Summer 7-16-2021

A Measure of Expectancies for Alcohol Analgesia: Preliminary Factor Analysis, Reliability, and Validity

Lisa Renee Larowe
Syracuse University

Abstract

Rates of alcohol consumption are substantially higher among persons with pain, and recent research has focused on elucidating bidirectional pain-alcohol effects. Expectancies for alcohol analgesia could influence the degree to which alcohol confers acute pain-relieving effects, and may amplify the propensity to respond to pain with drinking behavior. However, no validated measures of expectancies for alcohol analgesia are available. The goal of this project was to examine psychometric properties of a measure of Expectancies for Alcohol Analgesia (EAA) across two samples (current alcohol users with and without chronic pain). Study 1 included 200 moderate-to-heavy drinkers with no current acute/chronic pain (M_{age} = 33.4; 39% female) who were recruited for a primary laboratory study. Results indicated that the hypothesized single-factor structure of the EAA provided good model fit (Bollen-Stine bootstrap p = .17). The EAA also showed excellent internal consistency (α = .97), and scores were positively associated with average daily drinks, binge drinking frequency, and alcohol outcome expectancies (ps < .01). As expected, EAA scores were not associated with participant height (p > .05). Study 2 included 273 current alcohol users with chronic musculoskeletal pain (M_{age} = 32.9; 34% female) who completed an online survey of pain and substance use. Results of Study 2 further supported the single-factor structure (Bollen-Stine bootstrap p = .13), and internal consistency of the EAA was excellent (α = .97). EAA scores were positively associated with quantity/frequency of alcohol use, alcohol outcome expectancies, coping-related drinking motives, and pain severity (ps < .01). EAA scores were not associated with height (p > .05). Collectively, these findings provide initial support regarding the single-factor structure, reliability, and validity of the EAA. Examination of predictive utility and further validation will be important next steps.

A Measure of Expectancies for Alcohol Analgesia:

Preliminary Factor Analysis, Reliability, and Validity

by

Lisa R. LaRowe, M.S.

B.S., Northeastern University, 2015

M.S., Syracuse University, 2016

Doctoral Dissertation

Submitted in partial fulfillment of the requirements for the degree of

Doctor of Philosophy in Clinical Psychology

Syracuse University

July, 2021

Table of Contents

Page

List of Tables

List of Figures

List of Appendices

A Measure of Expectancies for Alcohol Analgesia: Preliminary Factor Analysis, Reliability, and Validity

Approximately half of all American adults consume at least one alcoholic beverage each month (Schiller, Lucas, & Peregoy, 2012), more than one-quarter engage in excessive drinking (e.g., binge drinking, drinking that causes harm, dependence/addiction; SAMHSA, 2015), and 8.5% meet criteria for alcohol use disorder (AUD; i.e., a problematic pattern of alcohol use that leads to clinically significant impairment and/or distress; American Psychiatric Association, 2013). Alcohol consumption engenders a significant economic burden in the U.S., having been estimated to cost over $250 billion in healthcare, lost productivity, and criminal justice expenses each year (Sacks, Gonzales, Bouchery, Tomedi, & Brewer, 2015). Although substantial progress has been made in the development and implementation of treatments for AUD (e.g., Bien, Miller, & Tonigan, 1993; Kaner et al., 2009; Miller, Book, & Stewart, 2011), identifying and addressing predictors of alcohol use among drinkers with comorbidities (e.g., pain) could increase the efficacy of tailored treatments.

Pain is a universal human experience that motivates half of all physician visits in the U.S. each year (Turk & Melzack, 1992), and is affected by biological, behavioral, cognitive-affective, and physiological-sensory processes (Gatchel, Peng, Peters, Fuchs, & Turk, 2007). Like alcohol use, pain represents a significant public health burden, with an annual economic impact of over $600 billion in healthcare costs and lost productivity (Gaskin & Richard, 2012). Chronic pain, which affects over 100 million American adults (IOM, 2011), is typically defined as pain that persists beyond the standard healing time (> 3-6 months; Treede et al., 2015). Chronic musculoskeletal pain (i.e., chronic pain of the muscles, ligaments/tendons, bones, or joints) is a particularly important public health issue due to its prevalence, and its impact on disability,

sickness absence, and healthcare costs (e.g., Badley, Rasooly, & Webster, 1994; Moncrieff & Pomerleau, 2000; Picavet & Schouten, 2003; Picavet & Van den Bos, 1997; Yelin, Cisternas, Trupin, & Gansky, 2014).

Interrelations between Pain and Alcohol Use

The prevalence of pain appears to be substantially higher among problem drinkers (vs. non-problem drinkers; Brennan, Schutte, & Moos, 2005), and up to three-quarters of substance use treatment patients who identify alcohol as their drug of choice also report moderate-to-severe past-month pain (Larson et al., 2007). Similarly, greater pain-related interference has been associated with a 33% increased risk of reporting past-year alcohol dependence (McDermott, Joyner, Hakes, Okey, & Cougle, 2018), and epidemiological estimates indicate that persons who endorse chronic musculoskeletal pain (vs. no pain) are twice as likely to meet diagnostic criteria for alcohol dependence (Von Korff et al., 2005). Given the high co-occurrence of pain and alcohol use, recent work has begun to elucidate bidirectional effects in pain-alcohol relations (e.g., Ditre, Zale, & LaRowe, 2019; Zale, Maisto, & Ditre, 2015). An established reciprocal model posits that pain and alcohol use interact in the manner of a positive feedback loop, resulting in the exacerbation and maintenance of both conditions over time (Ditre et al., 2019; Zale et al., 2015). Research in this domain is typically divided into two directions of empirical inquiry: (1) the effects of alcohol use on pain, and (2) the effects of pain on alcohol use.

In terms of the effects of alcohol use on pain, a recent meta-analysis concluded that a mean blood alcohol concentration (BAC) of .08% can increase pain threshold and reduce experimental pain intensity, with additional analgesic benefit observed for each .02% BAC increment (Thompson, Oram, Correll, Tsermentseli, & Stubbs, 2017). Despite evidence that acute alcohol administration can produce pain-relieving effects, there is also an established

literature indicating that excessive alcohol consumption is associated with the onset and severity of numerous painful conditions. For example, heavy alcohol use is a causal factor in the development of alcohol-induced pancreatitis (Lerch et al., 2003) and alcohol-related neuropathy (Chopra & Tiwari, 2012), and may increase the risk of developing osteoarthritis (Cheng et al., 2000) and pain following musculoskeletal injury (Sá, Baptista, Matos, & Lessa, 2008). In addition, there is evidence that heavy drinking may lead to deleterious health outcomes among persons with pain. For example, chronic pain patients who have an AUD have been shown to report more pain and physical impairment than those without an AUD (Holmes et al., 2010).

In terms of the effects of pain on alcohol use, there is converging research indicating that pain can increase motivation to drink alcohol. For example, experimental data have shown that laboratory pain induction increases self-reported urge to consume alcohol (Moskal, Maisto, De Vita, & Ditre, 2018), and cross-sectional data have demonstrated that greater levels of pain unpleasantness are associated with increased motivation to drink (Lawton & Simpson, 2009). Nearly one-quarter of patients enrolled in both pain treatment and inpatient substance abuse programs have endorsed using alcohol to cope with pain (Goebel et al., 2011; Sheu et al., 2008), and persons with comorbid substance use disorders and chronic pain have cited pain as the primary reason they began misusing alcohol or illicit substances in the first place (Sheu et al., 2008). Indeed, acute alcohol analgesia may negatively reinforce alcohol use and strengthen beliefs about the pain-relieving effects of alcohol (Ditre et al., 2019). Importantly, using alcohol to reduce pain can lead to increased alcohol consumption over time (Brennan et al., 2005).

Outcome Expectancies

Ditre and colleagues (2019) proposed that bidirectional pain-alcohol effects are likely influenced by outcome expectancies (i.e., estimates that a given behavior will lead to specific

outcomes). Outcome expectancies are central to Social Learning Theory, and are considered to be important determinants of motivation and behavior (e.g., Bandura, 1989; Rotter, 1954). In accordance with Social Learning Theory, the likelihood of a given behavior is a function of the value of the anticipated reinforcement and the perceived probability that the reinforcement will occur (Rotter, 1954). Importantly, outcome expectancies in a given situation are influenced by previous experiences in the same situation and expectancies generalized from other situations (Rotter, 1954).

Alcohol Outcome Expectancies. There is a vast literature documenting the role of outcome expectancies in the initiation, progression, and maintenance of alcohol use behavior (e.g., Brown, Goldman, Inn, & Anderson, 1980; Goldman, Brown, & Christiansen, 1987; Leigh & Stacy, 1993). Indeed, alcohol users hold a variety of beliefs about the effects of alcohol on their behavior, moods, and emotions (Goldman et al., 1987), and several measures have been developed to assess alcohol outcome expectancies (e.g., Brown, Christiansen, & Goldman, 1987; Fromme, Stroot, & Kaplan, 1993; Leigh & Stacy, 1993; Solomon & Annis, 1989). These measures assess both generalized (e.g., "Alcohol is like magic"; Brown et al., 1980) and specific (e.g., effects of alcohol use on social, sexual, or aggressive outcomes) alcohol outcome expectancies, and previous work has noted that the predictive utility of expectancy measures likely improves with greater specificity of measurement (e.g., Fromme et al., 1993). Current measures also tend to assess both positive (i.e., estimates that alcohol use will result in desired consequences) and negative (i.e., estimates that alcohol use will result in undesired consequences) alcohol outcome expectancies (e.g., Adams & McNeil, 1991; Fromme et al., 1993; Leigh & Stacy, 1993; Stacy, Widaman, & Marlatt, 1990).

Previous work has demonstrated that positive and negative alcohol outcome expectancies differentially predict alcohol use, and researchers have noted that positive outcomes of addictive behaviors are often more immediate and, therefore, more influential on substance use (e.g., Stacy et al., 1990). Indeed, higher scores on measures of positive alcohol outcome expectancies have consistently been correlated with greater drinking motives and quantity/frequency of alcohol consumption (e.g., Jones, Corbin, & Fromme, 2001; Madden & Clapp, 2019; Monk & Heim, 2013). In contrast, higher scores on measures of negative alcohol outcome expectancies have been associated with reduced consumption and a greater desire to restrain from drinking (e.g., Jones et al., 2001; Monk & Heim, 2013). Alcohol outcome expectancies also predict changes in drinking over time and the development and maintenance of alcohol-related problems (e.g., Christiansen, Smith, Roehling, & Goldman, 1989; Jones et al., 2001; Sebold et al., 2017; Sher, Wood, Wood, & Raskin, 1996; Smith, Goldman, Greenbaum, & Christiansen, 1995). Consequently, alcohol outcome expectancies are often an integral part of interventions targeting alcohol-related problems (e.g., Jones et al., 2001). Expectancies can be modified using cognitive restructuring techniques (Dobson, 2009), and changes in alcohol expectancies during treatment have been associated with improved treatment outcomes (e.g., Coates et al., 2018).

Pain-Related Outcome Expectancies. There is also an accumulating literature demonstrating that outcome expectancies can influence the experience of pain (e.g., Atlas & Wager, 2014; Bingel et al., 2011; Butcher & Carmody, 2012; Ossipov, Dussor, & Porreca, 2010; Peerdeman, van Laarhoven, Peters, & Evers, 2016). For example, expectancies that remifentanil (a μ-opioid receptor agonist) will be an effective pain medication have been shown to double the analgesic benefit of this drug, and it has been suggested that the descending pain control system may mediate this effect (Bingel et al., 2011). Similarly, a meta-analysis of 25 neuroimaging

studies of expectancy-based pain modulation revealed that expectations for pain-relief reduce activation in regions associated with pain processing (e.g., dorsal anterior cingulate, thalamus, insula) and affect/valuation (e.g., amygdala, striatum) during noxious stimulation (Atlas & Wager, 2014). Taken together, these findings indicate that pain-related outcome expectancies can modulate the pain experience.

Expectancies for Alcohol Analgesia

Researchers have posited that alcohol users may hold expectations regarding the effects of drinking on pain (Ditre et al., 2019; Zale et al., 2015). Expectancies for alcohol analgesia may influence the degree to which alcohol use reduces pain in the short term. Expectancies that alcohol will alleviate pain may also increase an individual's propensity to respond to actual or anticipated pain with drinking behavior. Over time, this could increase drinking behavior and lead to the development and maintenance of alcohol-related problems. Despite evidence that expectancies may influence pain-alcohol relations, there are currently no validated measures of expectancies for alcohol analgesia.

Development of a Measure of Expectancies for Alcohol Analgesia

To assess expectancies for alcohol analgesia in an ongoing experimental study of pain and alcohol consumption, a 5-item measure of expectancies for alcohol analgesia (Expectancies for Alcohol Analgesia; EAA) was adapted from an established measure of pain and smoking expectancies (PSE; Ditre, 2006). The PSE is a 5-item scale that assesses expectations that tobacco cigarette smoking will reduce pain. The PSE has demonstrated excellent internal consistency ($\alpha = .96$; Ditre, Heckman, Butts, & Brandon, 2010), and has been shown to account for nearly one-third of the variance in pain-induced urge to smoke cigarettes (Parkerson & Asmundson, 2016).

The EAA was adapted from the PSE by replacing the terms “smoking” and “cigarette” with “drinking alcohol”. The five adapted items assess the perceived likelihood that drinking alcohol will reduce or help one cope with pain, and are hypothesized to have a single-factor structure. The format (Likert-type likelihood scale) and item phrasing (i.e., first-person, hypothetical) of the EAA are comparable to widely-used measures of existing alcohol- and pain-related outcome expectancies (e.g., Fromme et al., 1993; Ilgen et al., 2011; Leigh & Stacy, 1993). Consistent with recommendations (e.g., Morean, Corbin, & Treat, 2012), each item only assesses one anticipated effect of alcohol. Moreover, the items are face valid, do not include reverse-scored items (which can have a negative effect on psychometric properties; Tsang, Royse, & Terkawi, 2017), and have a Flesch-Kincaid Grade-Level of 4.1 (consistent with guidelines that items be written below a Grade 6 reading level; Tsang et al., 2017).

Project Goal

Testing the psychometric properties of the EAA is a critical next step towards elucidating bidirectional pain-alcohol relations and informing the development of tailored interventions for the large proportion of alcohol users who experience pain. Therefore, the goal of this project was to examine the EAA factor structure and indices of reliability and validity among two independent participant samples. Study 1 included moderate-to-heavy drinkers with no current acute/chronic pain, who were recruited for a laboratory study of pain-alcohol effects. Study 2 included current alcohol users with chronic musculoskeletal pain, who were recruited to complete an online survey of pain and substance use.

Study 1

The goal of Study 1 was to evaluate the EAA factor structure, reliability, and validity among a sample of moderate-to-heavy drinkers with no current acute or chronic pain. We

hypothesized that the EAA would demonstrate (1) a single-factor structure (see Figure 1), (2) acceptable internal consistency ($\alpha > .7$), (3) initial evidence of concurrent validity via medium-to-large sized correlations with variables related to alcohol consumption and experimental pain experience, and (4) initial evidence of divergent validity via the absence of association with participant height (a theoretically distinct construct). An exploratory aim of this study was to assess whether EAA scores differed as a function of sociodemographic characteristics (e.g., gender, race).

Method

Participants. Participants were 200 moderate-to-heavy drinkers who were recruited for an ongoing experimental study of pain and alcohol consumption (R01AA024844). Consistent with procedures for the parent study, participants were included if they were between 21-65 years of age, and were classified as a moderate-to-heavy drinker using the Quantity-Frequency-Variability Questionnaire (described in Measures). Participants were excluded if they endorsed current acute/chronic pain, current use of prescription pain medications, history of or treatment for psychiatric or substance-related problems, medical conditions that contraindicate the use of alcohol, or an inability to read English. Participants were compensated up to $238 for their participation in the parent study.

Measures. A list of all study measures can be found in Table 1.

Demographic Variables. Participants were asked to report sociodemographic information, including age, gender, race, ethnicity, education, employment status, annual income, and height (Appendix A).

***Expectancies for Alcohol Analgesia*.** Expectations for alcohol-related pain inhibition were assessed using a newly developed measure of Expectancies for Alcohol Analgesia (EAA).

The EAA was adapted for use in an ongoing study of pain and alcohol use, from an established Pain and Smoking Expectancies measure (Ditre, 2006; Ditre, 2009; Parkerson & Asmundson, 2016). The EAA has five items that are rated on a scale ranging from 0 (completely unlikely) to 9 (completely likely). Items include: (1) Drinking alcohol would ease my pain; (2) If I were to experience pain, drinking would help me reduce it; (3) If I hurt myself, I would feel less pain if I could drink alcohol; (4) When I feel pain, drinking alcohol can really help; and (5) I feel like drinking alcohol would help me cope with pain (Appendix B). Items were summed to generate a total score (possible range: 0-45).

***Quantity and Frequency of Alcohol Consumption*.** Patterns of alcohol consumption over the past 3 months were assessed using the Modified Daily Drinking Questionnaire (DDQ-M; Appendix C; Dimeff, 1999), and the Quantity-Frequency-Variability Questionnaire (QFV; Appendix D; Cahalan, Cisin, & Crossley, 1969). The DDQ-M allows for calculation of average number of drinks consumed each day, average number of hours spent drinking each day, and frequency of binge drinking ($\geq$ 5 drinks within a couple of hours of each other). The QFV yields categorical classifications of alcohol use behavior (i.e., abstainers, infrequent, light, moderate, and heavy drinkers). Participants were only included in this study if their QFV responses indicated moderate-to-heavy drinking patterns. Both the DDQ-M and the QFV are valid and reliable instruments that are commonly used in research examining patterns of drinking behavior (e.g., Carey, Carey, Maisto, & Henson, 2006; Carey, Henson, Carey, & Maisto, 2009; Carey & Teitelbaum, 1996; Dvorak, Simons, & Wray, 2011; Simons, Maisto, Wray, & Emery, 2016).

***Experimental Pain Threshold and Tolerance*.** Experimental pain threshold and tolerance were assessed using contact-heat via the Q-Sense CPM unit manufactured by Medoc LTD (Ramat Yishai, Israel). A heat thermode was placed on the non-dominant forearm, and the

temperature on the thermode increased at a rate of 2°C/sec. To assess threshold, participants were asked to indicate when they first perceived the stimulus as painful using a remote push-button response device. To assess tolerance, participants were asked to indicate when they were no longer willing to tolerate the stimulus. Experimental pain threshold and tolerance were each assessed during three separate trials, and average temperatures were calculated for each outcome.

***Alcohol Outcome Expectancies*.** Alcohol outcome expectancies were assessed using the 34-item Alcohol Outcome Expectancies Scale (AOES; Appendix E; Leigh & Stacy, 1993). This measure assesses two global factors (positive and negative outcome expectancies), as well as eight sub-factors, including four positive alcohol outcome expectancies (i.e., social facilitation, fun, sex, and tension reduction), and four negative outcome expectancies (social, emotional, physical, and cognitive performance). This valid and reliable measure has previously been shown to predict drinking behavior (Leigh & Stacy, 1993).

Procedure. Participants were recruited to take part in a two-visit experimental study of pain-alcohol interrelations (R01AA024844), and were instructed to refrain from using any alcohol or illicit/over-the-counter drugs for 24 hours prior to each study visit. At the beginning of the first visit, participants completed a standardized set of baseline measures, which included the EAA. Participants were then counterbalanced to experimental procedures across the two study visits. At one visit, participants were randomized to one of four alcohol administration conditions (moderate alcohol dose, low alcohol dose, placebo, control), and underwent quantitative sensory testing (QST) using the Medoc Q-Sense CPM unit (described above) both pre- and post-alcohol consumption. At the other visit, participants were randomized to either pain or no pain conditions, and completed an alcohol taste-test while undergoing pain induction or no-pain induction. The current analyses utilized data collected from the baseline self-report measures and

the pre-alcohol QST assessment. The EAA was only administered at the first study session, as part of the standardized set of baseline measures.

Data Analytic Plan. All statistical analyses were conducted using IBM SPSS Statistics and Amos 24. First, responses to each EAA item were examined for univariate and multivariate normality. Second, a confirmatory factor analysis (CFA) was fit to the data to confirm the hypothesized five-item, one-factor structure of the EAA. CFA (vs. exploratory factor analysis) was used given the empirical basis for specifying a single-factor model (e.g., high internal consistency and hypothesized unidimensionality of the PSE; Ditre, 2006; Ditre et al., 2010; Parkerson & Asmundson, 2016), and because CFA reduces the likelihood of benefitting from chance characteristics of the data (Fabrigar, Wegener, MacCallum, & Strahan, 1999). Consistent with recommendations (e.g., Hu & Bentler, 1999; Matsunaga, 2010; Schreiber, Nora, Stage, Barlow, & King, 2006), several measures of absolute, parsimony-adjusted, and incremental fit were used to evaluate the goodness-of-fit of the CFA model. Specifically, model fit was determined by examining: standardized root mean square residual (SRMR; $< .08$), root mean square error of approximation (RMSEA; $< .10$), comparative fit index (CFI; $\geq .90$), and non-normed fit index (NNFI; $\geq .95$). Third, internal consistency of the EAA was tested using Cronbach's alpha (Santos, 1999). Fourth, we examined bivariate/point-biserial correlations between EAA total scores and (1) alcohol consumption patterns (DDQ-M and QFV scores), (2) alcohol outcome expectancies (AOES scores), (3) pain threshold/tolerance, and (4) participant height. Finally, we examined associations between EAA total scores and sociodemographic factors (i.e., gender, age, race, ethnicity, marital status, income, education) using bivariate correlations (for continuous variables) and analysis of variance (ANOVA; for categorical/dichotomous variables).

Results

Participant Characteristics. Participants included 200 moderate-to-heavy drinkers with no chronic/acute pain (39% female; 39% non-white; 8% Hispanic; M_{age} = 33.4, *SD* = 12.1, range: 21-63). More than one-quarter of the sample (27%) completed at least a 4-year college degree, and one-fifth reported a total household income greater than $50,000. Participants reported drinking approximately 4 alcoholic beverages each day (*SD* = 7.9), and nearly two-thirds (64%) were classified as heavy drinkers according to the Quantity-Frequency-Variability measure. Additional sociodemographic, alcohol, and pain characteristics are presented in Table 2.

Confirmatory Factor Analysis. Prior to conducting the CFA, we evaluated the assumption of multivariate normality (e.g., Byrne, 2010). Univariate normality is a necessary condition for multivariate normality (Byrne, 2010), and the skewness and kurtosis values for each item fell within acceptable limits (< |2.0|; Table 3). No univariate outliers were identified. However, even after excluding multivariate outliers (n = 6; identified via Mahalanobis distance; e.g., Blunch, 2012), Mardia's multivariate kurtosis coefficient was found to be 23.54, which indicated that the data remained multivariate non-normal. Therefore, we utilized a bootstrapping procedure, which is a robust method that performs effectively even under conditions of extreme non-normality (e.g., Hoyle, 2012; Nevitt & Hancock, 2001). Per recommendations (e.g., Bollen & Stine, 1992; Hoyle, 2012), naïve bootstrapping with 2000 samples was used to obtain parameter estimates, adjusted standard errors, and confidence intervals, and the Bollen-Stine bootstrap χ^2 test statistic was used to gauge model-fit without normal theory limitations. Additional model-fit indices (i.e., SRMR, RMSEA, CFI, NNFI) were estimated using a maximum likelihood (ML) estimation procedure, which is remarkably robust even when there is departure from multivariate normality (e.g., Olsson, Foss, Troye, & Howell, 2000). Consistent

with previous work (e.g., Cole et al., 2006; Hamilton & Akhter, 2009; Hong & Walker, 2015; Rice, Aucote, Möller-Leimkühler, & Amminger, 2015; Walker, 2010), both ML estimation and Bollen-Stine bootstrapping results will be presented. There were no missing data.

Standardized factor loadings ranged from .87 - .97 (all *p*s < .001; Figure 2). Unstandardized factor loadings, along with their accompanying bootstrapped standard errors and confidence intervals, are displayed in Table 4. Fit indices were as follows: Bollen-Stine bootstrap $p = .005$, CFI = .943, NNFI = .886, SRMR = .030, and RMSEA = .295 (90% CI: .243 - .350). Given that the Bollen-Stine bootstrap and RMSEA values indicated poor model fit and possible model misspecifications, standardized residual covariances and modification indices were evaluated (Byrne, 2010; Chau, 1997). Standardized residuals are fitted residuals divided by their asymptotically standard errors, and values > 2.58 are considered large (Byrne, 2010; Jöreskog & Sörbom, 1993). Standardized residual covariances were all low (see Table 5). Modification indices suggested misfit resulting from correlated errors between item #4 (i.e., "When I feel pain, drinking alcohol can really help") and item #5 (i.e., "I feel like drinking alcohol would help me cope with pain"; MI = 66.68), which could be explained by semantic overlap. Indeed, these items are the only two that do not directly assess expectancies that alcohol will reduce pain, but instead, assess whether alcohol can "help" more generally. Because the regression weights for items #4 and 5 were high (> .90) and statistically significant (*p*s < .001), and standardized residuals were all low, we elected to retain both items. However, the error covariance between these items was freed up (Muthen & Muthen, 2010).

After modification, standardized factor loadings ranged from .85 - .98 (all *p*s < .001; Figure 3). Unstandardized factor loadings are displayed in Table 6. Fit indices were as follows: Bollen-Stine bootstrap $p = .170$, CFI = .995, NNFI = .988, SRMR = .016, and RMSEA = .096

(90% CI: .030 - .165). This model provided good fit according to the Bollen-Stine bootstrap *p*, CFI, NNFI, and SRMR, and acceptable fit according to the RMSEA (e.g., Lai & Green, 2016). Standardized residual covariances of the modified model are presented in Table 7.

Internal Consistency. The EAA evinced excellent internal consistency ($\alpha = .97$).

Correlates of EAA Scores. EAA scores were positively associated with alcohol consumption patterns and outcome expectancies (Table 8). Specifically, expectancies for alcohol analgesia were positively associated with average number of drinks consumed per day ($r = .28$, $p < .001$), average number of hours spent drinking each day ($r = .36$, $p < .001$), frequency of binge drinking ($r = .29$, $p < .001$), and QFV drinking classification ($r = .25$, $p < .001$). EAA scores were also positively associated with both positive ($r = .42$, $p < .001$) and negative ($r = .38$, $p < .001$) alcohol outcome expectancies, and correlations with individual AOES subscales ranged from $r = .24$ - $.47$ (all ps $< .01$). Notably, the EAA was most strongly associated with the tension reduction subscale ($r = .47$, $p < .001$). As shown in Table 9, EAA scores were not associated with experimental pain threshold ($r = -.08$, $p = .27$) or tolerance ($r = -.05$, $p = .54$). As expected, EAA scores were not associated with height ($r = -.04$, $p = .55$).

EAA Scores as a Function of Sociodemographic Characteristics. Male participants scored higher ($M = 17.20$, $SD = 13.47$) on the EAA than female participants ($M = 12.81$, $SD = 11.95$; $F(1, 198) = .53$, $p = .02$). EAA scores were also positively associated with age ($r = .20$, $p = .004$). Although Hispanic participants scored lower on the EAA ($M = 7.63$, $SD = 10.29$) than non-Hispanic participants ($M = 16.7$, $SD = 13.06$; $F(1, 198) = 6.50$, $p = .01$), this result should be interpreted with caution due to the small number of participants who endorsed Hispanic ethnicity ($n = 16$). No differences in EAA scores were observed between Black/African American ($M = 14.77$, $SD = 14.92$) and White participants ($M = 15.61$, $SD = 11.63$; $F(1, 191) = .19$, $p = .67$). In

addition, no differences in EAA scores were observed as a function of marital status, education, or income (*p*s > .05).

Study 2

The goal of Study 2 was to evaluate the EAA factor structure, reliability, and validity among a sample of current alcohol users with chronic musculoskeletal pain. Although individuals who do not experience persistent pain may still develop alcohol outcome expectancies for pain relief (e.g., expectancies can be influenced by social/cultural transmission; Asmundson, Gomez-Perez, Richter, & Carleton, 2014; Johnson, Nagoshi, Danko, Honbo, & Chau, 1990), it is important to extend the findings of Study 1 to a sample of individuals with chronic pain. Indeed, persons with chronic pain (vs. without chronic pain) are more likely to meet criteria for alcohol dependence (Von Korff et al., 2005), and likely have a greater number of opportunities to learn about the effects of alcohol on pain, which, in turn, can strengthen expectancies for alcohol analgesia (Ditre et al., 2019; Thompson, Oram, Correll, Tsermentseli, & Stubbs, 2017). Consequently, persons with chronic pain may hold a greater number of beliefs regarding the pain-relieving effects of alcohol, and may be more likely to reference these expectancies when making decisions related to drinking behavior. We hypothesized that the EAA would demonstrate (1) a single-factor structure (see Figure 1), (2) acceptable internal consistency ($\alpha > .7$), (3) initial evidence of concurrent validity via medium-to-large sized correlations with outcomes related to both alcohol consumption and *clinical* pain experience, and (4) initial evidence of divergent validity via the absence of associations with height (a theoretically distinct construct). An exploratory aim of this study was to assess whether EAA scores differed as a function of sociodemographic characteristics (e.g., gender, race) and/or the

presence of a high level of alcohol problems (i.e., scoring above the recommended cut-off on the AUDIT [described below]).

Method

Participants. Participants included 300 alcohol users who were recruited to complete an online survey of pain and alcohol use behaviors via Amazon Mechanical Turk. Participants were included if they were at least 21 years-old and a current resident of the United States, and endorsed any past-month alcohol use (to increase variance in drinking across the sample) and current chronic musculoskeletal pain. Participants were excluded if they reported being unable to read English. We also included a response accuracy check ("To monitor quality, please respond with a two for this item"), and participants who responded incorrectly to this item were excluded from analyses (n = 27). Thus, the final sample consisted of N = 273 participants. Participants were compensated $3.00 for completing the online survey.

Online Survey. A brief (~40 minutes) online survey of chronic pain and substance-related behaviors was administered to participants via Amazon Mechanical Turk. Mechanical Turk has been shown to offer advantages that can reduce costs and increase recruitment feasibility (Ipeirotis, 2010). Samples recruited using Mechanical Turk are often more representative of the U.S. population than samples recruited from traditional participant pools (e.g., universities; Ipeirotis, 2010). Mechanical Turk also provides tools to increase data quality (e.g., response accuracy checks; Amazon Mechanical Turk, 2011), and previous work has found that the accuracy of data collected from Mechanical Turk is similar to that of traditional participant pools (Paolacci, Chandler, & Ipeirotis, 2010). Prior work has demonstrated variability in alcohol consumption among Mechanical Turk users, with half of users drinking ≥ 1 alcoholic beverage per week (M = 3, SD = 6, range = 0 - 40; Shapiro, Chandler, & Mueller, 2013). There is

also evidence that the prevalence of chronic pain among Mechanical Turk users is comparable to rates observed in the general population (Shapiro et al., 2013).

Measures. Demographic variables, expectancies for alcohol analgesia, quantity/frequency of alcohol consumption, and alcohol outcome expectancies were assessed using procedures that were identical to those used in Study 1. See Table 1 for a complete list of study measures.

***Hazardous and Harmful Patterns of Alcohol Consumption*.** The 10-item Alcohol Use Disorders Identification Test (AUDIT; Appendix F) was used to assess hazardous and harmful patterns of drinking (Babor, Higgins-Biddle, Saunders, & Monteiro, 1992). Items were summed to generate a total score. Total scores ≥ 16 represent a high level of alcohol problems (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001) The AUDIT includes three subscales that assess unique patterns of alcohol use. The AUDIT-Consumption subscale assesses quantity/frequency of alcohol use, the AUDIT- Harmful Use subscale assesses drinking that results in consequences to physical and mental health, and the AUDIT- Dependence subscale assesses for drinking that has resulted in dependence/addiction. Previous work has consistently demonstrated the reliability and validity of the AUDIT (e.g., Reinert & Allen, 2002).

***Drinking Motives*.** Motives for drinking alcohol were assessed using the Revised Drinking Motives Questionnaire (DMQ-R; Appendix G; Cooper, 1994; Martin, Ferreira, Haase, Martins, & Coelho, 2016). The DMQ-R is 20-item measure that assesses various reasons for drinking using a 5-point Likert scale ranging from 1 (*almost never/never*) to 5 (*almost always/always*). Four different motives were assessed, including negative reinforcement/coping motives (e.g., “To forget about your worries”), social motives (e.g., “To be sociable”), enhancement motives (e.g., “Because you like the feeling”), and conformity motives (e.g., “To

fit in with a group that you like"). The DMQ-R has previously been shown to predict greater alcohol use, risky drinking, and alcohol-related problems (Kuntsche, Stewart, & Cooper, 2008).

***Clinical Pain Variables*.** The Graded Chronic Pain Scale (GCPS; Appendix H; Von Korff, Ormel, Keefe, & Dworkin, 1992) provides a categorical classification of chronic pain by grade (severity) that ranges from Grade 1 (low intensity, low interference) to Grade 4 (severe interference). The GCPS also provides measures of characteristic pain intensity and pain-related disability. Consistent with scoring instructions (Von Korff et al., 1992), the characteristic pain intensity score was computed by summing ratings (0 = *no pain* to 10 = *pain as bad as it could be*) of pain "right now," "on average," and at its "worst" in the past three months. The pain-related disability score was computed by summing responses from three items assessing the extent to which pain has interfered with daily functioning over the past 3 months (0 = *no interference* to 10 = *unable to carry on any activities*) and one item reflecting the number of days that has interfered with usual activities (0 = *none* to 10 = *76-90 days*). The GCPS is reliable and valid measure of chronic pain in both clinical and non-clinical samples (Von Korff, 2011). In addition to the GCPS, the Orebro Musculoskeletal Pain Questionnaire – Short Form (OMPQ-SF; Appendix I) was used to assess psychosocial risk factors for the development of work disability due to pain (Linton, Nicholas, & MacDonald, 2011). The OMPQ-SF has been shown to predict poorer physical and mental health at a 2-year follow-up assessment (Smits et al., 2019).

Data Analytic Plan. All statistical analyses were conducted using IBM SPSS Statistics and Amos 24. First, responses to each EAA item were examined for univariate and multivariate normality. Second, a confirmatory factor analysis (CFA) was fit to the data to confirm the hypothesized five-item, one-factor structure of the EAA. Model fit was determined by examining: SRMR ($< .08$), RMSEA ($< .10$), CFI ($\geq .90$), and NNFI ($\geq .95$). Third, internal

consistency was tested using Cronbach's alpha (Santos, 1999). Fourth, we examined bivariate/point-biserial correlations between EAA scores and (1) past-month alcohol consumption patterns (DDQ-M and QFV scores), (2) problematic alcohol use (AUDIT scores), (3) alcohol outcome expectancies (AOES scores), (4) negative reinforcement/coping drinking motives (DMQ-R scores), (5) clinical pain variables (GCPS and OMPQ scores), and (6) participant height. Finally, we examined associations between EAA total scores and sociodemographic factors (i.e., gender, age, race, ethnicity, marital status, income, education) and the presence of a high level of drinking problems (AUDIT score $\geq$ 16) using bivariate correlations (for continuous variables) and analysis of variance (ANOVA; for categorical/dichotomous variables).

Results

Participant Characteristics. Participants included 273 alcohol users with chronic musculoskeletal pain (34.4% female; 36.3% non-white; 18.7% Hispanic; M_{age} = 32.9, *SD* = 9.2, range: 22-66). The sample was generally well-educated (67.8% completed at least a 4-year college degree), and almost half (48%) reported a total household income greater than $50,000. Participants reported drinking approximately 1.6 alcoholic beverages each day (*SD* = 1.4), and nearly half (48%) scored above the AUDIT cut-off for high level of drinking problems (*M* = 15.7, *SD* = 11.0). The most commonly endorsed pain locations were back/neck (43.6%), head/face (18.7%), and lower extremities (14.7%), and nearly half of the sample (46.3%) reported that their current pain problem has lasted for over 1 year. The majority of participants (65.9%) endorsed either Grade 3 or Grade 4 chronic pain, indicating high levels of pain-related disability. Additional sociodemographic, alcohol, and pain characteristics are presented in Table 10.

Confirmatory Factor Analysis. Data were examined for univariate and multivariate normality. The skewness and kurtosis values for all individuals items fell within acceptable limits (Table 11), and no univariate outliers were identified. However, data remained multivariate non-normal (Mardia's multivariate kurtosis coefficient = 12.59), even after excluding outliers that were identified via Mahalanobis distance (n = 9). Therefore, we utilized a naïve bootstrapping procedure with 2000 samples to obtain parameter estimates, adjusted standard errors, and confidence intervals, and the Bollen-Stine bootstrap χ^2 test statistic to assess model-fit (Bollen & Stine, 1992; Hoyle, 2012; Nevitt & Hancock, 2001). There were no missing data.

Standardized factor loadings ranged from .92 - .96 (all ps < .01; Figure 4). Unstandardized factor loadings are displayed in Table 12. Fit indices were as follows: Bollen-Stine bootstrap p = .006, CFI = .985, NNFI = .970, SRMR = .014, and RMSEA= .145 (90% CI: .100 - .194). Given suboptimal model fit according to the Bollen-Stine bootstrap and RMSEA, we inspected standardized residual covariances and modification indices (Byrne, 2010; Chau, 1997). Standardized residual covariances were all low (Table 13). Consistent with the findings from Study 1, modification indices suggested misfit resulting from correlated errors between items 4 and 5 (MI = 14.09). Following model modification, standardized factor loadings ranged from .90 - .95 (all ps < .01; Figure 5; unstandardized factor loadings are displayed in Table 14). Fit indices were as follows: Bollen-Stine bootstrap p = .126, CFI = .995, NNFI = .988, SRMR = .009, and RMSEA = .092 (90% CI: .039 - .151). This model provided good fit according to the CFI, NNFI, and SRMR, and acceptable fit according to the RMSEA (e.g., Lai & Green, 2016). Standardized residual covariances of the modified model are presented in Table 15.

Internal Consistency. The EAA evinced excellent internal consistency (α = .97).

Correlates of EAA Scores. EAA scores were positively associated with both alcohol consumption patterns (Table 16), and outcome expectancies and motives for drinking (Table 17). Specifically, expectancies for alcohol analgesia were positively associated with average number of drinks consumed per day ($r = .31$, $p < .001$), average number of hours spent drinking each day ($r = .22$, $p < .001$), frequency of binge drinking ($r = .47$, $p < .001$), and QFV drinking classification ($r = .45$, $p < .001$). EAA scores were also positively associated with AUDIT total scores ($r = .54$, $p < .001$), and scores on each of the AUDIT subscales, including quantity/frequency of drinking ($r = .38$, $p < .001$), alcohol dependence symptoms ($r = .47$, $p < .001$), and drinking that has resulted in consequences to physical/mental health ($r = .39$, $p < .001$). EAA scores were also positively associated with both positive ($r = .45$, $p < .001$) and negative ($r = .49$, $p < .001$) alcohol outcome expectancies, and correlations with individual AOES subscales ranged from $r = .33$ - $.52$ (all ps $< .001$). In addition, EAA scores were positively associated with coping ($r = .54$, $p < .001$), social ($r = .30$, $p < .001$), enhancement ($r = .46$, $p < .001$), and conformity ($r = .40$, $p < .001$) motives for drinking.

In terms of clinical pain variables (see Table 18), EAA scores were positively associated with chronic pain grade ($r = .39$, $p < .001$), characteristic pain intensity ($r = .39$, $p < .001$), and pain-related disability ($r = .38$, $p < .001$). Similarly, EAA scores were positively associated with scores on the OMPQ-SF ($r = .35$, $p < .001$).

As expected, EAA scores were not associated with participant height ($r = .11$, $p = .08$).

EAA Scores as a Function of Sociodemographic Characteristics and High Level of Drinking Problems. Male participants scored higher ($M = 26.87$, $SD = 12.55$) on the EAA than female participants ($M = 23.64$, $SD = 13.09$; $F(1, 271) = 3.96$, $p = .048$), and EAA scores were negatively associated with age ($r = -.18$, $p = .003$). EAA scores also differed as a function of race

($F(1, 267) = 3.13$, $p = .009$), with Asian participants scoring significantly higher ($M = 31.44$, $SD = 11.89$) then Black/African American ($M = 21.59$, $SD = 15.03$) and White ($M = 24.87$, $SD = 15.03$) participants. Similarly, Hispanic participants scored higher on the EAA ($M = 30.37$, $SD = 11.51$) than non-Hispanic participants ($M = 24.69$, $SD = 12.88$; $F(1, 271) = 8.38$, $p = .004$). No differences in EAA scores were observed as a function of marital status, education, or income ($ps > .05$).

Finally, EAA scores were higher among participants who scored above the AUDIT cut-off for a high level of drinking problems ($M = 32.15$, $SD = 8.27$), compared to those who scored below the cut-off ($M = 19.85$, $SD = 3.42$; $F(1, 271) = 81.45$, $p < .001$).

Discussion

These studies represent the first examination of psychometric properties of the Expectancies for Alcohol Analgesia Scale (EAA), which is a novel, five-item measure designed to assess expectancies that drinking alcohol will reduce pain. The EAA was administered to two independent samples: Study 1 included 200 moderate-to-heavy drinkers with no current pain, and Study 2 included 273 current alcohol users with chronic musculoskeletal pain. In both studies, results provided support for the single-factor structure, reliability, and validity of the EAA.

Single-Factor Structure

Initial evaluation of the hypothesized single-factor structure of the EAA indicated good model-fit across several indices in both Study 1 (i.e., CFI, SRMR) and Study 2 (i.e., CFI, NNFI, SRMR). However, the Bollen-Stine bootstrap χ^2 test statistic and RMSEA suggested poor model fit across both samples, and the NNFI was sub-optimal in Study 1. To improve model fit, we made one *post-hoc* adjustment in the factor structure by allowing correlated measurement errors

for items 4 ("When I feel pain, drinking alcohol can really help") and 5 ("I feel like drinking alcohol would help me cope with pain"). Overlap in the content of these items may give rise to covariation in measurement errors (i.e., both items address pain coping versus pain reduction), and modification indices suggested that substantial improvement in model-fit would be achieved by allowing the error covariance of these items to be estimated freely. In both studies, this *post-hoc* modification resulted in good model-fit according to the Bollen-Stine bootstrap χ^2 test statistic, CFI, NNFI, and SRMR (e.g., Bollen & Stine, 1992; Hu & Bentler, 1999), and acceptable fit according to the RMSEA (e.g., Lai & Green, 2016).

Internal Consistency

Cronbach's α coefficients indicated that internal consistency of the EAA was excellent ($\alpha \geq .9$) in both study samples (DeVellis, 2016). This finding suggests that the EAA items are inter-related, and that expectancies for alcohol analgesia were measured with a high degree of consistency (Henson, 2001). Although some researchers have argued for attaining the highest Cronbach's alpha possible, others have noted problems related to high intercorrelations among items, including the possibility that the items are overly redundant or that the construct measured is too specific (e.g., Briggs & Cheek, 1986; Neuendorf, 2003). Indeed, the EAA aims to measure a specific construct, and the high internal consistency provides evidence, in conjunction with the factor analysis results, that the EAA items measure a single construct (Tavakol & Dennick, 2011).

Concurrent Validity

Relations with Alcohol-Related Variables. Results also indicated that EAA scores were positively associated with average number of drinks per day, average number of hours spent drinking each day, and frequency of binge drinking in both studies. In addition, EAA scores were

associated with AUDIT total and subscale scores in Study 2, suggesting that expectancies for alcohol analgesia are related to greater quantity/frequency of alcohol consumption, alcohol-related consequences, and dependence symptoms among current alcohol users. Overall, correlations tended to be medium-to-large in magnitude ($rs \geq .3$; e.g., Pallant, 2013). These findings are consistent with expectancy theory, which dictates that there should be lawful relationships between alcohol outcome expectancies and quantity/frequency of drinking (Jones et al., 2001), and with an established literature indicating that positive alcohol outcome expectancies are related to greater drinking behavior (e.g., Jones et al., 2001; Leigh & Stacy, 1993; Monk & Heim, 2013). Taken together, these results provide initial support for the concurrent validity of EAA (e.g., Swank & Mullen, 2017).

EAA total scores were also positively associated with scores on a widely used measure of general alcohol outcome expectancies, further supporting the validity of the EAA. More specifically, higher EAA scores were related to greater positive (e.g., tension reduction, social facilitation) and negative (e.g., reduced cognitive/performance abilities) alcohol outcome expectancies. Although it seems rather intuitive that drinkers who hold expectancies for alcohol analgesia would also believe that drinking results in other positive outcomes, it was somewhat surprising that EAA scores were also positively associated with negative alcohol outcome expectancies. One possible explanation for this finding is that participants who scored higher on the EAA (who also reported a higher quantity and frequency of consumption) have had more opportunities to develop stronger expectancies for both the positive and negative effects of alcohol (e.g., Johnson et al., 1990).

Consistent with previous work documenting positive associations between negative reinforcement expectancies and coping motives for drinking (e.g., Urbán, Kökönyei, &

Demetrovics, 2008), relatively higher correlations (*r*s = .47) were observed between EAA scores and scores on the Tension Reduction/Negative Reinforcement subscale of the AOES, which assesses expectations that alcohol will alleviate negative affect (e.g., "I feel less stressed"). Similarly, although EAA scores were positively associated with motives for drinking in general, expectancies for alcohol analgesia were most strongly associated with coping motives (*r* = .54; e.g., "To forget about your problems"). Taken together, these findings suggest that EAA scores are most closely related to scores on measures that also assess negative reinforcement processes involved in drinking expectancies/motivation. Coping motives are believed to mediate the relationship between negative reinforcement expectancies and alcohol use/misuse (e.g., Cooper, Frone, Russell, & Mudar, 1995), and drinkers who hold expectancies for alcohol analgesia may be more motivated to drink to cope with pain, ultimately resulting in the development of problematic patterns of alcohol use.

Relations with Pain-Related Variables. EAA scores were also positively associated with each of the clinical pain variables assessed in Study 2. Specifically, higher EAA scores were associated with greater chronic pain grade, characteristic pain intensity, pain-related disability, and estimated risk for future work disability. Correlations were medium-sized, and provided additional support for concurrent validity of the EAA (e.g., Swank & Mullen, 2017). Indeed, individuals with more severe and disabling pain have likely encountered a greater number of opportunities to learn about the effects of alcohol on pain, which, in turn, may strengthen expectancies for alcohol analgesia. Moreover, given associations between EAA scores and quantity/frequency of alcohol consumption, it is possible that chronic and heavy alcohol use has led to increased pain facilitation among those with higher EAA scores (e.g., Ditre et al., 2019; Egli, Koob, & Edwards, 2012).

Contrary to expectation, EAA scores were not associated with experimental pain reactivity in Study 1. Participants in this study were excluded based on the endorsement of current acute or chronic pain, and it makes some sense that EAA scores did not predict experimental pain threshold/tolerance among this sample. Although chronic and/or heavy drinking can lead to increased pain facilitation and/or decreased pain inhibition (Elman & Borsook, 2016), participants in this sample were generally young (M_{age} = 33.4), and it is possible that problematic patterns of alcohol use have not yet resulted in altered pain reactivity (Elman & Borsook, 2016). Future research is needed to assess associations between expectancies for alcohol analgesia and experimental pain reactivity among persons with chronic pain, and among participants who endorse a substantial history of chronic/heavy drinking. Future work should also examine associations between EAA scores and experimental pain reactivity during acute alcohol intoxication (vs. 24-hour alcohol abstinence).

Divergent Validity

Results also provided support for the divergent validity of the EAA, which was tested by comparing EAA scores to a theoretically distinct construct. More specifically, EAA scores were not correlated with participant height. This finding is consistent with recommendations that correlations with scores on divergent measures should be lower than correlations with scores on measures that are theoretically-related to the construct of interest (Michalos, 2014). Taken together, the EAA demonstrated concurrent validity with theoretically-related constructs (e.g., frequency/quantity of alcohol consumption, alcohol outcome expectancies, clinical pain variables), as well as divergent validity with a theoretically-distinct measure (i.e., height).

Relationships with Sociodemographic Factors

Across both studies, EAA scores were higher among males than females. This pattern of findings is consistent with previous work demonstrating that males (vs. females) are more likely to hold positive alcohol outcome expectancies (e.g., Kirmani & Suman, 2010). In Study 1, older age was also associated with higher EAA scores. However, we observed a negative relationship between age and EAA scores among Study 2 participants. Future research should attempt to clarify the relationship between age and EAA scores. There was also a discrepancy across the two studies regarding the relationship between EAA scores and ethnicity. Results of Study 2 indicated that Hispanic (vs. non-Hispanic) participants scored higher on the EAA, and this is consistent with previous findings that Hispanic drinkers may hold more positive expectancies (e.g., social extroversion) regarding the effects of alcohol use (Marin, Posner, & Kinyon, 1993). In contrast, results of Study 1 indicated that Hispanic participants scored lower on the EAA, however, these results should be interpreted with caution given the small number of participants who endorsed Hispanic ethnicity (n = 16). Finally, the current results provide initial evidence that Asian drinkers (vs. Black/African American and White drinkers) may hold stronger expectancies for alcohol analgesia, however, future work is needed to replicate these findings among larger samples.

Strengths and Limitations

Study Strengths. This project has several strengths, including the recruitment of two participant samples (drinkers with and without chronic pain). Persons with chronic pain (vs. without chronic pain) are more likely to meet criteria for alcohol dependence (Von Korff et al., 2005), and it is critical to assess and address factors that maintain drinking behavior among drinkers with comorbid chronic pain. Individuals with chronic pain (vs. without chronic pain) may also hold a greater number of beliefs regarding the pain-relieving effects of alcohol (due to

having more opportunities to learn about the effects of alcohol on pain), and may be more likely to reference these expectancies when making decisions related to drinking behavior. However, pain is a near universal experience (IOM, 2011), and even persons without a pain disorder may encounter opportunities to develop beliefs about pain in the context of drinking (e.g., Johnson et al., 1990). Indeed, scores on the EAA ranged from 0-45 among both participant samples, providing support for the notion that persons with and without chronic pain may develop expectancies for alcohol analgesia. Other strengths include the recruitment of a diverse group of participants (both samples were >36% non-White), the inclusion of a response accuracy check in Study 2, and the use of valid/reliable measures of concurrent validity.

Study Limitations. Several limitations and directions for future research are worth noting.

***Limitations Related to Item Content*.** EAA items assess the likelihood of experiencing pain-relief when drinking alcohol (e.g., "If I hurt myself, I would feel less pain if I could drink alcohol"). However, the quantity of alcohol consumed and/or level of intoxication are not specified. Previous research has noted that alcohol expectancies may vary based on the amount of alcohol that a person imagines consuming, the duration of the drinking episode, and the limb of the blood alcohol curve (BAC), and that assessment of dose-related expectancies may yield important information about the perceived effects of drinking (e.g., Fromme et al., 1993; Morean et al., 2012). Future work should consider anchoring EAA items to specific quantities of alcohol, and testing whether expectancies for alcohol analgesia increase as one imagines consuming a greater number of drinks over a specified time period. Given evidence that individuals anticipate more positive alcohol effects on the ascending (vs. descending) BAC limb (e.g., Earleywine &

Martin, 1993), future work should also test whether drinkers similarly hold stronger expectancies for alcohol analgesia during the ascending BAC limb.

Limitations Related to the Assessment of Validity. Only the concurrent and divergent validity of the EAA were assessed in these studies. Thus, evidence of validity was limited to associations between EAA scores and criterion measurements (e.g., scores on self-report assessments of pain and alcohol use) made at the time the EAA was administered. Although the current results provide initial evidence of validity by demonstrating that EAA scores are correlated with measures of related constructs and are not correlated with variables that are conceptually distinct, future research is needed to assess the predictive validity of this measure. For example, it is important to test whether EAA scores are prospectively associated with the development of problematic patterns of alcohol consumption and poorer pain outcomes.

Additional research is also needed to provide support for the content validity (i.e., the extent to which elements of a measure are relevant to and representative of the targeted construct; Haynes, Richard, & Kubany, 1995) of the EAA. It has been suggested that factor analysis can provide evidence of content validity, as it allows empirical examination of the content dimensionality of items (Haynes et al., 1995; Schriesheim, Powers, Scandura, Gardiner, & Lankau, 1993), and results of the current study supported the unidimensional factor structure of the EAA. However, there may be limitations to using data reduction approaches in assessing content adequacy (e.g., factor analysis may only indicate that groups of items are perceived in a similar manner by respondents; Schriesheim et al., 1993). Future studies could include a quantitative approach, such as a judge panel method (e.g., Berk, 1984; Lawshe, 1975; Morris & Fitz-Gibbon, 1978), or an extended matrix and Q-method approach (e.g., Schriesheim et al., 1993; Stephenson, 1953). Future work could also consider improving the measure through

revision and expansion. For example, it may be important to test whether the EAA adequately assesses different dimensions of pain reduction (e.g., affective vs. physiological).

Limitations Related to Assessment of Reliability. In both studies, reliability was assessed using Cronbach's alpha, and results revealed that the EAA demonstrated excellent internal consistency. Although Cronbach's alpha is one of the most commonly reported reliability estimates in the literature (e.g., Brown, 2002), future research is needed to assess other forms of reliability. For example, evaluating test-retest reliability (by measuring the correlation between EAA scores that were administered to the same sample on two separate occasions) could provide valuable insight into the degree of stability in EAA scores across different situations/states (e.g., Crocker & Algina, 1986).

Limitations Related to the Study Samples. Although both studies included several measures of quantity/frequency of alcohol consumption (and Study 2 compared EAA scores as a function of scoring above [vs. below] the AUDIT cut-off for high level of drinking problems), the presence of alcohol use disorder (AUD) was not assessed. Future research should extend these findings to treatment-seeking drinkers with AUD, and determine whether the EAA predicts treatment outcomes among this population. In the contrary, both samples consisted of current alcohol users, and future work should also test the psychometric properties of the EAA among a sample that includes never and former drinkers. Indeed, it is possible that non-drinkers may still develop expectancies for alcohol analgesia due to social and/or cultural transmission (e.g., Leventhal & Schmitz, 2006). Finally, Study 2 was limited to participants who endorsed current chronic musculoskeletal pain, and future research should replicate these findings among participants with neuropathic pain conditions (e.g., fibromyalgia) and among treatment-seeking pain patients.

Limitations Related to Amazon Mechanical Turk. Study 2 participants were recruited using Amazon Mechanical Turk, and it is important to note two possible limitations of this method. First, although previous research has demonstrated that Mechanical Turk respondents are as representative of the U.S. population (in terms of gender, race, age, and education) as more traditional participant pools (e.g., Paolacci et al., 2010), it is unclear whether participants enrolled in this study are truly reflective of alcohol users with chronic musculoskeletal pain in the American population. For example, we observed high levels of drinking problems (mean AUDIT total score = 15.7) in this sample, and it is unclear whether similar alcohol consumption patterns/problems would be observed in samples recruited from other sources. We selected Amazon Mechanical Turk for convenience, and additional work is needed to generalize these results across larger and more diverse samples that are recruited via a variety of sampling methods (e.g., university participant pools, recruitment from pain/substance treatment centers). A second potential limitation of using Amazon Mechanical Turk for participant recruitment relates to data quality. However, previous work has demonstrated that data collected from alcohol users on Mechanical Turk tend to be of high quality (Kim & Hodgins, 2017), and steps were taken in the current study to increase data accuracy (e.g., inclusion of a response accuracy check).

Additional Future Research Directions

In addition to conducting supplemental validation studies of the EAA, future research is needed to clarify the role of expectancies for alcohol analgesia in bidirectional pain-alcohol effects. Alcohol can produce acute analgesia (Thompson et al., 2017), and expectations for pain relief have been shown to increase the magnitude of analgesic effects (e.g., Schenk, Sprenger, Geuter, & Büchel, 2014). Thus, it is possible that the experience of pain may be influenced by an interaction between alcohol consumption and expectancies for alcohol analgesia, and future work

should test whether higher EAA scores are associated with greater reductions in pain following drinking. It is also possible that expectancies for alcohol analgesia may lead to greater drinking in response to pain, and future work should test whether EAA scores moderate the effects of pain on alcohol use behavior (i.e., pain as a motivator of drinking). Researchers could also consider utilizing a randomized experimental design to test the effects of a manipulation designed to challenge alcohol-related outcome expectancies for pain reduction on alcohol urge/consumption, as this may provide evidence for a causal pathway between expectancies for alcohol analgesia and drinking behavior in the context of pain (Ditre et al., 2010).

Summary

The development and validation of a measure of expectancies for alcohol analgesia is a critical step in elucidating bidirectional pain-alcohol interrelations. Expectancies for alcohol analgesia could affect the degree to which alcohol confers acute pain-relieving effects, and may amplify propensity to respond to pain with drinking behavior (Ditre et al., 2019). Over time, this cycle could increase drinking and contribute to the development/maintenance of alcohol-related problems. This study, along with future research, has the potential to inform the development of tailored interventions for the large proportion of alcohol users who experience pain. Expectancies can be modified using cognitive restructuring techniques (Dobson, 2009), and tailored cognitive treatments for drinkers with pain could involve challenging expectancies for alcohol analgesia. An intervention component designed to reduce expectations that drinking will provide pain-relief could ultimately decrease motivation to drink in response to pain (e.g., Ditre et al., 2010; Reesor, Vaughan, Hernandez, & Johnston, 2017).

Table 1

List of All Study Measures

Construct	**Study 1 Measures**	**Study 2 Measures**
Expectancies for Alcohol Analgesia	Expectancies for Alcohol Analgesia (EAA; α = .97)	Expectancies for Alcohol Analgesia (EAA; α = .97)
Quantity/Frequency of Alcohol Consumption	Modified Daily Drinking Questionnaire (DDQ-M) Quantity-Frequency-Variability Questionnaire (QFV)	Modified Daily Drinking Questionnaire (DDQ-M) Quantity-Frequency-Variability Questionnaire (QFV)
Problematic Patterns of Alcohol Use	--	Alcohol Use Disorders Identification Test (AUDIT; α = .82)
Alcohol Outcome Expectancies	Alcohol Outcome Expectancies Scale (AOES; positive subscale α = .92, negative subscale α = .90)	Alcohol Outcome Expectancies Scale (AOES; positive subscale α = .94, negative subscale α = .94)
Motives for Alcohol Use	--	Revised Drinking Motives Questionnaire (DMQ-R; α = .93)
Experimental Pain Sensitivity	Experimental pain threshold/tolerance using a Medoc Q-Sense CPM device	--
Clinical Pain Severity	--	Graded Chronic Pain Scale (GCPS; α = .90) Orebro Musculoskeletal Pain Questionnaire – Short Form (OMPQ-SF; α = .65)
Other	Demographic questionnaire	Demographic questionnaire

Table 2

Study 1 Sociodemographic, Alcohol, and Pain Characteristics (N = 200)

	N (%)
Gender	
Male	122 (61.0%)
Race	
White	122 (61.0%)
Black or African American	71 (35.5%)
Asian	4 (2.0%)
American Indian/Alaska Native	3 (1.5%)
Ethnicity	
Hispanic	16 (8.0%)
Marital Status	
Single	152 (76.0%)
Married	24 (12.0%)
Divorced/Separated	24 (12.0%)
Education	
Did not graduate high school	8 (4.0%)
High school graduate or GED	62 (31.0%)
Some college/Technical school/Associates degree	76 (38.0%)
4-year college degree	35 (17.5%)
Some school beyond 4-year college degree	13 (6.5%)
Professional degree (e.g., MD, JD, PhD)	6 (3.0%)
Household Income	
< $10,000	52 (26.0%)
$10,000 - $49,999	109 (54.5%)
$50,000 - $89,999	27 (13.5%)
> $90,000	13 (6.5%)
Past 4-Week Bodily Pain	
None	106 (53.0%)
Very Mild	70 (35.0%)
Mild	18 (9.0%)
Moderate	6 (3.0%)
QFV Classification [a]	
Moderate	72 (36.0%)
Heavy	128 (64.0%)
	M (SD)
Age	33.39 (12.13)
Average daily drinks	3.88 (7.87)
EAA score [b]	15.49 (13.05)

Note. [a] Quantity-Frequency-Variability Measure, [b] Expectancies for Alcohol Analgesia.

Table 3

Item Characteristics and Intercorrelations for the Expectancies for Alcohol Analgesia Scale (EAA) among Study 1

Variable	Min	Max	Skew	Kurtosis		1	2	3	4	5
1 EAA_1	.000	9.000	.516	-1.118		1.000				
2 EAA_2	.000	9.000	.398	-1.268		.950**	1.000			
3 EAA_3	.000	9.000	.289	-1.331		.884**	.894**	1.000		
4 EAA_4	.000	9.000	.092	-1.395		.893**	.906**	.880**	1.000	
5 EAA_5	.000	9.000	.133	-1.400		.812**	.825**	.819**	.908**	1.000
Multivariate				38.885						

Note. $^{**}p < .01$.

Table 4

Unstandardized Factor Loadings with Bootstrap Standard Errors and Confidence Intervals among Study 1

Variable	**Estimate**	***SE***	**95% *CI***	***p***
1 EAA_1	1.000	.000	1.000-1.000	-
2 EAA_2	1.008	.016	.977-1.039	< .001
3 EAA_3	.992	.028	.939-1.046	< .001
4 EAA_4	.988	.029	.930-1.045	< .001
5 EAA_5	.903	.042	.823-.987	< .001

Table 5

Standardized Residual Covariances for the five items from the Expectancies for Alcohol Analgesia Scale (EAA) among Study 1

Variable	**1**	**2**	**3**	**4**	**5**
1 EAA_1	.000				
2 EAA_2	.155	.000			
3 EAA_3	-.047	-.034	.000		
4 EAA_4	-.152	-.103	.088	.000	
5 EAA_5	-.308	-.258	.124	.899	.000

Table 6

Unstandardized Factor Loadings with Bootstrap Standard Errors and Confidence Intervals Following Model Modifications among Study 1

Variable	**Estimate**	***SE***	**95% *CI***	***p***
1 EAA_1	1.000	.000	1.000-1.000	-
2 EAA_2	1.010	.017	.977-1.043	< .001
3 EAA_3	.981	.026	.929-1.030	< .001
4 EAA_4	.967	.025	.916-1.014	< .001
5 EAA_5	.871	.043	.794-.936	< .001

Table 7

Standardized Residual Covariances following Model Modifications among Study 1

Variable	1	2	3	4	5
1 EAA_1	.000				
2 EAA_2	.031	.000			
3 EAA_3	-.050	-.049	.000		
4 EAA_4	-.064	-.027	.278	.000	
5 EAA_5	-.090	-.051	.439	.000	.000

Table 8

Associations between EAA [a] scores and Alcohol-Related Variables among Study 1

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 EAA Total Score	--														
2 Average Daily Drinks	.279**	--													
3 Average Drinking Hours	.358**	.656**	--												
4 Frequency of Binge Drinking	.286**	.398**	.498**	--											
5 QFV [b] Category	.248**	.257**	.334**	.569**	--										
6 AOES [c] – Positive	.416**	.133	.097	.128	.036	--									
7 AOES – Social Positive	.333**	.024	.005	.047	-.032	.871**	--								
8 AOES – Fun	.332**	.247**	.180*	.204**	.094	.776**	.547**	--							
9 AOES – Sex	.244**	.099	.068	.071	-.013	.726**	.454**	.409**	--						
10 AOES – Tension Reduction	.465**	.087	.095	.120	.120	.812**	.679**	.577**	.440**	--					
11 AOES – Negative	.384**	-.063	-.058	-.039	-.001	.325**	.325**	.100	.262**	.347**	--				
12 AOES – Social Negative	.418**	.039	.076	.157*	.108	.292**	.213**	.128	.297**	.319**	.712**	--			
13 AOES – Emotional	.300**	-.021	.059	.024	.089	.132	.141	-.044	.112	.228**	.710**	.557**	--		
14 AOES – Physical	.276**	-.055	-.063	-.051	-.004	.285**	.282**	.070	.282**	.254**	.843**	.519**	.489**	--	
15 AOES – Cognitive	.288**	-.104	-.140	-.132	-.089	.294**	.329**	.120	.171*	.304**	.877**	.425**	.455**	.639**	--

Note. [a] Expectancies for Alcohol Analgesia Scale; [b] Quantity-Frequency-Variability Category (1 = Heavy Drinker, 0 = Moderate Drinker); [c] Alcohol Outcome Expectancies Scale. *$p < .05$, **$p < .01$.

Table 9

Associations between EAA [a] scores and Pain Variables among Study 1

Variable	1	2	3
1 EAA Total Score	--		
3 Pain Threshold	-.079	--	
4 Pain Tolerance	-.045	.556**	--

Note. [a] Expectancies for Alcohol Analgesia Scale. *p < .05, **p < .01.

Table 10

Study 2 Sociodemographic, Alcohol, and Pain Characteristics (*N = 273*)

	N (%)
Gender	
Male	179 (65.6%)
Race	
White	174 (63.7%)
Black or African American	32 (11.7%)
Asian	50 (18.3%)
American Indian/Alaska Native	10 (3.7%)
Other	6 (2.2%)
Ethnicity	
Hispanic	51 (18.7%)
Marital Status	
Single	136 (49.8%)
Married	125 (45.8%)
Divorced	12 (4.4%)
Education	
Did not graduate high school	1 (0.4%)
High school graduate or GED	16 (5.9%)
Some college/Technical school/Associates degree	71 (26.0%)
4-year college degree	157 (57.5%)
Some school beyond 4-year college degree	11 (4.0%)
Professional degree (e.g., MD, JD, PhD)	17 (6.2%)
Household Income	
< $10,000	12 (4.4%)
$10,000 - $49,999	130 (47.6%)
$50,000 - $100,000	121 (44.3%)
> $100,000	10 (3.7%)
Chronic Pain Grade [a]	
Grade 1	50 (18.3%)
Grade 2	43 (15.8%)
Grade 3	72 (26.4%)
Grade 4	108 (39.6%)
Primary Pain Location	
Back/neck	119 (43.6%)
Head/face	51 (18.7%)
Upper extremities	29 (10.6%)
Lower extremities	40 (14.7%)
Chest/breast	12 (4.4%)
Stomach/abdomen	22 (8.1%)
Prescription Opioid Use	
Yes	65 (23.8%)
	M (SD)
Age	32.86 (9.24)
Average daily drinks	1.57 (1.43)
AUDIT – total score [b]	15.70 (10.99)
EAA score [c]	25.75 (12.81)

Note. [a] Graded Chronic Pain Scale, [b] Alcohol Use Disorders Identification Test, [c] Expectancies for Alcohol Analgesia.

Table 11

Item Characteristics and Intercorrelations for the Expectancies for Alcohol Analgesia Scale (EAA) among Study 2

Variable	Min	Max	Skew	Kurtosis		1	2	3	4	5
1 EAA_1	.000	9.000	-.633	-.805		1.000				
2 EAA_2	.000	9.000	-.595	-.849		.868**	1.000			
3 EAA_3	.000	9.000	-.514	-.920		.815**	.832**	1.000		
4 EAA_4	.000	9.000	-.680	-.688		.831**	.869**	.846**	1.000	
5 EAA_5	.000	9.000	-.628	-.696		.771**	.791**	.824**	.853**	1.000
Multivariate				38.317						

Note. **$p < .01$.

Table 12

Unstandardized Factor Loadings with Bootstrap Standard Errors and Confidence Intervals among Study 2

Variable	**Estimate**	***SE***	**95% *CI***	***p***
1 EAA_1	1.000	.000	1.000-1.000	-
2 EAA_2	1.023	.024	.974-1.070	< .001
3 EAA_3	1.043	.028	.990-1.098	< .001
4 EAA_4	1.097	.030	1.044-1.158	< .001
5 EAA_5	1.068	.036	1.003-1.146	< .001

Table 13

Standardized Residual Covariances for the five items from the Expectancies for Alcohol Analgesia Scale (EAA) among Study 2

Variable	1	2	3	4	5
1 EAA_1	.000				
2 EAA_2	.334	.000			
3 EAA_3	.125	-.074	.000		
4 EAA_4	-.174	-.044	.006	.000	
5 EAA_5	-.225	-.175	-.048	.244	.000

Table 14

Unstandardized Factor Loadings with Bootstrap Standard Errors and Confidence Intervals Following Model Modifications among Study 2

Variable	**Estimate**	***SE***	**95% *CI***	***p***
1 EAA_1	1.000	.000	1.000-1.000	-
2 EAA_2	1.021	.024	.971-1.067	< .001
3 EAA_3	1.035	.028	.983-1.090	< .001
4 EAA_4	1.073	.028	1.021-1.129	< .001
5 EAA_5	1.037	.035	.974-1.106	< .001

Table 15

Standardized Residual Covariances following Model Modifications among Study 2

Variable	1	2	3	4	5
1 EAA_1	.000				
2 EAA_2	.157	.000			
3 EAA_3	.008	-.165	.000		
4 EAA_4	-.142	.015	.124	.000	
5 EAA_5	-.110	-.032	.151	.000	.000

Table 16

Associations between EAA [a] scores and Alcohol Consumption among Study 2

Variable	1	2	3	4	5	6	7	8	9
1 EAA – Total Score	--								
2 Average Daily Drinks	.310**	--							
3 Average Drinking Hours	.224**	.713**	--						
4 Frequency of Binge Drinking	.469**	.381**	.210**	--					
5 QFV Category [b]	.454**	.436**	.343**	.490**	--				
6 AUDIT [c] – Total Score	.543**	.260**	.168**	.693**	.513**	--			
7 AUDIT – Consumption	.382**	.460**	.329**	.502**	.468**	.590**	--		
8 AUDIT – Dependence	.474**	.213**	.122*	.675**	.434**	.910**	.372**	--	
9 AUDIT – Harm	.489**	.114	.073	.554**	.425**	.922**	.384**	.759**	--

Note. [a] Expectancies for Alcohol Analgesia Scale; [b] Quantity-Frequency-Variability Category (1 = Heavy Drinker, 0 = Moderate Drinker); [c] Alcohol Use Disorders Identification Test. *p < .05, **p < .01.

Table 17

Associations between EAA [a] *scores and Alcohol Outcome Expectancies and Motives among Study 2*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 EAA Total Score	--														
2 AOES [b] – Positive	.454**	--													
3 AOES – Social Positive	.339**	.928**	--												
4 AOES – Fun	.364**	.885**	.774**	--											
5 AOES – Sex	.439**	.790**	.642**	.531**	--										
6 AOES – Tension Reduction	.474**	.840**	.744**	.723**	.537**	--									
7 AOES – Negative	.487**	.499**	.418**	.281**	.563**	.510**	--								
8 AOES – Social Negative	.481**	.359**	.287**	.148*	.522**	.306**	.864**	--							
9 AOES – Emotional	.518**	.399**	.322**	.193**	.482**	.436**	.906**	.797**	--						
10 AOES – Physical	.419**	.432**	.356**	.209**	.521**	.460**	.920**	.734**	.810**	--					
11 AOES – Cognitive	.329**	.543**	.484**	.408**	.461**	.567**	.837**	.563**	.630**	.696**	--				
12 DMQ [c] – Social	.300**	.565**	.493**	.430**	.579**	.458**	.500**	.447**	.405**	.511**	.403**	--			
13 DMQ – Coping	.537**	.521**	.413**	.372**	.514**	.558**	.646**	.579**	.631**	.573**	.507**	.578**	--		
14 DMQ – Enhancement	.463**	.627**	.534**	.559**	.521**	.571**	.521**	.462**	.449**	.449**	.474**	.670**	.712**	--	
15 DMQ – Conformity	.400**	.275**	.180**	.080	.460**	.269**	.699**	.766**	.669**	.643**	.422**	.572**	.628**	.506**	--

Note. [a] Expectancies for Alcohol Analgesia Scale; [b] Alcohol Outcome Expectancies Scale; [c] Drinking Motives Questionnaire. *p < .05, **p < .01.

Table 18

Associations between EAA [a] scores and Pain Variables among Study 2

Variable	1	2	3	4	5
1 EAA Total Score	--				
2 Chronic Pain Grade [b]	.386**	--			
3 Characteristic Pain Intensity [b]	.386**	.759**	--		
4 Pain-Related Disability [b]	.381**	.907**	.731**	--	
5 OMPQ-SF [c]	.352**	.666**	.604**	.696**	--

Note. [a] Expectancies for Alcohol Analgesia Scale; [b] Graded Chronic Pain Scale; [c] Orebro Musculoskeletal Pain Questionnaire – Short Form. *p < .05, **p < .01.

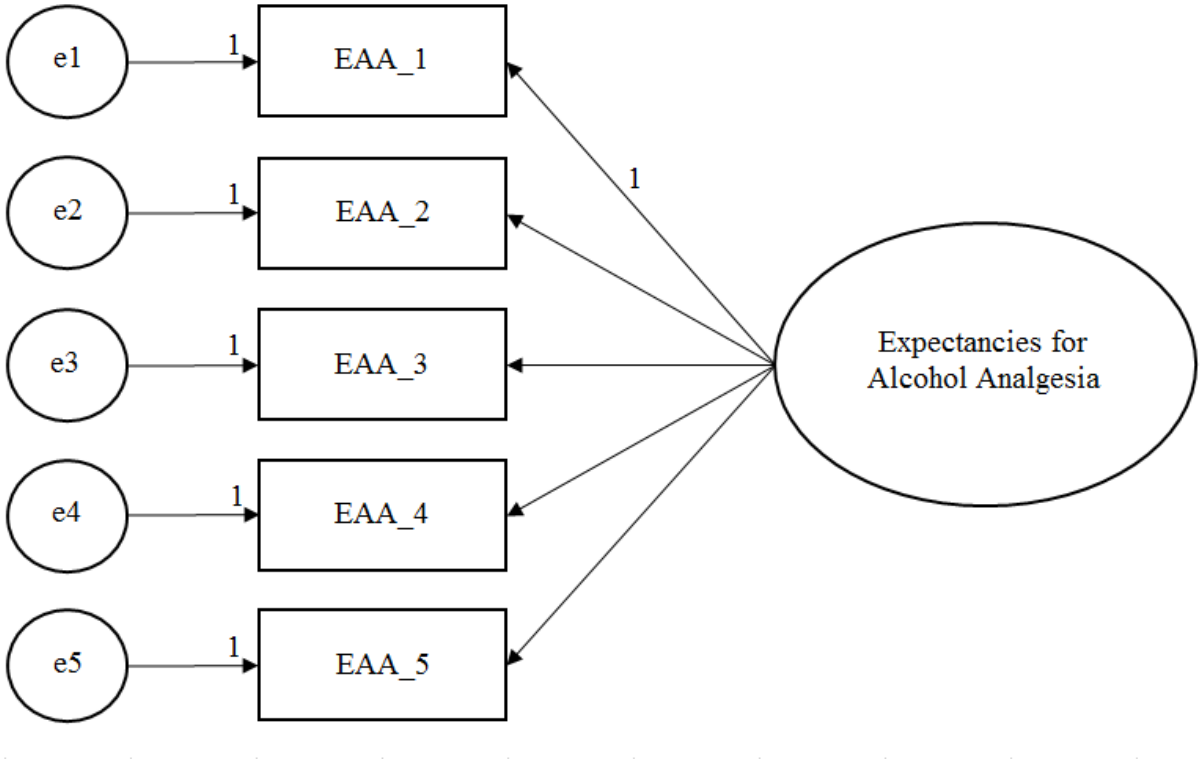

Figure 1. Hypothesized factor structure. e = error.

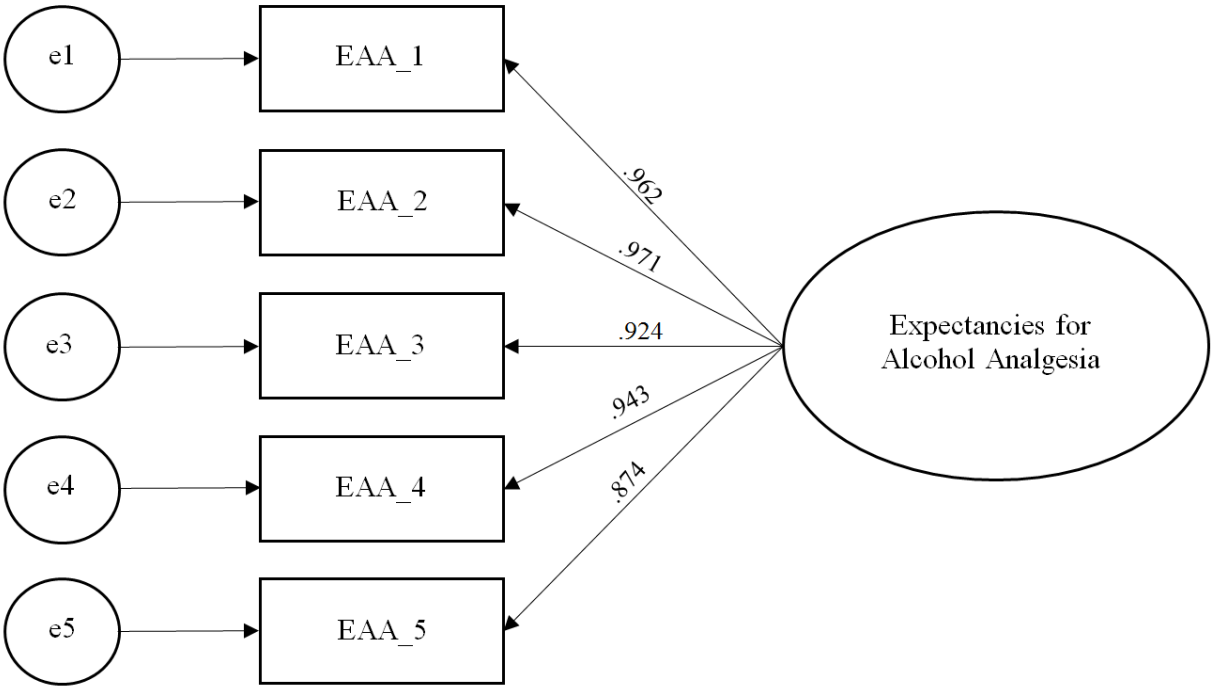

Figure 2. Standardized Estimates for the Initial CFA Model among Study 1.

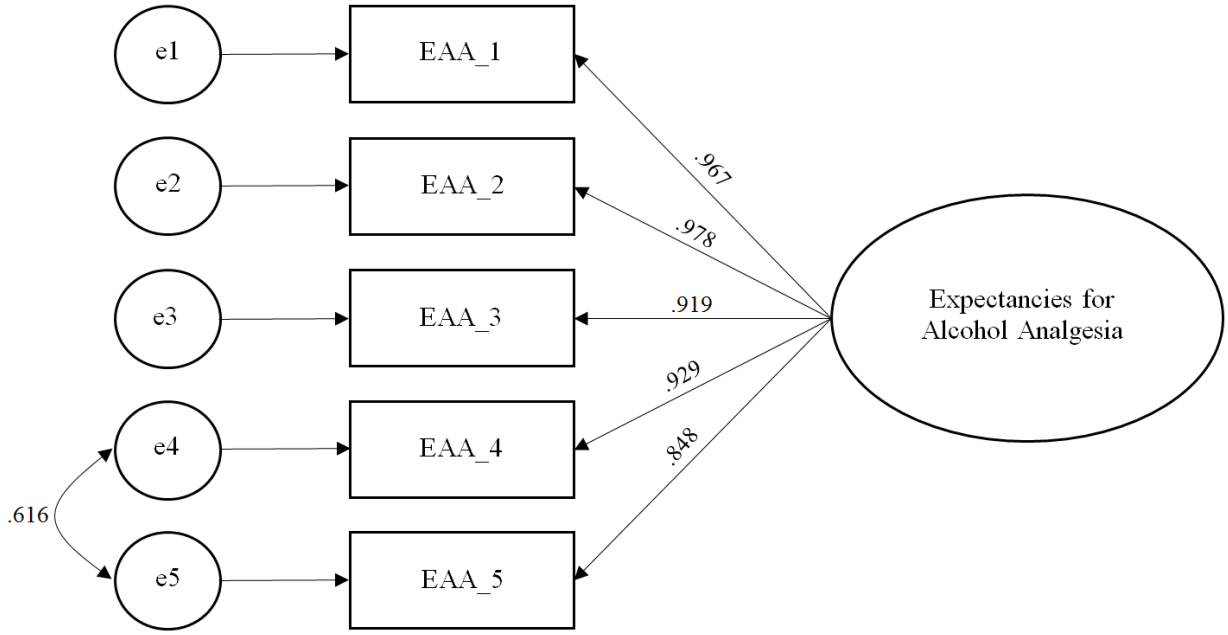

Figure 3. Standardized Estimates for the Modified CFA Model among Study 1.

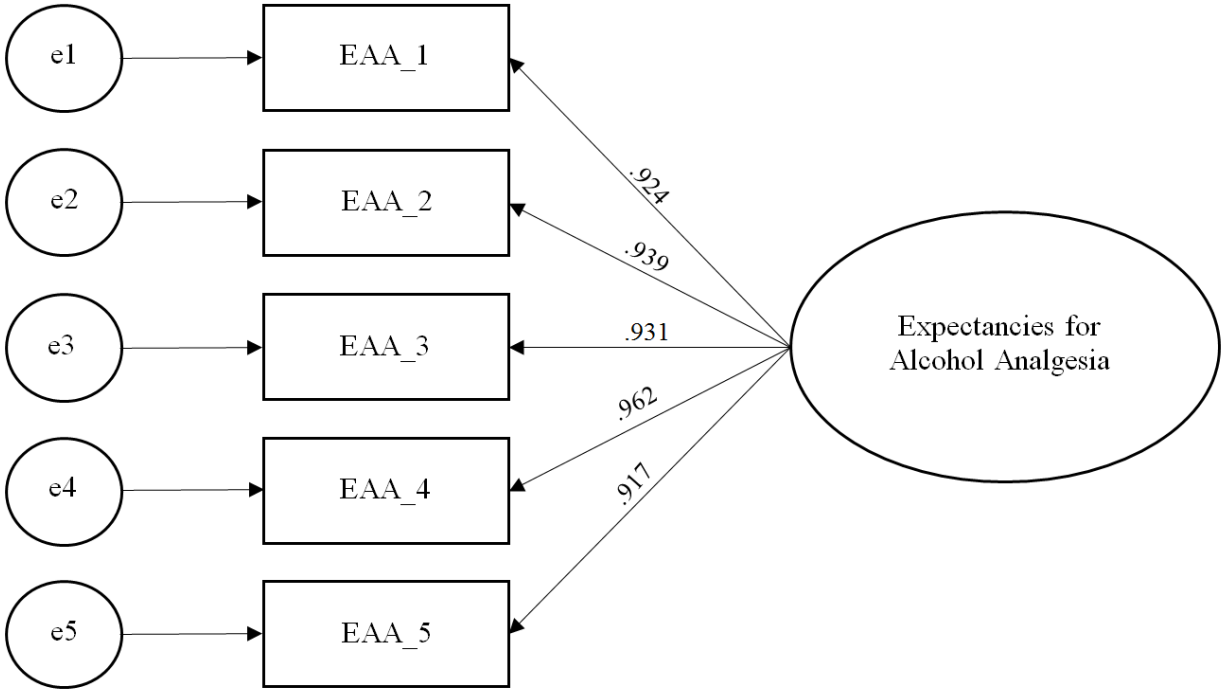

Figure 4. Standardized Estimates for the Initial CFA Model among Study 2.

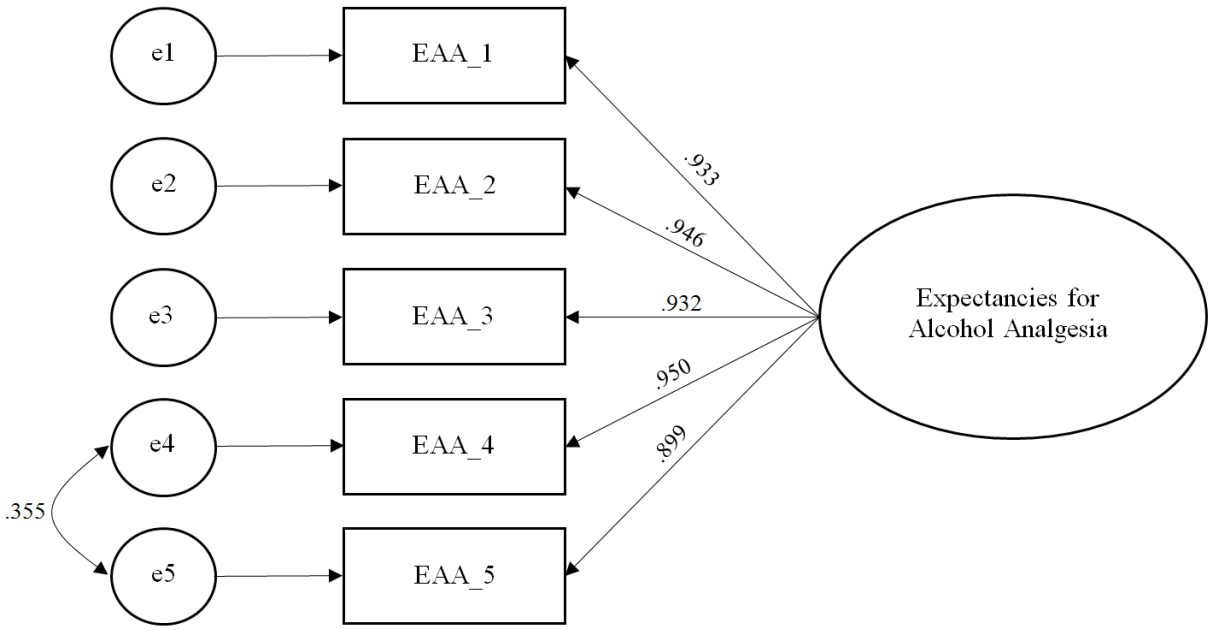

Figure 5. Standardized Estimates for the Modified CFA Model among Study 2.

Appendix A

Demographics Questionnaire

The following questions are about yourself and your life situation. All answers will be kept confidential.

1. Gender: (*Check one*) ___ Male ___ Female

2. What is your age? _____ Years Old

3. Date of Birth: _____/_____/_____
Month Day Year

4. What is your marital status?
___ Single ___ Divorced
___ Married ___ Widowed
___ Separated

5. With which racial category do you most identify yourself? (*Check one*)
___ American Indian/Alaska Native
___ Asian
___ Native Hawaiian or Other Pacific Islander
___ Black or African American
___ White
___ Other _____

6. Are you Hispanic/Latino? ___ Yes ___ No

7. What is the highest grade level you have completed?
___ Did not graduate high school
___ High school graduate or GED
___ Some college
___ Technical school/Associates degree
___ 4-year college degree
___ Some school beyond 4-year college degree
___ Professional degree (e.g. MD, JD, PhD)

8. What is your total household income?
___ Less than $10,000
___ $10,000 - $25,000
___ $25,000 - $50,000
___ $50,000 - $75,000
___ $75,000 - $100,000
___ More than $100,000

Appendix B

Expectancies for Alcohol Analgesia

Throughout our lives, most of us have experienced pain from time to time (ranging from minor headaches and sprains, to more persistently painful conditions like neck, knee, or lower back pain). Below is a list of statements about how drinking alcohol may influence your experience of pain.

Please rate how LIKELY or UNLIKELY you believe each statement is for you when you drink alcohol. If the statement seems UNLIKELY to you, select a number from 0-4. If the statement seems LIKELY to you, select a number from 5-9. For example, if you believe the statement would never happen, select 0; if you believe the statement would happen every time you drink alcohol, select 9.

Please use the guide below to help you rate each statement:

0	1	2	3	4	5	6	7	8	9
Completely	Extremely	Very	Somewhat	A little	A little	Somewhat	Very	Extremely	Completely
UNLIKELY					**LIKELY**				

1.	**Drinking alcohol would ease my pain.**	0	1	2	3	4	5	6	7	8	9
2.	**If I were to experience pain, drinking would help me reduce it.**	0	1	2	3	4	5	6	7	8	9
3.	**If I hurt myself, I would feel less pain if I could drink alcohol.**	0	1	2	3	4	5	6	7	8	9
4.	**When I feel pain, drinking alcohol can really help.**	0	1	2	3	4	5	6	7	8	9
5.	**I feel like drinking alcohol would help me cope with pain.**	0	1	2	3	4	5	6	7	8	9

Appendix C

Daily Drinking Questionnaire – Modified (DDQ-M)

1. For the past 90 days, please fill in a number for each day of the week indicating the typical number of drinks you usually consume on that day, and the typical number of hours you usually drink on that day. Please enter only one number, the average number of standard drinks and hours for each day.

A standard drink is defined as a 12 oz. beer or wine cooler, 5 oz. of wine, or 1.5 oz. (shot) of liquor (straight or in a mixed drink).

Please enter a number in each box.

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Number of drinks							
Number of hours							

2. Please indicate your current weight (in pounds):_____

3. Please indicate your height: _____

4. In the past 90 days, how many days have you had 5 or more drinks within a couple of hours of each other? A standard drink is defined as a 12 oz. beer or wine cooler, 5 oz. of wine, or 1.5 oz. (shot) of liquor (straight or in a mixed drink).

_____ More than once a day
_____ Once a day
_____ Nearly every day
_____ 3-4 times a week
_____ Once or twice a week
_____ 2-3 times a month
_____ Once a month
_____ Less than once a month, but at least once in the last 90 days
_____ Not at all

Appendix D

Quantity-Frequency-Variability (QFV)

The following questions are about your drinking patterns. In answering the questions, please think about what you have done on the average over the last 3 months.

1. When drinking wine:
W1. How often do you usually have wine or a punch containing wine?

_____3 or more times a day (1)
_____2 times a day (2)
_____once a day (3)
_____nearly every day (4)
_____3 or 4 times a week (5)
_____once or twice a week (6)
_____2 or 3 times a month (7)
_____about once a month (8)
_____less than once a month but at least once a year (9)
_____less than once a year (10)
_____never (11)

W2. Think of all the times you had wine recently. When you drink wine, how often do you have more than six glasses?

_____nearly every time (1) Skip to question # 2 below
_____more than half the time (2) Skip to question #2 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

W3. When you drink wine, how often do you have as many as five or six glasses?

_____nearly every time (1) Skip to question # 2 below
_____more than half the time (2) Skip to question #2 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

W4. When you drink wine, how often do you have at least three or four glasses?

_____nearly every time (1) Skip to question # 2 below
_____more than half the time (2) Skip to question #2 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

W5. When you drink wine, how often do you have one or two glasses?

_____nearly every time (1) Skip to question #2 below
_____more than half the time (2) Skip to question #2 below
_____less than half the time (3)
_____once in a while (4)
_____never (5)

2. **When drinking beer:**
B1. How often do you usually have beer?

_____ 3 or more times a day (1)
_____2 times a day (2)
_____once a day (3)
_____nearly every day (4)
_____3 or 4 times a week (5)
_____once or twice a week (6)
_____2 or 3 times a month (7)
_____about once a month (8)
_____less than once a month but at least once a year (9)
_____less than once a year (10)
_____never (11)

B2. Think of all the times you had beer recently. When you drink beer, how often do you have more than six glasses or cans?

_____nearly every time (1) Skip to question # 3 below
_____more than half the time (2) Skip to question #3 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

B3. When you drink beer, how often do you have as many as five or six glasses or cans?

_____nearly every time (1) Skip to question # 3 below
_____more than half the time (2) Skip to question #3 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

B4. When you drink beer, how often do you have at least three or four glasses or cans?

_____nearly every time (1) Skip to question # 3 below
_____more than half the time (2) Skip to question #3 below
_____less than half the time (3)

_____ once in a while (4)
_____ never (5)

B5. When you drink beer, how often do you have one or two glasses or cans?
_____nearly every time (1)
_____more than half the time (2)
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

3. **When you drink whiskey or liquor:**
L1. How often do you usually have whisky or liquor (such as martinis, manhattans, highballs, or straight drinks including scotch, bourbon, gin, vodka, rum, etc.)?

_____ 3 or more times a day (1)
_____2 times a day (2)
_____once a day (3)
_____nearly every day (4)
_____3 or 4 times a week (5)
_____once or twice a week (6)
_____2 or 3 times a month (7)
_____about once a month (8)
_____less than once a month but at least once a year (9)
_____less than once a year (10)
_____never (11)

L2. Think of all the times you had drinks containing whiskey or other liquor recently. When you had them, how often have you had more than six drinks?

_____nearly every time (1) Skip to question # 4 below
_____more than half the time (2) Skip to question #4 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

L3. When you have had drinks containing whiskey or other liquor, how often do you have as many as five or six drinks?

_____nearly every time (1) Skip to question # 4 below
_____more than half the time (2) Skip to question #4 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

L4. When you have had drinks containing whiskey or other liquor, how often have you had at least three or four drinks?

_____nearly every time (1) Skip to question # 4 below
_____more than half the time (2) Skip to question #4 below
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

L5. When you have had drinks containing whiskey or liquor, how often have you had one or two drinks?
_____nearly every time (1)
_____more than half the time (2)
_____less than half the time (3)
_____ once in a while (4)
_____ never (5)

Frequency: **When drinking anything**, check how often you have any drink containing alcohol, whether it is wine, whiskey, beer, or any other drink. Make sure that your answer is not less frequent than the frequency reported on any of the preceding questions.

_____ 3 or more times a day (1)
_____2 times a day (2)
_____once a day (3)
_____nearly every day (4)
_____3 or 4 times a week (5)
_____once or twice a week (6)
_____2 or 3 times a month (7)
_____about once a month (8)
_____less than once a month but at least once a year (9) ·
_____less than once a year (10)
_____never (11)

Appendix E

Alcohol Outcome Expectancies Scale (AOES)

Here is a list of some effects or consequences that some people experience after drinking alcohol. How likely is it that these things happen to **you** when you drink alcohol? Please select the number that best describes how drinking alcohol would affect you.

WHEN I DRINK ALCOHOL:

HOW LIKELY IS IT THAT THIS WOULD HAPPEN?

	No chance	Very unlikely	Unlikely	Likely	Very likely	Certain to happen
1. I am more accepted socially.	1	2	3	4	5	6
2. I become aggressive.	1	2	3	4	5	6
3. I am less alert.	1	2	3	4	5	6
4. I feel ashamed of myself.	1	2	3	4	5	6
5. I enjoy the buzz.	1	2	3	4	5	6
6. I become clumsy or uncoordinated.	1	2	3	4	5	6
7. I feel good.	1	2	3	4	5	6
8. I get into fights.	1	2	3	4	5	6
9. I can't concentrate.	1	2	3	4	5	6
10. I have a good time.	1	2	3	4	5	6
11. I have problems driving.	1	2	3	4	5	6
12. I feel guilty.	1	2	3	4	5	6
13. I get a hangover.	1	2	3	4	5	6
14. I feel happy.	1	2	3	4	5	6
15. I get a headache	1	2	3	4	5	6
16. I am more sexually assertive.	1	2	3	4	5	6
17. It is fun.	1	2	3	4	5	6
18. I get mean.	1	2	3	4	5	6
19. I have problems with memory and concentration.	1	2	3	4	5	6
20. I am more outgoing.	1	2	3	4	5	6
21. It takes away my negative moods and feelings.	1	2	3	4	5	6
22. I have more desire for sex.	1	2	3	4	5	6
23. It is easier for me to socialize.	1	2	3	4	5	6
24. I feel pleasant physical effects.	1	2	3	4	5	6
25. I am more sexually responsive.	1	2	3	4	5	6
26. I feel more sociable.	1	2	3	4	5	6
27. I feel sad or depressed.	1	2	3	4	5	6
28. I am able to talk more freely.	1	2	3	4	5	6
29. I become more sexually active.	1	2	3	4	5	6
30. I feel sick.	1	2	3	4	5	6
31. I feel less stressed.	1	2	3	4	5	6
32. I am friendlier.	1	2	3	4	5	6
33. I experience unpleasant physical effects.	1	2	3	4	5	6
34. I am able to take my mind off my problems.	1	2	3	4	5	6

Appendix F

Alcohol Use Disorders Identification Test (AUDIT)

1. How often do you have a drink containing alcohol?
(0) Never
(1) Monthly or less
(2) 2 to 4 times a month
(3) 2 to 3 times a week
(4) 4 or more times a week

2. How many drinks containing alcohol do you have on a typical day when you are drinking?
(0) 1 or 2
(1) 3 or 4
(2) 5 or 6
(3) 7, 8, or 9
(4) 10 or more

3. How often do you have six or more drinks on one occasion?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

4. How often during the last year have you found that you were not able to stop drinking once you had started?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

5. How often during the last year have you failed to do what was normally expected from you because of drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

6. How often during the last year have you been unable to remember what happened the night before because you had been drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

7. How often during the last year have you needed an alcoholic drink first thing in the morning to get yourself going after a night of heavy drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

8. How often during the last year have you had a feeling of guilt or remorse after drinking?
(0) Never
(1) Less than monthly
(2) Monthly
(3) Weekly
(4) Daily or almost daily

9. Have you or someone else been injured as a result of your drinking?
(0) No
(2) Yes, but not in the last year
(4) Yes, during the last year

10. Has a relative, friend, doctor, or another health professional expressed concern about your drinking or suggested you cut down?
(0) No
(2) Yes, but not in the last year
(4) Yes, during the last year

Appendix G

Drinking Motives Questionnaire – Revised (DMQ-R)

Please read this list of reasons people sometimes give for drinking alcohol. Thinking of all the times you drink, how often would you say that you drink for each of the following reasons?

	Almost Never or Never	**Some of the time**	**Half of the time**	**Most of the time**	**Almost Always or Always**
1. To forget your worries	1	2	3	4	5
2. Because your friends pressure you to drink	1	2	3	4	5
3. Because it helps you enjoy a party	1	2	3	4	5
4. Because it helps you when you feel depressed or nervous	1	2	3	4	5
5. To be sociable	1	2	3	4	5
6. To cheer up when you are in a bad mood	1	2	3	4	5
7. Because you like the feeling	1	2	3	4	5
8. So that others won't kid you about not drinking	1	2	3	4	5
9. Because it's exciting	1	2	3	4	5
10. To get high	1	2	3	4	5
11. Because it makes social gatherings more fun	1	2	3	4	5
12. To fit in with a group that you like	1	2	3	4	5
13. Because it gives you a pleasant feeling	1	2	3	4	5
14. Because it improves parties and celebrations	1	2	3	4	5
15. Because you feel more self-confident and sure of yourself	1	2	3	4	5
16. To celebrate a special occasion with friends	1	2	3	4	5
17. To forget about your problems	1	2	3	4	5
18. Because it's fun	1	2	3	4	5
19. To be liked	1	2	3	4	5
20. So you won't feel left out	1	2	3	4	5

Appendix H

Graded Chronic Pain Scale (GCPS)

1. On how many days in the **last 180 days (6 months)** have you had pain? _____ days

2. How would you rate your pain **RIGHT NOW**?

No Pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

3. In the **last 3 months**, how would you rate your WORST pain?

No Pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

4. In the **last 3 months**, ON AVERAGE, how would you rate your pain?

No Pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

5. In the **last 3 months**, how many days did pain keep you from doing DAILY ACTIVITIES (work, school, homework)?

None	1	2	3-4	5-6	7-19	11-15	16-24	25-60	61-75	76-90

6. In the **last 3 months**, how much has pain interfered with your DAILY ACTIVITIES?

No Interference										Unable to carry on any activities
0	1	2	3	4	5	6	7	8	9	10

7. In the **last 3 months**, how much has pain interfered with your RECREATIONAL, SOCIAL, & FAMILY ACTIVITIES?

No Interference										Unable to carry on any activities
0	1	2	3	4	5	6	7	8	9	10

8. In the **last 3 months**, how much has pain interfered with your ABILITY TO WORK, including housework?

No Interference										Unable to carry on any activities
0	1	2	3	4	5	6	7	8	9	10

Appendix I

Orebro Musculoskeletal Pain Questionnaire – Short Form (OMPQ-SF)

1. How long have you had your current pain problem?

__ 0-1 weeks	__1-2 weeks	__3-4 weeks	__4-5 weeks
__6-8 weeks	__ 9-11 weeks	__ 3-6 months	__ 6-9 months
__ 9-12 months	__ over 1 year		

2. How would you rate the pain that you have had during the past week?

No Pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10

Please circle the one number which best describes your current ability to participate in each of these activities.

3. I can do light work for an hour.

Can't do it because of pain problem										Can do it without pain being a problem
0	1	2	3	4	5	6	7	8	9	10

4. I can sleep at night.

Can't do it because of pain problem										Can do it without pain being a problem
0	1	2	3	4	5	6	7	8	9	10

5. How tense or anxious have you felt in the past week?

Absolutely calm and relaxed										As tense and anxious as I've ever felt
0	1	2	3	4	5	6	7	8	9	10

6. How much have you been bothered by feeling depressed in the past week?

Not at all										Extremely
0	1	2	3	4	5	6	7	8	9	10

7. In your view, how large is the risk that your current pain may become persistent?

No risk										Very large risk
0	1	2	3	4	5	6	7	8	9	10

8. In your estimation, what are the chances you will be working your normal duties in 3 months?

No chance										Very large chance
0	1	2	3	4	5	6	7	8	9	10

9. An increase in pain is an indication that I should stop what I'm doing until the pain decreases.

Completely disagree										Completely agree
0	1	2	3	4	5	6	7	8	9	10

10. I should not do my normal work with my present pain.

Completely disagree										Completely agree
0	1	2	3	4	5	6	7	8	9	10

References

Adams, S. L., & McNeil, D. W. (1991). Negative alcohol expectancies reconsidered. *Psychology of Addictive Behaviors, 5*(1), 9-14.

Amazon Mechanical Turk. (2011). Requester best practices guide. *Amazon Web Services*.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. https://doi.org/10.1176/appi.books.9780890425596

Asmundson, G. J., Gomez-Perez, L., Richter, A. A., & Carleton, R. N. (2014). The psychology of pain: models and targets for comprehensive assessment. In H. van Griensven, J. Strong, & A. Unruh (Eds), *Pain: A textbook for health professions* (pp. 35-48). Churchill Livingstone.

Atlas, L. Y., & Wager, T. D. (2014). A meta-analysis of brain mechanisms of placebo analgesia: consistent findings and unanswered questions *Placebo* (pp. 37-69): Springer.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (1992). The alcohol use disorders identification test. *Guidelines for use in primary health care. Geneva: World Health Organization*.

Babor, T. F., Higgins-Biddle, J. C., Saunders, J. B., & Monteiro, M. G. (2001). The alcohol use disorders identification test (AUDIT): Guidelines for use in primary care. *World Health Organization, Department of Mental Health and Substance Abuse*.

Badley, E. M., Rasooly, I., & Webster, G. K. (1994). Relative importance of musculoskeletal disorders as a cause of chronic health problems, disability, and health care utilization: findings from the 1990 Ontario Health Survey. *The Journal of Rheumatology, 21*(3), 505-514.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44*(9), 1175-1184.

Berk, R. A. (1984). *A guide to criterion-referenced test construction*. Baltimore, MD: Johns Hopkins University Press.

Bien, T. H., Miller, W. R., & Tonigan, J. S. (1993). Brief interventions for alcohol problems: a review. *Addiction, 88*(3), 315-336.

Bingel, U., Wanigasekera, V., Wiech, K., Mhuircheartaigh, R. N., Lee, M. C., Ploner, M., & Tracey, I. (2011). The effect of treatment expectation on drug efficacy: imaging the analgesic benefit of the opioid remifentanil. *Science Translational Medicine, 3*(70), 70ra14-70ra14.

Blunch, N. (2012). *Introduction to structural equation modeling using IBM SPSS statistics and AMOS*: Sage.

Bollen, K. A., & Stine, R. A. (1992). Bootstrapping goodness-of-fit measures in structural equation models. *Sociological Methods & Research, 21*(2), 205-229.

Brennan, P. L., Schutte, K. K., & Moos, R. H. (2005). Pain and use of alcohol to manage pain: prevalence and 3-year outcomes among older problem and non-problem drinkers. *Addiction, 100*(6), 777-786.

Briggs, S. R., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality, 54*(1), 106-148.

Brown, J. D. (2002). The Cronbach alpha reliability estimate. *JALT Testing & Evaluation SIG Newsletter, 6*(1), 17-19.

Brown, S. A., Christiansen, B. A., & Goldman, M. S. (1987). The Alcohol Expectancy Questionnaire: an instrument for the assessment of adolescent and adult alcohol expectancies. *Journal of Studies on Alcohol, 48*(5), 483-491.

Brown, S. A., Goldman, M. S., Inn, A., & Anderson, L. R. (1980). Expectations of reinforcement from alcohol: Their domain and relation to drinking patterns. *Journal of Consulting and Clinical Psychology, 48*(4), 419-426.

Butcher, B., & Carmody, J. (2012). Sex differences in analgesic response to ibuprofen are influenced by expectancy: A randomized, crossover, balanced placebo-designed study. *European Journal of Pain, 16*(7), 1005-1013.

Byrne, B. M. (2010). *Structural equation modeling with AMOS: Basic concepts, applications, and programming (2nd ed.)*. New York: Taylor and Francis Group, LLC.

Cahalan, D., Cisin, I. H., & Crossley, H. M. (1969). *American drinking practices: A national study of drinking behavior and attitudes*. Monographs of the Rutgers Center of Alcohol Studies, 6, 260.

Carey, K. B., Carey, M. P., Maisto, S. A., & Henson, J. M. (2006). Brief motivational interventions for heavy college drinkers: A randomized controlled trial. *Journal of Consulting and Clinical Psychology, 74*(5), 943-954.

Carey, K. B., Henson, J. M., Carey, M. P., & Maisto, S. A. (2009). Computer versus in-person intervention for students violating campus alcohol policy. *Journal of Consulting and Clinical Psychology, 77*(1), 74.

Carey, K. B., & Teitelbaum, L. M. (1996). Goals and methods of alcohol assessment. *Professional Psychology: Research and Practice, 27*(5), 460-466.

Chau, P. Y. (1997). Reexamining a model for evaluating information center success using a structural equation modeling approach. *Decision Sciences, 28*(2), 309-334.

Cheng, Y., Macera, C. A., Davis, D. R., Ainsworth, B. E., Troped, P. J., & Blair, S. N. (2000). Physical activity and self-reported, physician-diagnosed osteoarthritis: is physical activity a risk factor? *Journal of Clinical Epidemiology, 53*(3), 315-322.

Chopra, K., & Tiwari, V. (2012). Alcoholic neuropathy: possible mechanisms and future treatment possibilities. *British Journal of Clinical Pharmacology, 73*(3), 348-362.

Christiansen, B. A., Smith, G. T., Roehling, P. V., & Goldman, M. S. (1989). Using alcohol expectancies to predict adolescent drinking behavior after one year. *Journal of Consulting and Clinical Psychology, 57*(1), 93-99.

Coates, J. M., Gullo, M. J., Feeney, G. F., Young, R. M., Dingle, G. A., & Connor, J. P. (2018). Alcohol expectancies pre-and post-alcohol use disorder treatment: Clinical implications. *Addictive Behaviors, 80*, 142-149.

Cole, J. C., Khanna, D., Clements, P. J., Seibold, J. R., Tashkin, D. P., Paulus, H. E., . . . Furst, D. E. (2006). Single-factor scoring validation for the Health Assessment Questionnaire-Disability Index (HAQ-DI) in patients with systemic sclerosis and comparison with early rheumatoid arthritis patients. *Quality of Life Research, 15*(8), 1383-1394.

Cooper, M. L. (1994). Motivations for alcohol use among adolescents: Development and validation of a four-factor model. *Psychological Assessment, 6*(2), 117-128.

Cooper, M. L., Frone, M. R., Russell, M., & Mudar, P. (1995). Drinking to regulate positive and negative emotions: a motivational model of alcohol use. *Journal of Personality and Social Psychology, 69*(5), 990-1005.

Crocker, L., & Algina, J. (1986). *Introduction to classical and modern test theory*: ERIC.

DeVellis, R. F. (2016). *Scale development: Theory and applications* (Vol. 26): Sage Publications.

Dimeff, L. A. (1999). *Brief alcohol screening and intervention for college students (BASICS): A harm reduction approach.* New York, NY: Guilford Press.

Ditre, J. (2006). Pain as a motivator to smoke: Effects of pain induction on smoking urge and behavior (Master's Thesis, University of South Florida). Retrieved from Scholar Commons (http://scholarcommons.usf.edu/etd/2503)

Ditre, J. W., Heckman, B. W., Butts, E. A., & Brandon, T. H. (2010). Effects of expectancies and coping on pain-induced motivation to smoke. *Journal of Abnormal Psychology, 119*(3), 524-533. doi:10.1037/a0019568

Ditre, J. W., Zale, E. L., & LaRowe, L. R. (2019). A Reciprocal Model of Pain and Substance Use: Transdiagnostic Considerations, Clinical Implications, and Future Directions. *Annual Review of Clinical Psychology*, *15*, 503-528.

Dobson, K. S. (2009). *Handbook of cognitive-behavioral therapies.* New York, NY: Guilford Press.

Dvorak, R. D., Simons, J. S., & Wray, T. B. (2011). Alcohol use and problem severity: Associations with dual systems of self-control. *Journal of Studies on Alcohol and Drugs, 72*(4), 678-684.

Earleywine, M., & Martin, C. S. (1993). Anticipated stimulant and sedative effects of alcohol vary with dosage and limb of the blood alcohol curve. *Alcoholism: Clinical and Experimental Research, 17*(1), 135-139.

Egli, M., Koob, G. F., & Edwards, S. (2012). Alcohol dependence as a chronic pain disorder. *Neuroscience & Biobehavioral Reviews, 36*(10), 2179-2192.

Elman, I., & Borsook, D. (2016). Common brain mechanisms of chronic pain and addiction. *Neuron, 89*(1), 11-36.

Fabrigar, L. R., Wegener, D. T., MacCallum, R. C., & Strahan, E. J. (1999). Evaluating the use of exploratory factor analysis in psychological research. *Psychological Methods, 4*(3), 272-299.

Fromme, K., Stroot, E. A., & Kaplan, D. (1993). Comprehensive effects of alcohol: Development and psychometric assessment of a new expectancy questionnaire. *Psychological Assessment, 5*(1), 19-26.

Gaskin, D. J., & Richard, P. (2012). The economic costs of pain in the United States. *Journal of Pain, 13*(8), 715-724.

Gatchel, R. J., Peng, Y. B., Peters, M. L., Fuchs, P. N., & Turk, D. C. (2007). The biopsychosocial approach to chronic pain: scientific advances and future directions. *Psychological Bulletin, 133*(4), 581-624.

Goebel, J. R., Compton, P., Zubkoff, L., Lanto, A., Asch, S. M., Sherbourne, C. D., . . . Lorenz, K. A. (2011). Prescription sharing, alcohol use, and street drug use to manage pain among veterans. *Journal of Pain and Symptom Management, 41*(5), 848-858.

Goldman, M. S., Brown, S. A., & Christiansen, B. A. (1987). Expectancy theory-thinking about drinking. *Blane & KE Leonard (Eds.), Psychological theories of drinking and alcoholism* (pp. 181-226), *New York, NY: Guilford Publications*.

Hamilton, R. J., & Akhter, S. (2009). Construct validity of the motivated strategies for learning questionnaire. *Psychological Reports, 104*(3), 711-722.

Haynes, S. N., Richard, D., & Kubany, E. S. (1995). Content validity in psychological assessment: A functional approach to concepts and methods. *Psychological Assessment, 7*(3), 238-247.

Henson, R. K. (2001). Understanding internal consistency reliability estimates: A conceptual primer on coefficient alpha.(Methods, plainly speaking). *Measurement and Evaluation in Counseling and Development, 34*(3), 177-190.

Holmes, A., Williamson, O., Hogg, M., Arnold, C., Prosser, A., Clements, J., . . . O'donnell, M. (2010). Predictors of pain severity 3 months after serious injury. *Pain Medicine, 11*(7), 990-1000.

Hong, C., & Walker, D. A. (2015). A confirmatory factor analysis of the Technology Acceptance Model. *General Linear Model Journal, 41*(2), 22-29.

Hoyle, R. H. (2012). *Handbook of structural equation modeling*. New York, NY: Guilford Press.

Hu, L. t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1-55.

Ilgen, M. A., Roeder, K. M., Webster, L., Mowbray, O. P., Perron, B. E., Chermack, S. T., & Bohnert, A. S. (2011). Measuring pain medication expectancies in adults treated for substance use disorders. *Drug and Alcohol Dependence, 115*(1-2), 51-56.

IOM (2011). *Relieving Pain in America: A Blueprint for Transforming Prevention, Care, Education, and Research.* Washington, DC: The National Academies Press

Ipeirotis, P.G. (2010). Demographics of Mechanical Turk. NYU Working Paper No. CEDER-10-01. Available at SSRN: https://ssrn.com/abstract=1585030

Johnson, R. C., Nagoshi, C. T., Danko, G. P., Honbo, K. A. M., & Chau, L. L. (1990). Familial transmission of alcohol use norms and expectancies and reported alcohol use. *Alcoholism: Clinical and Experimental Research, 14*(2), 216-220.

Jones, B. T., Corbin, W., & Fromme, K. (2001). A review of expectancy theory and alcohol consumption. *Addiction, 96*(1), 57-72.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language*. Lincolnwood, IL: Scientific Software International.

Kaner, E. F., Dickinson, H. O., Beyer, F., Pienaar, E., Schlesinger, C., Campbell, F., . . . Heather, N. (2009). The effectiveness of brief alcohol interventions in primary care settings: a systematic review. *Drug and Alcohol Review, 28*(3), 301-323.

Kim, H. S., & Hodgins, D. C. (2017). Reliability and validity of data obtained from alcohol, cannabis, and gambling populations on Amazon's Mechanical Turk. *Psychology of Addictive Behaviors, 31*(1), 85-94.

Kirmani, M. N., & Suman, L. (2010). Gender differences in alcohol related attitudes and expectancies among college students. *Journal of the Indian Academy of Applied Psychology, 36*(1), 19-24.

Kuntsche, E., Stewart, S. H., & Cooper, M. L. (2008). How stable is the motive–alcohol use link? A cross-national validation of the Drinking Motives Questionnaire Revised among adolescents from Switzerland, Canada, and the United States. *Journal of Studies on Alcohol and Drugs, 69*(3), 388-396.

Lai, K., & Green, S. B. (2016). The problem with having two watches: Assessment of fit when RMSEA and CFI disagree. *Multivariate Behavioral Research, 51*(2-3), 220-239.

Larson, M. J., Paasche-Orlow, M., Cheng, D. M., Lloyd-Travaglini, C., Saitz, R., & Samet, J. H. (2007). Persistent pain is associated with substance use after detoxification: a prospective cohort analysis. *Addiction, 102*(5), 752-760.

Lawshe, C. H. (1975). A quantitative approach to content validity 1. *Personnel Psychology, 28*(4), 563-575.

Lawton, J., & Simpson, J. (2009). Predictors of alcohol use among people experiencing chronic pain. *Psychology, Health & Medicine, 14*(4), 487-501.

Leigh, B. C., & Stacy, A. W. (1993). Alcohol outcome expectancies: Scale construction and predictive utility in higher order confirmatory models. *Psychological Assessment, 5*(2), 216-229.

Lerch, M. M., Albrecht, E., Ruthenbürger, M., Mayerle, J., Halangk, W., & Krüger, B. (2003). Pathophysiology of alcohol-induced pancreatitis. *Pancreas, 27*(4), 291-296.

Leventhal, A. M., & Schmitz, J. M. (2006). The role of drug use outcome expectancies in substance abuse risk: An interactional–transformational model. *Addictive Behaviors, 31*(11), 2038-2062.

Linton, S. J., Nicholas, M., & MacDonald, S. (2011). Development of a short form of the Örebro Musculoskeletal Pain Screening Questionnaire. *Spine, 36*(22), 1891-1895.

Madden, D. R., & Clapp, J. D. (2019). The event-level impact of one's typical alcohol expectancies, drinking motivations, and use of protective behavioral strategies. *Drug and Alcohol Dependence, 194*, 112-120.

Marin, G., Posner, S. F., & Kinyon, J. B. (1993). Alcohol expectancies among Hispanics and non-Hispanic Whites: Role of drinking status and acculturation. *Hispanic Journal of Behavioral Sciences, 15*(3), 373-381.

Martin, J. L., Ferreira, J. A., Haase, R. F., Martins, J., & Coelho, M. (2016). Validation of the Drinking Motives Questionnaire-Revised across US and Portuguese college students. *Addictive Behaviors, 60*, 58-63.

Matsunaga, M. (2010). How to factor-analyze your data right: do's, don'ts, and how-to's. *International Journal of Psychological Research, 3*(1), 97-110.

McDermott, K. A., Joyner, K. J., Hakes, J. K., Okey, S. A., & Cougle, J. R. (2018). Pain interference and alcohol, nicotine, and cannabis use disorder in a national sample of substance users. *Drug and Alcohol Dependence, 186*, 53-59.

Michalos, A. C. (2014). *Encyclopedia of quality of life and well-being research*: Springer Netherlands Dordrecht.

Miller, P. M., Book, S. W., & Stewart, S. H. (2011). Medical treatment of alcohol dependence: A systematic review. *The International Journal of Psychiatry in Medicine, 42*(3), 227-266.

Moncrieff, J., & Pomerleau, J. (2000). Trends in sickness benefits in Great Britain and the contribution of mental disorders. *Journal of Public Health, 22*(1), 59-67.

Monk, R. L., & Heim, D. (2013). A critical systematic review of alcohol-related outcome expectancies. *Substance Use & Misuse, 48*(7), 539-557.

Morean, M. E., Corbin, W. R., & Treat, T. A. (2012). The Anticipated Effects of Alcohol Scale: Development and psychometric evaluation of a novel assessment tool for measuring alcohol expectancies. *Psychological Assessment, 24*(4), 1008-1023.

Morris, L. L., Fitz-Gibbon, C. T., & Henerson, M. E. (1978). P*rogram Evaluation Kit: How to Measure Achievement (Vol. 6)*. Sage Publications..

Moskal, D., Maisto, S. A., De Vita, M., & Ditre, J. W. (2018). Effects of experimental pain induction on alcohol urge, intention to consume alcohol, and alcohol demand. *Experimental and Clinical Psychopharmacology, 26*(1), 65-76.

Muthén, L.K. and Muthén, B.O. (2010). Mplus User's Guide. Sixth Edition. Los Angeles, CA: Muthén & Muthén

Neuendorf, K. (2003). Internal consistency reliability: Can Cronbach's alpha be too high. *Journal of Personality*, 1-3.

Nevitt, J., & Hancock, G. R. (2001). Performance of bootstrapping approaches to model test statistics and parameter standard error estimation in structural equation modeling. *Structural Equation Modeling, 8*(3), 353-377.

Olsson, U. H., Foss, T., Troye, S. V., & Howell, R. D. (2000). The performance of ML, GLS, and WLS estimation in structural equation modeling under conditions of misspecification and nonnormality. *Structural Equation Modeling, 7*(4), 557-595.

Ossipov, M. H., Dussor, G. O., & Porreca, F. (2010). Central modulation of pain. *The Journal of Clinical Investigation, 120*(11), 3779-3787.

Pallant, J. (2013). *SPSS survival manual*: McGraw-Hill Education (UK).

Paolacci, G., Chandler, J., & Ipeirotis, P. G. (2010). Running experiments on amazon mechanical turk. *Judgment and Decision Making, 5*(5), 411-419.

Parkerson, H. A., & Asmundson, G. J. (2016). The role of pain intensity and smoking expectancies on smoking urge and behavior following experimental pain induction. *Drug and Alcohol Dependence, 164*, 166-171.

Peerdeman, K. J., van Laarhoven, A. I., Peters, M. L., & Evers, A. W. (2016). An integrative review of the influence of expectancies on pain. *Frontiers in Psychology, 7*, 1270.

Picavet, H., & Schouten, J. (2003). Musculoskeletal pain in the Netherlands: Prevalences, consequences and risk groups, the DMC3-study. *Pain, 102*(1-2), 167-178.

Picavet, H., & Van den Bos, G. (1997). The contribution of six chronic conditions to the total burden of mobility disability in the Dutch population. *American Journal of Public Health, 87*(10), 1680-1682.

Reesor, L., Vaughan, E. M., Hernandez, D. C., & Johnston, C. A. (2017). Addressing outcomes expectancies in behavior change. *American Journal of Lifestyle Medicine, 11*(6), 430-432.

Reinert, D. F., & Allen, J. P. (2002). The alcohol use disorders identification test (AUDIT): a review of recent research. *Alcoholism: Clinical and Experimental Research, 26*(2), 272-279.

Rice, S. M., Aucote, H. M., Möller-Leimkühler, A. M., & Amminger, G. P. (2015). Confirmatory factor analysis of the Gotland Male Depression Scale in an Australian community sample. *European Journal of Psychological Assessment*.

Rotter, J. B. (1954). *Social learning and clinical psychology*. Englewood Cliffs, NJ: Prentice-Hall.

Sá, K. N., Baptista, A. F., Matos, M. A., & Lessa, Í. (2008). Chronic pain and gender in Salvador population, Brazil. *Pain, 139*(3), 498-506.

Sacks, J. J., Gonzales, K. R., Bouchery, E. E., Tomedi, L. E., & Brewer, R. D. (2015). 2010 national and state costs of excessive alcohol consumption. *American Journal of Preventive Medicine, 49*(5), e73-e79.

SAMHSA. (2015). Table 2.6B – Tobacco Product and Alcohol Use in Lifetime, Past Year, and Past Month among Persons Aged 18 or Older: Percentages, 2014 and 2015.

https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2015/NSDUH-DetTabs-2015/NSDUH-DetTabs-2015.htm#tab2-6b.

Santos, J. R. A. (1999). Cronbach's alpha: A tool for assessing the reliability of scales. *Journal of Extension, 37*(2), 1-5.

Schenk, L. A., Sprenger, C., Geuter, S., & Büchel, C. (2014). Expectation requires treatment to boost pain relief: an fMRI study. *Pain, 155*(1), 150-157.

Schiller, J. S., Lucas, J. W., & Peregoy, J. A. (2012). Summary health statistics for US adults: national health interview survey, 2011. *Vital and Health Statistics Series 10, Data from the National Health Survey, 256*, 1-218.

Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research, 99*(6), 323-338.

Schriesheim, C. A., Powers, K. J., Scandura, T. A., Gardiner, C. C., & Lankau, M. J. (1993). Improving construct measurement in management research: Comments and a quantitative approach for assessing the theoretical content adequacy of paper-and-pencil survey-type instruments. *Journal of Management, 19*(2), 385-417.

Sebold, M., Nebe, S., Garbusow, M., Guggenmos, M., Schad, D. J., Beck, A., . . . Neu, P. (2017). When habits are dangerous: alcohol expectancies and habitual decision making predict relapse in alcohol dependence. *Biological Psychiatry, 82*(11), 847-856.

Shapiro, D. N., Chandler, J., & Mueller, P. A. (2013). Using Mechanical Turk to study clinical populations. *Clinical Psychological Science, 1*(2), 213-220.

Sher, K. J., Wood, M. D., Wood, P. K., & Raskin, G. (1996). Alcohol outcome expectancies and alcohol use: A latent variable cross-lagged panel study. *Journal of Abnormal Psychology, 105*(4), 561-574.

Sheu, R., Lussier, D., Rosenblum, A., Fong, C., Portenoy, J., Joseph, H., & Portenoy, R. K. (2008). Prevalence and characteristics of chronic pain in patients admitted to an outpatient drug and alcohol treatment program. *Pain Medicine, 9*(7), 911-917.

Simons, J. S., Maisto, S. A., Wray, T. B., & Emery, N. N. (2016). Acute effects of intoxication and arousal on approach/avoidance biases toward sexual risk stimuli in heterosexual men. *Archives of Sexual Behavior, 45*(1), 43-51.

Smith, G. T., Goldman, M. S., Greenbaum, P. E., & Christiansen, B. A. (1995). Expectancy for social facilitation from drinking: The divergent paths of high-expectancy and low-expectancy adolescents. *Journal of Abnormal Psychology, 104*(1), 32-40.

Smits, E., Brakenridge, C., Gane, E., Warren, J., Heron-Delaney, M., Kenardy, J., & Johnston, V. (2019). Identifying risk of poor physical and mental health recovery following a road traffic crash: an industry-specific screening tool. *Accident Analysis & Prevention, 132*, 105280.

Solomon, K. E., & Annis, H. M. (1989). Development of a scale to measure outcome expectancy in alcoholics. *Cognitive Therapy and Research, 13*(5), 409-421.

Stacy, A. W., Widaman, K. F., & Marlatt, G. A. (1990). Expectancy models of alcohol use. *Journal of Personality and Social Psychology, 58*(5), 918-928.

Stephenson, W. (1953). The study of behavior; Q-technique and its methodology. University of Chicago Press.

Swank, J. M., & Mullen, P. R. (2017). Evaluating evidence for conceptually related constructs using bivariate correlations. *Measurement and Evaluation in Counseling and Development, 50*(4), 270-274.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2*, 53-55.

Thompson, T., Oram, C., Correll, C. U., Tsermentseli, S., & Stubbs, B. (2017). Analgesic effects of alcohol: a systematic review and meta-analysis of controlled experimental studies in healthy participants. *The Journal of Pain, 18*(5), 499-510.

Treede, R.-D., Rief, W., Barke, A., Aziz, Q., Bennett, M. I., Benoliel, R., . . . First, M. B. (2015). A classification of chronic pain for ICD-11. *Pain, 156*(6), 1003-1007.

Tsang, S., Royse, C. F., & Terkawi, A. S. (2017). Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. *Saudi Journal of Anaesthesia, 11*(Suppl 1), S80-S89.

Turk, D. C., & Melzack, R. (1992). The measurement of pain and the assessment of people experiencing pain. In D. C. Turk & R. Melzack (Eds.), *Handbook of Pain Assessment*. New York, NY: The Guilford Press.

Urbán, R., Kökönyei, G., & Demetrovics, Z. (2008). Alcohol outcome expectancies and drinking motives mediate the association between sensation seeking and alcohol use among adolescents. *Addictive Behaviors, 33*(10), 1344-1352.

Von Korff, M. (2011). Assessment of chronic pain in epidemiological and health services research. In D. C. Turk & R. Melzack (Eds.), *Handbook of Pain Assessment: Third Edition*. New York, NY: The Guilford Press.

Von Korff, M., Crane, P., Lane, M., Miglioretti, D. L., Simon, G., Saunders, K., . . . Kessler, R. (2005). Chronic spinal pain and physical-mental comorbidity in the United States: results from the national comorbidity survey replication. *Pain, 113*(3), 331-339.

Von Korff, M., Ormel, J., Keefe, F. J., & Dworkin, S. F. (1992). Grading the severity of chronic pain. *Pain, 50*(2), 133-149.

Walker, D. A. (2010). A confirmatory factor analysis of the attitudes toward research scale. *Multiple Linear Regression Viewpoints, 36*(1), 18-27.

Yelin, E. H., Cisternas, M. G., Trupin, L., & Gansky, S. (2014). costs of Musculoskeletal Diseases in the United States, 1996-2011: Population Growth, Population Aging, Health Care Utilization, or Prices?: 98. *Arthritis & Rheumatology, 66,* S41-S42.

Zale, E. L., Maisto, S. A., & Ditre, J. W. (2015). Interrelations between pain and alcohol: An integrative review. *Clinical Psychology Review, 37*, 57-71.

VITA

NAME OF AUTHOR: Lisa R. LaRowe

CONTACT INFORMATION:
430 Huntington Hall
Syracuse, NY 13244

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:
Syracuse University, Syracuse, NY
Northeastern University, Boston, MA

DEGREES AWARDED:
Bachelor of Science in Psychology, 2015, Northeastern University
Master of Science in Clinical Psychology, 2016, Syracuse University