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Measurement Equivalence of the Brief Comprehensive Effects of Alcohol Scale in a Multiethnic Sample of College Students

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Abstract

Objectives: This study examined the measurement equivalence of the Brief Comprehensive Effects of Alcohol scale (B-CEOA: Ham et al., 2005)—a measure that assesses alcohol outcome expectancies (AOE) and expectancy evaluations—across ethnic groups and genders among multiethnic college student samples.

Method: Undergraduates provided self-report data in two multisite studies (Study 1 : $N = 1,536$, 75.5% women, $M_{age} = 19.6$ years old, 56.4% European American, 9.8% African American, 7.6% Asian American, and 26.2% Hispanic/Latino American; Study 2: $N = 7,767$, 72.6% women, $M_{age} = 19.8$ years old, 63.3% European American, 7.9% African American, 14.3% Asian American, and 14.5% Hispanic/Latino American).

Results: Exploratory and confirmatory factor analyses supported a positive and negative 4-factor model. Positive and negative AOE and expectancy evaluations were positively associated with hazardous alcohol use. Measurement equivalence of the B-CEOA across ethnicities and genders was largely supported.

Conclusions: This study provides support for the utility of the B-CEOA in college students of different ethnicities and genders in assessment and prevention.

Keywords

Alcohol outcome expectancies; evaluations; measurement; college students; ethnicity; gender

Alcohol use and its negative consequences have plagued college campuses for decades (e.g., Grucza, Norberg, & Bierut, 2009; Ham & Hope, 2003), despite increased prevention efforts (Wechsler et al., 2002). College-attending young adults consume more alcohol and have higher rates of risky drinking practices than same-aged peers who do not attend college (Dawson, Grant, Stinson, & Chou, 2005; Grucza et al, 2009). Recent national estimates indicate that approximately 37% of college students report at least one binge-drinking episode (defined as five or more drinks in one sitting) in the past 2 weeks (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Heavy drinking among college students is not

only associated with an array of short-term alcohol-related negative consequences (e.g., blackouts, fatal and nonfatal injury, sexual victimization; Hingson, Heeren, Winter, & Wechsler, 2005), but it can also increase students' risk for alcohol use disorders after college (Jennison, 2004).

In light of the high alcohol use prevalence rates and the associated negative sequelae among college students, empirical work has focused on malleable risk factors for college drinking such as alcohol outcome expectancies (a person's beliefs about the effects of alcohol use) and evaluations (whether the anticipated effects are good or bad) of these outcome expectancies (e.g., Fromme, Stroot, & Kaplan, 1993). It is critical that such measures are conceptualized similarly across different college student populations to ensure that accurate conclusions are drawn. Thus, the current study aimed to examine and confirm the factor structure of a measure of both alcohol outcome expectancies and expectancy evaluations, test factorial invariance by ethnicity and gender, as well as to test invariance of the association between these constructs and hazardous alcohol use by ethnicity and gender.

Alcohol outcome expectancies (AOE) refer to one's beliefs about the effects of ingesting alcohol, and are believed to influence drinking behavior (see Goldman, Del Boca, & Darkes, 1999; Patel & Fromme, 2010). According to expectancy theory, holding positive expectancies about the effects of alcohol can facilitate drinking while negative AOE can inhibit drinking. The association between increased positive expectancies about the effects of alcohol and elevated drinking levels or alcohol-related negative consequences among college students in the United States has been well-established (e.g., Fromme et al., 1993; Ham & Hope, 2006; Ham, Stewart, Norton, & Hope, 2005; Valdivia & Stewart, 2005; Zamboanga, Horton, Leickowski, & Wang, 2006; Zamboanga, Schwartz, Ham, Borsari, & Van Tyne, 2010). The relations between negative AOE and drinking-related behaviors have been less clear.

First, despite their theoretical importance, negative AOE have received little attention in the literature compared with positive AOE. Further, there are findings that suggest the presence of the expected inverse association between negative AOE and drinking-related variables in American college students (e.g., Fromme et al., 1993; Ham et al., 2005; Leigh & Stacy, 1993; Valdivia & Stewart, 2005; Zamboanga, 2006), while others suggest a positive association (e.g., Wood, Nagoshi, & Dennis, 1992; Zamboanga & Ham, 2008; Zamboanga et al., 2010) or no relationship at all (e.g., Ham & Hope, 2006; Velez-Blasini, 1997; Zamboanga et al., 2006).

One explanation for the mixed findings could be that some college drinkers view researcher-labeled "negative" outcomes as being desirable (Fromme et al., 1993; Patrick & Maggs, 2011; Mallet, Bachrach, & Turrissi, 2008). For example, a negative AOE item "I would take risks" might be rated as desirable by students who perceive risk taking favorably. According to expectancy-value theories (e.g., Edwards, 1961; Fishbein & Ajzen, 1975; Fromme et al., 1993), a belief about the likelihood of an effect occurring will only increase a behavior if the individual desires or values the outcome. Empirical work has found a positive association between favorable evaluations of drinking outcomes and increased drinking and alcohol-

related problems (Fromme et al., 1993; Ham et al., 2005; Patrick & Maggs, 2011; Zamboanga, 2006).

Moreover, several studies have found these evaluations of drinking outcomes account for additional variance in college drinking behavior over and above that of AOE (e.g., Ham & Hope, 2006; Valdivia & Stewart, 2005; Zamboanga, 2006; Zamboanga & Ham, 2008). Thus, it is important that researchers and clinicians measure, rather than assume, student's evaluations of alcohol outcome desirability (e.g., Fromme et al., 1993). Further, it is important to consider the possibility that differences in the conceptualization of AOE and evaluations by ethnicity and gender could also contribute to mixed findings in the literature. Establishing measurement equivalence (or nonequivalence) of AOE and evaluations across ethnicities and gender can help in understanding whether or not conclusions we draw from the data could be biased by differences in measure conceptualization across various groups of college students.

Assessment of Alcohol Outcome Expectancies and Evaluations

The Comprehensive Effects of Alcohol scale (CEOA; Fromme et al., 1993) is an established measure of AOE and expectancy evaluations. Fromme and colleagues (1993) developed this measure in a sample of college students to address the need for a validated measure that includes AOE items (both positive and negative) as well as expectancy evaluation items of the same drinking outcomes. Unfortunately, administration of a lengthy measure in clinical practice and research may not be conducive to brevity in these settings. Therefore, the brief version of the CEOA (B-CEOA; Ham et al., 2005)—assessing 15 AOE and evaluations for these outcomes—has been used in lieu of the full version of CEOA in college clinical and research settings to assess AOE and/or expectancy evaluations (e.g., Corbin, Morean, & Benedict, 2008; Ham & Hope, 2006; Ham et al., 2005; Hatzenbuehler, Corbin, & Fromme, 2008; Hatzenbuehler, Corbin, & Fromme, 2011; Iwamoto, Corbin, & Fromme, 2010; Thompson et al., 2009; Woolsey, Waigandt, & Beck, 2011; Zamboanga et al., 2010). The relatively common use of the Brief Comprehensive Effects of Alcohol scale (B-CEOA) with college students in recent years highlights the need to test the utility of this measure for use with this population.

In contrast to the full version of the CEOA which contains seven subscales (four positive and three negative), Ham and colleagues (2005) found evidence supporting a four-factor AOE solution and a three-factor expectancy evaluations solution in the B-CEOA. Further, correlations between the B-CEOA subscales and drinking-related variables supported the convergent validity of the measure (Ham et al., 2005) and were comparable to that of the full CEOA as reported in Fromme et al. (2003). Despite the low number of items per factor in the B-CEOA, internal consistency values were generally fair to good, with poor internal consistency for the sexuality AOE factor ($\alpha = .59$).

Although some studies (e.g., Corbin et al., 2008; Thompson et al., 2009) have used the AOE subscales that were computed based on the factors found in Ham et al. (2005), some limitations of this approach for computing subscales have precluded many researchers from assessing both AOE and expectancy evaluations with the B-CEOA. For example, the

differing number and types of factors for AOE and expectancy evaluations presents problems in comparing and interpreting the findings across AOE and evaluation domains. Another problem is that some B-CEOA factors include both “positive” and “negative” items, making it difficult to distinguish positive and negative AOE and evaluations, despite the conceptual and empirical importance of such a distinction.

In addition, an examination of the factor structure modeled by Ham et al. (2005) suggests additional conceptual and statistical concerns with the tested model. For example, the presence of several cross-loading items suggests that there are items that do not uniquely belong to one factor. Further, the two-item Tension Reduction factor is an underidentified model and cannot converge in a single-factor confirmatory factor analysis model estimation. As the Ham et al. (2005) B-CEOA model is problematic in meaningful ways, consideration of a viable alternative model is warranted. Therefore, the current study examined an alternative model comprising positive and negative B-CEOA scales, resulting in four factors: positive AOE, negative AOE, positive expectancy evaluations, and negative expectancy evaluations.

Several researchers have chosen to compute B-CEOA positive and negative AOE and expectancy evaluation total scores—rather than the Ham et al. (2005) subscale scores—when using the B-CEOA in college students (Ham & Hope, 2006; Hatzenbuehler, Corbin, & Fromme, 2008; Iwamoto et al., 2010; Zamboanga et al., 2010). Although research with the original CEOA indicates that the items from the original seven subscales load on higher order positive and negative factors for AOE and expectancy evaluations in college students (Fromme et al., 1993), to our knowledge, no studies have examined the viability of the four factors of the B-CEOA in college students. Among a sample of middle school students, McCarthy, Pedersen, and D’Amico (2009) found support for a two-factor model of B-CEOA positive (excluding the sexuality items) and negative AOE. It is not known whether this finding in middle school youth generalizes to college students.

Furthermore, no published work has tested the positive and negative expectancy evaluations factor model based on the B-CEOA. Further exploration of the B-CEOA factor structure is warranted in a large, diverse, national sample in particular as the samples used in Ham et al. (2005) were drawn from samples at two sites that were relatively homogenous. Therefore, one aim of the present study was to explore and confirm the factor structure of the B-CEOA in a large, multiethnic, and geographically diverse sample of undergraduates in the United States to increase the generalizability of the findings.

Ethnicity

College students from ethnic minority groups are underrepresented in published work examining the validity of the B-CEOA (Ham et al., 2005) as well as the original CEOA (Fromme et al., 1993; Valdivia & Stewart, 2005). Therefore, it is not known whether or not findings related to the validity of the measure would generalize to students from ethnic minority backgrounds. To our knowledge, no studies have tested the factor structure equivalence of the B-CEOA (or CEOA) across ethnicity in American college students. The closest approximation was a study that examined the factor structure of the Effects of

Drinking Alcohol scale (Leigh, 1987)—a measure of positive and negative AOE—in Puerto Rican college students (using a Spanish translation of the measure) and non-Latino American college students by conducting separate principle component analyses for each group (Velez-Blasini, 1997).

The results of this study suggest that although both groups evidenced four-factor structures with the two positive and two negative factors, there were differences in the composition of two positive scales for Puerto Rican (i.e., social enhancement-enjoyment and sexual enhancement) and non-Latino American college students (i.e., social enhancement and global positive effects). However, this study is limited by the use of an exploratory factor analysis approach in which factorial equivalence between the two groups was not tested. Furthermore, it is not clear whether two higher order factors—positive and negative AOE—were present and structured similarly across Puerto Rican and non-Latino American college students.

It is also possible that differences between the factor structures could be related to differences in the meaning ascribed to the items in the English versus Spanish versions, which may have resulted from the translation process. In examining the factor structure of a measure specific to sexual AOE, Abbey, McAuslan, Ross, and Zawacki (1999) found metric invariance for African American and European American college students for the four factors. In short, an empirical examination of the AOE factor equivalence across ethnicities is limited, and research investigating the factor structure of expectancy evaluations across ethnic groups is missing from the literature.

According to Knight, Roosa, and Umana-Taylor (2009), in addition to testing for factorial invariance, establishing measurement equivalence also requires testing the relations between the measure under investigation for factorial invariance and another theoretically related construct. No known empirical work has tested the relations between the B-CEOA and theoretically relevant constructs (e.g., alcohol use) using a measurement equivalence approach. However, research with non-European American college students suggests that there is a positive link between positive AOE and alcohol use (e.g., Iwamoto et al., 2010; Zamboanga, 2005). To date, no empirical work has examined the association between expectancy evaluations and alcohol use for ethnic minority college students. Overall, the lack of research investigating the measurement equivalence of the AOE and evaluation measures in students from different ethnic groups represents a significant gap in the literature. Thus, a major aim of the current study was to test for factorial invariance of the B-CEOA as well as the equivalence of the associations between the B-CEOA and hazardous alcohol use—a theoretically related construct—across ethnic groups.

Gender

Both male and female college students have been well-represented in studies examining the psychometric properties of the B-CEOA. However, little is known about the equivalence (or nonequivalence) of the factor structure of the B-CEOA across genders. In the original validation of the CEOA, Fromme and colleagues (1993) examined possible gender differences in factor structure by conducting separate principal factor extraction analyses for

men and women. Analyses of the coefficients of congruence suggested that the factor structures were moderately to strongly similar for male and female students for most factors. One difference was found in that two positive AOE (i.e., tension reduction and sexuality) formed one factor for women, while they remained independent factors for men.

Conversely, other studies have found factorial invariance across gender for a tension reduction AOE factor (Hittner, 1995) and four sexually specific AOE factors (Abbey et al., 1999) in American college students. No known published work includes an investigation of the factor structure of expectancy evaluations across genders. As such, the present study adds to the literature by examining gender differences in factor structure by directly testing the factorial equivalence of a positive and negative B-CEOA factor structure for AOE and expectancy evaluations using confirmatory factor analyses.

Related to measurement equivalence, there is a small body of work that indicates the association between AOE and problem drinking is stronger for male than female college students, when using the B-CEOA (Thompson et al., 2009), CEOA (Read, Wood, Ljuez, & Palfai, 2004), or another AOE measure (Kidorf, Sherman, Johnson, & Bigelow, 1995). No studies could be found that have examined gender differences in the associations between expectancy evaluation factors and hazardous drinking. In light of the paucity of research examining gender invariance in AOE and evaluation measures, the current study tested for invariance in the B-CEOA factor structure as well as the equivalence of the relations between the B-CEOA and hazardous alcohol use across genders.

The Current Study

The purpose of the current study was to examine the measurement equivalence of the B-CEOA (Ham et al., 2005)—a measure of AOE and expectancy evaluations—across ethnicity and gender in college students. First, we tested and confirmed a positive and negative factor structure of the measure (i.e., positive AOE, negative AOE, positive expectancy evaluations, and negative expectancy evaluations) in a multiethnic college sample (randomly split into halves) using exploratory and confirmatory factor analyses. Next, we tested for factorial equivalence to ensure that the same set of items represent AOE and expectancy evaluations across ethnic groups and gender in another larger multiethnic college sample. Though there might be reason to expect differences in the conceptualization of AOE and evaluations factors across college students of different ethnic backgrounds (Velez-Blasini, 1997) or genders (Fromme et al., 1993), the limited available literature on this topic does not provide sufficient evidence in support of or against factorial variance. Thus, we did not advance any hypotheses about factorial equivalence or variance of the B-CEOA.

Last, we further examined the measurement equivalence of the B-CEOA by testing the associations between AOE and expectancy evaluation factors with hazardous drinking across ethnic groups and gender. Based on previous research and theory, it was expected that positive AOE and favorable evaluations of both positive and negative outcomes would be positively associated with hazardous alcohol use. Further, we expected that negative AOE would be inversely related to hazardous alcohol use.

Method

Participants and Procedures

Data were drawn from two studies of the Multi-Site University Study of Identity and Culture national collaborative (MUSIC; see Castillo & Schwartz, present issue). The first study (MUSIC-1) included a sample of 1,536 traditional-aged (i.e., 18–25 years old; $M_{\text{age}} = 19.6$) college students attending nine colleges and universities in the United States. Data for MUSIC-1 were collected in 2007 via web-based self-report questionnaires. The sample included 1,157 (75.5%) women and 867 (56.4%) European Americans, 150 (9.8%) African Americans, 117 (7.6%) Asian Americans, and 402 (26.2%) Hispanic or Latino Americans. The second MUSIC study (MUSIC-2) included a sample of 7,767 traditionally aged (i.e., 18–25 year old; $M_{\text{age}} = 19.8$) college students attending 1 of 30 colleges or universities in the United States who completed self-report web-based questionnaires in 2008–2009 and reported on at least one item of all the variables used in the current study. The MUSIC-2 sample included 5,638 women (72.6%) as well as 4,914 (63.3%) European Americans, 616 (7.9%) African Americans, 854 (11.0%) East Asian Americans, 254 (3.3%) South Asian Americans, and 1,129 (14.5%) Hispanic or Latino Americans.

Measures

B-CEOA (Ham et al, 2005).—Participants completed the B-CEOA, which includes 15 items that assess AOE and the same 15 items to assess expectancy evaluations. Participants indicate their degree of agreement that a particular effect will likely occur to the individual respondent from drinking (i.e., alcohol outcome expectancies) on a 1–4 scale, ranging from 1 (*disagree*) to 4 (*agree*). Participants also indicate to what degree each effect would be desirable or undesirable (i.e., expectancy evaluations) on a 1–5 scale, ranging from 1 (*bad*) to 5 (*good*). The B-CEOA includes a subset of items extracted from the original CEOA (Fromme et al., 1993), with eight items from the original CEOA positive expectancy domain (two items from each of the four positive subscales of Tension Reduction, Sociability, Sexuality, and Liquid Courage) and seven items from the negative expectancy domain (two items from Cognitive and Behavioral Impairment, two items from Self-Perception, and three items from Risk and Aggression subscales) in the original CEOA (Ham et al., 2005).

Based on the four-factor AOE (i.e., Risk and Aggression/Liquid Courage/Sociability, Self-Perceptions/Cognitive and Behavioral Impairment, Sexuality, and Tension Reduction) and three-factor expectancy evaluation (i.e., Tension Reduction/Sociability/ Sexuality, Liquid Courage/Risk and Aggression/Self-Perceptions, and Cognitive and Behavioral Impairment) structure found by Ham et al. (2005), the B-CEOA scales showed evidence of adequate internal consistency, construct validity, and criterion validity. Though a positive/negative factor model had not been tested for the B-CEOA in college students prior to the present study, previous studies have found fair to excellent internal consistency for positive AOE, negative AOE, positive expectancy evaluations, and negative expectancy evaluations ($\alpha = .66 - .90$) in college student samples (Hatzenbeuhler et al., 2008; Zamboanga et al., 2010).

In the current study, AOE scores ranged from 1 to 4. Means for the researcher-labeled (i.e., based on Fromme et al., 1993) positive AOE subscale were 2.56 (standard deviation [*SD*]

= .63) and 2.54 ($SD = .66$) for MUSIC-1 and MUSIC-2, respectively. The means for the negative AOE subscale were 2.48 ($SD = .61$) for MUSIC-1 and 2.55 ($SD = .63$) in MUSIC-2. Expectancy evaluation scores ranged from 1 to 5, with positive expectancy evaluation subscale means of 3.26 ($SD = .84$) and 3.18 ($SD = .94$) and negative expectancy evaluation subscale means of 2.32 ($SD = .84$) and 2.18 ($SD = .79$) for MUSIC-1 and MUSIC-2, respectively. Furthermore, data from both samples in the current study suggested that the internal consistency was acceptable to good for all the subscales (positive AOE: $\alpha = .77 - .80$; negative AOE: $\alpha = .70 - .71$; positive expectancy evaluations: $\alpha = .83 - .86$; and negative expectancy evaluations: $\alpha = .79$).

Hazardous alcohol use.—We used the 10-item Alcohol Use Disorder Identification Test (AUDIT; Babor et al., 2001) to measure hazardous alcohol use among the students sampled in MUSIC-2. The AUDIT comprises 10 items assessing drinking quantity and frequency (e.g., “How often do you have a drink containing alcohol?”), symptoms of alcohol dependence (e.g., “How often during the past year have you found that you were not able to stop drinking once you had started?”), and alcohol-related negative consequences (e.g., “Have you or someone else been injured as a result of your drinking?”). The total AUDIT score was computed by summing the 10 items. The utility of the AUDIT for use with college students is well established (e.g., Kokotailo et al., 2004; O’Hare & Sherrer, 1999; Zamboanga, et al., 2007). For the current study, AUDIT total scores ranged from 0 to 37 (mean [M] = 5.64, $SD = 6.05$). The internal consistency of the AUDIT was demonstrated to be good ($\alpha = .86$).

Results

Data Analytic Plan

Data analyses proceeded in four steps. Data for the first two steps were drawn from MUSIC-1 and data for the third and fourth steps were drawn from MUSIC-2. First, to examine the factor structures of B-CEOA, exploratory factor analyses (EFA) were conducted separately for AOE and expectancy evaluations. Second, to confirm the factor structure derived from the EFA analyses, confirmatory factor analyses (CFA) were conducted for each subscale that emerged in the EFA analyses. The sample obtained from MUSIC-1 ($N = 1536$) was randomly split into two subsamples for the first two data analytic steps. The first half ($N = 746$) was used for the EFA, and the second half ($N = 790$) was used for the CFA.

Third, to examine the first component of measurement equivalence as described by Knight and colleagues (2009), a single-factor factorial invariance analyses were conducted for each B-CEOA subscale across European Americans, African Americans, Asian Americans, and Hispanic/Latino Americans, and again across gender. Fourth, to examine the second component of measurement equivalence, analyses were conducted in which each B-CEOA subscale (modeled as a latent variable based on the factor structure from the factorial invariance analyses) was regressed on hazardous alcohol use (measured by observed AUDIT scores) across the four ethnic groups, and again across gender.

All CFAs and measurement equivalence analyses and were conducted in Mplus 6.11 (Muthén & Muthén, 2011). It should be noted that non-normality was present in the distribution of AUDIT scores. Based on analyses conducted using two different estimators,

one used for normally distributed data (maximum likelihood, or ML) and the other estimator that is used for non-normally distributed data (maximum likelihood with robust standard errors and chi-square test, or MLR) in Mplus, the best fit for the data was found when using ML. Thus, the ML estimator was used as it was found to be a better representation of our data.

Exploratory Factor Analyses

The factor structures of B-CEOA were explored separately for AOE and expectancy valuations. Principal Axis Factoring was employed to provide an accurate estimation of the population factor structure as recommended by Widaman (1993). In addition, oblimin rotation with the delta parameter set at 0 was employed to allow for correlations among factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999). As the current literature distinguished CEOA items as positive and negative (Fromme et al., 1993), we elected to extract two factors from all B-CEOA items. Items with loadings on a factor lower than .30 were excluded from that factor.

Alcohol outcome expectancies.—Principal axis factoring with oblimin rotation was conducted among all B-CEOA AOE items to extract two factors (see Table 1, top half). The two-factor model explained 33.66% of the variance in all items. Consistent with Kaiser criterion (1960), the eigenvalue of each factor was higher than 1.0. According to the rotated factor loadings shown in Table 1, there were two differences between the current results and the theoretical two-factor structure of B-CEOA. First, “I would feel calm” and “I would feel peaceful,” which are theoretically positive AOE, double loaded on positive and negative AOE in B-CEOA. However, as the two items loaded negatively on negative AOE, we included them as positive AOE in CFA analyses. Second, “I would take risks,” which is a theoretically negative AOE item, loaded on the positive outcome expectancies factor in the B-CEOA. As such, this item was included as a positive factor item in accordance with the current findings.

Expectancy evaluations.—Principal axis factoring with oblimin rotation was conducted among all B-CEOA expectancy evaluation items to extract two factors (see Table 1, bottom half). The two-factor model explained 38.71% of the variance in all items. Consistent with Kaiser criterion (1960), the eigenvalue of each factor was higher than 1.0. According to rotated factor loadings shown in Table 1, there was only one difference between the current finding and the theoretical factor structure of B-CEOA. “I would enjoy sex more,” which is theoretically an item for the positive factor, double loaded on both the positive and negative expectancy evaluation factors. However, given that this item’s loading on positive expectancy evaluations was close to .30 and higher than that on the negative expectancies factor, this item was included in the positive expectancy valuation factor in the subsequent analyses.

Confirmatory Factor Analyses

CFAs were conducted for each factor derived from the EFA. The criteria for a good model fit include the comparative fit index (CFI > .95 for a good fit; Hu & Bentler, 1999), the Tucker Lewis index (TLI > .95 for a good fit; Hu & Bentler, 1999) and the root mean square error of

approximation (RMSEA < .08 for a fair fit; Browne & Cudeck, 1993; and < .05 for a good fit; Hu & Bentler, 1999).

Initial CFA results resulted in poor fitting models for positive AOE ($\chi^2 = 418.62$, $p < .001$; CFI = .73; TLI = .60; RMSEA = .20), negative AOE ($\chi^2 = 202.62$, $p < .001$; CFI = .69; TLI = .49; RMSEA = .17), positive expectancy evaluations ($\chi^2 = 502.65$, $p < .001$; CFI = .70; TLI = .57; RMSEA = .18), and negative expectancy evaluations ($\chi^2 = 208.45$, $p < .001$; CFI = .81; TLI = .71; RMSEA = .14) factors. Based on an examination of modification indices and conceptual considerations (e.g., the “easier to talk to people” and “sociable” items reflect social aspects of alcohol outcomes; Kline, 2010), three to four residuals were correlated to achieve an acceptable model fit. These CFA results for positive alcohol outcome expectancies showed that factor loadings of “I would feel calm” and “I would feel peaceful” were below .30. Therefore, these two items were excluded from the positive AOE factor, and the CFA were conducted again among the remaining items for the final CFA. The final results of the CFAs are displayed in Figures 1 and 2. Generally, all the four single-factor models showed a fair to good fit to the data. In addition, factor loadings of all items were above .30. Therefore, these factor structures were used for the following invariance and validity analyses.

Factorial Invariance Analyses

Factorial invariance analyses were conducted for each factor in B-CEOA first across ethnic groups and again across gender. For each factor, four types of factorial invariance analyses proceeded in successive order (Knight & Hill, 1998; Millsap & Kwok, 2004; Widaman & Reise, 1997). First, a configural invariance model was estimated, which tests whether the same set of items forms a factor across groups. Second, a metric invariance model was estimated, which tests whether the factor loading of each item are invariant across groups. Third, a strong invariance model was estimated, which tests whether the intercept of each item to the latent factor are invariant across groups. Finally, a strict invariance model was estimated, which tested whether the residual variance of each item of a latent factor are invariant across groups. In each step, if an invariant model fit the data significantly worse than its previous model, a partially invariant model was estimated that allow for only some of the items to be invariant across groups. Partial invariant models were tested sequentially, stopping when the fit of a partially constrained model did not differ significantly from a previous type of invariance.

A subsequent model was considered to have a significantly poorer fit than the previous model when two of the following three criteria were met: the chi-square goodness of fit test was significant ($p < .05$), the change in CFI was higher than or equaled to .01 and the change in the TLI was higher than or equaled to .02 (Cheung & Rensvold, 2002; Vandenberg & Lance, 2000). One limitation of the current analyses is that the effect of different universities was not taken into consideration, as models nested with universities are unidentified. This is due to the number of parameters being estimated in the factorial invariance analyses exceeding the number of clusters ($n = 31$) available in MUSIC-2. Results of factorial invariance analyses across ethnic groups and genders are displayed in Table 2 and 3,

respectively. Parameter estimates for the final partially strict invariance models are displayed in Table 4.

Invariance across East and South Asian Americans.—Because Asian Americans consisted of two groups. East and South Asian Americans, factorial invariance analyses were first conducted across the two Asian American groups to determine whether the two groups can be combined into one group of Asian Americans for further analyses involving other ethnic groups in the study. For all model comparisons, the change in chi-square values (χ^2) ranged from 2.25 to 24.08, and the corresponding *p*-values ranged from .813 to .001. In addition, the change in CFI values ranged from $-.002$ to .008 and the changes in TLI values ranged from $-.006$ to .005. In other words, as the criteria for meeting at least two of the three criteria were not met in any of the invariance tests, all four subscales demonstrated configural, metric, strong and strict invariance. Therefore, the two Asian American groups were combined into one for the purposes of the following analyses.

Invariance across ethnic groups.—Results of factorial invariance analyses across ethnic groups are displayed in Table 2. Parameter estimates for the final partially strict invariance models are displayed in Table 4. The subscale of positive AOE demonstrated configural and metric invariance, but did not achieve intercept invariance. As the strong invariance model fit the data significantly poorer than the metric invariance model, a partially strong invariance model was proposed and supported, which freely estimated the intercepts of “I would be brave and daring,” “I would be courageous,” “It would be easier to talk to people” and “I would act sociable.” These parameters were also freely estimated in the subsequent model. A partially strict invariance model was supported, which further constrained the residual variances of all items to be invariant.

The negative AOE subscale demonstrated configural and metric invariance, but did not achieve intercept invariance. As the strong invariance model fit the data significantly poorer than the metric invariance model, a partially strong invariance model was proposed, which freely estimated the intercepts of “I would be clumsy” and “I would be loud boisterous, or noisy.” These parameters were also freely estimated in the subsequent models. As the first partially invariant strict model that constrained all residual invariances to be invariant fit the data significantly poorer than the previous model, a second partially invariant strict model was proposed and supported, which further freely estimated the residual variances of “I would be clumsy,” “I would feel guilty,” and “I would feel moody.”

Both the subscales of positive and negative expectancy evaluations demonstrated configural, metric, strong, and strict invariance across ethnic groups.

Invariance across genders.—Results of factorial invariance analyses across genders are displayed in Table 3. The subscales of positive AOE as well as positive and negative expectancy evaluations achieved configural, metric, strong and strict invariance across genders.

The subscale of negative AOE demonstrated configural and metric invariance, but did not demonstrate intercept invariance. As the strong invariance model fit the data significantly

poorer than the metric invariance model, a partially strong invariance model was proposed, which freely estimated the intercepts of “I would be clumsy” and “I would act aggressively.” These parameters were also freely estimated in the subsequent models. As the first partially invariant strict model that constrained all residual variances to be invariant fit the data significantly poorer than the previous model, a second partially invariant strict model was proposed and supported, which further freely estimated the residual variances of “I would feel dizzy” and “I would be clumsy.” Parameter estimates for the final partially strict invariance model are displayed in Table 4.

Testing the Associations Between B-CEOA and Hazardous Alcohol Use

Analyses were conducted to examine the relations between each B-CEOA subscale and hazardous alcohol use (as assessed by AUDIT total scores) first across ethnic groups and again across genders. For each factor, three models were estimated in successive order. The first model freely estimated the slope and intercept across groups. The second model tested for slope invariance across groups. The third model tested both the slope and intercept invariance across groups. If an invariant model fit the data significantly worse than its previous model, a partially invariant model was estimated that allow for only some of the groups to be invariant. The criteria of comparing models were the same as those in the factorial invariance analyses.

The relations between each subscale and the AUDIT score demonstrated slope and intercept invariance across ethnic groups (see Table 5), and again across gender (see Table 6). AUDIT scores were positively associated with all the subscales, except the negative AOE among African Americans ($p = .088$).

Discussion

Because AOE and the subjective evaluations of these expected drinking outcomes have been identified as risk factors for or protective factors against problem drinking among college students, it is critical that these constructs are conceptualized similarly by all college students to draw accurate conclusions from findings. With this backdrop, the purpose of the current study was to examine the measurement equivalence of the B-CEOA (Ham et al., 2005), a measure derived from the original CEOA (Fromme et al., 1993), that assesses AOE and expectancy evaluations. Though the B-CEOA has been used in a number of studies examining college student drinking (e.g. Corbin et al., 2008; Ham & Hope, 2006; Ham et al., 2005; Hatzenbuehler et al., 2008; Hatzenbuehler et al., 2011; Iwamoto et al., 2010; Thompson et al., 2009; Woolsey et al., 2011; Zamboanga et al., 2010), no study has examined its measurement equivalence in college students from diverse ethnic backgrounds and across genders. We addressed this gap in the literature by examining B-CEOA factorial validity and measurement equivalence across ethnic groups and gender, among multiethnic college students. The results largely provide support for the utility of the B-CEOA—particularly the expectancy evaluations scales—in college students of different ethnicities as well as for both male and female college students.

B-CEOA Positive and Negative Factors

Findings supported positive and negative factor models for both AOE and expectancy evaluations. There were some differences in the positive/negative factor structure found in the present study compared to the higher order positive and negative factors in the original CEOA. In particular, “I would take risks” loaded onto the positive AOE factor, rather than the negative AOE factor as described by Fromme and colleagues (1993). However, this is partially consistent with previous findings suggesting that the “I would take risks” item loads on a factor (i.e., Risk and Aggression/Liquid Courage/ Sociability) with several positive AOE items in the B-CEOA (Ham et al., 2005). Further, Fromme et al. (1993) found that the Risk and Aggression expectancy evaluation items loaded on both positive and negative scales, suggesting that college students might have ambivalence regarding the desirability of these drinking outcomes.

Though it is not known whether or not the “taking risks” item in particular would have loaded on both positive and negative evaluation factors within the Fromme et al. (1993) model, this finding does provide some empirical evidence that risk-related outcome items might not be distinctly positive or negative. A relatively unexpected finding was that the items related to tension reduction (i.e., “I would feel calm” and “I would feel peaceful”) did not demonstrate significant loadings on the positive AOE factor in the CFA. It is possible that these cognitions related to the likelihood of experiencing alcohol’s tension reducing effects do not fit well within a positive/negative AOE factor framework. Most of the items loading onto the positive AOE factor appear to reflect some level of increased arousal (e.g., “I would be sociable,” “I would be a better lover,” and “I would be brave and daring”), seemingly contrary to tension reduction items reflecting lowered arousal. It is worth noting, however, that the corresponding tension reduction evaluation items did have significant loadings on the positive expectancy evaluation factor.

The current study was the first to examine a positive and negative factor structure for B-CEOA expectancy evaluations. The findings provided support for positive and negative B-CEOA expectancy evaluation factors, and the items loading on each of the two factors were consistent with the positive and negative factor items in the full CEOA (Fromme et al., 1993).

Factorial Invariance across Ethnic Groups and Genders

The present study was the first to examine factorial equivalence of the B-CEOA across ethnic groups and genders. The results suggest that factor structures of the B-CEOA were similar for European American, African American, Asian American, and Hispanic/Latino American college students. The factor structures for both positive and negative expectancy evaluations fully met all forms of invariance for ethnic groups. For AOE, the factor structure fully met standards for configural and metric invariance, and met standards for partially strong and strict invariance for ethnic groups. These findings are consistent with Abbey and colleagues’ (1999) findings that sexually specific AOE had comparable factor structure and factor loadings in both African American and European American college students, but also expands on these findings by demonstrating factorial equivalence of general AOE and

expectancy evaluations in several ethnic groups using more stringent criteria for invariance testing.

Findings also suggest similar B-CEOA factor structures for men and women, and are consistent with previous work, which found factorial invariance across genders in specific AOE domains (Abbey et al., 1999; Hittner, 1995). The factor structures for positive AOE as well as both types of expectancy evaluations fully met all forms of invariance for both genders. For negative AOE, the factor structure fully met standards for configural and metric invariance, and met standards for partially strong and strict invariance for both genders.

Associations Between the B-CEOA Scales and Hazardous Alcohol Use

Consistent with theory and research, greater positive AOE, positive expectancy evaluations, and negative expectancy evaluations were associated with elevated levels of hazardous alcohol use. Thus, students who reported that they expect positive drinking outcomes to occur, and perceive both positive and negative types of drinking outcomes as desirable, also reported higher levels of hazardous alcohol use. Negative AOE were generally positively related to hazardous alcohol use. Though not consistent with theory, these positive associations between negative AOE and alcohol use are consistent with some previous empirical work (e.g., Wood et al., 1992; Zamboanga & Ham, 2008; Zamboanga et al., 2010), and add to the mixed findings related to the association between negative AOE and drinking behaviors in the literature.

Ethnic and gender equivalence was found for the associations between B-CEOA scales and hazardous alcohol use. The direction and strength of these relationships did not differ significantly for European American, African American, Asian American, and Hispanic/Latino ethnic groups. The current results also provide support for equivalence in the associations among AOE and expectancy evaluations with hazardous alcohol use across men and women. In contrast to previous work suggesting that the association between AOE and drinking-related variables was stronger for men than women (Kidorf et al., 1995; Read et al., 2004; Thompson et al., 2009), the results of the current study suggest that the direction and strength of this relationship was similar across genders.

Limitations and Future Directions

There are some study limitations that warrant consideration. First, self-report data can be biased or otherwise inaccurate. Researchers examining the validity of AOE and expectancy evaluation measures might consider methods such as collateral verification or prospective self-monitoring in addition to retrospective self-report. Second, causal interpretability of the results is limited due to the cross-sectional study design. Third, future studies examining the validity of the B-CEOA would benefit from the inclusion of other types of AOE measures, additional measures of alcohol use and alcohol-related consequences, and a diagnostic assessment of alcohol use disorders. Fourth, as mentioned previously, we were not able to control for the effect of different universities in the invariance analyses. It is possible that students attending a college or university with a more approving, alcohol-promoting culture would rate the effects of alcohol as more desirable than students attending an institution where less emphasis is placed on alcohol use. Fifth, though a strength of the study was that

there was a large sample size and that the sample was multiethnic, some groups were unrepresented (e.g., American Indians, non-traditional college students, non-English speaking individuals) in the current study. Thus, it is not known whether the current findings will generalize to other groups of interest.

Finally, it should be noted that intercept invariance was not achieved when considering the AOE factor structure across ethnic groups and when considering negative AOE between genders. According to Widaman and Reise (1997), invariance in factor loadings are important for making meaningful group comparisons in relationships across groups, while invariance in intercepts are important for finding meaningful mean level difference across groups. As our goal in the current study is about group differences in the relations between the B-CEOA and hazardous alcohol use, metric invariance was more important to establish than invariance in intercepts. By establishing metric invariance, this allows for meaningful comparisons in relationships between B-CEOA scales and hazardous alcohol use across groups. However, given the noninvariant intercepts in positive and negative AOE scales, it is important that researchers be cautious in making interpretations about the mean level differences across groups.

Conclusions and Clinical Implications

Overall, the current findings provide support for using the positive and negative subscales of the B-CEOA to assess AOE and expectancy evaluations in college students. Importantly, the factor structure and associations between factors and hazardous alcohol use were similar across ethnic groups and genders, suggesting that the B-CEOA could be beneficial in alcohol-related assessment batteries and in alcohol treatment monitoring for a wide range of college students. Based on these data from a large, national, multiethnic sample of American college students, college students' beliefs about the likelihood of positive or negative outcomes occurring from drinking in addition to ratings of the desirability of drinking outcomes (both positive and negative) are associated with increased levels of hazardous alcohol use. As such, assessment of these cognitions may be important in identifying high-risk college drinkers, which include, but is not limited to, students who pregame (Read, Merrill, & Bytschkow, 2010; Zamboanga et al., 2010), participate in drinking games (Borsari, 2004), and/or are involved in college athletics (Martens, Dams-O'Connor, & Beck, 2006).

Furthermore, alcohol prevention and intervention programs may consider targeting these cognitions in particular, using expectancy challenge techniques (e.g., Wiers & Kummeling, 2004) or brief motivational interventions (e.g., Borsari & Carey, 2005). Although additional research is needed to determine the utility of the B-CEOA in predicting a range of alcohol-related outcomes longitudinally, it is hoped that the present results will be useful in informing AOE measurement selection among college student researchers and clinicians in the alcohol field. Furthermore, for those researchers and clinicians who choose to use the B-CEOA, the present results provide data to guide scoring and interpretation when administering the instrument to college students of both genders and from different ethnic backgrounds.

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Figure 1.
Path diagrams for final alcohol outcome expectancies confirmatory factor analyses.

Figure 2.
Path diagrams for final expectancy evaluations confirmatory factor analyses.

Table 1

Principal Axis Factoring With Oblimin Rotation of the Brief Comprehensive Effects of Alcohol Scale

	Factor 1: Positive	Factor 2: Negative
<i>Outcome expectancies (N = 664)</i>		
Eigenvalues	3.166	1.884
Variance explained (%)	21.105	12.559
Cronbach's alpha	.789	.679
<i>B-CEOA item content</i>		
Courageous	.711	.227
Brave and daring	.702	.298
Easier to talk to people	.640	-.069
Take risks	.620	.357
Sociable	.616	-.034
Better lover	.493	-.077
Enjoy sex more	.442	-.083
Loud boisterous, or noisy	.166	.582
Clumsy	.120	.509
Aggressively	.245	.485
Moody	.029	.483
Calm	.365	-.441
Peaceful	.398	-.420
Dizzy	-.071	.414
Guilty	-.087	.354
<i>Expectancy evaluations (N = 658)</i>		
Eigenvalues	4.382	1.424
Variance explained (%)	29.214	9.494
Cronbach's alpha	.823	.781
<i>B-CEOA item content</i>		
Sociable	.767	-.087
Easier to talk to people	.725	-.086
Calm	.696	-.056
Peaceful	.677	-.057
Courageous	.565	.215
Better lover	.493	.132
Brave and daring	.441	.311
Enjoy sex more	.282	.202
Aggressively	-.134	.794
Moody	-.065	.696
Guilty	-.072	.677
Loud boisterous, or noisy	.102	.525
Clumsy	.054	.443
Take risks	.303	.406

	Factor 1: Positive	Factor 2: Negative
Dizzy	.146	.353

Note. B-CEOA = Brief Comprehensive Effects of Alcohol scale.

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Table 2

Confirmatory Factor Analytic Model of Factorial Invariance Tests across Ethnic Groups

Model	Model description	χ^2	df	p	df	χ^2	χ^2/p	CFI	TLI	CFI	TLI	RMSEA
<i>Positive outcome expectancies</i>												
1	Configural invariance model	344.57	50	.000				.986	.977			.056
2 ^a	Metric invariance model	455.01	68	.000	18	11.44	.000	.982	.978	.004	-.001	.055
3	Strong invariance model	756.43	86	.000	18	301.42	.000	.969	.969	.013	.009	.064
3p ^b	Partially strong invariance model	484.07	74	.000	6	29.06	.000	.981	.978	.001	.000	.054
4	Partially strict invariance model	700.11	95	.000	21	216.04	.000	.972	.975	.009	.003	.058
<i>Negative outcome expectancies</i>												
5	Configural invariance model	146.45	26	.000				.986	.967			.050
6	Metric invariance model	202.06	41	.000	15	55.60	.000	.981	.972	.005	-.005	.046
7	Strong invariance model	447.17	56	.000	15	245.12	.000	.953	.950	.028	.022	.061
8p ^b	Partially strong invariance model	282.96	50	.000	9	80.91	.000	.972	.967	.009	.005	.050
8	Partially strict invariance model	427.12	68	.000	18	144.16	.000	.957	.962	.015	.005	.053
8p ^b	Final partially strict invariance model	340.73	59	.000	9	57.76	.000	.966	.966	.006	.001	.050
<i>Positive expectancy evaluations</i>												
9	Configural invariance model	218.14	70	.000				.995	.991			.034
10	Metric invariance model	268.36	91	.000	21	50.21	.000	.994	.992	.001	-.001	.032
11	Strong invariance model	500.30	112	.000	21	231.94	.000	.986	.986	.008	.006	.043
12	Strict invariance model	614.74	136	.000	24	114.44	.000	.983	.986	.003	.000	.043
<i>Negative expectancy evaluations</i>												
13	Configural invariance model	486.51	50	.000				.970	.950			.068
14	Metric invariance model	566.19	68	.000	18	79.68	.000	.966	.958	.004	-.008	.063
15	Strong invariance model	662.17	86	.000	18	95.98	.000	.961	.961	.005	-.003	.060
16	Strict invariance model	697.70	107	.000	21	35.54	.025	.960	.968	.001	-.007	.054

Note. df = degree of freedom; CFI = comparative fit index; TLI = Tucker Lewis index; RMSEA = root mean square error of approximation.

Metric invariance model = configural invariance model + all factor loadings invariant; strong invariance model = metric invariance model + all measurement intercepts invariant; partially strong variance model = metric invariance model + some measurement intercepts invariant; partially strict invariance model = partially strong variance model + all unique variance invariant; final partially strict invariance model = partially strong variance model + some unique variance invariant.

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Every comparison is done between the current model fit and the previous one, except for the comparisons marked with superscripts b, q. Compares the model fit and the one that is two rows above.

$$Ns = 7,477 - 7,562.$$

Table 3

Confirmatory Factor Analytic Model of Factorial Invariance Tests across Gender

Model	Model description	χ^2	df	p	df	χ^2	χ^2/p	CFI	TLI	CFI	TLI	RMSEA
<i>Positive outcome expectancies</i>												
1	Configural invariance model	272.70	24	.000				.988	.980			.052
2 ^a	Metric invariance model	290.50	30	.000	6	17.80	.007	.988	.983	.000	-.003	.048
3	Strong invariance model	357.04	36	.000	6	66.55	.000	.985	.983	.003	.000	.049
4	Strict invariance model	368.39	43	.000	7	11.34	.124	.985	.985	.000	-.002	.045
<i>Negative outcome expectancies</i>												
5	Configural invariance model	202.10	12	.000				.977	.942			.065
6	Metric invariance model	205.13	17	.000	5	3.03	.696	.977	.960	.000	-.018	.054
7	Strong invariance model	439.48	22	.000	5	234.35	.000	.949	.931	.028	.029	.071
7 _p ^b	Partially strong invariance model	210.93	20	.000	3	5.80	.122	.977	.965	.000	-.005	.050
8	Partially strict invariance model	303.25	26	.000	6	92.33	.000	.966	.961	.011	.004	.053
8 _p ^b	Final partially strict invariance model	223.56	24	.000	4	12.64	.013	.976	.970	.001	-.005	.047
<i>Positive expectancy evaluations</i>												
9	Configural invariance model	144.62	34	.000				.996	.993			.030
10	Metric invariance model	161.95	41	.000	7	17.33	.015	.996	.994	.000	-.001	.028
11	Strong invariance model	200.25	48	.000	7	38.30	.000	.995	.994	.001	.000	.029
12	Strict invariance model	228.60	56	.000	8	28.35	.000	.994	.994	.001	.000	.029
<i>Negative expectancy evaluations</i>												
13	Configural invariance model	533.98	24	.000				.965	.938			.076
14	Metric invariance model	565.55	30	.000	6	31.57	.000	.963	.948	.002	-.010	.069
15	Strong invariance model	579.86	36	.000	6	14.31	.026	.962	.956	.001	-.008	.064
16	Strict invariance model	645.97	43	.000	7	66.10	.000	.958	.959	.004	-.003	.061

Note. df = degree of freedom; CFI = comparative fit index; TLI = Tucker Lewis index; RMSEA = root mean square error of approximation.

Metric invariance model = configural invariance model + all factor loadings invariant; strong invariance model = metric invariance model + all measurement intercepts invariant; partially strong variance model = metric invariance model + some measurement intercepts invariant; partially strict invariance model = partially strong variance model + all unique variance invariant; final partially strict invariance model = partially strong variance model + some unique variance invariant.

^aEvery comparison is done between the current model fit and the previous one, except for the comparisons marked with superscripts b.

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$N_s = 7,450 - 7,535$.
Compares the model fit and the one that is two rows above.
 q

Table 4

Unstandardized Parameter Estimates for Final Partially Strict Invariance Models

Group	Item Estimates (B (SE))							
Positive Outcome Expectancies across Ethnic Groups								
Loadings		enjoy sex more	brave and daring	courageous	easier to talk to people	a better lover	take risks	act social
	AFI							
	EUR	.40 (.01)	.77 (.01)	.73 (.01)	.59 (.01)	.41 (.01)	.79 (.01)	.57 (.01)
	ASI							
	HIS							
Intercepts								
	AFI		2.56 (.03)	2.52 (.04)	2.80 (.04)			2.95 (.03)
	EUR	2.13 (.01)	2.72 (.01)	2.65 (.01)	3.22 (.01)	1.98 (.01)	2.72 (.01)	3.36 (.01)
	ASI		2.66 (.03)	2.61 (.03)	3.03 (.03)			3.02 (.03)
	HIS		2.64 (.03)	2.56 (.03)	3.03 (.03)			3.17 (.03)
Unique Variances								
	AFI							
	EUR	1.02 (.02)	.43 (.01)	.49 (.01)	.62 (.01)	.87 (.02)	.42 (.01)	.54 (.01)
	ASI							
	HIS							
Negative Outcome Expectancies across Ethnic Groups								
Loadings		dizzy	clumsy	loud, boisterous, or noisy	act aggressively	guilty	moody	
	AFI							
	EUR	.28 (.01)	.28 (.01)	.33 (.02)	.51 (.02)	.55 (.02)	.77 (.02)	
	ASI							
	HIS							
Intercepts								
	AFI		3.02 (.03)	2.58 (.04)				
	EUR	3.03 (.01)	3.23 (.01)	2.90 (.01)	2.02 (.01)	1.99 (.01)	2.10 (.01)	
	ASI		3.03 (.02)	2.65 (.03)				
	HIS		3.13 (.03)	2.71 (.03)				
Unique Variances								
	AFI	.92 (.02)	.96 (.05)	.95 (.02)	.85 (.02)	.93 (.06)	.51 (.05)	
	EUR		.68 (.02)			.88 (.02)	.47 (.02)	
	ASI		.87 (.04)			.80 (.04)	.54 (.04)	
	HIS		.85 (.04)			1.00 (.05)	.54 (.04)	

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		dizzy	clumsy	loud, boisterous, or noisy	act aggressively	guilty	moody
<i>Negative Outcome Expectancies across Gender</i>							
Loadings	F	.28 (.01)	.28 (.01)	.33 (.02)	.52 (.02)	.55 (.02)	.76 (.02)
	M						
Intercepts	F	3.04 (.01)	3.23 (.01)	2.82 (.01)	1.94 (.01)	1.99 (.01)	2.10 (.01)
	M		3.06 (.02)		2.25 (.02)		
Unique Variances	F	.85 (.02)	.68 (.01)	.96 (.02)	.82 (.02)	.89 (.02)	.50 (.02)
	M	1.08 (.04)	.92 (.03)				

Note. Specific parameters that are invariant are reported only once to denote that it is the same value across groups. AFI = African Americans; EUR = European Americans; ASI = Asian Americans; HIS = Hispanic Americans; F = Female; M = Male. *N*s = 7,524–7,562.

Table 5

Standardized Estimates From Invariance Analyses for the Relation Between B-CEOA Scores and Alcohol Use Disorders Identification Test (AUDIT) Scores across Ethnic Groups

Model	Model Description	df	χ^2	$\chi^2\text{-}p$	CFI	TLI	Slopes				Intercepts			
							AFI	EUR	ASI	HIS	AFI	EUR	ASI	HIS
Positive outcome expectancies														
1	Freely estimate slopes and intercepts						.202	.362	.255	.322	4.122	5.116	4.439	4.126
2	Invariant slopes	3	5.44	.142	.000	-.001								
3	Invariant slopes and intercepts	3	8.87	.031	.001	-.001								
Negative outcome expectancies														
4	Freely estimate slopes and intercepts						.082	.066	.156	.100	9.940	11.783	10.458	10.728
5	Invariant slopes	3	7.08	.069	.000	-.005								
6	Invariant slopes and intercepts	3	41.76	.000	.005	-.001								
Positive expectancy evaluations														
7	Freely estimate slopes and intercepts						.129	.264	.186	.282	3.427	4.204	3.614	3.384
8	Invariant slopes	3	9.25	.026	.000	.000								
9	Invariant slopes and intercepts	3	57.63	.000	.002	.001								
Negative expectancy evaluations														
10	Freely estimate slopes and intercepts						.250	.223	.287	.230	4.236	4.486	4.704	3.999
11	Invariant slopes	3	5.37	.147	.000	-.001								
12	Invariant slopes and intercepts	3	6.74	.081	.000	-.001								

Note. CFI = comparative fit index; TLI = Tucker Lewis index; AFI = African Americans; EUR = European Americans; ASI = Asian Americans; HIS = Hispanic Americans.

$N = 7,743 - 7,764$.

Standardized Estimates From Invariance Analyses for the Relation Between B-CEOA Scores and Alcohol Use Disorders Identification Test (AUDIT) Scores across Gender

Table 6

Model	Model Description	df	χ^2	χ^2 -p	CFI	TLI	Slopes		Intercepts		
							Male	Female	Male	Female	
Positive outcome expectancies											
1	Freely estimate slopes and intercepts										
2	Invariant slopes	1	10.09	.001	.000	.000		.324	.346	4.804	4.649
3	Invariant slopes and intercepts	1	.39	.532	.000	.000					
Negative outcome expectancies											
4	Freely estimate slopes and intercepts							.113	.070	10.659	10.898
5	Invariant slopes	1	.84	.361	.000	-.004					
6	Invariant slopes and intercepts	1	23.84	.000	.002	-.001					
Positive expectancy evaluations											
7	Freely estimate slopes and intercepts							.263	.261	3.633	3.918
8	Invariant slopes	1	.70	.403	.000	.000					
9	Invariant slopes and intercepts	1	.92	.337	.000	.000					
Negative expectancy evaluations											
10	Freely estimate slopes and intercepts							.304	.195	4.182	4.411
11	Invariant slopes	1	8.17	.004	.000	-.001					
12	Invariant slopes and intercepts	1	3.00	.083	.001	-.001					

Note. CFI = comparative fit index; TLI = Tucker Lewis index.

$N = 7,715 - 7,736$.