Short Communication

# Simultaneous alcohol & tobacco use expectancies in young adult co-users☆

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HIGHLIGHTS

- Alcohol and tobacco use is highly comorbid in young adults.
- Expectancies of simultaneous alcohol & tobacco use (SATU) have not been studied.
- The novel SAT-EQ correlated with validated measures of substance use cognitions.
- Craving/automaticity and social enhancement expectancies were robust predictors of SATU.

## 1. Introduction

Alcohol and tobacco use are among the leading causes of preventable morbidity and mortality worldwide; in the United States alone, excessive alcohol use accounts for 1 in 10 deaths (Stahre, Roeber, Kanny, Brewer, & Zhang, 2014), and cigarette smoking is responsible for > 1 in 5 deaths (U.S. Department of Health and Human Services, 2014). The total economic impact ranges from ~$249 billion/year for alcohol use (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015) to more than $300 billion/year for smoking (U.S. Department of Health and Human Services, 2014). Epidemiological data have shown that co-use of both substances is common (McKee, Falba, O'Malley, Sindelar, & O'Connor, 2007), and tobacco use is associated with frequent binge drinking and increased length of drinking episodes, and it potentiates the experience of alcohol-related reinforcement (see McKee & Weinberger, 2013 for a review). The co-use of alcohol and tobacco may be a risk factor for more problematic use of both substances in young adults, who report heightened effects of tobacco when alcohol is used simultaneously and vice versa (Jackson, Colby, & Sher, 2010; Johnson, Boles, Vaughan, & Kleber, 2000; Rose et al., 2004) and thus may be disproportionately vulnerable to progressive use.

Expectancies, or beliefs about drug effects, play a key role in reinforcement and are robust predictors of alcohol (Flory, Lynam, Milich, Leukefeld, & Clayton, 2004) and tobacco use (Myers, McCarthy, MacPherson, & Brown, 2003) in young adults. While relatively little research has examined expectancies specific to the co-use of alcohol and tobacco, preliminary work suggests that expectancies may play a similarly important role for the concurrent use of both substances. For example, individuals may engage in simultaneous alcohol and tobacco use (SATU) in order to enhance the positive effects, or to alleviate the negative effects, of either or both substances (Kirchner & Sayette, 2007; Rose et al., 2004; Sayette, Martin, Wertz, Perrott, & Peters, 2005). Laboratory (Piasecki, McCarthy, Fiore, & Baker, 2008; Sayette et al., 2005; Shiffman & Kirchner, 2009) and survey (Johnson et al., 2000) studies suggest that simultaneous users expect more benefit from concurrent use compared with use of alcohol or tobacco alone. While there are a number of well-validated measures of various cognitive appraisals (including expectancies, beliefs, motives, and reasons) related to alcohol or tobacco use alone (Brown, Christiansen, & Goldman, 1987; Cooper, 1994; Fromme, Stroot, & Kaplan, 1993; Myers et al., 2003; Wahl, Turner, Mermelstein, & Flay, 2005; Wetter et al., 1994), there are no measures designed to assess expectancies for use of both. The present report details the initial psychometric examination of such a measure using survey data from a large group of young adults with recent SATU. Exploratory factor analysis was used to identify the factor structure of the novel measure. The associations between the resulting SATU-specific expectancy factors and recent SATU were then examined first alone and then in conjunction with other conceptually similar cognitive appraisal measures of alcohol-only and tobacco-only. It was hypothesized that scores on the newly developed measure would be associated with frequency of SATU even after controlling for well-validated and robust measures of alcohol and tobacco motives/expectancies.

## 2. Materials and methods

### 2.1. Participants

Participants were 1063 young adults (M = 22.2, SD = 2.07, range = 18–25; 47% female). Eligibility criteria included using alcohol

and cigarettes simultaneously in the past month. Exclusion criteria include past year psychiatric hospitalization and/or difficulty with the English language.

## 2.2. Procedure

Participants were recruited online from January 2013 to September 2014 from a variety of sources (Craigslist, Facebook, SurveyMonkey panel, referrals from other studies, campus ads, community ads, and friend referrals). Internet-based recruitment (including use of social networking sites) has been shown to be an efficient and cost-effective option for assessment of health behavior in young adults (Pedersen & Kurz, 2016; Ramo & Prochaska, 2012; Thornton, Harris, Baker, Johnson, & Kay-Lambkin, 2016). Informed consent was obtained online and participants received $30 for completing the online survey. Procedures were approved by the Institutional Review Board of the University of California, San Diego.

## 2.3. Measures

### 2.3.1. SATU expectancies

SATU expectancies were assessed with the Simultaneous Alcohol & Tobacco Expectancy Questionnaire (SAT-EQ). This measure was developed in an earlier qualitative study with 62 young adults (aged 18–25) who had used alcohol and tobacco simultaneously at least once in the previous 30 days. We first conducted four focus groups to generate expectancies for SATU, in a group discussion format and via written responses to handouts; each session was recorded and transcribed. We then developed a classification system to ensure a representative range of items that were presented to the next four focus groups, which focused on item development. Based on existing literature (Dani & Harris, 2005; Duhig, Cavallo, McKee, George, & Krishnan-Sarin, 2005; Harrison, Desai, & McKee, 2008; Harrison, Hinson, & McKee, 2009; McKee, Hinson, Rounsaville, & Petrelli, 2004) and content analysis of focus group transcripts, we identified six broad item categories: automaticity, craving, reinforcement enhancement, sensory, social, and reversal of negative consequences. Two independent raters sorted responses from the item development focus groups into these categories. This process produced a preliminary measure that was presented to the final two focus groups for feedback on item wording, content and clarity, and response options. The final SAT-EQ measures consists of 18 items; the measure instructions were: "Please rate the extent to which each statement is true for you" on a 6-point Likert scale ranging from "very untrue" to "very true".

### 2.3.2. Alcohol expectancies

Alcohol expectancies were measured using the Alcohol Expectancies Questionnaire-Adolescent, Brief scale (AEQ-AB; Stein et al., 2007). This 7-item measure (which contains positive and negative expectancy subscales) was based on the original, larger AEQ-A (Brown et al., 1987).

### 2.3.3. Drinking motives

Drinking motives were measured using the two highest-loading items from each of the four subscales (social, coping, enhancement, and conformity motives) of the Drinking Motives Questionnaire-Revised (DMQ-R; Cooper, 1994).

### 2.3.4. Smoking expectancies

Smoking expectancies were evaluated using the 16-item short form of the Smoking Consequences Questionnaire (S-SCQ; Myers et al., 2003). The subscales include positive reinforcement, negative reinforcement, and negative consequences.

### 2.3.5. Alcohol and cigarette use and co-use

Participants reported past 30-day frequency of alcohol and cigarette use, as well as frequency of SATU ("In the past 30 days, how many days

have you consumed alcohol and smoked cigarettes simultaneously (around the same time)?"). There was a wide distribution of past-month frequency of days with alcohol use ($M = 11.1$, $SD = 7.80$), cigarette use ($M = 18.1$, $SD = 12.03$), and SATU ($M = 10.1$, $SD = 8.37$).

### 2.4. Data analyses

The pattern of correlations among the SAT-EQ items was first examined using a graphical approach known as heat mapping (not shown). Maximum likelihood (ML) factor analysis was used to examine the underlying factor structure of the items. The factor solution implemented an oblique (promax) rotation which allowed for correlation among the factors. Several strategies were used to identify the number of retained factors (Costello & Osborne, 2005; Fabrigar, Wegener, MacCallum, & Strahan, 1999; Pett, Lackey, & Sullivan, 2003), including examination of the scree plot of eigenvalues and interpretability of factors and communalities. The final solution met the following criteria: (a) each item loaded at least 0.32 on one factor; (b) items with cross-loadings of 0.32 or higher on two or more factors were removed if there were several strong loaders ($> 0.50$) on each factor; (c) items with communalities of $< 0.40$ were removed; and (d) each factor had three or more strong loadings. The resulting factor scores on the SAT-EQ were next used to predict past-month SATU within an OLS regression framework to evaluate criterion validity of the measure. A larger regression model then evaluated whether the SAT-EQ scales uniquely accounted for variance in past-month SATU when controlling for demographics and thematically related and validated measures of alcohol and smoking motives/expectancies. All statistical analyses were conducted in SPSS version 21 and R Studio version 1.0.143.

## 3. Results

### 3.1. Exploratory factor analysis

Maximum likelihood factor analysis indicated that the correlation matrix was not an identity matrix (Bartlett's test of sphericity ($\chi^2$) $= 10,839$, df $= 153$, $p < 0.001$), and there was evidence that the factor analysis would account for a substantial amount of variance (Kaiser-Meyer-Olkin statistic $= 0.90$; Kaiser, 1974). The final result of this analysis was a rotated 4-factor solution, which accounted for 68.6% of the total variance. With 18 items and 1063 participants, the scale exceeded the recommended 10-participants-per-item ratio recommended for instrument analysis (DeVellis, 2003; Nunnally & Bernstein, 1994). The four SAT-EQ factors were labeled affect regulation (6 items; $M = 3.63$, $SD = 1.30$, alpha $= 0.91$), social enhancement (6 items; $M = 3.49$, $SD = 1.20$, alpha $= 0.86$), craving/automaticity (3 items; $M = 4.11$, $SD = 1.37$, alpha $= 0.83$), and social avoidance (3 items; $M = 3.19$, $SD = 1.35$, alpha $= 0.81$). Internal consistency (Cronbach's alpha) for the full SAT-EQ measure was 0.90. Rotated factor loadings for the 4-factor solution are shown in Table 1. The SAT-EQ factor correlations and correlations of the SAT-EQ factors with subscales from related measures of alcohol and tobacco cognitive appraisals are shown in Table 2.

### 3.2. Regressing SATU on SAT-EQ scales

A linear regression model was estimated to evaluate association between SATU expectancies and SATU. The four SAT-EQ subscales accounted for 8.4% of the variance in predicting past-month frequency of days with SATU. Affect regulation ($b = 1.14$, s.e. $= 0.25$, $p < 0.001$), social enhancement ($b = -0.82$, s.e. $= 0.24$, $p < 0.001$), and craving/automaticity ($b = 1.10$, s.e. $= 0.21$, $p < 0.001$) were all significant; social avoidance was not associated with the outcome ($b = 0.08$, s.e. $= 0.22$, $p = 0.70$) when controlling for the other subscales.