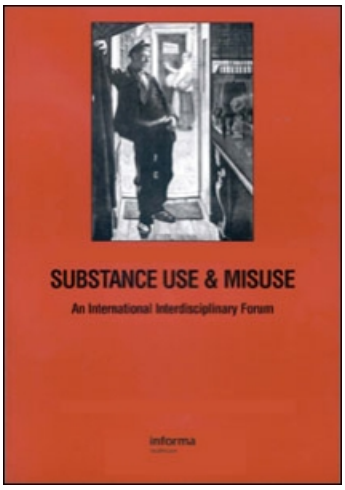

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Lawrence M. Scheier [a]; Sandra C. Lapham [b]; Janet C'de Baca [b]
[a] LARS Research Institute, Inc., Las Vegas, Nevada, USA [b] Behavioral Health Research Center of the Southwest, Albuquerque, New Mexico, USA

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Cognitive Predictors of Alcohol Involvement and Alcohol Consumption–Related Consequences in a Sample of Drunk-Driving Offenders

LAWRENCE M. SCHEIER,[1] SANDRA C. LAPHAM,[2] AND JANET C'DE BACA[2]

[1]LARS Research Institute, Inc., Las Vegas, Nevada, USA
[2]Behavioral Health Research Center of the Southwest, Albuquerque, New Mexico, USA

Motivational theories of alcohol involvement emphasize a wide range of cognitive factors as precursors to "heavy" or high-risk drinking. Central to this consideration has been expectancies, drinking urges, triggers, and situational cues, all of which can synergistically or independently stimulate drinking. Unfortunately, empirical studies have scrutinized low-level or moderate drinkers drawn from the general population, and less is known about the role of cognitive factors as precursors to high-risk drinking. The present study examines the unique contribution of several measures of cognitive motivation to harmful alcohol use in a sample of convicted drunk drivers. Confirmatory factor analysis indicated the psychometric soundness of a model positing four latent predictor constructs assessing drinking urges/triggers, situational cues, positive and negative expectancies and outcome constructs assessing harmful alcohol use and perceived consequences of harmful drinking. A structural equation model indicated that each motivational construct was associated uniquely with both drinking and perceived consequences, with the largest overall effect in both cases associated with situational cues. Results are discussed in terms of identifying prominent cognitive factors that may foster harmful drinking among high-risk populations and their implications for treatment.

Keywords alcohol involvement; cognitive motivators; confirmatory modeling; drinking urges/triggers; DWI; expectancies; situational cues

Introduction

Cognitive motivational theories have become increasingly popular as a means to account for different levels and types of drinking (Adesso, 1985; Cooper, Frone, Russell, and Mudar, 1995; Cox and Klinger, 1988; Goldman and Rather, 1993). The principal focus of motivational models rests with internal cognitive events hypothesized to precede

Address correspondence to Lawrence M. Scheier, LARS Research Institute, Inc., 11735 Glowing Sunset Lane, Las Vegas, NV 89135. E-mail: scheier@cox.net

and prompt alcohol consumption. The introduction of cognitive models to explain drinking has fueled the development of a diverse terminology to account for the different types of motivational and reinforcing properties associated with internal events. Perhaps the most frequently encountered examples found in the various literatures on alcohol use and abuse include expectancies, urges, triggers, cues, and cravings (e.g., Baker, Morse, and Sherman, 1987; Carey, 1993; Ludwig and Stark, 1974; Marlatt, 1978; Rankin, Hodgson, and Stockwell, 1979; Rohsenow et al., 1989; Singleton and Gorelick, 1998; Stacy, Widaman, and Marlatt, 1990; and Tiffany, 1990). Despite a wealth of information gathered pertaining to the predictive role of each type of motivational factor, differing perspectives and foci have led alcohol consumption researchers to concentrate on at most one or two types of cognitive motivational factors without considering their competing influences.[1]

To better understand the pivotal role of cognition in drinking, the present study examines the prediction of high-risk drinking from a broad array of cognitive factors, using a sample of adults convicted of driving while impaired (DWI). DWI offenders represent a unique class of high-risk drinkers particularly because they often drink despite the severity of legal and financial sanctions imposed on them by society. In addition, some DWI offenders continue to drink unabated despite experiencing personal, social, and physical ramifications stemming from their excessive drinking practices. Evaluating the potential harmful effects from alcohol abuse, particularly for this group of high-risk drinkers, should entail considering a wide range of motivating factors that provides impetus for their continued drinking. Prior to testing an explicit model linking cognitive factors with drinking, we briefly explore learning theory as a general framework from which to better understand the broad array of motivational factors linked with excessive drinking practices (see Addesso, 1985; Cox and Klinger, 1988; and Tiffany, 1990).

Theoretical Arguments for Considering Motivational Factors in Drinking

Traditional cognitive models of learning suggest that expectancies represent cognitive schemata that capture *if–then* relations between thought and action (Tolman, 1932). This has led many investigators to suggest that expectancies represent mental packages that bundle stimulus with reward (Goldman, Brown, Christiansen, and Smith, 1991; Goldman and Rather, 1993). People drink because of an association between drinking and a desired outcome (e.g., the perception that drinking is relaxing). The expectancy (belief) takes shape as a cognitive guide based on the anticipation of a specific outcome. [Thus, individuals who may not have consumed alcohol in a balanced placebo design and in the absence of physiological changes actually believe they are intoxicated and act accordingly (Marlatt and Rohsenow, 1980).]

Bolles (1967, 1972) refined existing concepts regarding expectancies as intervening mechanisms in generating behavior. According to Bolles, learning reflects an underlying

[1]It is worth noting that expectancies have received the lion's share of attention with respect to motivational factors, perhaps owing to the wealth of information linking them with adolescent (Chen, Grube, and Madden, 1994; Christiansen and Goldman, 1983; Scheier and Botvin, 1997), young adult (Christiansen, Smith, Roehling, and Goldman, 1989), and adult alcohol use (Conners, Maisto, and Derman, 1992; Conners, O'Farrell, Cutter, and Thompson, 1986; Fromme, Kivlahan, and Marlatt, 1986; Marlatt and Rohsenow, 1980). Additional findings also implicate expectancies as predictors of high-risk drinking and suggest they may even portend alcoholism (Christiansen, Goldman, and Brown, 1985; Mann, Chassin, and Sher, 1987; Smith, 1994).

reinforcement process comprised of multiple stages that encompass a series of *pushes* and *pulls* consisting of anticipation, incentive motivation, and situational stimuli. Importantly, Bolles eschewed a singular concept of reinforcement and instead suggested multiple successive contingencies (e.g., expectancies, cues, and triggers) that link stimulus with response. In these terms, a decision process incorporating only perceived consequences of drinking represents necessary but perhaps not sufficient conditions of the overall cognitive process underlying the motivations for drinking.

The search for additional cognitive factors implicated in drinking has led alcohol consumption researchers to examine cravings and related motivational determinants as they relate to alcohol consumption (Baker et al., 1986; Carey, 1993; Ludwig and Stark, 1974; Ludwig and Wikler, 1974; Ludwig, Wikler, and Stark, 1974; Marlatt, 1978; Rankin et al., 1979; Singleton and Gorelick, 1998). Based on the seminal work of Jellinek (1960), researchers have elaborated a central role for cravings and urges in the development of alcoholism and as important components in the relapse process (Annis and Davis, 1988; Donovan and Rosengren, 1999; Marlatt, 1978; Marlatt and Gordon, 1980; Marlatt and Gordon, 1985; Tucker, Vuchinich, and Harris, 1985). Different learning theorists have equated cravings with appetitive desire (anticipation of euphoria or excitation) or conditioned compensatory responses (Tiffany, 1990). Marlatt (1978) suggested that urges reflect intentions, whereas cravings capture the more anticipated outcome (i.e., expectancy) that comes from the positive reinforcing properties associated with alcohol use. Singleton and Gorelick (1998) described craving as a slow, effortful, and controlled conscious response that reflects activated mental representations associated with drinking action plans. Blocks to these plans induce cravings as a response mechanism, orienting the person to secure alcohol by using alternative strategies. Others have attempted to distinguish cravings and urges by suggesting that cravings tap a host of internal cues that prompt alcohol use related to physical dependence and its effects, whereas urges are more inclusive and involve a wide spectrum of social (e.g., seeing coworkers in a bar, attending a holiday party) as well as interoceptive cues (e.g., feeling depressed, lonely, or angry) that are part of the decision-making process that fosters alcohol use (Bohn, Krahn, and Staehler, 1995; Kozlowski, Mann, Wilkinson, and Poulos, 1989; Kozlowski and Wilkinson, 1987; Rohsenow et al., 1989; see Baker et al., 1987, for a complete analysis of urges as affective motivational processes).

To further illustrate this important point, consider an employee who receives his or her weekly paycheck and decides to join some friends who are drinking in a local tavern. For this individual, several different cognitive events coalesce as part of the decision whether to consume alcohol. One component represents the decision to spend time with friends, which can hold its own intrinsic motivation. A second component deals with the expectancy that drinking is pleasurable, can heighten certain sensations (e.g., relaxation and tension reduction), and thus constitutes its own positive reward structure (positive expectancy). A third and perhaps decisive cue may regard availability of financial resources to purchase alcoholic beverages (with the money received on payday serving as an incentive). A fourth situational factor may reflect relief from work-related stress. As can be seen from this brief example, a series of pushes and pulls (as described by Bolles) generate drinking from multiple levels of social, internal, and extrinsic cues. Each drinking-related impetus represents a type of cognitive event or decision synthesis that Bolles termed *psychological syllogism*. Without the application of such precise conceptual dissection, one could easily ascribe the decision to drink after work as a simple expectation that drinking with friends would be fun (i.e., social facilitation expectancy).

Cognitive Motivation, Perceived Consequences, and Harmful Drinking Practices

In addition to focusing on relations between cognition and behavior, we also examine relations between cognitive motivation and perceived consequences of drinking. The close symmetry that exists between actual behavior (i.e., drinking) and anticipated outcomes of behavior (e.g., hangovers and blackouts) suggests a need to explore these relations simultaneously. Additional compelling reasons argue for modeling consequences alongside actual behavior in a motivational framework. First, certain theoretical predictions would suggest that perceived consequences constitute a cognitive event encompassing elicitation of either excitatory (increased drinking) or inhibitory (decreased drinking) impulses. Accordingly, drinking is part of an evaluative process, which entails reviewing accessible memories of events that link behavior with consequences; i.e., an alcoholic considers the pros and cons associated with drinking before actually making the decision to drink. In keeping with a learning approach, it is vital to consider the effect of motivational factors on the mental structures containing perceived consequences, and it is equally important to examine direct linkages between motivation and behavior. If cognitive processes are more closely allied (e.g., urges or cravings with perceived consequences) than the cognitive-behavioral connection (e.g., urges or cravings and consumption), prediction of perceived consequences from cognitive motivational factors would be larger than prediction of actual drinking practices from cognitive motivational factors.

Second, according to Cox and Klinger's (1988) motivational framework, part of the cognitive chain of events leading to drinking involves a cognitive valuation placed on the perception that drinking will lead to specific affective change (i.e., relief from emotional strain or stress). The cognitive-symbolic act or appraisal of drinking consequences requires representation of a multitude of perceived consequences; e.g., "If I drink, then what will happen?" Specification of relations between cognitive motivational constructs and perceived consequences should help to paint a more refined picture of the essential conditions and contextual factors that regulate high-risk drinking.

Methodological Enhancements and Importance of the Current Study

There are also a number of methodological enhancements associated with the present study. First, studies of expectancies primarily examine adolescent alcohol use, which accentuate the beginning point of high-risk drinking, or utilize college samples, which may identify precursors to more problematic (i.e., binge) drinking. In either case, prevalence rates for these distinct age groups still mark the moderate end of the behavioral distribution and may not reflect excessive or harmful drinking practices. The present study examines relations between cognitive motivation and high-risk drinking using a sample of men and women previously convicted of DWI. Application of *DSM-III-R* (*Diagnostic and Statistical Manual of Mental Disorders, 3rd Edition, Revised*) (American Psychiatric Association, 1987) criteria indicated relatively high rates of alcohol abuse and dependence among the study participants (Lapham et al., 2001) in addition to high rates of self-reported negative consequences from alcohol use. Although using a restricted high-risk sample may contribute to certain statistical anomalies (i.e., correlations being downwardly biased by restricted variation), it affords the opportunity to examine the role of motivational factors that may be amenable to cognitive-based treatment interventions.

As an added refinement, we examined the dimensional structure of four theoretically important components of motivation using confirmatory factor analysis (CFA). Consistent

with theory-testing procedures, confirmatory techniques represent an improvement over the use of exploratory factor analysis techniques (Anderson and Gerbing, 1988; Bentler, 1978). With few exceptions (Fromme, Stroot, and Kaplan, 1993; Leigh and Stacy, 1993; Sher, Wood, Wood, and Raskin, 1996; Smith, 1994; Smith, Goldman, Greenbaum, and Christiansen, 1995; Woldt and Bradley, 2002), previous studies of motivational factors have relied on exploratory techniques and have not utilized inferential tests to confirm model fit. Lacking such information, we do not have any real gauge of whether a growing body of empirical findings fits any of the cognitive or social-learning theories and stimulates research on alcoholism and high-risk drinking. Coupled with CFA techniques, we used structural equation modeling (SEM) to examine the influence of cognitive motivation on harmful alcohol use and perceived consequences. The EQS program (Bentler, 1995) was used to conduct the CFA and SEM analyses.

Method

Sample and Screening Procedures

The sample used in the present study was derived from a 5-year follow-up study of female and male offenders convicted of a first DWI. Participants were referred to the Lovelace Comprehensive Screening Program (LCSP), which had a contract with the Metropolitan Court of Bernalillo County, New Mexico, to provide screening services (Lapham et al., 1995). Characteristics of this population were similar to other DWI offender populations with respect to age, gender, and marital status (Lapham, Skipper, Hunt, and Chang, 2000; Lapham et al., 1995; Lapham, Skipper, and Simpson, 1997). However, the present sample contained higher proportions of Hispanics and American Indians than those from other geographical areas (Moskowitz, Walker, and Gomberg, 1979; Perrine, Peck, and Fell, 1989; Vingilis, 1983). The mean blood alcohol concentration (BAC) at arrest for DWI offenders in the LCSP was 0.16 g/dL, which is located in the middle range for mean BACs of arrested drunk drivers elsewhere in the United States (The Century Council, 1997).

The sample chosen for the follow-up study included 1,208 consecutive female referrals from April 1989 through March 1992 and 1,407 males drawn from all males referred for screening during the study period. Details regarding selection, screening criteria, and factors contributing to study attrition for the sample are reported elsewhere (Lapham, Baum, Skipper, and Chang, 2000). Briefly, subjects were selected on the 5-year anniversary of their LCSP referral, and their screening took place over a 36-month period. Males were frequency matched to females by date of screening referral and ethnicity. LCSP record data and other commercially available electronic databases were used to locate subjects. Bilingual (English/Spanish) staff used a comprehensive location protocol that included a sequence of introductory letters, telephone calls, and home visits. Once located, willing participants provided written informed consent and were given $75 to complete the interview. An institutional review board approved the protocol for the 5-year follow-up study.

Interviews were conducted from January 1994 to June 1997, and participants provided self-report information in response to survey questions and standardized tests and using a computerized version of the Diagnostic Interview Schedule (DIS) (Robins, Helzer, Croughan, and Ratcliff, 1981). Interviews were conducted by counselors having master's degrees and trained in intake assessment and referral processes (and lasted no more than 2 hours). Counselors rendered diagnoses of alcohol abuse or dependence based on extensive interview materials and written test results. Refusal rates were the highest for males in

the age bracket of 18–34 (27.8%) and the lowest for females (12.8%) in the same group compared to males 35–44 years of age (24.7%) and females in the same age bracket (16.%).

Search of National Death Index records identified 18 females and 38 males as deceased. Of the remaining 2,559 subjects, 2,062 (81%) were located (1,005 females and 1,057 males), and 1,396 were interviewed. A total of 239 subjects were contacted but did not schedule or failed to keep their interview appointments. An additional 427 participants refused to be interviewed, and 497 could not be located. A total of 9% of the participants had bench warrants issued for their lack of compliance with the court-mandated screening and referral process; of these individuals, 64% were located, and 59% were eventually interviewed.

Analyses were conducted to assess differences between interviewed participants and those not participating in the follow-up portion of the study. Logistic models indicated that males, individuals of Mexican national ethnicity, and those with outstanding arrest warrants were less likely to be interviewed. Contrasts between located and nonlocated subjects indicated no differences in the arrest blood alcohol levels or alcohol diagnoses, but located subjects were more likely to be females, to be over 30 years of age, to be Hispanic, to possess a telephone, and not to have outstanding arrest warrants (Lapham, Baum, et al., 2000).

Specification and Construction of Motivational Predictor Constructs

Expectancies. Expectancies are defined as perceived positive benefits and negative outcomes resulting from alcohol use. Using the 34-item Alcohol Outcome Expectancy Scale (AOES) (Leigh and Stacy, 1993), we posited a latent factor of positive expectancies reflected by four indicators assessing social facilitation (e.g., "I am more accepted socially"), tension reduction (e.g., "I feel less stressed"), fun and excitement (e.g., "I enjoy the buzz"), and sexual excitation (e.g., "I am more sexually assertive"). A second latent factor of negative expectancies was reflected by four indicators capturing physical effects (e.g., "I get a hangover"), cognitive events (e.g., "I am less alert"), social experiences (e.g., "I become aggressive"), and emotional experiences (e.g., 'I feel ashamed of myself").

The instructional set for the AOES includes a common stem for each item (e.g., "Here is a list of some effects or consequences that some people experience after drinking alcohol . . . "). Participants were then asked to rate the likelihood of these effects when *they* drink alcohol; e.g., "How likely is it that this would happen?" Non–alcohol users were instructed to respond to what they think would happen *if* they drank alcohol. Response categories for all expectancy items ranged from (1) "No chance" to (6) "Certain to happen."

Leigh and Stacy (1993) reported a reliable psychometric model that contained four latent constructs tapping negative expectancies and four latent constructs tapping positive expectancies. The respective indicators for each factor were derived from exploratory factor analysis based on a sample of high-risk drinkers and tested subsequently using CFA procedures. In the present study, parameterization of the expectancy constructs departs somewhat from the approach suggested by Leigh and Stacy. They specified second-order constructs to account more parsimoniously for the moderate relations among the four negative and likewise four positive first-order constructs. The second-order constructs reflect more generalized expectancy constructs, albeit predictive relations with alcohol should not be dissimilar from a model specifying two first-order constructs tapping positive and negative expectancies; i.e., this parameterization reflects more a conceptual refinement regarding level of statistical abstraction.

Triggers. Triggers are defined as objects, environments, or emotions that are strongly associated with alcohol consumption through repeated stimulus response pairings. A 17-item

drinking trigger (DT) scale was utilized for the 5-year follow-up study to assess situational and emotional triggers prompting alcohol consumption. Supporting information for creating face valid items was based on clinical acumen stemming from alcohol treatment, casework, and a review of the literature (Bohn et al., 1995; Love, James, and Willner, 1998; Rankin et al., 1979; Rohsenow et al., 1989). Respondents were provided a common stem, "As you know, there are many situations that can trigger an urge to drink alcohol. Circle the number, which corresponds to how much the following situation affects your desire to drink." Response categories ranged from (0) "None" to (4) "Very strong." Sample items include: "Something really bad just happened," "See my coworkers drinking," and "I'm very angry after a fight with someone."

Exploratory factor analysis of the DT scale relied on maximum likelihood extraction with varimax rotation and resulted in a clearly defined three-factor structure. Criteria for acceptance of a final solution included the scree test (Cattell, 1966), magnitude of factor loadings based on the procrustean transformation matrix, Kaiser's minimum eigenvalue rule (>1), and clarity of substantive interpretation (Zwick and Velicer, 1986). An item, "The kids are driving me crazy," did not load at the minimum threshold criteria and was eliminated. Based on the EFA results, three indicators were created, including five items assessing internal triggers (e.g., "I'm feeling down"; $\alpha = 0.92$ by the Cronbach [1951] method); seven items assessing social triggers (e.g., "I'm hanging out with friends" and "It's a family gathering"; $\alpha = 0.90$); and four items assessing work-related triggers (e.g., "I see my co-workers drinking" and "I just got paid"; $\alpha = 0.88$).

Situational Cues. A fourth latent construct reflected situational cues related to drinking and was based on the 42-item Inventory of Drinking Situations—Short Form (IDS) (Annis and Davis, 1988; Annis, Graham, and Davis, 1987; Annis and Kelley, 1984). The IDS, structured for use with clinical as well as general populations, essentially taps two cognitive-behavioral domains of situational drinking cues that may be responsible for alcoholic relapse (Marlatt and Gordon, 1980, 1985). The first domain assesses intrapersonal cues that reinforce drinking as a response to internal psychological or physical events, and a second domain assesses interpersonal cues that underscore the importance of social influences in drinking situations (Deardorff, Melges, Hoyt, and Savage, 1975). Psychometric information for the IDS indicates eight subscales with adequate reliability (αs ranging from 0.87 for urges/temptations to 0.96 for unpleasant emotions). In addition to reliability estimates, adequate content, concurrent, and predictive validity based on treatment and non–alcohol-abusing samples have been reported (Annis, 1986; Annis et al., 1987).

Factor analysis of the IDS based on the present sample resulted in a three-factor structure including subscales assessing psychological, social, and somatic motivational cues for drinking (which represent Annis's collapsed versions of the eight originally derived scales). A common stem preceded each item: "Listed below are a number of situations or events in which some people drink heavily. Read each item carefully, and answer in terms of your own drinking over the past year." A 17-item scale assessed psychological cues (e.g., "When there were fights at home" and "When someone criticized me"; $\alpha = 0.96$); a 13-item scale assessed social cues (e.g., "When something good happened and I felt like celebrating" and "When I was out with friends and they stopped by a bar to drink"; $\alpha = 0.95$); and a 12-item scale assessed somatic cues (e.g., "When I remembered how good it tasted" and "When I wanted to heighten my sexual enjoyment"; $\alpha = 0.93$). Response categories ranged from (1) "Never drink heavily in that type of situation" to (4) "Almost always drink heavily in that type of situation."

Outcome Constructs: Harmful Alcohol Use and Perceived Consequences

Harmful Alcohol Use. Three indicators reflected an outcome construct that captured harmful alcohol use. Alcohol consumption patterns were assessed using a steady pattern chart as part of the Lovelace Comprehensive Screening Inventory (LCSI) (Lapham, Wanberg, Barton, and Timken, 1996). Participants who reported drinking at least once per week provided information detailing type of beverage, amount used, and duration of use over a 7-day period broken into morning, afternoon, and evening periods. A standard ethanol content (SEC) score was computed for the week and then converted based on annual consumption patterns into a 3-month SEC total. Following computation of a composite SEC score, the resulting distribution was divided into four quartile groups ranging from (1) "No use" to (4) "Heavy use."

A second indicator assessed frequency and quantity of liquor, beer, and wine use. Frequency questions like "How many times each month do you drink whisky or spirits?" had a 5-point response scale ranging from (1) "I don't drink" to (5) "Almost daily or daily." The same question was repeated for beer and again for wine and wine coolers. A second set of items assessed quantity of liquor, beer, and wine consumption per occasion of use (e.g., "How much spirits or alcohol do you use?") with response categories ranging from (1) "Never drink" to (5) "Six or more drinks per occasion." Following computation of the individual quantity and frequency scales for the three different beverage types, the resultant scales were cross-multiplied (quantity $\times$ mean frequency) and a summary quantity/frequency (Q/F) or gross estimate consumption score was computed across the three beverages. (The resultant score was transformed logarithmically.)

A third indicator of consumption captured recent alcohol use based on three items from the LCSI: "When was the last time you drank any alcohol?" with responses including more than 1 week ago, within the past week, yesterday, and today; "With regards to your drinking pattern do you: drink on an off with no pattern, drink for several days and stop for several weeks or months, drink for several days and then not drink, and use at least some alcohol every day?"; and "Indicate the last time you used alcohol" with responses including never used, more than 1 year ago, 7–12 months ago, 3–6 months ago, and used in the last 2 months.

Perceived Consequences. A latent construct that tapped perceived consequences of high-risk drinking was reflected by indicators assessing harmful drinking patterns, the conditions when drinking occurs, and immediate negative consequences from excessive drinking. A single 30-item indicator assessing number of alcohol symptoms was taken from the computerized version of the DIS (Robins et al., 1981). Adequate validity and psychometric information has been reported for the DIS using a computerized version (Greist et al., 1987; Robins, Helzer, Katliff, and Seyfried, 1982). Sample items included "Has there ever been a period when you spent so much time drinking alcohol or getting over its effects that you had little time for anything else?" and "Has your drinking or being hung over often kept you from working or taking care of children?" Items were scored using a dichotomous yes/no format and a summary index formed that counted the total number of problems. The DIS computer program uses these symptoms as benchmark criteria for indicating a diagnosis of alcohol abuse/dependence.

The 25-item Michigan Alcohol Screening Test (MAST) (Selzer, 1971; Tulevski, 1989) was used as an indicator of alcoholism severity. The MAST items assess physical ("Have you ever had severe shaking after drinking?"), interpersonal ("Have you ever lost friends or lovers because of your drinking?"), and work-related consequences ("Have you ever lost a

job because of drinking?"). MAST scores correlate well with other measures of alcoholism severity (Horn, Wanberg, and Foster, 1987; Skinner and Allen, 1983). Included in the MAST are 12 items indicative of physical dependence on alcohol. Based on the present sample, internal consistency for the complete set of MAST items was 0.79.

Negative consequences from drinking consisted of seven items to assess the consequences of heavy drinking (Lapham et al., 1996). Work by Wanberg and Horn (1988) suggests the utility of a brief assessment of negative consequences for use with nonclinical drinkers. The scale consists of moderate symptoms associated with drinking (e.g., "Have you ever had a bad headache because of having too much to drink?" and "Have you ever passed out as a result of drinking?"). Internal consistency for the seven-item scale based on the present sample was 0.84.

Results

Characterization of Alcohol Use, Prevalence of Lifetime Alcohol Abuse, and Dependence Diagnoses

Table 1 contains information characterizing the drinking histories of the participants. About one quarter of female participants received a lifetime diagnosis of alcohol abuse (21% for male participants) and 62% received a diagnosis of alcohol dependence (70% for male participants). All participants had one or more DWIs on their record, although males were significantly more likely to have more than one DWI citation. Although not detailed in the table, several pieces of information provide insight into the drinking histories of this sample. First, with respect to recent alcohol use, slightly under one quarter of the sample indicated they had drunk alcohol within the past day, while an additional 32% indicated they had drunk within the past week. Participants also provided estimates of their drinking patterns, and 10% indicated they drank every day, and 16% of the participants indicated they binged with alcohol (drink for several days and then not drink). Almost 70% of the sample indicated they had drunk alcohol in the past 2 months, and as an indication of negative side effects, 46% indicated they had been drunk many times. Only 5% indicated "never having been drunk." With respect to drinking contexts, 25% of the sample drank at least once per week in their own homes. Of those who drank in their own homes, 39% reported having between one and four drinks, and 15% indicated they had between five and eight drinks.

Table 2 provides summary descriptive statistics for the various indicators included in the model for the entire group and by gender. There were no significant gender differences with respect to the indicators of perceived consequences, the behavioral indices of drinking, and any of the scales assessing cognitive motivation. Among the available diagnostic measures, participants also showed relatively high levels of alcohol dependence symptoms and negative consequences (Lapham et al., 1996).

Results of the Confirmatory Factor Analysis

A confirmatory measurement model consisted of the four motivational constructs including drinking urges and triggers, situational cues, positive alcohol expectancies, and negative alcohol expectancies; and two outcome constructs including harmful alcohol use and perceived consequences. To achieve dimensional purity, each set of observed indicators was constrained to have nonzero loadings on only one factor, thus mimicking simple structure.

Table 1
Selected demographic characteristics of the DWI offender sample

	Females ($n = 701$)		Males ($n = 552$)		
Risk Factor	*N*	%	*N*	%	*p* value
Age					
< 30	222	31.7	193	35	$\chi 2(3) = 1.67$
30–34	169	24.1	125	22.6	$p = .64$
35–39	125	17.8	98	17.8	
40–78	185	26.4	136	24.6	
Ethnicity					
Non-Hispanic White	245	35	199	36	$\chi 2(3) = 0.55$
Hispanic/Mexican	336	47.9	254	46	$p = .91$
American Indian	100	14.3	81	14.7	
Other	20	2.8	18	3.3	
Education					
<12 years	174	24.9	138	25	$\chi 2(3) = 2.69$
12 years	184	26.3	166	30.1	$p = .26$
>12 years	342	48.9	247	44.8	
Unknown	1		1		
Marital status					
Single	259	37	245	44.4	$\chi 2(2) = 18.27$
Married	188	26.9	170	30.8	$p \leq .001$
Divorced/separated /widowed	252	36	137	24.8	
Unknown	2		0		
Family income					
<16,800	263	41.7	143	28	$\chi 2(3) = 23.01$
16,800–31,199	191	30.3	186	36.5	$p \leq .001$
31,200 +	177	28	181	35.5	
Unknown	70		42		
Number of prior DWIs					
1	609	92.7	448	86.7	$\chi 2(3) = 14.85$
2	45	6.8	57	11	$p \leq .01$
3 +	3	0.5	12	2.3	
Unknown	44		35		
DSM-III-R alcohol diagnosis—lifetime					
No diagnosis	101	14.4	47	8.6	$\chi 2(3) = 13.15$
Alcohol abuse	167	23.9	117	21.3	$p \leq .001$
Alcohol dependence	432	61.7	385	70.1	
Unknown	1		3		

An initial CFA model indicated a less than optimal fit, $\chi^2(155) = 2141.23$, $p \leq .001$, Normed Fit Index (NFI) (Bentler and Bonett, 1980) = 0.866, Comparative Fit Index (CFI) (Bentler, 1990) = 0.874 (optimally >0.90), and Standardized Root Mean Square Residual (SRMR) = 0.076 (with smaller values <0.05 indicating better fit). The ratio of the likelihood

Table 2
Summary descriptive statistics for scale indicators used in model

Scale	# Items	All offenders			Males		Females		Pt. bi-serial correlations
		M	*SD*	Range	*M*	*SD*	*M*	*SD*	
Desire to drink	Internal (5)	1.14	1.22	0–5	1.13	1.18	1.14	1.25	0.004
	Social (7)	1.67	1.05	0–5	1.64	1.04	1.69	1.07	0.022
	Work-related (4)	1.16	1.22	0–5	1.14	1.23	1.17	1.22	0.01
Inventory for Drinking Situations	Psychological cues (17)	1.54	0.64	1–8	1.55	0.67	1.53	0.61	−0.014
	Social cues (13)	2.16	0.78	1–8	2.17	0.8	2.16	0.76	−0.006
	Somatic cues (12)	1.46	0.56	1–8	1.47	0.58	1.46	0.54	−0.006
Negative expectancy	Physical (4)	3.32	1.14	1–6	3.28	1.16	3.35	1.13	0.032
	Cognitive (4)	3.61	1.05	1–6	3.6	1.04	3.62	1.06	0.007
	Social (3)	2.77	1.16	1–6	2.78	1.17	2.77	1.15	−0.005
	Emotional (3)	2.88	1.14	1–6	2.87	1.14	2.9	1.15	0.012
Positive expectancy	Social (6)	3.63	0.98	1–6	3.65	0.98	3.62	0.99	−0.014
	Tension (3)	3.48	1.07	1–6	3.47	1.09	3.48	1.05	0.004
	Fun (6)	3.94	0.92	1–6	3.94	0.92	3.95	0.93	0.006
	Sexual (4)	3.35	1.22	1–8	3.29	1.2	3.4	1.23	0.046
Harmful alcohol use	Recent alcohol use (3)	1.54	0.71	0–3.33	1.54	0.71	1.54	0.71	0.006
	Gross estimate (6)	2.73	1.47	0–5.98	2.69	1.47	2.76	1.48	0.025
	Standard ethanol content[a]	2.49	1.13	1–4	2.45	1.12	2.52	1.14	0.028
Perceived consequences	Alcohol symptoms (30)	4.43	2.34	0–9	4.4	2.42	4.46	2.28	0.013
	MAST score (25)	15.05	12.22	0–55	14.94	12.05	15.14	12.36	0.008
	Negative consequence (7)	10.61	5.6	0–21	10.55	5.55	10.67	5.65	0.01

[a]Standard ethanol content (SEC) is computed using a steady pattern chart, which captures the average consumption patterns based on beverage type, amount, and duration over several episodes. The formula for computing SEC is # oz × % alcohol × 2. SECs were computed for a normal drinking week and then computed per drinking day for a year, 3-month period, and peak drinking episodes.

test statistic to degrees of freedom ($\chi^2/df = 13.81$) is more than twice the desired benchmark value (<5), and the CFI falls short of the 0.90 criteria (Hu and Bentler, 1998). Despite the less than adequate fit, standardized factor loadings were all moderate and significant, attesting to the reliability of the hypothesized factors themselves. We then respecified the model, using information from empirical specification searches conducted with the LaGrange modification indices (LM) (Chou and Bentler, 1990). The LM test highlights model refinements that capture nonfactor determined, measurement-specific variances (often reflecting method variation) and help to improve the overall model fit (MacCallum, 1986).

A total of four correlated residuals were added, including an association between indicators of social cues from the IDS and social urges from the desire to drink scale ($r = 0.52$, $p \leq .001$); psychological situational drinking cues from the IDS and internal triggers from the desire to drink ($r = 0.55$, $p \leq .001$); recent alcohol use and SEC from the harmful alcohol use factor ($r = 0.44$, $p \leq .001$); and negative consequences from perceived consequences and the Q/F gross estimate of drinking measure from harmful alcohol use ($r = 0.36$, $p \leq .001$). The addition of these four correlated residuals significantly improved the overall fit of the model, $\Delta\chi^2(4) = 665.3$, $p \leq .001$ [augmented model fit $\chi^2(151) = 1475.97$, $p \leq .001$, NFI = 0.908, CFI = 0.916, and SRMR = 0.067]. At this point, no further modifications altered the overall model fit more than the 3.84 χ^2points required for each single degree of freedom. The correlation between model parameters prior to adding residual correlations and estimates obtained after the model modifications was 0.95, indicating little disfigurement in the model parameters following the changes. Figure 1 shows the final measurement model with standardized factor loadings for the indicators.

Table 3 contains correlations among the latent constructs corresponding to the final CFA model and should be read in conjunction with the standardized factor loadings presented in Figure 1. The largest magnitude of overlap was between situational cues and perceived consequences ($r = 0.66$). Among the four motivational constructs, the largest association was between negative and positive alcohol expectancies ($r = 0.59$). All four motivational constructs were moderately and significantly related to harmful alcohol use.

Table 3
Factor intercorrelations from confirmatory measurement model

	F1	F2	F3	F4	F5	F6
Desire to drink (F1)	−0.82	0.56	0.167	0.363	0.476	0.529
Inventory of Drinking Situations (F2)		−0.83	0.275	0.418	0.474	0.655
Negative alcohol expectancies (F3)			−0.78	0.587	0.064*	0.509
Positive alcohol expectancies (F4)				−0.81	0.327	0.528
Harmful alcohol use (F5)					−0.98	0.524
Perceived consequences (F6)						−1

Note. $N = 1253$. All correlations significant $p \leq .001$ unless otherwise noted ($^*p \leq .05$). Numbers on diagonal represent estimates of internal consistency computed by the Werts, Linn, and Jöreskog (WLJ) (1974) method for structural composites. The WLJ computational method provides a more conservative estimate of the lower bound Cronbach's (1951) alpha and corrects the estimate of internal consistency for measurement error. A series of fully saturated latent variable models that specified first-order constructs were conducted to obtain the parameter estimates used in the WLJ formula for computing alpha.

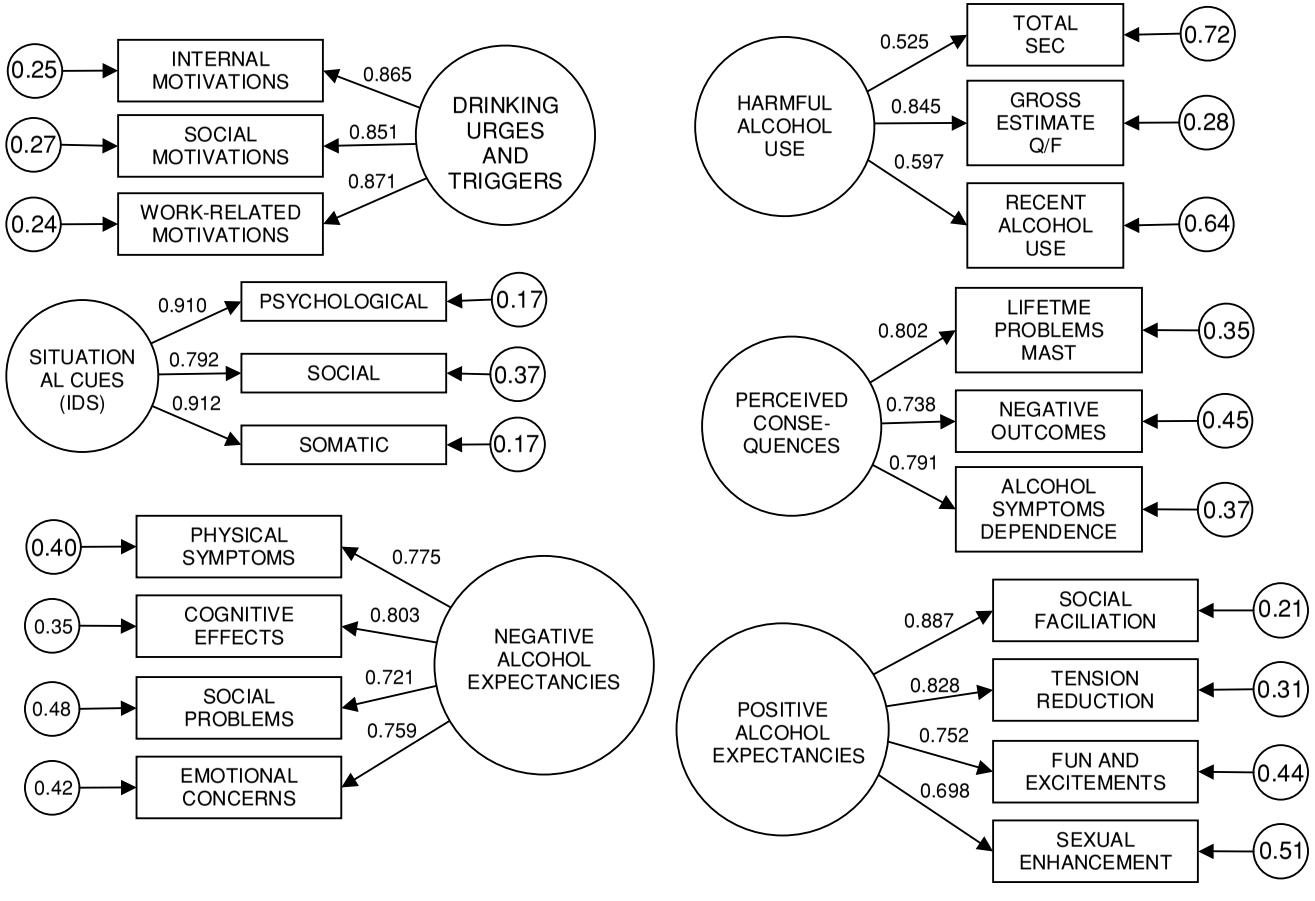

Figure 1. Results of confirmatory measurement model depicting cognitive motivational predictor constructs and outcome factors of harmful drinking and perceived consequences. Large circles represent first-order factors, and smaller circles with numbers inside reflect residual error variances for indicators. All estimates are standardized. All loadings are significant ($p \leq .001$), based on z-critical test of unstandardized estimate divided by its standard error.

The two largest correlations were between harmful alcohol use and drinking urges/triggers ($r = 0.48$) followed by alcohol and situational cues ($r = 0.47$). Another association worth noting is the relatively small, albeit significant, association between negative expectancies and harmful alcohol use ($r = 0.06$).

Results of the Structural Equation Model Predicting Harmful Alcohol Use

Specification of the SEM varied only slightly from the CFA by replacing the correlations between motivational constructs and the factors of harmful alcohol use and perceived consequences with regression paths. Even with these slight modifications, an initial SEM had the same fit as the CFA model (with the degrees of freedom remaining identical with the different structural configuration). We then conducted additional specification searches using the framework of identifying nonstandard paths from motivational constructs to high-risk drinking and associated negative consequences. A final, well-fitting SEM included three additional regression paths, $\chi^2(148) = 1026.90$, $p \leq .001$, NFI $= 0.930$, CFI $= 0.937$, SRMR $= 0.057$. [The modified model improved significantly on the base model, $\Delta\chi^2(3) = 87.59$, $p \leq .001$.]

Results of the final SEM are included in Figure 2. Situational cues had the largest overall effect on harmful alcohol use followed in order by drinking urges and triggers, positive, and

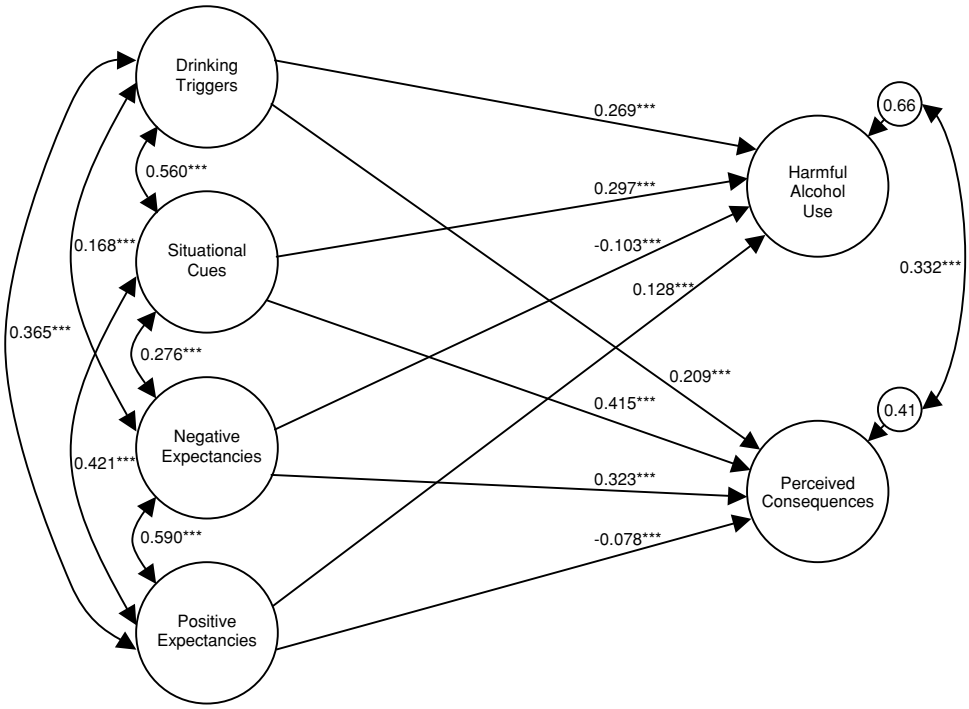

Figure 2. Final structural equation model showing unique effects of cognitive motivational factors on high-risk drinking and perceived consequences. Curved lines with numbers represent correlations among exogenous predictors or small associations. Small circles with numbers inside for outcome constructs are disturbance terms capturing residual variation net of prediction. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

negative alcohol expectancies. In addition, all four motivational constructs were associated significantly with perceived consequences. Situational cues had the largest overall effect, followed in decreasing order of magnitude by negative alcohol expectancies, drinking urges and triggers, and positive alcohol expectancies.

Correlations among the four latent predictor constructs remained relatively intact (with all being significant), and the model also included an association between harmful alcohol use and perceived consequences ($r = 0.332$, $p \leq .001$). The three additional regression effects included paths between negative emotional expectancies and total SEC ($\beta = -0.049$, $p \leq .05$); positive fun expectancies and negative consequences (an indicator of perceived consequences: ($\beta = 0.165$, $p \leq .001$); and positive fun and excitement and the latent construct of harmful alcohol use ($\beta = 0.220$, $p \leq .001$).

Inclusion of Exogenous Predictors

Previous empirical studies with this select sample of DWI recidivists have shown that age (less than vs. more than 30 years of age), education level (greater than vs. less than or equal to 12 years of education), ethnicity (Hispanic vs. all other ethnicities and non-Hispanic White vs. Hispanic and all other ethnicities), and total number of DWI citations relate statistically to various facets of high-risk drinking (i.e., MAST scores and alcohol involvement) (Lapham et al., 1995, 1997). Failure to include relevant predictors might bias the obtained regression parameters. A final model examined the relative influence of these four covariates plus gender as exogenous measures. Gender was included because males are more likely to abuse alcohol, be arrested for DWI offenses, and report more adverse alcohol-related consequences. Females, on the other hand, are more vulnerable to the effects of alcohol, partly because their metabolism of alcohol differs substantially from males, and this may increase the potential for intoxication among females.

This final model fit well (while all other parameters obtained with the previous SEM carried over), $\chi^2(232) = 1771.14$, $p \leq .001$, NFI = 0.900, CFI = 0.912, SRMR = 0.056, although there was some notable decrement in fit compared to the final SEM. (The models are not nested and therefore cannot be contrasted statistically.) Being male and non-Hispanic White led to higher harmful alcohol use ($\beta = -0.100$, $p \leq .01$ and $\beta = 0.137$, $p \leq .01$, respectively). Males also reported more perceived consequences ($\beta = -0.06$, $p \leq .001$) and total DWI offenses ($\beta = -0.100$, $p \leq .001$), and subjects of Hispanic ethnicity (Hispanic coded as "1" vs. all other race groups coded as "0") reported more negative consequences ($\beta = -0.100$, $p \leq .001$). Only a few of the correlations among the six exogenous predictors and between the exogenous predictors and four motivational constructs were of sizable magnitude and worth noting. These included non-Hispanic White participants reporting more education ($r = 0.135$, $p \leq .001$), and individuals reporting more DWI offenses also reported more drinking urges ($r = 0.147$, $p \leq .001$) and more situational cues ($r = 0.167$, $p \leq .001$).[2]

[2]The sample size was sufficiently large enough to conduct tests of factorial invariance and structural equivalence based on gender. Formal tests of measurement invariance examine whether the obtained dimensional structure (factor loading) differs based on gender. Following recommended conventions for testing model invariance (Byrne, Shavelson, and Muthén, 1989), we first tested factor loading invariance and obtained a model with partial invariance between female and male participants. Only one indicator out of a possible 20 constraints varied between male and female participants, and this included sexual enhancement, an indicator loading on positive expectancies ($\lambda = 0.746$ females and $\lambda = 0.642$ males). A model with one relaxed constraint significantly improved on the base model with no relaxed constraints, $\Delta\chi^2(1) = 7.8$, $p \leq .001$. The next step examined equivalence for the structural component of the model (paths from motivational constructs to problem drinking and

Discussion

This study provides first-hand evidence that cognitive motivational factors other than expectancies are efficient predictors of drinking in a high-risk sample of DWI offenders. Essentially three lines of converging empirical evidence support this claim. First, the results of the CFA analyses support the hypothesized dimensional structure of the four motivational and two outcome constructs. Evidence from the standardized factor loadings for each construct reinforce that the factors were well conceptualized using a diverse set of social, psychological, work-related, and somatic cues to capture the different facets of cognitive motivation. The relations between constructs support a modicum of conceptual overlap; however, each construct also captures distinct pieces of cognitive motivation. Importantly, there is insufficient evidence to support collapsing all four motivational constructs into a single higher order factor, suggesting that cognitive motivation is comprised of at least four unique motivational components associated with drinking alcohol.[3] Furthermore, post hoc specification searches did not support adding cross-factor loadings, lending support to the simple structure hypothesized for the factor structure.

Model refinements included four correlated residuals that made conceptual sense and helped to capture meaningful relations not elaborated in the hypothesized factor structure. Interestingly while the loadings for the various motivational constructs were fairly well balanced indicating equal contribution to the underlying factor structure, the same could not be said for the alcohol use and consequence constructs. The magnitude of the gross estimate (Q/F) indicator was considerably larger than either the SEC or recent alcohol use indicators. The Q/F measures of alcohol consumption have been a staple part of alcohol research (Lemmens, Tan, and Knibbe, 1992) and are recognized as reliable indicators of consumption with applications in both epidemiological and clinical treatment settings (Skinner and Sheu, 1982).

A second piece of evidence comes from the structural analyses and reinforces the independent contribution of each construct toward predicting drinking and perceived consequences of drinking. The largest effect size in both cases was associated with situational cues, which included indicators tapping psychological (e.g., letting oneself down, having an argument with a friend, and getting angry at something), social (e.g., relaxing and having a good time), and somatic cues (e.g., how good it tasted, passing by a liquor store, and heightened sexual enjoyment). In developing the IDS scale, Annis and colleagues primarily sought to construct a scale that taps situations that render alcoholics vulnerable to relapse.

consequence outcomes). A model positing equivalence for males and females fit well, and post hoc empirical specification searches indicated no improvements in the model fit would be obtained by relaxing any of the constraints. The final step involved testing whether covariance structures among the four motivational constructs and two outcome constructs differed based on gender. The LM test indicated two constraints should be freed including the correlation between situational cues and alcohol use ($r_{S,A} = 0.437$ females and 0.523 males, $p \leq .001$) and between alcohol use and consequences ($r_{A,C} = 0.562$ females and 0.468 males, $p \leq .001$) [nested difference test: $\Delta\chi^2(2) = 11.3$, $p \leq .001$]. Overall, the combined tests hypothesizing factorial invariance, structural invariance, and equality of covariances indicated little practical difference between male and female participants.

[3] An empirical test of a second-order measurement model that specified a single unitary construct reflecting cognitive motivation did not fit well [$\chi^2(73) = 1508.92$, $p \leq .001$, NFI = 0.871, CFI = 0.876, SRMR = 0.103]. All the loadings for the four primary (first-order) constructs were significant and included drinking urges/triggers ($\lambda = 0.660$, $p \leq .001$), situational cues ($\lambda = 0.748$, $p \leq .001$), negative expectancies ($\lambda = 0.475$, $p \leq .001$), and positive expectancies ($\lambda = 0.640$, $p \leq .001$). The disparity in the magnitude of the standardized loadings indicates some appreciable conceptual differences in what each motivational construct assesses and supports retaining the primary first-order structure.

In this respect, respondents were asked to indicate how frequently they drank heavily under different circumstances. The measure of situational cues contained an assortment of cognitive instigators over which the alcoholic has little control. Based on the factor loadings for the three indicators (psychological, social, and somatic) it appears that social cues play a less influential role compared to psychological and somatic cues, possibly alluding to the importance of internally regulated cues as more salient driving forces in high-risk drinking. Woldt and Bradley (2002) also reported strong prediction from situational cues using a sample of male DWI offenders. Their study of drinking motives included measures of enhancement (e.g., drinking to have a good time), coping with negative emotions, and interpersonal facilitation (e.g., feeling less shy or worried in a social situation), all of which overlap conceptually with the IDS measures.

A third important piece of evidence comes from the prediction of perceived consequences of harmful drinking, which we modeled along with actual drinking behavior as an outcome construct. The perceived consequence measures reflect a hybrid construct capturing different elements of the dependence symptoms and problems that accompany "heavy drinking." Again, all four cognitive motivational constructs predicted the consequence outcome, and again the effect of situational cues was sizably larger in magnitude compared to other facets of cognitive motivation. As expected, the two expectancy constructs were differentially associated with perceived consequences. It was no surprise that the association between negative expectancies and perceived consequences was larger and positive, whereas the same relation for positive expectancies and consequences was smaller and negative. At face value alone, we would expect the expectancy constructs would share the most variance with perceived consequences especially given that both expectancy and perceived consequence items tap anticipated (action) outcomes associated with drinking. Take for instance the negative expectancy items which assessed typical alcohol-related problems including hangovers, headaches, and unpleasant physical effects. One would expect these items would pair nicely with MAST symptoms, many of which also capture unpleasant side effects and problems stemming from excessive drinking.

The present findings reinforce a stronger linkage between somatic and psychological events (situational cues) that prompt "heavy drinking." Sample cues contained in the IDS include fights, arguments, and problems with people at work, all of which imply a need for adaptive coping strategies to help the high-risk drinker to offset pressures or demands. Rather than implementing any one of several effective coping responses that would attenuate the effect of various stressors, DWI offenders respond by drinking, and their concern regarding potential deleterious effects from drinking does little to mitigate their drinking. Observation and recognition of this direct cognitive connection bodes well for treatment providers who now have additional concrete evidence of a type of cognitive vulnerability that may revolve around poor coping mechanisms. The sequence of cognitive events precipitating drinking reinforces the need to develop internal control and self-regulatory mechanisms that attenuate stress, mollify the influence of relapse-based cues, and dampen urges to drink as part of therapeutic interventions.

The relative strength of one type of cognition over another may result from the absolute reinforcement power attributed to a specific cognition. For instance, situational cues may carry a greater influence in predicting drinking outcomes (and perceived consequences) because they involve closer ties between meaningful and important social events and actual or anticipated outcomes. Urges and triggers, on the other hand, may represent cognitive representations of physiological events, which are not shared consensually, are less powerful and reinforcing, and therefore are less motivating.

The addition of several key demographic characteristics that have been shown to influence consumption patterns as well as consequences stemming from consumption indicated a few small albeit significant effects associated with gender and total number of DWI offenses. Overall, males were at greater risk for drinking, drinking-related consequences, and DWI offenses. Follow-up multiple group comparison analyses reinforced the equivalence of dimensional structures for male and female participants. Likewise, this pattern extended to the structural path coefficients, which did not vary significantly for male and female participants. The apparent similarity in the structure and operation of cognitive vulnerability comes in stark contrast to noted gender differences in reported consumption patterns. Despite differences in behavioral practices, the possibility exists that broad-brush cognitive-based interventions targeting deeply ingrained and learned patterns of thinking about drinking might fare equally well with both male and female alcoholics.

Implications for Treatment

Clarification of the various motivational factors that precede high-risk drinking holds great promise for a wide range of alcoholism and alcohol abuse treatment approaches. Numerous examples exist of treatment modalities that use cognitive and behavioral control strategies to help alcoholics to effectively overcome urges and motivations to drink (e.g., Harris and Miller, 1990; Miller, Leckman, Delaney, and Tincom, 1992; Miller and Taylor, 1980; Sanchez-Craig, Annis, Bornet, and MacDonald, 1984). A guiding principle in many, if not all, of these studies was the emphasis on self-efficacy and efforts to redirect, mitigate, and even extinguish internal thought processes that increase vulnerability and tempt alcoholics to drink (Zweben and Fleming, 1999). At a minimum, a cognitive-behavioral therapeutic intervention emphasizing cognitive restructuring or problem-solving approaches would involve imparting a variety of personal control and self-regulatory skills that help drinkers to diminish or resist the influence of drinking-related cognitions. Programs of this nature encourage drinkers to increase their vigilance to internal cognitive or environmental cues and apply alternative and more effective (health-enhancing) strategies.

As an example of cognitive restructuring, drinkers can learn to implement self-statements that help them to offset social pressures to drink (e.g., "I can't drink with you today, I have certain things I must do") as well as learn new self-schemata that provide health-enhancing alternatives to drinking (e.g., "I can't hang out at the bar because I'm scheduled to meet someone at the health club"). In certain situations, personal control and self-regulation is combined with instrumental support mechanisms that can help to abate temptations arising from stressful or highly charged cognitive states. Alcoholics can be taught to rely on social support mechanisms (i.e., friends and recovering alcoholics) to offset immediate urges, and therapeutic interventions can be appropriately staged to increase the drinker's reliance on personal control and self-management strategies.

Researchers and clinicians alike concerned with distilling the meaning of relapse may also benefit from greater clarification of the cognitive processes that stimulate high-risk drinking (Miller, 1996). The present findings clearly articulate that a broader conceptualization of relapse that emphasizes a diverse set of cognitive motivational factors may be required. Models of alcohol treatment have been particularly concerned with the role of urges, triggers, and cravings, and alcoholics themselves have rated these as important precipitants to their renewed drinking efforts. Despite being regarded as hallmark features of relapse, in the present study triggers and urges placed second behind situational cues in their relative prediction of high-risk drinking. Second, perceived consequences of drinking and a host of dependence-based symptoms stemming from drinking also need to be factored

into the motivational sequence that precedes or defines conditions of relapse and high-risk drinking. In essence, the decision to drink does not come without an assessment of the costs associated with drinking, including evaluation of negative outcomes (expectancies) and associated problems.

Limitations of the Present Study

There are a number of limitations associated with this study. First, the cross-sectional nature of these data limits any inferences regarding causality. Future studies incorporating longitudinal follow-up with repeated measures will be better situated to identify temporal relations among these important constructs.

Second, even with the inclusion of four highly relevant motivational constructs conceptually linked with high-risk drinking, there was still a relatively large amount of variance left unaccounted for in the outcome constructs (the values of R^2 were 0.66 and 0.41 for the drinking and perceived consequence measures). In light of this, additional measures that have been empirically linked with high-risk alcohol use (e.g., personality and physiological factors) need to be included. Inclusion of additional domains of risk (cognitive and otherwise) coupled with a greater articulation of the more proximal processes linked to drinking should be informative with respect to treatment initiatives.

Third, we chose to posit a direct effect model even in light of suggested mediating mechanisms posited by cognitive learning theory and supported through empirical studies addressing expectancies in youth (Scheier and Botvin, 1997) and other motivational factors with the general population (e.g., Adesso, 1985). Models positing generative mediating mechanisms might suggest, for instance, that situational cues or triggers influence expectancies, which in turn serve to regulate actual consumption. We modeled only the relatively unique role for each cognitive motivational construct in an attempt to establish primacy among the different motivational components. Future researchers may want to consider more elaborate cognitive models that mimic decision processes fostering high-risk alcohol use. Without being able to dissect the *black box* into its constituent pieces and determine with first-hand information the actual sequence of cognitive events, we can only impose hypothetical models and check their heuristic utility using available statistical conventions. As we move forward in our understanding of the cognitive basis for drinking, the next step should consider using the present empirical findings as a springboard and testing alternative and more well-defined models that posit more complex sequences of cognitive events leading to high-risk alcohol use.

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RÉSUMÉ

Les théories motivationnelles d'engagement à la consommation de boissons alcoolisées soulignent une grande gamme de facteurs cognitifs comme précurseurs à boire avec excès ou à haut risque. Les éléments centraux dans cette réflexion sont les espérances, les envies d'alcool, des éléments déclencheurs, et des signaux situationnels, dont chacun peut en synergie ou d'une manière indépendante stimuler à boire. Malheureusement, les études empiriques ont scruté des buveurs légers ou modérés, tirés de la population générale et moins est connu du rôle des facteurs cognitifs comme les précurseurs à boire à haut risque. La présente étude examine la contribution unique de plusieurs mesures de motivation cognitive à l'usage nocif de l'alcool dans un échantillon de conducteurs déclarés coupable pour leur

alcool au volent. L'analyse factorielle confirmatoire a indiqué la solidité psychométrique d'un modèle avançant quatre constructions latentes de facteur prédictif évaluant les Envies d'alcool, les Signaux Situationnels, les Espérances Positifs et Négatifs, et les construits latents évaluant l'usage nocif d'alcool et les conséquences perçues de la consommation problématique d'alcool. Un modèle d'équations structurelles a indiqué que chaque construit latent de motivation a été associée de façon unique tant avec la consommation qu'avec les conséquences perçues, avec le plus grand effet général dans les deux cas associés avec les signaux situationnels. Les résultats sont discutés en matière d'identifier les facteurs cognitifs importants qui peuvent encourager l'usage nocif d'alcool parmi les populations à haut risque et leurs implications pour le traitement.

RESUMEN

Las teorías de motivación por usar el alcohol regularmente acentúan una gran variedad de factores cognoscitivos que sirven de precursores al beber en grandes cantidades o con riesgo elevado. El tema central a esta consideración han sido las expectativas, los impulsos de beber, las cosas que provocan beber, y las señales circunstanciales, que pueden estimular sinérgicamente o independientemente beber. Desafortunadamente, los estudios empíricos han examinado a bebedores de bajo volumen o moderados seleccionados de la población en general y se sabe menos sobre el papel de factores cognoscitivos que pueden ser precursores al beber de riesgo elevado. Este estudio examina la contribución única de varias medidas de motivación cognoscitiva del uso dañino del alcohol en una muestra de personas condenados por conducir bajo los efectos del alcohol. El análisis factorial confirmativo indicó la validez psicométrica de un modelo que postuló cuatro construcciones latentes del pronosticador que determinaban los impulsos/provocadores de beber, las señales circunstanciales, las expectativas positivas y negativas, y las construcciones del resultado que determinaban uso dañoso del alcohol y consecuencias percibidas del beber dañino. Un modelo de ecuación estructural indicó que cada construcción de motivación fue asociada únicamente al beber y a las consecuencias percibidas, con el efecto general mayor en ambos casos asociado con indicaciones situacionales. Los resultados se presentan en términos de la identificacion de los factores cognoscitivos prominentes que pueden fomentar el beber dañino dentro de poblaciones de riesgo elevado y las implicaciones de esos factores para el tratamiento.

THE AUTHORS

Lawrence M. Scheier, Ph.D., is president of LARS Research Institute, Inc., a Nevada-based nonprofit company specializing in prevention science, program development, evaluation, and behavioral science technology transfer. LARS is funded through NIH grants and private sector contracts. Dr. Scheier's research focuses on vulnerability of adolescents to drug use and deviance, cognitive models of racial identity, self-efficacy, social marketing of health persuasion campaigns, and longitudinal methodology. Dr. Scheier is the coauthor of the *Complete Writing Guide to NIH Behavioral Science Grants* (Oxford University Press, 2008) and editor of the *Handbook of Drug Use Etiology* (American Psychology Association, 2006). Dr. Scheier

was P.I. of the methodology core at the Cornell University Medical College Multiethnic Drug Abuse Prevention Research Center, a NIDA-funded center evaluating Life Skills Training, a middle school, drug abuse and violence prevention program.

Sandra C. Lapham, M.D. is a board-certified physician in internal medicine and directs the not-for-profit Behavioral Health Research Center of the Southwest (BHRCS), a center of Pacific Institute for Research and Evaluation (PIRE), located in Albuquerque, New Mexico. In 2002 Dr. Lapham established Behavioral Research, Inc., to develop commercial applications for products and services in support of BHRCS. Her research focuses on interventions for substance-abusing populations; computerized assessments aimed at improving health in special populations (e.g., pregnant women, adolescents, impaired drivers); methods for screening, treating, and sanctioning convicted impaired-driving offenders; implementation of opiate replacement treatment programs; testing new pharmaceuticals in addiction medicine; workplace substance abuse prevention; and substance abuse policy research. She can be reached at slapham@bhrcs.org.

Janet C'de Baca, Ph.D., is a research scientist at BHRCS, a center of the Pacific Institute for Research and Evaluation. Dr. C'de Baca is a licensed clinical psychologist with expertise in substance abuse research and treatment. Her research focuses on alcohol and drug addiction, screening and intervention programs for impaired drivers, and prevention programs for high-risk juveniles. She has been involved in the development and application of a risk behavior–screening instrument for use with adolescents. She has coauthored a book on sudden personal transformations. She currently has an NIH grant to compare the effectiveness of a cognitive-behavioral training program to a drug education program in reducing rearrests and substance use among youth involved with the juvenile justice system. She also is a motivational interviewing trainer. She can be reached at jcdebaca@bhrcs.org.

Glossary

Cognitive motivation: A formulation used to infer internal cognitive activity (i.e., thought and memory) as impetus to behavioral action. Usually distinguished from a learned behavioral response that is mediated by pure sensorimotor or muscular reflex activity. The cognitive component suggests neural activity that is based on anticipation or selection of outcomes with specific reinforcement contingencies.

Confirmatory factor analysis (CFA) also called a measurement model: A technique available in covariance structure analysis that posits relations between observed (manifest)

measures and latent unobserved constructs (also called latent factors). The implied model and its associated parameterization are evaluated with regard to its fit with a set of observed data. A CFA model implying simple structure posits that measured variables will have nonzero loadings on one and only one latent factor. Differs from an exploratory factor analysis by virtue of the ability of the researcher to parameterize a specific model and then evaluate the inferential fit of this model against sample variances and covariances.

Cravings: A subjectively experienced motivational state, often considered a form of appetitive desire, and closely linked to expectancies, beliefs, and anticipatory responses. Cravings are thought of as internal cues that may arise from dependence and physiological signals. Cravings in a social-cognitive model are effortful and involve mental representations or schemata that include drinking activity. Cravings are thought to *arouse* central motive states that induce fixed behavior patterns directed toward drinking. In this respect, they acquire incentive motivational properties by repeated pairings with alcohol consumption and reinforcement from drinking. Cravings can be assessed with verbal reports in clinical situations, through self-report paper-and-pencil assessment, or include physiological markers assessed in a laboratory setting.

Driving while intoxicated (DWI): A legal term referring to the offense of driving a motor vehicle while intoxicated. Usually indicated by state mandated blood alcohol levels and supported by psychomotor and cognitive tests given on-site by police officers. Significant impairment determined through analysis of gait, motor movement, coordination, and verbal performance. Standardized tests of blood alcohol level are the accepted legal criteria for constituting a DWI conviction. A DWI conviction is more commonly known as drunk driving and may also be called driving under the influence in some jurisdictions.

Expectancies: A social-cognitive term used to refer to beliefs about the positive beneficial effects as well as negative or harmful consequences anticipated from behavioral engagement. In alcohol terminology, expectancies capture a wide range of physiological, cognitive, physical, emotional, social, and behavioral effects related to drinking. A key feature of expectancy theory is the role of *expectancy*, which derives from social-cognitive learning theories. Expectancy is a belief or cognitive anticipation of behavioral outcomes that has an intrinsic motivational property. The expectancy or belief is based on past performance (direct mastery experiences) and can also derive from vicarious observational experiences that incorporate reinforcement. Some learning theorists believe that learning is an accretion of new expectancies avoiding an S→R connection and creating S→S* relations. These S→S* relations take on incentive or motivational properties even in the absence of a conditioned response and represent links from cue to consequences.

Latent construct: A statistical abstraction based on the intercorrelation of several measured or observed indicators (assessed by using scales or single items). Usually, when three or more observed indicators are moderately correlated and contain an element of conceptual overlap, an *unobserved* latent construct is hypothesized to statistically *cause* the associations among the observed indicators. A latent construct is modeled based on classic psychometric theory with specified true and error variance terms. Loadings of the observed indicators on the latent construct are free from random error and thus provide a higher level of statistical reliability. A latent construct can be modeled as an independent predictor or dependent factor.

Learning theory: A useful explanatory framework that links an exteroreceptive or interoreceptive stimulus with a specific behavioral response through reinforcement schedules.

Most learning theory incorporates classical or operant conditioning as well as instrumental learning to shed light on behavior. Significant debate exists among learning theorists regarding the role of cognitive *mediators*, which can be applied in the current study to concern about triggers, cues, expectancies, and cravings, all of which mediate behavioral effects of drinking.

Measurement model: A component of a structural equation model that articulates the relations between observed indicators and latent constructs. The measurement model tests the psychometric adequacy of proscribed relations based on error-free loadings that mimic standardized factor loadings obtained from varimax rotated exploratory factor analysis.

Reinforcement: An event that increases or decreases the likelihood of a behavioral action or response. The concept of reinforcement is used primarily in learning theory to establish a link between internal cognitive events and responses (i.e., behavioral actions). Reinforcement has a *response-strengthening* effect, which is generally attributed to *incentive motivation* or *incentive cue*.

Situational cues: In a learning theory framework, there are certain events that *initiate* behavior by their association with the incentive cues and have associative control over a response of drinking. Such cues or events might include bars, paychecks at the end of the week, seeking relief from tension, and a host of related situational events that occur with some frequency. Either by habit strength or some other connection, these motivating cues elicit fixed action patterns that involve drinking. In learning terms, cues are *discriminative stimuli* that indicate new environmental contingencies are operative.

Structural equation modeling (SEM): A statistical approach based on covariance analysis that uses matrix algebra to solve simultaneous regression equations. An outgrowth of path analysis but can include latent factors and observed variables. A model involves specification of statistical relations between measures, which is then tested against sample data. The values of parameters associated with the statistical relations can either be fixed (set at zero) or free to take on any value. The fit of a model is inferentially evaluated based on the degree of convergence between the fixed and free parameters in the model with actual sample covariances and variances.

Triggers: Defined as objects, environments, or emotions strongly associated with alcohol consumption through repeated stimulus response pairings. In effect, triggers represent the stimulus in the paired stimulus–response learning set and provide the initial cognitive elicitation or excitation that leads to drinking.

Urges: Considered *mental way stations* with an appreciable affective component, urges can result from an unconditioned or conditioned drug withdrawal response, response to tolerance, or an operant reinforcement that elicit a hedonic response. Urges can be conditioned to environmental stimuli. Some theorists suggest that urges are cognitive manifestations of the anticipation of withdrawal relief. For example, gustatory activation by smelling alcohol can induce drinking urges, and likewise sniffing cigarette smoke in a bar can tempt someone who is trying to quit smoking. In both cases, aversive behaviors or withdrawal stimuli are avoided by succumbing to the urges. Positive reinforcing and appetitive, excitatory effects of the drug can also be causes of urges.

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