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Relationships between Drinking Motives and Smoking Expectancies among Daily Smokers who are also Problem Drinkers

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Abstract

Objective—There is a high co-occurrence of problem drinking and regular cigarette smoking, and cognitive processes (e.g., motivation to use, expectations about the consequences of use) related to each are positively associated with one another. We explored drinking motives in relation to cognitive-based smoking processes among smokers with problematic drinking. We expected that drinking coping motives would be associated with smoking consequences related to negative reinforcement and negative personal outcomes, and inflexibility of smoking behavior; observed effects for coping motives would be unique from shared variance with other motives and incrementally evident beyond the variance accounted for by tobacco-related health problems, smoking rate, negative affectivity, cannabis use, and gender.

Methods—The sample included 195 individuals recruited into a larger study of smoking cessation treatments (i.e., they were interested in quitting), who were heavy drinkers and smoked daily. Participants were primarily male ($n = 122$, 63%), fairly young ($M_{age}=30.3$ years; $SD=12.46$), and predominantly White/Caucasian ($n = 175$, 80%). Roughly 57% ($n = 111$) had at least one comorbid Axis I disorder, the most common being social anxiety ($n = 21$, 11%) and generalized anxiety disorder ($n = 12$, 6%).

Results—Coping drinking motives predicted negative smoking consequences, negative reinforcement, and smoking inflexibility. Enhancement drinking motives marginally predicted positive reinforcement. Conformity drinking motives predicted smoking consequences related to appetite/weight control. Social drinking motives predicted negative reinforcement and barriers to cessation, and marginally predicted positive reinforcement.

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DISCLOSURES

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Conclusions—Theoretical models and clinical activities focused on smoking cessation among problem drinkers may benefit from considering the role of drinking motives, particularly coping-oriented motives, to better understanding cognitive-based smoking processes.

Keywords

smoking; alcohol; cognition; motivation

There is broad-based empirical evidence of high co-occurrence between the health behaviors of cigarette smoking and alcohol use problems (Bobo, 1989; Falk, Yi, & Hiller-Sturmhofel, 2006). Relative to those who do not have alcohol dependence, individuals with a history of alcohol dependence are more likely to smoke daily (Kozlowski & Ferrence, 1990), smoke at a higher rate, and have greater difficulty quitting smoking (Burling & Ziff, 1988; Istvan & Matarazzo, 1984; Jiang & Ling, 2013; Van Zundert, Kuntsche, & Engels, 2012).

Conversely, cigarette smokers drink more frequently and in higher quantities relative to non-smokers (Anthony & Echeagaray-Wagner, 2000; Chiolero et al., 2006; Dawson, 2000; Falk et al., 2006; Kahler et al., 2009). Studies also suggest that alcohol-smoking relations are often bi-directional (i.e., they influence the onset and course of one another; Haas & Smith, 2012; Harrison, Hinson, & McKee, 2009; Jones, Oeltmann, Wilson, Brener, & Hill, 2001; Krukowski, Solomon, & Naud, 2005; Reed, Wang, Shillington, Clapp, & Lange, 2007). Notably, alcohol consumption combined with cigarette smoking increases the risk of numerous health conditions such as various types of cancer (e.g., oral, pharyngeal, laryngeal, esophageal, and lung cancer) relative to only smoking, only drinking, or neither smoking or drinking (Blott et al., 1988; Sees & Clark, 1993). Thus, examination of co-use of the two substances is clinically important.

A growing body of concurrent substance use literature has shown that cognitive processes related to alcohol use impact smoking and vice versa (e.g., Cooney et al., 2007; Shiffman & Paty, 2006). Findings indicate that cognitive processes related to alcohol use more strongly impacted cigarette use than cognitive processes related to smoking impacted drinking (Piasecki et al., 2011), which lends credence to the notion that smoking behavior is, at least in part, contingent on cognitively-based processes related to alcohol (Shiffman & Paty, 2006). Such processes include motivation. Motivational models for substance use can be usefully applied to the co-occurrence of substance use behavior because they recognize that there are a number of distinct motives for using substances that can vary both between and within individuals (Cooper, 1994). That is, two individuals may use a substance(s) for different reasons, and one individual may use for multiple types of reasons. Motivational models globally predict that distinct motives may, theoretically, be related to particular types of problems (Cooper, 1994). For example, specific motives may play unique roles in various aspects of use (e.g., excessive use, withdrawal symptoms, craving) or problems related to use (e.g., psychological disturbances, risk-taking behavior, beliefs about quitting).

There are four motives for drinking proposed by Cooper (1994): social motives (drinking for favorable social outcomes); conformity motives (drinking to avoid rejection or encourage acceptance from social group or peers); coping motives (drinking to mitigate negative affect); and enhancement motives (drinking to increase positive affect). Drinking motives

are consistently linked with increases in alcohol consumption, excessive drinking, and related harmful consequences (Beseler, Aharonovich, Keyes, & Hasin, 2008; Doyle, Donovan, & Simpson, 2011; Foster & Neighbors, 2013; Holahan, Moos, Holahan, Cronkite, & Randall, 2001; Kuntsche, Knibbe, Gmel, & Engels, 2005; Mohr et al., 2005; Read, Wood, Kahler, Maddock, & Palfai, 2003). Moreover, research suggests drinking motives relate to other problem behaviors associated with being under the influence of alcohol, including destruction of property, damage to social relationships, trouble with authorities, drinking while at school/work, social complications, and delinquent activity (Bradley, Carman, & Petree, 1992; Karwacki & Bradley, 1996; Windle & Windle, 1996). This corpus of research suggests drinking motives may relate to a broad array of clinically-relevant outcomes.

Empirical evidence generally suggests that alcohol behavior, tobacco use, and motives for drinking and smoking are positively associated with one another (Novak, Burgess, Clark, Zvolensky, & Brown, 2003). Positive associations between drinking motives and regular smoking (Kristjansson et al., 2011) have been found; however, additional work is needed to explore the role of drinking motives in regard to cognitively-based smoking processes. Thus, prior work lends support for possible relationships between drinking motives and smoking cognitions among people who smoke regularly. The present work was designed to expand prior research by further exploring the role of drinking motives in relation to cognitive-based smoking processes among smokers with problematic drinking patterns. This effort will facilitate further advances in better understanding how motives for one substance (i.e., alcohol) can relate to clinically-relevant processes of another frequently co-occurring substance use behavior (i.e., smoking).

Of the documented alcohol use motives, the motivation to use for coping reasons is of central theoretical relevance in this domain (Zvolensky, Bernstein, Marshall, & Feldner, 2006). In particular, individuals who frequently use alcohol for negative affect reduction or affect regulation may be at an increased risk for negative emotional states (e.g., stress, anxiety, depression), dysfunctional cognitive processes (e.g., excessive fear of quitting), and greater challenges in altering substance use behavior (e.g., more failed attempts to quit). This type of perspective is supported theoretically and empirically by both non-alcohol oriented research on avoidance-oriented coping (e.g., Feldner, Zvolensky, & Leen-Feldner, 2004; Gross, 1998) and alcohol-specific work on coping motives (e.g., Conrod, Pihl, & Vassileva, 1998; Stewart, Karp, Pihl, & Peterson, 1997; Stewart & Zeitlin, 1995; Stewart, Zvolensky, & Eifert, 1999).

The present study sought to address the role of drinking motives in regard to a wide array of smoking-based cognitive processes. Specifically, the study was designed to examine the incremental validity of drinking motives in regard to smoking quit processes, and to evaluate the unique effects above and beyond theoretically relevant covariates including health problems (Kung, Wang, & Tseng, 2008), smoking rate (Godtfredsen, Prescott, Osler, & Vestbo, 2001), negative affectivity (Piper, & Curtin, 2006; Stevens, Colwell, Smith, Robinson, & McMillian, 2005), cannabis use (Peters, Budney, & Carroll, 2012), and gender (Westmaas & Langsam, 2005). It is important to note that other drinking motives (e.g., social, enhancement, or conformity) may exhibit significant relationships with smoking quit processes, and the present study included examinations of these relationships. Based on

research indicating drinking to regulate negative affect is related to undesired alcohol-related consequences (Neighbors, Lee, Lewis, Fossos, & Larimer, 2007), and given the theoretical importance of coping motives for dysfunctional cognitive processes and failed quit behavior (Zvolensky, Bonn-Miller, Bernstein, & Marshall, 2006), we expected that coping motives for drinking would predict smoking consequences related to negative reinforcement and negative personal outcomes, and inflexibility of smoking behavior. Specific to coping motives, we expected that any observed effects would be unique from shared variance with other alcohol use motives and incrementally evident above and beyond the variance accounted for by tobacco-related health problems, smoking rate, negative affectivity, cannabis use, and gender. This expectation is based on theoretical predictions that indicate coping reasons are central to substance use for affect regulation (Zvolensky et al., 2006), and this may be a potential intervention juncture for altering substance use behavior. These expectations were guided by integrative models of drinking motives and concurrent cigarette and alcohol use that indicate motivation for coping-oriented drinking as being a unique explanatory factor for cognitive-based smoking processes (Piko et al., 2007).

METHODS

Participants

The sample consisted of 195 daily smokers who responded to advertisements about a larger study of smoking cessation treatments and reported problematic drinking, as indexed by an Alcohol Use Disorders Identification Test (AUDIT) score of 8 or greater (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). As shown in Table 1, the sample was primarily male ($n = 122$, 62.6%), with a mean age of 30.3 years ($SD = 12.46$). Participants were mainly White/Caucasian ($n = 175$, 89.7%), had never married ($n = 125$, 6%), and had post-high school education: about half ($n = 97$, 49.7%) had completed some college and about a quarter ($n = 54$, 27.7%) completed two or more years of college. Respondent characteristics can be found in Table 1. Of the sample, 57% met criteria for at least one current Axis I diagnosis, and the most common diagnoses were Social Anxiety Disorder (11%), Generalized Anxiety Disorder (6%), Alcohol Abuse (6%), and Alcohol Dependence (5%).

Predictors and Outcomes

Smoking consequences—The Smoking Consequences Questionnaire (SCQ; Brandon & Baker, 1991) is a 50-item self-report measure that assesses tobacco use outcome expectancies believed to underlie smoking motivation on a Likert-type scale, ranging from 0 (“*completely unlikely*”) to 9 (“*completely likely*”). The four constituent factors of the SCQ are: 1) Negative Consequences ($\alpha = .88$), which relates to perceived unpleasantness of smoking effects; 2) Positive Reinforcement-Sensory Satisfaction ($\alpha = .87$), which relates to positive emotional states; 3) Negative Reinforcement-Negative Affect Reduction ($\alpha = .94$), which relates to negative emotional states; and 4) Appetite-Weight Control ($\alpha = .91$), which relates to the desired outcome of controlling weight. The SCQ has demonstrated adequate psychometric properties and predictive validity (Wetter et al., 1994), and the subscales demonstrated high levels of internal consistency in the current sample. Scores for each subscale were computed by summing relevant items.

Barriers to smoking cessation—The Barriers to Cessation Scale (BCS) assesses barriers, or specific stressors, associated with smoking cessation (Macnee & Talsma, 1995a). The BCS is a 19-item measure on which respondents indicate, on a 4-point Likert-style scale (0 = “not a barrier” to 3 = “large barrier”), the extent to which they identify with each of the listed barriers to cessation. Researchers report good internal consistency regarding the total score (Macnee & Talsma, 1995a), as well as the three subscales that reflect different types of stressors associated with quitting smoking: 1) Addictive Barriers, such as withdrawal symptoms of feeling lost without cigarettes; 2) External Barriers, such as triggers or encouragement from friends; and 3) Internal Barriers, such as emotions or feeling in control of moods (Macnee & Talsma, 1995a). The BCS has also evidenced good content and predictive validity (Macnee & Talsma, 1995a). As with previous research (e.g., Macnee & Talsma, 1995b), the total score summary statistic was utilized. This scale demonstrated high levels of internal consistency in the current sample ($\alpha = .85$).

Avoidance and inflexibility—The Avoidance and Inflexibility Scale (AIS) is an 18-item measure which assesses avoidance and inflexibility related to smoking (Gifford & Lillis, 2009). Participants responded according to a Likert-type scale ranging from 1 (*Not at all*) to 5 (*Very much*). Items included “How likely is it that these feelings will lead you to smoke?” and “To what degree must you reduce how often you have these thoughts in order not to smoke.” The AIS has demonstrated good internal consistency (Gifford & Lillis, 2009; Gifford, Ritsher, McKellar, & Moos, 2006). Higher scores represent more smoking-based avoidance or inflexibility in the presence of uncomfortable or difficult sensations or thoughts, whereas lower scores suggest more ability to accept difficult feelings or thoughts without allowing them to trigger smoking. In the present study, the total score was used and the scale demonstrated a high level of internal consistency ($\alpha = .92$).

Smoking history—The Smoking History Questionnaire (SHQ), a 31-item measure, was used to assess smoking rate, age of onset of initiation, years of being a daily smoker, and other characteristics (Brown, Lejuez, Kahler, & Strong, 2002). Smoking rate was obtained from the open-ended question, “Since you started regular daily smoking, what is the average number of cigarettes you smoked per day?”

Drinking motives—The Drinking Motives Questionnaire (DMQ) is a 20-item measure used to assess motives for drinking (Cooper, 1994). Participants rated items on a 5-point scale ranging from 1 (*Never/Almost Never*) to 5 (*Almost Always/Always*). The DMQ demonstrates adequate psychometric properties (Cooper et al., 1992). A recent cross-national evaluation of this measure demonstrated that the 4-factor motive structure was invariant across large samples of American, Canadian, and Swiss late adolescents (Kuntsche, Stewart, & Cooper, 2008) and adults (Grant, Stewart, O'Connor, Blackwell, & Conrod, 2007; Németh, Kuntsche, Urbán, Farkas, & Demetrovics, 2011). The measure yields four sub-scales that reflect drinking motives, including social motives (e.g., “Because it helps you enjoy a party”; $\alpha = .91$), coping motives (e.g., “To forget your worries”; $\alpha = .88$), enhancement motives (e.g., “Because you like the feeling”; $\alpha = .82$), and conformity motives (e.g., “Because your friends pressure you to drink”; $\alpha = .81$). Scores for each subscale were computed by summing relevant items.

Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I)—Diagnostic assessments were conducted using the SCID-I-NP (Non-Patient Version) to assess DSM-IV-TR diagnoses for current and past Axis I disorders (First, Spitzer, Gibbon, & Williams, 2007). All SCID-I interviews were administered by trained research assistants or doctoral level staff and supervised by independent doctoral-level professionals. Interviews were audio-taped and the reliability of a random selection of 12.5% of interviews were reviewed (MJZ) for accuracy; no cases of diagnostic coding disagreement were noted.

Alcohol history—Alcohol consumption quantity and frequency was assessed using the 42-item Alcohol History Questionnaire (AHQ; Filbey et al., 2007). Example open-ended items include, “How old were you when you first had an alcoholic drink?” and “How many years have you been drinking regularly?”

Alcohol use—Alcohol consumption was assessed using the Alcohol Use Disorders Identification Test (AUDIT), a 10-item measure that screens for harmful or hazardous drinking (Saunders et al., 1993). Items include quantity and frequency of use, heavy drinking, tolerance, dependence, and problems. The AUDIT has demonstrated good psychometric properties (Maisto, Conigliaro, McNeil, Kraemer, & Kelley, 2000). The AUDIT’s internal consistency alpha was .68 in the present sample, and in past work it has reliably distinguished between harmful, hazardous, and no drinking histories (Fleming, Barry, & MacDonald, 1991; Saunders et al., 1993). For example, a score of 8 on the AUDIT produces 85% sensitivity and 89% specificity for hazardous or harmful drinking (Cherpitel, 1995).

Covariates

Demographics—Participants reported demographic information including gender, age, race/ethnicity, marital status, and education.

Medical history—The current research team developed the Medical Screening Questionnaire (MSQ) to assess medical history. Items of interest for the current study involved those specific to tobacco disease in which participants indicated having ever been diagnosed with the following (0 = no, 1 = yes): heart problems, hypertension, respiratory disease, and asthma. As in past work (Leventhal, Zvolensky, & Schmidt, 2011), a composite score was created from this measure, ranging from 0-4, with greater scores reflecting the occurrence of multiple markers of tobacco-related disease.

Positive and negative symptoms—The Positive Affect Negative Affect Schedule (PANAS) is a 20-item, trait-like measure of positive affect and negative affect (Watson, Clark & Tellegen, 1988). Mood descriptors (e.g., “Nervous,” “Excited”) are rated on a 5-point Likert-style scale, with instructions to rate “to what extent you generally feel this way, that is, how you feel on average.” Both 10-item positive and negative affect subscales have demonstrated good psychometric properties (Merz et al., 2013), strong internal consistency (Watson et al., 1988; Watson, 2000), and test-retest reliability (Watson et al., 1988). The sum of the 10-item PANAS negative affect scale was used as a covariate in the current

investigation, with higher scores reflecting greater self-reported negative affectivity ($\alpha = .92$ in the current sample).

Nicotine dependence—The Fagerström Test for Nicotine Dependence (FTND) is a six-item scale that assesses gradations in tobacco dependence (Heatherton, Kozlowski, Frecker, & Fagerström, 1991). The FTND has good psychometric properties (Radzius et al., 2003), exhibits positive relations with key smoking variables, and has high test-retest reliability (Heatherton, et al., 1991; Pomerleau, Carton, Lutzke, Flessland, & Pomerleau, 1994). The FTND score ranges from 0 to 10, and higher scores suggest greater dependence (Fagerström, Heatherton, & Kozlowski, 1990). Items include, “How many cigarettes did you smoke yesterday?” and “How many cigarettes did you smoke during the last five days?” ($\alpha = .33$).

Cannabis use—The Marijuana Smoking History Questionnaire (MSHQ) is a 40-item measure used to assess participants’ history and patterns of cannabis use (Bonn-Miller & Zvolensky, 2009). MSHQ items used in study analyses included, “How many years have you smoked marijuana?” and “Think about your smoking during the last week, how much marijuana did you smoke per occasion in an average day?” Participants rated the latter item on an eight-point Likert scale (1-8). Scores correspond to pictures depicting increasing sizes of marijuana joints, with 1 indicating the smallest marijuana joint and 8 indicating the largest marijuana joint. Studies have used the MSHQ as a successful indicator of cannabis use (e.g., Buckner, Zvolensky, & Schmidt, 2012). In the present study, we employed the MSHQ as a covariate given the frequent co-occurrence of cannabis with alcohol (Degenhardt, Hall, & Lynskey, 2001) and tobacco use (Agrawal, Budney, & Lynskey, 2012; Degenhardt et al., 2001).

Procedure

Participants were daily smokers who responded to community-based advertisements (e.g., flyers, newspaper ads, radio announcements) to participate in a larger study examining the efficacy of two smoking cessation interventions: a novel four-session smoking cessation behavioral intervention that focused on vulnerability to panic (Panic-Smoking Program), and a standard smoking cessation program. Data for the current study came from the baseline assessment of this larger trial, prior to randomization. Individuals responding to study advertisements were scheduled for an in-person, baseline assessment and were evaluated according to study inclusion and exclusion criteria. After providing written informed consent, participants were interviewed using the SCID and completed an online survey. This study was approved by the institutional review boards (IRB) at the University of Vermont and Florida State University.

For the current study, individuals were selected based on meeting the eligibility criteria for the larger study as previously noted, as well as meeting heavy drinking criteria (scoring 8 or higher on the AUDIT questionnaire; Saunders et al., 1993). These data have not been published or presented previously.

Statistical analyses

Univariate statistics (Table 1) and correlations (Table 2) were computed for relevant variables. Incremental validity of drinking motives were examined in relation to the criterion variables using hierarchical multiple linear regression (Cohen & Cohen, 1983). All participants completed all survey items in the present study. Separate models were constructed for each smoking consequences subscale (i.e., negative consequences, positive reinforcement, negative reinforcement, and appetite weight control), barriers to cessation, and avoidance and inflexibility. Multicollinearity was investigated for each regression model and was not an issue. At Step 1, tobacco-related health problems, smoking rate, negative affectivity, cannabis use, and gender were entered. At Step 2, social motives, enhancement motives, coping motives, and conformity motives were simultaneously entered (Tables 3 and 4). This analytic approach ensures variance due to drinking motives is not better explained by other theoretically-relevant predictor variables (Sechrest, 1963). These analyses were conducted using SAS System for Windows, version 9.3., and p values $< .05$ were considered statistically significant.

RESULTS

Descriptive Data, Correlations, and t-tests among Theoretically Relevant Variables

Means, standard deviations, and bivariate correlations are presented in Table 2. Generally, drinking motives correlated with each other, avoidance and inflexibility, smoking consequences, and barriers to cessation (all p 's $< .05$). Social motives were correlated with positive and negative reinforcement (p 's $< .001$), coping motives were correlated with smoking consequences (all p 's $< .05$), and conformity motives were correlated with both negative reinforcement and appetite weight control (p 's $< .01$). Independent samples t -tests were conducted with gender for each variable of interest. These tests revealed significant differences in mean scores between males and females for barriers to cessation; $t(193) = 3.45$, $p = 0.001$ and negative consequences; $t(193) = 2.26$, $p = 0.02$. Differences in mean scores for males and females also emerged for negative reinforcement; $t(193) = 2.84$, $p = 0.01$ and appetite weight control $t(193) = 4.27$, $p < 0.0001$. Additionally, males and females differed with respect to mean scores for negative affectivity; $t(193) = 2.94$, $p = 0.003$ and health problems; $t(193) = -2.99$, $p = 0.03$. As the variable for gender was dummy coded with females receiving a 0 and males receiving a 1, positive t values indicate that males had significantly greater means relative to females. Conversely, negative t values indicate that males had significantly lower means relative to females.

Primary Analyses

Tables 3 and 4 present details of the hierarchical multiple linear regression analyses. Generally speaking, when drinking motives were entered into the model at Step 2, the model accounted for greater statistical variance relative to Step 1 wherein only covariates were entered. Similar results emerged consistently across all models in the present study (see Tables 3 and 4 for specific β , F , and p values). Adjusted R^2 , an indication of the amount of variance explained by the model while taking into account extra explanatory variables including covariates (Olejnik, Mills, & Keselman, 2000), is also reported in Tables 3 and 4.

For the negative consequences subscale of the SCQ, the model at Step 1 accounted for 5% of the variance, and both smoking rate and gender were significant predictors. The model at Step 2 accounted for 9% of the variance. Of the covariates, smoking rate was a significant and gender a marginal predictor. Coping drinking motives was the only significant predictor among the motives. Regarding the positive reinforcement-sensory satisfaction subscale of the SCQ, the model at Step 1 accounted for 2% of the variance with cannabis use as a significant predictor, whereas the model at Step 2 accounted for 10% of the variance. Social and enhancement motives emerged as marginal predictors. With respect to the negative reinforcement subscale of the SCQ, the model at Step 1 predicted 14% of the variance, and negative affectivity emerged as a significant predictor. At Step 2, the model accounted for 20% of the variance. Negative affectivity was a significant predictor, and among drinking motives, social and coping motives emerged as predictors. For the appetite weight control subscale of SCQ, the model at Step 1 predicted 9% of the variance, with gender as a significant predictor, and smoking rate as a marginal predictor. The model at Step 2 predicted 12% of the variance. Gender was a significant predictor, as were conformity drinking motives. For barriers to cessation, the model at Step 1 accounted for 10% of the variance, and both negative affectivity and gender were significant predictors. The model at Step 2 accounted for 17% of the variance, with negative affectivity, gender, and social drinking motives as significant predictors. In regard to avoidance and inflexibility, the model at Step 1 accounted for 6% of the variance with both smoking rate and negative affectivity as significant predictors. The model at Step 2 accounted for 11% of the variance, with smoking rate and coping drinking motives as significant predictors.

DISCUSSION

The present study evaluated drinking motives in regard to cognitive-based smoking processes among treatment-seeking smokers who were problematic drinkers. As hypothesized, coping drinking motives significantly predicted outcomes related to negative smoking consequences, negative reinforcement, and smoking inflexibility. These findings indicate that drinking to regulate negative affect may be related to greater expectancies regarding the mood-modulating effects of smoking and smoking inflexibility. These results are in line with previous research indicating that motives for drinking are related to problem behaviors other than alcohol (e.g., Bradley et al., 1992), and uniquely extend such work to smoking processes. It is possible that coping alcohol use motives may relate to regulatory mechanisms for using psychoactive substances to alleviate distress, which in turn, may reinforce continued use of alcohol and perhaps tobacco among comorbid users (Stewart, Conrod, Pihl, & Dongier, 1999). This type of account is supported by basic and applied work on the neuroregulatory functions of substance use for mood and mood-related sequelae (e.g., mood-driven behavior) and reward sensitivity theories of addiction (e.g., Robinson & Berridge, 1993). Thus, theoretical models and clinical activities focused on smoking cessation among problem alcohol users may ultimately benefit from considering the role of coping-oriented drinking motives in the context of better understanding certain cognitive-based smoking processes. For example, if the present results are independently replicated, it may be useful to assess for drinking motives among smokers who are problem drinkers in efforts to quit smoking. Future work is also needed to examine whether coping motives for

alcohol use relate to other smoking correlates (e.g., withdrawal symptoms, early lapse) using prospective methodology. An alternative explanation for these outcomes may be related to the problem of confounding, or spurious variables (Blyth, 1972). It is possible that coping motives are a feature of emotional dysregulation, which is often associated with all of the outcomes related to coping in the present study. This perspective would suggest that the link between coping drinking motives and cognitively-based smoke processes may only be related in as far as emotional dysregulation affects motives and quit processes.

Furthermore, social drinking motives predicted smoking expectancies related to barriers to cessation and negative reinforcement, and marginally predicted positive reinforcement. Thus, drinking for favorable social outcomes also appears related to smoking expectancies pertaining to negative affect reduction and affect regulation. One potential explanation for this finding may be related to the social aspect of smoking (e.g., smoking as a means to socialize with others; Moran, Wechsler, & Rigotti, 2004). It is possible that regular smokers who have established smoking expectancies (due to substantial experience with smoking) identify social motivations for drinking based on aspects of smoking that are socially-derived. Moreover, social drinking motives significantly predicted greater barriers to cessation. Accordingly, drinking for social facilitation and other socially-derived reasons may foster more perceived obstacles to quitting smoking, especially given the co-occurrence of smoking and drinking in social settings (Witkiewitz et al., 2012). It stands to reason that socially-motivated drinking is associated with barriers to cessation due to positive expectancies linked with smoking. For example, an individual who associates smoking with a chance to socialize with other smokers might perceive this social interaction as a barrier to quitting.

Additionally, enhancement drinking motives marginally predicted smoking expectancies related to positive reinforcement. This may be some indication that drinking to increase positive affect is linked with smoking outcome expectancies related to sensory satisfaction (e.g., taste and relaxation). Along these lines, it is possible that smokers who consume alcohol for enhancement motivations might perceive smoking to also fulfill desires related to maintaining or increasing positive affect. It is important to note that findings with respect to enhancement motives were marginal, and additional work is needed to better elucidate the effect of enhancement drinking motives on smoking processes.

Finally, conformity motives significantly predicted smoking consequences related to appetite and weight control. This finding suggests that drinking to avoid rejection or encourage acceptance from a social group may be related to expectancies that smoking can facilitate weight control. It is possible that individuals who perceive and conform to drinking pressures also may be sensitive to societal or normative expectations linked with appearances and weight. Further, individuals who drink to conform may have dissonant cognitions related to drinking (consuming calories) versus weight control (restricting calories), and thus, may be more likely to smoke as a means of reducing or controlling appetite.

The present study has a number of limitations. First, regarding the data, our results are correlational, which precludes causal interpretations of the observed relationships.

Additionally, many of the effect sizes for the present data were small but not unprecedented (Piasecki et al., 2011). It is possible that even small changes in drinking motives may have cumulative effects on co-use of tobacco and alcohol when experienced on a frequent basis. Thus, further work is needed to evaluate the behavioral significance of these results, examine whether associations hold temporally, and assess clinical benefit versus cost of implementing programs or interventions designed to target drinking motives. Second, the relatively homogeneous demographic composition of the sample may limit the generalizability of the present findings to other racial/ethnic groups. Third, as the key variables were assessed via self-report, there is the possibility that the observed relations were in part a function of shared method variance. Fourth, the sample was comprised of adult smokers who voluntarily participated in a smoking cessation intervention, and therefore, additional research is needed to understand whether findings extend to a non-treatment seeking sample. Finally, we oriented the study on an *a priori* basis on the role of alcohol use motives in terms of smoking processes and behavior. However, it is possible that there is merit to exploring the role of smoking motives for alcohol use processes and behavior and even more complex constellations of polysubstance use behavior (e.g., cannabis use).

In summary, the present study provides initial empirical support for the role of alcohol coping motives in regard to a number of cognitive-based smoking processes. This research contributes to concurrent substance use literature by examining heavy drinking among smokers. This population is at risk for health problems associated with using either tobacco or alcohol independently, and this population is also at increased risk for additive and multiplicative health effects as a result of using both substances simultaneously (see Taylor & Rehm, 2006 for a review; Jarvis, Hayman, Braun, Schwertz, Ferrans, & Piano, 2007). Indeed, the findings suggest that the continued study of alcohol use motives among smokers who are problem drinkers may be fruitful in efforts to improve our understanding the comorbidity of smoking and alcohol use problems.

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Table 1Respondent Characteristics: Demographics, Alcohol/Tobacco Use, and Axis I Disorders (*N* = 195)

DEMOGRAPHICS	<i>n</i>	%
Gender		
Male	122	63%
Female	73	37%
Race/Ethnicity		
Caucasian/White	175	80%
Black/non-Hispanic	7	4%
Black Hispanic	2	1%
Hispanic	5	3%
Asian	1	1%
Other	5	3%
Marital Status		
Married	46	24%
Widowed	3	2%
Separated	2	1%
Divorced	19	10%
Never Married	125	64%
Highest Level of Education		
Some High School	5	3%
High School	39	20%
Some College	97	50%
2 year College	12	6%
4 year College	20	10%
Some Graduate School	10	5%
Graduate School	12	6%
ALCOHOL & TOBACCO	<i>Age</i>	<i>n (%)</i>
Age of first alcoholic beverage (n = 194)	0-10	22 (11%)
	11-20	170 (87%)
	21-30	2 (1%)
	31+	0 (0%)
Age of first cigarette	0-10	17 (9%)
	11-20	168 (86%)
	21+	10 (5%)
	<i>Mean</i>	<i>SD</i>
Cigarettes smoked per day	15.0	7.86
Years as a daily smoker	12.0	11.72
Level of nicotine dependence	4.61	2.15

DEMOGRAPHICS	<i>n</i>	%
Drinks per occasion	1.58	1.12
Heavy drinking occasions (past year)	2.26	0.94
Times drunk in past year	2.26	0.88
AXIS-I DISORDERS	<i>n</i>	%
Social anxiety disorder	21	11%
Generalized anxiety disorder	12	6%
Alcohol abuse	12	6%
Alcohol dependence	10	5%

Table 2

Means, Standard Deviations, and Correlations among Variables ($N = 195$)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Social motives	--														
2. Coping motives	0.35***	--													
3. Enhance motives	0.61***	0.43***	--												
4. Conform motives	0.33***	0.49***	0.33***	--											
5. Barriers to Cessation	0.32***	0.22**	0.18*	0.13 [†]	--										
6. Negative Consequences	0.14* [†]	0.25***	0.11	0.08	0.34***	--									
7. Positive Reinforcement	0.28***	0.16*	0.30	0.11	0.47***	0.22**	--								
8. Negative Reinforcement	0.25***	0.35***	0.12 [†]	0.22**	0.49***	0.30***	0.51***	--							
9. Appetite Weight Control	0.06	0.22**	0.03	0.19**	0.32***	0.19**	0.29***	0.42***	--						
10. Avoidance & Inflexibility	0.19**	0.33***	0.18*	0.15*	0.58***	0.41***	0.43***	0.45***	0.20**	--					
11. Cannabis Use	0.08	0.13 [†]	0.08	0.13 [†]	0.10	0.12	0.26***	0.19**	0.15*	0.11	--				
12. Negative Affectivity	0.12	0.32***	-0.05*	0.19**	0.30***	0.16*	0.07	0.35***	0.13 [†]	0.20**	0.04	--			
13. Fagersröm Smoking Index	-0.23**	0.12	-0.16	-0.04	0.02	0.16*	-0.02	0.004	0.12	0.18*	0.15*	0.07	--		
14. Health Problems	*0.07	-0.09	-0.03	-0.04 [†]	-0.06	-0.005	-0.05	-0.06	0.01	-0.07	0.15*	-0.03	0.04	--	
15. Gender	-0.04	-0.11	-0.01	0.02	-0.26***	-0.15*	-0.09	-0.19**	-0.28***	-0.13 [†]	-0.08	-0.19**	0.04	0.20**	--
<i>M</i>	15.79	10.38	15.02	6.94	25.78	6.51	6.10	4.91	4.02	44.86	4.81	20.28	0.75	0.28	0.62
<i>SD</i>	5.42	4.80	4.72	3.39	10.30	1.12	1.31	1.70	2.34	10.27	1.74	7.15	0.72	0.53	0.49
Min	5.00	5.00	5.00	5.00	0.00	2.72	2.47	0.67	0.00	15.00	0.00	10.00	0.00	0.00	0.00
Max	25.00	25.00	25.00	24.00	53.00	8.94	9.00	9.00	9.00	65.00	6.00	44.00	12.00	2.00	1.00

 $p < .001$,

**
 $p < .01$,
*
 $p < .05$,
†
 $p < .10$

Table 3

Hierarchical Regression Analysis Predicting Subscales of the Smoking Consequences Scale from Motives while Controlling for Covariates ($N = 195$)

Criterion			Predictor	B	SE	t	β	Adj R^2	F
Smoking Consequences (Negative)	Step 1	Covariates	Health problems	0.03	0.15	0.17	0.01	0.05	2.94*
			Smoking rate	0.26	0.11	2.32	0.16*		
			PANAS negative	0.02	0.01	1.74	0.13 [†]		
			Cannabis use	-0.01	0.03	-0.35	-0.02		
			Gender	-0.34	0.17	-1.99	-0.15*		
	Step 2	Covariates and Drinking Motives	Health problems	0.07	0.15	0.47	0.03	0.09	3.03**
			Smoking rate	0.27	0.11	2.42	0.18*		
			PANAS negative	0.01	0.01	0.74	0.06		
			Cannabis use	-0.02	0.03	-0.69	-0.05		
			Gender	-0.31	0.17	-1.86	-0.14 [†]		
			Social	0.03	0.02	1.52	0.14		
			Coping	0.04	0.02	2.09	0.19*		
			Enhancement	-0.0002	0.02	-0.01	-0.001		
			Conformity	-0.02	0.03	-0.63	-0.05		
Smoking Consequences (Positive Reinforcement)	Step 1	Covariates	Health problems	-0.14	0.18	-0.79	-0.06	0.02	1.90 [†]
			Smoking rate	0.05	0.13	0.38	0.03		
			PANAS negative	0.01	0.01	0.73	0.05		
			Cannabis use	0.08	0.03	2.42	0.17*		
			Gender	-0.17	0.20	-0.81	-0.06		
	Step 2	Covariates and Drinking Motives	Health problems	-0.08	0.17	-0.46	-0.03	0.10	3.32***
			Smoking rate	0.16	0.13	1.18	0.08		
			PANAS negative	0.01	0.01	0.47	0.04		
			Cannabis use	0.05	0.03	1.61	0.11		
			Gender	-0.17	0.20	-0.86	-0.06		
			Social	0.04	0.02	1.91	0.17 [†]		
			Coping	0.01	0.02	0.21	0.02		
			Enhancement	0.05	0.03	1.87	0.18 [†]		
			Conformity	-0.01	0.03	-0.23	-0.02		
Smoking Consequences (Negative Reinforcement)	Step 1	Covariates	Health problems	-0.18	0.22	-0.81	-0.05	0.14	7.26***
			Smoking rate	0.07	0.16	0.43	0.03		
			PANAS negative	0.08	0.02	4.69	0.32***		
			Cannabis use	0.06	0.04	1.61	0.11		
			Gender	-0.41	0.25	-1.61	-0.11		

Criterion		Predictor	B	SE	t	β	Adj R^2	F
Step 2 Covariates and Drinking Motives		Health problems	-0.07	0.21	-0.31	-0.02	0.20	6.53***
		Smoking rate	0.10	0.16	0.60	0.04		
		PANAS negative	0.05	0.02	2.98	0.21**		
		Cannabis use	0.05	0.04	1.33	0.09		
		Gender	-0.40	0.24	-1.64	-0.11		
		Social	0.06	0.03	2.29	0.20*		
		Coping	0.08	0.03	2.52	0.21*		
		Enhancement	-0.04	0.03	-1.21	-0.11		
		Conformity	0.02	0.04	0.59	0.04		
Smoking Consequences (Appetite/Weight Control)	Step 1 Covariates	Health problems	0.21	0.30	0.68	0.05	0.09	4.83***
		Smoking rate	0.41	0.23	1.84	0.13 [†]		
		PANAS negative	0.03	0.02	1.20	0.08		
		Cannabis use	-0.003	0.05	-0.06	-0.004		
		Gender	-1.41	0.35	-4.06	-0.29***		
	Step 2 Covariates and Drinking Motives	Health problems	0.35	0.30	1.16	0.08	0.12	4.03***
		Smoking rate	0.40	0.23	1.72	0.12 [†]		
		PANAS negative	0.002	0.02	0.07	0.005		
		Cannabis use	-0.01	0.05	-0.10	-0.01		
		Gender	-1.46	0.34	-4.26	-0.30***		
		Social	0.01	0.04	0.34	0.03		
		Coping	0.06	0.04	1.37	0.12		
		Enhancement	-0.03	0.05	-0.74	-0.07		
		Conformity	0.12	0.05	2.15	0.17*		

 $p < .001$

**
 $p < .01$

*
 $p < .05$

[†]
 $p < .10$

Table 4

Hierarchical Regression Analysis Predicting Barriers to Cessation, and Avoidance and Inflexibility from Motives while Controlling for Covariates ($N = 195$)

Criterion			Predictor	B	SE	<i>t</i>	β	Adj R^2	<i>F</i>
Barriers to Cessation	Step 1	Covariates	Health problems	0.09	1.34	0.07	0.005	0.10	5.38***
			Smoking rate	0.51	1.00	0.51	0.03		
			PANAS negative	0.35	0.10	3.44	0.24***		
			Cannabis use	0.27	0.23	1.15	0.08		
			Gender	-3.99	1.53	-2.61	-0.19**		
	Step 2	Covariates and Drinking Motives	Health problems	0.64	1.31	0.49	0.03	0.17	5.33***
			Smoking rate	1.35	1.00	1.35	0.09		
			PANAS negative	0.27	0.11	2.50	0.18*		
			Cannabis use	0.11	0.23	0.50	0.03		
			Gender	-4.14	1.49	-2.78	-0.19**		
			Social	0.60	0.17	3.59	0.31***		
			Coping	0.06	0.19	0.32	0.03		
			Enhancemen [†]	-0.11	0.20	-0.55	-0.05		
			Conformity	0.05	0.24	0.20	0.02		
Avoidance and Inflexibility	Step 1	Covariates	Health problems	-0.50	1.36	-0.37	-0.03	0.06	3.27**
			Smoking rate	2.69	1.01	2.67	0.19**		
			PANAS negative	0.23	0.10	2.19	0.16*		
			Cannabis use	-0.05	0.24	-0.22	-0.02		
			Gender	-1.98	1.55	-1.28	-0.09		
	Step 2	Covariates and Drinking Motives	Health problems	0.07	1.33	0.05	0.003	0.11	3.73***
			Smoking rate	2.91	1.02	2.84	0.20**		
			PANAS negative	0.11	0.11	1.05	0.08		
			Cannabis use	-0.15	0.23	-0.66	-0.05		
			Gender	-1.86	1.52	-1.22	-0.09		
			Social	0.24	0.17	1.42	0.13		
			Coping	0.41	0.19	2.17	0.19*		
			Enhancemen [†]	0.06	0.20	0.32	0.03		
			Conformity	0.01	0.24	0.05	0.004		

 $p < .001$

**
 $p < .01$

*
 $p < .05$

[†]
 $p < .10$