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Abstract

Recent findings indicate that core symptoms of generalized anxiety disorder (GAD) are related to heavy drinking and that the GAD-alcohol relation may be moderated by alcohol expectancies. Additionally, this research highlighted a need to develop a measure specifically designed to assess worry-reduction alcohol expectancies. The present two-phase study focused on the development and validation of the Worry-Reduction Alcohol Expectancy Scale (WRAES). During Phase I, a pilot 45-item instrument was administered to 380 participants. Exploratory factor analyses suggested retention of two factors, which are summarized as worry-reduction alcohol expectancies related to daily living (12 items) and health/safety (8 items). The final 20-item scale developed during Phase I was administered to 324 Phase II participants for assessment of reliability, validity, and cross-validation of factor structure. Further, two-week test-retest reliability was examined with 87 Phase II participants. Results indicate the WRAES is a psychometrically sound instrument prepared for application. Results, application possibilities, and future directions are discussed.

To My Father

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Development and Validation of the Worry-Reduction Alcohol Expectancy Scale

Prior research has shown a high prevalence of co-occurring anxiety and alcohol problems in college and community samples (Kessler et al., 1997; Regier et al., 1990), although the etiology and underlying mechanisms involved are not well understood. Both cross-sectional and prospective studies indicate that the odds of having either an anxiety disorder or alcohol use disorder are two to five times more likely when the other condition is present (Kushner, Sher, & Erickson, 1999). Although the anxiety-alcohol relationship has proven robust, a weakness in earlier studies has been the tendency to lump anxiety disorders into a single category (Kushner, Sher, & Beitman, 1990). Investigating anxiety disorders collectively in this context may be misleading, because they will likely differ by nature and frequency in their connection with alcohol use disorders. Furthermore, research attention on specific anxiety disorder-alcohol associations has varied widely. Among the understudied relations is the connection between generalized anxiety disorder (GAD) and alcohol use. Recent findings indicate that core GAD symptoms (excessive worry and trait anxiety) are related to heavy drinking, and that the GAD-alcohol relation may be moderated by alcohol expectancies (Smith & Tran, 2002). Additionally, this research highlights a need to develop a measure specifically designed to assess worry-reduction alcohol expectancies. Such an instrument is expected to provide a better test than those currently available for the moderating and mediating effects of alcohol expectancies on the relation between heavy drinking and excessive worry, the cardinal feature of GAD.

Generalized Anxiety and Alcohol Use Disorders

GAD is characterized by excessive and uncontrollable worry, trait anxiety,

irritability, and physical symptoms such as muscle tension and fatigue, as specified in the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition (American Psychiatric Association, 1994). Research has indicated that between 8.3% - 56.2% of inpatient alcoholics, with a median prevalence of 22.9%, meet the criteria for GAD (Bowen, Cipywnyk, & Keegan, 1984; Ross, Glasser, & Germanson, 1988; Weiss & Rosenberg, 1985). However, while GAD has frequently been found in alcoholics in treatment, investigators have raised concerns regarding whether GAD presents an elevated risk for the development of problematic drinking (Kushner, Sher, & Beitman, 1990; Stein, 2001). Essentially, because symptoms of alcohol withdrawal mimic the GAD syndrome, it is difficult to parse GAD from alcohol withdrawal in an alcohol dependent individual undergoing detoxification. Thus, the apparent link between GAD and problem drinking may be an artifact of sampling from a pool of individuals experiencing anxiety from alcohol withdrawal. Additionally, research with anxiety patients has not consistently shown a positive association between GAD and alcohol use disorders (Thyer, Parrish, & Himle, 1986). Greeley and Oei (1997) noted, however, that the small number of studies directly examining this relationship "would lend caution to the interpretation" that this disorder is unlikely to coexist with alcohol abuse or dependence.

Nevertheless, some converging data indicate that the GAD-alcohol problem link may exist independent of the sampling confound created by investigating GAD in alcoholic inpatients. The lifetime prevalence rate for a substance use disorder is three times greater for individuals with GAD compared to the general population (Kessler et al., 1997). Also, in a longitudinal study rates of comorbid alcohol or substance abuse

diagnoses among patients with GAD increased from 4 % at intake to18% at 8-year follow-up (Bruce, Machan, Dyck, & Keller, 2001). Research with an epidemiological sample has further indicated that children with early symptoms of generalized anxiety disorder were at increased risk for initiation of alcohol use at 4-year follow-up (Kaplow, Curran, Angold, & Costello, 2001). Moreover, Smith and Tran (2002) found that GAD symptomology was related to heavy drinking in a sample of college students whose scores on an alcohol screening test suggest that they were experiencing low to moderate alcohol problems, and thus were unlikely to be experiencing anxiety from alcohol withdrawal. These investigators also found that the relationship between GAD symptoms and heavy drinking may be moderated by alcohol expectancies. According to Smith and Tran's (2002) study hypothesis, based on alcohol expectancy theory (Goldman, Brown, & Christiansen, 1987), whether an individual with GAD symptoms will drink heavily depends upon the expectations they have about the ability of alcohol to relieve these symptoms. However, despite finding a moderating effect of tension-reduction alcohol expectancies, no instrument existed by which to examine the role of alcohol expectancies for worry-reduction. The development of such an assessment tool is necessary to further explore the link between GAD and alcohol problems.

Related Measures of Alcohol Expectancies

To date, a variety of scales have been designed to assess one's beliefs about the effects of alcohol. However, among the available instruments, none directly assess worry-reduction alcohol expectancies in a systematic and comprehensive manner. Furthermore, extant scales that tap similar constructs, the Tension Reduction scale of the Alcohol Expectancy Questionnaire (TR-AEQ; Brown, Goldman, Inn, & Anderson, 1980), the

Alcohol Expectancies for Social Evaluative Situations (AESES; Bruch et al., 1992), and the Coping Motives scale of the Drinking Motives Questionnaire (CM-DMQ; Cooper, Russell, Skinner, & Windle, 1992), are each not suited for the measurement of worry-reduction alcohol expectancies.

The TR-AEQ is a 9-item scale designed to assess whether an individual agrees that a moderate level of alcohol consumption will provide relaxation and/or tension reduction. Although some items of this scale peripherally approximate worry-reduction alcohol expectancies (e.g. "If I am tense or anxious, having a few drinks makes me feel better"), other items are quite dissimilar to the construct (e.g. "If I am cold, having a few drinks will give me a sense of warmth").

The 10-item AESES measures expectations of social facilitation from alcohol consumption. The instrument's items are tangentially related to worry-reduction alcohol expectancies. Specifically, although some of the AESES' items are concerned with worry-reduction alcohol expectancies (e.g. "I don't worry as much about what people are thinking about me when I am drinking"), these items are based solely on situations in which one may interact socially with others.

Finally, the 5-item CM-DMQ measures how often an individual uses alcohol to relax and/or cope with negative emotional states. Despite the inclusion of an item directly concerned with drinking to relieve worry ("To forget your worries"), items in the CM-DMQ assess reasons people drink as opposed to expectations about the effects of alcohol. Though conceptually related, the assessment of drinking motives taps a more behavioral dimension than the measurement of alcohol expectancies, which is concerned solely with beliefs about the effects of alcohol. Additionally, while evaluation of both motives and

expectations yield explanations of current drinking behavior, only assessment of expectancies allows prediction of future drinking behavior when future behavior differs from current drinking.

In sum, the current instrument pool offers at best peripheral assessment of worry-reduction alcohol expectancies. Based upon the characteristics of this assessment void (lack of sufficient number and variety of items directly tapping worry-reduction alcohol expectancies), a targeted measure of sufficient length to capture the breadth and depth of this alcohol expectancy content domain is expected to address this gap.

Psychometrics in Scale Development

Regardless of the content of an instrument, researchers developing a measure must attend to the importance of psychometrics and evaluate the instrument's psychometric properties (Clark & Watson, 1995). Based upon classical test theory (Lord & Novick, 1968), two vital dimensions of a measure are its reliability and validity.

Reliability, in a psychometric context, refers to the extent that a measure leads to the same results regardless of opportunities for variations to occur (Nunnally, 1970). One commonly used method of assessing the reliability of an instrument is to investigate its internal consistency, which estimates reliability based on the average correlation among items within a test. Cronbach's (1951) coefficient alpha, split-half reliability, item-item correlations, and item-total correlations are useful indexes in this regard. Another method of illustrating a measure's reliability is to test a sample of subjects and retest them at a later point in time with the same instrument, referred to as test-retest reliability. Although variations in test-retest time intervals are necessary due to differences in measurement objectives, a two-week interval has been an accepted standard for most purposes. These

two methods of reliability estimation do not represent an exhaustive list; however, their application provides the researcher with valuable information regarding a measure's psychometric reliability.

Importantly, although a measure may be demonstrably reliable, having high reliability does not ensure validity. In a psychometric context, validity refers to "the scientific utility of a measuring instrument, broadly statable in terms of how well it measures what it purports to measure" (Nunnally, 1970, pg. 83). This psychometric dimension has been subdivided into types or modes of validity, including construct validity, face validity, content validity, convergent validity, and discriminant validity. Construct validity is conceptualized as the ability of an instrument to adequately measure an abstract theoretical construct. Notably, construct validity is demonstrated via each of the other types of validity; each of the other modes of validity jointly contributes to a measure's construct validity. Among the validity types endowing construct validity, a measure's face validity refers to the ostensive characteristics of the instrument, while content validity is the extent to which the content of the construct of interest has been adequately sampled. Further, convergent validity refers to the degree that an instrument correlates positively with measures of related constructs, while the extent to which an instrument correlates less well with non-related construct measures expresses an instrument's discriminant validity. Proper methodological assessment of validity should afford evidence of the veracity of results obtained through use of the instrument.

Current Study

The present document details the development and validation of the Worry-Reduction Alcohol Expectancy Scale (WRAES), which was constructed based on the

following criteria. First, the instrument should directly measure worry-reduction alcohol expectancies. Second, the instrument should cover a breadth of worry domains. This characteristic is essential in enabling the researcher to capture the variety of worry topics about which people may have expectancies for worry reduction via alcohol use. Third, the instrument should be psychometrically sound, as indexed by reliability and validity indicators. Fourth, the instrument should meet requirements for ease of use, including brevity and easy scoring. It is hoped that the addition of the WRAES to the alcohol and anxiety research fields will spark interest in the relation between worry and alcohol use and will facilitate further investigation of the connection between GAD and problem drinking.

Study 1

Method

Participants

Three hundred eighty undergraduate students (46.1% male, 53.9% female) participated in the first study (see Table 1). The sample ranged in age from 18 to 52 years (median = 19 years), was predominantly Caucasian (82.8%), unmarried (97.8%), and Freshman/Sophomore (80.6%). Participants were enrolled in introductory psychology courses at a public Midwestern university and received course credit for research participation. All participation was voluntary. Treatment of research participants followed the ethical guidelines of the American Psychological Association (2002).

Scale Construction

The construct definition for worry-reduction alcohol expectancies was generated via literature-based definitions of worry and alcohol outcome expectancies. Borkovec,

Robinson, Pruzinsky, and DePree (1983) conceptualized worry as "a chain of thoughts and images, negatively affect-laden and relatively uncontrollable; it represents an attempt to engage in mental problem-solving on an issue whose outcome is uncertain but contains the possibility of one or more negative outcomes". Alcohol outcome expectancies, alternatively, have been defined as "the beliefs that individuals hold about the effects of alcohol on their behavior, moods, and emotions" (Leigh & Stacy, 1991). Thus, worry-reduction alcohol expectancies are characterized as beliefs that individuals hold about the ability of alcohol to reduce or diminish negatively affect-laden, relatively uncontrollable chains of thoughts and images commonly referred to as worry.

The initial item pool for the pilot expectancy questionnaire was generated by research team members. The author devised a two-dimensional content criterion to guide the development of a representative collection of items after reviewing worry-related and alcohol expectancy-related measures and reviewing relevant literature (Brown, Goldman, Inn, & Anderson, 1980; Bruch et al., 1992; Constans, Barbee, Townsend, & Leffler, 2002; Diefenbach et al., 2001; Dupuy, Beaudoin, Rheaume, Ladouceur, & Dugas, 2001; Hoyer, Becker, & Roth, 2001; Leigh & Stacy, 1993; Meyer, Miller, Metzger, & Borkovec, 1990; Newman, Zuellig, Kachin, Constantino, & Cashman, 2002; Tallis, Eysenck, & Mathews, 1992). The two dimensions of this content criterion were created to uniquely address the questions "About what is the worry?" and "In what specific way is it expected that alcohol reduces worry?". The first dimension of the criterion was devoted to domains of worry and included the following: general, catastrophes, finances, health, minor hassles, safety, school/work, and social. Use of this dimension of the content criterion was intended to ensure that scale items adequately sampled typical areas of

worry. The second dimension of the criterion was devoted to the structural characteristics of worry, and included: frequency, intensity, duration, and discardability/controllability of worry (ease with which worry can be "let go"). Use of this dimension of the content criterion was intended to ensure that scale items adequately sampled different structural aspects of worry presence.

Using this content criterion, 45 items were generated by research team members to be included in the pilot expectancy questionnaire. A total of 10 items were produced for the 'general' worry domain, while 5 items were created for each of the seven other domains. Each item was written as a statement, such as "When I drink, my worries about my health are less intense," and each statement was rated on a 5-point Likert scale. The Likert scale's point values were as follows: 1 = *strongly disagree*, 2 = *agree*, 3 = *neither agree nor disagree*, 4 = *agree*, 5 = *strongly agree*. The 45 items developed for the pilot measure were placed in alternating sequence, based on worry domain, in the following order: general, school/work, safety, health, finances, social, minor hassles, general, and catastrophes.

Procedure

At the beginning of each study session, a research team member read aloud the study consent form and study instructions. After providing informed consent, participants completed the WRAES as part of a battery of measures in groups of 5 to 20 individuals.

Analysis of the Pilot Expectancy Measure

The 45 items of the pilot WRAES were initially analyzed with respect to means, standard deviations, skewness, and kurtosis. All of the items showed good distributional properties and were retained for further analyses. An exploratory principal components

analysis (PCA) was used to determine the underlying factor structure of the WRAES and select items for the final version of the measure. All analyses were performed using SPSS, version 11.5. Following the recommendations of Stevens (2000), this analysis first included performing an unrotated PCA. However, because it was determined that the unrotated PCA did not yield interpretable factors, the authors next conducted both an orthogonal (varimax) and oblique (oblimin) rotated PCA. An orthogonal rotation was selected over an oblique rotation, as it yielded a more clearly interpretable structure. Both the Kaiser criterion (1960) and Scree Test (Cattell, 1966) were used to index the number of factors to retain for the final WRAES. The Kaiser criterion indicates that only those components whose eigenvalues are greater than 1 should be retained. The Scree Test, alternatively, is a graphical method wherein the magnitude of each component's eigenvalues are plotted against their ordinal numbers. Due to the nature of factor analysis, component eigenvalues initially drop sharply before leveling. Upon viewing the line graph of the component eigenvalues, the recommendation is to retain all components in the sharp descent before the first one on the line where the eigenvalues level off. Items with loadings on retained factors with a value of .50 or greater were selected for further consideration.

Results

Use of the Kaiser criterion and Scree Test suggested retention of two factors. The resulting factor structure of the pilot expectancy measure is presented along with salient loadings above .50 in Table 2. All items loaded unambiguously on only one of the two uncorrelated factors. The two factor solutions are summarized as worry-reduction alcohol expectancies related to daily living (Factor 1) and health and safety (Factor 2). All items

loading on Factor 1 were from the general, school/work, and minor hassles domains. Factor 2, conversely, was composed of items from the health and safety domains. Collectively both factors accounted for 60% of the variance; Factor 1 and Factor 2 accounted for 55.15% and 4.55%, respectively, of the variance.

Although 18 of the initial pool of 45 items loaded >.50 on Factor 1, only the highest 12 loadings were selected for inclusion in the final measure to ensure brevity. This resulted in 4 items from each contributing domain (general, school/work, minor hassles) selected for final inclusion. Furthermore, one item that loaded >.50 on Factor 2 (item 40) was discarded due to redundancy with other items, resulting in 4 items from each contributing domain (health, safety) selected for final inclusion. In total, 20 items (12 items loading >.50 on Factor 1, 8 items loading >.50 on Factor 2) were selected for inclusion in the final measure.

Study 2

Method

Participants

Three hundred twenty-four undergraduate students (31.6% male, 68.4% female) participated in the second study (see Table 3). The median age of the sample was 19 years, with a range of 18 to 45 years. The sample was predominantly Caucasian (80.7%), unmarried (96.3%) and Freshman/Sophomore (80.7%). Of these, 91 undergraduates (26.4% male, 73.6% female) returned 11 to 17 days ($M = 15.1$, $SD = 1.44$) later to provide two-week retest data. Participants were volunteers enrolled in introductory psychology courses at a public Midwestern university and received course credit for research participation. Treatment of research participants followed the ethical guidelines

of the American Psychological Association (2002).

Procedure

Research team members acquainted participants with the study consent form and study instructions by reading them aloud prior to participation. After signing the study consent form, participants completed a battery of measures in groups of 5 to 20 individuals. The battery of measures included the final WRAES measure, composed of items selected for final inclusion in Study 1. Additional measures in the assessment battery were included to assess the WRAES' convergent and discriminant validity, respectively.

Measures

Measures similar and dissimilar to the WRAES were selected from three instrument pools that were chosen to provide a broad test of convergent and discriminant validity. Specifically, instruments were selected from pools of alcohol expectancy measures, drinking motives scales, and scales measuring situation-specific drinking. Within each of these three instrument pools, measures were chosen to investigate the convergent and discriminant validity of the WRAES.

Alcohol Expectancies. Among extant alcohol expectancy measures, the Tension Reduction scale of the Alcohol Expectancy Questionnaire (TR-AEQ; Brown, Goldman, Inn, & Anderson, 1980) and the Alcohol Expectancies for Social Evaluative Situations (AESES; Bruch et al., 1992) were chosen to examine the WRAES' convergent validity. In contrast, the Physical and Social Pleasure scale of the Alcohol Expectancy Questionnaire (PSP-AEQ; Brown, Goldman, Inn, & Anderson, 1980) and the Expectancies of Cognitive and Behavioral Impairment compiled from two subscales of

the Expectancy Questionnaire (CBI-EQ; Leigh & Stacy, 1993) were selected to test the WRAES' discriminant validity.

The 9-item TR-AEQ measures beliefs that alcohol enhances relaxation and reduces stress (e.g. "If I am tense or nervous, having a few drinks makes me feel better"). This scale is widely used, and has demonstrated adequate internal consistency and an 8-week test-retest reliability coefficient of .65 (Brown, 1984; Brown, Christiansen, & Goldman, 1987). The TR-AEQ has discriminated between problem and non-problem drinkers in college students and adult male alcoholics, and was predictive of alcoholic relapse after inpatient treatment (Brown, 1985a; Brown, 1985b). However, there is also some evidence that suggests that TR-AEQ scores were not predictive of drinking behavior in an undergraduate sample (Corcoran and Parker, 1991).

The 10-item AESES measures expectations of social anxiety reduction from alcohol consumption in interactional and performance situations (e.g. "I don't worry as much about what people are thinking about me when I am drinking"). The AESES has evidenced high internal consistency (coefficient alpha = .84-.89), a high correlation with Cooper, Russell, & George's (1988) short form of the AEQ (.86 for women and .79 for men), and a moderate correlation (.38) with alcohol use (Bruch et al., 1992). In addition, the scale had a 4-week test-retest reliability coefficient of .79 (Tran, Haaga, & Chambless, 1997).

The 9-item PSP-AEQ measures beliefs that alcohol increases enjoyment of social events and is sensually appealing (e.g. "Having a few drinks is a nice way to celebrate special occasions", "Some alcohol has a pleasant, cleaning, tingly taste"). Research has suggested that the PSP-AEQ is the strongest measure of positive alcohol expectancies

among the AEQ's subscales (Corcoran, 1997). This scale has demonstrated adequate internal consistency and an 8-week test-retest reliability coefficient of .64 (Brown, 1984; Brown, Christiansen, & Goldman, 1987). Also, the PSP-AEQ predicted alcoholic beverage selection in both a dating situation and when no information was available to others regarding drink selection (Corcoran, 1997; Corcoran & Segrist, 1993). The 8-item CBI-EQ reflects beliefs that alcohol consumption results in cognitive and behavioral impairment (e.g. "When I drink alcohol I get mean"). Both subscales from the EQ that comprise the CBI-EQ (Social and Cognitive/Performance) were adequate with respect to internal consistency (coefficient alpha = .82 for each) and have demonstrated high 1-week test-retest reliability (.87) and moderate correlations with alcohol use (Leigh & Stacy, 1993).

Drinking Motives. From the existing pool of drinking motives scales, the 5-item Coping Motives scale of the Drinking Motives Questionnaire (CM-DMQ; Cooper, Russell, Skinner, & Windle, 1992) was selected to evaluate the WRAES' convergent validity, while the 5-item Social Motives scale of the Drinking Motives Questionnaire (SM-DMQ; Cooper, Russell, Skinner, & Windle, 1992) was selected to examine the WRAES' discriminant validity. The CM-DMQ measures how frequently an individual drinks to relax and/or cope with negative mood (e.g. "To cheer you up when you're in a bad mood"). This instrument has exhibited high split-half reliability (r = .85) and a statistically significant mean inter-item correlation of .51 (Stewart, Zeitlin, & Samoluk, 1996). The SM-DMQ, alternatively, assesses how often an individual drinks to enhance social activities (e.g. "Because it makes a social gathering more enjoyable"). The SM-DMQ has shown adequate split-half reliability (r = .66) and a statistically significant

mean inter-item correlation of .31 (Stewart, Zeitlin, & Samoluk, 1996). Both scales of the DMQ were found to predict distinct patterns of alcohol use behavior and alcohol abuse symptoms (Cooper, Russell, Skinner, & Windle, 1992).

Situation-Specific Drinking. Among the available scales measuring situation-specific drinking, the 4-item Unpleasant Emotions scale of the 42-item version of the Inventory of Drinking Situations (UE-IDS-42; Annis, Graham, & Davis, 1987) was chosen to test the WRAES' convergent validity, while the 4-item Pleasant Emotions scale of the IDS-42 (PE-IDS-42; Annis, Graham, & Davis, 1987) was included to investigate the WRAES' discriminant validity. The UE-IDS-42 measures frequency of heavy drinking in situations characterized by negative personal states (e.g. "When I was afraid that things weren't going to work out"). This scale has exhibited a coefficient alpha of .87 and has demonstrated adequate validity through significant and positive correlations with relevant drinking variables (Annis, Graham, & Davis, 1987). In contrast to the UE-IDS-42, the PE-IDS-42 assesses frequency of heavy drinking in situations involving positive mood states (e.g. "When everything was going well"). The PE-IDS-42 has demonstrated a coefficient alpha of .87, and consistent with its counterpart, has shown desirable validity indices through a pattern of significant correlations with relevant drinking variables (Annis, Graham, & Davis, 1987).

Analysis of the WRAES

To investigate the reliability of the WRAES, internal consistency and test-retest coefficients were examined. To determine internal consistency, Cronbach's alpha, split-half reliability, item-total correlations, and mean item-item correlations were calculated. Two-week test-retest reliability was determined using Pearson's *r* to correlate Time 1

responses with Time 2 responses, both showing normal data distributions. Notably, when Time 1-Time 2 difference scores were transformed to a z-scale, four of the 91 test-retest participants showed difference z-scores greater than 3. These outliers were subsequently eliminated, resulting in 87 participants in the test-retest analysis. Pearson's *r* and Spearman's *rho* were used to assess convergent and discriminant validity, by correlating WRAES responses with responses to similar and dissimilar measures, respectively. To examine whether the WRAES' correlations with convergent measures were significantly higher than its correlations with discriminant measures, Meng, Rosenthal, and Rubin's (1992) method for comparing correlation coefficients with one-tailed *Z* (normal curve) tests was utilized.

A confirmatory factor analysis (CFA) was performed to examine the underlying factor structure of the WRAES generated in Study 1. To avoid confirmation bias and further test the adequacy of the factor model that emerged from the exploratory analysis in Study 1, several alternative measurement models representing different characterizations of the factor structure of the WRAES were evaluated to determine which model best describes the data (see Figures 1-3). The following four models were compared: (a) No latent factors underlie the WRAES and all items are completely independent (Model 0-Null model); (b) Two independent latent factors underlie the WRAES, the Daily Living and Health/ Safety subscales that emerged from Study 1 (Model 1- Two uncorrelated factors model); (c) Two non-independent latent factors underlie the WRAES, the Daily Living and Health/ Safety subscales that emerged from Study 1 (Model 2- Two correlated factors model); (d) One factor underlies the WRAES

(Model 3- One-factor model). The two uncorrelated factors model (Model 1) represents the results of Study 1.

All CFA procedures were conducted with AMOS 4.0. For all models examined each observed variable was constrained to load on only one hypothesized factor. Additionally, scaling metrics were fixed by setting all factor variances equal to 1.00, error terms were uncorrelated, and the latent factor covariances were estimated. The CFA was conducted with the entire sample of Phase II participants (n = 324).

To investigate model fit, the chi-square goodness-of-fit test, the Normed Fit Index (NFI; Bentler & Bonnett, 1980), the Comparative Fit Index (CFI; Bentler, 1990), and the Root-Mean-Square Error of Approximation index (RMSEA; Steiger & Lind, 1980) were employed. The chi-square test is likely the most frequently used measure of overall model fit, wherein a good-fitting model will produce a non-significant chi-square value. Joreskog and Sorbom (1993) noted, however, that for a large enough value of n, even trivial differences will be found significant when using the chi-square test. Both the NFI and CFI range in value from 0 to 1, with values approximating 1 indicating a model with good fit. NFI and CFI values <.90, however, suggest that the model can be improved (Bentler, 1990; Bentler & Bonnett, 1980). The RMSEA assesses how well the proposed model, with optimally chosen parameter values, fits the population covariance matrix were it available (Browne & Cudeck, 1993). Values of the RMSEA less than .05 indicate a good fit, and values reaching .08 indicate reasonable errors of approximation in the population (Browne & Cudeck, 1993). MacCallum et al. (1996) further elaborated on RMSEA cutpoints and suggested that values ranging from .08 to .10 indicate a mediocre fit while values in excess of .10 signify a poor fit.

Results

Participants' responses to the WRAES were approximately normally distributed. Total scores ranged from 20 to 99, with a mean of 62.29 (SD = 15.92). As with the WRAES' distribution, the respective distributions for the Tension Reduction scale of the Alcohol Expectancy Questionnaire (TR-AEQ), the Alcohol Expectancies for Social Evaluative Situations (AESES), the Expectancies of Cognitive and Behavioral Impairment compiled from the Expectancy Questionnaire (CBI-EQ), and the Social Motives scale of the Drinking Motives Questionnaire (SM-DMQ) were each approximately normally distributed. According to Fidell and Tabachnick (2003), the criterion for normality is met when skewness values lie between -2 and 2 and kurtosis values lie between -4 and 4. All calculated values were within the acceptable range. However, the distributions for the Physical and Social Pleasure scale of the AEQ (PSP-AEQ), the Coping Motives scale of the DMQ (CM-DMQ), and both the Pleasant Emotions and Unpleasant Emotions scales of the Inventory of Drinking Situations, 42-item version (PE-IDS-42; UE-IDS-42) did not approximate normality. Pearson's *r* was used when both measures in a bivariate correlation approximated normality, while Spearman's *rho* was utilized when one or both measures in a bivariate correlation did not have normal distribution(s). Means, medians and standard deviations of Study 2 measures are listed in Table 4.

Internal Consistency and Test-Retest Reliability

Internal consistency of the WRAES in terms of Cronbach's alpha was very high, coefficient alpha = .96. Split-half reliability was also high, $r = .91$, with the corrected

Spearman-Brown equal-length estimate for split-half reliability = .95. Item-total correlations among WRAES items were all statistically significant (*r*s = .60 - .83, *p*s < .001). Inter-item correlations among WRAES items ranged from .22 -.85, with a statistically significant mean inter-item correlation ($r = .54, p < .001$). Two-week test-retest reliability was acceptable, $r = .75$ ($p < .001$).

The internal consistency of the two WRAES subscales, Daily Hassles (DH) and Health/ Safety (HS) was also high. Cronbach's alpha was very high for both scales, as coefficient alphas for DH and HS were .96 and .93, respectively. Split-half reliability for the 12-item DH scale was high at .89, with a Spearman-Brown corrected reliability estimate of .94. For the 8-item HS scale, the split-half reliability was .85, while the Spearman-Brown estimate = .92. Item-total correlations were also high for the DH scale (*r*s = .77 - .89, *p*s < .001) and the HS scale (*r*s = .65 -.87, *p*s < .001). Inter-item correlations among items comprising the DH scale ranged from .51 - .85, while the HS scale's inter-item correlations ranged from .39 - .83. The mean inter-item correlations for both the DH scale ($r = .67, p < .001$) and HS scale ($r = .61, p < .001$) were statistically significant.

Convergent and Discriminant Validity

Correlations between the WRAES and the convergent and discriminant measures are listed in Table 5. In each case, the WRAES is more highly correlated with convergent measures than with their discriminant counterparts. Among alcohol expectancy measures, the WRAES is more highly correlated with convergent scales measuring tension reduction (TRS-AEQ; $r = .53$) and expectancies of social facilitation (AESES; $r = .51$)

than with discriminant comparator measures assessing physical and social pleasure (PSP-AEQ; $r = .48$) and expectancies of cognitive and behavioral impairment (CBI-EQ; $r = .31$), respectively. The WRAES is also more highly correlated with the convergent drinking motives scale assessing drinking to cope with negative mood (CM-DMQ; $r = .52$) than with the discriminant comparison scale in this category quantifying drinking to enhance social activities (SM-DMQ; $r = .37$). Among drinking situations scales, the WRAES is more highly correlated with the convergent measure assessing heavy drinking in negative affect situations (UE-IDS-42; $r = .36$) than with its discriminant counterpart measuring heavy drinking when in positive mood states (PE-IDS-42; $r = .30$). This pattern of results is consistent with study hypotheses and is reflected in the statistically significant difference between the mean convergent and discriminant correlations ($p < .05$, one-tailed). However, of the individual comparisons, only the contrasts between the AESES and CBI-EQ ($p < .001$, one-tailed) and between the CM-DMQ and SM-DMQ ($p < .001$, one-tailed) were statistically significant.

Confirmatory Factor Analysis

Results from CFA indicate that Model 2 provides the best fit to the data when compared to Models 0, 1, and 3 (see Table 6). The correlation between the two latent factors was .662. Additionally, Model 2 provides an acceptably good fit to the data, as indicated by relatively large NFI (.853) and CFI (.876). However, the NFI, CFI, and RMSEA (.116) all suggest that although Model 2 provides a relatively better fit to the data than Model 0, 1, or 3, the fit can still be improved.

Modification indices (MI) for Model 2 indicate misspecification based on two MI values substantially larger than the rest. Specifically, these MI values are associated with

the pairing of items 4 and 9 (55.11) and items 16 and 17 (151.33), and represent misspecified error covariances. Aish and Joreskog (1990) reported that measurement error covariances represent systematic, non-random measurement error in item responses and that these covariant errors may reflect item characteristics such as a high degree of overlap in item content. Additionally, modification indices suggested that item 14 loads dually on both latent factors. Based on these MI indices, items 4 and 16 were dropped in sequential steps based on item overlap, and item 14 was next dropped because dual loading could not be accommodated theoretically. After performing these sequential modifications, the resulting model (Model 4- Modified two correlated factors model; see Figure 4) provided an improved fit compared to Model 2 according to relatively low RMSEA (.097) and high NFI (.905) and CFI (.926) values (see Table 6) which suggest a good fit to the data.

Gender Differences

There were no significant differences between men and women on their WRAES scores. Overall mean scores for men and women were 63.61 (SD = 15.52) and 61.67 (SD = 16.13), respectively, and results from a t-test were non-significant ($p = .31$). Results from a t-test comparing mean scores for men ($M = 40.08$) and women ($M = 39.63$) on the Daily Hassles subscale also revealed no significant difference ($p = .72$). However, t-test results between men ($M = 23.52$) and women ($M = 22.03$) on the Health/ Safety subscale approached significance ($p = .07$). There were negligible differences between the sexes on reliability estimates and convergent and discriminant correlation patterns. With respect to examining model invariance across gender groups with CFA, splitting the sample by gender yielded too few men ($n = 102$) to permit testing based on Comrey and

Lee's (1992) rating scale for adequate sample sizes in factor analysis which identified an *N* of 100 as 'poor'.

Discussion

Converging evidence indicates that generalized anxiety disorder (GAD) is related to heavy drinking (Kessler et al., 1997; Bruce, Machan, Dyck, & Keller, 2001; Kaplow, Curran, Angold, & Costello, 2001; Smith & Tran, 2002). However, recent research by Smith and Tran (2002) indicated the necessity of developing a targeted measure of worry-reduction alcohol expectancies to fully examine the GAD-heavy drinking association. The goal of the present study was to develop and validate a direct measure of worry-reduction alcohol expectancies that covers a breadth of worry domains, is psychometrically sound, and is easy to use by virtue of its brevity and simplicity of scoring. The development of the 20-item Worry-Reduction Alcohol Expectancy Scale (WRAES) during Study 1 and the psychometric evaluation of the WRAES during Study 2 fulfills these objectives.

In Study 1, the Pilot WRAES was pared from 45 initial items to the final 20-item measure based on the results of an exploratory principal components analysis (PCA). Two factors with a good simple structure emerged from the exploratory analysis, the 12-item Daily Hassles and 8-item Health/ Safety subscales. In Study 2, the reliability and validity of the WRAES was examined through indices of internal consistency, test-retest reliability, correlations with convergent and discriminant measures, and a confirmatory factor analysis (CFA). Results of these studies indicate that the WRAES is a psychometrically sound, valid measure of worry-reduction alcohol expectancies.

The reliability indicators used in this study each indicated that the WRAES is a reliable instrument. The internal consistency of the instrument and its subscales considered individually was very high, as indicated from Cronbach's alpha and split-half reliability indexes. Moreover, the mean inter-item correlations and item-total correlations were moderate to high for the WRAES and its subscales. The adequate two-week test-retest reliability coefficient provided further demonstration of the reliability of the WRAES. However, the very high Cronbach's alpha coefficients suggest that the WRAES may be saturated with similar items and may benefit from further item reduction.

Based on its correlations with convergent and discriminant measures, the WRAES also demonstrated good construct validity. Notably, the WRAES fared well in a rigorous, broad examination of convergent and discriminant validity using domains of measures that were chosen based on degree of similarity with the measure. Specifically, convergent and discriminant measures were selected from the domains of alcohol expectancy measures, drinking motives scales, and scales assessing situation-specific drinking. When compared, each of the correlations between the WRAES and convergent measures were higher than those found between the WRAES and their respective discriminant counterparts. However, when compared using a *Z* test for the significance of the difference between the convergent and discriminant correlations, only two of the four differences were statistically significant. In particular, only the differences between a pair of alcohol expectancy measures (a measure of social anxiety-reduction alcohol expectancies compared with a measure of expectancies of cognitive and behavioral impairment) and between drinking motives measures (a coping motives scale compared with social motives measure) were statistically significant. Reflecting the overall pattern

of results, however, the difference between the mean convergent correlation coefficient and mean discriminant correlation coefficient was statistically significant. These supportive results are notable in light of the stringent statistical tests used to compare convergent and discriminant correlations, moving beyond the usual standard for validity testing.

Despite the otherwise positive results, the factor structure of the WRAES which emerged from the exploratory sample was not the best fit to the data from the confirmatory sample when compared to alternative models. In particular, while an exploratory PCA yielded a two uncorrelated factors structure, a CFA performed with a cross-validation sample indicated that a two correlated factors structure best fit the data. The CFA result is reasonable, however, as results from several studies indicate the relatively high degree of association among topically different alcohol expectancy domains (Leigh, 1989; Leigh & Stacy, 1991). Thus, finding that the uncorrelated factors that emerged from the exploratory EFA were correlated in a cross-validation sample was not surprising. Of note regarding the CFA is that although the two correlated factors model best fits the data from the cross-validation sample, the goodness-of-fit indices suggest that the fit can be somewhat improved. Toward this end, modification indices were examined to determine which, if any, changes to the WRAES may be beneficial. When examining the modification indices, it was determined that the elimination of three questions improved the fit of the two correlated factors model. With these items removed, the goodness-of-fit statistics indicated that the modified model was a good fit to the data. Notably, the suggested modification of removing items coincided with the item reduction suggested by the very high Cronbach's alpha coefficients. Nevertheless, Byrne (2001)

noted that performing post hoc analyses to improve the fit of the model mark an end to confirmatory analyses and the beginning of additional exploratory model-fitting. Specifically, although the deletion of three items from the two correlated factors model resulted in a better fit to the data, these results must be treated tenuously.

There were some limitations to the current study. First, both the exploratory and confirmatory samples were composed entirely of college students. Although the college population is relatively diverse, generalization of these results to other groups or populations remains to be tested through empirical validation. Second, due to small numbers of non-Caucasians, separate analyses for non-Caucasian racial/ ethnic groups were not statistically justifiable. As a result, generalizations to groups outside the Caucasian population are not yet warranted. Third, the relatively few men in Study 2 prevented testing of model invariance across gender groups. Although mean differences between men and women on the WRAES and its subscales were not statistically significant, and differences in reliability estimates and patterns of convergent-discriminant correlations were negligible, separate examination by gender of the WRAES' factor structure was not performed. Another limitation of the current study is that all measures selected to examine convergent and discriminant validity were relatively similar, as evidenced by generally moderate correlation coefficients between the WRAES and these measures. However, the instruments that were selected were intended to provide a stringent test of convergent and discriminant validity that would provide support for the uniqueness of worry-reduction alcohol expectancies within their general domain.

Further investigations are needed to examine the psychometric properties of the

WRAES across different groups, because the scale must be viable in these populations to better study the relationship between GAD and alcohol use. Specifically, research designed to examine the WRAES in other university samples, community samples, clinical samples, and across racial/ ethnic groups is necessary for further validation. Additional evidence of the instrument's validity could be obtained through inspection of its predictive validity in longitudinal samples. Future research is also necessary to investigate the clinical utility of the WRAES. Specifically, studies designed to test the ability of the instrument to identify worriers at risk for the development of drinking problems and to inspect the scale's sensitivity to treatment outcome would enhance the examination of the measure's qualities.

Regarding the application possibilities of the WRAES, the measure is well-suited to advance the research on the link between GAD and heavy drinking. In particular, the instrument provides a tool to examine the moderating and mediating effects of worry-reduction alcohol expectancies on this relationship. Testing these effects would elucidate the nature of the GAD-heavy drinking connection and inform the development of a model describing this association. Also, pending empirical demonstration of the scale's clinical utility, the measure could be utilized to determine which GAD-diagnosed individuals are likely to develop problematic drinking behaviors and assess treatment outcome of individuals dually-diagnosed with GAD and alcohol abuse or dependence.

In conclusion, the results of this study suggest that the WRAES is a reliable and valid instrument for examining worry-reduction alcohol expectancies. Psychometric research is needed in additional populations, however, to evaluate the instrument's utility in these groups. In addition, follow-up studies investigating the suggested modifications

of the WRAES' factor structure from Study 2 should generate a better fitting model. The potential application of the WRAES in identifying worriers at risk for development of problematic drinking and in assessing treatment outcome also warrants attention. Finally, research on the link between worry and heavy drinking should be facilitated with the introduction of the WRAES to the domain of alcohol expectancy measures.

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Table 1

Study 1 Sample Demographic Characteristics

N	380
Age Range (Median)	18 - 52 (19)
Sex	
Male	46.1%
Female	53.9%
Race/ Ethnicity	
Caucasian	82.8%
African-American	10.1%
Asian-American	2.4%
Hispanic	2.4%
Other	2.3%
Marital Status	
Single/ Never Married	97.8%
Married	1.3%
Divorced	0.9%
Academic Status	
Freshman	51.8%
Sophomore	28.8%
Junior	13.7%
Senior	5.4%
Non-Degree	0.3%

Table 2

Factor Structure of the Pilot Expectancy Measure[a]

	Two-factor solution[b]	
Item	I	II
43. When I drink, I worry less about little things[c]	.721	
2. Drinking helps me stop worrying about school/work for a while[c]	.719	
11. When I drink, it is easier to "let go" of my worries about school/work[c]	.710	
35. Drinking makes my worries less overwhelming[c]	.704	
1. When I drink, it is easier to "let go" of my worries[c]	.703	
7. When I drink, it is easier to "let go" of my worries about minor hassles[c]	.701	
16. When I drink, my worries about all the little things I have to do are less intense[c]	.699	
20. Alcohol helps reduce the intensity of my worries about school/work[c]	.692	
38. When I have had a stressful day at school/work, alcohol helps me to worry about it less[c]	.690	
34. When I drink, my worrying about minor hassles is less intense[c]	.685	
37. When I have had a stressful day, alcohol helps me to stop worrying[c]	.669	
19. Drinking helps me to worry less[c]	.658	
25. Drinking helps me worry less about everything I need to get done	.633	
44. Drinking gives me relief from worry	.607	
8. When I drink, I feel like I can escape from my worries	.584	
10. Alcohol helps reduce the intensity of my worries	.571	
28. Alcohol helps me forget my worries	.552	
17. When it is hard to quit worrying, alcohol helps me to stop	.529	
39. Drinking helps me to worry less about my safety concerns[c]		.674
30. When I drink alcohol, it is easier to "let go" of my worries about safety[c]		.666
13. My worries about my health are less intense when I drink[c]		.663
22. When I drink alcohol, it is easier to "let go" of my worries about health[c]		.646
4. I don't worry about my health as much when I drink[c]		.642
21. My worries about safety are less intense when I drink[c]		.640
31. My worries about the health of my family and friends are less intense when I drink[c]		.628
40. Alcohol helps me to worry less about the health of my family and friends		.577
12. Alcohol helps me cope with the worries I have about the safety of my family and friends[c]		.532
Eigenvalue	24.815	2.047

[a]Only salient loadings above .50 are reported

[b]Two-factor orthogonal solution

[c]Item selected for inclusion in the final measure

Table 3

Study 2 Sample Demographic Characteristics

N	324
Age Range (Median)	18 - 45 (19)
Sex	
Male	31.6%
Female	68.4%
Race/ Ethnicity	
Caucasian	80.7%
African-American	15.8%
Asian-American	0.6%
Hispanic	0.9%
Other	2.0%
Marital Status	
Single/ Never Married	96.3%
Married	2.5%
Divorced	1.2%
Academic Status	
Freshman	55.8%
Sophomore	24.9%
Junior	14.6%
Senior	3.7%
Non-Degree	1.0%

Table 4

Study 2 Measures

	Mean (SD)	Median
Worry-Reduction Alcohol Expectancy Scale	62.29 (15.92)	63
Convergent Measures		
Tension Reduction scale-Alcohol Expectancy Questionnaire	5.08 (2.56)	5
Alcohol Expectancies for Social Evaluative Situations	29.96 (11.48)	30
Coping Motives scale-Drinking Motives Questionnaire	9.01 (3.68)	8
Unpleasant Emotions scale-Inventory of Drinking Situations-42-item version	11.21 (18.48)	.00
Discriminant Measures		
Physical and Social Pleasure scale-Alcohol Expectancy Questionnaire	6.42 (2.33)	7
Expectancies of Cognitive and Behavioral Impairment- Expectancy Questionnaire	24.60 (7.21)	25
Social Motives scale-Drinking Motives Questionnaire	12.01 (3.86)	12
Pleasant Emotions scale-Inventory of Drinking Situations-42-item version	31.39 (27.24)	25

Table 5

Convergent and Discriminant Validity

	Convergent		Discriminant		*Z*
Alcohol Expectancy	TR-AEQ	.53	PSP-AEQ	.48	1.21
	AESES	.51	CBI-EQ	.31	3.63**
Drinking Motives	CM-DMQ	.52	SM-DMQ	.37	3.43**
Drinking Situations	UE-IDS-42	.36	PE-IDS-42	.30	1.03
Composite Mean	Convergent Mean	.48	Discriminant Mean	.37	2.03*

Notes: TR-AEQ = Tension Reduction scale-Alcohol Expectancy Questionnaire; AESES = Alchol Expectancies for Social Evaluative Situations; CM-DMQ = Coping Motives scale-Drinking Motives Questionnaire; UE-IDS-42 = Unpleasant Emotions scale-Inventory of Drinking Situations-42-item version; PSP-AEQ = Physical and Social Pleasure scale-Alcohol Expectancy Questionnaire; CBI-EQ = Expectancies of Cognitive and Behavioral Impairment-Expectancy Questionnaire; SM-DMQ = Social Motives scale-Drinking Motives Questionnaire; PE-IDS-42 = Pleasant Emotions scale-Inventory of Drinking Situations-42-item version. $^{*}p < .05$, $^{**}p \leq .001$

Table 6

Summary of Goodness-of-Fit Indices

Model	Chi-Square	Df	NFI	CFI	RMSEA
Model 0	6126.09	190	.000	.000	.311
Model 1	1064.43	170	.826	.849	.128
Model 2	902.33	169	.853	.876	.116
Model 3	1811.77	170	.704	.723	.173
Model 4	480.04	118	.905	.926	.097

Notes: Model 0 = Independence Model; Model 1 = Two Uncorrelated Factors Model; Model 2 = Two Correlated Factors Model; Model 3 = One Factor Model; Model 4 = Modified Two Correlated Factors Model. NFI = Normed Fit Index; CFI = Comparative Fit Index; RMSEA = Root-Mean Square Error of Approximation

Figure 1. *Two Uncorrelated Factors Model (Model 1)*

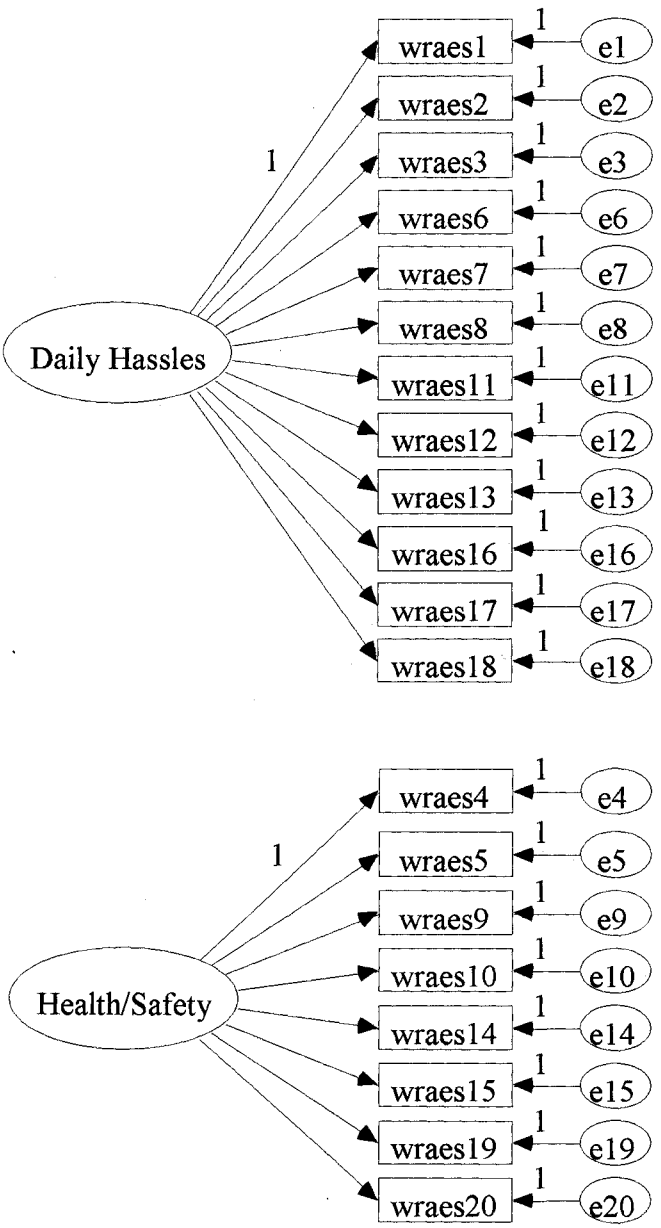


Figure 2. *Two Correlated Factors Model (Model 2)*

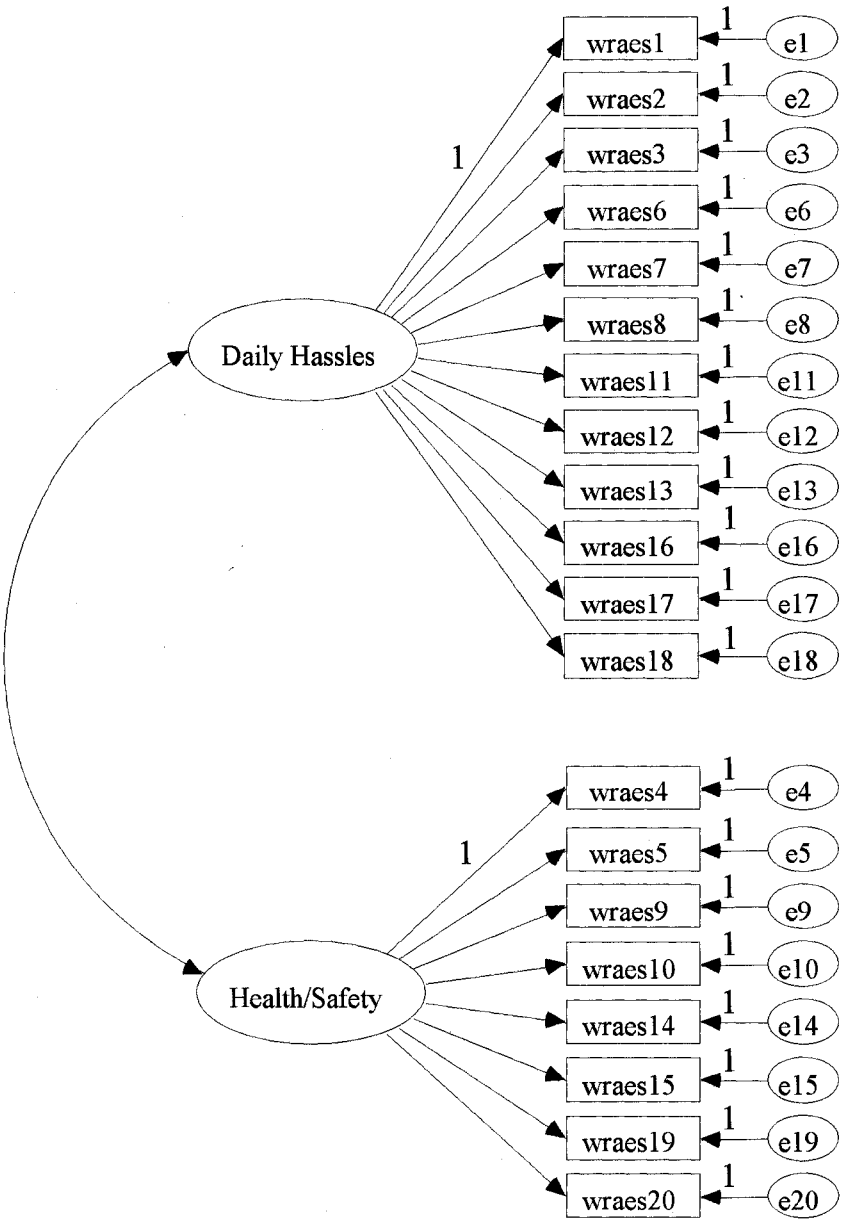


Figure 3. *One Factor Model (Model 3)*

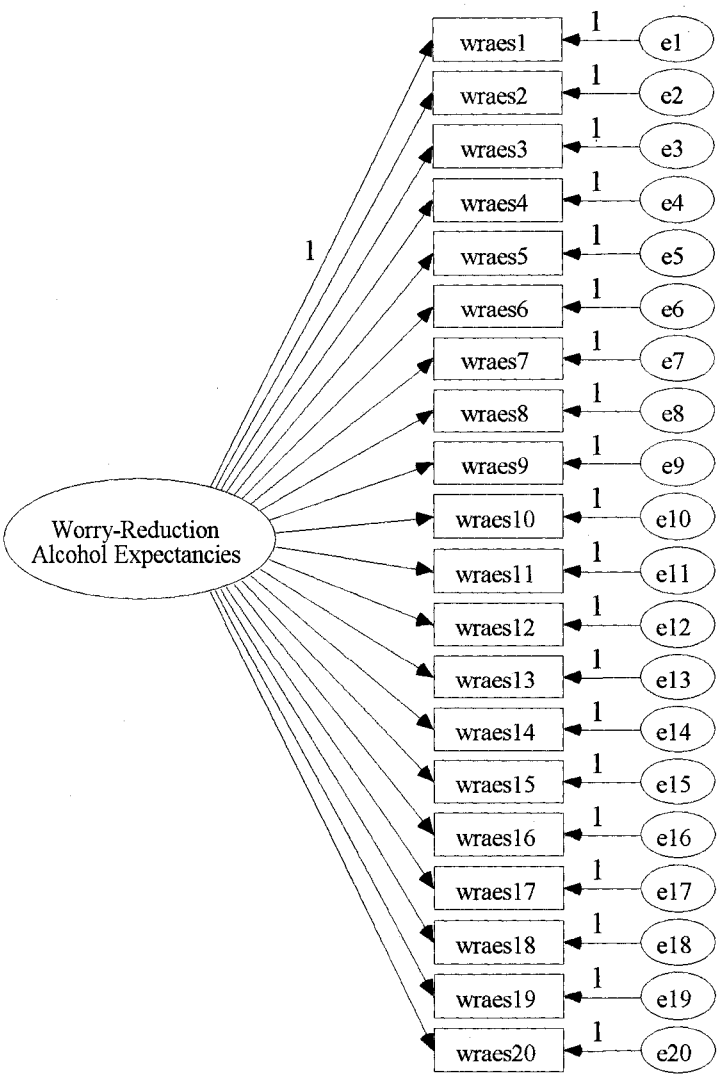
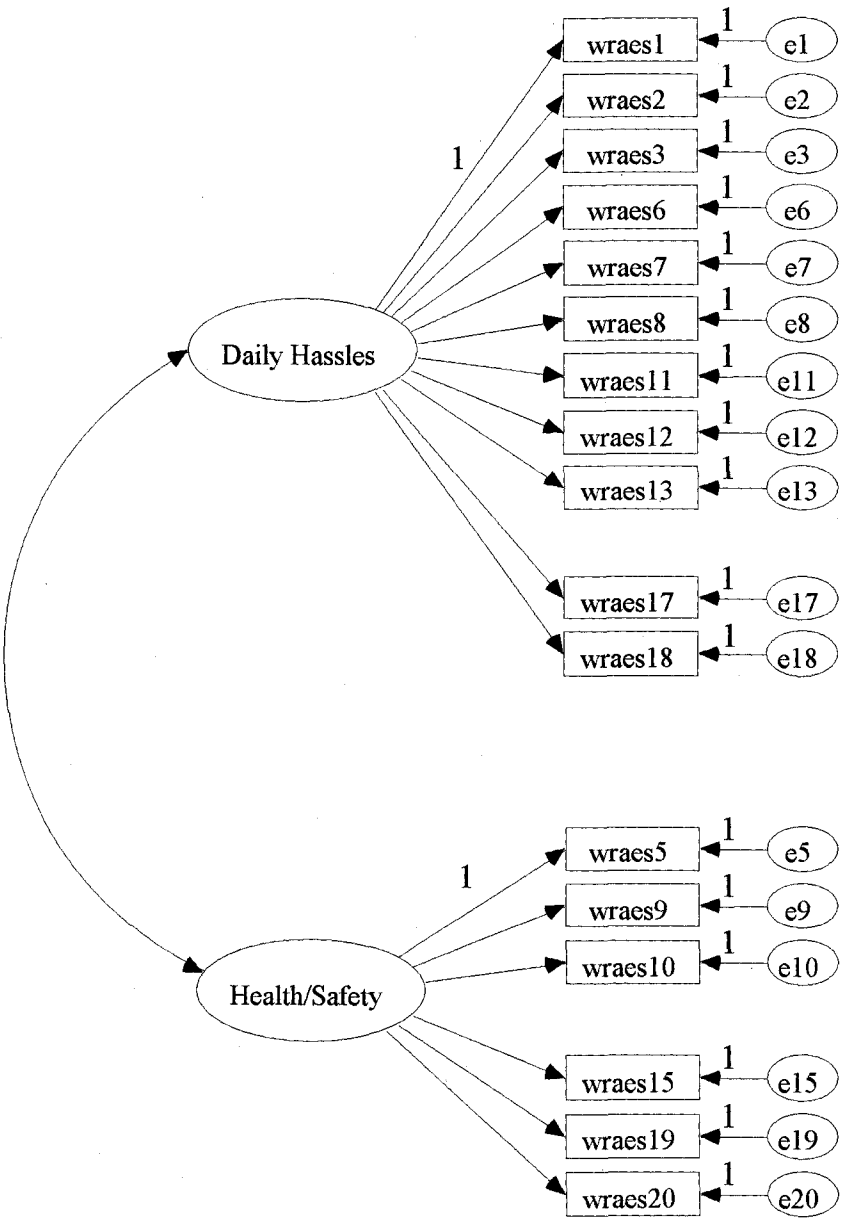


Figure 4. *Modified Two Correlated Factors Model (Model 4)*



APPENDIX A

Worry-Reduction Alcohol Expectancy Scale

WRAES

Below is a series of statements about the effects of alcohol. When the statements refer to drinking alcohol, this refers to any type of alcoholic beverage, such as beer, wine, whiskey, liquor, rum, gin, vodka, scotch, tequila, cordials, wine coolers, or any of various alcoholic mixed drinks. Whether or not you have had actual drinking experience, please answer based on your personal thoughts, feelings, or beliefs about the effects of alcohol. Please read each statement carefully and then use the scale below to rate how much you agree or disagree with the statement.

1=strongly disagree
2=disagree
3=neither agree or disagree
4=agree
5=strongly agree

1. When I drink, it is easier to "let go" of my worries	1	2	3	4	5
2. Alcohol helps reduce the intensity of my worries about school/work	1	2	3	4	5
3. When I drink, my worries about all the little things I have to get done are less intense	1	2	3	4	5
4. I don't worry about my health as much when I drink	1	2	3	4	5
5. My worries about safety are less intense when I drink	1	2	3	4	5
6. Drinking helps me to worry less	1	2	3	4	5
7. When I drink, it is easier to "let go" of my worries about school/work	1	2	3	4	5
8. When I drink, my worrying about minor hassles is less intense	1	2	3	4	5
9. My worries about my health are less intense when I drink	1	2	3	4	5
10. Alcohol helps me cope with the worries I have about the safety of my family and friends	1	2	3	4	5
11. Drinking makes my worries less overwhelming	1	2	3	4	5
12. Drinking helps me stop worrying about school/work for a while	1	2	3	4	5
13. When I drink, it is easier to "let go" of my worries about minor hassles	1	2	3	4	5

14. My worries about the health of my family or friends is less intense when I drink	1	2	3	4	5
15. When I drink alcohol, it is easier to "let go" of my worries about safety	1	2	3	4	5
16. When I have had a stressful day, alcohol helps me to stop worrying	1	2	3	4	5
17. When I have had a stressful day at school/work, alcohol helps me to worry about it less	1	2	3	4	5
18. When I drink, I worry less about little things	1	2	3	4	5
19. When I drink alcohol, it is easier to "let go" of my worries about health	1	2	3	4	5
20. Drinking helps me to worry less about my safety concerns	1	2	3	4	5