



Memory associations between negative emotions and alcohol on the lexical decision task predict alcohol use in women

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ARTICLE INFO

Keywords:

Alcohol
Implicit
Lexical decision task
Alcohol outcome expectancies
Women

ABSTRACT

Implicit alcohol expectancies, or beliefs about alcohol which exist in the form of automatic 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, questionnaire 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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1. Introduction

Beliefs about the outcomes of alcohol consumption, or “alcohol outcome expectancies”, have become an increasing focus of study in the field of alcohol use disorders. Expectancy processes may be understood as associative memory links between alcohol and the consequences of its use, including cognitive, affective, and behavioral outcomes that permit people to anticipate or predict reward or punishment following behavioral actions (Goldman, Darkes, Reich, & Brandon, 2006). Expectancies have been shown to be powerful predictors of drinking behavior across various kinds of studies, methods, and participants (Goldman, Del Boca, & Darkes, 1999). Alcohol outcome expectancies have been shown to influence behavior above and beyond the pharmacological effects of alcohol (Marlatt, Demming, & Reid, 1973), and to differentiate between heavy and social drinkers (Wiers, Hoogeveen, Sergeant, & Gunning, 1997; Wiers, Stacy et al., 2002). In general, individuals with positive outcome expectancies; namely, the belief that positive outcomes will result from drinking, consume more alcohol than those with negative outcome expectancies

(Leigh & Stacy, 1993; Smith, Goldman, & Greenbaum, 1995; Wiers et al., 1997; Wiers, Stacy et al., 2002).

Alcohol outcome expectancies regarding emotion regulation merit special consideration, given that heavy or problem drinkers are more likely than social drinkers to report that they use alcohol to regulate their emotions (Cooper, 1994; Cooper, Frone, Russel, & Mudar, 1995). Furthermore, drinking to cope with emotions is associated with worse drinking outcomes than is drinking for other reasons (Carrigan, Samouk, & Stewart, 1998; Cooper, 1994; Cooper, Russel, Skinner, & Windle, 1992; Kushner, Abrams, & Borchardt, 2000) and may be especially problematic in females. Women have been shown to use substances in response to emotional turmoil more than men do (McKay & Schare, 1999; Share, McCrady, & Epstein, 2004). Additionally, some research has shown that women who attribute negative consequences to anxiety symptoms are more likely to report drinking in an effort to cope than women who do not (Zack, Poulos, Fragopolous, & MacLeod, 2003). This pattern does not hold true for men (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., 2000; Novak, Burgess, Clark, Zvolensky, & Brown, 2000), the investigation of negatively reinforcing outcome expectancies may be principally important in the study of female drinkers (Zack et al., 2003).

Alcohol expectancies have been investigated by using both “explicit” and “implicit” measures, with explicit measures being the more

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commonly used instruments by far (e.g., Brown, Christiansen, & Goldman, 1987; Earleywine & Erblich, 1996; Fromme, Stroot, & Kaplan, 1993; Leigh & Stacy, 1993). However, questionnaires and other explicit measures present several problems, such as self-representation issues and experimenter demand (Jajodia & Earleywine, 2003; Jones, Corbin, & Fromme, 2001). For example, people may misrepresent their opinions or beliefs to conform with social expectations or with the experimenter's perceived preferences (Jones et al., 2001).

Implicit cognitions, or cognitions which are automatic, involuntary, or unconscious (Bargh, 1992; Wiers & Stacy, 2006) also have been used to understand memory associations between alcohol and outcome expectancies (Birch et al., 2004; Wiers, Stacy et al., 2002; Zack, Toneatto, & MacLeod, 1999; Zack et al., 2003). A growing body of literature shows that performance on implicit tasks predicts actual drinking above and beyond explicit measures of outcome expectancies, demographic variables, and other variables related to alcohol use (Ames & Stacey, 1998; Goldman, Reich, & Darkes, 2006; Jajodia & Earleywine, 2003; Zack et al., 1999). Moreover, implicit measures reveal different patterns of memory associations than do explicit measures. For example, one study found that although "coping-motivated" drinkers reported more use of alcohol to decrease negative emotions, these same participants showed associations between alcohol and both negative and positive emotions on an implicit (Stroop) task (Stewart, Hall, Wilkie, & Birch, 2002). Differences have even been found between children of alcoholics and children of non-alcoholics on free-association type tasks which tap positive and negative memory associations about alcohol (Erblich, Erblich, & Earlywine, 2001). Findings like these imply that implicit tasks are indeed tapping into cognitions which are not measured by traditional self-report measures. Still, researchers continue to debate about which implicit tests may best capture the underlying mechanisms which are most salient to alcohol use and addiction (Fazio & Olson, 2003; Gawronski, LeBel, & Peters, 2007).

The main implicit tasks that have been used to assess beliefs about alcohol include the Stroop task (Stewart et al., 2002), free association of words (Stacy, 1997), various semantic priming tasks (Zack et al., 1999), and more recently, categorization tasks. The Implicit Association Test (IAT; Wiers, Woerden, Smulders, & De Jong, 2002) is a categorization task in which response keys represent two categories each (e.g., key one represents alcohol and positive emotions, key two represents tools and negative emotions). Participants are asked to categorize words or images which appear on a computer screen. Interference in categorization of items, as represented by delayed response time, is believed to reflect 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 (Wiers & Stacy, 2006; Wiers et al., 2002; Wiers et al., 2002), and has been predictive of drinking in diverse samples of participants (Jajodia & Earleywine, 2003).

One of the criticisms of the IAT is that it uses a dichotomous either-or approach to measuring positive and negative associations which may not truly reflect patterns of memory association most relevant in alcohol use (Fazio & Olson, 2003; Gawronski et al., 2007; Roediger, 2003; Roediger, Buckner, & McDermott, 1999). Recently another implicit task, the Extrinsic Affective Simon Task (EAST), has been utilized with the hope of overcoming the categorical weaknesses of the IAT (De Houwer, 2002; De Houwer & De Bruycker, 2007). The EAST still requires affective categorization, however, and may not capture the dimensional nature of addictive memory associations (Reich, Below, & Goldman, 2010) or ambivalence in cognitions about alcohol; key aspects of the conceptualization of addictive behavior (Conner & Sparks, 2002; Jajodia & Earleywine, 2003).

The measurement of concurrent positive and negative memory associations about alcohol is necessary if implicit measures are to accurately reflect current understandings of addiction, and it may be especially relevant to the study of implicit alcohol associations in women. One study found a significantly different relationship between implicit cognitions and alcohol use between men and women (Thush & Wiers, 2007).

Specifically, positive expectancies were predictive of drinking in both men and women, whereas negative expectancies were only predictive of (decreased) drinking in women.

The implicit tasks discussed so far may not be able to accurately capture these kinds of relationships between alcohol and relief of negative emotions, because memory associations may not be stored categorically but in a network with different strengths of associations between multiple concepts. The lexical decision task (LDT), which is a type of implicit measure that uses semantic priming as its basis, arguably may be the only kind of implicit measure that directly assesses associative memory networks (Gawronski & Bodenhausen, 2005). In this 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, and 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 (Meyer & Schvaneveldt, 1976). 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; De Houwer, 2002; Wiers & Stacy, 2006, ch.6 and 7), and may more directly measure the memory associations of most interest in addiction research. The LDT 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). To date, the usefulness of the LDT for predicting alcohol use has not been investigated.

In the current study a group of college women were given a lexical decision task targeting relationships between emotion- and alcohol-word pairs. In addition they were given explicit measures of alcohol outcome expectancies, and their usual alcohol consumption was measured at the laboratory session and at a two-month follow-up. Since the literature has shown that the best predictor of future drinking is past drinking, and drinking habits of college students have been shown to vary greatly over time (Greenbaum, Del Boca, Darkes, Chen-Pin, & Goldman, 2005), drinking habits were measured at both baseline and at two-months in order to capture any changes in drinking between the initial laboratory session and the two-month follow-up. Such a design is similar to that of previous studies in this area (see Wiers et al., 2002; Zack et al., 1999), as it has been argued that using a single time period is not sufficient for making the claim of "prediction". In the current study, it was hypothesized that stronger associations (as measured by shorter response times) between alcohol-words and emotion-words on the LDT would be predictive of drinking at follow-up above and beyond that predicted by initial drinking, demographic variables, and explicit measures of alcohol outcome expectancies.

2. Method

2.1. Participants

Eighty female participants over the age of 18 who were native English-speakers with no history of dyslexia (Izura & Ellis, 2002; Miller-Shaul & Breznitz, 2004) were recruited from psychology classes at the University of New Mexico. 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; De Moor, Verguts, & Brysbaert, 2005; Zack et al., 1999; 2003). This resulted in a final sample size of 78. The sample was ethnically diverse and had a mean age of 19.4 years (Table 1). No demographic variables were found to have a significant correlation with drinking outcomes in this sample. The 67 participants (85.9%) who completed the 2-month follow-up received either additional research credit (N = 19) or \$5 (N = 5).

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