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Ham, Lindsay S.; Stewart, Sherry H.; Norton, Peter J.; and Hope, Debra A., "Psychometric Assessment of the Comprehensive Effects of Alcohol Questionnaire: Comparing a Brief Version to the Original Full Scale" (2005). *Faculty Publications, Department of Psychology*. 910.

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Published in *Journal of Psychopathology and Behavioral Assessment* 27:3 (September 2005), pp. 141–158;
doi: 10.1007/s10862-005-0631-9
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Accepted June 18, 2004.

Psychometric Assessment of the Comprehensive Effects of Alcohol Questionnaire: Comparing a Brief Version to the Original Full Scale

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Abstract

The current set of studies compared the psychometric properties of the original Comprehensive Effects of Alcohol Questionnaire (CEOA) to a 15-item version (B-CEOA) in a nonclinical undergraduate sample ($N = 581$), and attempted to replicate and extend the B-CEOA findings in an undergraduate sample referred to an alcohol intervention ($N = 734$). Psychometric assessment included construct validity, internal consistency, and concurrent validity, using both “positive” and “negative” expectancy items in all analyses. Results provided further support for the empirical validity of the original CEOA, and provided support for the use of the B-CEOA despite the reduction in the number of items. The B-CEOA factor structures obtained using exploratory and confirmatory techniques provided support for a 4-factor structure of expectancies and 3-factor structure of valuations. Findings reveal potential problems with “positive” and “negative” expectancy items. Trade-offs regarding factor structure, internal consistency, and administration time should be considered in using the B-CEOA vs. the CEOA.

Keywords: expectancy, valuation, psychometrics, assessment, alcohol

According to expectancy theory, "alcohol outcome expectancies" refer to the beliefs that people hold about the effects of consuming alcohol (Brown, Goldman, Inn, & Anderson, 1980). These expectancies are thought to influence drinking behavior. Several studies have supported the relationship between expectancies and problematic drinking behavior (Brown, 1985; Martin & Hoffman, 1993; Reis & Riley, 2000; Wood, Nagoshi, & Dennis, 1992). Alcohol expectancies predict future drinking in nondrinking adolescents (Smith, Goldman, Greenbaum, & Christiansen, 1995) and discriminate problem from nonproblem drinkers (Brown, Goldman, & Christiansen, 1985). Expectancy challenge techniques, in which the goal is to reduce expectancies, have been shown to be effective in reducing drinking levels (Darkes & Goldman, 1993; Jones-Madsen, Silvia-Young, & Richman, 1995). It seems that expectancies are important in understanding drinking behavior, and may provide directions for problem drinking prevention and intervention.

Given their importance, it is vital that alcohol expectancies are adequately assessed. The most widely used alcohol outcome expectancies measure has been the Alcohol Expectancy Questionnaire (AEQ; Brown et al., 1980), which assesses six distinct positive alcohol expectancies (i.e., expectancies regarding the desirable consequences of alcohol use). The AEQ and other similar expectancy measures have been criticized for neglecting to assess negative alcohol expectancies (i.e., expectancies regarding the undesirable consequences of alcohol use) as well as the perceived desirability, or subjective valuation, of alcohol's effects (i.e., whether an individual views a particular effect as good or bad; Adams & McNeil, 1991; Fromme, Stroot, & Kaplan, 1993; Leigh, 1989). The Comprehensive Effects of Alcohol questionnaire (CEOA; Fromme et al., 1993) was developed in order to address these two criticisms. The CEOA includes items addressing positive expectancies, negative expectancies, and valuations of various possible consequences of drinking. The CEOA also uses a continuous response format, in contrast to the AEQ's dichotomous true-false format, to allow for assessment of the "strength" of agreement with each item. Fromme et al. (1993) identified four theoretically distinct "positive" expectancies (Sociability, Tension Reduction, enhanced Sexuality, and Liquid Courage) as well as three theoretically distinct "negative" expectancies (Cognitive & Behavioral Impairment, Risk & Aggression, and negative Self-Perception) and included items on the CEOA to tap each of these seven expectancy domains. They also allowed respondents to rate their own subjective valuations of each of these expected effects.

Positive expectancies have been studied substantially more than negative expectancies, and have typically been associated with heavier drinking and problem drinking (e.g., Brown, 1985; Fromme et al., 1993). The association between negative expectancies and drinking behavior has been less clear. There have been inconsistencies in the direction of negative expectancies' relationship with drinking behavior. Some have asserted that negative expectancies are related to less drinking behavior, based on the notion that holding such negative beliefs about the outcomes of drinking would provide motivation to refrain from drinking (e.g., Cox, Klinger, & Blount, 1993; Miller, 1985). Using the Negative Alcohol Expectancy Questionnaire (NAEQ; NIAAA, 1995), Jones and McMahon (1994) found that negative expectancies regarding distal drinking outcomes (i.e., expected aversive "next day" consequences) formed a reliable association with less relapse. Using the CEOA, Fromme et al. (1993) and Valdivia and Stewart (in press) found that negative expectancies predicted

less drinking. Others assert that negative expectancies are related to greater drinking behavior, because more frequent or experienced drinkers have more experience with the negative effects of alcohol (e.g., Lee, Greely, & Oei, 1999). Expectancy of losing control from drinking on the Drinking Expectancy Questionnaire (DEQ; Young & Knight, 1989) was related to greater drinking frequency (Lee et al., 1999). There have also been inconsistencies regarding the predictive power of negative expectancies in comparison to positive expectancies with studies showing negative expectancies to be as powerful or more powerful predictors of drinking outcomes than positive expectancies (e.g., Jones & McMahon, 1994; McMahon, Jones, & O'Donnell, 1994) and others finding just the reverse (e.g., Stacy, Widaman, & Marlatt, 1990). Only two of these studies of expectancies (i.e., Fromme et al., 1993; Valdivia & Stewart, in press) have used the CEOA to examine positive and negative expectancies.

Expectancies have also been studied more than valuations of alcohol's effects. According to classic expectancy-value theory (Bandura, 1977), an outcome expectancy will only increase behavior if the person desires or values the expected outcome. Heavier drinkers view the negative effects of alcohol as more benign than lighter drinkers (Williams & Ricciardelli, 1996). Thus, the so-called "negative" expectancies have less of an effect in preventing drinking among heavy drinkers. Valuations of alcohol's effects have been found to increase the predictive utility of expectancies of alcohol use (Leigh, 1987; Valdivia & Stewart, in press) and to independently predict posttreatment abstinence survivorship for alcoholic individuals (Jones & McMahon, 1996). Assessment of valuations may be the missing link that accounts for the discrepancies in the positive and negative expectancy research. Recent work by Fromme and D'Amico (2000) with adolescents indicates that the subjective valuations of alcohol's effects may be more important for the so-called "negative" expectancies (i.e., Cognitive and Behavioral Impairment and negative Self-Perceptions) than positive expectancies in predicting alcohol use. Another study found that positive expectancies and positive valuations of "negative" outcomes were significant independent predictors of drinking and alcohol-related health problems (Werner, Walker, & Greene, 1993). Both negative expectancies and valuations appear to be important constructs in addition to the traditional focus on positive expectancies in alcohol research.

According to Dimeff, Baer, Kivlahan, and Marlatt (1999), the CEOA is a sound and comprehensive measure, but given that its administration time can be as long as 10 min, it may be too lengthy for many clinical purposes. In a brief college alcohol intervention called the Alcohol Skills Training Program (ASTP; see Study 2) developed by the University of Washington research group (Addictive Behaviors Research Center, 1997), the allotted time for assessment is approximately 20 min. This does not leave much time for other assessment measures when considering the administration time for the original CEOA. Therefore, there is a need for a brief version of the CEOA. In the current set of studies, the psychometric properties of a brief CEOA (B-CEOA) were compared with those of the original CEOA in a nonclinical undergraduate sample in terms of factor structure, internal consistency, and concurrent validity of the expectancy and valuation scales. The BCEOA results were replicated and extended to a referred undergraduate sample (i.e., those referred to a campus alcohol intervention) to evaluate the brief measure's clinical utility.

Study 1

This study utilized a nonclinical undergraduate sample to examine the psychometric properties of both the original CEOA and the B-CEOA. The CEOA was administered to the participants and the B-CEOA items were extracted. In examining the factor structure of expectancies, previous studies have entered positive and negative expectancy items into separate analyses (Fromme et al., 1993; Valdivia & Stewart, in press). To provide a more stringent test of the structure of the CEOA, all 38 items (positive and negative alike) were entered into a single factor analysis. Given that men engage in more heavy drinking (e.g., Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994) and there is a preponderance of women in this sample, additional B-CEOA factor analyses were conducted to ensure that the factor structure would be maintained across gender. To assess concurrent validity, weekly alcohol consumption was used as the criterion variable. Although it was expected that positive expectancies would predict increased drinking behavior, exploratory regression analyses were conducted to determine the relationship between negative expectancies and drinking behavior due to inconsistencies in previous results (e.g., Lee et al., 1999; McMahon, Jones, & O'Donnell, 1994; Stacy et al., 1990). With respect to the concurrent validity of valuations, it was hypothesized that the more one values a particular effect of alcohol, regardless of whether that outcome is theoretically negative or positive, the greater the drinking behavior, consistent with expectancy-value theory (Bandura, 1977). It was expected that the psychometric results would be maintained across the original CEOA and the B-CEOA, with the exception that fewer factors would likely emerge with the brief version due to the smaller number of items being entered into the factor analyses.

Method

Participants

The sample consisted of 581 university students recruited through the undergraduate student participant pool at Dalhousie University. The sample was 68.5% women with a mean age of 19.7 years ($SD = 3.8$, range = 16–48 years). The sample was 71.6% first year students, 16.6% in second year, 4.6% in third year, and 2.4% in fourth year or higher, with 4.8% failing to report their year in university. Forty-seven percent of the students were of the legal drinking age. Although a substantial portion of the students were under Nova Scotia's legal drinking age of 19, a 2002 study on Nova Scotia teen drug use indicated that 83% of men and 79% of women in grade 12 had consumed alcohol (Poulin, 2002). Eighty-one percent of students in the current sample reported that they had drunk alcohol within the past month. The sample reported drinking an average of 5.77 drinks per week ($SD = 7.74$).

Measures

Participants were administered the Comprehensive Effects of Alcohol scale (CEOA; Fromme et al., 1993), which includes 38 items that assess expectancies and valuations. Participants indicate their degree of agreement that a particular effect will likely occur to the individual respondent from drinking (i.e., expectancies) on a 1–4 scale (1 = *disagree* to 4 = *agree*). Participants further indicate whether and to what degree each effect would be desirable or

undesirable (i.e., valuations) to the individual respondent on a second 1–5 scale (1 = *bad* to 5 = *good*). The CEOA has been shown to have adequate internal consistency, temporal stability, construct validity, and criterion validity (Fromme et al., 1993; Valdivia & Stewart, in press). The 15-item version of the CEOA (B-CEOA) was developed by the University of Washington research group for use in their ASTP brief college alcohol intervention (Addictive Behaviors Research Center, 1997). The ASTP intervention manual including the B-CEOA is available from the authors. The B-CEOA includes a subset of items assessing expectancies and valuations extracted from the original CEOA. B-CEOA items were chosen based on the highest factor loadings on each expectancies scale according to those found in the factor analysis of the original CEOA by Fromme and colleagues (1993). The resulting 15 items included two items from each of Fromme and colleagues' (1993) seven expectancies scales, except for the Risk & Aggression scale, which contained three items. In this study, these 15 items were extracted from the scores on the original CEOA for each participant to examine the psychometrics of the B-CEOA in comparison to the CEOA. There have been no psychometric data collected to date for the B-CEOA.

Information on drinking behavior was obtained using the quantity and frequency method (see Stewart, Peterson, & Pihl, 1995). Participants first indicated the number of times per week that they typically engage in drinking behavior. Participants who engage in drinking less than once per week were asked to provide monthly or yearly drinking frequency. Participants then indicated their typical number of alcoholic beverages consumed per drinking occasion. Drinking behavior items were embedded in a questionnaire on basic demographic information (gender, age, year in university) to reduce their salience (cf. Sobell & Sobell, 1990). Questions were posed in an open-ended format rather than a forced-choice format and participants were ensured confidentiality to increase response accuracy (cf. Sobell & Sobell, 1990). Frequency and quantity estimates were multiplied to yield a composite weekly drinking estimate (cf. Stewart et al., 1995).

Procedure

Participants completed measures voluntarily during class time. Of the 581 participants, 575 completed the expectancy portion of the CEOA and 548 completed the valuations portion of the CEOA.

Results

Construct Validity: Factor Structure

The factor structures of the CEOA and B-CEOA were determined separately for expectancies and valuations using exploratory principal components analyses (PCAs). Although Fromme et al. (1993) employed both exploratory and confirmatory factor analyses, the current study used exploratory PCAs as the B-CEOA has never undergone factor analyses. Confirmatory factor analysis would be inappropriate for the B-CEOA at this initial stage (Floyd & Widaman, 1995) and the use of exploratory PCAs provides the opportunity to compare the results from both versions. To provide a more stringent test of construct (fac-

torial) validity, PCAs included the “positive” and “negative” outcome items simultaneously, contrary to Fromme et al.’s (1993) and Valdivia and Stewart’s (in press) approach. Because of previous findings of intercorrelations among alcohol expectancy factors (Goldman, Brown, Christiansen, & Smith, 1991; Leigh & Stacy, 1991), oblique rotation was used (i.e., Oblimin; cf., Fromme et al., 1993), which allowed for intercorrelation among factors (Tabachnick & Fidell, 2001). For the PCAs, the number of factors to retain was determined through consideration of (a) results of parallel analysis (Horn, 1965; Longman, Cota, Holden, & Fekken, 1989); (b) simple structure (Thurstone, 1947); and (c) factor interpretability. Parallel analysis is a procedure that statistically determines the break in the scree plot (Horn, 1965; Longman et al., 1989); it produces more accurate factor extractions than the commonly used Kaiser’s (1960) eigenvalues > 1.0 rule (Zwick & Velicer, 1986). The parallel analyses were conducted using both the mean eigenvalues and the 95th percentile eigenvalues (cf. Longman et al., 1989). In interpreting factors, a cutoff of $\geq .40$ was used to determine salient loadings.

Full-Scale CEOA Expectancies. A PCA was conducted on the 38 full-scale CEOA expectancy items. Eigenvalues obtained in the PCAs are shown in Table I. Parallel analyses using mean and 95th percentile eigenvalues supported five-factors in contrast to the eight factors suggested by Kaiser’s (1960) rule. A seven-factor model provided fewer hyperplane items (i.e., items that do not have salient loadings on any factors in the model)¹ and accounted for more variance than the five-factor model or an alternative six-factor model. The seven-factor model was chosen; it accounted for 54.1% of the variance in the 38 CEOA expectancy items. Table I shows the rotated factor loadings for this seven-factor solution. The seven-factor solution had adequate simple structure (Thurstone, 1947) [i.e., no complex items, only one hyperplane item, and sufficient salient loadings per factor (range = 3–8)]. Correlations among the factors ranged from $< .01$ to $.33$. The seven expectancy factors corresponded extremely closely to the seven expectancy scales proposed by Fromme et al. (1993) and were labeled Liquid Courage, Cognitive & Behavioral Impairment, Risk & Aggression, Tension Reduction, Self-Perception, Sexuality, and Sociability, respectively.

Table I. Principal Components Analyses of the Comprehensive Effects of Alcohol: Obliquely Rotated Factor Loadings (Pattern Matrix) for Expectancies in the Nonclinical Sample ($N = 575$)

	Factor 1: LC	Factor 2: CBI	Factor 3: RA	Factor 4: TR	Factor 5: SP	Factor 6: Sex	Factor 7: Soc
Eigenvalues	9.34	3.34	2.52	1.73	1.36	1.18	1.04
Variance explained (%)	24.68	8.79	6.62	4.55%	3.58	3.10	2.75
Cronbach’s alpha	.84	.82	.82	.66	.68	.73	.82
<i>CEOA item content (theoretical scale)</i>							
21. Creative (LC)	.65	-.07	-.02	.16	.15	.08	.06
20. Unafraid (LC)	.60	.08	.35	.19	-.08	-.06	.09

Table 1 continued

	Factor 1: LC	Factor 2: CBI	Factor 3: RA	Factor 4: TR	Factor 5: SP	Factor 6: Sex	Factor 7: Soc
22. Courageous (LC)	.58	.06	.31	.14	.01	.06	.12
19. Brave and daring (LC)	.57	-.10	.37	.08	-.08	-.00	.15
6. Writing impaired (CBI)	-.08	.72	.03	.02	-.13	.11	-.06
8. Difficulty thinking (CBI)	.00	.71	.02	.04	.12	-.03	-.05
11. Head fuzzy (CBI)	.04	.66	-.13	.07	.09	.06	-.02
2. Dulled senses (CBI)	.12	.66	-.04	-.09	-.14	.02	.00
15. Clumsy (CBI)	-.06	.60	.05	-.04	.09	-.04	.25
26. Responses slow (CBI)	-.11	.57	.14	.26	.12	-.06	.06
13. Dizzy (CBI)	-.02	.50	-.03	-.04	.28	-.04	.09
9. Neglect obligations (CBI)	.05	.49	.23	-.01	.19	-.16	.00
35. Tough (RA)	.02	.06	.72	-.02	.09	.18	-.03
25. Aggressive (RA)	-.01	.02	.70	-.10	.09	.09	-.08
37. Powerful (LC)	.18	-.05	.64	-.02	-.02	.25	-.08
36. Take risks (RA)	.13	.04	.62	.15	.01	-.01	.20
17. Loud, boisterous, noisy (RA)	-.04	.17	.51	-.05	.13	-.15	.31
10. Dominant (RA)	.13	.11	.50	-.05	.00	.17	.00
29. Calm (TR)	.11	-.04	-.04	.75	-.02	.10	.00
27. Relaxed (TR)	-.04	.12	.07	.69	-.12	-.10	.23
18. Peaceful (TR)	.26	.04	-.17	.61	.05	.18	-.11
33. Self-critical (SP)	.07	-.02	-.04	.11	.70	.06	-.03
28. Guilty (SP)	-.16	.01	.02	.01	.67	-.06	-.01
4. Problems worse (SP)	.04	.06	-.03	-.06	.60	.04	-.05
30. Moody (SP)	-.04	.06	.23	-.04	.59	.04	.05
23. Shaky, jittery next day (CBI)	.19	.07	.11	-.20	.47	.05	.06
12. Enjoy sex more (Sex)	-.06	.03	.09	.05	-.05	.77	.01
32. Better lover (Sex)	-.12	-.11	.19	.10	.06	.76	.04
7. Sexy (Sex)	.12	.15	.08	-.07	.02	.53	.14
16. Act out fantasies (Sex)	.08	.08	.13	.09	.21	.44	.14
34. Talkative (Soc)	-.23	-.02	.20	.12	.10	-.07	.78
38. Sociable (Soc)	-.08	.05	.01	.11	-.01	.06	.72
1. Outgoing (Soc)	.15	.02	-.02	-.14	-.12	.06	.67

Table I continued

	Factor 1: LC	Factor 2: CBI	Factor 3: RA	Factor 4: TR	Factor 5: SP	Factor 6: Sex	Factor 7: Soc
14. Friendly (Soc)	.17	.13	-.18	.08	-.05	.08	.66
31. Easier to talk to people (Soc)	-.06	.02	.04	.21	.00	.13	.64
3. Humorous (Soc)	.14	.02	-.03	-.18	-.08	.13	.53
24. Energetic (Soc)	.27	-.15	.08	.02	.09	-.07	.51
5. Express Feelings (Soc)	.20	.05	-.15	-.01	.33	.33	.27

Note: Salient loadings ($\geq |.40|$) are indicated in bold.

LC = Liquid courage; CBI = Cognitive & Behavioral Impairment; RA = Risk & Aggression; TR = Tension Reduction; SP = Self-Perception; Sex = Sexuality; Soc = Sociability.

B-CEOA Expectancies. A PCA with oblique rotation was performed on the 15 B-CEOA expectancy items (see Table II for eigenvalues). Parallel analyses using mean and 95th percentile eigenvalues supported four-factors, consistent with the four-factors suggested by Kaiser's (1960) rule. This four-factor solution accounted for 57.9% of the variance in B-CEOA expectancy item scores. Table II shows the rotated factor loadings for this four-factor solution. This model had adequate simple structure with no hyperplane items and only one complex item. Correlations among the factors ranged from .05 to .25. Given the pattern of results, the factors were labeled Liquid Courage/Sociability/Risk & Aggression, Self-Perception/Cognitive & Behavioral Impairment, Sexuality, and Tension Reduction, respectively.

Examination of the B-CEOA expectancies factor structure separately for men and women yielded similar results, with four-factor solutions. The factor solutions consisted of the same four factors as the previous analyses for both men (variance accounted for 57.7%) and women (variance accounted for 58.5%).

Table II. Principal Components Analyses of the Brief Comprehensive Effects of Alcohol: Obliquely Rotated Factor Loadings (Pattern Matrix) for Expectancies in the Nonclinical Sample ($N = 575$)

	Factor 1: RA/LC/Soc	Factor 2: SP/CBI	Factor 3: Sex	Factor 4: TR
Eigenvalues	4.36	1.92	1.26	1.14
Variance explained (%)	29.04	12.83	8.39	7.61
Cronbach's alpha	.81	.60	.60	.60
<i>B-CEOA item content (theoretical scale)</i>				
19. Brave and daring (LC)	.73	-.02	.22	-.09
31. Easier to talk to people (Soc)	.71	-.11	-.04	.18
38. Sociable (Soc)	.70	-.04	-.09	.13
36. Take risks (RA)	.67	.07	.25	-.12
22. Courageous (LC)	.64	.02	.31	.09
17. Loud, boisterous, noisy (RA)	.57	.31	.01	-.27
28. Guilty (SP)	-.33	.75	.16	.05

Table II continued

	Factor 1: RA/LC/Soc	Factor 2: SP/CBI	Factor 3: Sex	Factor 4: TR
13. Dizzy (CBI)	.20	.65	-.27	.10
30. Moody (SP)	.02	.64	.22	-.11
15. Clumsy (CBI)	.41	.55	-.30	.10
32. Better lover (Sex)	.11	.01	.77	.14
12. Enjoy sex more (Sex)	.15	.00	.65	.23
25. Aggressive (RA)	.25	.23	.45	-.39
18. Peaceful (TR)	.04	.11	.13	.77
29. Calm (TR)	.12	.03	.11	.74

Note: Salient loadings ($\geq .40$) are indicated in bold.

LC = Liquid Courage; CBI = Cognitive & Behavioral Impairment; RA = Risk & Aggression; TR = Tension Reduction; SP = Self-Perception; Sex = Sexuality; Soc = Sociability.

Full-Scale CEOA Valuations. A PCA was conducted on the 38 CEOA valuation items (see Table III for eigenvalues). Parallel analysis using mean and 95th percentile eigenvalues provided significant and marginally significant support, respectively, for six factors. Eight factors were suggested by Kaiser's (1960) rule. The six-factor model had fewer hyperplane items, included only one complex loading, and was more readily interpretable than the seven- or eight-factor models. The six-factor solution accounted for 53.3% of the variance. Table III shows the rotated factor loadings for the six-factor solution. The six-factor solution had adequate simple structure: one complex item, two hyperplane items, and sufficient salient loadings per factor (range = 4–9). Correlations among these factors ranged from $< .01$ to $.40$. The six valuation factors corresponded closely to the seven valuation scales proposed by Fromme et al. (1993) save that Risk & Aggression and Liquid Courage items loaded on a single factor. The six extracted factors were labeled Sociability, Self-Perception, Liquid Courage/Risk & Aggression, Tension Reduction, Cognitive & Behavioral Impairment, and Sexuality, respectively.

Table III. Principal Components Analyses of the Comprehensive Effects of Alcohol: Obliquely Rotated Factor Loadings (Pattern Matrix) for Valuations in the Nonclinical Sample ($N = 548$)

	Factor 1: Soc	Factor 2: SP	Factor 3: LC/RA	Factor 4: TR	Factor 5: CBI	Factor 6: Sex
Eigenvalues	8.17	5.91	2.00	1.51	1.41	1.30
Variance explained (%)	21.49	15.56	5.18	3.98	3.71	3.41
Cronbach's alpha	.86	.79	.82	.75	.70	.83
<i>CEOA item content (theoretical scale)</i>						
1. Outgoing (Soc)	.75	-.01	.05	-.11	.02	.02
38. Sociable (Soc)	.73	-.06	-.06	.17	.06	.04
31. Easier to talk to people (Soc)	.71	-.10	.04	.17	-.03	.07
3. Humorous (Soc)	.69	-.01	-.00	-.24	.14	.11
14. Friendly (Soc)	.67	.09	-.06	.15	-.25	.17

Table III continued

	Factor 1: Soc	Factor 2: SP	Factor 3: LC/RA	Factor 4: TR	Factor 5: CBI	Factor 6: Sex
34. Talkative (Soc)	.66	.10	-.10	.05	.14	.10
5. Express feelings (Soc)	.63	.09	.17	.01	-.06	-.05
21. Creative (LC)	.42	-.26	.23	.21	-.00	.13
24. Energetic (Soc)	.39	-.27	.29	.24	.07	.09
28. Guilty (SP)	.10	.73	.04	-.09	-.08	-.09
23. Shaky, jittery next day (CBI)	.05	.64	-.09	-.14	.08	-.00
9. Neglect obligations (CBI)	-.13	.61	.13	.05	.10	.04
26. Responses slow (CBI)	.05	.52	-.01	-.06	.35	.02
4. Problems worse (SP)	-.33	.52	.13	.42	-.07	-.04
8. Difficulty thinking (CBI)	-.08	.50	.04	.11	.33	.14
33. Self-critical (SP)	.05	.48	.26	-.01	-.15	-.11
6. Writing impaired (CBI)	-.14	.42	-.09	.17	.25	.23
30. Moody (SP)	-.07	.42	.21	-.20	-.08	-.06
2. Dulled senses (CBI)	-.16	.36	-.06	.27	.32	.20
36. Take risks (RA)	-.05	.11	.71	.05	.04	-.02
20. Unafraid (LC)	.01	-.18	.68	.19	.11	.05
19. Brave and daring (LC)	.08	-.10	.68	.17	.10	.11
37. Powerful (LC)	-.09	.03	.66	-.02	-.04	.18
22. Courageous (LC)	.16	-.13	.64	.22	.06	.06
35. Tough (RA)	-.01	.24	.57	-.16	.07	-.00
25. Aggressive (RA)	-.03	.28	.50	-.17	.02	-.00
10. Dominant (RA)	.03	.13	.44	-.26	-.00	.16
29. Calm (TR)	.31	-.12	.07	.57	.04	.07
27. Relaxed (TR)	.23	-.09	.09	.51	.03	.17
18. Peaceful (TR)	.35	-.04	.14	.47	-.12	.09
11. Fuzzy (CBI)	.09	-.08	-.01	-.02	.81	.03
13. Dizzy (CBI)	-.02	-.05	.13	.02	.78	-.08
15. Clumsy (CBI)	.10	.33	-.00	.05	.61	-.20
17. Loud, boisterous, noisy (RA)	.02	-.02	.31	-.25	.47	.12
12. Enjoy sex more (Sex)	-.02	-.03	.01	-.02	-.17	.90
32. Better lover (Sex)	.06	-.10	-.00	.04	.02	.77
7. Sexy (Sex)	.13	.02	.06	-.12	.05	.70
16. Act out fantasies (Sex)	.12	.10	.19	.04	-.06	.65

Note: Salient loadings ($\geq .40$) are indicated in bold.

LC = Liquid Courage; CBI = Cognitive & Behavioral Impairment; RA = Risk & Aggression; TR = Tension Reduction; SP = Self-Perception; Sex = Sexuality; Soc = Sociability.

B-CEOA Valuations. A PCA with oblique rotation was conducted on the 15 B-CEOA valuation items (see Table IV for eigenvalues). Parallel analyses using mean and 95th percentile eigenvalues supported three factors, consistent with the three factors suggested by Kaiser's (1960) rule. This three-factor solution accounted for 52.9% of the variance. Table IV

shows the rotated factor loadings for this three-factor solution. This model showed adequate simple structure with two complex items and two hyperplane items. An examination of a four-factor model yielded no improvement in simple structure, so the three-factor model was retained as the best solution on the principle of parsimony. Correlations among the three factors ranged from .09 to .29. The factors were labeled Tension Reduction/Sexuality/Sociability, Liquid Courage/Risk & Aggression/Self-Perception, and Cognitive & Behavioral Impairment, respectively.

Table IV. Principal Components Analyses of the Brief Comprehensive Effects of Alcohol: Obliquely Rotated Factor Loadings (Pattern Matrix) for Valuations in the Nonclinical Sample ($N = 548$)

	Factor 1: TR/Soc/Sex	Factor 2: LC/RA/SP	Factor 3: CBI
Eigenvalues	3.89	2.76	1.18
Variance explained (%)	25.90	18.41	7.89
Cronbach's alpha	.81	.72	.61
<i>B-CEOA item content (theoretical scale)</i>			
38. Sociable (Soc)	.79	-.16	.15
31. Easier to talk to people (Soc)	.79	-.06	.08
29. Calm (TR)	.72	-.13	.10
32. Better lover (Sex)	.66	.26	-.05
18. Peaceful (TR)	.65	.06	-.05
12. Enjoy sex more (Sex)	.56	.31	-.19
36. Take risks (RA)	.05	.76	.03
25. Aggressive (RA)	-.16	.69	.07
19. Brave and daring (LC)	.43	.60	.05
22. Courageous (LC)	.48	.50	.02
30. Moody (SP)	-.35	.38	.27
28. Guilty (SP)	-.36	.34	.20
15. Clumsy (CBI)	-.04	-.07	.84
13. Dizzy (CBI)	.14	-.03	.81
17. Loud, boisterous, noisy (RA)	.09	.26	.50

Note: Salient loadings ($\geq |.40|$) are indicated in bold.

LC = Liquid Courage; CBI = Cognitive & Behavioral Impairment; RA = Risk & Aggression; TR = Tension Reduction; SP = Self-Perception; Sex = Sexuality; Soc = Sociability.

Examination of the B-CEOA valuations factor structure separately for men and women yielded similar results, with three-factor solutions. For men (variance accounted for 53.0%), the factors consisted of Tension Reduction/Sexuality/Sociability, Liquid Courage/Risks & Aggression, and Cognitive & Behavioral Impairment/Self-Perception. For women (variance accounted for 51.9%), the factors consisted of Tension Reduction/Sexuality/Sociability, Liquid Courage/Risks & Aggression/Self-Perception, and Cognitive & Behavioral Impairment. Self-Perception items loaded with different factors in the men and women: with Cognitive & Behavioral Impairment in the men and with Liquid Courage/Risks & Aggression in the women.

Internal Consistency²

Internal consistency was assessed using Cronbach's alpha for each of the factors for each of the PCAs. The internal consistencies for the full-scale CEOA expectancy factors were adequate to good, with alpha's ranging from .66 to .84 (see Table I). The internal consistencies for the B-CEOA expectancy factors were adequate to good, with alphas ranging from .60 to .81 (see Table II). CEOA valuations factors demonstrated adequate to good internal consistencies, with alphas ranging from .70 to .86 (see Table III). For B-CEOA valuations, internal consistencies were also adequate to good, with alphas ranging from .61 to .81 (see Table IV). Internal consistency appears to have generally been maintained with the shortened versions of both the expectancy and valuation scales despite the decrease in the number of items.

Concurrent Validity: Weekly Drinking Levels

All regression analyses used factor scores rather than scale scores as predictors since the intent of the study was to establish concurrent validity using a data-driven rather than theory-driven approach. Linear regression was employed to test whether a given block of CEOA factors predicted typical weekly alcohol use (see Tabachnick & Fidell, 2001).

Full Scale CEOA Expectancies. As a block, the seven CEOA expectancy factors explained a significant 10.2% of the variance in drinks per week, $F(7, 557) = 9.02, p < .001$. As shown in Table V (top, left panel), when controlling for the other expectancy factors, the higher the expectancies of Risk & Aggression or enhanced Sexuality from drinking, and the lower the expectancies of negative Self-Perception, the greater the amount of weekly drinking.

B-CEOA Expectancies. As a block, the four B-CEOA expectancies explained a significant 11.9% of the variance in drinks per week, $F(4, 560) = 18.87, p < .001$. As shown in Table V (top, right panel), when controlling for the other B-CEOA expectancies, the higher the expectancies of Risk & Aggression/Liquid Courage/Sociability or enhanced Sexuality from drinking, and the lower the expectancies of negative Self-Perception/Cognitive & Behavioral Impairment, the greater the amount of weekly drinking. The higher the expectancies of Tension Reduction the lower the weekly drinking, when controlling for the other B-CEOA expectancies (see Table V, top, right panel). Although the expectancy factors are not directly comparable across the full scale and brief versions, the types of significant expectancy predictors of weekly alcohol use levels were similar across the two versions of the questionnaire (see Table V).

Full Scale CEOA Valuations. The six CEOA valuation factors explained a significant 11.0% of the variance in drinks per week, $F(6, 530) = 10.95, p < .001$. As shown in Table V (bottom, left panel), when controlling for the other valuations, the higher the positive valuations of negative Self-Perception, Cognitive & Behavioral Impairment, or enhanced Sexuality drinking outcomes, the greater the amount of weekly drinking.

Table V. Summary of the Multiple Regression Analyses Predicting Weekly Alcohol Consumption for the Full and Brief Versions of the Comprehensive Effects of Alcohol Questionnaire in the Non-clinical Sample

CEOA	β	B-CEOA	β
Expectancy Factors (N = 565)		Expectancy Factors (N = 565)	
LC	.04	LC/RA/Soc	.22***
RA	.22***	SP/CBI	-.20***
Soc	.05	Sex	.21***
SP	-.17***	TR	-.08*
CBI	-.07		
Sex	.14**		
TR	-.02		
Valuation Factors (N = 537)		Valuation Factors (N = 537)	
Soc	.01	Soc/Sex/TR	.10*
Sex	.15**	CBI	.12**
TR	.01	LC/RA/SP	.19*
LC/RA	.07		
CBI	.18***		
SP	.13**		

Note: LC = Liquid Courage; CBI = Cognitive & Behavioral Impairment; RA = Risk & Aggression; TR = Tension Reduction; SP = Self-Perception; Sex = Sexuality; Soc = Sociability.

* $p < .05$, ** $p < .01$, *** $p < .001$

B-CEOA Valuations. The three B-CEOA valuation factors explained a significant 7.7% of the variance in drinks per week, $F(3, 533) = 14.90, p < .001$. As shown in Table V (bottom, right panel), when controlling for the other valuation factors, the higher the positive valuations of Sociability/Sexuality/Tension Reduction, Liquid Courage/Risk & Aggression/Self-Perception, or Cognitive & Behavioral Impairment drinking outcomes, the more drinks consumed per week. Although the valuation factors are not directly comparable across CEOA versions, the types of significant valuation predictors of weekly alcohol use levels were similar across the two versions of the questionnaire (see Table V).

Discussion

Study 1 examined the psychometric properties of both the original CEOA scale and the B-CEOA in a nonclinical undergraduate student sample. Comparison of the results from the two versions does provide support for the use of the B-CEOA.

Construct Validity: Factor Structure

Expectancies. As expected, the factor structure of CEOA expectancies was similar to that of Fromme et al.'s (1993) original seven-factor structure (i.e., Liquid Courage, Cognitive &

Behavioral Impairment, Risk & Aggression, Self-Perception, Tension-Reduction, Sexuality, and Sociability), despite the current study's strategy of entering all 38 items (positive and negative) into a single factor analysis. The factor structures obtained in Fromme et al.'s (1993) and Valdivia and Stewart's (in press) work were not merely secondary to their strategy of conducting separate analyses for positive and negative expectancies. The results from the PCA of the B-CEOA expectancies provided support for the use of the B-CEOA, with a four-factor structure. Despite the expected reduced number of factors, the original structure proposed by Fromme et al. (1993) was generally retained in the brief version in that all items had salient loadings on the same factor in which other items from their theoretically expected factors loaded (i.e., both Liquid Courage items had salient loadings on the same factor, etc.).

Valuations. It was expected that the factor structure of CEOA valuations would be similar to that of the expectancy scale (cf. Valdivia & Stewart, in press). The PCA of the valuation items from the original CEOA provided support for a six-factor solution that was similar to the seven-factor solution obtained for expectancies. The current analytic strategy which included all 38 valuation items in a single analysis produced a difference from Valdivia and Stewart's (in press) factor structure in that the valuation of Liquid Courage (purportedly a positive expectancy) and the valuation of Risk & Aggression (putatively a negative expectancy) combined to create a single valuations factor. The Self-Perception items formed an independent factor rather than combining with Risk & Aggression items as in Valdivia and Stewart (in press). These differences are likely due to the change in analytic strategy across studies. The present results and those of Valdivia and Stewart (in press) suggest that the general structure of expectancies and valuations on the full scale CEOA is consistent with the structure proposed by Fromme et al. (1993).

The PCA of the B-CEOA valuations provided support for the use of this shortened version in that the original structure was largely maintained despite the reduction in the overall number of factors to a three-factor solution. The combination of Liquid Courage and Risk & Aggression into one factor as well as the independent factor of Cognitive & Behavioral Impairment factors still existed in this B-CEOA valuations solution, consistent with the factor structure of the original CEOA. The "positive" expectancies of Tension Reduction, Sociability, and enhanced Sexuality outcomes from drinking had salient loadings on the first factor, supporting the conceptualization of these scales as tapping "positive" expectancies (Fromme et al., 1993). Contrary to the original scale, the items from the original Self-Perception factor did not have salient loadings in the three-factor solution. These two items did have reasonably high loadings on the factor including Liquid Courage and Risk & Aggression. It is likely that the failure of the Self-Perception items to have salient loadings were due to gender differences in factor structure, as Self-Perception loaded on the factor with Cognitive and Behavioral Impairment for men and the factor with Liquid Courage/Risks & Aggression for women.

Internal Consistency

For both expectancies and valuations, the internal consistency was maintained in both the original CEOA and B-CEOA solutions despite the reduction in the number of items in the B-CEOA.

Concurrent Validity

Expectancies. Regression analyses revealed similar concurrent validity across the two versions of the CEOA. For the original CEOA, the greater the CEOA expectancies of Risk & Aggression or Sexuality, and the lower the expectancies of negative Self-Perception from drinking, the more one drank per week, consistent with previous work conducted by Fromme et al. (1993). Results of regression analyses conducted on the B-CEOA expectancies provided similar results, with greater expectancies related to Liquid Courage/Risk & Aggression/Sociability (i.e., social drinking outcomes) or Sexuality and the lower the Self-Perception/Cognitive & Behavioral Impairment expectancies, being related to higher weekly alcohol consumption. Surprisingly, the expectancy of Tension Reduction from drinking predicted less weekly consumption, contrary to previous literature (e.g., Brown, 1985; Fromme et al., 1993), although the unique contribution was modest.

As the B-CEOA expectancy factors accounted for similar amounts of variance in weekly consumption (12%, 38-item CEOA: 10%) than the original CEOA, there appears to be promise for the use of the B-CEOA expectancies as predictors of drinking behavior.

Valuations. The concurrent validity was also examined for both versions of the CEOA for valuations. As expected, the more one positively valued CEOA factors of enhanced Sexuality, Cognitive & Behavioral Impairment, or negative Self-Perception from drinking, the more one drank per week. This result supports Fromme and D'Amico's (2000) findings of greater positive valuations related to Cognitive & Behavioral Impairment predicting greater drinking behavior, but contradicts their findings of lesser positive valuations of Self-Perception predicting greater drinking behavior. Similar to the CEOA valuations, the more one positively valued B-CEOA factors of Sociability/Sexuality/Tension Reduction (i.e., positive effects of drinking), Cognitive & Behavioral Impairment, or Liquid Courage/Risk & Aggression/Self-Perception, the greater the weekly consumption.

The B-CEOA valuations factors accounted for less variance (8%) than that of the 38-item CEOA (11%) indicating that predictive power may be lost when removing the 23 items. This difference in variance accounted for may be related to the poorer performance of the Self-Perception items in the valuations factor analysis. Although there may be information lost with the B-CEOA valuations, this loss is not substantial. Given the benefits of using the B-CEOA and the positive results of the B-CEOA with the expectancies in a nonclinical sample, there appears to be promise for the use of this measure. These results were therefore replicated and extended in a sample of students referred to an alcohol intervention.

Study 2

Study 2 examined the psychometrics of the B-CEOA in a sample of undergraduates who were referred to a brief alcohol intervention to fulfill a portion of their disciplinary consequences for violating the campus alcohol policy.³ For establishing the concurrent validity of the B-CEOA, this second study included both measures of weekly alcohol consumption and alcohol-related problems, as assessment of alcohol-related problems is relevant to a sample of students who have already experienced negative consequences due to being referred to the alcohol intervention. It was expected that the factor structure, internal consistency, and concurrent validity would remain similar to that of the B-CEOA in Study 1.

Method

Participants

The sample consisted of 734 students at the University of Nebraska–Lincoln who attended the Alcohol Skills Training Program (ASTP). The sample was 30.5% women with a mean age of 19.3 years ($SD = 1.4$; range = 17–30 years). The sample was 57.7% first year students, 21.7% in second year, 12.4% in third year, and 7.2% in fourth year or higher, with 1.0% failing to report their year in university. Fifteen percent of the students were of the legal drinking age. The sample reported drinking an average of 17.79 ($SD = 13.60$) drinks per week, which is about 12 more drinks per week on average than the nonclinical sample.⁴ The 633 individuals who completed the Rutgers' Alcohol Problem Index reported a mean score of 16.11 ($SD = 12.53$), which is above the recommended clinical cutoff of 15 (e.g., Thombs & Beck, 1994), providing evidence that the sample includes individuals with a clinical level of alcohol problems.

Measures

The participants completed the B-CEOA (Addictive Behaviors Research Center, 1997) described in Study 1. The participants did not complete the full version of the CEOA; instead the participants completed the short version of the questionnaire as a component of their clinical intervention. The participants completed the Alcohol Use Questionnaire (AUQ; Addictive Behaviors Research Center, 1997) and the Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) to assess weekly drinking and drinking-related negative consequences. The AUQ is an eight-item self-report measure that assesses current alcohol use and perceived drinking norms. It includes an item assessing number of drinks per week. The RAPI is a 26-item questionnaire designed to assess problems with drinking among adolescents and young adults, aged 12–21. For each item, respondents indicate on a scale of 0–4 (0 = *never*, 4 = *more than 10 times*) the number of times during the past 6 months they have experienced the particular problem because of their alcohol use. The RAPI has been shown to have high internal consistency (.92) and moderate convergent validity with a composite variable of alcohol use intensity (validity coefficients ranging from .20 to .57; White & Labouvie, 1989).

Procedure

Participants completed a battery of measures for clinical use in two 90-min group ASTP sessions. Students were given the opportunity to request that their responses to the questionnaires be excluded from research when giving consent to treatment. None of the students requested that their responses be excluded from future research.

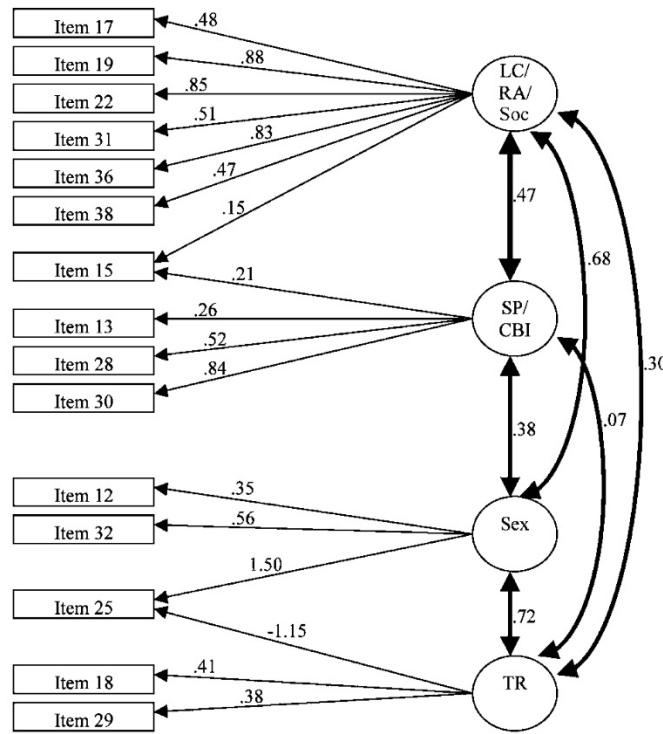
Results

Construct Validity: Confirmatory Factor Analysis

To test the fit of the clinical data to the four- and three-factor models for expectancies and valuations, respectively, obtained using nonclinical samples, confirmatory factor analysis was conducted using LISREL 8.2 (Jöreskog & Sörbom, 1997). Given the sensitivity of maximum likelihood analyses to violations of normality, all items were initially assessed for multivariate outliers and incomplete data. Twenty multivariate outliers were identified by entering all measures into a multiple regression and computing Mahalanobis distance. A chi-square cutoff of $p < .001$ was used as the criteria for multivariate outliers (Tabachnick & Fidell, 1996). A final sample of 700 was used for the subsequent SEM analyses.

As B-CEOA items are ordinal, the data were converted into a matrix of product-moment, polychoric, and polyserial correlations using PRELIS 2.20 (Jöreskog & Sörbom, 1997), which were used to test the expectancies and valuations models. Fit was assessed by the Standardized Root Mean Square Residual (SRMR; ideally ≤ 0.05), Root Mean Square Error of Approximation (RMSEA; ideally .02 to .07), and Non-Normed Fit Index (NNFI; ideally $\geq .95$; see Gerbing & Anderson, 1993; Hu, Bentler, & Kano, 1992; Kline, 1998; Loehlin, 1998; Schumacker & Lomax, 1996).

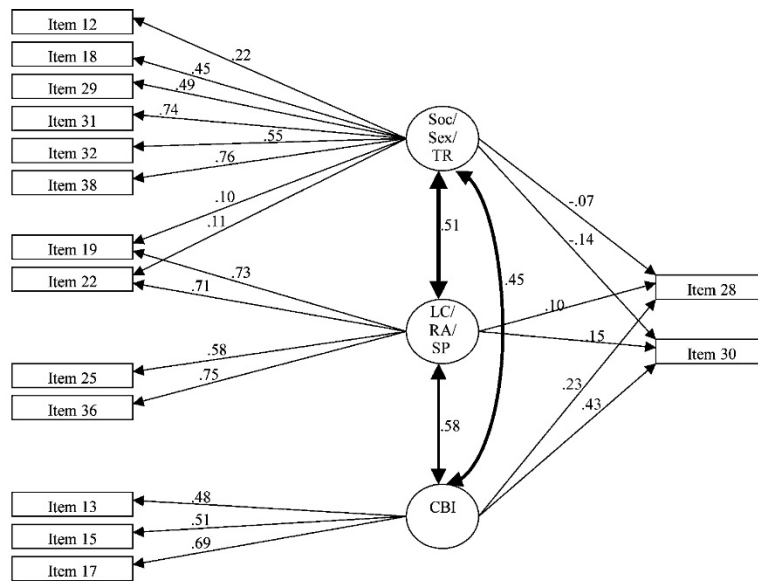
B-CEOA Expectancy. Indices of fit suggested substandard fit to the hypothesized four-factor model, which was based on the highest factor loadings obtained during the nonclinical exploratory factor analysis, SRMR = 0.058, RMSEA = 0.058, NNFI = 0.94. Examination of the Lambda-Y modification indices suggested substantial change if complex item loadings were permitted. Highly elevated modification values were present on the two item-factor loadings that were, in Study 1, loaded just above or just below the $\pm .40$ salience threshold determined a priori. Specifically, item 15 had a secondary loading of .41 on the Liquid Courage/Risk & Aggression/Sociability factor, and item 25 had a secondary loading on the Tension Reduction factor of $-.39$ in Study 1. Respecification of the tested model to estimate the two complex items resulted in better model fit, SRMR = 0.051, RMSEA = 0.054, NNFI = 0.95 (see Fig. 1).



Note. LC=Liquid Courage; CBI=Cognitive & Behavioral Impairment; RA=Risk & Aggression; TR=Tension Reduction; SP=Self-Perception; Sex=Sexuality; Soc=Sociability.

Figure 1. Confirmatory factor analyses of the Brief Comprehensive Effects of Alcohol for Expectancies in the Alcohol Skills Training Program sample ($N = 700$).

B-CEOA Valuations. As was found with the expectancies data, indices of fit suggested substandard fit to the hypothesized three-factor model, which was based on the highest factor loadings obtained during the nonclinical exploratory factor analysis, SRMR = 0.10, RMSEA = 0.066, NNFI = 0.93. Lambda-Y modification indices suggested improvement of fit if certain items that had shown complex or hyperplane loadings in Study 1 were reestimated. Specifically, item 19 had a secondary loading of .43 on Sociability/Sexuality/Tension Reduction, and item 22 had a secondary loading of .48 on Sociability/Sexuality/Tension Reduction in Study 1 and items 28 and 30 were hyperplane in Study 1. Respecification of the tested model to estimate these four items resulted in acceptable model fit, SRMR = 0.046, RMSEA = 0.052, NNFI = 0.96. For clarity, the two items that were hyperplane items in Study 1 are presented on the opposite side of Figure 2 from the other items.



Note. LC=Liquid Courage; CBI=Cognitive & Behavioral Impairment; RA=Risk & Aggression; TR=Tension Reduction; SP=Self-Perception; Sex=Sexuality; Soc=Sociability.

Figure 2. Confirmatory factor analyses of the Brief Comprehensive Effects of Alcohol for valuations in the Alcohol Skills Training Program sample ($N = 700$).

Internal Consistency

Internal consistency for the B-CEOA was assessed using Cronbach’s alpha for each of the factors across valuations and expectancies as in Study 1. The internal consistencies for the expectancy factors were generally adequate to good, with alphas ranging from .59 to .81 (see Table VI), and with only the enhanced Sexuality factor falling below .60. For valuations, the internal consistencies were adequate to good, with alphas ranging from .66 to .77 (see Table VI).

Table VI. Summary of the Multiple Regression Analyses for the Brief Comprehensive Effects of Alcohol Questionnaire in the Alcohol Skills Training Program Sample

Predictor	Cronbach's α	Drinks per week, N = 681 (β)	Alcohol-related problems, RAPI; N = 585 (β)
Drinks per week		—	.47***
<i>B-CEOA Expectancy Factors</i>			
LC/RA/Soc	.81	.15**	.23***
SP/CBI	.60	-.06	.14***
Sex	.59	.17*	.11 [†]
TR	.73	-.05	-.02
Drinks per week		—	.53***
<i>B-CEOA Valuation Factors</i>			
Soc/Sex/TR	.68	.08	.14**
CBI	.66	.13**	.03
LC/RA/SP	.77	.06	-.04

Note: LC = Liquid Courage; CBI = Cognitive & Behavioral Impairment; RA = Risk & Aggression; TR = Tension Reduction; SP = Self-Perception; Sex = Sexuality; Soc = Sociability.

[†] $p = .06$. * $p < .05$, ** $p < .01$, *** $p < .001$

Concurrent Validity: Weekly Drinking Levels

To test whether B-CEOA factor scores would predict drinks consumed per week, drinks per week served as the criterion in each analysis and the B-CEOA expectancy or valuation factor scores served as predictors in a linear regression.

B-CEOA Expectancies. The B-CEOA expectancy factors explained a significant 6.0% of the variance in drinks per week, $F(4, 681) = 10.86, p < .001$. As shown in Table VI (top, left panel), when controlling for the other variables, the higher the expectancies for Liquid Courage/Risk & Aggression/Sociability or enhanced Sexuality, the greater the number of drinks per week.

B-CEOA Valuations. The B-CEOA valuation factors together explained a significant 4.7% of the variance in drinks per week, $F(3, 681) = 11.17, p < .001$. As shown in Table VI (top, right panel), when controlling for the other valuations, the greater the positive valuations of Cognitive & Behavioral Impairment, the more drinks consumed weekly.

Concurrent Validity: Alcohol Problems

It was also expected that B-CEOA factor scores would predict alcohol-related problems. Given that heavier drinking is highly predictive of alcohol-related problems (e.g., Wechsler, Lee, Kuo, & Lee, 2000), analyses predicting RAPI scores controlled for drinks per week. Alcohol-related problems on the RAPI served as the criterion with drinks per week entered into the first block and B-CEOA factor scores entered into the second block of a set of hierarchical multiple regressions.

B-CEOA Expectancies. The final model including drinks per week and the B-CEOA expectancy factors accounted for a significant 43.9% of the variance in alcohol problems, $F(5, 580) = 92.52, p < .001$. The block of expectancies accounted for significantly more variance than the model including only drinks per week, R^2 change = .14, $F_{inc}(4, 580) = 36.61, p < .001$. As shown in Table VI (top, right panel), when controlling for the other variables (including drinks per week), the higher the expectancies for Liquid Courage/Risk & Aggression/Sociability and Cognitive & Behavioral Impairment/Self-Perception, the greater the levels of alcohol-related problems. There was a trend for greater expectancies related to enhanced Sexuality from drinking to be related to greater alcohol-related problems ($p = .06$).

B-CEOA Valuations. The final model including drinks per week and the valuation factor scores accounted for a significant 32.3% of the variance in RAPI scores, $F(4, 581) = 69.15, p < .001$. The block of B-CEOA valuations accounted for significantly more variance than the model including only drinks per week, R^2 change = .02, $F_{inc}(3, 581) = 5.51, p = .001$. As shown in Table VI (bottom, right panel), when controlling for the other variables (including drinks per week), the higher the positive valuations of Sociability/Sexuality/Tension Reduction effects, the greater the levels of alcohol-related problems.

Discussion

The purpose of Study 2 was to replicate and extend the findings regarding the psychometric properties of the B-CEOA in Study 1 in a population of referred students. Findings were generally supportive of the factor solutions found in Study 1.

Construct Validity: Factor Structure

Results of the confirmatory factor analyses provided converging support for the four-factor Expectancies and three-factor Valuations structures. However, acceptable fit was only obtained when estimating complex factor structures that allowed for multivocal item loadings (i.e., variables that have salient loadings on two or more factors in the model). The fit degraded below the a priori tolerances when models with only simple item loadings were estimated.

Internal Consistency

The internal consistency was generally adequate. There was questionable internal consistency for the enhanced Sexuality factor ($\alpha = .59$) in the B-CEOA expectancies factor solution, which may be related to the low number of items on this scale (i.e., only three).

Concurrent Validity: Weekly Drinking Levels and Alcohol Problems

Expectancies. Regression analyses were conducted to examine the concurrent validity of the B-CEOA expectancies using weekly alcohol consumption and alcohol-related problems as criterion variables. Consistent with the findings from the nonclinical sample in Study 1, the more one expected Liquid Courage/Risk & Aggression or Sexuality, the more one drank per week. However, expectancies related to negative Self-Perceptions/Cognitive & Behavioral Impairment and Tension Reduction were not related to weekly drinking levels.

For alcohol-related problems, greater expectancies of Liquid Courage/Risk & Aggression/Sociability, negative Self-Perceptions/Cognitive & Behavioral Impairment, and enhanced Sexuality predicted greater problems. The greater the expectancies of negative Self-Perceptions/Cognitive & Behavioral Impairment from drinking, the more alcohol-related problems experienced, contrary to results using drinking behavior as the criterion, but consistent with findings of Lee et al. (1999). This result may explain inconsistencies in previous findings (e.g., Fromme et al., 1993; Jones & McMahon, 1994; Lee et al., 1999), as the differences may partially be a reflection of the measure of drinking behavior utilized (i.e., frequency, quantity, weekly consumption, alcohol-related problems).

Valuations. For valuations, consistent with Study 1 and expectancy-value theory (Bandura, 1977), the more one positively valued Cognitive & Behavioral Impairment when drinking, the more one drank per week. Valuations of Cognitive & Behavioral Impairment did not predict alcohol-related problems when controlling for weekly consumption. The more one positively valued effects regarding Sociability/Enhanced Sexuality/Tension Reduction, the more one experienced alcohol-related problems when controlling for weekly consumption. These findings are consistent with the notion that drinking levels and alcohol-related problems are distinct constructs (e.g., Sadava, 1990; White & Labouvie, 1989). Given the low variance accounted for in predicting alcohol-related problem while controlling for weekly drinking for valuations (2%) compared to expectancies (14%), further evaluation is needed.

General Discussion

The current set of studies compared the psychometric properties of the B-CEOA to the original CEOA in a nonclinical undergraduate sample, and attempted to replicate and extend the psychometric findings to a referred undergraduate sample. The results provide support for the construct validity of the original CEOA, with a similar factor structure to that of Fromme et al. (1993) and Valdivia and Stewart (in press). The convergence between the factor structures obtained with the nonreferred sample using exploratory techniques, and the referred sample using confirmatory statistics, provides support for the four-factor structure of alcohol expectancies and three-factor structure of alcohol valuations for the B-CEOA. The items from each theoretical scale proposed by Fromme et al. (1993) generally grouped together into a factor for both versions, rather than separating, providing support for the construct validity of the CEOA and B-CEOA. The internal consistency was generally maintained in the shortened version despite the substantial reduction in items.

Although the expectancy and valuation factors are not directly comparable across the versions, the types of significant expectancy and valuation predictors of drinking behavior were similar across the two versions of the questionnaire. Negative and positive expectancies as well as valuations had important contributions to the prediction of drinking behavior and problems, supporting the notion that negative expectancies (Jones & McMahon, 1994; McMahon et al., 1994) and valuations (Jones & McMahon, 1996; Leigh, 1987) are important predictors as well as positive expectancies. The B-CEOA expectancy factors provided support for the predictive power of the model for drinking behavior, while the

B-CEOA valuation factors had a slight loss of predictive power compared to the original version. The discrepancy in the predictive power for valuations could be due to the differences in the empirical basis of the development of the expectancies scales, with the lack thereof for valuations. Alternatively, the discrepancy could be related to the differences across samples, such as gender differences. Men and women may differ in their valuations of particular effects from drinking, such as those related to risks and aggression or sexuality, that could alter the predictive power of valuations.

Despite the fewer factors and loss in predictive power and internal consistency, the B-CEOA has distinct advantages. The use of the brief version would clearly be more cost and time efficient, providing a method to measure expectancies and valuations in large questionnaire batteries used in research protocols or to monitor changes over the course of therapy.

The findings suggest that not all effects of alcohol are viewed as “positive” or “negative” universally. Although CEOA expectancies was generally composed of the same factor structure as Fromme et al. (1993) introduced, Risk & Aggression (“negative” expectancy) and Liquid Courage (“positive” expectancy) were combined into one factor for CEOA valuations, B-CEOA expectancies, and B-CEOA valuations. These constructs may not be distinguishable along a continuum of negative and positive, but instead viewed as a general factor related to courage and risk-taking behavior. The inconsistencies of the relationship of negative expectancies (e.g., Fromme et al., 1993; Lee et al., 1999; Stacy et al., 1990) with drinking measures may be due to a lack of distinct “positive” and “negative” expectancies.

The regression analyses also supported the notion that valuations are important in determining desirability of drinking outcomes as there was at least one “negative” expectancy valuation predicting drinking behavior in each regression, with often more than one “negative” valuation serving as a significant contributor (with the exception of the regression with alcohol-related problems as the criterion). The valuations of two “positive” expectancies, Sociability and Tension Reduction, did not predict drinking behavior, unless combined with each other or other variables into one factor. This was consistent with work by Fromme and D’Amico (2000) finding that the valuations of sociability and tension reduction did not predict drinking quantity or frequency when controlling for expectancies. Certain valuations of expectancies may have greater importance in predicting drinking behavior and consequences than others. For instance, the results indicate that negative valuations regarding Cognitive & Behavioral Impairment were most important in predicting drinking behavior for the referred sample. It is possible that, among heavy drinkers, placing a high value on this negative effect from drinking is more important than valuations of positive effects.

Several limitations to the current study should be noted. First, the principal component analyses related to the B-CEOA items include factors with only two salient item loadings. Although this is expected given the low number of total items (Tabachnick & Fidell, 2001) and items taken from each original CEOA scale, this is not optimal in terms of simple structure (Thurstone, 1947). Although there was converging evidence provided by the confirmatory factor analyses for the B-CEOA factor structure, additional examination of item content may be warranted, as several items may hold multivocal or hyperplane loadings.

Adding complexity, the items with multivocal or hyperplane loadings for alcohol expectancies differ from those with multivocal or hyperplane loadings for alcohol valuations. The different factors structures for expectancies and valuations could present problems for researchers wishing to examine the validity of expectancy-value interactions [i.e., Bandura's (1977) expectancy-value theory] as there are not comparable scales available to compute interaction terms. However, internal consistency and concurrent validity analyses are encouraging in providing support for these factor structures. Additional research is needed to determine the stability of the B-CEOA structure and to replicate the promising findings regarding concurrent validity.

There were differences in sample characteristics across the two studies that may have limited the comparability of the B-CEOA results. The first study was conducted with university student volunteers, which may compromise the generalizability of the results. However, the second study included students referred to an alcohol intervention to fulfill disciplinary consequences who had high levels of drinking and alcohol-related problems, providing results with clinical relevance. Another problem with the two samples was that the gender ratios varied across samples (nonclinical: 68.5% women; referred: 30.5% women), which could also have contributed to differences in the results across Studies 1 and 2. A greater proportion of men have alcohol use disorder diagnoses, and men tend to have higher levels of alcohol-related problems than women (e.g., Hill & Chow, 2002; Wechsler et al., 1994). The referred group was likely a representative sample of college student problem drinkers, and the preponderance of women is typical of university undergraduate psychology courses (see Stewart, Taylor, & Baker, 1997) indicating the Study 1 sample was likely representative of their population as well. Examination of factor structure across gender in Study 1 indicated few differences, suggesting that differences in gender composition was not likely solely responsible for the differences across samples. Further research needs to be conducted to determine the generalizability of the present results to non-college treatment settings and to the general population.

The assessment of typical weekly consumption in both studies may be limited in its utility in that it may not tap into specific periods of time when the student drank more heavily (Conrod, Stewart, & Pihl, 1997). There are limitations of the retrospective self-report method that could be remedied by using collateral sources, prospective self-monitoring, and/or laboratory observation. It should be noted that the predictive power of both the original CEOA and B-CEOA are modest. The modest predictive power could be related to problems with the measure's validity but may be related to inadequacies in the dependent measure as well. A strength of these results is that the CEOA predictive power was similar to that of Fromme et al. (1993).

There were limitations in the methods of B-CEOA development and administration. The B-CEOA was developed by the Addictive Behaviors Research Center (1997) by selecting items with the highest loadings from the CEOA according to Fromme et al.'s (1993) findings from the factor analyses of expectancy scores. Smith, McCarthy, and Anderson (2000) have criticized the derivation of items for shortened versions of questionnaires from a single administration of the full version. Problems with this method are demonstrated by the differences in the highest factor loadings using exploratory techniques in this study compared to the highest factor loadings in original exploratory factor analyses presented

by Fromme et al. (1993). The confirmatory factor analyses conducted on the B-CEOA included items that did not represent the strongest factor loadings obtained from the current exploratory factor analyses. By using the highest factor loadings resulting from the factor analyses of the CEOA to form the shortened version, the resulting factor structures may have greater similarity across instrument versions as well as across expectancies and valuations within the brief version. Such a strategy may also improve internal consistency and test-retest reliability. As the B-CEOA has been in use for 6 years in the ASTP intervention, it was important to investigate the psychometrics of the brief measure examined in the current study. For the nonclinical sample, the B-CEOA items were embedded in the longer version, while the referred sample received the B-CEOA on its own. It is possible that the differences in administration context led to the differences in factor structure across the nonclinical and referred samples.⁵ Further research should consider this limitation and administer the two versions separately to a single sample in counterbalanced order.

In summary, the results provide further support for the empirical validity of the original CEOA, and provided support for the use of the B-CEOA in referred and nonclinical samples of undergraduates. The results indicated that positive and negative expectancies and valuations factors were able to predict drinking behavior and consequences, with similarities in the pattern of significant predictors across CEOA versions. The B-CEOA expectancy factors provided support for the predictive power of the model for drinking behavior and consequences, while the B-CEOA valuation factors had a slight loss in predictive power. It may be that the items regarding negative Self-Perceptions, as well as other valuations, need to be reevaluated and possibly redesigned or omitted. The loss of predictive information with valuations in going from the full length to the B-CEOA might be remedied if future research were to design an empirically derived brief version of the original CEOA valuations scale. Liquid Courage and Risk & Aggression expectancies and valuations often grouped together, leading to questions regarding the differentiation between these two constructs, and suggest that these two scales should be combined in computing scale scores. "Positive" and "negative" expectancies were not always viewed as such by participants, and it appeared that valuations of expectancies are important constructs independent from expectancies that need to be further studied for potential usefulness in assessment and treatment. This study provides evidence that the B-CEOA offers an alternative shorter measure of expectancies and valuations, which accounts for a similar amount of variance in drinking as the original CEOA. There are important trade-offs related to the factor structure and internal consistency of the B-CEOA that must be considered. It is clear that further research should be conducted on the CEOA and B-CEOA, particularly with a variety of populations and examining gender differences, and including measures of alcohol-related negative consequences as well as consumption measures.

Acknowledgments – The paper was completed during the first author's predoctoral internship at the Medical University of South Carolina. The first author is now affiliated with the Department of Psychology, Florida International University. Study 1 was supported by an operating grant from the Social Sciences and Humanities Research Council of Canada awarded to the second author. The second author is supported through an Investigator Award from the Canadian Institutes of Health Research. Study 2 was supported in part by a National Research Service Award Predoctoral Fellowship

(1 F31 AA13462-01A1) from the National Institute on Alcohol Abuse and Alcoholism awarded to the first author. The authors thank Brenda Lindsay and Heather Lee Loughlin and all other undergraduate research assistants who assisted with data collection and data entry. Thanks are also due to University of Nebraska–Lincoln graduate students who served as therapists in the Alcohol Skills Training Program.

Notes

1. All four items on the sexuality subscale did not have salient loadings on any factors in the five-factor model.
2. For full scale CEOA valuations in Study 1, internal consistency was calculated with the complex item (i.e., “My problems would seem worse”) on the Self-Perception factor. For B-CEOA expectancies, internal consistency was calculated with the complex item (i.e., “I would be clumsy”) loading on the Self-Perception/Cognitive & Behavioral Impairment factor. For B-CEOA valuations, internal consistency was calculated with the first complex item (i.e., “I would be brave and daring”) loading on the Liquid Courage/Risk & Aggression/Self-Perception factor. Internal consistency was also calculated with the second complex item (i.e., “I would be courageous”) loading on the Liquid Courage/Risk & Aggression/Self-Perception factor.
3. Violations of the campus alcohol policy included drinking or being in the presence of alcohol on campus property or committing any type of alcohol-related legal offense (e.g., minor in possession, driving while intoxicated). Unfortunately, the researchers and clinicians do not have access to information regarding the violation that caused the referral. However, the clinical impression is that the majority of students referred had been drinking on campus property or drinking underage off of campus property.
4. Although both studies assessed “drinks per week,” these values may not be directly comparable as they were gathered by slightly different assessment methods.
5. This concern was raised in another scale assessing alcoholism, the MacAndrews Alcoholism (MAC; MacAndrew, 1965) Scale of the MMPI. However, the validity of the MAC Scale has been found to hold when administered independent of the context of the full scale MMPI (e.g., MacAndrew, 1979), indicating that such differences in administration may not greatly impact the accuracy of alcohol-related measures.

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