Available online at www.sciencedirect.com
ScienceDirect
Schizophrenia Research 99 (2008) 139–148
SCHIZOPHRENIA RESEARCH
www.elsevier.com/locate/schres

Spanish version of the Screen for Cognitive Impairment in Psychiatry (SCIP-S): Psychometric properties of a brief scale for cognitive evaluation in schizophrenia

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Received 9 July 2007; received in revised form 4 September 2007; accepted 12 September 2007
Available online 23 October 2007

Abstract

Objective: The Screen for Cognitive Impairment in Psychiatry (SCIP) is a brief scale designed for detecting cognitive deficits in several psychotic and affective disorders. This study examined the psychometric properties of the Spanish version of the SCIP in a sample of outpatients suffering schizophrenia-spectrum disorders.
Methods: Psychometric properties were evaluated in a sample of 126 stable patients with schizophrenia. Men and women 18 to 55 years of age were recruited from consecutive admissions to 40 psychiatric outpatient clinics in Spain and asked to complete a series of cognitive measures at baseline, as well as three versions of the SCIP separated by one week intervals. A matched sample of 39 healthy controls was also subjected to the baseline examination. The feasibility, reliability and validity of the SCIP was examined; concurrent validity was assessed by means of a complete neuropsychological battery.
Results: Average time for SCIP administration was 16.02 (SD=5.01) minutes. Test–retest reliability intra-class correlation coefficients ranged from 0.74 to 0.90, with an internal consistency Cronbach's alpha value of 0.73. The three parallel forms of SCIP were shown to be equivalent. The SCIP scales were correlated with corresponding neuropsychological instruments, with

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0920-9964/$ - see front matter
doi:10.1016/j.schres.2007.09.012

Pearson's r between 0.38 and 0.60, $p<0.01$. The SCIP effectively discriminated between the patient and control samples. Factor analysis revealed one significant dimension, cognitive performance, that accounted for 49.8% of the total variance.
Conclusions: The Spanish version of the SCIP is a simple, brief, valid and reliable tool for detection of cognitive impairment in patients with schizophrenia by minimally trained healthcare personnel.

Keywords: Schizophrenia; SCIP; Cognitive functions; Screening

1. Introduction

Patients with schizophrenia exhibit a wide range of cognitive deficits (Cuesta and Peralta, 1995; Cuesta et al., 1998) that may approach two standard deviations below scores from a healthy normative sample (Heinrichs and Zachzanis, 1998; Daban et al., 2006). The cognitive deficits are relevant to rehabilitation and functional outcome (Green, 1996; Green et al., 2004; Green et al., 2005), but they show only small reliable improvements with novel antipsychotic therapies (Cuesta et al., 2001; Woodward et al., 2005; Woodward et al., 2007). The relevance of the latter was recently underscored by a recent National Institutes of Mental Health initiative, Measurement and Treatment Research to Improve Cognition in Schizophrenia (MATRICS) (Green and Nuechterlein, 2004; Kern et al., 2004), towards delineation of the domains and measures most relevant to pharmacotherapeutic change. The expert panel from MATRICS has recommended the quantification of working memory, attention, verbal learning and memory, visual learning and memory, reasoning and problem solving, speed of information processing, and social cognition in clinical trials with schizophrenia (Nuechterlein et al., 2004).

Although the cognitive domains and measures with primary relevance to psychosocial outcome have not received similar scrutiny, several studies have implicated the relative importance of working memory, new verbal learning and memory, and reasoning and problem solving (Meltzer et al., 1996; Penadés et al., 2001; Martinez-Aran et al., 2002). A variety of instruments are available to quantify the nature and severity of the cognitive impairment in schizophrenia, and a rational selection of a tool for routine clinical practice will require a clear a priori consideration of the goals and expectations from the cognitive assessment. The MATRICS protocol, for example, was designed to assess change to medications, and it entails the administration by specially trained staff of approximately 60 to 120 min of standardized neuropsychological instruments. It is relatively brief and will produce a wide range of scores, but it is also expensive and requires advanced training in psychological assessment. At the opposite end of the spectrum is the Mini-Mental State Examination (MMSE; Folstein et al., 1975). The MMSE requires minimal training or special assessment equipment, and it can be administered bedside in a matter of minutes. Although it is sensitive to the cognitive deficits associated with the degenerative dementias for which it was designed, the MMSE is often too basic for application to psychiatric populations (Manning et al., 2007), and the very high scores tend to reach a ceiling that limit its validity, sensitivity, and reliability for such patients (Faustmann et al., 1990).

Several assessment scales that are less cumbersome than the MATRICS protocol, but more sensitive than the MMSE, have been developed with potential value to schizophrenia. Cognistat (Kiernan et al., 1987), before 1995 known as Neurobehavioural Cognitive Status Examination, consists of ten scales that quantify orientation, attention, memory, language and reasoning problems. This test can be completed in approximately 10–20 min, and has been developed for patients with neurological damage, the main limitation being the underestimation of the cognitive deficit of the psychiatric patients. Another drawback is the lack of alternative forms to minimize practice effects. The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph et al., 1998) is possible to administer in approximately 20–30 min and presents two parallel forms. The RBANS evaluates immediate memory, visuospatial skills, language, attention, memory delayed and can be study successfully as tool of screening in the schizophrenia (Gold et al., 1999). The principal disadvantage in the schizophrenic patients is that it was designed to identify cognitive deficit in dementia and does not provide any specific measure of executive function. The Woodcock-Johnson III Test of Cognitive Abilities (WJ III COG, Woodcock et al., 2001) is based on Cattell-Horn-Carroll's theory about cognitive skills. The use of either the standard alone battery (35–45 min) or the extended version of that (90–120 min) is done depending on the evaluation purpose. Its principal limitation is primary the need of additional extensive material because some subtests are computerized and the auditory subtest needs a tape. Additionally,

the interpretation of the results is complicated for clinicians and there are no studies with psychiatric samples. The Brief Assessment of Cognition in Schizophrenia (BACS; Keefe et al., 2004) is a battery that has two alternative versions; this set of tests serves to evaluate the aspects of the cognition distressing the patients with schizophrenia: verbal learning, working memory, speed processing, attention, executive function and verbal fluency. The principal limitation is that it requires approximately 40 min for administering and correcting. Several investigations of the reliability and validity of this scale are currently underway.

The present report pertains to the Screen for Cognitive Impairment in Psychiatry (SCIP; Purdon, 2005), the briefest and least expensive of the five instruments, with minimal training requirements and minimal demands for additional instrumentation beyond the score sheet, a pencil, and a wristwatch. The SCIP has three alternate forms with good reliability among healthy controls in the original English version (Purdon, 2005), and the Spanish translation (SCIP-S) (Pino et al., 2006). It consists of five subscales that each require approximately two to three minutes to administer to provide an estimate of working memory, immediate verbal learning, delayed verbal learning, verbal fluency, and psychomotor speed. The principal limitation is the absence of direct scoring of problem solving or social cognition, but several investigations are currently underway. Among healthy controls the SCIP and SCIP-S showed no reliable gender differences and both exhibited slight reliable learning effects from prospective exposure to the alternate forms (Purdon, 2005; Pino et al., 2006). The current investigation examined the internal consistency and test–retest reliability of the SCIP in a sample of patients with schizophrenia, and represents the first report of the convergent validity of the SCIP on traditional neuropsychological assessment tools, and the discriminant validity of the SCIP in a comparison between patients and healthy controls.

2. Method

2.1. Participants

All patients were evaluated by experienced psychiatrists and met DSM IV-TR criteria (American Psychiatric Association, 2000) for schizophrenia, schizoaffective disorder, or schizophreniform disorder. The patients were 18–55 years of age and in a stable phase of the illness defined by no hospitalization in the past 3 months, a total score under 70 on the Positive and Negative Syndrome Scale (PANSS, Kay et al., 1986; Peralta and Cuesta, 2004), a score under 3 on all seven positive symptom items of the PANSS (delusions, conceptual disorganization, hallucinations, agitation, grandiosity, suspiciousness, and hostility), and no changes in drug regimen or dose during the study. Patients were not included if they were suffering from a severe medical or neurological condition, or another psychiatric disorder that required treatment. Patients were also excluded if they were participating in a clinical trial, suffering an episode of major depression, or exhibiting difficulties with reading or writing. A total of 126 patients participated in the study, and a healthy control group of 39 subjects, matched to patients by sex, age, and educational level was also recruited.

2.2. The Screen for Cognitive Impairment in Psychiatry

The SCIP was designed for detecting cognitive deficits in several psychotic and affective disorders. It may be administered without the need for additional equipment (only pencil and paper) and requires nearly 15 min. Three alternative forms of the scale are available to facilitate repeated testing while minimizing learning effects. The SCIP includes a Working Memory Test (WMT), a Verbal Learning Test-Immediate (VLT-I), a Verbal Fluency Test (VFT), a Verbal Learning Test-Delayed, and a Processing Speed Test (PST). The original SCIP version is in English (Purdon, 2005), and the rational, development, and Spanish translation were described in a previous publication (Pino et al., 2006).

2.3. Procedure

The study was approved by the Ethics Committee of the University of Barcelona, and all subjects provided informed written consent to participate. Data were collected in the outpatient facilities of 40 hospitals across Spain by forty-four psychiatrists and 41 neuropsychologists. The process of recruitment began with a conference of consensus on the diagnostic criteria about the different schizophrenia spectrum disorders. This consensus was carried out between all partaking psychiatrists. This conference dealt mainly with the standard psychiatric interview of the DSM-IV diagnostic criteria (anamnesis and the exploration of the mental condition), the PANSS scale and the different inclusion/exclusion criteria of our study. A neuropsychologist with extensive experience in the psychological assessment of psychiatric samples (OP) ensured the familiarity of the neuropsychologists with the tools described below, and provided a 60-minutes training on the standardized administration of the SCIP to the psychiatrist-examiners. The psychiatrists' training

consisted of two video cases. In the first video the subtests were performed with time breaks between them in order to discuss and clarify the results. In this case the agreement between codifiers was 0.99. In the second video the psychiatrists scored the whole five subtests without pauses; following this relatively brief training phase, the kappa index of agreement on scoring was again 0.99. Patients were examined on three occasions separated by a week (+/−2 days) interval corresponding to visit 0 (baseline), visit 1, and visit 2. On each occasion, the study psychiatrists administered the SCIP, and they completed clinical ratings of the patient on the PANSS, the Hamilton Scale for Depression (HAMD; Hamilton, 1960), the Clinical Global Impression scale (CGI-G; Guy, 1976), and the Social and Occupational Functioning Assessment Schedule (SOFAS-EEASL; Goldman et al., 1992). The order of administration for the three forms of the SCIP was determined by a complete counterbalanced design for the first two visits, followed by a retest of the last form administered at the third visit (e.g. 1-2-2, 1-3-3, 2-1-1, 2-3-3, 3-1-1, 3-2-2). At the baseline examination, the neuropsychologist recorded social and demographic characteristics and then completed an extended neuropsychological examination that included the Edinburgh Handedness Inventory (Oldfield, 1971), the Wechsler Adult Intelligence Scale-III (Wechsler, 1999) subscales corresponding to Symbol Search, Digit Symbol Coding, Arithmetic, Digit Span, Letter/Number Sequencing, and Vocabulary, the Wechsler Memory Scale-III (Wechsler, 2004) subscales corresponding to Word List I and Word List II, the Wisconsin Card Sorting Test (WCST; Berg 1948; Heaton et al., 1993), Trail Making Test (TMT A and B; Army Individual Test Battery, 1944), and a test of semantic fluency (Estes, 1974; Rosen, 1980). Patients were discontinued from this investigation and their data were removed from the analysis if they required a change in antipsychotic medication, withdrew consent to participate, were non-compliant with the protocol, required the addition of CNS-active medications, experienced symptom exacerbation, or experienced syndrome relapse. Healthy control subjects were interviewed with the Comprehensive Assessment of Symptoms and History (CASH; Andreasen et al., 1992) and subjected to all neuropsychological tests described for the patients' baseline examinations.

2.4. Data analysis

The reliability of the SCIP was examined with multivariate comparisons of baseline scores to assess the equivalence of the three alternate forms of the SCIP, and by multivariate analysis of practice effects between the equivalent forms administered at visit 0 (baseline) and visit 1. The magnitude of the practice effect on each subscale, and on the total score, was calculated with Cohen's *d*, representing the difference between scores at visit 1 and baseline divided by the standard deviation of the baseline visit. Test–retest reliability of common forms was assessed with intra-class correlations between the SCIP administered at visits 1 and 2. Reliability was also examined with an assessment of internal consistency using Cronbach's alpha coefficient applied to the SCIP. The validity of the SCIP as a measure of the construct of cognitive impairment in schizophrenia was examined by evaluation of the convergence of the SCIP subscale scores on the scores from standard psychological assessment tools using Pearson correlation coefficients, and by principal components factor analysis of the SCIP subscale scores. Correlations between subtests were also evaluated by means of Pearson correlation coefficients.

The validity of the SCIP in the discrimination between the schizophrenia and matched healthy control sample was assessed by multivariate comparison of the baseline SCIP subscale scores of the two groups. Discriminant validity was examined further with the magnitude of the differences between the patient and control samples on each subscale score, and the total score, expressed by Cohen's *d*, representing the difference between the scores of the two groups divided by the pooled standard deviation. Discriminant validity was also examined by calculation of the severity of the cognitive impairment in the schizophrenia sample for each subscale score expressed in standard deviation units (*z* scores) derived from the mean and standard deviation of the healthy control sample, and a global deficit score representing an average of the standard scores from the five SCIP subtests. The discriminant validity of the SCIP was also examined by extraction of cut-scores to maximize the sensitivity and the specificity of the instrument for detection of cognitive impairment in schizophrenia. SPSS version 12.0 statistical software was used with significance levels of 0.01 for Pearson correlations and 0.05 in all other cases. A ComKappa version 1 program was used to calculate kappa coefficient (Robinson and Bakeman, 1998); multiple kappa coefficients were obtained comparing the scores of each psychiatrist to the correct codification and then an overall kappa was reached averaging those coefficients.

3. Results

3.1. Sample descriptive statistics

Regarding the subtype of schizophrenia, 111 patients (88.1%) were diagnosed with schizophrenia, 13 (10.3%)

Table 1
Demographic characteristics of the sample at baseline

Variable	*N*	%
Mean age (SD)	126	36.66 (8.38)
Subtype of schizophrenia		
Schizophrenia	111	88.1
Schizoaffective disorder	13	10.3
Schizophreniform	2	1.6
Living arrangement		
Original family	92	73.0
Own family	14	11.1
Friends	0	0.0
Sheltered housing	3	2.4
Alone	11	8.7
Other	6	4.8
Educational level		
Illiterate	0	0.0
Functional illiterate	2	1.6
Primary education	45	35.7
Secondary education	55	43.7
University education	21	16.7
Other	3	2.4
Sex		
Males	92	73.0
Females	34	27.0
Marital status		
Single	109	86.5
Married	7	5.6
Living with couple	2	1.6
Widow/er	1	0.8
Separated or divorced	7	5.6
Employment status		
Student	3	2.4
Wage earner	24	19.0
Self-employed	6	4.8
Non-paid work	3	2.4
Disability	52	41.3
Unemployed	25	19.8
Retired	8	6.3
Housewife	1	0.8
Other	4	3.2

with schizoaffective disorder, and 2 (1.6%) with schizophreniform disorder. The average duration of illness in the 126 patients was 144.24 (SD=94.46) months, and the average number of prior hospital admissions was 2.58 (SD=3.65). Most patients were receiving a single antipsychotic medication (65.08%), but many were also receiving a combination of two (28.57%), and a small portion were receiving three antipsychotic medications (4.76%). Only 2 patients (1.58%) were not receiving antipsychotic treatment at the time of the assessment. In addition to antipsychotic treatment, 73 patients (57.94%) were receiving another drug treatment (e.g. antidepressants, benzodiazepines). Substance use within 24 hours of the assessment was also prevalent, with consumption of caffeine in 61.90%, nicotine in 57.10%, alcohol in 7.90%, and marijuana in 4.00% of the sample. Additional demographic characteristics of the patient sample enrolled in this study are detailed in Table 1.

Table 2
Correlations between SCIP and neuropsychological battery

Subtests	Neuropsychological battery test(s)	Pearson's *r*
VLT-I	Word list I total score (WMS-III)	0.55 *
WMT	Arithmetic total score (WMS-III)	0.45 *
	Digit total score (WMS-III)	0.40 *
	Letters and Numbers total score (WMS-III)	0.38 *
VFT	Semantic fluency	0.44 *
	TMT-A administration time	−0.38 *
	Digit Symbol-Coding total score (WAIS-III)	0.39 *
	Symbol Search total score (WAIS-III)	0.47 *
VLT-D	Word list II total score (WMS-III)	0. 48 *
PST	Digit Symbol-Coding total score (WAIS-III)	0.57 *
	Symbol Search total score (WAIS-III)	0.60 *

VLT-I = Verbal Learning Test-Immediate; WMT = Working Memory Test; VFT = Verbal Fluency Test; VLT-D = Verbal Learning Test-Delayed; PST = Processing Speed Test.
* $p<0.01$.

The control group was composed of 24 males and 15 females with a mean age of 37.31 (SD=7.94) ranging from 20 to 52 years old. Regarding their education level, 28.20% followed primary education, 43.60% secondary education and 28.20% had university education.

3.2. SCIP descriptive statistics

One hundred and twenty patients completed the SCIP at all three visits (95.24%). Among the six patients that did not complete the study, two discontinued without explanation, two were lost to follow up, one became clinically unstable, and one used off protocol substances. Time taken for SCIP administration was 16.02 (SD=5.01) minutes at the baseline visit, and decreased to 14.50 min (SD=4.73) in the second test administration.

3.3. Equivalence of parallel forms, test–retest reliability, and internal consistency

No significant differences were observed at baseline between the three alternate forms of the SCIP, suggesting good equivalence of the parallel forms (all subtest's

Table 3
Correlations between SCIP subtests

	VLT-I	WMT	VFT	VLT-D	PST
VLT-I	1	0.41	0.39	0.58	0.32
WMT		1	0.45	0.29	0.44
VFT			1	0.22	0.42
VLT-D				1	0.17
PST					1

Table 4
Mean SCIP scores in patients and controls

Subtest	Patients			Controls			
	N	Mean (SD)	Min–max.	*N*	Mean (SD)	Min–max.	Cohen's *d*
VLT-I	124	18.46 (3.81)	7–28	39	22.00 (3.55)	14–29	0.94
WMT	124	17.04 (4.33)	2–24	39	19.87 (2.94)	12–24	0.70
VFT	124	14.34 (5.40)	3–30	39	20.44 (5.22)	10–32	1.14
VLT-D	124	4.56 (2.25)	0–10	39	6.59 (1.93)	2–10	0.93
PST	124	9.10 (2.89)	1–19	39	12.44 (2.56)	8–18	1.19
Total SCIP	124	63.51 (13.45)	31–94	39	81.33 (9.67)	63–101	1.41

VLT-I = Verbal Learning Test-Immediate; WMT = Working Memory Test; VFT = Verbal Fluency Test; VLT-D = Verbal Learning Test-Delayed; PST = Processing Speed Test; Total SCIP = SCIP total score.

$p>0.05$). The equivalence of the alternate forms was also supported by the significant improvement in scores between visit 0 (baseline) and visit 1, ($F_{(5,117)}=5.427$, $p<0.05$), though the univariate analyses identified gains only on the WMT ($F_{(1,121)}=21.140$, $p<0.05$) and the PST ($F_{(1,121)}=5.086$, $p<0.05$) subtests. Intra-class correlation coefficients for the common forms of the SCIP subscales administered at visits 1 and 2 ranged from a low of 0.74 for the VLT-D to a high of 0.81 for the VFT, and the ICC for the SCIP total score was 0.90, suggesting good test–retest reliability of the instrument. The five SCIP subscales produced a combined Cronbach's alpha coefficient of 0.73 with each subscale significantly correlated with the combined factor, and a decreased alpha value with removal of individual subscale scores (values ranging from 0.65 and 0.72), together suggesting good internal consistency of the scale.

3.4. Construct validity

3.4.1. Concurrent and convergent validity

Pearson's correlation coefficients between the subscales of the SCIP and test scores from established standardized neuropsychological instruments sensitive to each relevant domain were all statistically significant, and ranged from a low of 0.38 (WMT and WAIS III Letter/Number Sequencing) to a high of 0.60 (PST and WAIS III Symbol Search), suggesting that the SCIP subscale scores provide a valid quantification of their underlying cognitive domains (see Table 2). The convergent validity of the SCIP as a measure of cognitive impairment in schizophrenia was further supported by the principal component analysis extraction of a single factor accounting for 49.80% of total variance, and the significant loading of each subtest on this factor score, ranging from 0.641 to 0.783. Correlations between subtests' scores are shown in Table 3; they range from 0.17 (VLT-D–VMT) to 0.58 (VLT-I–VLT-D).

3.5. Discriminant validity between patients and healthy controls

A significant difference was obtained from the multivariate analysis of variance comparing the five SCIP subscale scores from the schizophrenia sample at baseline to the scores of the matched healthy control sample ($F_{(5,157)}=14.320$, $p<0.05$). The univariate comparisons for all five subscales were also significant, and the magnitude of the difference was substantial (see Table 4), with Cohen's *d* scores ranging from a low of 0.70 (WMT) to a high of 1.19 (PST). The SCIP scores offer a measure sensitive to the discrimination between patients anticipated to show cognitive deficits from a matched sample of normal controls. The magnitude of the effect, expressed in z scores for the patients derived from the mean and standard deviation of the healthy control sample, ranged from −0.96 (WMT) to −1.30 (PST), with a global SCIP score of −1.10 (see Table 5). Tentative cut-scores that maximize sensitivity and specificity are reported in Table 5 for each subscale and SCIP total score.

Table 5
Cut-off points and mean z scores for each subtest, total SCIP and SCIP composite score

Subtest	Cut-off point	Mean (SD)
VLT-I	≤20	−0.99 (1.07)
WMT	≤16	−0.96 (1.47)
VFT	≤16	−1.17 (1.03)
VLT-D	≤5	−1.05 (1.16)
PST	≤10	−1.30 (1.13)
Total SCIP	≤67	
Z SCIP		−1.10 (0.83)

VLT-I = Verbal Learning Test-Immediate; WMT = Working Memory Test; VFT = Verbal Fluency Test; VLT-D = Verbal Learning Test-Delayed; PST = Processing Speed Test; Total SCIP = SCIP total score; Z SCIP = SCIP composite score.

4. Discussion

The Screen for Cognitive Impairment in Psychiatry (SCIP) is a brief scale consisting of tests of working memory, verbal fluency, processing speed, and both immediate and delayed verbal learning and memory. It was designed for detection of cognitive deficits in several psychotic and affective disorders when time and additional equipment are in short supply. The SCIP requires a pencil, a paper, and a watch, and an examiner can produce reliable results in a fifteen minute patient examination after only one hour of training in standardized procedures.

4.1. Psychometric properties

The reliability of the standardized administration of the SCIP was supported by several analyses in this study. The three alternate forms of the SCIP are equivalent and relatively small practice effects were detected over the course of three weeks' time. Common forms showed good test–retest reliability, with intra-class correlation coefficients ranging from 0.74 to 0.81 in the different subscales, and a correlation of 0.90 for the total score. Internal consistency was also good, with a Cronbach's alpha coefficient of 0.73, a more than adequate value taking into account that the test only has five elements and that they are intended to measure specific functions. Moreover, removal of any subtest would involve a decrease in this coefficient, which supports the relevance of each of them.

The validity of the SCIP was also well supported in this study. Concurrent validity was supported by the associations between SCIP subtests and standardized neuropsychological instruments applied in routine clinical practice. The scores also converged on a single cognitive factor in the patient sample accounting for almost 50% of the total variance. All five SCIP subtests discriminated the patient sample from a healthy normal control group, with large magnitude effects including a global score that was below one standard deviation of the control group. The criterion validity of the individual subscales was supported, but the global score may provide an efficient metric for detection of impairment.

4.2. Practical aspects

In contrast to the 74.36 min (SD = 19.13) required for the administration of the standardized test battery in this investigation, the 16.02 min (SD = 5.01) required for the SCIP represents a considerable savings of time. In skilled hands, the longer battery will convey a much richer body of information concerning psychological status and cerebral function, but the SCIP may represent a more feasible option in situations where time, training, and materials are at a premium and the critical assessment question is whether or not a cognitive deficit is present. The SCIP administration time is similar to that of the MMSE, and clearly shorter than the time required for similar scales such as BACS, requiring a mean of 34.2 min (SD = 8.95) (Keefe et al., 2004), or the RBANS, with an approximate duration of 30 min per administration (Randolph et al., 1998).

Taking into account that Spanish is spoken by over 352 million people worldwide, the Spanish version of several assessment scales can be effectively used in Spanish speaking population (Colom et al., 2002; Vieta et al., 2007; Sanchez-Moreno et al. in press). In previous work we demonstrated the equivalence of the three alternate forms, as well as reliable but small practice effects, in both English and Spanish college samples assessed by skilled psychological examiners (Purdon, 2005; Pino et al., 2006). The current investigation extends these inferences to a reasonably large sample of patients suffering from schizophrenia examined by psychiatrists provided one hour of training. The current results also support the concurrent, convergent, and discriminant validity of the SCIP in detection of the cognitive deficits related to schizophrenia.

4.3. Limitations and future research

In future work it will be necessary to assess the generalization of the stable results obtained by psychiatrists testing patients with schizophrenia, to psychiatrists testing patients with mood disorders and anxiety disorders, and to primary care physicians confronted with a wider spectrum of undiagnosed psychiatric conditions. The sensitivity and specificity of the SCIP for detection of cognitive deficits in other medical conditions will be an important priority in our future research. It will also be necessary to establish the stability of the results obtained from standardized applications of the SCIP by other front line staff including nurses and social workers, and other staff that might be involved in clinical trials with novel treatments presumed to enhance cognitive skills including research coordinators and assistants. The results of the current study suggest that the SCIP will offer reliable and valid quantification in these contexts and, if true, then the SCIP may offer a feasible tool for large population based-epidemiological studies. It will also be important to further examine the sensitivity of the SCIP to changes with treatment, particularly in the context of clinical trials for the

assessment of cognitive enhancing properties of novel treatments, but also for the quantification of cognitive adverse effects that might arise from a variety of CNS-active treatments, and in the assessment of benefits claimed from various cognitive retraining products that are available now or are soon to be on the market. The SCIP offers a relatively simple and inexpensive tool that could easily allow mass testing in these situations if its sensitivity to change can be supported.

On a final note, in the interest of brevity the original SCIP did not include a test of problem solving and social cognition. Supplemental tests will be required in situations where these skills are a priority. However, we are also investigating supplemental scoring strategies, including errors of intrusion and perseverations on the verbal fluency and verbal learning subtests of the SCIP. Although in normal control samples we have observed very few of these types of errors, in the clinical samples these additional scores may offer valuable measures of frontal lobe functions that should correlate with executive and problem solving skills. This too will be a focal point in our future investigations with the SCIP.

In the meantime, we are confident that the Spanish version of the SCIP is a simple and brief tool with adequate psychometric properties for the detection of cognitive impairment in patients with schizophrenia by minimally trained healthcare staff, and it may be therefore suitable for inclusion in research protocols in which a lengthy, detailed neuropsychological assessment would not be possible.

Role of funding source

Pfizer Spain provided an unrestricted grant for this study. This study was also supported by projects 2007FIC00736 (G. Guilera) and 2005SGR00365 (J. Gómez-Benito and G. Guilera) of the "Departament d'Universitats, Recerca i Societat de la Informació de la Generalitat de Catalunya", SEJ2005-09144-C02-02/PSIC (J. Gómez-Benito and G. Guilera) of the "Ministerio de Educación y Ciencia de España", and grants RD06/0011 (E. Vieta) and REM-TAP (R. Tabarés-Seisdedos) of the "Ministerio de Salud de España, Instituto de Salud Carlos III, Red de Enfermedades Mentales".

Contributors

All authors contributed substantially in the preparation and review of the manuscript and also in the design and conduction of the study.

Conflict of interest

None.

Acknowledgments

This study was funded by Pfizer Spain. This study was also supported by projects 2007FIC00736 (G. Guilera) and 2005SGR00365 (J. Gómez-Benito and G. Guilera) of the "Departament d'Universitats, Recerca i Societat de la Informació de la Generalitat de Catalunya", SEJ2005-09144-C02-02/PSIC (J. Gómez-Benito and G. Guilera) of the "Ministerio de Educación y Ciencia de España", and grants RD06/0011 (E. Vieta) and REM-TAP (R. Tabarés-Seisdedos) of the "Ministerio de Salud de España, Instituto de Salud Carlos III, Red de Enfermedades Mentales".

Appendix A

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