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Pharmacological Versus Social Alcohol Expectancies: Making an Important Distinction between the Anticipated Rewarding Effects of Alcohol

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Making an Important Distinction between the Anticipated Rewarding Effects of Alcohol

by

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Abstract

Despite over 30 years of research investigating alcohol expectancies, they have never been examined in terms of the anticipated pharmacological versus social rewards resulting from alcohol consumption, and both appear to play a central role in drinking motivation and behavior. The purpose of this study was to develop a two-dimensional instrument designed to assess both the pharmacological alcohol expectancies of pleasurable, internal states that result from alcohol consumption, as well as the social expectancies that drinking alcohol will result in higher social status and increased effectiveness in social situations. This measure, called the Pharmacological and Social Alcohol Expectancy Scale (PSAES), was developed and validated in a college sample using a two-phase design with three separate samples. Phase I results demonstrated that a respecified model of the PSAES adequately fit the proposed two-dimensional factor structure and provided justification for the items representing two distinguishable domains: social and pharmacological. The measure was then used to 1) assess patterns of drinking expectancies at various drinker levels and 2) investigate whether known risk factors for alcohol use disorders differentiate scores on the two factors. Phase II results indicated that pharmacological and social expectancies are both significantly positively associated with drinking behavior, and that sensation-seeking is significantly associated with pharmacological expectancies. The PSAES represents the first alcohol expectancy

instrument to provide adequate coverage of pharmacological expectancies. Implications and limitations are discussed.

Introduction

Alcohol use disorders (AUDs) constitute a substantial public health problem that plagues adults as well as one-fourth of young adults in late adolescence (Johnston, O'Malley, & Bachman, 1996; Tarter, Kirisci, & Mezzich, 1997). National epidemiology studies (e.g., Grant et al., 2004; Hezler et al., 1991; Kessler et al., 1997) indicate very high prevalence rates of past-year and lifetime AUDs in the United States population (percentages range from 7.41-7.7% for past-year and 18.2-23.5% for lifetime). According to the National Epidemiologic Survey on Alcohol and Related Conditions, AUDs are twice as common in men as in women, decrease over essentially all demographic strata with age (Grant et al., 2004), and result in number of adverse consequences that can cause substantial morbidity and mortality, such as depression, severe anxiety, insomnia, suicide, and the abuse of other substances (Schuckit, 1998). Prolonged heavy drinking has a variety of health ramifications, including increased risk of heart disease, stroke, cancers, and cirrhosis of the liver (Sher, Grekin, & Williams, 2005).

The notable age-related patterns of alcohol use, abuse, and dependence are also cause for concern (Masten et al., 2008). Recent research has shown that alcohol use tends to increase during adolescence, peak during late adolescence and early adulthood, and for most people, gradually decrease into adulthood (Sher, Grekin, & Williams, 2005). The younger individuals are when they initiate drinking, the more likely they are to experience alcohol dependence at some point across the lifespan, drive while intoxicated,

ride with drunk drivers, have unplanned and unprotected sex after drinking, and have alcohol-related injuries (Hingson et al., 2003). Although many individuals who develop AUDs tend to "mature out" of AUDs during the transition to adulthood, a significant number show more chronic forms over the lifetime (Sher, Grekin, & Williams, 2005).

Undeniably, the need for efficacious treatments for alcohol abuse and dependence is of paramount importance, but the development of effective treatments requires a thorough knowledge of the etiology of AUDs. Attempting to understand the complex etiology and antecedents of alcohol use disorders is a crucial component to treating AUDs, as identifying those at risk for an alcohol use disorder could allow for early interventions that could potentially prevent the devastating consequences of AUDs on both the individual and society as a whole. The etiology is extraordinarily complicated because unlike some other medical illnesses, there is no one "gene" or single antecedent that causes a person to develop a "problem" with alcohol. Rather, the etiology of AUDs can be conceptualized as a complicated risk matrix that includes genetic factors, environmental influences, personality factors, individual differences (e.g., pharmacological vulnerability), antecedent and comorbid psychopathology (Conduct Disorder, Attention Deficit Hyperactivity Disorder, mood and anxiety disorders, etc.), and neuropsychological deficits (Sher, Grekin, & Williams, 2005).

Another significant variable in the intricate risk matrix of AUDs that has received intense interest over the past 30 years is alcohol expectancies. Alcohol expectancies can be thought of as memory associations in the brain related to alcohol use that create anticipatory schema designed to prepare an individual for upcoming situations involving alcohol (Goldman, 1999, 2002). Alcohol expectancies are of interest to the study of

AUDs because the expectations individuals possess about alcohol affect drinking behavior. In fact, alcohol expectancies have been shown to mediate biopsychosocial influences on drinking behavior, explaining up to 50%
of the variance in drinking outcomes (Darkes et al., 2004; Goldman, Darkes, & Del Boca, 1999; Goldman, Reich, & Darkes, 2006). Expectancies have demonstrated predictive validity cross-sectionally (e.g., Leigh, 1989; Goldman et al., 1999) and longitudinally over months and years (Baer, 2002; Stacy et al., 1991). Even more striking is the recent finding that expectancies measured during adolescence predict drinking as much as two decades later (Patrick et al., 2010).

A recent review of models of addiction (Redish, Jensen, & Johnson, 2008) focuses on expectations of pharmacological brain effects as the central motivation for substance consumption, including alcohol. These anticipated effects would include the subjective experience of feeling "buzzed," "high," "wasted," "drunk," etc. However, over the last 30 years, a sizeable body of research has demonstrated that the pharmacological actions of ethanol do not completely determine alcohol-related behavior. Many factors unrelated to alcohol pharmacology (e.g., personality, family environment, alcohol use of peers) are thought to influence the onset of drinking in humans during adolescence as well as the trajectory of drinking after onset. Social factors appear to have a tremendous influence on drinking, especially during adolescence. Indeed, positive social expectancies are most highly correlated with drinking behavior in the general population (Smith et al., 1995). Given these two themes in the alcohol literature, the current study aimed to develop a measure that distinguishes between the expected

pharmacological and social rewarding effects of alcohol, and to then utilize that instrument to define risk for alcohol use disorders.

Expectancy Theory

Tolman (1932) first introduced the concept of expectancy to psychology in reference to general learning theory, and research on expectations has since emerged in a number of diverse fields. The term "expectancy" is not as important as the construct the word is intended to represent; various words have been used to describe the concept, including anticipation, expectation, prediction, and even motivation. Regardless of the preferred nomenclature, expectancies are conceptualized as memory associations that create anticipatory schema intended to prepare an individual for upcoming situations. Consider Goldman et al. (2006): "…the nervous system has evolved to store information about experiences so as to anticipate (predict) and negotiate future circumstances" (p. 58). Expectancy is a highly multi- and interdisciplinary theme, and there is now a growing body of literature from various fields pointing to various anticipatory mechanisms in the brain, revealing the crucial role of expectation in a number of cognitive capacities such as motor control, vision, learning, motivation, and emotion (Pezzulo, Hoffmann, & Falcone, 2007). The increasingly vast empirical foundation for expectancy theory has demonstrated the pivotal function of expectancies in the preparation and initiation of voluntary behavior, leading some to posit that expectation is at the center of cognition (Pezzulo et al., 2007). From this perspective, the brain can be thought of as a truly anticipatory machine, always preparing for the future.

Expectancy theory postulates that stimuli activate a network of memory associations, which allows for appraisal of stimuli and facilitates cognitive, behavioral,

and physiological reactions to particular stimuli (Bargh & Williams, 2006; Goldman 1999, 2002). The idea that our brains are anticipatory machines is significant for a number of reasons. First, anticipating future events can be thought of as an advantage from an evolutionary perspective. Predicting future events and utilizing learned associations about those events enables individuals to make the most effective decisions in an efficient amount of time. Humans do evolve and adapt to the present environment, but we have also developed the ability to anticipate the future (i.e., a prediction of the future based on learned information from similar past circumstances). This capacity for prediction aids our ability to initiate behaviors that will be most effective in attaining our desired future states, or goals.

Second, expectancy theory posits that an individual's expectations can actually shape his or her behavior, including one's physiological responses. A pertinent example of this phenomenon is evident when individuals exhibit a "placebo effect" when they are given a substance that does not actually contain medication, but they are told that the substance will cause a certain effect. Individuals will report feeling that particular effect, despite merely having received a placebo. For instance, studies have demonstrated that when a placebo is presented to participants as a stimulant they exhibit increased heart rate and blood pressure, and when the placebo is presented as a depressant the opposite effect occurs (Kirsch, 1999). The magnitude of the effect of anticipatory cognition is apparent when the evidence presented demonstrates that simply believing that one is receiving a drug, even when no such drug is actually administered, can alter an individual's neurophysiological responses.

In recent years, researchers have utilized an elegant approach to the analysis of placebo responses by implementing a "hidden treatment" group to balanced placebo designs. Unlike traditional placebo groups where individuals in the placebo condition believe they are receiving a drug but no drug is actually administered, hidden treatment groups are entirely unaware that a medical therapy is being carried out, removing the element of expectancy entirely. The results of the hidden therapies are then compared with the open therapies. The results of these studies have demonstrated that when the expectancy, or psychological component, of a treatment is removed, the effects of a variety of treatments are significantly reduced (Benedetti, Carlino, & Pollo, 2011). These data suggest that the action of various drugs can be increased or decreased by anticipatory processes, creating a complex interaction between psychological factors and pharmacodynamics.

Alcohol Expectancies and Drinking Behavior

As mentioned previously, expectancies are memory associations – anticipatory schema that prepare an individual for upcoming situations. These memory associations have been studied extensively within the alcohol domain, and are referred to as alcohol expectancies. Alcohol expectancies have been measured explicitly via traditional paper and pencil questionnaires and implicitly through modified Stroop tasks, free associates, and false memory tasks (e.g., Kramer & Goldman, 2003; Reich, Goldman, & Noll, 2004). Heavier drinkers tend to endorse more positive and arousing expectancies, while lighter drinkers tend to endorse more negative and sedating expectancies (Darkes, Greenbaum, & Goldman, 1996). Drinking behavior is positively associated with positive expectations about alcohol (e.g., the belief that alcohol will make one happy or more relaxed) and

inversely associated with negative expectations about alcohol (e.g., the belief that alcohol will make one sad or woozy) (Stacy, 1997).

Alcohol expectancies are of even more interest when these anticipatory cognitions are understood as part of the larger risk matrix of variables associated with alcohol use disorders (AUDs). Expectancies exist prior to the onset of drinking, and the expectations children hold about alcohol before they even start drinking have been shown to predict when they will initiate drinking (Christiansen et al., 1989); more positive expectancies have been associated with an early age of drinking onset and vice versa. Anticipated outcomes from alcohol use shift from primarily negative to primarily positive upon entry into adolescence, which coincides with drinking initiation (Dunn & Goldman, 1998). In addition, the more drinking experience an individual has, the more likely that individual is to hold positive expectations about alcohol, and thus the more likely he or she is to drink more often and in higher quantities (Smith et al., 1995). Furthermore, alcohol-related anticipatory cognitions appear to mediate biopsychosocial influences on drinking behavior, explaining up to 50% of the variance in drinking outcomes (Darkes, Greenbaum, & Goldman, 2004; Goldman, Darkes, & Del Boca, 1999; Goldman, Reich, & Darkes, 2006).

Rewarding Pharmacological Effects of Alcohol Consumption

In their recent review of addiction models, Redish, Jensen, and Johnson (2008) focus on anticipated pharmacological brain effects as the main incentive for consuming alcohol. These pharmacological effects are in fact primary – that is, they can be conceptualized as the immediate subjective effects of alcohol "hitting the brain" and impacting brain neurophysiology. Thought of in a different way, the pharmacological

effects of alcohol are those that one might be able to experience even in a solitary drinking setting. Much of the research examining the pharmacological effects of alcohol has used animal models, largely because animal models allow researchers to use methods that cannot ethically be used with human subjects. The majority of animal models of alcohol-seeking behavior attempt to demonstrate the reinforcing (pleasurable) pharmacological properties of alcohol (Tabakoff & Hoffman, 2000), which are thought to play a key role in human alcohol use. A set of experiments has shown that P-rats consume alcohol for its reinforcing actions on the central nervous system. In those studies, the animals self-administered small amounts of alcohol via a special infusion device directly into a brain region thought to be critically involved in initiating the reinforcing effects of substance abuse (Gatto et al., 1994; Rodd-Henricks et al., 2000b). Animal model experiments are crucial for addressing the pharmacological and neurophysiological questions of alcohol research.

Despite their utility, a major issue with animal model studies is whether the behavior that is measured in the animals is relevant to human motivation for consuming alcohol; that is, they often lack face validity. Most animal studies use adult models, despite the onset of drinking during adolescence in humans. Many animal models force or encourage alcohol consumption using external manipulations, and the animals generally do not self-administer their initial exposure; in some instances, the alcohol is even injected directly into the stomach by the animal using surgically implanted tubes (i.e., intragastric self-administration). This method is used to avoid the influence of taste and assure that alcohol is being administered by the animal for its pharmacological properties, but is not relevant to standard routes of human alcohol consumption.

Each animal model of drinking behavior mimics only certain aspects of human drinking behavior, and given the complexity surrounding human alcohol consumption, one can see the inherent difficulty in fully modeling those human circumstances in animals. The limitation of alcohol animal studies perhaps most relevant to the current proposal is that animal models typically use organisms that are unaware of the effects of alcohol until alcohol exposure; that is, animals generally do not have pre-existing knowledge of alcohol effects prior to their first exposure. Results of balanced-placebo design studies in humans have demonstrated that the anticipated effects of alcohol are often as powerful as the actual pharmacological effects of alcohol in determining alcohol behavior. Over the last 30 years, alcohol expectancy research has demonstrated that many alcohol-related behaviors in humans are actually the result of alcohol-related anticipatory cognitions that have no basis in pharmacology.

Rewarding Social Effects of Alcohol Consumption

Given the well-established body of literature demonstrating that pharmacological mechanisms of alcohol do not completely determine alcohol-related behavior in humans, it is important to highlight some of the factors that motivate individuals to consume alcohol. Many factors unrelated to alcohol pharmacology (e.g., personality, family environment, alcohol use of peers) are thought to influence the onset of drinking in humans during adolescence as well as the trajectory of drinking after onset (Sher, Grekin, & Williams, 2005). Social factors appear to strongly influence human drinking behavior, especially during adolescence. Adolescents and young adults resemble their peers with respect to substance use: drinking attitudes and the behavior and influence of peers are among the strongest correlates of adolescent alcohol use and abuse (Hawkins, Catalano,

& Miller, 1992). The belief that alcohol enhances social interactions, the ability to make friends, and increases positive moods in social situations seem to play an important part in alcohol initiation and alcohol consumption thereafter.

Some recent studies with adolescent rats have attempted to model social influences on drinking behavior by demonstrating that rats will exhibit a greater preference for alcohol when they are allowed to observe another rat that has been exposed to the substance (Galef, Whiskin, & Bielavska, 1997). Using this demonstrator-observer paradigm, animal alcohol researchers have demonstrated that adolescent rats are more likely to drink alcohol after interacting with an alcohol-intoxicated peer than an anesthetized peer that had also received alcohol (Fernandez-Vidal & Molina, 2004). Animal researchers have also used this paradigm to demonstrate that alcohol preference increases in adolescent male rats that are allowed to observe and interact with an intoxicated familiar peer, but decreases when allowed to observe and interact with an intoxicated unfamiliar peer (Maldonado, Finkbeiner, & Kirstein, 2008). In contrast, the relationship does not appear to be important for female adolescent rats; they exhibit an increased preference for alcohol after exposure to either a familiar peer or an unfamiliar peer. As highly innovative as these demonstrator-observer animal models of drinking consumption may be, they are limited in their relevance to human consumption in that the demonstrator is typically force-fed alcohol, eliminating the possibility of interactions during drinking that may affect alcohol intake, and they do not account for the effect of specific social affiliations on social drinking.

Both the human and animal literature regarding psychosocial influences on alcohol consumption suggest that psychosocial factors play a critical part in the initiation

and developmental trajectory of alcohol use. These social factors include the influence of parents and peers, positive social expectancies, and perceived drinking norms. While popularity with one's peers at the elementary school level is associated with low risk for alcohol use (Zucker, 2006), peer popularity in high school may put students at higher risk for alcohol use (Diego, Field, & Sanders, 2003). Popular adolescents are more likely to be invited to parties, and exposure to alcohol at parties increases in adolescence, which may account for some of this increased risk (Masten et al., 2008). Parents and youths in the United States tend to view underage drinking as a normal socialization that occurs with adolescence (Maddox & McCall, 1964; Jessor & Jessor, 1977).

Social learning theory (Bandura, 1977) has been utilized as a theoretical framework for understanding the role of social influences on drinking, indicating that adolescent alcohol consumption is a learned behavior acquired through a process of observation, modeling, mimicking, and social reinforcement (Epstein, Griffin, & Botvin, 2008). The alcohol expectancy literature has demonstrated that positive social expectancies (e.g., social enhancement, social facilitation) are most strongly correlated with drinking behavior when compared to other specific alcohol expectancies (e.g., sexual enhancement, attractiveness, happiness).

A Different Way of Looking at Alcohol Expectancies

The literature presented above indicates the importance of both the pharmacological and social rewarding effects of alcohol on drinking motivation and behavior. Drinking motives research has demonstrated that drinking is motivated by both internal rewards (e.g., enhancement of a desired emotional state) and external rewards (e.g., social approval). Internally focused motives, specifically mood enhancement and

coping, have been associated with heavy drinking (Cooper et al., 1992; Cooper et al., 1995; Park & Levenson, 2002). If efforts to limit premature and excessive drinking are to succeed, research is needed to determine which alcohol expectancies are most predictive of alcohol-related problems and alcohol use disorders, and making a distinction between the anticipated rewarding pharmacological and social effects of alcohol could provide an important platform for defining risk for heavy drinking, alcohol-related problems, and AUDs.

Despite the vast and diverse research investigating alcohol expectancies from various perspectives (e.g., positive and negative expectancies, valence and arousal, circumplex models, and many others), alcohol expectancies have never been examined in terms of the anticipated pharmacological versus social rewards resulting from alcohol consumption. Furthermore, while a number of measures designed to measure alcohol expectancies have demonstrated effectiveness in assessing rewarding social expectancies of alcohol, there is a relative lack of alcohol expectancy instruments that assess specifically for rewarding pharmacological expectancies of alcohol, and those that do exist focus largely on the negative pharmacological effects of alcohol consumption (e.g., feeling sick, woozy).

A truly comprehensive list of the expected rewarding outcomes of alcohol use must include both the direct chemical effects (i.e., pharmacological expectancies), as well as those effects that enhance individuals' social effectiveness and social status (i.e., social expectancies). In the current study, pharmacological expectancies are conceptualized as internal, purely subjective effects individuals could even experience in solitary drinking, while social expectancies are those that involve expectations of increased social status

and effectiveness in social situations. Of course, these constructs are not entirely orthogonal, and in fact may interact and overlap with one another.

Statement of Purpose

The primary purpose of the current study was to develop a two-dimensional instrument designed to assess both the pharmacological alcohol expectancies of pleasurable, internal states that result from alcohol consumption, as well as the social expectancies that drinking alcohol will result in higher social status and increased effectiveness in social situations. This measure was named the Pharmacological and Social Alcohol Expectancy Scale (PSAES). The measure was then subjected to measure validation attempts by 1) assessing patterns of alcohol expectancies at various drinker levels and 2) investigating whether known risk factors for alcohol use disorders (i.e., impulsivity, sensation-seeking, negative affectivity, family history of AUDs) are differentiated by scores on the two factors – social and pharmacological expectancies. Although defining risk can only be accomplished by employing a longitudinal risk paradigm, looking at cross-sectional associations between risk variables and expectancy patterns could help determine whether individuals who are already at elevated risk for AUDs anticipate more pharmacological effects from alcohol.

Specific Aims

1) It was expected that when the proposed two-dimensional model was formally tested, the PSAES alcohol expectancy items would adequately fit two correlated factors of social and pharmacological expectancies. 2) In line with previous alcohol expectancy research, it was hypothesized that there would be a positive, linear relationship between social expectancies and alcohol consumption. 3) Expanding on the current alcohol

expectancy literature, it was hypothesized that there would be a positive, linear relationship between pharmacological expectancies and alcohol consumption. 4) It was also hypothesized that known risk factors for AUDs (i.e., impulsivity, sensation-seeking, negative affectivity, family history of AUDs) would be positively associated with pharmacological expectancies. Furthermore, a secondary aim that was exploratory in nature predicted that individuals with these risk factors would endorse a larger percentage of pharmacological expectancies than social expectancies relative to total expectancy endorsement.

Design Overview

Phase I: Measure Development

The goal of item pool generation for the PSAES was to exhaustively generate items that represented the intended domains. Item generation for the pharmacological construct was particularly difficult given the lack of existing measures and the complexity of using words to represent internal, subjective experiences. A multiple-step process, including a review of existing measures, ethnographic interviews, interviews with professionals, and expert consensus panel, was used to create the item pool for the PSAES. Most items comprising the Pharmacological and Social Alcohol Expectancy Scale (PSAES) were derived from alcohol expectancy, alcohol motives, and reasons for drinking questionnaires, including the Alcohol Expectancy Questionnaire (Brown, Christiansen, & Goldman, 1987), the Alcohol Expectancy Multi-Axial Assessment (AEMax; Goldman, & Darkes, 2004), the Alcohol Outcome Expectancy Questionnaire (Leigh & Stacy, 1993), the Comprehensive Effects of Alcohol Questionnaire (Fromme, Stroot, & Kaplan; 1993), the Drinking Motive Questionnaire – Revised (DMQ-R; Cooper, 1994), and the Reasons for Drinking Scale (RDS; Carpenter & Hasin, 1998). Items were modified to ensure similar formatting.

Additional pharmacological items were generated for the PSAES due to the relative lack of rewarding pharmacological expectancy items in existing expectancy, motives, and reasons for drinking measures. These additional pharmacological items were generated using the criteria of whether or not one could feel the effects in the

absence of others, as well as some of the words or phrases used to describe the pharmacological effects of alcohol consumption in the animal literature. An expert panel consisting of four Ph.D.-level researchers and eight graduate students specializing in alcohol expectancy research met on multiple occasions to discuss which items best fit the conceptual model. A list of the 30 items (15 social and 15 pharmacological) can be found in Appendix A. The preliminary PSAES items were administered to a development sample (Sample 1) along with some basic demographic questions, and a factor analytic strategy was utilized for item analysis and selection. The items remaining after item analysis were used to create both a Likert format and absolute forced-choice format of the PSAES to be administered in Phase II. The forced-choice version was administered in an attempt to avoid response-format biases often present in Likert-type scales. PSAES items were presented in this comparative fashion to see if asking participants to choose one type of expectancy over another would provide additional information.

Phase II: Measure Replication and Validation.

A Likert format version of the PSAES was administered to a new sample (Sample 2). Sample 2 participants were assessed for drinking variables, risk factors for alcohol use disorders, and demographic information. An additional sample (Sample 3) received an absolute forced-choice version of the PSAES, and was also assessed for drinking variables, risk factors for alcohol use disorders, and demographic information. See Table 1 for a summary of the assessment schedule based on phase and sample numbers.

Phase I

Phase I Participants

For both Phase I (Sample 1) and Phase II (Samples 2 and 3) students aged 18-23 years were recruited via the SONA system at the University of South Florida. All three samples consisted of college students who completed the study protocol for SONA credit points. The Phase I sample (Sample 1) consisted of 212 students, and included both drinkers and non-drinkers. Because there is currently no consensus in the statistical community on the minimum sample size required for factor analysis, with some statistical pundits recommending at least 100 (Gorsuch, 1983), 150 (Hutcheson & Sofroniou, 1999), 200 (Guilford, 1954), 250 (Cattell, 1978), and even 500 cases (Comrey & Lee, 1992), the development sample of 200 was chosen based on feasibility and practicality for the current study and its consistency with most of the aforementioned recommendations. Sample 1 participants' mean age was 20.20 years (*SD* = 1.44) with a range of 18 to 23 years. Seventy-six percent of Sample 1 participants were female and all participants identified themselves as either White/Caucasian (55.0%), Black/African-American (11.9%), Hispanic/Latino(a) (26.1%), Asian (6.6%) or Other (0.5%).

Phase I Measures

Background/Demographics Form

Participants from all three samples completed a form developed to assess important demographic and background variables including age, gender, ethnicity, religiosity, and year in school.

The Pharmacological and Social Alcohol Expectancy Scale (PSAES)

The PSAES contains 30 items designed to assess both pharmacological and social alcohol expectancies. Fifteen items are intended to assess participants' pharmacological alcohol expectancies, and 15 items are intended to assess participants' social alcohol expectancies. A complete list of PSAES items can be found in Appendix A along with participant instructions. Items were presented in random order at each phase. Phase I (Sample 1) participants completed a preliminary version of the PSAES in a 5-point Likert format. Participants were asked to respond to the set of items in the way that best describes them. Each item begins with the stem, "If I drink alcohol…" and ends with an anticipated effect of alcohol (e.g., "I feel energized", "I fit in better with a group I like", etc.). For the Likert version of the PSAES, a participant's pharmacological expectancy score was based on the sum of responses for all items that load onto the pharmacological expectancies factor. A participant's social expectancy score was based on the sum of responses for all items that load onto the social expectancies factor.

Phase I Procedure

For both phases (all three samples) the protocols were administered electronically directly through the SONA system so all participants could complete the protocol at times and places convenient for them. A brief introduction and directions were provided in electronic form as an information sheet at the start of the survey with an opportunity for participants to ask questions. The information sheet included a brief description of the research project, voluntary participation, and researcher contact information. Phase I (Sample 1) participants completed the 30 PSAES items in 5-point Likert format in

addition to the background/demographics form without the questions assessing for family history of alcohol problems.

Results of Phase I: Measure Development

Specific Aim 1: Creating a 2-Dimensional Model of Expectancies

Confirmatory Factor Analysis (CFA) in Mplus v. 6.11 (Muthén & Muthén, 1998-2010) was used to evaluate whether the proposed two-factor measurement model (Pharmacological and Social) of the PSAES would produce adequate fit. See Figure 1 for a visual display of this measurement model. The data were first screened for univariate outliers and there were no out-of-range values.

All models were identified by setting latent factor means to 0 and latent factor variances to 1, such that all item intercepts, factor loadings, and residual variances were then estimated. The 30 items utilized a five-point response scale. Weighted least squares means and variance adjusted (WLSMV) estimation was utilized to compensate for any bias resulting from the categorical nature of the variables. The first-order measurement model for the 30-item PSAES, consisting of two correlated factors, did not adequately fit the data from the overall sample, χ^2 (404, N = 212) = 1372.42, $p < .001$, CFI = .85, TLI = .84, RMSEA = .11.

In order to improve the fit of the model, sources of misfit were evaluated to modify the model (i.e., model respecification). Sources of local misfit were identified using the normalized residual covariance matrix. Relatively large positive residual covariances were observed among certain items and modification indices corroborated this pattern. The variables that had the highest error covariance between items were left out from the respecified model. In addition, modification indices indicated that model fit

would improve if certain items were allowed to load onto both dimensions, which was inconsistent with the proposed factor structure, so these cross-loading items were also removed from the respecified model. In total, 13 items were removed from the original PSAES; five items were removed from the pharmacological scale and eight from the social scale. See Table 2 for a list of the items that remained following the above item analysis and reduction.

When these errors were freed, the CFA on the remaining seventeen items resulted in a significant improvement in the values of all fit indices, [χ^2 (118, N = 212) = 296.80, p < .001, CFI = .99, TLI = .98, RMSEA = .085. That is, the modification resulted in good model fit for the sample data with regard to the proposed two-dimensional model of the PSAES. Based on the good fit indices resulting from model respecification, the remaining 17 items appeared to measure two separate but related constructs, as originally hypothesized. Further examination of local fit via normalized residual covariances and modification indices yielded no interpretable remaining relationships, and consequently this two-factor model was retained.

Table 3 provides the estimates and their standard errors for the item factor loadings from the standardized solution. All factor loadings and the factor covariance were statistically significant. As shown in Table 3, standardized loadings for the pharmacological factor items ranged from .65 to .89 (with R^2 values for the amount of item variance accounted for by the factor ranging from .42 to .79), and standardized loadings for the social factor ranged from .83 to .93 (with R^2 values ranging from .68 to .86). The correlation coefficient between the pharmacological and social factors was .92. See Figure 2 for a visual display of this respecified model with factor loadings

and the correlation between the two factors. The adequate fit of the respecified model provided justification for the theoretical model of the PSAES indicating that the items represent two distinguishable domains: social expectancies and pharmacological expectancies.

Phase II, Sample 2

Phase II, Sample 2 Participants

Phase II, Sample 2 consisted of 164 students and was composed of both drinkers and non-drinkers. Power analyses demonstrated that given a sample of $N = 159$, would provide power of .80 to detect a 'medium' sized ($f = .25$) effect with a two-tailed alpha level of .05 (Cohen, 1988). A medium effect size was chosen because smaller effect sizes are unlikely to have clinical or theoretical significance. Sample 2 participants' mean age was 20.50 years ($SD = 1.51$) with a range of 18 to 23 years. Eighty-three percent of participants were female and all participants identified themselves as either White/Caucasian (64.6%), Black/African-American (14.0%), Hispanic/Latino(a) (1.8%), Asian (11.6%) or Other (7.9%).

Phase II, Sample 2 Measures

Background/Demographics Form

In addition to measured used in Phase I, Participants in each of the Phase II samples completed additional items to assess for family history of alcohol problems. The family history questions were based on the Family History-Research Diagnostic Criteria (FH-RDC) method of Andreasen et al. (1977), and were used to categorize participants as family history negative (FH-; no parental history of problems with alcohol) or family history positive (FH+; any parental history of problems with alcohol). Using the FH-RDC method, for a participant to be considered FH+, the respondent must not only acknowledge that he/she has a parent who has ever had drinking problems, but must

further indicate that the parent had at least one alcohol-related problem in any of several problem areas (Andreasen et al., 1977). These areas include physical or emotional problems due to drinking, problems with relationships, problems with work, problems with the law, or spending a lot of time being intoxicated or recovering from being intoxicated.

PSAES

Phase II, Sample 2 participants completed a refined version of the PSAES (i.e., after item analysis and reduction) in the same 5-point Likert format as Phase I participants, Following item analysis and item selection using a factor analytic strategy completed in Phase 1, the researcher created a refined version of the PSAES in 5-point Likert format to be administered to Sample 2. *Alcohol Experiences Form (AEF)*

This form was developed for use in the current study, and was administered to participants in each Phase II sample. The AEF assessed drinker level (DL) and drinking history (DH), including typical patterns of alcohol use (e.g., quantity, frequency, and frequency of binge drinking) and history of drinking (e.g., age of first use).

Zuckerman-Kuhlman Personality Questionnaire Form III (ZKPQ III; Zuckerman et al., 1993)

Participants in each Phase II sample completed the ZKPQ III in order to assess two personality characteristics that have a well-established association with risk for alcohol-related problems and alcohol use disorders: behavioral undercontrol (impulsivity and sensation-seeking) and negative affectivity (tendency toward depression and anxiety) (Sher, Grekin, & Williams, 2005). The ZKPQ III consists of 99 True-False items that yield scores for the following: Impulsivity-sensation seeking (separate scores can be

computed for each construct), neuroticism-anxiety, aggression-hostility, activity, sociability, and infrequency (social desirability). Coefficient alphas range from .73 to .83; validity data are also available (Zuckerman et al., 1993).

Phase II, Sample 2 Procedure

In Phase II, Sample 2 participants completed the research protocol in the following order: the refined Likert version of the PSAES, the ZKPQ III, the complete background/demographics form (including the family history questions), and the AEF.

Results of Phase II, Sample 2: Measure Replication and Validation

Replicating the PSAES Factor Structure in Phase II

The respecified two-factor model for the 17-item PSAES, consisting of two correlated factors, adequately fit the data from Phase II (Sample 2), $\chi 2$ (118, N = 164) = 348.09, $p < .001$, CFI = .97, TLI = .96, RMSEA = .11, demonstrating replication of the measurement model and providing additional evidence that the items represent their respective constructs with minimal ambiguity. Table 4 provides the estimates and their standard errors for the item factor loadings from the standardized solution. All factor loadings and the factor covariance were statistically significant. As shown in Table 4, standardized loadings for the pharmacological factor items ranged from .53 to .91 (with R^2 values for the amount of item variance accounted for by the factor ranging from .28 to .84), and standardized loadings for the social factor ranged from .79 to .90 (with R^2 values ranging from .63 to .82). The correlation coefficient between the pharmacological and social factors was = .88. See Figure 3 for a visual display of this replicated measurement model with factor loadings and the correlation between the two factors.

Specific Aim 2: Relationship between Drinker Level and Social Expectancies

To test the hypothesis that there would be a positive, linear relationship between drinker level and social expectancies, a linear regression was conducted with social expectancies as the independent variable and drinker level as the dependent variable. Drinker level was measured by quantity of alcoholic beverages consumed per typical drinking occasion and treated as a continuous variable. Linear regression analysis

revealed a significant effect of social expectancies on drinker level, $R^2 = .31$, $F(1, 163) = 72.72$, $p < .001$, indicating that social expectancies are positively associated with drinking behavior. See Table 5 for a summary of these regression results. These results replicate past research demonstrating an association between social expectancies and alcohol consumption and provide additional evidence for the validity of the social expectancies subscale of the PSAES.

Specific Aim 3: Relationship between Drinker Level and Pharmacological Expectancies

To test the hypothesis that there would be a positive, linear relationship between drinker level and pharmacological expectancies, a linear regression was conducted with pharmacological expectancies as the independent variable and drinker level as the dependent variable. Drinker level was measured by quantity of alcoholic beverages consumed per typical drinking occasion and treated as a continuous variable. The linear regression analysis revealed a significant effect of pharmacological expectancies on drinker level, $R^2 = .42$, $F(1, 163) = 117.20$, $p < .001$, indicating that pharmacological expectancies are positively associated with drinking behavior. See Table 6 for a summary of these regression results. These results add to previous alcohol expectancy research by demonstrating that pharmacological expectancies, which have not been explicitly measured in any existing alcohol expectancy instrument to date, are positively associated with alcohol consumption. These results provide additional evidence for the validity of the pharmacological expectancies subscale of the PSAES.

Incremental Validity of the Pharmacological Expectancy Subscale

A hierarchical multiple regression analysis was performed to examine the unique contribution of pharmacological expectancies in the explanation of drinking behavior. The variables that explain drinking behavior were entered in two steps. In step 1, quantity of drinks consumed per typical occasion was the dependent variable and the social expectancies subscale was the independent variable. In step 2, the pharmacological expectancies subscale was entered into the step 1 equation. Results of the variance inflation factor (less than 3.0) and the collinearity tolerance (greater than .34) suggest that the estimated βs are well established in the following regression model.

The results of step 1 indicated that the variance accounted for (R^2) with the first variable (the social expectancies subscale) equaled .31 (adjusted $R^2 = .31$), which was significantly different from zero, $F(1, 163) = 72.72$, $p < .001$. In step 2, the pharmacological expectancies subscale of the PSAES was entered into the regression equation. The change in variance accounted for (ΔR^2) was equal to .11, which was significantly different from zero, $F(1, 163) = 31.45$, $p < .001$. The unstandardized regression coefficients (B) and associated standard errors, as well as the standardized regression coefficients (β) for the full model are reported in Table 7. These results provide additional evidence for the validity of the pharmacological expectancies subscale of the PSAES by demonstrating that the pharmacological expectancies subscale provides incremental validity in the prediction of drinking behavior.

Specific Aim 4: Relationship between Risk Factors and Pharmacological Expectancies

Multiple linear regression analysis was used to test the hypothesis that known risk factors for AUDs (i.e., impulsivity, sensation-seeking, negative affectivity, family history of AUDs) would predict higher endorsement of pharmacological expectancies. Basic descriptive statistics and regression coefficients are shown in Table 8. Before the multiple regression analysis was performed, the independent variables were examined for collinearity. Examination of the variance inflation factor statistics (all less than 1.5) and collinearity tolerance (all greater than .71) suggested that the estimated βs are well established in the following regression model. The four predictor model was able to account for 11% of the variance in pharmacological expectancies, $R^2 = .11$, $F(4, 159) = 4.77$, $p < .01$. When individual beta weights were examined, only sensation-seeking (SS) had a significant positive regression weight, indicating that individuals higher in SS have higher pharmacological expectancies. Impulsivity, negative affectivity, and family history were not significant contributors to the multiple regression model.

Each risk variable was also examined individually using separate linear regression analyses. Impulsivity (IMP) was a significant predictor of pharmacological expectancies when examined in a separate regression analysis, $R^2 = .03$, $F(1, 163) = 4.54$, $p < .05$, but was not significant once it was entered into the multiple regression equation controlling for all of the other variables in the regression equation. Examination of the intercorrelation matrix (see Table 9) revealed that IMP has a high correlation with SS (*r*

= .44, $p < .01$), which is consistent with existing literature. The two constructs tend to overlap a great deal depending on how they are measured and thus may account for the contradictory findings in the separate regressions.

When multiple regression analysis was used to determine whether risk factors for AUDs were associated with social expectancies, the four-predictor model (SS, IMP, NA, FH) was only able to account for 5% of the variance in social expectancies, $R^2 = .11$, $F(4, 159) = 2.28$, $p = .06$. When individual beta weights were examined, none of the risk variables were significant contributors to the multiple regression model, indicating that risk factors for AUDs are more associated with pharmacological expectancies than social expectancies. Basic descriptive statistics and regression coefficients are shown in Table 10.

Phase II, Sample 3 (Forced-choice Format)

Phase II, Sample 3 Participants

Phase II, Sample 3 consisted of 162 students and was composed of both drinkers and non-drinkers. Power analyses demonstrated that a sample of 159 would provide power of .80 to detect a 'medium' sized (f = .25) effect with a two-tailed alpha level of .05 (Cohen, 1988). A medium effect size was chosen because smaller effect sizes are unlikely to have clinical or theoretical significance. Sample 3 participants' mean age was 20.24 years (SD = 1.65) with a range of 18 to 23 years. Eighty-four percent of participants were female and all participants identified themselves as either White/Caucasian (59.9%), Black/African-American (12.4%), Hispanic/Latino(a) (14.2%), Asian (5.6%) or Other (8.0%).

Phase II, Sample 3 Measures

Phase II, Sample 3 participants completed the same measures as participants in Sample 2 (i.e., Background/Demographics Form with family history questions, ZKPQ III, AEF, PSAES) except a refined version of the PSAES items in an absolute forced-choice format was administered to Sample 3 instead of the Likert version. Sample 3 participants were asked to choose between two rewarding effects of alcohol, one social and one pharmacological. Each item began with the stem, "In an upcoming drinking situation, if I could only have one of the following effects result from drinking alcohol, I would rather…" and the participant chose between two different rewarding effects resulting from drinking alcohol (e.g., "feel energized OR fit in with a group of friends I like"). For

the absolute forced-choice version of the PSAES, a participant's pharmacological expectancy score was based on the proportion of pharmacological expectancy items chosen relative to total expectancy endorsement. A participant's social expectancy score was based on the proportion of social expectancy items chosen relative to total expectancy endorsement; it should be noted that this score is simply the inverse of the pharmacological expectancy score.

Phase II, Sample 3 Procedure

Phase II, Sample 3 participants completed the research protocol in the following order: the absolute forced-choice version of the PSAES, the ZKPQ III, the complete background/demographics form (including the family history questions), and the AEF. Sample 3 participants completed the same research protocol are participants in Sample 2, except they completed the absolute forced-choice version of the PSAES instead of the Likert version.

Results of Analysis of Phase II, Sample 3 (Forced-Choice Format)

Transformation of Absolute Forced-Choice Data

Examination of the outcome variable of interest from the forced-choice version of the PSAES showed the proportion of pharmacological expectancies endorsed relative to total expectancy endorsement to be non-normally distributed. A traditional approach to transforming data expressed as proportions often used in the social sciences is to take the arcsine of the square root of the proportion to be transformed (Kruskal, 1968). Thus, the pharmacological expectancies proportion variable was transformed using an arcsine [$Y = 2*\arcsin\sqrt{x}$] transformation, which is used to normalize data when data are expressed as proportions between 0 and 1. This transformation improved the skewness and kurtosis for this proportion variable, resulting in a data distribution that approached normality and allowing standard robust statistical procedures to be used to analyze the forced-choice data (e.g., ANOVA, linear regression).

Specific Aims 2 & 3: Relationship between Drinker Level and Expectancies

To test the hypothesis of a positive, linear relationship between drinker level and pharmacological expectancies, a linear regression was conducted with the transformed pharmacological expectancies proportion as the independent variable and drinker level as the dependent variable. Drinker level was measured by quantity of alcoholic beverages consumed per typical drinking occasion and treated as a continuous variable. The linear regression analysis revealed no significant effect of pharmacological expectancies on drinker level, $R^2 = .002$, $F(1, 161) = 0.38$, $p = .54$ measured with a forced-choice format.

See Table 11 for a summary of these regression results. Because the proportion of social expectancies is simply the inverse of the proportion of pharmacological expectancies, the resulting statistics for social expectancies are identical to pharmacological expectancies (i.e., no significant effect of proportion of social expectancies endorsed on alcohol consumption).

Specific Aim 4: Relationship between Risk Factors and Pharmacological Expectancies

Multiple linear regression analysis was employed to test the hypothesis that known risk factors for AUDs (i.e., IMP, SS, NA, FH+) would predict a higher proportion of pharmacological expectancies endorsed relative to total expectancy endorsement. Basic descriptive statistics and regression coefficients are shown in Table 12. Before the multiple regression analysis was performed, the independent variables were examined for collinearity. Examination of the variance inflation factor statistics (all less than 1.4) and collinearity tolerance (all greater than .76) suggested that the estimated βs are well established in the following regression model. The four predictor model was only able to account for 4% of the variance in pharmacological expectancies, $R^2 = .04$, $F(4, 157) = 1.42$, $p = .23$, a statistically insignificant amount. In addition, examination of individual beta weights indicated that none of the predictors were significant individual contributors to the multiple regression model.

The results obtained from analyses using the forced-choice version of the PSAES were discrepant from those obtained using the Likert version. The reasons for this discrepancy will be examined in the discussion section of the current study. Taken together, the results obtained using the forced-choice format of the PSAES indicate that

presenting the items in a comparative fashion is not a useful way of measuring rewarding pharmacological and social expectancies.

A Note on Gender Differences

A multitude of previous research demonstrates that drinking and personality variables differ between male and female samples. All three samples collected in the current study contained mostly females and only small percentages of male participants. Given the small number of males in each sample it was difficult to formally test whether significant gender differences actually existed in any of the variables measures due to lack of power. However, when descriptive statistics were examined visually, no major gender differences appeared in any of the variables measured in the current study. T-tests investigating differences in means between males and females revealed no significant differences in any variable of interest, not surprisingly, given the insufficient power. However, there was significantly greater anxiety-neuroticism in males as compared to females in sample 2. Sample 3 revealed no such differences. All gender-related analyses conducted are summarized in Table 13.

Discussion

The current study extended previous research on alcohol expectancy measurement via the development of the first alcohol expectancy instrument to provide adequate coverage of anticipated positive pharmacological effects resulting from alcohol consumption. Although alcohol expectancies have been investigated from various perspectives, they have never been examined by separating the anticipated rewarding pharmacological effects from the rewarding social effects resulting from drinking alcohol. Moreover, existing alcohol expectancy measures that do assess for pharmacological alcohol expectancies mostly measure negative pharmacological alcohol expectancies. The purpose of the current investigation was to develop a two-dimensional instrument designed to assess both pharmacological and social alcohol expectancies and to use that instrument to assess patterns of drinking expectancies at various drinker levels and investigate whether known risk factors for alcohol use disorders could differentiate scores on the two factors.

As hypothesized, results demonstrated that the Pharmacological and Social Alcohol Expectancy Scale (PSAES) adequately fit the proposed two-dimensional factor structure, providing justification for the model categorizing these items into social and pharmacological alcohol expectancies. The respecified two-factor model of the PSAES was replicated and demonstrated adequate fit in Phase II. The most notable structural feature of the PSAES is the pharmacological factor. Although a number of alcohol expectancy instruments have demonstrated effectiveness in measuring the rewarding

social effects of alcohol, no other measure of alcohol expectancies to date has explicitly measured rewarding pharmacological expectancies, and a comprehensive inventory of the expected rewarding outcomes of alcohol consumption must include both expectations of direct chemical effects (i.e., pharmacological expectancies) and expectations regarding individuals' enhanced social effectiveness and increased social status (i.e., social expectancies).

Replicating previous research, the current study hypothesized a positive relationship between both social and pharmacological expectancies and alcohol consumption. This hypothesis was supported by the data, as individuals with higher social or pharmacological expectancies reported drinking more per typical occasion, on average. These results replicated previous expectancy research that positive social expectancies are associated with increased alcohol consumption. In addition, the results indicated that pharmacological expectancies provided incremental validity in the prediction of drinking behavior in this study, providing additional evidence for the validity of the pharmacological expectancies subscale of the PSAES.

Finally, the current study posited that risk factors for AUDs (i.e., impulsivity, sensation-seeking, negative affectivity, family history of AUDs) would predict higher endorsement of pharmacological expectancies. Furthermore, a secondary aim that was exploratory in nature predicted that individuals with these risk factors would endorse a larger percentage of pharmacological expectancies than social expectancies relative to total expectancy endorsement. The results partly support these stated hypotheses as they were measured in the present study in that only sensation-seeking emerged as a significant predictor of pharmacological expectancies; impulsivity, negative affectivity,

and family history of AUDs were not predictive of pharmacological expectancy endorsement. None of the risk variables for AUDs were significant predictors for social expectancies in this study, suggesting that pharmacological and social expectancies are differentially associated with risk factors for pathological drinking behavior.

Individuals in this study who scored higher on a measure of sensation-seeking reported more pharmacological expectancies of alcohol consumption than individuals who scored lower in sensation-seeking, which is consistent with prior research (Darkes, Greenbaum, & Goldman, 2004; Urbán, Kökönyei, & Demetrovics, 2008). The lack of an association between family history of alcoholism and pharmacological alcohol expectancies is not without precedent; family history has been unreliable in previous studies as a correlate to other positive alcohol expectancies and heavy drinking among college students, although this variable is an important risk factor for problem drinking.

Likert formats can sometimes have the unfortunate consequence of various response biases (e.g., acquiescence responding, "halo" effects). The aim of presenting the PSAES items in a comparative or forced-choice fashion to a separate sample was an attempt to avoid such biases. Results obtained using data from the absolute forced-choice version of the PSAES were discrepant from those obtained from the Likert of the PSAES. Drinker level and risk factors for AUDs were unrelated to proportion of pharmacological or social expectancies endorsed.

One possible reason for the major discrepancy in results between the Likert and forced-choice versions of the PSAES could be that ipsative measures have demonstrated more utility for evaluating traits *within* individuals, whereas Likert-type scales have been more useful in evaluating traits *across* individuals (Baron, 2011). In addition, the forced-

choice design is generally not recommended when measuring two factors with all positively-keyed items (Brown & Maydeu-Olivares, 2011), such as the measure developed in the current study. Furthermore, research indicates that results obtained from forced-choice designs are even less reliable when the two factors being measured are highly correlated (Brown & Maydeu-Olivares, 2011), as is the case in the current study. It is likely, therefore, that the poor results obtained from the forced-choice version of the PSAES do not reflect the limitations of the PSAES items themselves, but the limitations inherent in a forced-choice response style. Taken together, the results of the forced-choice format of the PSAES indicate that presenting the items in a comparative fashion is not a useful way of measuring rewarding pharmacological and social alcohol expectancies.

Limitations and Directions for Future Research

While the current study demonstrates a number of important strengths, the results should be considered in light of several methodological limitations. Despite strong evidence that supports the utility of self-report measures (Del Boca & Noll, 2000), it is important to acknowledge that the current study relied upon self-report data to develop and validate the proposed PSAES factor structure and may have been limited by participants' willingness to respond honestly. In addition, the current data were cross-sectional; in future research, it will be important to replicate the current findings by testing all outcomes of interest over time in a longitudinal sample to establish temporal precedence. Future studies could also investigate whether endorsing expecting more pharmacological effects from alcohol consumption might result in an accelerated and problematic drinking trajectory.

There were also some limitations inherent in the study sample. First, the sample was largely composed of white, female college students and results might vary with different participant characteristics. The PSAES was explicitly developed and validated in a sample of young adults ranging in age from 18 to 23. Given that alcohol consumption, alcohol-related problems, and the prevalence of alcohol use disorders peak during this developmental time period (Grant et al., 2004), understanding the alcohol expectancies and drinking behavior of individuals within this age range is particularly important. However, it is unclear to what extent the results would generalize to other age groups, which warrants future research in this area. Validating and using the PSAES in an adolescent sample with a larger percentage of individuals who have not yet initiated alcohol use would be highly beneficial, especially considering that alcohol expectancies develop prior to alcohol use and have been identified as contributing factors to drinking initiation. Future evaluation of the psychometric properties of the PSAES in this sample will help to answer the question of whether the proposed interpretation of PSAES scores in the current study generalize to younger drinkers.

Another remaining question for further research concerns what factors make higher sensation-seeking individuals endorse more positive pharmacological outcomes of alcohol consumption than their less sensation-seeking peers. One possibility is that sensation seekers use information about the consequences of alcohol selectively and are biased toward the positive messages from the media and from interactions with peers. An alternative possibility is that they are more sensitive to the effects of alcohol; therefore, continued use has a greater impact on the crystallization of their positive pharmacological expectancies.

Conclusions

In summary, the current study utilized psychometric methodology to separate positive pharmacological alcohol expectancies from positive social alcohol expectancies. Associations between expectancy patterns, drinking behavior, and risk variables related to the development of AUDs were examined to determine whether individuals who are already at elevated risk for AUDs anticipate more pharmacological effects from alcohol. Results suggest that drinker level is positively associated with anticipated rewarding social and pharmacological drinking outcomes and that sensation-seeking is positively associated with positive pharmacological alcohol expectancies. Moving forward, identifying the specific patterns of anticipated alcohol effects that result in accelerated and problematic drinking trajectories will be essential in informing the prevention and treatment of alcohol use disorders. It is hoped that the newly developed PSAES will serve as an impetus for future work in this direction by providing a reliable measure of the anticipated rewarding pharmacological effects of alcohol consumption.

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Appendices

Appendix 1: Sample Original PSAES

Instructions: The following pages contain statements describing possible effects of alcohol. Read each statement and decide whether it is an accurate statement about you. You will have five choices for each item: (1) Not at All Like me, (2) Not Much Like me, (3) Neutral, (4) Somewhat Like Me, (5) or Very Much Like Me. Remember to give your own opinion of yourself. Be sure to try and answer every statement. Even if you are unsure of your answer, try to choose the one that *best* describes you. There are no right or wrong answers. Answer each item quickly and according to your first impression.

Pharmacological Expectancy Items

1. If I drink alcohol, I feel more energized.
2. If I drink alcohol, I feel better physically.
3. If I drink alcohol, I feel giddy.
4. If I drink alcohol, I feel drunk.
5. If I drink alcohol, I feel more relaxed.
6. If I drink alcohol, I get a wonderful feeling.
7. If I drink alcohol, I am in a better mood.
8. If I drink alcohol, I feel warm and cozy.
9. If I drink alcohol, I feel more aroused/physiologically excited.
10. If I drink alcohol, I feel more carefree.
11. If I drink alcohol, I feel more intelligent.
12. If I drink alcohol, I feel horny.
13. If I drink alcohol, I get a more pleasurable experience.
14. If I drink alcohol, I feel blissful.
15. If I drink alcohol, I feel buzzed.

Social Expectancy Items

1. If I drink alcohol, people like me better.
2. If I drink alcohol, I look cooler to others.
3. If I drink alcohol, others see me as more important.
4. If I drink alcohol, I fit in better with a group I like.
5. If I drink alcohol, I am more accepted by friends.
6. If I drink alcohol, others think I am more fun.
7. If I drink alcohol, others find me more attractive.
8. If I drink alcohol, others see me as more social.
9. If I drink alcohol, others see me as more confident.
10. If I drink alcohol, others find me more interesting.
11. If I drink alcohol, it's easier to talk to others.
12. If I drink alcohol, it's easier to do what I want at a party.
13. If I drink alcohol, I have a better time at parties.
14. If I drink alcohol, others find me funnier.
15. If I drink alcohol, I'm more likely to have sex.

Appendix 2: Tables

Table A1

Assessment Schedule

	Phase I	Phase II	
Measure	Sample 1	Sample 2	Sample 3
Background/Demographics Form	X	X	X
FH-RDC Questions		X	X
PSAES (Original Likert Version)	X		
PSAES (Refined Likert Version)		X	
PSAES (Forced-Choice Version)			X
AEF		X	X
ZKPQ III		X	X

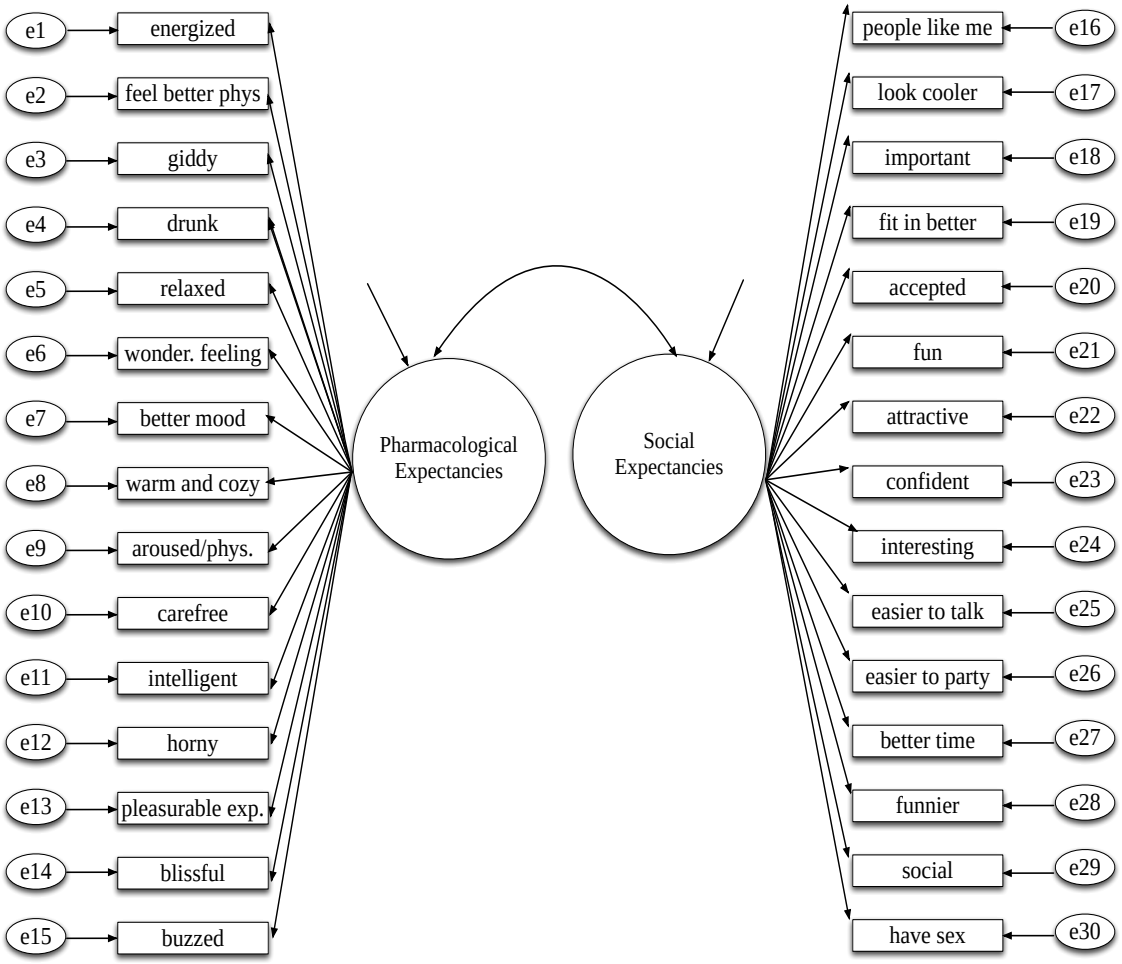

Figure A1. First-order measurement model of the original PSAES consisting of 30 items loading onto two correlated factors.

Table A2

List of Remaining 17 PSAES Items Following Model Respecification

Subscales	Items
Pharmacological Expectancies	I feel more energized
	I feel giddy
	I feel drunk
	I feel more relaxed
	I get a wonderful feeling
	I am in a better mood
	I feel warm and cozy
	I feel more aroused/physiologically excited
	I get a more pleasurable experience
	I feel blissful
Social Expectancies	I look cooler to others
	I fit in better with a group I like
	Others think I am more fun
	Others find me more attractive
	Others see me as more confident
	Others find me more interesting
	Others find me funnier

Table A3

Standardized Estimates and Their Standard Errors for the Item Factor Loadings from Phase I Confirmatory Factor Analysis of PSAES Items

Item	PE	SE
I feel more energized.	.78(.03)	
I look cooler to others.		.84(.02)
I feel giddy.	.85(.02)	
I feel drunk.	.65(.04)	
I fit in better with a group I like.		.86(.02)
I feel more relaxed.	.79(.03)	
I get a wonderful feeling.	.87(.02)	
Others think I am more fun.		.91(.02)
I am in a better mood.	.88(.02)	
Others find me more attractive.		.83(.02)
I feel warm and cozy.	.77(.03)	
Others see me as more confident.		.88(.02)
I feel more aroused/physiologically excited.	.80(.03)	
Others find me more interesting.		.93(.01)
I get a more pleasurable experience.	.89(.02)	
Others find me funnier.		.89(.02)
I feel blissful.	.85(.02)	

Note. PE = pharmacological expectancies; SE = social expectancies.

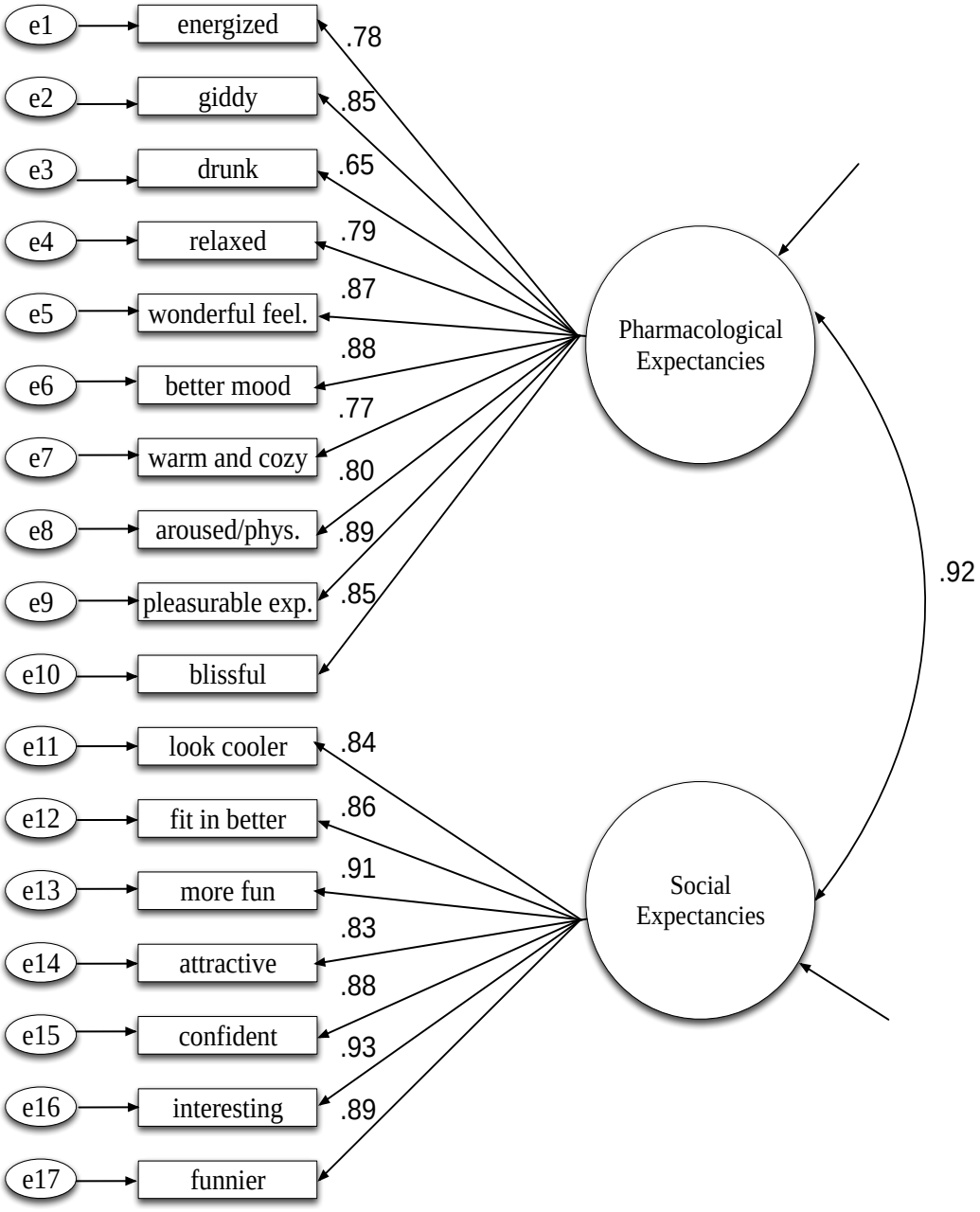

Figure A2. Phase I respecified measurement model of the PSAES consisting of 17 items loading onto two correlated factors. Factor loadings and the factor correlation are provided.

Table A4

Standardized Estimates and Their Standard Errors for the Item Factor Loadings from Phase II Confirmatory Factor Analysis of PSAES Items

Item	PE	SE
I feel more energized.	.80(.03)	
I look cooler to others.		.80(.03)
I feel giddy.	.77(.03)	
I feel drunk.	.53(.05)	
I fit in better with a group I like.		.81(.02)
I feel more relaxed.	.82(.03)	
I get a wonderful feeling.	.87(02)	
Others think I am more fun.		.90(.02)
I am in a better mood.	.89(.02)	
Others find me more attractive.		.79(.03)
I feel warm and cozy.	.76(.03)	
Others see me as more confident.		.85(.02)
I feel more aroused/physiologically excited.	.79(.03)	
Others find me more interesting.		.90(.02)
I get a more pleasurable experience.	.91(.02)	
Others find me funnier.		.90(.02)
I feel blissful.	.81(.03)	

Note. PE = pharmacological expectancies; SE = social expectancies.

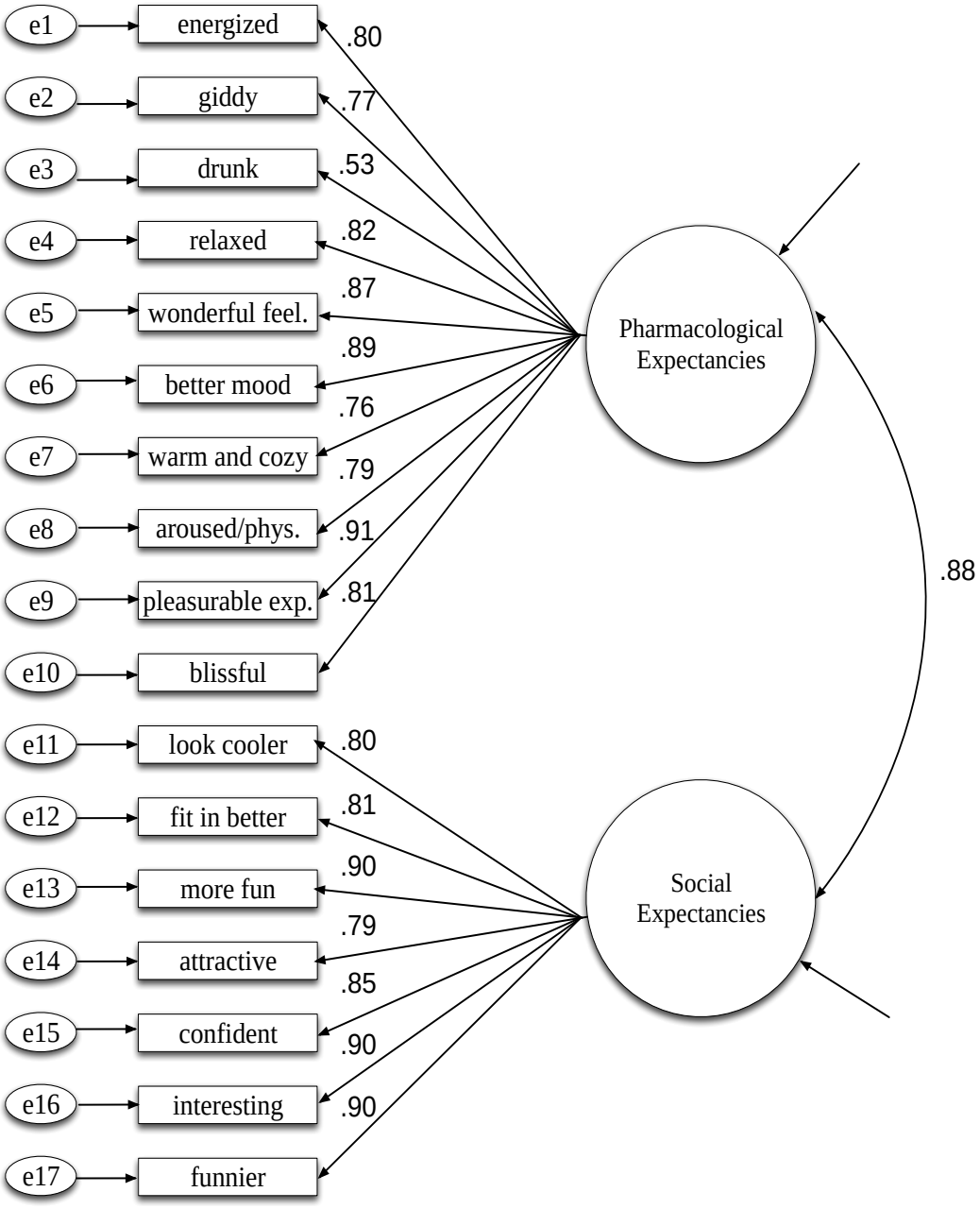

Figure A3. Phase II replication of the respecified measurement model of the PSAES consisting of 17 items loading onto two correlated factors. Factor loadings and the factor correlation are provided.

Table A5

Linear Regression Analysis of Social Expectancies (Measured with Likert Version of PSAES) and Drinker Level

	Unstandardized Coefficients		Standardized Coefficients	
Model	*B*	*SE (B)*	*β*	*t*
Constant regression	.09	.32		0.28
Social Expectancies	.15**	.02	.56	8.53**
F	72.72**			
R^2	.31			
Adj. R^2	.31			

Note. **$p < .01$.

Table A6

Linear Regression Analysis of Pharmacological Expectancies (Measured with Likert Version of PSAES) and Drinker Level

	Unstandardized Coefficients		Standardized Coefficients	
Model	*B*	*SE (B)*	*β*	*t*
Constant regression	-.90	.35		-2.61*
Pharmacological Expectancies	.12**	.01	.65	10.83**
F	117.20**			
R^2	.42			
Adj. R^2	.42			

Note. **$p < .01$. *$p < .05$.

Table A7

Hierarchical linear regressions predicting number of drinks per typical occasion

Step	*Model 1*	*B*	*SE*	*β*	*R*	R^2	ΔR^2
1	Enter: PSAES SE factor				.56	.31	.31**
2	Enter: PSAES PE factor				.65	.42	.11**
	PSAES SE factor	.02	.03	.09			
	PSAES PE factor	.11**	.02	.57			

Note. Beta weights are shown for all variables only at the final step of the hierarchical model. SE = Social Expectancies; PE = Pharmacological Expectancies.

**$p < .001$.

Table A8

Multiple Regression Analysis Predicting Self-Reported Pharmacological Expectancies Measured by the Likert Version of the PSAES

Variable	*M*	*SD*	Correlation with PE	Multiple Regression Weights	
				b	β
PE	29.43	10.01			
SS	6.09	3.11	.31**	.99**	.31
IMP	2.60	2.17	.17*	.01	.00
NA	8.30	4.62	.11	.19	.09
FH	0.13	0.34	.06	.85	.03
R^2					.11**
F					4.77**

Note. $N = 164$. PE = pharmacological expectancies. SS = sensation-seeking. IMP = impulsivity. NA = negative affectivity. FH = family history.
*$p < .05$. **$p < .01$.

Table A9

Correlations Between All Variables of Interest in Phase II, Sample 2

Variable	1	2	3	4
1. Impulsivity				
2. Sensation-Seeking	.44**			
3. Negative Affectivity	.33**	.05		
4. Pharmacological Expectancies	.17*	.31**	.11	
5. Social Expectancies	.16*	.19*	.11	.81**

Note. $^{**}p < .01$ $^{*}p < .05$

Table A10

Multiple Regression Analysis Predicting Self-Reported Social Expectancies Measured by the Likert Version of the PSAES

Variable	*M*	*SD*	Correlation with SE	Multiple Regression Weights	
				b	*β*
SE	17.30	7.02			
SS	6.09	3.11	.19**	.35	.15
IMP	2.60	2.17	.16*	.23	.07
NA	8.30	4.62	.11	.11	.07
FH	0.13	0.34	.08	1.30	.06
R^2					.05
F					2.28

Note. N = 164. PE = pharmacological expectancies. SS = sensation-seeking. IMP = impulsivity. NA = negative affectivity. FH = family history.

*$p < .05$. **$p < .01$.

Table A11

Linear Regression Analysis of Pharmacological Expectancies (Measured with Forced-Choice Version of PSAES) and Drinker Level

	Unstandardized Coefficients		Standardized Coefficients	
Model	*B*	*SE (B)*	*β*	*t*
Constant regression	2.23	.51		4.36**
Pharmacological Expectancies	.15	.25	.05	0.62
F	0.38			
R^2	.002			
Adj. R^2	.001			

Note. **$p < .01$. *$p < .05$.

Table A12

Multiple Regression Analysis Predicting Self-Reported Pharmacological Expectancies Measured by the Forced-Choice Version of the PSAES

Variable	*M*	*SD*	Correlation with PE	Multiple Regression Weights	
				b	β
PE	1.94	0.68			
SS	2.44	1.95	.36	.01	.03
IMP	5.90	3.03	.01	-.06	-.17
NA	9.54	4.66	.08	-.01	-.06
FH	0.15	0.36	.48	.00	.00
R^2					.04
F					1.42

Note. *N* = 161. PE = pharmacological expectancies. SS = sensation seeking. IMP = impulsivity. NA = negative affectivity. FH = family history.

*$p < .05$. **$p < .01$.

Table A13

Summary of Results of all Phase II Gender-Related Analyses

	Phase II, Sample 2	
Variable	**Females (*n* = 136)**	**Males (*n* = 28)**
Alcohol Quantity	2.58 (1.83)	2.93 (2.02)
Pharmacological Composite Score	29.52 (9.78)	28.93 (11.26)
Social Composite Score	16.98 (6.77)	18.86 (8.07)
ZKPQ Impulsivity	2.56 (2.14)	2.79 (2.33)
ZKPQ Sensation-Seeking	6.02 (3.11)	6.43 (3.12)
ZKPQ Neuroticism-Anxiety	8.66 (4.67)	6.50 (4.00)
	Phase II, Sample 3	
Variable	**Females (*n* = 136)**	**Males (*n* = 26)**
Alcohol Quantity	2.40 (2.00)	3.19 (2.76)
Pharmacological Proportion Score	1.96 (0.66)	1.84 (0.78)
ZKPQ Impulsivity	2.41 (1.96)	2.58 (1.90)
ZKPQ Sensation-Seeking	5.72 (3.07)	6.81 (2.65)
ZKPQ Neuroticism-Anxiety	9.57 (4.70)	9.35 (4.52)