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Validation of the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): report of results from the Australian site

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Abstract

*The concurrent, construct, discriminative and predictive validity of the World Health Organization's Alcohol Substance Involvement Screening Test (ASSIST) were examined in an Australian sample. One hundred and fifty participants, recruited from drug treatment (*n = *50) and primary health care (PHC) settings (*n = *100), were administered a battery of instruments at baseline and a modified battery at 3 months. Measures included the ASSIST; the Addiction Severity Index-Lite (ASI-Lite); the Severity of Dependence Scale (SDS); the MINI International Neuropsychiatric Interview (MINI-Plus); the Rating of Injection Site Condition (RISC); the Drug Abuse Screening Test (DAST); the Alcohol Use Disorders Identification Test (AUDIT); the Revised Fagerstrom Tolerance Questionnaire (RTQ); and the Maudsely Addiction Profile (MAP). Concurrent validity was demonstrated by significant correlations between ASSIST scores and scores from the ASI-lite, SDS, AUDIT and DAST; and significantly greater ASSIST scores for those with diagnoses of abuse or dependence. Construct validity was established by significant correlations between ASSIST scores and measures of risk factors for the development of drug and alcohol problems. Participants diagnosed with attention deficit/hyperactivity disorder or antisocial personality disorder had significantly higher ASSIST scores than those not diagnosed as such. Discriminative validity was established by the capacity of the ASSIST to discriminate between substance use, abuse and dependence. ROC analysis was able to establish cut-off scores for an Australian sample, with suitable specificities and sensitivities for most substances. Predictive validity was demonstrated by similarity in ASSIST scores obtained at baseline and at follow-up. The findings demonstrated that the ASSIST is a valid screening test for psychoactive substance use in individuals who use a number of substances and have varying degrees of substance use.* [Newcombe DAL, Humeniuk RE, Ali R. Validation of the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): report of results from the Australian site. *Drug Alcohol Rev* 2005;24:217 – 226]

Key words: ASSIST, risky substance use, substance involvement, validity.

Introduction

Psychoactive substance abuse problems are prevalent and widespread worldwide, and are associated with significant morbidity and mortality. The World Health Organization (WHO) has identified alcohol, tobacco and illicit drugs as among the top 20 risk factors for ill-health [1], and has adopted a public health approach to screening for alcohol and drug abuse and early intervention for such problems [2]. Part of such an approach includes the development of a reliable and valid screening instrument that can be used in primary care settings, such as general practitioners' (GP) surgeries and community health-care facilities.

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There is considerable value in devising screening instruments that are capable of detecting risky, hazardous or harmful substance use where the level of risk can determine the most appropriate treatment for the individual. As a consequence screening has the potential to detect health problems or risk factors early before they have caused serious health and other problems in large numbers of people.

The limitations of using existing screening tests in primary care settings have been outlined recently by McPherson & Hersh [3] and Babor [4]. Many existing instruments, such as the Addiction Severity Index (ASI) [5], and expanded Substance Abuse Module of the Composite International Diagnostic Interview (CIDI-SAM) [6], although comprehensive, are time-consuming to administer in primary care settings. On the other hand, some of the briefer instruments available, such as the CAGE—Adapted to Include Drugs (CAGE-AID) [7], have a focus on dependence, which is less useful for detecting problematic or risky drug use in non-dependent people. Moreover, the available self-report screening tests have a number of limitations from a cross-cultural perspective [4]. Most were developed in the United States and do not have demonstrated sensitivity and specificity for use in other cultures and have not been extensively validated [4].

The WHO recently sponsored the development of the ASSIST to address the need for a reliable and valid screening test for problematic or risky substance use that is also culturally adaptable [2]. The ASSIST (version 2.0) has a number of attributes that makes it suitable for use in primary care settings [2]. It is relatively brief, comprising eight questions that are designed to be answered by respondents in approximately 5 minutes. There are questions on cannabis, cocaine, amphetamines, inhalants, sedatives, hallucinogens, opiates and other miscellaneous drugs, as well as questions on alcohol and tobacco, which aims to present the drug items in the context of a more general health and lifestyle-screening interview. The interview commences with a general screening question that asks about lifetime use; if the respondent reports no psychoactive substance use, the interview can be terminated. If the respondent admits to lifetime use of one or more substances, the remaining questions need only to be asked with regard to those substances used. Question 2 asks about frequency of use in the past 3 months. If none of the substances have been used in the past 3 months, the interviewer can skip to the last three questions, which enquire about lifetime and recency of usage patterns. Question 3 is a measure of psychological dependence and asks about frequency of compulsion to use substances in past three months. Question 4 is a measure of harmful substance use, and asks how frequently the respondents' drug use had led to health, social, legal or financial problems. Question 5 asks whether respondents have failed to meet role obligations because of their use of substances (except tobacco). Responses to questions 2–5 on the ASSIST (version 2.0) are rated on a five-point Likert frequency scale ranging from 'never' (in the past 3 months) to daily or almost daily. Questions 6–8 ask about lifetime and recent problems, including whether friends or relatives have expressed concern, prior attempts at controlling drug use and prior injection of drugs during the past 3 months and in their lifetime (the questionnaire items are listed in Appendix I). At the completion of the interview a number of domains can be derived for each respondent, from their responses to the questions; for example, a Specific Substance Involvement (SSI) score can be derived for each substance (see methods), and can be used as a guide to further intervention. In addition, individuals who indicate that they have injected drugs in the last 3 months can be provided with information on risks associated with injecting.

A test–retest study of the ASSIST was conducted in 1997/1998 with 236 participants recruited from 10 sites in different parts of the world. The results of this study show that the ASSIST items were reliable and that the ASSIST screening procedure was feasible in primary care settings in a number of cultures [2]. The next phase of the development of the ASSIST was an international multi-site validation of the ASSIST carried out during 2000/2002, which was considered an essential prerequisite for the ASSIST to be used in primary care settings [2]. This phase was undertaken in Australia, Brazil, India, Thailand, United Kingdom, United States and Zimbabwe. To ensure that the ASSIST had clinical utility an appropriate brief intervention and referral procedure for people who screened positive for risky substance use on the ASSIST was also developed and a pilot study of these procedures was undertaken (the results of the pilot study will not be reported in this paper).

The present study was carried out as part of the multi-site international study that investigated the validity of the ASSIST instrument. This report describes the results of the quantitative analysis of the concurrent, construct, discriminative and predictive validity of the ASSIST items in the Australian sample.

Method

Participants and study design

Ethical approval was obtained from the Royal Adelaide Hospital Research Ethics Committee. One hundred and fifty participants were recruited, 100 from primary health-care (PHC) settings and 50 from specialist drug and alcohol treatment settings (treatment group). This sampling procedure was used to ensure that partici-

pants exhibited a range of substance use, from dependence to occasional and non-problematic use and also to establish three reference groups, which included (1) people currently abstaining or non-problematic substance users who had never been treated for drug and alcohol problems, and thus represented those at low risk of developing harms associated with drug use; (2) current substance users who, while not dependent, were at risk of experiencing harms from their drug use either now or in the future. These people were not currently in treatment, although may have received treatment in the past; and (3) high level or dependent users, currently in treatment, and represented those at high risk of harm, including frequent injection.

At baseline a comprehensive test battery was administered to participants from both participant groups. The purpose of the baseline interview was to obtain data for the quantitative examination of the concurrent, construct and discriminative validity of the ASSIST. A brief intervention was also provided to those PHC subjects who scored positively (ASSIST SSI score between 4 and 15 for alcohol, cannabis, cocaine and amphetamines, and between 4 and 10 for opiates) on the ASSIST. Participants from the treatment group were also administered an independent clinical evaluation (ICE) by a registered psychologist who specialises in the addiction field, and who was blind to the finding of other tests, to determine diagnoses of current and lifetime dependence on a range of substances (alcohol, opiates, cannabis, benzodiazepines, cocaine, amphetamine and nicotine). The ICE was usually completed within 24 hours of the baseline interview.

All participants were contacted by telephone 3 months after their baseline interview, and were re-interviewed using a condensed test battery. The follow-up interview collected data required for the examination of predictive validity, and to also determine the effectiveness of the brief intervention administered to eligible participants at baseline. Subjects receiving any kind of treatment at baseline, including a brief intervention, were not included in the analysis of predictive validity.

Procedures

Participants from PHC settings were recruited by means of fliers placed in the waiting rooms of agencies, such as community health centre and GP surgeries; PHC settings thought to have an over-representation of substance users were selected. PHC respondents underwent a preliminary screening interview over the telephone to determine if they were suitable for the study. Participants from treatment settings were approached directly by the research officer following examination of prospective participants' case-notes. A stratified sampling procedure was used to ensure recruitment was balanced with regards to gender and the following age groups: 18–25, 26–35 and 36–45 years. The following exclusion criteria were used to screen out inappropriate study participants: (1) communication difficulties; (2) severe behavioural disturbances and/or mental health problems; (3) drug and alcohol intoxication or severe withdrawal; and (4) duration of treatment or incarceration longer than 1 month in the previous 3 months or (5) any event that would preclude the participant from attending the second interview.

The administration of the test battery at baseline was conducted in private at the research office and and took generally 60–90 minutes to complete. Participants were assured that all information provided was strictly confidential and all gave informed consent. Participants were compensated AUD $40 upon completion of baseline testing, with an explanation that this amount was also to cover the follow-up interview.

Measures

All participants were administered a comprehensive test battery at baseline that included a demographic profile, the ASSIST questionnaire and the following standardized instruments: the Addiction Severity Index–lite (ASI-lite), a condensed version of the ASI that incorporates the alcohol and drug use section, including family history of related problems [5]; the Severity of Dependence Scale (SDS), a five-item interviewer-administered questionnaire that focuses on aspects of psychological dependence, relating to the most problematic substance for each participant [8]; the MINI International Neuropsychiatric Interview (MINI Plus), an abbreviated structured diagnostic interview, which uses decision tree logic to assess the major adult Axis 1 disorders in *Diagnostic and Statistical Manual* version IV (DSM-IV) and International Classification of Diseases version 10 (ICD-10). Sections related to drug and alcohol use and to attention deficit/hyperactivity disorder (ADHD) and antisocial personality disorder (ASPD) were administered [9]; the Rating of Injection Site Condition (RISC), a brief clinician administered assessment of visible injection stigmata and related complications (scarring, abscess, infection, active infection, etc.), which was conducted for participants who reported intravenous drug use on question 8 of the ASSIST [10]; the Drug Abuse Screening Test (DAST), a self report assessment consisting of 10 true–false statements describing medical, social and behavioural events common to the careers of drug users [11]; the Alcohol Uses Disorders Identification Test (AUDIT), which was included to provide comparison of the ASSIST

alcohol questions with a validated screening test for alcohol [12]; the Revised Fagerstrom Tolerance Questionnaire (RTQ), a 10-item self-report questionnaire designed to measure nicotine dependence which was included to supplement information collected via the ASI-lite (which does not incorporate tobacco use), and was administered only to those participants who reported having smoked in the preceding 3 months [13]; and the Maudsely Addiction Profile (MAP), a self-report questionnaire which provides a functional assessment of physical health, anxiety and depression [14]. The previous instruments focused on events that occurred over the preceding 3 months, and lifetime experience, except the MINI-Plus which also assessed events that occurred over the past 12 months.

The follow-up assessment battery consisted of the ASSIST, the alcohol and drug section of the ASI and the SDS. Table 1 lists the abbreviations, full title and primary purpose of each instrument used in the current study.

ASSIST scores

Several different domains can be derived for each participant, from their results on the ASSIST, but for the sake of brevity only those domains that are most likely to be used for clinical and research work will be examined in this report. Table 2 presents the formulae used for calculating the scores. The most likely domain to be used by clinicians for screening purposes is the 'specific substance involvement score' (SSI) derived for each substance, which has a maximum score of 20 for each substance, with the exception of tobacco, which has a maximum achievable score of 16. A 'global continuum of risk score' (or total substance involvement) is calculated by the addition of all items for all substances on the ASSIST and has a maximum score of 208. A 'global continuum of illicit drug risk score' is calculated by the addition of all items with the exception of scores for alcohol and tobacco and has maximum score of 170. A 'current frequency of drug use' score for each specific substance, with a maximum

Table 1. *List of abbreviations for all instruments used in the validation of the ASSIST*

Instrument	Full title	Primary function/measure
ASI-Lite	Addiction Severity Index – lite	Frequency of lifetime and recent alcohol and drug use and associated problems/family history of problems
SDS	Severity of Dependence Scale	Severity of psychological dependence
MINI Plus	MINI International Neuropsychiatric Interview	Presence/absence of diagnosis of substance dependence/abuse and ADHD/ASPD
RISC	Rating of injecting site conditions	Assessment of injection stigmata and related complications
DAST	Drug Abuse Screening Test	General assessment of medical/social/ behavioural events
AUDIT	Alcohol Uses Disorder Identification Test	Assessment of harms from alcohol use
RTQ	Revised Fagerstrom Tolerance Questionnaire	Measure of nicotine dependence
MAP	Maudsely Addiction Profile	Functional assessment of physical health, anxiety and depression

Table 2. *Domains and formulae used to calculate ASSIST scores*

Domain	ASSIST Formula
Global Continuum of Risk Score	$\Sigma\ Q1_{a-j} + 2_{a-j} + 3_{a-j} + 4_{a-j} + 5_{a-j} + 6_{a-j} + 7_{a-j} + 8$ (max score: 208)
Global Continuum of Illicit Drug Risk Score	$\Sigma\ Q_{1c-j} + 2_{c-j} + 3_{c-j} + 4_{c-j} + 5_{c-j} + 6_{c-j} + 7_{c-j} + 8$ (max score: 170)
Specific substance involvement score: tobacco	$\Sigma\ Q2_a + 3_a + 4_a + 6_a + 7_a$ (max score: 16)
Specific substance involvement score for each substance, except tobacco	$\Sigma\ Q2 + 3 + 4 + 5 + 6 + 7$ [addition of response to each question for each substance] (max score: 20)
Current frequency of substance use score for each substance	$\Sigma\ Q2$ (max score: 4)
Total current frequency of substance use score excluding tobacco and other drugs	$\Sigma\ Q2_{c-I}$ (max score: 32)

score of 4; and a 'total current frequency of use' score, with a maximum score of 32, can also be derived.

Data analysis

A somewhat different approach is required to examine each type of validity examined in this study [15]. Concurrent validity was examined by comparing ASSIST scores with scores obtained from the ASI-lite, MINI-Plus, SDS, RTQ, DAST and AUDIT, which offer alternative measures of the same phenomena. Two-tailed Pearson product-moment correlation coefficients were calculated between ASSIST domains and scores obtained from the latter instruments. The higher the correlation the more valid the ASSIST is for that particular domain. Two-tailed independent *t*-tests were used to compare ASSIST scores, which had been divided into two groups according to the presence or absence of MINI Plus diagnoses of current or lifetime diagnoses of abuse or dependence.

Construct validity was examined by comparing ASSIST domains with scores obtained from instruments designed to measure associated phenomena or constructs to those of interest. Two-tailed Pearson product-moment correlation coefficients were calculated between ASSIST scores and measures of a number of risk factors associated with alcohol and drug problems, such as those derived from the RISC, MAP and ASI that reflect physical, psychological or social problems associated with substance abuse. Two-tailed independent *t*-tests were also used to compare ASSIST scores, which had been divided into two groups according to MINI-plus diagnoses of ADHD and ASPD. Individuals with ADHD and ASPD are at a higher risk of developing substance-related disorders [16], and it is expected that subjects diagnosed as such would have higher ASSIST scores.

Discriminative validity was examined by grouping participants into three known groups (dependence, abuse and non-problematic substance use). The dependent group consisted of participants recruited from specialist drug and alcohol treatment settings who met ICE criteria for current dependence on specific substances. Participants recruited from PHC settings were classified as substance abusers or non-problematic users according to the presence of a diagnosis for abuse on the MINI-Plus. One-way analysis of variance (ANOVA), with *post-hoc* Scheffé's tests, were used to compare ASSIST scores between the three groups. A significant difference in ASSIST scores between known groups would indicate good discriminative validity. Receiver operating characteristic (ROC) analysis was used to identify cut-off scores which would discriminate between non-problematic use and abuse, and abuse and dependence. The latter categories reflect low, moderate and high risk, respectively, of individuals developing problems as a result of their substance use.

Predictive validity refers to the ability of the ASSIST to indicate future risk in the absence of a clinical intervention. It was investigated by using paired *t*-tests to compare baseline and follow-up Global Continuum of Risk and SSI scores obtained from PHC participants who did not receive a brief intervention. It is anticipated that there will be no significant difference between baseline and follow-up scores, indicating good predictive validity.

Data were analysed using SPSS for Windows, version 10.1. To ensure the quality of the data, all data were double-entered, cleaned and matched using purpose-written syntax programs to detect discrepancies and common errors. To compensate for the increased likelihood of type 1 error caused by multiple comparisons, the alpha level was adjusted so that $p < 0.01$ was required for significance.

Results

Sample characteristics

The mean age of the sample was 31.3 years (SD = 8.4) and there were equal numbers of male and female participants. The majority identified themselves as Caucasian (95%). The mean years of school education was 12 years (SD = 2.8, range 7 – 24 years). Sixty-one per cent of subjects ($n = 92$) were unemployed, 27% ($n = 40$) and 12 % ($n = 18$) were employed part-time or full-time, respectively. Twenty-eight per cent reported that they were either married or cohabiting, 60% had never been married. Of the 150 participants interviewed at baseline, 92.7% ($n = 139$) were interviewed successfully at follow-up 3 months later. The mean time from baseline interview to follow-up interview was 104 days (SD = 14.9 days: range 78 – 181 days).

Concurrent validity of the ASSIST

Comparison with the Addiction Severity Index. There were significant positive correlations ($r = 0.71 – 0.89$; $p < 0.001$ in each case; $n = 150$) between the ASSIST Current Frequency of Use score for alcohol, cannabis, cocaine, amphetamines, inhalants, sedatives, hallucinogens and opiates and corresponding questions from the ASI. Note that the ASI classifies substances differently than the ASSIST; it has two questions concerning sedatives (barbiturates and sedatives in general) and three containing opiates. The substance used most frequently was used for comparison with ASSIST scores. There were significant positive correlations for all substances examined ($p < 0.001$). In addition, there was a significant correlation between the ASSIST Total Current Frequency of Use score and a derived ASI

Cumulated Frequency of Use score [addition of responses to questions 1 + (3 or 4 or 5) + (6 or 7) + 8 + 9 + 10 + 11 + 12: note that for each question the total number of days used in last 90 days was considered] for all substances, $r = 0.89$, ($p < 0.001$). It should be noted that the ASI excludes tobacco.

Comparisons with MINI-Plus diagnoses of substance abuse and dependence. Subjects were divided into two groups according to the presence or absence of MINI-Plus diagnoses of current or lifetime diagnoses of abuse or dependence for each individual substance. As can be seen from Table 3, all SSI scores with the exception of inhalants and cocaine were significantly higher for those participants receiving a diagnosis of abuse or dependence on the MINI Plus for that substance. The result for inhalants and cocaine most likely reflects the finding that few participants reported using these substances in the preceding 3 months.

Comparisons with the SDS, RTQ and AUDIT. The ASSIST Global Continuum of Risk domain was significantly correlated with the score obtained on the SDS ($r = 0.67$, $p < 0.001$). Furthermore, the ASSIST SSI scores for tobacco and alcohol were significantly positively correlated with the RTQ total score ($r = 0.85$, $p < 0.001$) and AUDIT score ($r = 0.84$, $p < 0.001$), respectively, thus indicating that the ASSIST is a valid measure of both nicotine and alcohol problems.

Construct validity of the ASSIST

Comparisons with the Addiction Severity Index. The ASSIST Global Continuum of Risk domain was modestly, but significantly correlated with the following ASI measures: family history of substance-related and psychiatric problems (addition of responses to questions 22–30: $r = 0.40$, $p < 0.001$); reported emotional burden of drug and alcohol use in the past 90 days (questions 18a + 18b: $r = 0.70$, $p < 0.001$) and financial burden of substance use (questions 15c + 15d: $r = 0.21$, $p = 0.009$). Furthermore, the SSI score for alcohol was significantly positively correlated with the following ASI measures; number of times ever treated for alcohol abuse (question 14a; $r = 0.35$, $p < 0.001$); the financial burden of alcohol use (question 15a; $r = 0.59$, $p < 0.001$) and the emotional burden of alcohol use (question 18a; $r = 0.66$, $p < 0.001$).

Comparisons with MINI-Plus diagnoses of ADHD and ASPD. Participants were divided into two groups according to the presence or absence of MINI-Plus diagnoses of ADHD and ASPD, respectively. Global Continuum of Risk domain scores were significantly higher for participants diagnosed with ADHD (61.44 ± 14.1: mean $\pm$ SD) than those not diagnosed with the disorder (34.3 ± 23.5: mean $\pm$ SD), $t = -3.42$, $p = 0.001$. Similarly, Global Continuum of Risk domain scores were significantly higher for participants diagnosed with ASPD (57.97 ± 23.6: mean $\pm$ SD) than those not diagnosed with the disorder (30.38 ± 20.7: mean $\pm$ SD), $t = -6.36$, $p < 0.001$.

Comparison with the MAP and the RISC. Global Continuum of Risk and Total Current Frequency of Substance Use were significantly positively correlated with the sum of physical and psychological health problems as measured by the MAP (questions 1k and 2k), $r = 0.57$, $p < 0.001$, and $r = 0.39$, $p < 0.001$, respectively. Moreover, the Global Continuum of Risk domain was significantly positively correlated with a number of scores derived from the RISC, including; sum of recent injection areas (question 2m; $r = 0.70$, $p < 0.001$), and sum of recent injection area frequency (question 4g; $r = 0\ .81$, $p < 0.001$).

Discriminative validity of the ASSIST

Table 4 shows the results of ANOVA and *post-hoc* Scheffé's tests used to determine if ASSIST scores were

Table 3. *Comparison of mean (SD) ASSIST scores divided according to the presence or absence of MINI plus current or lifetime diagnoses of abuse or dependence for each substance*

MINI-plus current or lifetime diagnosis of abuse or dependence	ASSIST Substance Involvement Score	
	Diagnosis present (*n*)	Diagnosis absent (*n*)
Alcohol	6.30 (5.1) ($n = 119$)	3.55 (2.9)*** ($n = 31$)
Cannabis	7.89 (5.8) ($n = 80$)	2.66 (4.4)*** ($n = 70$)
Cocaine	7.40 (6.9) ($n = 5$)	0.19 (0.75)^{NS} ($n = 145$)
Amphetamine-type stimulants	9.51 (7.5) ($n = 53$)	0.94 (2.8)*** ($n = 97$)
Inhalants	11.50 (9.2) ($n = 2$)	0.19 (0.8)^{NS} ($n = 148$)
Sedatives	8.65 (7.0) ($n = 23$)	0.98 (3.0)*** ($n = 127$)
Hallucinogens	1.00 (1.3) ($n = 9$)	0.26 (0.8)** ($n = 141$)
Opiates	11.47 (6.2) ($n = 36$)	0.36 (1.4)*** ($n = 114$)

Result of between-group comparisons, **p $\leqslant$ *0.01,* ***p $\leqslant$ *0.001.* ^{NS} *= not significant; for cocaine,* p = *0.08; inhalants,* p = *0.33.*

Table 4. *Discrimination between use and abuse; abuse and dependence using ANOVA and ROC analysis*.

ASSIST domain		ROC (AUC)	ROC sensitivity (%)	ROC specificity (%)	ASSIST cut-off score	ANOVA Mean diff.
Global Continuum of Risk	Use/abuse	0.89	90	78	15.0	21.2^{***}
	Abuse/depend[2]	0.83	82	72	39.5	23.4^{***}
SSI[1] score for alcohol	Use/abuse	0.76	71	63	4.5	4.1^{***}
	Abuse/depend[2]	0.83	86	77	10.5	6.3^{***}
SSI[1] score for cannabis	Use/abuse	0.92	85	83	2.5	6.6^{***}
	Abuse/depend[2]	0.86	95	64	9.5	6.9^{**}
SSI[1] score for amphetamines	Use/abuse	0.87	100	69	0.5	5.1^{***}
	Abuse/depend[2]	0.86	89	80	11.5	10.1^{***}
SSI[1] score for sedatives	Use/abuse	0.94	100	83	0.5	8.6^{***}
	Abuse/depend[2]	0.56	81	67	9.0	2.5^{NS}
SSI[1] score for Opiates	Use/abuse	1.00	100	91	0.5	12.4^{***}
	Abuse/depend[2]	0.68	58	71	14.5	$2.3^{\star}$

[1]SSI = substance involvement score; [2]Depend = dependence. Participants in the dependence group met ICE criteria for current dependence; participants in the abuse group met MINI-Plus criteria for current abuse. $^{\star}p = 0.038$, ** $p \leqslant 0.01$, *** $p \leqslant 0.001$, ^{NS} = not significant. Too few cases to undertake analysis for cocaine, inhalants and hallucinogens

significantly different between the three known groups ('non-problematic use', 'abuse', 'dependence'). There were significant differences between 'use' and 'abuse' groups for Global Continuum of Risk and Substance Involvement domains for alcohol, cannabis, amphetamines, sedatives and opiates. There were also significant differences between 'abuse' and 'dependence' groups for Global Continuum of Risk and Current Substance Involvement domains for alcohol, cannabis, amphetamine and hallucinogens, but not for sedatives. There were insufficient cases to undertake analyses for cocaine, hallucinogens and inhalants.

ROC analysis showed that ASSIST scores for most domains could be used to discriminate between 'use' and 'abuse' (i.e. low risk vs. moderate risk), and 'abuse' and 'dependence' (i.e. moderate risk vs. high risk). Cut-off scores that best separate groups and their respective sensitivities and specificities are presented in Table 4. Area under the ROC curve (AUC) is also presented in the table. The closer the AUC is to 1, the more disparate the groups. In general, AUCs were higher for 'use' and 'abuse' comparisons than for 'abuse' vs 'dependence' comparisons.

Predictive validity of the ASSIST

The forthcoming analyses were limited to those participants ($n = 20$) who did not receive a brief intervention or any kind of treatment and were part of the PHC group. A paired-groups comparison between ASSIST Global Continuum of Risk domain scores at baseline (7.15 ± 5.7: mean $\pm$ SD) and at follow-up (8.25 ± 6.5: mean $\pm$ SD) revealed no significant difference ($t = -1.68$, $p = 0.11$) between time-points. There were no significant differences between ASSIST SSI scores obtained at baseline and then at follow-up for tobacco (3.5 ± 4.9 vs. 3.3 ± 4.7; $p = 0.63$), cannabis (0.8 ± 0.9 vs. 1.3 ± 2.0; $p = 0.09$), cocaine (0.0 vs. 0.1 ± 0.2; $p = 0.33$), amphetamines (0.2 ± 0.8 vs. 0.3 ± 0.9; $p = 0.16$) and alcohol (3.1 ± 1.5 vs. 2.4 ± 0.9; $p = 0.04$). There were insufficient data to perform analyses on inhalants, sedatives, hallucinogens and opiates.

Discussion

In psychological testing, validity typically refers to how well an instrument such as the ASSIST measures what it is designed to measure [15]. Ensuring that an instrument is valid is an important step in its development and subsequent acceptance, as clinicians need to be confident of its output before administering a therapeutic intervention and/or referral procedure. The results of this study indicate that the ASSIST is a valid screening test for psychoactive substances in individuals who use a number of different substances and have varying degrees of substance involvement in the Australian context.

The results show the substantial validity of the ASSIST. Its concurrent validity is evident in the significant positive correlations obtained between ASSIST scores and a range of scores from other instruments, such as the ASI, SDS, AUDIT and RTQ, that provide collateral validation of substance use, abuse and dependence. For example, the significant correlation between the Global Continuum of Risk domain score and the score derived from the SDS would suggest that the ASSIST is a valid measure of severity of dependence for the substance that was most problematic for the person concerned. Moreover, ASSIST SSI scores were also significantly greater for those participants that received a diagnosis of abuse or

dependence on the MINI-Plus, thus indicating that the ASSIST SSI scores reflect problematic substance use accordingly.

Similarly, there is substantial evidence for the construct validity of the ASSIST. Construct validity was investigated by comparing ASSIST scores with measures that provide circumstantial evidence for substance abuse and dependence. As expected, the relationships between ASSIST scores and other measures were not as strong as those found with concurrent validity, as the constructs under comparison were not the same, but instead were theoretically related to each other. Nevertheless, there were significant, albeit modest, positive correlations between ASSIST scores and a number of measures that are considered risk factors for the development of substance use disorders or are associated with substance use, including recent injecting behaviour and scores reflecting a number of physical, psychological or social problems associated with regular substance use. Furthermore, the finding that participants diagnosed with either ADHD and ASPD had significantly higher ASSIST scores is further evidence for the construct validity of the ASSIST.

A good screening test should not only discriminate between those who are at a high risk of developing problems, and thus likely to have a diagnosable substance use disorder, from non-dependent users who are at low or moderate risk of developing problems, but also between individuals who are at moderate risk of developing problems from those at low risk. The discriminative validity of the ASSIST was examined by grouping participants into three groups according to known standards of dependence, abuse and non-problematic use and then comparing ASSIST scores using ANOVA and ROC analysis to determine sensitivity and specificity of cut-off scores. Overall, the results show that the ASSIST can discriminate between non-problematic substance use, abuse and dependence for Global Continuum of Risk and SSI scores. The latter categories reflect low, moderate and high risk, respectively, of individuals developing problems arising from their substance abuse. Thus, ASSIST SSI scores may be useful, in conjunction with clinical judgement, in determining the most appropriate treatment for individuals. However, it appears that the ASSIST discriminates more effectively between non-problematic drug use and abuse than between abuse and dependence. ROC curve analysis was able to provide a series of cut-off scores for an Australian sample, with acceptable sensitivities and specificities for most substance types, with the exception of cocaine, inhalants and hallucinogens. As dependence on inhalants and hallucinogens is relatively uncommon, it is not unreasonable to fail to find sufficient numbers of cases in these categories.

Evidence for the predictive validity of the ASSIST is less comprehensive as the small sample resulted in insufficient cases to undertake data analysis in many drug categories (inhalants, sedatives, hallucinogens and opiates). However, within the recognized constraints, the available data indicate that the ASSIST has good predictive validity, especially with respect to paired-groups comparison between baseline and follow-up SSI scores and Global Continuum of Risk scores.

There are some caveats to this study, and certainly there is a need for further research in this area. The current study reports data obtained from only 150 participants from the Australian site. As mentioned previously, the number within certain drug categories were too small to undertake many of the analyses required (i.e. for hallucinogens, inhalants and cocaine). In particular, it was not possible to determine scores that could be used to discriminate between use and abuse, and abuse and dependence for these drugs.

The use of a reliable and valid screening instrument is considered a key aspect of a public health approach to early intervention for drug-related problems [2]. Previous work has already established that the scores derived from the ASSIST are reliable and that it is feasible to use the ASSIST in a variety of settings and cultures and that the instrument can be used to screen for a variety of drugs [2]. The current study provides extensive evidence of the validity of the ASSIST in the Australian context, and in particular shows that the instrument has the potential to be a low-cost tool for detecting drug-related problems in primary-care settings. The next step is to show the clinical usefulness of the ASSIST assessment in relation to a therapeutic intervention, in the form of a brief intervention that can be administered in primary-care settings.

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Appendix I. *ASSIST 2.0*

Question		Response alternatives
Q1	In your life, which of the following substances have you ever used? (Q1a, tobacco products; Q1b, alcoholic beverages; Q1c, cannabis; Q1d, cocaine; Q1e, amphetamine-type stimulants; Q1f, inhalants; Q1g, sedatives or sleeping pills; Q1h, hallucinogens; Q1i, opiates; and Q1j 'other drugs'	0 = no, 1 = yes
Q2	In the past 3 months, how often have you ever used the substances you mentioned (first drug, second drug, etc.)?	0 = Never 1 = Once or twice 2 = Weekly 3 = Monthly 4 = Daily or almost daily
Q3	During the past 3 months, how often have you had a strong desire or urge to use (first drug, second drug, etc.)?	0 = Never 1 = Once or twice 2 = Weekly 3 = Monthly 4 = Daily or almost daily
Q4	During the past 3 months, how often has your use of (first drug, second drug, etc.) led to health, social, legal or financial problems?	0 = Never 1 = Once or twice 2 = Weekly 3 = Monthly 4 = Daily or almost daily
Q5	During the past 3 months, how often have you failed to do what was normally expected of you because of your use of (first drug, second drug, etc.)?	0 = Never 1 = Once or twice 2 = Weekly 3 = Monthly 4 = Daily or almost daily
Q6	Has a friend of relative or anyone else ever expressed concern about your use of (first drug, second drug, etc.)?	0 = No, never 2 = Yes, in the past 3 months 1 = Yes, but not in the past 3 months
Q7	Have you ever tried to control, cut down or stop using (first drug, second drug, etc.)?	0 = No, never 2 = Yes, in the past 3 months 1 = Yes, but not in the past 3 months
Q8	Have you ever used any drug by injection? (non-medical use only)	0 = No, never 2 = Yes, in the past 3 months 1 = Yes, but not in the past 3 months

(World Health Organization, 2000. Requests for permission to reproduce or translate this instrument should be addressed to the Department of Mental Health and Substance Dependence. World Health Organization, Geneva, Switzerland.)
Notes: For questions 2 to 5. *Never*: refers to not used in last 3 months. *Once or twice*: refers to using 1–2 times in last 3 months. *Weekly*: refers to using 1–4 times per week. *Monthly*: refers to using 1–3 times in 1 month. *Daily or almost daily*: refers to using 5–7 days a week.