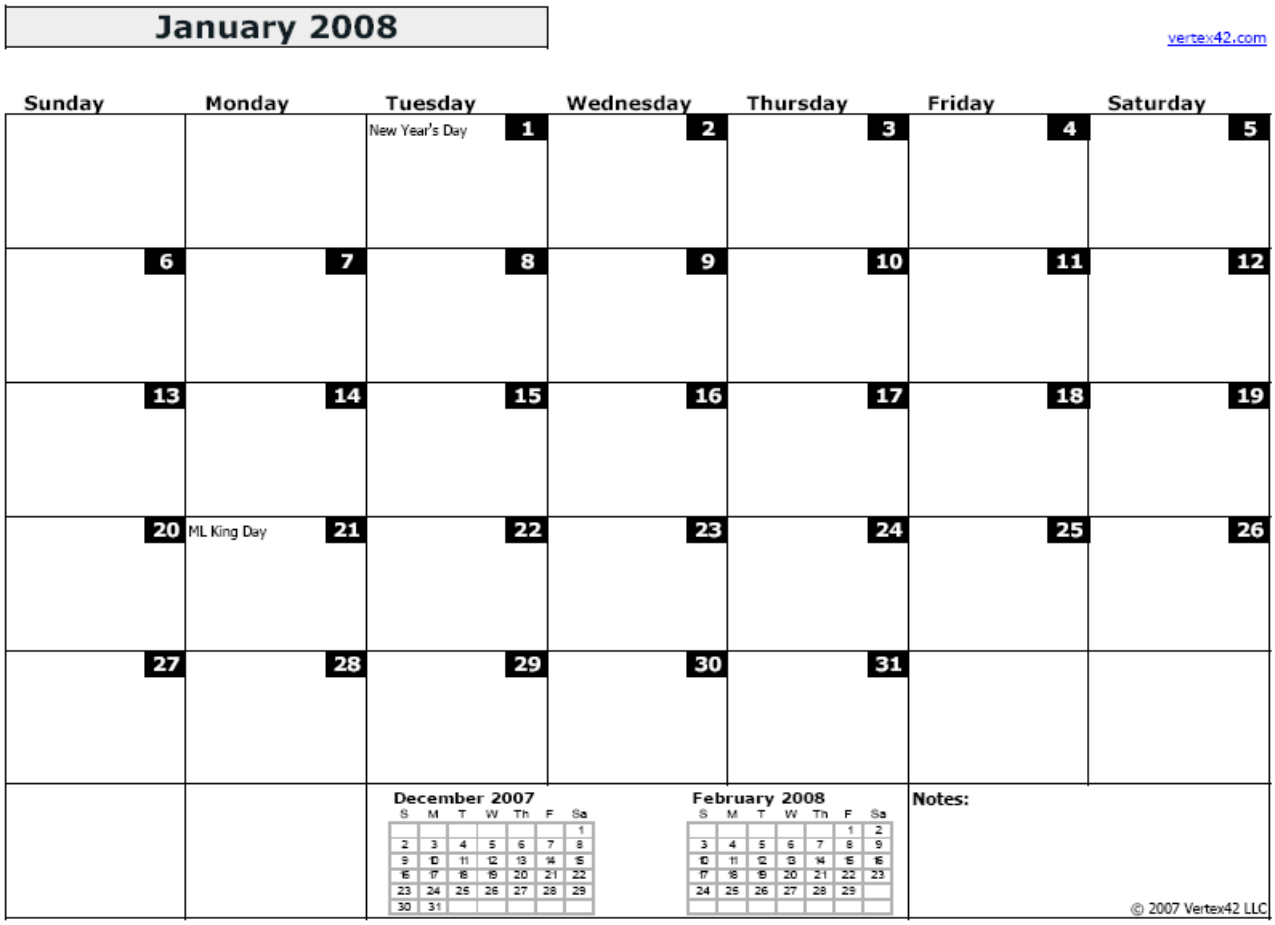
☐ Timeline Followback for Marijuana

☐ Timeline Followback for Other Drugs

PRIMARY Drug Name: _____

SECONDARY Drug Name: _____

88 = no secondary drug assessed



January 2008

vertex42.com

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		New Year's Day 1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	ML King Day 21	22	23	24	25	26
27	28	29	30	31		

December 2007

S	M	T	W	Th	F	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

February 2008

S	M	T	W	Th	F	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	

Notes:

Appendix E

Word List

Negative Emotion Words			Positive Emotion Words		
abandoned	exhausted	preoccupied	accomplished	fabulous	mellow
abused	exposed	remorse	adored	familiar	nostalgic
afraid	failure	repressed	adventurous	fascinated	optimistic
aggravated	fatigue	restless	affectionate	flirty	peaceful
agitated	fearful	scared	agreeable	focused	playful
alienated	feeble	sensitive	amorous	friendly	pleasant
annoyed	fidgety	shaky	animated	frisky	pleased
apathy	fitful	sick	aroused	fun	praise
apprehensive	fixation	sleepless	artistic	generous	praise
aversion	forgetful	soreness	attentive	giddy	pretty
avoidant	frightened	stressful	awake	giggly	productive
bewildered	frustrated	struggle	beauty	good	refreshed
bizarre	futile	tense	blissful	happy	rejuvinated
blamed	gloomy	tired	bouncy	health	relaxed
blocked	guilty	trapped	breezy	high	relieved
careless	hopeless	trembling	calm	hopeful	sassy
chilled	hurt	tremor	carefree	hot	satisfied
condemned	impeded	wroubled	caring	hyper	serene
confused	indecisive	wurmoil	cheerful	imaginative	silly
criticized	inferior	unbalanced	chipper	impervious	smiling
crying	insane	uncertain	comfort	impressed	strong
death	insomnia	unfocused	confident	inquisitive	surprised
defective	irritated	unfriendly	content	inspired	talkative
demented	isolated	unsettled	creative	intense	tranquil
depressed	lethargic	unsettled	determined	interested	triumphant
desolate	lonely	unstable	easy	jolly	untroubled
despair	misunderstood	uptight	ecstatic	joyful	validated
disapproval	nervous	useless	energetic	jubilant	vital
distress	neurotic	vulnerable	engaged	laughter	wanted
distrust	obsession	watched	enjoy	lighthearted	warm
disturbed	outcast	worry	entertained	lovable	wellbeing
downhearted	panic	worthless	excited	loved	
dread			exotic	luminous	

Appendix E (contd.)

Neutral Category 1

archway	chairs	lights
atrium	chimney	lobby
attic	closet	office
auditorium	corner	partition
banks	corridor	patio
base	door	pipes
basement	elevator	playroom
bathroom	entrance	porch
beams	floor	rafters
bedroom	foundation	roof
bench	frame	room
brick	front	side
builder	furniture	sign
ceiling	glass	skylight
cellar	hall	smokestack
cement	kitchen	stairway

Neutral Category 2

bathrobe	mittens	shorts
blazer	nightgown	slippers
bluejeans	nylons	smock
boots	overcoat	socks
bow-tie	pajamas	stockings
bra	panties	suit
cardigan	pants	sweater
coat	pantyhose	sweatshirt
cufflinks	parka	swimsuit
dress	pullover	tank top
earmuffs	raincoat	tracksuit
garter	robe	trousers
girdle	sandals	t-shirt
gloves	scarf	tuxedo
gown	shirt	underpants
hat	shoes	undershirt
		vest

Neutral Category 3

antelope	donkey	mule
alligator	duck	panther
beaver	elephant	pig
bear	fish	pony
buffalo	giraffe	porcupine
bunny	goat	puppy
camel	horse	rabbit
cat	jaguar	raccoon
cheetah	kitten	skunk
chicken	lamb	squirrel
cougar	leopard	tiger
cow	lion	turtle
deer	monkey	wolf
dolphin	moose	zebra
dog	mouse	

Appendix E. (contd.)

Alcohol Words

addiction	drafts	pickeled	tavern
alcohol	dregs	pilsener	tequila
alehouse	drink	pint	thirsty
amaretto	drugged	plastered	tipsy
barfly	drunkard	port	toasted
barroom	eggnog	pub	tonic
bartender	euphoria	punch	tranquilizer
beer	firewater	quench	two-four
bender	fizz	refil	unconscious
beverage	flask	relapse	urge
binge	gimlet	rum	vermouth
bitters	gin	rummy	vodka
blackout	gulp	rush	wasted
blitzed	guzzle	rye	whiskey
boilermaker	habbit	saloon	wine
bombed	hammered	schnapps	wineskin
booze	hangover	scotch	withdrawl
bottle	highball	screwdriver	wrecked
brandy	homebrew	sedative	
brewery	hooch	sherry	
budweiser	impaired	shooter	
burboun	inebriated	shotglass	
burgundy	insobriety	six-pack	
buzz	intoxicated	sloshed	
champagne	kahlua	smashed	
chaser	keg	soda	
chug	lager	soused	
cider	liqueur	spiked	
cocktail	liquor	spirits	
cognac	loaded	spree	
compulsion	looped	spritzer	
cooler	lush	stagger	
corckscrew	malt	stein	
craving	margarita	stoned	
cups	martini	stupor	
daquiri	mickey	suds	
delirium	mixer	swig	
dependence	moonshine	swizzle	
detoxify	ouzo	tanked	
distilled	overdose	taproom	

Non-Words

abuved	evurtoydy	maldoc	roets
adrinced	evurytody	malkund	roscend
axorage	exchunning	manheys	rotellite
backworg	exdelross	melch	roversent
bices	exompied	mepaly	ruspogsible
brasilant	expluners	mictolish	satulion
brentiners	expufience	mopical	sempy
bydies	expulners	mugmals	shincol
calhong	expurnurive	nelutife	shinkyrisk
calpintony	extallent	norsitine	shuntyil
cansilered	fauted	nosdrin	sijentif
cantijons	felteur	nosferdim	sijentifac
ceulint	fibosh	octiors	soisend
charlok	filhows	octiors	sowkes
cigpletely	folsidvy	offable	sriper
clest	fopures	onyhay	stemeoilfy
closiderm	fordem	oprith	steolify
colowisc	forissitude	orwumned	stique
compterile	forjilla	ourtnikay	streub
comptonid	geldlto	oxderist	studole
corrowtly	geuches	oxymun	swince
credilos	gines	panjy	taspy
cullore	gordifun	phoediy	tescoper
curpont	grempted	pikulace	thenosind
dansdefer	gremted	piltinude	thonade
dapulaktory	guaxe	plauf	throsid
degnoes	howier	poixed	thwakify
deslouse	hommek	pokhated	tinelis
dirumptly	iatz	poufters	todraxe
donify	imytand	poynu	tonapht
doitle	inntruas	prajecd	torbifund
dorlukes	jescind	prckinton	tormisily
dozail	kolterfate	prestorutt	tosky
drecmaly	lakortay	profting	trewjing
drelody	leashter	protade	undrolfted
dupferences	lewl	prugon	wiscosed
dwesmy	likber	prukend	wumd
ebomies	lollinex	quathey	yeoning
eldron	lostering	reldimor	yurd
elocded	maldoc	renud	
elowtricity	malkund	retosun	

Appendix F

Consent to Participate in Research

CONSENT TO PARTICIPATE IN RESEARCH

INTRODUCTION

You are invited to participate in the "Words and Memory" study conducted by Marita Campos-Melady and Dr. Jane E. Smith, from the Psychology Department at the University of New Mexico. Results will contribute to Ms. Campos-Melady's Master's Thesis. You were identified as a possible volunteer in the study because of your enrollment in a Psychology course at UNM.

PURPOSE OF THE STUDY

The purpose of this study is to understand word-associations in memory and how they may or may not influence your behavior.

PROCEDURES AND ACTIVITIES

There are two parts to this study. In the first part of the study you will participate in a short computer task that examines associations between different words in your memory. Some of the words relate to specific kinds of behaviors and problems that are common to college students.

You will be asked to sit at the computer and respond in a yes/no fashion to a series of items presented on the monitor using the keyboard. This task should take less than ten minutes. After you have completed the first part of the study, you will be given more details about the study. You will then be asked to complete several questionnaires which ask about various personal habits and your current life situation and background. These questionnaires should take about an hour.

In eight weeks you will be contacted by email and asked to complete a short online questionnaire about your habits at that time. This questionnaire should take about ten minutes to complete. If you know now that you do not want to complete this follow-up questionnaire, please notify the experimenter and do not complete the first part of the study today. Even if you choose not to participate in the study, you will still get 2 class credits for today's segment.

You will receive class credit worth two grade points for participation in this study today. If you participate in the eight-week follow-up, you will receive your choice of an additional one class credit (provided your follow-up takes place before the end of the current semester's research credit deadline (which is set by your instructor), or $5. The can be picked up in the experimenter's office during her posted office hours (which can be found on the study website), once the experimenter has been notified of your decision.

POTENTIAL RISKS AND DISCOMFORTS

Some of the questionnaires and interview items may ask about information of a personal nature, but these measurements are not designed to be overly invasive. Examples of the kind of questions that are considered personal in nature are questions about body image, substance use, dating habits, intrusive thoughts, personal habits, and emotional well-being. Any of these topics may be asked about in this experiment. Such questions usually do not cause unmanageable distress, however if at any time you become distressed during the study, or if you would like to speak to someone about any concerns which arise today, please speak to the experimenter. She can provide you with a list of appropriate contact people and/or counselors.

POTENTIAL BENEFITS TO PARTICIPANTS AND/OR TO SOCIETY

Most people find completing the kind of tasks, questionnaires, and interview questions used in this study to be interesting and sometimes enjoyable. The responses you provide today and at the 8 week follow up will aid the psychological community in understanding how associations in memory influence behaviors. This understanding may aid in future research and for the development of new procedures which could be of help to individuals and society at large.

CONFIDENTIALITY

Any information obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. The questionnaires administered today as well as the online questionnaire may contain items which ask about activities of a personal nature. Your data will not be shared with anyone, and will be used only for the purposes of this study. You name will not be associated in any way with your scores or answers, which will be filed using a number assigned to you. All pen-and-paper information will be stored at all times in a locked office in the experimenter's lab. All electronic information, including the computer task results and your follow-up questionnaire, will be stored on a USB drive which will be kept at all times in a locked office. All online information will be sent through a secure site (the experimenter's licensed webpage) to a local server located in the experimenter's laboratory. No one but the experimenter will have access to this information, and all data will be destroyed upon completion of the study. If you have any concerns about the privacy of your responses, please speak to the experimenter.

PARTICIPATION AND WITHDRAWAL

You can choose whether to participate in this study or not. If you volunteer to participate, you may withdraw at any time without penalty or loss of benefits to which you might otherwise be entitled. You may also refuse to answer any questions you do not want to answer and still remain in the study. You are under no obligation to complete any of the tasks, questionnaires, or interviews today or the follow-up questionnaire. If

you become uncomfortable or wish to end your participation at any time, please just notify the experimenter. You will receive class credit for today's participation even if you choose not to participate in some or all of today's tasks. In the event that you choose to withdraw from the study, all of your responses will be destroyed. After completion of today's questionnaires and interview items, the experimenter may inform you that you are not eligible to participate in the eight week follow-up. In this case you will still receive credit for your participation today, but cannot receive credit or cash for the follow-up portion of the study.

INVESTIGATORS AND REVIEW BOARD

If you have any questions or concerns about the research, please feel free to contact: Dr. Jane E.
Smith, 01 University of New Mexico, MSC03 2220, Albuquerque, NM 87131, 505-277-2650, janellen@unm.edu

If you have other concerns or complaints, contact the Institutional Review Board at the University of New Mexico, 1717 Roma NE, Room 205, Albuquerque, NM 87131, (505) 277-2257, or toll free at 1-866-844-9018.

SIGNATURE OF RESEARCH PARTICIPANT

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been provided a copy of this form.

Name of Participant (please print)

_____

Signature of Participant Date

_____

SIGNATURE OF INVESTIGATOR

In my judgment the participant is voluntarily and knowingly providing informed consent and possesses the legal capacity to give informed consent to participate in this research study

Name of Investigator or Designee

_____

Signature of Investigator or Designee Date

_____

IRB APPROVAL STAMP

Appendix G

Participants' Debriefing Form

The lexical decision task and implicit alcohol cognitions: a better measure for predicting alcohol use?

Thank you for participating in this study. The purpose of this study was to examine potential connections between certain kinds of thoughts about alcohol and actual drinking behaviors. In order to more effectively prevent and treat alcohol use disorders, researchers attempt to understand the factors that contribute to drinking behavior. In recent years, some research has focused on people's thoughts about and attitudes toward alcohol and how these relate to actual drinking. Several researchers have found that positive attitudes toward alcohol are associated with increased drinking. Specifically, those who believe that alcohol will have positive effects, especially on emotions, are more likely to use alcohol.

Some researchers have theorized that people may not be consciously aware of the associations which exist in their memory. Such potentially unconscious memory associations are called "implicit cognitions" and have been studied in relation to alcohol use. Positive implicit cognitions about alcohol have been shown to be related to reported drinking in several studies. For example, people who show stronger associations in memory between positive or emotion-related concepts and alcohol-related concepts may be more likely to drink.

This study was based mainly on the work of Zack and colleagues, who examined unconscious associations as they relate to drinking using the same computer task you completed in the lab. The computer task you completed is known as a lexical decision task, and is a kind of test which is thought to measure the strength of memory associations between words. This type of task is used to explore associations between thoughts of which people may not even be consciously aware. In this study we looked at your performance on the computer task, specifically how long it took you to respond to alcohol-related words like "beer" when they appeared onscreen immediately after emotion-related words like "happy". Then we compared these results to your answers on the questionnaires about alcohol which you completed in the lab, and on the online follow-up. The purpose of this analysis is to examine whether performance on the computer task could predict drinking above and beyond self-reported attitudes about alcohol on pen-and-paper measures.

If you would like to read more about implicit cognitions in alcohol research the articles referenced at the bottom of this page are suggested.

All of the responses you provided for this study will be kept completely confidential. They will not be shared with any outside parties, nor will your name be associated in any way with your responses. All of the data will be destroyed after it has been analyzed for the purposes of this study.

If you would like more information on this study, have any questions or concerns, or would like to receive the complete report when the data has been analyzed, please contact Marita Campos-Melady at mcmelady@unm.edu or Dr. Jane E. Smith at janellen@unm.edu.

For further reading on the background of this study, please see:

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