Reliability and Validity of a Two-Question Version of the World Health Organization's Alcohol, Smoking and Substance Involvement Screening Test: The ASSIST-FC

BONNIE McREE, PH.D., M.P.H.,[a,*] THOMAS F. BABOR, PH.D., M.P.H.,[a] MIRANDA L. LYNCH, PH.D.,[b,†] & JANICE A. VENDETTI, M.P.H.[a]

[a]*Department of Community Medicine and Health Care, University of Connecticut School of Medicine, Farmington, Connecticut*
[b]*Roswell Park Cancer Institute, Buffalo, New York*

ABSTRACT. Objective: The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST), developed for the World Health Organization (WHO), screens for risks associated with the use of tobacco, alcohol, and seven categories of drugs. Although the ASSIST has acceptable psychometric properties, it is relatively long for a screening test. This study was designed to identify a subset of questions from the full ASSIST instrument having comparable psychometric properties for the classification of low-, moderate-, and high-risk substance use. **Method:** The study used three data sets from prior studies using the WHO ASSIST. Samples 1 and 3 were obtained from WHO multisite studies conducted in seven countries. Sample 2 included patient data from a U.S.-based screening and brief intervention program that incorporated the ASSIST into its clinical protocol. Samples 1 and 2 were used to conduct psychometric analyses for combinations of ASSIST items. Sample 3 was used to estimate sensitivity, specificity, and positive and negative predictive value for a two-item ASSIST. **Results:** Based on correlation statistics, reliability metrics, and validation analyses, a new, two-item version is proposed. The ASSIST-FC contains one question about the frequency (F) of current use and a second question about current or past concern (C) expressed by others. The ASSIST-FC demonstrates no substantial loss in reliability, validity, and predictive ability when statistically compared with the full-length ASSIST. **Conclusions:** The ASSIST-FC has advantages for clinical applications in settings where a brief, efficient, reliable screening test is needed to identify patients with hazardous and harmful substance use who would benefit from a brief intervention. It can also be used to identify patients who are manifesting symptoms of substance dependence that would require further diagnostic evaluation. (*J. Stud. Alcohol Drugs, 79,* 649–657, 2018)

SCREENING FOR ALCOHOL, tobacco, and other drug use has become a widely accepted public health approach in health care settings because of improved screening technologies, expert committee recommendations, and positive research findings about the effectiveness of early intervention (Babor et al., 2007; U.S. Preventive Services Task Force, 2018). Despite advances in the development of self-report screening tests for specific types of psychoactive substances, there has been considerably less attention devoted to instruments that screen for multiple substances. To address this weakness, the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) was developed for the World Health Organization (WHO) (WHO ASSIST Working Group, 2002) to identify unhealthy use of tobacco, alcohol, cannabis, cocaine, amphetamine-type stimulants (ATS), sedatives, hallucinogens, inhalants, opioids, and "other drugs." The test uses a common question and response format for all substances and estimates the relative risk of using each substance class to prioritize the type of intervention provided.

The ASSIST was developed by an international team of investigators through a process of psychometric evaluation to ensure that it is reliable, valid, feasible, and cross-culturally applicable (Humeniuk et al., 2008; WHO ASSIST Working Group, 2002). Additional studies have substantiated the validity of the instrument in a variety of countries, medical care settings, and population groups (e.g., Henrique et al., 2004; Johnson et al., 2015; Khan et al., 2012; Soto-Brandt et al., 2014; Rubio Valladolid et al., 2014). WHO developed training packages for the ASSIST and the ASSIST-linked brief intervention (Humeniuk et al., 2010a, 2010b) have been disseminated internationally. In response to the growing number of large-scale screening and early intervention programs, several tailored ASSIST training initiatives and teaching programs have emerged, some specifically focused on provider type (e.g., primary care practitioners, medical

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*Correspondence may be sent to Bonnie McRee at the Department of Community Medicine and Health Care, University of Connecticut School of Medicine, 263 Farmington Avenue, Farmington, CT 06030-6325, or via email at mcree@uchc.edu. †At the time the research was conducted, Miranda L. Lynch was with the University of Connecticut School of Medicine, Farmington, Connecticut.

residents, behavioral health specialists) or specific settings such as community health centers or emergency departments (Bray et al., 2017; Nilsen et al., 2008; Ronzani et al., 2008).

Although the ASSIST has acceptable psychometric properties, in some health care settings (e.g., emergency departments, busy community health care centers) it is considered to be too long for a screening test and has been found difficult to administer in its recommended interviewer format (Ali et al., 2013; Tiet et al., 2016). The ASSIST was designed to provide adequate information to inform a brief intervention, which for those experiencing substance-related problems, increases the administration time. In many countries, health care providers are being asked to increase the number of risk factors they screen for and at the same time improve the efficiency of their procedures. This has led to the development of pre-screen tests and shorter screening instruments, intended to quickly determine whether further assessment is required, thus substantially reducing both provider and patient burden.

To that end, a shorter version of the ASSIST, called ASSIST-Lite, was developed by Ali and colleagues (2013) by reducing the number of items and modifying the response categories and scoring procedures. Similarly, Tiet and colleagues (2016) developed a two-item version (ASSIST-Drug). Based on the development sample, the ASSIST-Drug was 94.1% sensitive and 89.6% specific for drug use disorders. These new instruments both have limitations in terms of maintaining a compatibility with the original ASSIST instrument, its scoring procedures, and training programs. Neither version preserves the original response categories. The ASSIST-Drug combines all substances (i.e., the questions do not differentiate between substances) and was validated on a sample of predominantly White men in the United States. The ASSIST-Lite does not use the same question stem for each substance as in the full ASSIST.

Because these studies resulted in new instruments that are not entirely compatible with the structure and functions of the original ASSIST, we conducted additional analyses on three data sets to identify a subset of questions from the full ASSIST instrument that had comparable psychometric performance. We then evaluated the validity of the shortened instrument in relation to the full instrument and to external validity indicators. The aim of these analyses was to develop a stand-alone screening assessment that could be used in clinical settings or be administered as a pre-screen for the full ASSIST. In either scenario, the brief version was designed to be fully compatible with existing WHO-sponsored ASSIST screening and brief intervention training packages.

Method

The study, determined to be exempt under University Institutional Review Board review, used three de-identified data sets from prior studies using the WHO ASSIST. As described below, Samples 1 and 3 were obtained from WHO multisite international ASSIST trials (Humeniuk et al., 2008, 2011). Sample 2 represented a subset of patient data from the Connecticut Screening, Brief Intervention, and Referral to Treatment (SBIRT) Program evaluation that incorporated ASSIST screening procedures in its clinical protocol (McRee et al., 2017). Samples 1 and 2 were used to examine reliability metrics and conduct classification analyses for different combinations of ASSIST items. Sample 3 was used to estimate sensitivity, specificity, and positive and negative predictive value for the two-item ASSIST instrument using a structured diagnostic assessment, the Mini International Neuropsychiatric Interview (MINI)-Plus, as the "gold standard."

Study samples and participants

The Sample 1 data set comprised 731 medical patients enrolled in a multisite randomized controlled trial of brief intervention with users of illicit drugs (Humeniuk et al., 2011). Participants in this study scored within the moderate-risk range on the ASSIST for cannabis, cocaine, amphetamine-type stimulants, or opioids. The study was conducted in four countries (Australia, Brazil, India, and the United States) within primary health care settings located across both metropolitan and rural areas. Primary inclusion criteria were age between 16 and 62 years; the ability to participate in a 3-month follow-up interview; the absence of cognitive impairment; and no current involvement in treatment for drug or alcohol dependence. Sample 1 participants were 72% male with a mean age of 31 years. Approximately 60% identified as Caucasian, 24% Indian, 7% African, and the remainder as other.

The Sample 2 data set originally comprised 29,251 medical patients who received SBIRT services as part of the CT SBIRT Program, which provides screening and early intervention services for patients seeking primary medical care within 10 community health centers located across Connecticut's metropolitan, suburban, and rural areas. Because the CT SBIRT model used universal screening of all patients rather than targeted screening procedures, a large majority of patients screened negative on the ASSIST for lifetime illicit substance use. To avoid statistical skewness problems with a large sample of zero-inflated data, Sample 2 was limited to those who had endorsed use of at least one psychoactive substance, other than tobacco and alcohol, over their lifetime (n = 10,438). The participants who met this inclusion criterion were 50% female and, on average, 42 years old. Almost half (47%) were White, 27.8% were African American, 0.5% were Asian American, and the remainder were other. Of those, 31.5% identified as Hispanic. All risk levels (i.e., low, moderate, high), as identified by the ASSIST screening score, were represented in the sample, as were all categories of psychoactive substances.

Table 1. Demographic characteristics and substance use risk distributions for three samples of primary care patients

	Sample 1			Sample 2			Sample 3		
	WHO ASSIST BI Trial (N = 731)			CT SBIRT Program (N = 10,438)			WHO ASSIST Validity Study (N = 1,047)		
Variable	% Female	M_{age} (*Mdn*)	Age range	% Female	M_{age} (*Mdn*)	Age range	% Female	M_{age} (*Mdn*)	Age range
Demographics	27.9	31.4 (29)	16.0-62.0	50.00%	42.1 (43)	13.9-91.9	34.00%	30.4 (30)	18.0-45.0
Substance category	High *n* (%)	Moderate *n* (%)	Low *n* (%)	High *n* (%)	Moderate *n* (%)	Low *n* (%)	High *n* (%)	Moderate *n* (%)	Low *n* (%)
Tobacco	92 (12.6)	496 (67.8)	143 (19.6)	696 (6.7)	5,534 (53.0)	4,208 (40.3)	86 (8.2)	646 (61.7)	315 (30.1)
Alcohol	52 (7.1)	310 (42.4)	369 (50.5)	119 (1.1)	610 (5.9)	9,709 (93.0)	176 (16.8)	347 (33.1)	524 (50.1)
Cannabis	29 (4.0)	539 (73.7)	163 (22.3)	60 (0.6)	1,866 (17.9)	8,512 (81.5)	67 (6.4)	238 (22.7)	742 (70.9)
Cocaine	14 (1.9)	130 (17.8)	587 (80.3)	70 (0.7)	879 (8.4)	9,489 (90.9)	36 (3.4)	75 (7.2)	935 (89.4)
ATS	10 (1.4)	176 (24.1)	545 (74.5)	1 (0.0)	76 (0.7)	10,361 (99.3)	79 (7.5)	119 (11.4)	849 (81.1)
Inhalant	1 (0.1)	17 (2.3)	713 (97.5)	–	48 (0.5)	10,390 (99.5)	7 (0.7)	20 (1.9)	1,020 (97.4)
Sedative	3 (0.4)	61 (8.4)	667 (91.2)	5 (0.1)	126 (1.2)	10,307 (98.7)	38 (3.6)	115 (11.0)	894 (85.4)
Hallucinogen	1 (0.1)	29 (4.0)	701 (95.9)	13 (0.1)	161 (1.6)	10,264 (98.3)	1 (0.1)	38 (3.6)	1,008 (96.3)
Opioid	3 (0.4)	123 (16.8)	605 (82.8)	69 (0.7)	740 (7.1)	9,629 (92.2)	111 (10.6)	89 (8.5)	847 (80.9)

Note: ATS = amphetamine-type stimulants.

The Sample 3 data set included 1,047 participants recruited from drug treatment and primary care settings in Australia, Brazil, India, Thailand, United Kingdom, United States, and Zimbabwe for the WHO validation study of the ASSIST (Humeniuk et al., 2008). Participants had an average age of 30 years; 66% were male, and they represented all risk levels (i.e., low, moderate, high) for tobacco, alcohol, and other drug use as identified by the ASSIST. In addition to the ASSIST, participants were administered the drug and alcohol sections of the MINI-Plus (Sheehan et al., 1998), which was used in the current study to validate the two-item ASSIST instrument.

Table 1 describes the age, gender, and distributions of participants across drug classes and risk categories examined in the current study.

Measures

ASSIST data from an earlier version (2.0) of the instrument as well as data from the current version, 3.0, were included in the analyses. Although the questions and response categories are virtually identical in both, a weighted scoring routine was added to Version 3.0 as part of the validation study of the instrument (Humeniuk et al., 2008). The eight ASSIST questions are listed in Table 2.

ASSIST scoring procedures. Question 1 is dichotomous (yes, no). Questions 2–5 use an ordinal response scale (*never, once or twice, monthly, weekly,* or *daily/almost daily*), and Questions 6–8 are categorical items (*never; yes, but not in the past 3 months;* or *yes, in the past 3 months*). Question 5 is not asked for tobacco.

In Version 2.0, scoring categories were weighted identically for similar questions. That is, Questions 2–5 were scored 0–4, and Questions 6–8 were scored 0, 1, or 2. The scoring categories for Version 3.0 are weighted according to how much they contribute to individual risk based on the results of principal components analyses from the WHO ASSIST validation study (Humeniuk et al., 2008). For practical purposes, we used the final version of the ASSIST established cutoffs that are the same for all substances with the exception of alcohol (i.e., low risk: 0–3 for tobacco and other drugs, 0–10 for alcohol; moderate risk: 4–26 for tobacco and other drugs, 11–26 for alcohol; high risk: ≥27 for all substances). In conducting analyses with Version 2.0 data, response categories were recoded to match the Version 3.0 weighting framework standard.

Risk score calculation. As described in prior publications (Humeniuk et al., 2008; WHO ASSIST Working Group, 2002), two types of risk scores can be calculated from a completed ASSIST. The Substance Specific Involvement (SSI) score is derived by summing across Questions 2–7 for each drug category separately. The risk score identifies low-, moderate-, or high-risk psychoactive substance use. A Global Continuum of Risk score may also be obtained by summing the sums of Questions 1–7 for all drug classes together and including Question 8. A primary purpose of the current analyses was to maintain the integrity of the SSI score because it is the most clinically relevant and is used to determine a patient's need for brief intervention or more intensive treatment.

MINI-International Neuropsychiatric Interview (MINI)-Plus. The MINI-Plus (Sheehan et al., 1998) is a structured diagnostic interview that assesses the presence or absence of various psychiatric disorders according to criteria from the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV; American Psychiatric Association, 1994) and the *International Statistical Classification of Diseases and Related Health Problems, 10th Revision* (ICD-10; World Health Organization, 1992). Sections relating to drug and alcohol abuse and dependence, attention deficit/hyperactivity disorder, and antisocial personality disorder were administered to participants in Sample 3. The drug and alco-

Table 2. Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) question stems

1. In your life, which of the following substances have you ever used (asked for tobacco, alcohol and each of 7 illicit drug categories[a])?
For each substance endorsed in Question 1:
2. During the past three months, how often have you used the substances mentioned?
For each substance used in the past 3 months (as endorsed in Question 2):
3. During the past three months, how often have you had a strong desire or urge to use?
4. During the past three months, how often has your use led to health, social, legal or financial problems?
5. During the past three months, how often have you failed to do what was normally expected of you because of your use?
For all substances "ever used" (as endorsed in Question 1):
6. Has a friend, relative or anyone else ever expressed concern about your use?
7. Have you ever tried and failed to control, cut down or stop using?
8. Have you ever used any [non-medical] drug by injection?

[a]The "other" drug use category, a catch-all for psychoactive substances not listed, was eliminated from the analyses due to insufficient sample size.

hol abuse and dependence symptom counts and dependence diagnoses were used as the standard to validate the two-item brief ASSIST.

Statistical analysis

All analyses were performed using the statistical software R (R Development Core Team, 2014). Before conducting the analyses, it was decided that Questions 1 (lifetime use) and 8 (injection drug use) would not be considered for the brief version of the ASSIST. Neither question is included in the SSI scoring routines, the primary risk scores typically used in routine clinical practice. Although "lifetime use" may be an important factor in determining overall risk from a past drug use history and undoubtedly helps to mitigate the conversation about substance use, particularly among pre-contemplators, current use was considered to be more relevant to a patient's presenting health condition. Further, injection drug use would likely be considered, even without a targeted question, if a patient screened positive for current, frequent opioid or cocaine use. Last, the "other" drug use category, a catch-all category for psychoactive substances not listed, was eliminated from the analyses as sample size was insufficient.

Initial reliability metrics. Initial reliability analyses were conducted on the Sample 1 and Sample 2 data sets to identify candidate items for the shortened version of the ASSIST. Pearson correlations between each item (2–7) and its corresponding SSI score were examined to determine which questions best captured the total score for each substance. Once high-correlation items were identified, the Spearman–Brown formula was used for different combinations of two-question scores to compare the reliability of a subset of questions with the SSI scores for each drug category (Eisinga et al., 2013).

Classification analyses. Classification analyses were also conducted on the Sample 1 and Sample 2 data sets. Based on the correlation results and initial reliability analyses, four combinations of questions were examined to compare the risk classification (i.e., low-, moderate- or high-risk use) when using the total SSI scores relative to a brief (two-item or three-item) ASSIST score. Several scoring schemes were used to investigate brief instrument possibilities for the most promising two-item question combination. Not all psychoactive substances were examined in these analyses. For both Samples 1 and 2, the SSI classification on the full ASSIST instrument (Q2–7) for "inhalants" was zero for the high-risk classification category; therefore, the substance category was not investigated. Although a variety of cutoff options were examined using traditional classification analyses, we also used a recently developed ROC-based formal metric that allows for optimal threshold determination with three ordinal classes. The analyses examined threshold determination for locating two cutoff points for a three-class classification using the full ASSIST as a three-group gold standard and proceeding with the methodology described in Attwood (2014).

Validity analyses. Concurrent validity of the new two-item ASSIST instrument was examined using the Sample 3 data set from the WHO ASSIST validation study that included the MINI-Plus diagnostic assessment. The goal of these analyses was to estimate sensitivity, specificity, and positive and negative predictive value (PPV, NPV) for the full and brief ASSIST instrument (positive = moderate or high risk; negative = low risk), compared to a diagnosis of substance dependence using the MINI-Plus as the gold standard. It should be noted that the MINI-Plus questions target only the two main substances used by an individual; therefore, it does not include diagnostic information on other substances used. Also, the MINI-Plus does not include tobacco use. Sensitiv-

Table 3. Cut-off points for risk-level scores for the full ASSIST and ASSIST-FC

Variable	Low	Moderate	High
Full ASSIST risk-level scores			
Alcohol	0–10	11–26	≥27
All other substances	0–3	4–26	≥27
ASSIST-FC (Q2+Q6) risk-level scores			
Alcohol	0–5	6–8	9–12
All other substances	0	2–6[a]	7–12

[a]The ASSIST-FC Moderate risk-level for "all other substances" does not include 1 because after 0, the lowest possible score is 2.

ity was calculated as: True Positives / (True Positives + False Negatives); Specificity: True Negatives / (True Negatives + False Positives); Positive Predictive Value: True Positives / (True Positives + False Positives); and Negative Predictive Value: True Negatives / (True Negatives + False Negatives).

Results

Initial reliability results

Across the two data sets, initial reliability results showed that Q2 (frequency of current use of tobacco, alcohol, and seven other drug categories), Q3 (a strong desire or urge to use), and Q6 (concern expressed by others) had the highest correlations with the total SSI scores by substance (see Supplemental Tables A and B). Results of the analyses for Q6 showed higher consistency to the total SSI scores for Sample 1, although the correlations were also high for Sample 2.

Based on these results, in which three questions (Q2, Q3, and Q6) showed good ranges of internal consistency with the total SSI score, we selected Q2 (frequency of current use) as the first question for the shortened ASSIST because of its strong performance and its intuitive advantage as an introductory screening question. Using the Spearman–Brown formula, reliability metrics were examined for each of the two data sets in order to compare the reliability of a subset of questions to the full test. Analyses for all two-question sets (Q2 plus one other question for Q3–Q7) showed that Q3 and Q6 had the highest reliability scores across the items.

Classification analyses

Based on the correlation results and the reliability metrics, four combinations of the best performing items were examined to identity the optimal risk classification of a brief ASSIST score relative to the total SSI score: Instrument A = Q2 + Q6; Instrument B = Q2 + Q3 + Q6; Instrument C = Q3 + Q6; and Instrument D = Q2 + Q3. Scoring schemes for the brief ASSIST instruments were also tested to investigate the different instrument possibilities.

The risk-level cutoff points analyzed were based not only on statistical considerations but also on clinical experience grounded in many years of field application of the ASSIST instrument. Results indicated that Instrument A yielded the most comparable classification to the full ASSIST. An ROC-based analysis identified the final three-class cut points for alcohol and other substances separately. These are presented in Table 3. Instrument A comprises the current frequency of use question (F) and concern expressed by others (C), hereafter referred to as ASSIST-FC.

The ASSIST-FC was then compared with the full ASSIST classification for each substance (Table 4) using Samples 1 and 2. The ASSIST-FC cutoff points show a high degree of overlap between the two instruments with few false negatives, which is the primary concern when using a shortened screening assessment. Supplemental Table C shows the low, moderate, and high classification crosstabs for each substance separately. As might be expected, classification is higher for Sample 2, which includes a much wider range of severity scores than Sample 1, which was restricted to patients who scored in the moderate-risk range for most substance classes. We also note that classification accuracy

Table 4. Comparisons of risk stratification for Sample 1 (N = 731) and Sample 2 (N = 10,438) data sets using ASSIST Risk-level scores

Substance	Data set	Proportion correctly classified	Proportion under-classified
Alcohol	Sample 1	469/731 = .642	52/731 = .071
	Sample 2	9,442/10,438 = .905	85/10,438 = .008
Tobacco	Sample 1	338/731 = .462	0/731 =.000
	Sample 2	6,726/10,438 = .644	2/10,438 < .001
Cannabis	Sample 1	374/731 = .512	1/731 = .001
	Sample 2	8,717/10,438 = .835	8/10,438 = .001
Cocaine	Sample 1	610/731 = .834	2/731 = .003
	Sample 2	9,611/10,438 = .921	3/10,438 < .001
ATS	Sample 1	627/731 = .858	1/731 = .001
	Sample 2	10,328/10,438 = .989	0/10,438 = .000
Sedatives	Sample 1	670/731 = .917	1/731 = .001
	Sample 2	10,311/10,438 = .988	1/10,438 < .001
Hallucinogens	Sample 1	674/731 = .922	0/731 = .000
	Sample 2	10,212/10,438 = .978	2/10,438 < .001
Opioids	Sample 1	625/731 = .855	0/731 = .000
	Sample 2	10,064/10,438 = .964	6/10,438 = .001

TABLE 5. Pearson correlations for ASSIST and ASSIST-FC substance specific involvement scores (SSI) with MINI-Plus abuse and dependence severity scores using Sample 3 (N = 1,047)

Substance	Full ASSIST Total SSI corr MINI-Plus [95%CI]	ASSIST-FC Total SSI corr MINI-Plus [95% CI]
Tobacco[a]	N.A.	N.A.
Alcohol	.64 [.60, .67]	.57 [.53, .61]
Cannabis	.69 [.66, .72]	.66 [.62, .69]
Cocaine	.71 [.68, .74]	.70 [.67, .73]
ATS	.79 [.76, .81]	.78 [.75, .80]
Inhalants	.71 [.68, .74]	.63 [.60, .67]
Sedatives	.61 [.57, .65]	.59 [.55, .63]
Hallucinogens	.45 [.40, .50]	.38 [.33, .43]
Opioids	.81 [.80, .84]	.80 [.78, .82]

Notes: All *p*s < .001 for both metrics. [a]Tobacco N/A, severity not measured by the MINI-Plus.

is lower in Sample 1 because of the low prevalence for some substances.

Validity analyses

Concurrent validity of the ASSIST-FC instrument was examined using the Sample 3 data set (N = 1,047) to compare the full ASSIST and ASSIST-FC SSI scores with the MINI-Plus symptom count of abuse and dependence items for each substance category as a diagnostic severity measure. As shown in Table 5, with the exception of alcohol, inhalants, and hallucinogens, validity estimates based on the MINI-Plus were only slightly reduced for the ASSIST-FC, and the coefficients were uniformly high across substances.

Sensitivity, specificity, PPV, and NPV for the ASSIST and ASSIST-FC instruments were compared to a diagnosis of dependence (+/-) based on the MINI-Plus diagnostic assessment. Because the MINI-Plus only screens for the two primary substances used by an individual, there is a lack of information on subsequent substances that may have been used. With the exception of specificity for the "sedative" category, results were highly comparable across the two instruments for the four measures. Table 6 presents results for participants reporting current use of the substance, as well as the results for all participants (including nonusers of a particular substance). It should be noted that low base rates, or prevalence, in different settings can affect PPV.

Using the validation data set (Sample 3, Humeniuk et al., 2008), which contained the WHO Alcohol Use Disorders Identification Test (AUDIT) measure of heavy episodic drinking (Question 3, frequency of six or more drinks), we repeated the validity analysis described above by substituting the binge question for the alcohol frequency question. The correlation significantly improved from .57 in the original analyses to .60 using the binge question (z = 3.33, p < .001).

Discussion

This study used three existing data sets to develop a two-item brief ASSIST, called the ASSIST-FC. The aim was to identify a subset of the original ASSIST items that were easy to score and interpret and fully compatible with the ASSIST scoring procedures and established training programs.

We were able to significantly reduce the number of items with no substantial loss in reliability, validity, and predictive ability when compared with the full-length ASSIST version. Not only is the new instrument supported statistically, but also intuitively as a clinical tool with the combination of questions measuring "frequency" of current use and "concern" expressed by others either in the past 3 months or "ever." The number of substance categories has been reduced from alcohol, tobacco, and seven illicit drug categories on the full ASSIST to alcohol, tobacco, and five illicit drug categories on the ASSIST-FC. The "other" category still exists to catch any substance not otherwise captured. It is recommended that users limit the drug categories to the five most prevalent categories in order to speed up the screening

TABLE 6. Sensitivity, specificity, PPV, NPV for Sample 3 (N = 1,047) using the MINI-Plus primary substance +/- as the gold standard and the ASSIST moderate or high = +, low = -

		For those currently using[a]						Currently using + all nonusers[b]			
Substance		Sens.	Spec.	PPV	NPV			Sens.	Spec.	PPV	NPV
Alcohol	ASSIST	.856	.737	.683	.885	Alcohol	ASSIST	.856	.737	.683	.885
(n = 1,047)	ASSIST-FC	.799	.740	.670	.847	(n = 1,047)	ASSIST-FC	.799	.740	.670	.847
Cannabis	ASSIST	.960	.356	.586	.902	Cannabis	ASSIST	.950	.862	.540	.990
(n = 203)	ASSIST-FC	.949	.125	.508	.722	(n = 685)	ASSIST-FC	.940	.807	.454	.987
Cocaine	ASSIST	.970	.500	.889	.800	Cocaine	ASSIST	.941	.975	.727	.996
(n = 41)	ASSIST-FC	.970	.000	.800	.000	(n = 523)	ASSIST-FC	.941	.965	.653	.996
ATS	ASSIST	.968	.300	.865	.667	ATS	ASSIST	.957	.944	.763	.992
(n = 113)	ASSIST-FC	.978	.100	.835	.500	(n = 595)	ASSIST-FC	.968	.930	.722	.994
Sedatives	ASSIST	.950	.200	.704	.667	Sedatives	ASSIST	.905	.971	.576	.996
(n = 30)	ASSIST-FC	.950	.100	.679	.500	(n = 512)	ASSIST-FC	.905	.957	.475	.996
Opioids	ASSIST	.969	.048	.863	.200	Opioids	ASSIST	.962	.954	.846	.990
(n = 151)	ASSIST-FC	.962	.048	.862	.167	(n = 633)	ASSIST-FC	.954	.950	.833	.988

Notes: PPV = Positive Predictive Value, NPV = Negative Predictive Value; MINI = Mini International Neuropsychiatric Interview; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; sens. = sensitivity; spec. = specificity. [a]Results are limited to those reporting current use of a substance; [b]results are for all participants including those who reported never using a particular substance over lifetime.

process. In the United States, the Department of Justice's Drug Enforcement Administration (DEA) classifies Ecstasy/MDMA as a hallucinogen. In the original ASSIST, it is classified as a stimulant. However, because it has both stimulant and hallucinogenic properties we chose to list it by name, within the "other" category, so as not to overlook it.

The initial choice of the two-item ASSIST-FC was based on a combination of statistical and practical considerations. Item-total correlations within scales derived from the original eight-item ASSIST were obtained from two large samples of primary care patients, one a four-nation clinical trial and the other a U.S.-based screening and brief intervention program serving a diverse statewide population. The findings identified three items that suggested good discriminability, two of which were chosen because of their clinical relevance, ease of administration, and cross-cultural applicability. The "frequency" item was chosen because it provides the most direct way to screen for recent use of psychoactive substances and to obtain an approximate indication of hazardous use and severity. The "concern" item was chosen because it provides a broader assessment of harmful substance use both in the past 3 months and in the person's lifetime. Such a question provides useful clinical information, especially when a patient admits to past concern about substance use in the context of current frequency of use. These items were chosen over the question measuring "craving" because the latter has proven difficult to translate into some languages and is a criterion that can be misinterpreted if not properly explained, thus requiring extra time for training and administration.

Tentative cutoff scores for low, moderate, and high risk for substance-related problems were then evaluated both in terms of their ability to classify patients correctly in the original samples and against external validation criteria available from the multinational sample. When the psychometric properties of the two-item ASSIST-FC were compared with those of the three candidate items (FC plus craving), there was only a small increase in test performance, further supporting the choice of the more efficient two-item version. Using the MINI-Plus diagnostic interview as the gold standard against which to compare the full ASSIST with the ASSIST-FC, there was only a small decrease in the strength of correlation for the shorter version, and the test performance metrics (sensitivity, specificity, PPV, NPV) were also comparable for the ASSIST-FC. Specificity, which is affected by sample size and large numbers of negative classifications, was lower in the sample containing only those who reported current use of a substance versus the sample that included the nonusers.

Regarding the alcohol section of the ASSIST-FC, a long-standing criticism is its inability to identify heavy episodic (binge) drinking, especially in individuals who may do so infrequently. Patients who binge drink occasionally (e.g., less than weekly) may score in the low-risk category on the ASSIST even though they are at risk for acute injuries or accidents from intoxication and would benefit from a brief intervention. Unlike the AUDIT, which contains both a frequency of drinking question and a binge question (six or more standard drinks), the ASSIST only used the frequency question to maintain compatibility with the nine other drug classes. In the early stages of the ASSIST development, a binge question was contemplated, but it was concluded that the consequences of binge drinking would likely be captured in other questions, including the "concern from others." Because of this perceived deficiency, a supplemental binge drinking question is sometimes included in the screening process (Bray et al., 2017). Although the addition of the binge question alters the original structure of the instrument, we suggest it as a practical option in that the ASSIST-FC may be administered with or without the question. Based on preliminary analyses reported here, the scoring and accuracy of the ASSIST alcohol score could be improved by replacing the alcohol frequency item with a binge question.

Nevertheless, further research should be conducted before the instrument is formally revised. The analyses we report here are based on the AUDIT's binge question, which reflects the approximate 10 g standard drink found in the United Kingdom and Norway. In the United States and other countries with standard drinks of approximately 14 g, binge-drinking levels are defined as five or more drinks at one time for a man or four or more drinks at one time for a woman. Because the recommended drinking guidelines vary from country to country and are calculated based on the amount of alcohol typically found in a standard drink for that country, further research is needed using country-specific guidelines and standard drink sizes.

A second issue with the alcohol section is that it is possible to be drinking within lower-risk drinking guidelines (i.e., one drink per day for women or two per day for men) and still score in the "moderate" risk range, even if no one has expressed concern about use. In this instance, information gathered from the binge question can assist in determining whether a brief intervention is necessary. In the absence of binge drinking behavior, simple advice to limit alcohol use to the recommended guidelines would be sufficient.

The strengths of these analyses include the use of multiple data sets from multiple countries, and the benefits of a decade of experience with the use of the ASSIST in clinical settings and research investigations throughout the world. The limitations include the relatively weak gold standard criterion that was used to validate both instruments, in that the MINI-Plus contains fewer questions than the full ASSIST, and it was administered by research assistants as a structured interview rather than by clinicians as part of a diagnostic evaluation. Compared with the full ASSIST, the ASSIST-FC lacks the ability to identify injection drug use and it also lacks the clinical benefits of additional items that increase classification accuracy. A major strength of using the full ASSIST is that the additional questions often encourage the patient to talk about his or her substance use

and at the same time provide a basis for a motivational brief intervention with the patient. Humeniuk and colleagues (2011) report that administration of the ASSIST alone may contribute to a reduction of substance use over time. Therefore, it is recommended that for those who screen positive on the ASSIST-FC, and where time permits, additional substance use information be collected by administering the full ASSIST.

Nevertheless, the ASSIST-FC is likely to have advantages for clinical applications in settings where a brief, efficient, reliable screening test is needed to identify patients who are engaged in hazardous and harmful use and who would benefit from a brief intervention. It can also be used to identify patients who are manifesting symptoms of substance dependence that require further diagnostic evaluation and possibly treatment. Other benefits of the ASSIST-FC include the following: (a) the two items (Frequency, Concern) are easy for clinicians to learn and to remember without prompting; (b) the ASSIST-FC could reduce the time to screen for psychoactive substance use by 75%, relative to the full ASSIST; (c) the ASSIST-FC maintains the tripartite scoring routine that allows low, moderate, and high risk estimations and could serve as a pre-screen for more severe cases; (d) the ASSIST-FC is fully compatible with the ASSIST training packages developed by WHO, the Pan American Health Organization, and other training centers. It is recommended that the full ASSIST be conducted when a patient screens positive on any of the drug classes for the ASSIST-FC, a precaution that would allow additional confirmation of the screening results.

Further research is needed to test the savings in time associated with the ASSIST-FC and to evaluate its diagnostic accuracy in different settings and different cultures. To facilitate use of the ASSIST-FC in clinical settings and the conduct of additional validation research needed, Appendix A provides a recommended format for the use and scoring of the ASSIST-FC.

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Conflict of Interest Statement

Because Thomas Babor is Editor of the *Journal of Studies on Alcohol and Drugs,* the review of this manuscript was partially blinded by removing his name from the list of authors when the manuscript was reviewed. Neither the reviewers, the assistant field editor, nor the field editor who made the final decision were informed that Dr. Babor was one of the authors until after the article review was concluded. This was done to prevent real or apparent conflicts of interest.

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