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Validation of the Brief Biphasic Alcohol Effects Scale (B-BAES)

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Abstract

Background—The Biphasic Alcohol Effects Scale (BAES) is a reliable and valid 14-item measure of alcohol's acute stimulant and sedative effects, but its length may preclude use in research paradigms with time constraints on assessment. Here, we report further psychometric support for the six-item Brief BAES (B-BAES) originally developed by our group in 2009.

Methods—Two studies are included: the first study tested the B-BAES in an independent sample of young adult heavy social drinkers administered 0.8 g/kg alcohol in a laboratory challenge study ($N = 104$) to confirm the reliability and validity of the 6-item B-BAES. The second study compared the predictive validity of the B-BAES versus the BAES in a separate sample of 104 heavy drinkers who took part in a prospective laboratory alcohol challenge and follow-up study of drinking behaviors.

Results—An item analysis demonstrated strong support across several intervals on the breath alcohol curve for the same six B-BAES items (energized, excited, up, sedated, slow thoughts, sluggish). Confirmatory factor analysis with the B-BAES demonstrated strong support for the same underlying structure as with the full BAES, and tests of internal consistency reliability were very strong to excellent. B-BAES subscale scores correlated highly with corresponding scores of the BAES, and predicted binge drinking frequency during a two-year follow up.

Conclusions—These results provide strong psychometric support to confirm use of the B-BAES in studies assessing alcohol's stimulant and sedative properties. The B-BAES may be a useful new tool to enhance the scope of future research assessing alcohol's biphasic effects, particularly in paradigms when time and concise measurement are priorities.

Keywords

Brief Biphasic Alcohol Effects Scale; B-BAES; alcohol response; alcohol subjective effects; psychometric

INTRODUCTION

Although alcohol is considered a depressant, it is known to produce both stimulant and sedative effects, with stimulant effects preceding sedative effects (Pohorecky, 1977). This biphasic effect of alcohol is central to the Differentiator Model (Newlin and Thomson, 1990), which purports that persons at risk for alcohol use disorders experience heightened positive-like effects of alcohol during the rising phase of the blood alcohol curve (BAC) and

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reduced sedative-like effects during the declining limb compared to their low-risk counterparts. Although various measures have been used over the years to assess alcohol's effects (e.g., Addiction Research Center Inventory; Haertzen[0] et al., 1963; Subjective High Assessment Scale; Judd et al., 1977; Alcohol Sensation Scale; Maisto et al., 1980, and Profile of Mood States; McNair et al., 1971), the 14-item Biphasic Alcohol Effects Scale (BAES; Martin et al., 1993) was the first systematic self-report scale designed to measure stimulant and sedative effects of alcohol as separate and distinct constructs.

Seven items (elated, energized, excited, stimulated, talkative, up, vigorous) comprise the stimulant subscale of the BAES, and another seven items (difficulty concentrating, down, heavy head, inactive, sedated, slow thoughts, sluggish) comprise the sedative subscale. The BAES has demonstrated strong psychometric properties, including good internal consistency reliability and a factor structure that supports the distinctness of the stimulant and sedative constructs during both the ascending and descending limbs of the breath alcohol curve (BrAC; Earleywine and Erblich, 1996; Martin et al., 1993; Rueger et al., 2009). This four-factor structure has been shown to be invariant to dose, drinking history, and sex, and has demonstrated robustness to an instructional set that does not disclose the content of the beverage (Rueger et al., 2009).

One issue limiting the scope of use of the BAES is that, at 14 items, it may not be practical to use in research paradigms with constraints on assessment. For example, in human laboratory studies of alcohol effects, there are often multiple assessments in one session. Frequently, the BAES is administered before alcohol is consumed and then the assessment is repeated 3–4 more times after consumption to capture rising and declining BrAC limb effects. In such a design, using the full 14-item BAES would result in the participant having to complete 70 items for just this questionnaire alone. In addition, assessments during neuroimaging can be challenging, and briefer measures would enhance such research. Similarly, research that involves assessments on small handheld devices, such as ecological momentary assessments can be burdensome with lengthy measures. Although there are some cautions in using shorter assessment tools, such as the loss of variance, and a bigger impact of missing values on items, the benefits outweigh the potential costs in research paradigms that render a lengthier scale unusable.

To address this issue, our group recently developed a brief version of the BAES (the B-BAES; Rueger et al., 2009) in a sample of 190 social drinkers. The results of the item analysis indicated that 6 of the 14 BAES items showed the strongest associations with the full BAES subscales (Rueger et al., 2009); these include *energized*, *excited*, and *up* for the brief stimulation (B-STIM) subscale, and *sedated*, *slow thoughts*, and *sluggish* for the brief sedation (B-SED) subscale. These new subscale scores showed excellent internal consistency, and very strong correlations with the full BAES scores. Further, confirmatory factor analysis of these six items supported the four-factor structure, i.e., distinct stimulation and sedation factors at ascending and descending BrAC limbs (Newlin and Thomson, 1990), as demonstrated with the full BAES (Earleywine and Erblich, 1996; Rueger et al., 2009). These results were promising in that, after reducing the scale to less than half of the items of the full BAES, there remained robust psychometric properties of the instrument.

While the six-item B-BAES may be particularly useful as a brief measurement tool to assess alcohol's acute effects, replication of its psychometric strengths in an independent sample is necessary to confirm utility of this measure. Additionally, support for the abbreviated version would be further enhanced if B-BAES scores, just like the full BAES scores, predicted future drinking patterns over time (King et al., 2011a). Thus, the two-fold goal of the present study was to (1) confirm that the same six items of the BAES are retained for the

abbreviated B-BAES in an independent sample; and (2) test the predictive validity of the B-BAES in relation to future drinking behaviors.

STUDY ONE

The B-BAES was developed using ratings of stimulation and sedation from the BAES at the ascending and descending limbs of the BrAC (Rueger et al., 2009). However, tests of its psychometric properties would also be important to establish at pre-drink baseline and peak BrAC (e.g., King et al., 2011a). Thus, the goal of Study One was to replicate and extend analyses of the B-BAES in an independent sample at four time points along the BrAC: baseline (–15 min), ascending limb (30 min), peak BrAC (60 min), and descending limb (120 min). We hypothesized for all four time points that (1) the same three B-STIM items (*energized, excited, and up*) and the same three B-SED items (*sedated, slow thoughts, and sluggish*) would be retained; (2) the six B-BAES items would demonstrate strong internal consistency reliability; (3) B-STIM and B-SED subscale scores would be significantly correlated with their respective full BAES scale scores, STIM and SED; and (4) confirmatory factor analysis would support models that demonstrate the distinctness of stimulation and sedation as predicted by theory.

Method

Participants—The sample consisted of 104 nonalcoholic heavy social drinkers (39 female) who were participants in the second cohort of the Chicago Social Drinking Project (CSDP) at the University of Chicago, tested from June 2009 to June 2011. All participants in the second wave of the CSDP were heavy drinkers, operationally defined as persons who consume five or more drinks on an occasion (four or more for women), one to five times on average per week as their predominant adult pattern. These criteria were chosen to be consistent with SAMHSA guidelines for heavy drinking (SAMSHA, 2005) and for comparisons across prior studies (King and Epstein, 2005; King et al., 2002; McKee et al., 2010). An additional criterion was employed to assure regular weekly alcohol consumption of at least 10 drinks per week, but no more than 40 drinks per week to avoid possible alcohol dependence and withdrawal or difficulties adhering to 48 hour alcohol abstinence criteria before sessions. During in-person screening, participants completed demographic, background, and self-report alcohol measures, including the Alcohol Use Disorder Identification Test (AUDIT; Barbor et al., 1989), the Alcohol Quantity-Frequency interview for drinking over the past six months (Cahalan et al., 1969), and the non-patient version of the Structured Clinical Interview for DSM-IV Disorders (SCID; First et al., 2002). They also completed a medical history form and underwent a brief medical assessment. These procedures were conducted to ensure that participants met the eligibility criteria for heavy social drinkers and had no past or current major medical or psychiatric condition including alcohol or other substance dependence.

Procedure—The overall study design was a within-subjects, double-blind, placebo-controlled human laboratory paradigm. In the lab protocol, the BAES was administered both before and after participants consumed their allocated beverage. The current analyses used data from the alcohol session (0.8 g/kg dose). In order to reduce alcohol expectancy, the Alternative Substance Paradigm (Conrad et al., 2012 in press) was employed: participants were told that the beverage might contain a stimulant, a sedative, alcohol, or a placebo, or two substances in combination and at various dose levels. Neither the participant nor the experimenter knew the contents of the beverage. A validity check indicated that 20% of participants incorrectly identified that the high alcohol dose beverage contained another active substance, and these participants reported more subjective sedation but similar

stimulation than those who correctly identified the beverage contained alcohol (Conrad et al., 2012, in press).

Participants were instructed to abstain from alcohol and medications for at least 48 hours, as well as caffeine, cigarettes, and food for three hours prior to the session. When participants arrived (between 3pm and 5pm) they were provided a snack at 20% daily calories based on their body weight to reduce the possibility of alcohol-induced nausea, and to avoid hunger effects on mood state. This was followed by administration of the Biphasic Alcohol Effects Scale (BAES; Martin et al., 1993). The participants then consumed the assigned session beverage over a 15 min interval in the presence of the research assistant; the beverage was divided into two equal portions to consume over five minutes each, with a five-minute rest period between portions. The BAES was repeated at 30, 60, and 120 minutes after beverage onset. Breath alcohol concentrations (BrACs) were obtained using the Alco-Sensor IV (Intoximeter Inc., St. Louis, MO) at the same intervals, as well as other subjective and objective measures as part of the larger study. During portions of the session when measures were not being obtained, participants were allowed to relax in a comfortable room and watch television or movies, and/or read. At the end of each session, participants were transported home by a livery service. The study was fully approved by The University of Chicago Institutional Review Board.

Measures—As stated previously, the Biphasic Alcohol Effects Scale (BAES; Martin et al., 1993) is a 14-item scale consisting of adjectives that describe the stimulant- and sedative-like effects of alcohol. The items are presented in alphabetical order, and are rated on an 11-point rating scale from 0=Not at All to 10=Extremely. While the original instructions ask the participant to attribute their mood state to effects produced by alcohol, modified instructions (Rueger et al., 2009) that ask the participant to assess mood state without revealing that alcohol was consumed, were used in order to allow for baseline measurement as well as placebo. Figure 1 includes the items for the BAES with the original as well as modified instructions that were used in the current study.

Data analytic strategy—Item reduction of the BAES was based on the corrected item-total correlations (i.e., the extent to which each item correlates with the scale score without that item), and communality (i.e. the extent to which an item shares variance with the other items) from the reliability analysis. Items that contributed the least to the internal consistency of the subscales (DeVellis, 1991; Nunnally, 1978) on both indices were considered for exclusion. The final items chosen for retention on each B-BAES subscale were tested for internal consistency using Cronbach's alpha. These items were then summed to create subscale scores, and a test of criterion-related validity was conducted by comparing the B-BAES subscale scores with the corresponding subscales from the BAES. These analyses were conducted at each of the four time points along the BrAC, as well as separately by sex.

The underlying factor structure of the B-BAES was tested with confirmatory factor analysis using AMOS 16.0 (Arbuckle, 2005). Replicating previous analyses with the full BAES (Earleywine and Erblich, 1996; Rueger et al., 2009), four competing models were tested using the B-BAES at the ascending and descending limbs. Model One (Four-Factor) examined the theoretically-predicted model of stimulant and sedative effects of alcohol as distinct constructs on the ascending (30 min) and descending (120 min) limbs (Newlin and Thomson, 1990). This model supports the biphasic nature of alcohol's stimulant and sedative effects by modeling the potential for distinct and higher stimulant effects at the ascending limb relative to the descending limb, and distinct and higher sedative effects at the descending limb relative to the ascending limb. Model Two (Two-Factor, Limb) examined the B-BAES items as representing subjective alcohol effects at the ascending and

descending limbs, irrespective of the nature of the effect (i.e., stimulation or sedation). Model Three (Two-Factor, Effect) examined the B-BAES items as representing distinct stimulant and sedative effects of alcohol, irrespective of the BrAC limb. Model Four (One-Factor) examined the B-BAES items as representing a global construct of subjective alcohol effects, irrespective of specific effect (i.e., stimulation and sedation) or BrAC limb (i.e., ascending or descending limb). In addition, a two-factor model testing the six B-BAES items at peak BrAC (60 min; Model Five) was included to confirm stimulation and sedation as distinct constructs at this commonly used time point on the BrAC. For all models, fit was assessed using the standardized root mean square residual (SRMR) and the comparative fit index (CFI; Hu and Bentler, 1998).

Results and Discussion

The average age of this sample was 24.9 years (± 2.3 *SD*) with an average of 15.6 (± 1.5 years of education. The racial breakdown was 77% Caucasian, 12% African American, 9% Multiracial, and 3% Asian. The participants averaged 14.97 (± 5.06) drinking days per month, of which 10.70 (± 4.91) were binge-drinking days. The mean AUDIT score for this sample was 12.15 (± 4.15).

The item analysis showed that the same six items (*energized, excited, sedated, slow thoughts, sluggish, and up*) met criteria for retaining in the B-BAES in this independent sample (see Table 1). These items consistently showed the highest correlations with the total score and had the highest shared variance with the other items across all four time points. Cronbach's alphas for *energized, excited, and up* ranged from .89 to .93 across all analyses, and for *sedated, slow thoughts, and sluggish* ranged from .90 to .91. Correlations between the corresponding subscale scores of the B-BAES with the full BAES across time points were very large in magnitude, ranging from .95 to .97 for B-STIM and STIM, and .92 to .96 for B-SED and SED. As was found in the initial evaluation of the B-BAES (Rueger et al., 2009), none of the correlations between the stimulation and sedation subscale scores across the four timepoints along the BrAC were statistically significant (*r*s ranging from $-.04$ to $-.18$ for B-BAES and $.00$ to $-.14$ for BAES). Analyses by sex revealed that the same six B-BAES items were the most robust for men and women. Cronbach's alphas for B-STIM ranged from .88 to .94 for women, and from .87 to .93 for men. For B-SED, alphas ranged from .79 to .92 for women, and from .90 to .94 for men. Correlations between B-STIM and STIM ranged from .93 to .98 for women, and from .96 to .97 for men. For B-SED and SED, correlations ranged from .91 to .96 for women, from .92 to .95 for men.

Results of the confirmatory factor analysis (Table 2) demonstrated strong support for the same underlying structure as with the full BAES: four distinct factors representing distinct stimulation and sedation constructs at ascending and descending limbs (Model One). There was no support for the two-factor models based on limb (Model Two) or effect (Model Three), or for the one-factor model (Model Four). In other words, there was no support for combining stimulation and sedation into one construct, or collapsing assessments from ascending and descending limbs into one timeframe. Stimulation and sedation as distinct constructs at peak BrAC was also supported (Model Five). All together, results from Study One support the use of the B-BAES at ascending, peak, and descending limbs of the breath alcohol curve.

STUDY TWO

Demonstration of the construct validity, i.e., whether a measure performs as theory would predict, and criterion-related validity, i.e., whether a new measure is related to another commonly-used measure of the same construct, is vitally important to psychometrically supporting the use of a measure (DeVellis, 1991; Nunnally, 1978). These elements of

validity for the B-BAES were demonstrated in Study One. Equally important is the ability of a measure to show longitudinal associations with outcomes that the dimensions are theorized to predict. Therefore, the goal of Study Two was to test the predictive validity of B-STIM and B-SED in relation to future binge drinking through a two-year follow up period.

Method

The sample consisted of 104 (44 female) heavy social drinkers from the first cohort of the Chicago Social Drinking Project (CSDP) at the University of Chicago. They were tested in the laboratory from March 2004 to July 2006 and took part in intensive follow ups over the ensuing two years, from June 2004 to July 2008. The original laboratory data were examined in the original development of the B-BAES (Rueger et al., 2009). In this study, the B-BAES was compared to the BAES on the predictive validity of alcohol's stimulant and sedative effects in relation to future drinking behaviors. The main drinking outcome over the two years of follow up was frequency of binge drinking (% days in past month for each follow up assessment), with binge defined as consumption of 5 or more alcoholic drinks (4 for women; SAMHSA, 2005). The current study focused on heavy drinkers from this sample because the light drinkers primarily exhibited light drinking patterns throughout follow up with minimal variability. Further no alcohol response measure predicted light drinkers' very infrequent binge drinking patterns over time, or any other drinking outcome, for that matter (King et al., 2011).

The laboratory procedures were identical to those described in Study One: participants were administered alcohol (0.8 g/kg) or placebo (1% alcohol per volume as taste mask) in random order in two double-blinded individual laboratory sessions, and the BAES was given at pre-drink baseline and at four post-drink intervals (i.e., 30, 60, 120, and 180 minutes after beverage onset) throughout the BrAC. After completion of the laboratory portion, these participants subsequently completed eight follow up assessments of drinking and related behaviors on a quarterly basis over a two-year interval. The retention rate for follow up was 99%. Details on procedures are in King et al. (2011a).

Data analytic strategy—Analyses to compare B-BAES subscale scores to the BAES scores in predicting future drinking escalations over the two years of follow up were conducted using a double change index score as in King et al. (2011a). This index score was calculated for both the stimulation and sedation subscales for BAES and B-BAES by subtracting the rating at baseline from the rating at peak BrAC (60 minute time point) for both placebo and alcohol session, and then subtracting the placebo change score from the alcohol change score to derive a net overall change score. This overall change score reduces the potential confounds of non-specific and expectancy effects during the placebo session and response bias during baseline measurement. These net overall change scores calculated with B-BAES and BAES ratings were highly correlated (B-STIM and STIM: $r = 0.92$; B-SED and SED: $r = 0.93$, both $ps < .001$).

To address the question of predictive validity, three separate analyses were conducted using the net overall change score from the lab session, and number of binge drinking occasions at baseline (i.e., month before enrollment), and during the two-year follow-up period (eight quarterly assessments of past month binge drinking). First, zero-order correlations between the net overall change scores measured by both the B-BAES and BAES with the number of binge drinking episodes were compared at the two-year follow up. Second, alcohol response as measured by B-BAES net overall change scores at baseline were used to predict future drinking trajectories from baseline through the eight quarterly assessments in the two-year follow-up period, and compared to results previously published using the BAES (King et al., 2011). To determine drinking trajectories, a discrete mixture modeling approach determined

by the Bayesian Information Criterion for model selection was used, and as previously reported (King et al., 2011), four trajectory groups (gradual maturing, moderate-frequency binge, high-frequency binge, and exacerbating; see Figure 4 in King et al., 2011) were found to best describe the data. Third, to examine prediction of binge drinking at a daily level with greater specificity, the association of each subject's B-STIM and B-SED net overall change scores to frequency of subsequent binge drinking was examined using a Generalized Estimation Equations (GEE; Zeger et al., 1988) modeling approach predicting odds of binge drinking days through the two years of follow up.

Results and Discussion

The average age of this sample was 25.6 years (± 3.2 *SD*) with an average of 16.1 years (± 1.8) years of education. The racial breakdown was 77% Caucasian, 11% African-American, 7% Asian, and 4% Asian. The participants averaged 14.88 (± 5.06) drinking days per month, of which 9.86 (± 4.56) were binge-drinking days. The mean AUDIT score for this sample was 11.60 (± 3.7). Alcohol effects (stimulation and sedation) across the BrAC were assessed using two-way ANOVA. This analysis demonstrated a significant Dose $\times$ Time effect whether using the B-BAES or BAES for both stimulation (B-STIM: $F = 7.01$; STIM: $F = 8.62$, both $p < .001$) and sedation (B-SED: $F = 5.36$; SED: $F = 6.33$, both $p < .001$; see Figure 2).

Zero-order correlations between net overall change scores and the number of binge drinking episodes at the two-year follow up were of similar magnitude, whether using the B-BAES or BAES ($r = +.09$ for both B-STIM and STIM; $p = \text{ns}$; B-SED: $r = -.30$, $p < .01$; SED: $r = -.23$, $p < .05$). Trajectory analyses were consistent with these correlational analyses in that lower ratings of sedation predicted future drinking trajectory group when using the B-BAES (B-SED: $r = -.27$, $p < .01$) or the BAES (SED: $r = -.20$, $p < .05$; also reported in King et al., 2011). Finally, analyses with GEE indicated that greater B-STIM scores as well as lower B-SED scores predicted greater binge drinking over the two-year follow up period ($p < .001$), which are consistent with analyses reported using the STIM and SED (see King et al., 2011a). Taken together, these results demonstrate that stimulant and sedative responses to alcohol can predict future drinking, whether assessed with the 14-item BAES or the abbreviated 6-item B-BAES.

GENERAL DISCUSSION

The results of these two studies demonstrate strong psychometric support for the B-BAES. Item analyses and confirmatory factor analysis in an independent sample of heavy social drinkers supported the six items that comprise the B-BAES. The subscale scores, B-STIM and B-SED, demonstrated very strong to excellent internal consistency reliability, and correlated highly with corresponding scores of the BAES. Further, in an intensive prospective design, the B-BAES subscale scores were comparable to the full BAES subscale scores in predicting future binge drinking, which establishes the predictive validity of this abbreviated measure. These results support the use of the B-BAES in a variety of research designs, including repeated measurement in the human laboratory, ecological momentary assessment or mobile phone applications to measure brief in vivo alcohol responses, or functional brain imaging procedures which require brief assessments on keypads and minimal participant movement. In these types of paradigms, and others, the B-BAES could be used efficiently and reliably to assess subjective effects of alcohol to test models of risk related to stimulant and sedative effects. In addition, because of the increased ease of administration of a shorter measure, the B-BAES could also be more readily incorporated in other studies in which subjective effects is not a main construct of interest, thereby expanding the utility of this measure to other related lines of research.

The current study had some important strengths worth noting. First, analyses across two independent samples of young adult heavy social drinkers with similar demographics and drinking patterns offer confidence in generalizability to other young adult samples. Second, the use of prospective analyses with intensive and multiple follow-ups over two years offered a unique and robust test of predictive validity. Third, the laboratory-based protocol with alcohol administration offered direct measurement of alcohol effects, which is highly desirable compared to retrospective self-report of alcohol effects. This type of prospective, lab-based experimental design is crucial to elucidate the mechanisms by which alcohol responses may relate to future risk for drinking exacerbations and problems (King et al., 2011b).

There were also limitations in the study, which lead to suggestions for future investigations. First, it is unclear if findings from the current study would generalize to other populations, such as older drinkers or those with alcohol dependence. Related, these findings in an English-speaking population may not generalize to other languages and cultural groups, as some items may have unique meaning to an English-speaking U.S. sample. Most notably, slang terms such as “up” may not translate to other languages and cultures. If difficulties in translation arise, as we have recently incurred in piloting a Chinese translation of the BAES, then we may suggest use of the item *Vigorous* to replace *Up*, as it demonstrated consistent robust psychometric properties as the fourth strongest adjective for stimulant effects (Table 1), and may be easier to translate. In spite of this potential limitation, the benefit of using briefer measures in research with non-English-speaking participants is that there will likely be fewer translation problems due to fewer items to translate. A third limitation was the sample size for Study One, which was modest for a confirmatory factor analysis and precluded multiple group analyses. A larger, more diverse sample would be especially desirable to test for differences in the underlying structure across sex or race/ethnicity, and would also allow for additional analyses, such as those based on item-response theory, that could provide further psychometric support for the B-BAES.

In conclusion, the brevity of the B-BAES, along with the robust reliability and validity evidence for B-STIM and B-SED in the assessment of the stimulant and sedative effects of alcohol, indicate that this new abbreviated measure could greatly enhance the scope of future research assessing alcohol’s biphasic effects. With 6 items instead of 14 items, the ease of use and time to complete the B-BAES compared with full BAES is reduced by more than 50%. It would benefit the literature if future research addressed the potential to shorten other measures of subjective effects. As clinical research paradigms are increasingly using more technical elements, the B-BAES may represent an important advance in the measurement of acute alcohol effects to facilitate state-of-the-art clinical research paradigms.

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Biphasic Alcohol Effects Scale (BAES; Martin et al., 1993)

Original Instructions: The following adjectives describe feelings that some people have after drinking alcohol. Please rate the extent to which drinking alcohol has produced these feelings in you at the present time.

Modified Instructions: Please rate the extent to which these words describe your feelings at the present time (circle the appropriate number for each word).

Stimulation (STIM)

Elated
Energized
Excited
Stimulated
Talkative
Up
Vigorous

Sedation (SED)

Difficulty Concentrating
Down
Heavy Head
Inactive
Sedated
Slow Thoughts
Sluggish

Brief Biphasic Alcohol Effects Scale (B-BAES; Rueger et al., 2009)

Instructions: Please rate the extent to which these words describe your feelings at the present time (circle the appropriate number for each word).

Brief Stimulation (B-STIM)

Energized
Excited
Up

Brief Sedation (B-SED)

Sedated
Slow Thoughts
Sluggish

Figure 1.

The items per subscale for the BAES and B-BAES, and instructions for administration. The modified instructions have been validated with the BAES and B-BAES (Rueger et al., 2009). Items for the BAES and B-BAES are typically presented in alphabetical order, with an 11-point rating scale from 0=Not at All to 10=Extremely.

Figure 2.

The two-way Analysis of Variance demonstrated a significant Dose $\times$ Time effect whether using the B-BAES or BAES for both stimulation and sedation. This figure shows the mean ratings for stimulation and sedation using the B-BAES and BAES across the BrAC during the alcohol session.

Table 1

Item Analysis of the 14 Items of the Biphasic Alcohol Effects Scale across the Breath Alcohol Curve

		Baseline		Ascending		Peak		Descending	
		<i>r</i>	<i>R</i> ²	<i>r</i>	<i>R</i> ²	<i>r</i>	<i>R</i> ²	<i>r</i>	<i>R</i> ²
Stimulation	Elated	0.67	0.50	0.67	0.55	0.72	0.58	0.80	0.68
	Energized	0.80	0.65	0.79	0.75	0.85	0.76	0.89	0.82
	Excited	0.81	0.68	0.84	0.78	0.89	0.84	0.89	0.83
	Stimulated	0.74	0.56	0.64	0.50	0.63	0.41	0.71	0.54
	Talkative	0.72	0.58	0.64	0.55	0.75	0.60	0.79	0.68
	Up	0.81	0.69	0.80	0.70	0.84	0.76	0.84	0.75
	Vigorous	0.70	0.50	0.75	0.63	0.76	0.61	0.80	0.68
Sedation	Difficulty Concentrating	0.54	0.57	0.46	0.25	0.61	0.45	0.61	0.46
	Down	0.48	0.28	0.20	0.16	0.32	0.29	0.57	0.37
	Heavy Head	0.65	0.50	0.65	0.47	0.73	0.60	0.63	0.46
	Inactive	0.53	0.41	0.61	0.40	0.69	0.54	0.67	0.57
	Sedated	0.69	0.68	0.70	0.60	0.72	0.64	0.79	0.70
	Slow Thoughts	0.78	0.82	0.78	0.72	0.82	0.73	0.82	0.74
	Sluggish	0.88	0.81	0.77	0.72	0.84	0.75	0.85	0.75

Note. *r* = correlation between item and total score without that item; *R*² = shared variance of item with all other items; Items in bold font are the highest three statistics for each item.

Table 2

Test of Four Competing Models Representing the Underlying Factor Structure of the B-BAES

Models Tested	Description of Model	CFI	SRMR
Model 1: Four-Factor	<i>Factor One:</i> Stimulation at Ascending Limb <i>Factor Two:</i> Sedation at Ascending Limb <i>Factor Three:</i> Stimulation at Descending Limb <i>Factor Four:</i> Sedation at Descending Limb	.98	.05
Model 2: Two-Factor (Limb)	<i>Factor One:</i> Subjective Alcohol Effects at Ascending Limb <i>Factor Two:</i> Subjective Alcohol Effects at Descending Limb	.67	.27
Model 3: Two-Factor (Effect)	<i>Factor One:</i> Stimulation Across both Limbs <i>Factor Two:</i> Sedation Across both Limbs	.79	.09
Model 4: One-Factor	<i>Single Factor:</i> Subjective Alcohol Effects Across BrAC	.49	.33
Model 5: Two-Factor (Peak)	<i>Factor One:</i> Stimulation at Peak BrAC <i>Factor Two:</i> Sedation at Peak BrAC	.98	.06

Note. The four competing models, Models 1–4, included the six B-BAES items at the ascending limb and six B-BAES items at the descending limb of the BrAC; The fifth model included the six items at peak BrAC; Ascending limb is 30 minutes after the initiation of beverage consumption, Peak BrAC is 60 minutes, and descending limb is 120 minutes. CFI = Comparative Fit Index; SRMR = Standardized Root Mean Square Residual; Fit indices for the best fitting models are highlighted in bold font; $N = 104$.