Validation of the Alcohol Smoking and Substance Involvement Screening Test (ASSIST) in acute psychiatric inpatients

Validación de la prueba de detección de consumo de alcohol, tabaco y sustancias (ASSIST) en pacientes con trastorno psiquiátrico ingresados en una unidad de agudos

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Abstract

The aims of this study were to examine the psychometric properties of The Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) in psychiatric inpatients, due to the scarcity of screening instruments validated in this population. Patients from Hospital Clínic's psychiatric ward (n = 202) completed: ASSIST, Addiction Severity Index (ASI), MINI-International Neuropsychiatric Interview (MINI), Alcohol Use Disorders Identification Test (AUDIT), Fagerström Test for Nicotine Dependence (FTND), Severity of Dependence Scale (SDS), and Drug Abuse Screening Test (DAST). Reliability and validity evidences based on internal structure (Exploratory and Confirmatory Factor Analyses) and on the relation to other variables were obtained. Excellent internal consistency was found for Total Substance Involvement (TSI) (α = .92 and ω = .93) and for Specific Substance Involvement (SSI) scores (α = .88 - .96 and ω = .89 - .95). Analysis of internal structure for tobacco, alcohol and cannabis subscales resulted in unidimensional models with adequate goodness-of-fit indices. ASSIST scores were significantly correlated with those of ASI (r = .795 to r = .953), AUDIT (r = .864), FTND (r = .808), DAST (r = .831), SDS (r = .519) and with "number of diagnoses of abuse/dependence" in MINI-Plus (TSI: r = .857 to r = .862; SSI: r = .646 to r = .834). Receiver operating characteristic analysis (ROC) and Mann-Whitney's U test found good discriminative validity evidences. ASSIST scores showed good reliability and there were validity evidences that support its use for identifying risk levels of tobacco, alcohol and other substance use in psychiatric patients.

Keywords: Addiction; alcohol use disorder; substance use disorder; ASSIST; mental health; screening.

Resumen

Los objetivos fueron examinar las propiedades psicométricas de la prueba de detección de consumo de alcohol, tabaco y sustancias (ASSIST) en pacientes con trastorno psiquiátrico. Un total de 202 pacientes ingresados en psiquiatría del Hospital Clínic completaron: ASSIST, Índice de gravedad de la adicción (ASI), MINI-Entrevista Neuropsiquiátrica Internacional (MINI), cuestionario de identificación de los trastornos debidos al consumo de alcohol (AUDIT), Test de Fagerström (FTND), Escala de gravedad de la dependencia (SDS) y Prueba de detección de abuso de drogas (DAST). Se obtuvieron la fiabilidad y evidencia de validez de la estructura interna (análisis factorial exploratorio/confirmatorio) y de la relación con otras variables. Se encontró excelente consistencia interna en puntuaciones de riesgo total (TSI) (α = ,92 y ω = ,93) y de cada sustancia (SSI) (α = ,88 - ,96 y ω = ,89 - ,95). La estructura interna de tabaco, alcohol y cannabis resultó en modelos unidimensionales con índices de bondad de ajuste adecuados. Las puntuaciones del ASSIST correlacionaron significativamente con: ASI (r = ,795 a r = ,953), AUDIT (r = ,864), FTND (r = ,808), DAST (r = ,831), SDS (r = ,519) y «número de diagnósticos de abuso/dependencia» en MINI-Plus (TSI: r = ,857 - ,862; SSI: r = ,646 - ,834). El análisis de curva ROC y U de Mann-Whitney mostraron evidencias de validez discriminativa. Las puntuaciones del ASSIST tienen buena fiabilidad y existen evidencias de validez para su uso en la detección del nivel de riesgo de consumo de tabaco, alcohol y sustancias en pacientes con trastorno psiquiátrico.

Palabras clave: Adicción; trastorno por consumo de alcohol; trastorno por consumo de sustancias; ASSIST; salud mental; cribado.

Alcohol and substance use disorders (SUD), affect approximately 2.6% of the world's population each year (Degenhardt et al., 2017). Psychiatric disorders are associated with an increased risk of SUD. Among those with a comorbid mental disorder, the other psychiatric disorder often precedes the SUD (Degenhardt et al., 2019). The estimated prevalences of lifetime comorbidity of mood and anxiety disorders with any SUD is 40.9% and 29.9% respectively (Conway, Compton, Stinson & Grant, 2006) and those of bipolar disorder and schizophrenia with any SUD are higher than 40% (Dixon, 1999; Merikangas et al., 2011).

A low proportion of people with SUD receive addiction treatment (only 11% of those with a past year SUD), being this proportion slightly higher (18%) among those with a comorbid psychiatric disorder (Harris et al., 2019). When co-ocurring SUD disorders are undiagnosed and untreated in psychiatric patients, the course of illness is more severe and disabling, having these patients worse treatment outcomes than those with only SUD (Morisano, Babor & Robaina, 2014). To achieve effective diagnosis and treatment of comorbid SUD, it is important to integrate screening into everyday practice in psychiatric inpatients wards (Crome, Bloor & Thom, 2006). With the exception of the ASSIST, existing screening instruments neither cover all substances nor help deciding which type of intervention is more appropriate because most of them focus on dependence.

The World Health Organization (WHO) developed the ASSIST (Ali et al., 2002) which screens for all type of substances and has eight items (Q1: lifetime use, Q2: frequency of use during the last 3 months, Q3: compulsion to use substances, Q4: health, social, financial or legal problems associated with substance use, Q5: failure to meet role obligations, Q6: concern of family, friends or professionals with their use, Q7: failed attempts to quit or reduce and Q8: injection of drugs in their lifetime). Several domains or scores can be derived: Specific Substance Involvement score (SSI) for each substance (sum of response weights to items 1 to 7) and Total Substance Involvement score (TSI) (sum of response weights for items 1 to 8), as well as frequency, dependence and abuse. The SSI is a risk score for each substance, that determines the level of risk of substance use (low, moderate or high) and the most appropriate intervention for that level of use (no treatment, brief intervention or referral to addiction treatment respectively).

The proposed classification of SUD in ICD-11 covers different levels of substance use, from single harmful use to consolidated addictive behaviors, with the aims of facilitating early recognition of health problems derived from substance use and providing treatment interventions (Bascarán, Flórez, Seijo & García, 2019). Similarly, the ASSIST, can be a useful instrument for identifying different levels of risk in psychiatric patients and for increasing early access to appropriate interventions.

The original validation of the ASSIST (Humeniuk et al., 2008), and the validation in a Spanish sample (Rubio Valladolid et al., 2014), included patients from primary care and drug treatment settings. The only validation study in psychiatric population obtained good results but was limited to patients with first episode psychosis (Hides et al., 2009).

The aims of the study were to evaluate the reliability of the scores and to obtain validity evidences of the Spanish version of ASSIST to support its use to assess low, moderate and high level of risk of tobacco, alcohol and substance use in hospitalized psychiatric patients.

We expected that the reliability would be similar to that reported in previous studies (Hides et al., 2009; Humeniuk et al., 2008; Rubio Valladolid et al., 2014), that is, between .89 to .93 for TSI score and above .75 for SSI scores. We hypothesized a one factor model based on results of previous research (Pérez-Moreno, Calzada-Álvarez, Rovira-Guardiola & Torrico Linares, 2012; Tiburcio Sainz et al., 2016). We also hypothesized that ASSIST scores would have moderate to high correlations with the scores of instruments considered a gold-standard in addictions and other related variables.

Method

Participants

This cross-sectional study was undertaken in a general tertiary hospital that provides specialized services for a middle-income population mainly of Spanish nationality. Eligible subjects (Figure 1) included patients 18 years or older hospitalized in the psychiatric ward of Hospital Clinic of Barcelona, who had achieved stability from acute psychiatric symptoms and whose discharge date was within the next four days. Exclusion criteria were: 1) Mini Mental State Examination (Lobo, Ezquerra, Gómez, Sala & Seva, 1979) score below 27; 2) diagnosis of significant cognitive impairment or mental retardation; 3) inability to communicate due to language barrier, deafness or severe visual deficits; 4) aggressive behavior; 5) confusion or memory deficits due to recent electroconvulsive therapy; 6) presence of acute severe psychiatric symptoms. From 224 eligible candidates, 13 patients refused to participate and 211 patients gave informed consent. A convenience sample of 202 individuals was recruited after patients successfully completed all tests.

The sample (n = 202) consisted of 166 patients hospitalized for a psychiatric disorder and 36 patients hospitalized for detoxification of an alcohol or substance use disorder. The mean length of stay at the hospital was 19.6 days, (SD = 11.0). Age ranged from 19 to 84, with a mean of 44.0 ± 15.5 years. 47% of the sample were male, 52% were single, 32.2 % were

Ana Isabel López-Lazcano, Hugo López-Pelayo, Mercè Balcells-Oliveró, Lidia Segura, Antoni Gual

employed and 74.3% reported having completed secondary education or higher (see tables A and B in supporting material for a detailed description of the sample).

Procedure

The validation process followed the AERA, APA and NCME standards (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014; Muñiz & Fonseca-Pedrero, 2019) for sources of validity evidence in educational and psychological testing. Reliability of the scores was estimated through internal consistency. Validity evidences based on internal structure and on the relation to other variables were obtained.

Before starting the recruitment, we ensured that items from the ASSIST Spanish version (Rubio Valladolid et al., 2014) were understandable for this population. Twenty randomly selected psychiatric inpatients were assessed with the ASSIST before starting the recruitment of the sample to check whether patients understood what was being asked in the test. Some comprehension difficulties were encountered with the self-administered version that were solved when a psychologist administered the test. Therefore, self-administration was disregarded. Patients consecutively admitted to the psychiatric ward were interviewed by a clinical psychologist with expertise in addictions and trained in the use of questionnaires. Patients were informed that their participation was voluntary. It took from 60 to 90 minutes to administer the whole battery and from 5 to 15 minutes to administer the ASSIST. Patients were assigned to the General Psychiatry Group (GPG) if they had been hospitalized due to a psychiatric disorder or to the Addiction Group (AG) if they had been hospitalized due to an alcohol or substance use disorder.

Measures

This study used the protocol developed by the WHO ASSIST group (Humeniuk et al., 2008). Sociodemographic data and independent and blind psychiatric diagnose of SUD if present were gathered. Participants completed the ASSIST V3.0 (Rubio Valladolid et al., 2014) and the following battery of tests (Figure 1) in their Spanish version:

Addiction Severity Index (ASI): a semi-structured interview to assess the severity of problems in several areas (medical, employment status, legal aspects, family/social, psychiatric, use of alcohol and drugs) in substance-abusing patients. The ASI-6, the latest version of the ASI, contains 257 items. The information is provided by the patient in the form of responses to closed questions and Likert-type responses with a range between 0 and 4. Only the section of drug and alcohol use was used. Internal consistency ranged between .47 and .95 and test-retest reliability ranged from .36 to 1. The study of the internal structure revealed a good fit to a unidimensional solution for all scales (Díaz-Mesa et al., 2010).

MINI International Neuropsychiatric Interview (MINI) (Ferrando et al., 1998): a structured diagnostic interview assessing the diagnostic criteria for DSM-IV and ICD-10 psychiatric disorders. Items have dichotomous responses. Only drug and alcohol use sections were used. It determines the presence or absence of diagnoses of dependence and/or abuse on alcohol and on the two most problematic drugs and whether there is a current and/or lifetime diagnosis. The kappa values for inter-rater reliability were above .75 and the majority were a .90 or higher, regarding test-retest reliability the majority of the values were higher than .75 and only one bellow .45 (Sheehan et al., 1998).

Severity of Dependence Scale (SDS) (González-Sáiz & Carulla-Salvador, 1998): a five-item scale that focus on psychological aspects of substance dependence and measures severity of substance use. Each item is scored on a 4 point scale (0 to 3). Adequate reliability coefficients were found for all substance dependence scales (α = .737 - .877; test-retest r = .796 - .952). Low internal consistency was found for the abuse scales (α = .329 - .694), and adequate test-retest coefficients on alcohol, cocaine and heroin (test-retest r = .708 - .902) (Vélez-Moreno et al., 2015).

Alcohol Use Disorder Identification Test (AUDIT): a screening test to identify hazardous and harmful drinking and alcohol dependence. It has ten items with three to four response options. Internal reliability measured by Cronbach's alpha coefficient was .86 and test-retest correlation coefficient was .90 (Rubio Valladolid, Bermejo Vicedo, Caballero Sánchez-Serrano & Santo-Domingo Carrasco, 1998).

Drug Abuse Screening Test (DAST-10): a self-administered test that has 10 items with dichotomous response, and provides a quantitative index of the extent to which drug abuse problems are suffered, measuring an underlying dimension of dependence. It has a high internal consistency (α = .89). The exploratory factor analysis in its Spanish version extracted two components that explained 62.18% of the variance. The cut-off points ($\geq$ 3) showed a high degree of agreement with the diagnostic criteria DSM-IV TR (κ DAST-10 = .91), correctly classifying more than 90% of the subjects evaluated (Pérez-Gálvez, García-Fernández, de Vicente-Manzanaro, Oliveras-Valenzuela & Lahoz-Lafuente, 2010).

Fagerström Test for Nicotine Dependence Test (FTNDT): a six item self-report questionnaire, designed to measure the severity of nicotine dependence. Items have between two and four response options and provide a total score ranging between 0 and 10. Cronbach alpha coefficient for the Fagerstrom test was .66 (Becoña & Vázquez, 1998).

Data analysis

The SPSS statistical package (IBM Corp. Released, 2019) and R statistical software (R Core Team, 2020) were used.
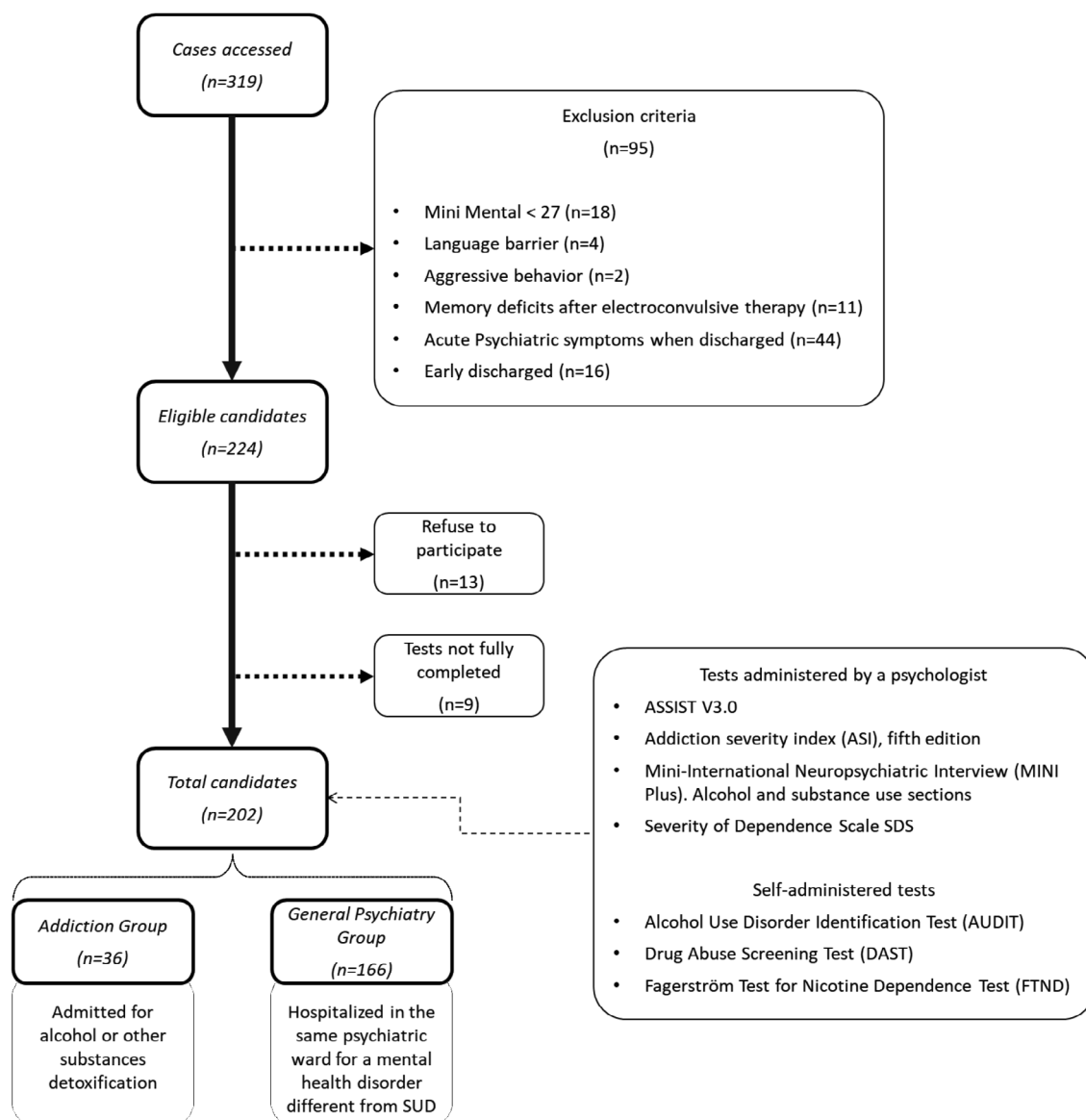
Figure 1. Flowchart showing the recruitment of patients and the battery of tests applied to the sample of candidates (n = 202).

Only the participants that answered the ASSIST and the whole battery of tests were included, therefore no procedure for imputation of missing values was required. Data were checked for normal distribution using the Kolmogorov-Smirnov test. Since ASSIST items did not follow a normal distribution, non-parametric tests were used. Mann-Whitney-U test was used to compare medians and Spearman test to perform correlation analyses. A *p* value of < .001 was considered statistically significant.

The items of the ASSIST were described using mean, standard deviation, median, interquartile range, skewness and kurtosis. Item discrimination indices were calculated by means of item-total corrected correlation considered adequate when it was above .30 (Nunnally & Bernstein, 1994).

Validity evidence based on internal structure was assessed through factor analysis. ASSIST dimensional structure was analyzed by randomly splitting the sample in two halves. The first of the two halves was used to perform an Exploratory Factor Analysis (EFA) to detect the latent structure of each substance subscale by means of a maximum likelihood estimation with varimax rotation.

With the second half of the sample, the structure resulting from the previous analysis was tested by means of a Confirmatory Factor Analysis (CFA) with the maximum likelihood estimation procedure. To check the global fit of the model χ^2 goodness of fit, the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) indices were analyzed. An RMSEA < .06 and CFI > .95 values indicated a good fit (Hu & Bentler, 1999).

Ana Isabel López-Lazcano, Hugo López-Pelayo, Mercè Balcells-Oliveró, Lidia Segura, Antoni Gual

In order to assess the reliability of the scores, internal consistency for TSI and SSI scores was measured according to Cronbach's alpha (Cronbach, 1951). In addition, because of the drawbacks of the Cronbach's alpha coefficient for the assessment of reliability, the McDonald's omega (Dunn, Baguley & Brunsden, 2014) was also calculated.

Validity evidence based on the relationships to other variables was examined. Spearman's correlation was used to compare the scores of the ASSIST domains with the scores from other instruments administered simultaneously and considered gold standards in addictions (Figure 1). The AG was divided into two groups according to the presence vs. absence of a diagnosis of dependence in each substance made by an independent psychiatrist. ASSIST scores of both groups were compared using Mann-Whitney-U test.

Additionally, ASSIST domains that measure abuse and dependence were compared with the derived scores "total number of diagnoses of abuse" and "total number of diagnosis of dependence" in the MINI using Spearman's correlations. ASSIST domains "Lifetime substance use" and TSI were compared to ASI items: "number of previous treatments for alcohol or substance abuse" and "economic expenditure on alcohol or drugs over the last three months", which are risk factors considered as indirect measures of abuse or dependence.

Discriminative validity evidences were tested comparing the ASSIST scores of the following groups: low risk (patients from GPG without a diagnosis of abuse or dependence), moderate risk (patients from GPG with abuse or dependence diagnosis according to the MINI) and high risk (patients from the AG, admitted for a current SUD) using Mann-Whitney U test. Receiver operating characteristic analysis (ROC) and sensitivity and specificity of the cut-off scores were calculated when possible and compared to the sensitivity and specificity obtained using the cut-off scores suggested by the WHO.

Effect size estimates were calculated following Cohen's d recommendations (Cohen, 1988).

Ethical issues

The protocol was approved by the Ethics Committee of Hospital Clínic (CEIm, number 2011/6516), according to the Helsinki Declaration (World Medical Association Declaration of Helsinki, 2013), and the Spanish 14/2007 Law of July 3rd, of Biomedical Research. The anonymity of participants and confidentiality of data was guaranteed.

Results

The description of the first seven ASSIST items are presented in Table 1. Item-total corrected correlation indices were above .40, except for Q1 and Q2 for alcohol, meaning that the items show good discrimination.

Evidences of internal structure of the ASSIST

EFA for the tobacco, alcohol, cannabis, cocaine, amphetamines and sedatives subscales produced one factor each (with eigenvalues ranging 2.9 - 4.8) that explained between 57.3% to 80.3% of the variance. All factor loads were greater than .5 in all questions. The other substances subscales had insufficient data to carry out an EFA. Eigenvalues, the percentages of explained variance, factorial loadings and the Kaiser-Meyer Olkin index (KMO) are detailed in Table 2.

CFA results are shown in Figure 2. Analyses of substance subscales were based the results of the EFA, suggesting one-dimensional scales. For tobacco, using the Lagrange multipliers method, the best fit of the model was obtained by correlating Questions 6 and 7 ($r = .246$) ($\chi^2(3) = 5.298$, $p = .258$) (CFI = .995, RMSEA = .059, RMSEA 90% CI = .000-.177).

The same procedure was applied to the alcohol subscale. Question 2 was related to Question 6 ($r = .284$) and to Question 7 ($r = .241$) ($\chi^2(7) = 9.133$, $p = .243$) (CFI = .996, RMSEA = .058, RMSEA 90% CI = .000-.148). For the cannabis subscale, Question 2 was related to 3 (r = .541) and to 6 ($r = .372$) and Question 7 was related to 6 ($r = .250$) and to 5 ($r = .477$) ($\chi^2(5) = 5.728$, $p = .334$) (CFI = .999, RMSEA = .040, RMSEA 90% CI = .000-.155). The other substance subscales did not obtain an adequate adjustment in the analysis.

Reliability of ASSIST scores

Internal consistency, estimated by means of Cronbach's α coefficient was .92 for the TSI score and ranged from .88 to .96 for SSI scores. McDonald's Omega was .93 for the TSI score and between .89 to .96 for SSI scores (detailed results in supporting material, table C).

Evidences of validity based on the relation with other variables

Significant positive correlations were found between the ASSIST and gold standard instruments in addiction as summarized in Table 3.

SSI scores for subjects with a MINI diagnosis of "abuse or dependence" were significantly higher than the scores of those subjects without a diagnosis. SSI scores for those participants with an independent psychiatric diagnosis of current dependence were significantly higher than those from subjects without a diagnosis for tobacco, alcohol, cocaine, sedatives and opioids in the AG (see Table 4).

As for evidences of discriminative validity (see Table 5) there were significant differences in the SSI scores between low and moderate risk for alcohol, cannabis, cocaine, amphetamines and sedatives ($p < .001$) and between moderate and high risk for alcohol. There were no significant differences between moderate and high risk (dependence) for cannabis, cocaine and sedatives.

Table 1. *ASSIST items description.*

	Q1	Q2	Q3	Q4	Q5	Q6	Q7
Tobacco							
Mean *(SD)*	2.58 (1.04)	3.39 (2.93)	3.3 (2.95)	1.57 (2.71)		2.79 (2.7)	1.56 (2.12)
Median *(IQR)*	3 (3 - 3)	6 (0 - 6)	6 (0 - 6)	0 (0 - 4)		3 (0 - 6)	0 (0 - 3)
Skewness	› 2.47	-1.91	-1.95	-.37		-1.76	-.34
Kurtosis	-2.11	-.27	-.22	1.22		.14	1.00
Discrimination index	.456	.868	.873	.537		.753	.597
Alcohol							
Mean *(SD)*	2.97 (.3)	2.65 (1.94)	1.1 (2.16)	1.4 (2.58)	.97 (2.43)	1.57 (2.42)	.91 (1.97)
Median *(IQR)*	3 (3 - 3)	3 (0 - 4)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 3)	0 (0 - 0)
Skewness	98.46	-.97	.57	.03	2.81	-.60	2.16
Kurtosis	-9.97	.00	1.54	1.38	2.16	1.07	1.94
Discrimination index	.107	.615	.853	.898	.761	.778	.806
Cannabis							
Mean *(SD)*	1.78 (1.48)	1.05 (2.07)	.95 (2.09)	1.06 (2.34)	.9 (2.37)	1.25 (2.19)	.65 (1.67)
Median *(IQR)*	3 (0 - 3)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 3)	0 (0 - 0)
Skewness	-1.87	1.14	1.45	1.40	3.51	.39	4.8
Kurtosis	-.39	1.67	1.82	1.81	2.31	1.42	2.47
Discrimination index	.527	.912	.891	.893	.802	.826	.708
Cocaine							
Mean *(SD)*	1.01 (1.42)	.3 (1.04)	.35 (1.27)	.34 (1.33)	.37 (1.55)	.49 (1.46)	.31 (1.17)
Median *(IQR)*	0 (0 - 3)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Skewness	-1.53	12.97	10.32	12.98	15.49	7.94	15.13
Kurtosis	.70	3.63	3.45	3.79	4.11	3.00	3.95
Discrimination index	.583	.857	.85	.86	.795	.792	.808
Amphetamines							
Mean *(SD)*	.65 (1.24)	.14 (.78)	.1 (.74)	.14 (.9)	.14 (.98)	.16 (.86)	.06 (.51)
Median *(IQR)*	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Skewness	-.10	37.94	51.29	44.69	48.79	33.12	98.69
Kurtosis	1.38	6.06	7.20	6.67	7.06	5.67	9.59
Discrimination index	.567	.814	.734	.767	.760	.714	.509
Sedatives							
Mean *(SD)*	.67 (1.25)	.75 (1.86)	.7 (1.89)	.78 (2.11)	.63 (2.06)	.64 (1.77)	.43 (1.45)
Median *(IQR)*	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Skewness	-.20	3.39	3.66	4.08	7.44	4.88	9.65
Kurtosis	1.34	2.25	2.35	2.43	3.03	2.56	3.32
Discrimination index	.789	.932	0.93	.901	.794	.815	.774
Opioids							
Mean *(SD)*	.28 (.88)	.12 (.76)	.13 (.82)	.13 (.92)	.11 (.9)	.18 (.93)	.19 (0.99)
Median *(IQR)*	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)	0 (0 - 0)
Skewness	5.91	43.33	39.53	49.75	68.00	30.28	27.52
Kurtosis	2.80	6.57	6.36	7.12	8.27	5.50	5.31
Discrimination index	.650	.907	.885	.814	.782	.826	.879

Note. Not enough data for Inhalants and Hallucinogens.

Table 2. *Exploratory factor analysis.*

Sub-scale	Number of factors	Eigenvalue	Variance explained	Factor loads	KMO	Barret's χ^2		
						χ^2	*df*	*p*
Tobacco	1	2.9	57.3%	› .50	.78	314.88	10	‹ .001
Alcohol	1	4.1	68.0%	› .70	.88	506.99	15	‹ .001
Cannabis	1	4.8	80.3%	› .80	.85	515.14	15	‹ .001
Cocaine	1	4.6	76.6%	› .70	.86	317.05	15	‹ .001
Amphetamines	1	4.2	70.3%	› .50	.84	171.68	15	‹ .001
Sedatives	1	3.6	59.7%	› .60	.80	113.89	15	‹ .001

Note. KMO = Kaiser-Meyer-Olkin.

Ana Isabel López-Lazcano, Hugo López-Pelayo, Mercè Balcells-Oliveró, Lidia Segura, Antoni Gual
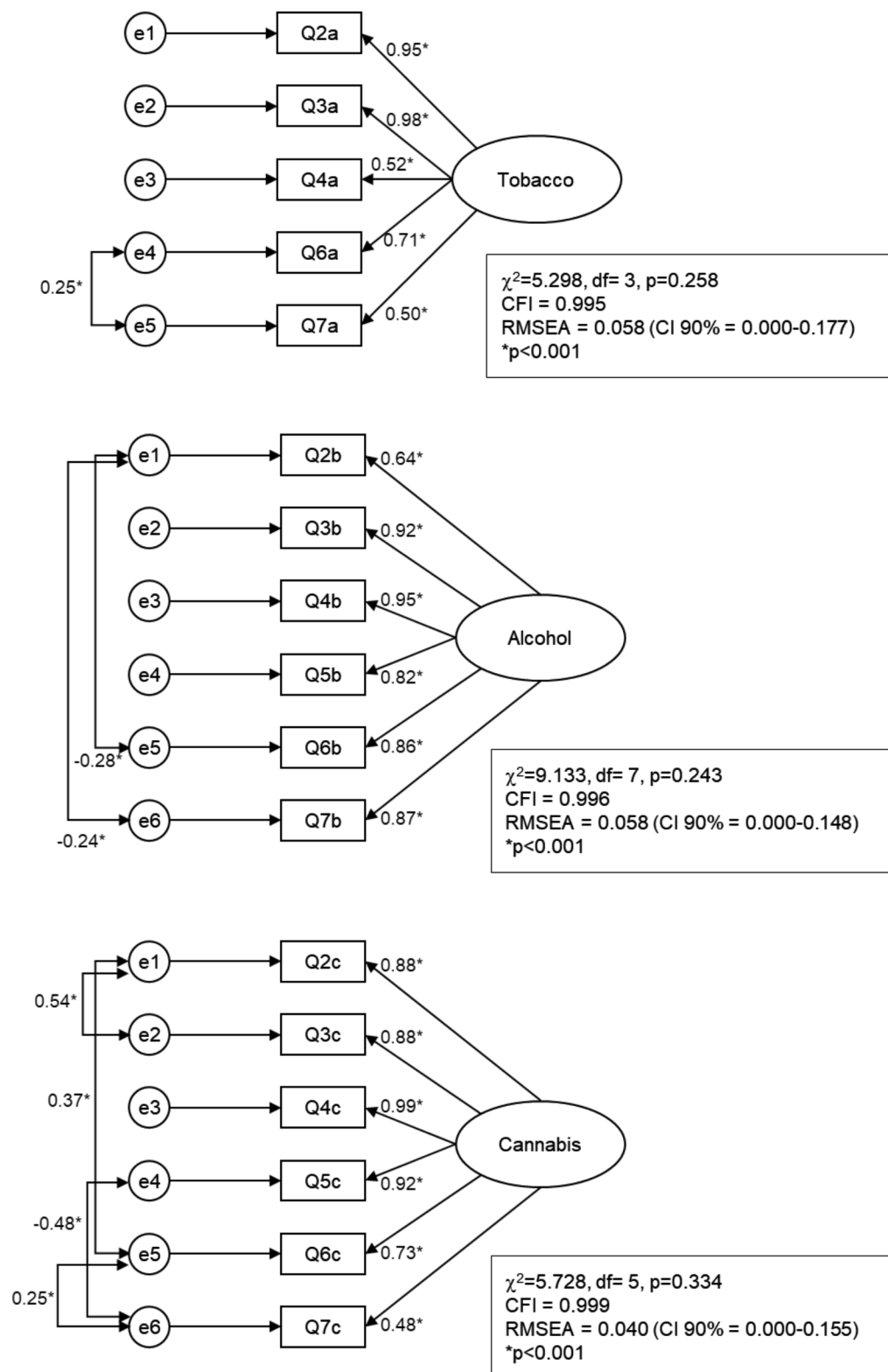

Figure 2. Confirmatory Factor Analysis for Tobacco, Alcohol and Cannabis ASSIST subscales.

Discrimination between moderate and high risk could not be investigated for amphetamines due to the absence of subjects with a dependence diagnosis (high risk) in the AG. For inhalants, opioids and hallucinogens ROC and Mann-Whitney's U could not be calculated due to insufficient data.

According to ROC analysis the ASSIST can discriminate better between low risk and moderate risk than between moderate risk and high risk. The area under the curve is higher for comparisons between low and moderate risk in all substances (cut-off-scores from 1.50 to 33.5, Area Under the Curve (AUC) from .386 to .991).

Table 3. *Evidences of validity based on the relation with other variables.*

Correlation between ASSIST domains & gold standard instruments	Spearman's r	p
TSI & SDS	.709	‹.001
TSI illicit & SDS	.519	‹.001
TSI illicit & DAST	.831	‹.001
SSI Tobacco & FTND	.808	‹.001
SSI Alcohol & AUDIT	.864	‹.001
TSI & MINI Plus "number of diagnoses" of current or lifetime abuse or dependence for alcohol and a maximum of two drugs	.862	‹.001
TSI Illicit & MINI Plus "number of diagnoses" of current or lifetime abuse or dependence for alcohol and a maximum of two drugs	.857	‹.001
SSI for all substances & MINI Plus "number of diagnoses"	.646 - .834	‹.001
ASSIST "Dependence" for illicit substances & DAST	.821	‹.001
ASSIST "Abuse" for illicit substances & DAST	.826	‹.001
ASSIST "Total and Current Frequency" for all substances & ASI "Frequency of use of each substance"	.795 - .953	‹.001
ASSIST "Dependence" for all substances & MINI Plus "Total number of diagnoses of dependence"	.795	‹.001
ASSIST "Dependence" for illicit substances & MINI Plus "Total number of diagnoses of dependence"	.825	‹.001
ASSIST "Abuse" for all substances & MINI Plus "Total number of diagnoses of abuse"	.842	‹.001
ASSIST "Abuse" for all illicit & MINI Plus "Total number of diagnoses of abuse"	.837	‹.001
ASSIST "Lifetime Substance Use" & ASI "Lifetime substance use"	.430	‹.001
ASSIST "Lifetime Substance Use" & ASI "Number of previous treatments"	.460	‹.001
TSI & ASI "Expenses in alcohol or drugs over the last three months"	.722	‹.001

Table 4. *Specific Substance Involvement (SSI) scores according to presence of MINI plus criteria for current or lifetime diagnosis of abuse or dependence, and according to Addiction Group with Independent Psychiatric Diagnosis (IPD).*

SSI Score	Present abuse or dependence	Absent abuse or dependence	Mann-Whitney U test			Cohen's d
	Mean rank	Mean rank	U	z	p	
		MINI Plus current or lifetime abuse or dependence (n = 202)				
Alcohol	149.49	68.70	984.5	-9.74	‹.001	1.00
Cannabis	166.60	78.93	515.0	-11.41	‹.001	.69
Cocaine	161.54	93.02	711.5	-9.00	‹.001	.40
Amphetamines	154.64	99.59	310.5	-5.98	‹.001	.24
Sedatives	182.28	90.09	193.0	-11.33	‹.001	.53
Opioids	182.00	99.04	105.0	-9.11	‹.001	.25
		IPD (n = 36)				
Tobacco	21.29	12.92	77.0	-2.26	.024	2.68
Alcohol	23.46	8.58	25.0	-4.00	‹.001	2.51
Cannabis	33.00	17.65	5.0	-2.54	.038	.60
Cocaine	32.90	16.18	5.5	-4.17	‹.001	.72
Sedatives	29.94	15.23	20.5	-3.96	‹.001	.97
Opioids	34.00	16.00	.0	-5.90	‹.001	.50

Discussion

The aims of this study were to examine the reliability and to obtain sources of validity evidence of the ASSIST in psychiatric inpatients because there are few data about its use in this population. This research found that the ASSIST has good psychometric properties to measure different risk levels of substance use in hospitalized psychiatric patients. Items with adequate discrimination, evidences

of unidimensional internal structure for tobacco, alcohol and cannabis, good internal consistency, and evidences of validity based on relations with other instruments (SDS, DAST, FTND, AUDIT, MINI, ASI) were found. EFA and CFA showed a unidimensional model for tobacco, alcohol, and cannabis which suggests that the total SSI score obtained for these substances is empirically supported in this sample. Other studies reported the same result for

Ana Isabel López-Lazcano, Hugo López-Pelayo, Mercè Balcells-Oliveró, Lidia Segura, Antoni Gual

Table 5. *Discrimination between low and moderate risk and moderate and high risk using Mann-Whitney's U test and receiver operating characteristic analysis (ROC).*

Risk level (n)	ROC (AUC)	ROC		ASSIST cut-off score	WHO cut-off score	ROC WHO		Mann-Whitney U test			
		Sensitivity	Specificity			Sensitivity	Specificity	U	z	p	d
SSI Alcohol											
Low (141) / Moderate (24)	.946	83.3%	86.5%	5.50	11	66.7%	99.3%	183.0	-7.08	<.001	1.95
Moderate (24) / High Alto (24)	.895	79.2%	75.0%	27.50	27	87.5%	70.8%	60.5	-4.70	<.001	1.66
SSI Cannabis											
Low (132) / Moderate (33)	.991	97.0%	97.0%	7.50	4	100%	94.7%	40.5	-10.57	<.001	3.94
Moderate (33) / High (2)	.386	50.0%	63.6%	32.50	27	50%	36.4%	25.5	-.54	=.61	.49
SSI Cocaine											
Low (159) / Moderate (9)	.932	88.9%	92.9%	1.50	4	77.8%	97.4%	95.0	-7.86	<.001	1.87
Moderate (9) / High (4)	.833	75.0%	77.8%	31.50	27	100%	66.7%	6.0	-1.86	=.06	1.38
SSI Amphetamines											
Low (162) / Moderate (3)	.988	100%	96.9%	1.50	4	66.7%	98.1%	6.0	-7.77	<.001	1.80
Moderate (3) / High (0)	n/a	n/a	n/a	n/a	27	n/a	n/a	n/a	n/a	n/a	n/a
SSI Sedatives											
Low (154) / Moderate (11)	1	100%	94.2%	1.50	4	100%	96.1%	.0	-9.76	<.001	7.32
Moderate (11) / High (9)	.606	66.7%	81.8%	33.5	27	66.7%	27.3%	39.0	-.80	=.42	.02

Note. ROC WHO: Sensitivity and Specificity values when using the ASSIST cut-off scores proposed by the WHO.

tobacco and alcohol in university students (Tiburcio Sainz et al., 2016) and for cocaine in a sample of cocaine users (Pérez-Moreno et al., 2012). Values of internal consistency ranging from .88 to .96 were similar to those reported by previous studies (Hides et al., 2009; Humeniuk et al., 2008; Rubio Valladolid et al., 2014).

SSI scores were significantly higher for those patients with a diagnosis of abuse or dependence on the MINI, showing that SSI scores reflect problematic substance use.

ROC analysis and Mann-Whitney's U test showed evidences of good discriminative validity, finding significant differences especially between groups of low and moderate risk for alcohol, cannabis, cocaine, amphetamines and sedatives. The AUC showed excellent results (AUC > .90). Good discriminative validity (AUC > .80) was also found between moderate (problematic use) and high risk (dependence) for alcohol. Similarly to previous studies (Humeniuk et al., 2008), ASSIST discriminates more effectively between low and moderate risk than between moderate and high risk, without differences for sedatives between moderate and high-risk groups.

The optimal cut-off points for moderate risk obtained in the present study for alcohol, cocaine, amphetamines and sedatives, are comparable to those established in the multi-

site international study (Humeniuk et al., 2008), whereas in the Spanish version validation study (Rubio Valladolid et al., 2014) cut-off points for these substances were a bit higher. Cut off points for alcohol and amphetamines were congruent to those obtained in the study with first episode psychotic patients (Hides et al., 2009) while the cut-off point for alcohol in the study with adolescent population (Gryczynski et al., 2015) was lower.

In the present study the optimal cut-off point for cannabis is higher than the one obtained in the aforementioned studies. This may be due to the presence of only two subjects with a diagnosis of dependence in the AG compared to a high proportion of subjects with cannabis use disorder in the GPG.

Compared to the original validation study (Humeniuk et al., 2008), the proposed cut-off scores obtained higher or similar sensitivity and specificity scores. When using the WHO cut-off-scores, the values remained alike to previous studies, except for the cut-off for high risk in cannabis and sedatives that were lower.

In many substances, as cannabis, validation in sensible population is a clear need (López-Pelayo, Batalla, Balcells, Colom & Gual, 2015). Among the advantages of ASSIST, we can highlight its shorter application time compared to

Supporting materials

Table A. *Sociodemographic characteristics of the sample and differences between groups with Student's t for continuous and Chi-square for categorical variables.*

	Total n = 202	Addiction Group n = 36	General Psychiatry Group n = 166	Mean differences
Mean age in years *(SD)*	44.0 (15.5)	48.2 (12.4)	43.1 (16.0)	$t = 1.818$ $df = 200$ $p < .071$ Cohen's $d = .34$
Female	53.0	63.9	50.6	$\chi^2 = 2.09$ $df = 1$ $p < .148$
Civil status (%)				$\chi^2 = 5.332$ $df = 5$ $p < .377$
Married or living together	32.7	44.4	30.1	
Separated or divorced	11.9	11.1	12.1	
Widowed	3.5	2.8	3.6	
Never married	52.0	41.7	54.2	
Type of residence (%)				$\chi^2 = .290$ $df = 3$ $p < .962$
Own home or family home	63.4	63.9	63.3	
Rental property or room	36.6	36.1	36.8	
Ethnic group (%)				$\chi^2 = .932$ $df = 3$ $p < .818$
White/Caucasian	94.6	94.4	94.6	
Afro-American / Asian / Hispanic	5.5	5.6	5.4	
Employment status				$\chi^2 = 7.360$ $df = 8$ $p < .498$
Employed	32.2	33.3	31.9	
Not working due to medical illness	4.5	5.6	4.2	
Unemployed	24.8	19.4	25.9	
Disability	23.3	30.6	21.7	
Other (Retired, Student, or Stays at home)	15.4	11.1	16.3	
Level of schooling (%)				$\chi^2 = 5.07$ $df = 9$ $p < .828$
Elementary school or lower	25.6	14.3	28.1	
Secondary school	46.2	48.6	45.7	
University degree and higher	28.1	37.1	26.2	

Table B. *Clinical characteristics of Addiction Group (AG) and General Psychiatry Group (GPG).*

Addiction Group n = 36		General Psychiatry Group n = 166	
Alcohol Use Disorder n = 30	83.3%	Schizophrenia and Other Psychotic Disorders n = 79	47.6%
Sedative Use Disorder n = 14	38.9%	Mood Disorder (depressive or bipolar disorder) n = 61	36.7%
Cocaine Use Disorder n = 10	27.8%	Substance Induced Disorder n = 6	3.6%
Cannabis Use Disorder n = 6	16.7%	Miscellany n = 20	12.0%
Opioid Use Disorder n = 6	16.7%	Dual diagnosis n = 38	22.9%
Nicotine Use Disorder n = 24	66.7%		
Dual diagnosis n = 17	47.2%		
Polysubstance use n = 20	55.6%		

Note. Diagnosis according to DSM-IV criteria. Addiction Group (AG) includes patients admitted for alcohol or other substances detoxification. General Psychiatry Group (GPG) includes hospitalized in the same psychiatric ward for a mental health disorder different from SUD.

Table C. *Cronbach's α and McDonald's Omega coefficients.*

	Cronbach's α	McDonald's Omega
Total Substance Involvement (TSI)	.92	.93
TSI Illicit substances	.91	.93
SSI Tobacco	.88	.89
SSI Alcohol	.93	.92
SSI Cannabis	.95	.95
SSI Cocaine	.96	.93
SSI Amphetamines	.93	.89
SSI Sedatives	.95	.96
SSI Opioids	.96	.94

Ana Isabel López-Lazcano, Hugo López-Pelayo, Mercè Balcells-Oliveró, Lidia Segura, Antoni Gual

MINI (Ferrando et al., 1998) or PRISM (Torrens, Serrano, Astals, Pérez-Domínguez & Martín-Santos, 2004), and that unlike other tests adapted to psychiatric population, it covers all substances. For example, the DALI (Rosenberg et al., 1998) does not screen for tobacco, amphetamines, sedatives or opioids or the DAST (Pérez-Gálvez et al., 2010) that does not include alcohol or tobacco. The fact that this study was carried out with patients suffering from an acute episode, whose cognitive processes and ability to complete a test could be compromised, shows that it can be applied in inpatient settings and to patients suffering not only from a first psychotic episode but also from other mental illnesses. Screening for SUDs with validated instruments in psychiatric patients (Greenberg & Rosenheck, 2014; Langås, Malt & Opjordsmoen, 2011b, 2011a; Torrens, Martin-Santos & Samet, 2006) and other vulnerable populations that may have dual diagnoses (Vargas-Cáceres et al., 2020) is essential in order to provide accurate identification of risky behaviors regarding substance use, diagnosis, and a brief motivational intervention or a referral to specialized addiction treatment when needed. An early intervention can improve the course of their illness.

The present study has several limitations, the more relevant being the sample size and the resulting small representation of certain substances such as inhalants, hallucinogens or amphetamines that made it impossible to calculate the sensitivity and specificity for some substances. Recruitment was only done in one hospital setting being generalization of results modest. However, both limitations are common in validation studies. Test-retest reliability was not done because patients were discharged soon after the first administration. Evidences of predictive validity were not calculated either. An additional limitation is that using similar indices to those used in previous studies to assess the correlations with the ASSIST scores introduces a potential redundancy bias. Lastly, the sample was limited to inpatients. Generalization to mental health outpatients should not be difficult due to their milder symptoms and better cognitive state. Evidences of validity have not been gathered for the self-administered version of the ASSIST.

Despite those limitations, the excellent properties of the Spanish version of the ASSIST in psychiatric population encourage its implementation as part of our regular practice. The study has several strengths. First, it has a dimensional approach of mental disorders and did not focus on just one mental disorder or substance. Second, it was conducted following a well-established method of validation (Humeniuk et al., 2008). The inclusion of every relevant parameter of validation in the same study is not common (López-Pelayo et al., 2015).

Considering that a moderate risk in a primary care population can be regarded as high risk in patients with psychiatric disorders, it is important to detect problematic use (moderate risk) in this population and to implement early interventions.

The Spanish version of ASSIST is available for improving early detection and intervention of substance use disorders in psychiatric inpatients. Its implementation may help reducing re-hospitalizations and relapses, increasing adherence to treatment, and improving quality of life of people suffering from a mental health disorder.

ASSIST showed good validity and reliability evidence in assessing the level of risk of substance use in psychiatric inpatients.

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Conflict of interests

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