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ORIGINAL PAPER

The Portuguese version of the Personal and Social Performance Scale (PSP): reliability, validity, and relationship with cognitive measures in hospitalized and community schizophrenia patients

Sofia Brissos · Filipa Palhavã · João Gama Marques · Susana Mexia · Ana Lisa Carmo · Manuel Carvalho · Cátia Dias · João Data Franco · Rita Mendes · Pedro Zuzarte · Ana Isabel Carita · Andrew Molodynski · Maria Luisa Figueira

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Abstract
Purpose Deficits in social functioning are a core feature of schizophrenia and are influenced by both symptomatic and neurocognitive variables. In the present study we aimed to determine the reliability and validity of the Portuguese version of the Personal and Social Performance (PSP) scale, and possible correlations with measures of cognitive functioning.
Methods One-hundred and four community and inpatients with schizophrenia were assessed using measures of social functioning and symptom severity alongside measures of executive function, processing speed, and verbal memory.
Results Convergent validity with the GAF in the four domains of the PSP varied from 0.357 to 0.899. Reliability was found to be satisfactory, with a Cronbach's alpha coefficient of 0.789. Inter-rater reliability in the four domains of the PSP varied from 0.430 to 0.954. Low-functioning patients (PSP < 70) were older, had longer duration of illness, were more symptomatic and had worse cognitive performances, as compared with high-functioning patients (PSP ≥ 70). In a regression model, deficits in social functioning were strongly predicted both by symptomatic and neurocognitive variables; these together accounted for up to 62% of the variance.
Conclusions The present study supports the reliability and validity of the Portuguese language version of the PSP and further supports the original measure. The co-administration of brief cognitive assessments with measures of functioning may lead to more focused interventions, possibly improving outcomes in this group.

Keywords Disability neurocognition · Psychometric properties · Social functioning · Validity

S. Brissos (✉) · F. Palhavã · J. G. Marques · S. Mexia
Lisbon's Psychiatric Hospitalar Centre, Rua Conde Redondo, n° 8 3° dt, 1150-105 Lisbon, Portugal
e-mail: sofiabrissos@netcabo.pt

S. Brissos
Janssen-Cilag Pharmaceutical, Rua Conde Redondo, n° 8 3° dt, 1150-105 Lisbon, Portugal

A. L. Carmo · M. Carvalho · C. Dias · J. D. Franco · R. Mendes · P. Zuzarte · M. L. Figueira
Department of Psychiatry, Santa Maria's University Hospital, Lisbon, Portugal

A. I. Carita
Faculty of Human Kinetics, Technical University of Lisbon, Lisbon, Portugal

A. Molodynski
Department of Psychiatry, Social Psychiatry Group, Oxford University, Oxford, UK

M. L. Figueira
Faculty of Medicine, University of Lisbon, Lisbon, Portugal

Introduction

Deficits in psychosocial domains are a core feature of schizophrenia and can be observed in the early stages of illness, during acute exacerbations, and as part of the residual syndrome [1]. The concept of functioning is complex and includes the capacity to work or study, to live independently, and to sustain important personal relationships. Despite the recent widespread use of the term "social functioning", there remains limited consensus about its definition [2]. The concept of social functioning includes such things as the capacity of a person to function in

different societal roles such as homemaker, worker, student, spouse, family member or friend. Also of importance is the individuals' satisfaction with their ability to meet these roles, their ability to take care of themselves, and the extent of their leisure and recreational activities [3].

DSM-IV-TR acknowledges that social functioning should be considered an integral part of the assessment of antipsychotic treatment in schizophrenia [4]. Partly as a result of this, improved personal and social functioning has become an important outcome measure in randomized controlled trials of new antipsychotics and innovative psychosocial therapies [2, 5].

Researchers traditionally measure one or two elements of functioning and may fail to take into account all the other elements necessary for optimal functioning [6]. New social functioning scales reflect both the need to extend assessment beyond specific clinical syndromes and the limitations of symptom scales to detect outcome differences between some treatments [7]. The main limitation of social functioning scales is the lack of consensus concerning the definition and evaluation of social functioning, which is related to the lack of distinction between objective indicators of functioning such as employment or independent living and subjective indicators such as the individual's ratings of their feelings and their personal views of their social situation [1–3]. The global assessment of functioning (GAF) scale is the most well known and used measure of social functioning in research [8]. It is quick and simple to use in either research or clinical settings, producing a single score ranging from 0 to 100. However, the single score includes some symptoms which may affect scores independently of actual functioning. The Social and Occupational Functioning Assessment Scale (SOFAS) [4] was developed from the GAF in an attempt to reduce or eliminate this issue but is quite a general instrument and does not include clear operational instructions for rating the severity of disability. The same problem applies to other scales that are available for assessing social functioning in schizophrenia. As a result there is a pressing need for more targeted, robust instruments that can assess functioning independently of symptoms [2]. Against this background, Morosini et al. [9] developed the Personal and Social Performance (PSP) scale, a short instrument consisting of four domains, with a 100-point single-item scale, in a rehabilitation centre for patients with schizophrenia. The PSP scale may offer several advantages over existing scales as it does not confuse symptoms and functioning, has specific operationalisation of the domains, and allows for both a global score and more detailed consideration of functioning in different domains [10]. It is easy to understand and quick to use, requiring minimal training, making it potentially usable in day to day clinical practice. It has been used in controlled trials and has been proposed as being particularly well suited for assessing social functioning outcomes in antipsychotic trials [2]. Recently, the scale has been validated in samples of acute and stabilised patients with schizophrenia in Germany [10], Mexico [1], Thailand [11] and China [12], and has shown good validity and reliability [13].

A negative correlation between the Positive and Negative Symptoms of Schizophrenia Scale (PANSS) cognitive factor and the total PSP score has been reported, supporting the idea that cognition in schizophrenia is relevant for real-world functioning [1, 14]. Cross-sectional and longitudinal studies have revealed that negative symptoms and neurocognitive measures of attention, executive function, working memory, verbal memory, and psychomotor speed were commonly linked to all domains of everyday function [15–19]. Learning and memory performance, processing speed, and executive functioning are related to occupational performance as measured by actual time worked and remuneration levels [20]. Verbal memory has been found to explain 40% of the variance in psychosocial functioning [17], supporting the hypothesis that cognitive variables are important predictors of functioning. Recently, Lipkovich et al. [21] proposed a model whereby cognitive impairment may precede psychiatric symptoms and both of these may precede functional impairment. They concluded that processing speed demonstrated direct and indirect effects via negative symptoms on three domains of functioning (instrumental, intrapsychic and interpersonal) and that this highlighted the importance of improving cognition for improving functional outcomes [21].

The main objective of this study was to translate and subsequently determine the reliability and validity of the Portuguese version of the PSP in both stabilised (community) and acute (hospitalised) patients with schizophrenia. We also aimed to determine what correlations, if any, there were between the PSP and a number of measures of cognitive functioning. Overall, we hypothesised that social functioning would be correlated with both symptom levels and cognitive variables.

Methods

Study design

The study received full approval by the local ethics committees. The PSP scale was translated into Portuguese by a psychiatrist (SB) and then back-translated into English by an English native-speaker. Finally, the translated version was reviewed by a committee including the Study Supervisor (MLF) to ensure it was fidelitous to the original.

All those performing ratings had received previous training on the PANSS. All attended a 3-h training session in which the original and the Portuguese version of the PSP

scale were presented and discussed, and afterwards gave independent ratings of six case-vignettes; these ratings were repeated 6 months later, after study termination. Training in the neurocognitive measures was conducted by a PhD level neuropsychologist.

The objectives of the study were explained to all patients and informed consent was gained prior to any tests being administered. Patients were at the same time rated with the PANSS, CGI-S (Clinical Global Impression-Severity scale) and GAF. All tests were administered on the same day, and length of interview varied between 30 min and 1 h. Those performing testing were aware of the patients' diagnosis and overall clinical status.

Measures

Diagnosis was ascertained from clinical interview conducted by the study investigators and confirmed with medical chart review and the Portuguese version of the MINI [22].

Symptom severity was evaluated with the PANSS [23] and the CGI-S. Social functioning was evaluated with the Portuguese versions of the PSP [9] and the GAF [8]. The PSP ratings are based on the assessment of four objective indicators: (1) socially useful activities, including work and study; (2) personal and social relationships; (3) self-care; and (4) disturbing and aggressive behaviours. These are rated on a six-point severity scale (absent to very severe), according to specific operational definitions. The interviewer assigns a global score on a 100-point scale, based upon information from interview or other valid sources relevant to the four aforementioned domains. As a result of this, the PSP not only assigns a potentially useful global score but also allows for the measurement and tracking of the aforementioned individual domains [9, 24]. Although there are no cutoff points, the total score is usually divided into three levels: 71–100, reflecting mild functioning difficulties (where a score of 91–100 is indicative of better than adequate functioning); 31–70, reflecting varying degrees of difficulties; and 0–30, reflecting functioning so poor that the patient needs intensive support and supervision [9].

The neurocognitive test battery was particularly directed at the domains of processing speed (Wechsler Memory Scale [WMS]—Mental Tracking; Trail Making Test part A [TMT-A]); executive functions (Digit Span; Trail Making Test part B [TMT-B]); and verbal memory (California Verbal Learning Test [CVLT]). These are well-established tests with detailed descriptions in standard texts [25, 26].

Patients

104 individuals (72 males, 32 females) were recruited from two Portuguese psychiatric departments located in Lisbon (Lisbon's Psychiatric Hospitalar Centre and Santa Maria's University Hospital) from September 2009 to April 2010. Seventy-six were out-patients (56 males, 20 females), and 28 were inpatients (16 males, 12 females). Inclusion criteria were as follows: a DSM-IV-TR diagnosis of schizophrenia [4], age between 18 and 65 years, and having been on a stable dose of antipsychotic for 2 weeks prior to interview, except for inpatients. Eighteen patients were excluded due to history of neurological disorders or severe head trauma (2), illiteracy (2), substance dependence (2), or refusal to participate (12).

Statistical analysis

After training, the investigators rated six different case-vignettes to obtain the intraclass correlation coefficients (ICCs) with 95% confidence intervals. This was repeated at the end of the study. In order to examine construct validity, the sample comprised in- and out-patients, since it was expected that patients with more severe symptoms would score lower on the PSP. Convergent validity was evaluated between the PSP and the GAF, and divergent validity with the CGI-S, the PANSS, and neurocognitive tests. The internal consistency of the PSP was calculated using Cronbach's alpha coefficient.

Patients were divided in two groups (in- and outpatients) and in a second analysis, the sample was divided according to the level of disability into high-functioning patients (PSP total score ≥ 70) and low-functioning patients (PSP total score < 70). Comparisons between these groups were made using independent Chi-squared test, t tests or analysis of covariance (with educational level, CGI severity, PANSS positive, negative, general and total scores as covariates—ANCOVA) as appropriate. Relationships between PSP score, clinical, and neuropsychological variables were calculated with Spearman's rank order correlation coefficient. The variables with significant correlation with PSP dimensions and total score were considered as possible explanatory variables in a multiple linear regression model (variances provided as adjusted R^2).

We used version 17.0 of the SPSS statistical software package.

Results

Social functioning, demographic, clinical, and neurocognitive characteristics of the sample

The degree of difficulties in social functioning in each of the four PSP domains for our patient sample is illustrated in Fig. 1.

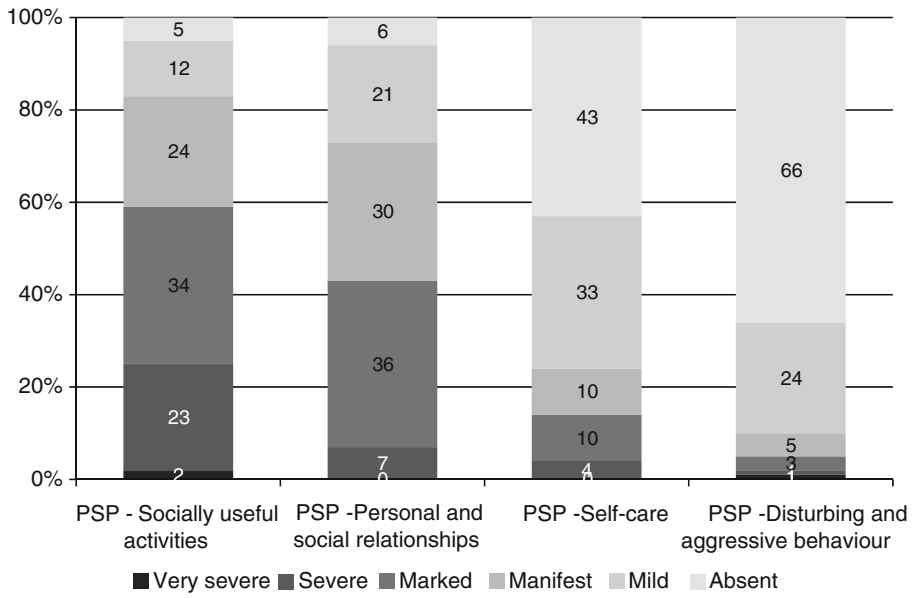

Fig. 1 Social functioning of schizophrenia patients ($n = 104$) according to the Personal and Social Performance (PSP) scale domains

Table 1 Clinical characteristics of inpatients and outpatients with schizophrenia

	Inpatients ($n = 28$)		Outpatients ($n = 76$)		Between groups[a]	
	Mean	SD	Mean	SD	t	p
Age	34.6	10.55	39.8	9.70	2.354	0.021
Educational level (years)	11.1	3.92	8.8	3.83	2.661	0.009
Age at illness onset (years)	23.4	6.75	25.0	8.04	0.814	0.418
Illness duration (years)	8.8	8.67	15.0	9.80	2.691	0.009
Number of admissions	3.4	4.49	3.5	4.47	0.025	0.980
PANSS positive	18.3	5.78	14.4	5.88	2.992	0.003
PANSS negative	20.7	5.55	18.7	6.59	1.379	0.171
PANSS general	37.7	6.39	32.5	10.29	3.003	0.004
PANSS total score	76.4	15.48	65.7	19.71	2.568	0.012
CGI-severity score	4.1	1.17	3.8	1.48	1.047	0.298
GAF score	47.5	16.64	56.5	19.58	2.151	0.034
PSP total score	48.3	16.10	55.5	17.26	1.942	0.055

CGI clinical and global impression, *GAF* global assessment of functioning, *PANSS* positive and negative syndrome scale, *PSP* Personal and Social Performance

[a] Student's t test (two-tailed) for independent samples, significance level $p < 0.05$

The majority of patients were single (80%) and unemployed/inactive (69%). When we separated the sample between in- and out-patients, we found significant differences in age, educational level, and illness duration, but not in gender ($\chi^2 = 2.628, p = 0.150$), civil status ($\chi^2 = 2.463$, $p = 0.700$), occupational status ($\chi^2 = 2.628$, $p = 0.150$), age at illness onset, and number of admissions (Table 1). There were also significant differences between in- and outpatients in the positive, general, and total PANSS scores (Table 1), but not in the PANSS negative sub-scale or in the CGI severity score. Interestingly, although outpatients showed higher PSP total scores as compared with inpatients (as might be expected), these differences were not statistically significant (Table 1). We also found a significant association between admission status (in- vs. outpatients) and PSP disturbing and aggressive behaviour only ($\chi^2 = 14.485$, $p = 0.013$), indicating that patients with more severe difficulties in this area of functioning are more likely to be treated in hospital settings.

The sample was further analysed by dividing participants into "high-functioning" (PSP total score ≥ 70) and "low-functioning" (PSP total score < 70). No significant differences emerged between the groups with respect to gender ($\chi^2 = 1.030$, $p = 0.414$), civil status ($\chi^2 = 0.675$,

Table 2 Clinical characteristics of high- versus low-functioning patients with schizophrenia

	High functioning (PSP ≥ 70) ($n = 19$)		Low functioning (PSP < 70) ($n = 85$)		Between groups[a]	
	Mean	SD	Mean	SD	t	p
Age	32.6	7.78	39.7	10.20	2.852	0.005
Educational level (years)	10.7	3.70	9.1	3.99	1.552	0.124
Age at illness onset (years)	25.2	6.47	24.4	8.05	0.363	0.717
Illness duration (years)	7.7	4.12	14.9	10.35	4.647	<0.001
Number of admissions	2.4	2.52	3.7	4.78	1.191	0.236
PANSS positive	11.5	4.87	16.3	5.99	3.295	0.001
PANSS negative	13.7	4.31	20.5	6.10	4.560	<0.001
PANSS general	27.2	8.51	35.4	9.28	3.559	0.001
PANSS total score	52.4	15.44	72.2	18.11	4.419	<0.001
GAF score	78.8	11.85	48.5	15.86	7.835	<0.001

GAF global assessment of functioning, *PANSS* Positive and Negative Syndrome Scale, *PSP* Personal and Social Performance

[a] Student's t test (two-tailed) for independent samples, significance level $p < 0.05$

Table 3 Neurocognitive test performance of high- versus low-functioning patients with schizophrenia (educational level, CGI severity, PANSS positive, negative, general, and total scores as covariates)

	High functioning (PSP ≥ 70) ($n = 19$)		Low functioning (PSP < 70) ($n = 85$)		ANCOVA[a]	
	Mean	SD	Mean	SD	F	p
TMT-A	44.3	14.7	64.9	29.23	5.214	<0.001
TMT-B	109.5	44.13	205.4	181.57	3.156	0.005
CVLT, list A	36.0	10.70	31.3	12.26	3.313	0.004
CVLT, free short recall	8.00	2.67	6.49	3.30	2.587	0.019
CVLT, cued short-recall	9.4	2.29	7.9	2.89	2.561	0.020
CVLT, free delayed-recall	8.6	2.71	6.8	3.21	2.660	0.016
CVLT, cued delayed-recall	9.7	2.54	7.9	3.07	2.621	0.017
CVLT, recognition	14.1	1.65	13.5	2.56	0.723	0.653
Digit span forward	5.6	0.96	5.6	1.31	2.179	0.044
Digit span backward	3.7	0.87	3.3	1.21	3.071	0.006
Digit span total	9.5	1.47	9.1	2.22	4.310	<0.001
Mental control	6.7	1.59	5.9	2.24	1.485	0.185

CGI clinical and global impression, *CVLT* California Verbal Learning Test, *PSP* Personal and Social Performance, *TMT-A* Trail-Making Test (part A), *TMT-B* Trail-Making Test (part B)

[a] Analysis of covariance (with educational level, CGI severity, PANSS positive, negative, general and total scores as covariates—ANCOVA), with a significance level of $p < 0.05$

$p = 0.714$), educational level, and age at illness onset (Table 2). However, significant differences were found in age and illness duration, indicating that patients with lower functioning are older, and have longer illness duration (Table 2). An association between occupational status and functioning level ($\chi^2 = 20.099$, $p < 0.001$) was demonstrated, indicating that patients with lower functioning are more frequently unemployed/inactive. Low-functioning patients, as measured by total PSP score, had significantly higher scores on all PANSS sub-scales and on the CGI-S score (Table 2). Low-functioning patients also performed worse on neurocognitive tests, even after controlling for educational and symptom level, and significant differences emerged in all but two measures (CVLT recognition, and Mental Control) (Table 3).This appears to indicate that patients who perform worse on neurocognitive tests present also with lower levels of social functioning. We also investigated the association between functioning status (high vs. low), and PSP domains; we found associations with socially useful activities ($\chi^2 = 79.358$, $p < 0.001$), personal and social relationships ($\chi^2 = 41.463$, $p < 0.001$), and self-care ($\chi^2 = 26.315$, $p < 0.001$), but not with PSP disturbing and aggressive behaviour. This appears to demonstrate that lower-functioning patients have more difficulties in functioning in the three former broad areas of functioning but do not necessarily demonstrate more behavioural issues.

Psychometric properties

All item-to-item correlations between PSP categories and PSP total score were significant, ranging from $r = 0.252$ ($p = 0.010$) to $r = 0.936$ ($p < 0.001$). Lower correlations were found for PSP aggressive and disturbing behaviour (ranging from 0.252 to 0.412). Higher correlations were found for PSP total score (ranging from 0.347 to 0.936).

Correlational analysis revealed positive correlations between GAF scores and PSP scores on all categories (Table 4), these being lower for the PSP disturbing and aggressive behaviour ($r = 0.357$). In terms of psychopathology, significant negative correlations were found between the CGI-S and PSP scores on all categories (ranging from −0.334 to −0.708), and between the PSP and the PANSS (ranging from −0.266 to −0.738). These results are presented in Table 4. No significant correlations were found between PSP total and subscale scores and age, age of illness onset, illness duration or educational level (Table 4). We found a significant association between gender and PSP personal and social relationships ($\chi^2 = 9.790$, $p = 0.044$), indicating that in this sample women had better functioning in this domain. Occupational status was associated with scores in the domains of socially useful activities ($\chi^2 = 24.325$, $p < 0.001$), personal and social relationships ($\chi^2 = 17.154$, $p = 0.002$), and self-care ($\chi^2 = 14.060$, $p = 0.007$), indicating that unemployed/inactive patients have more difficulties in these functioning areas. Significant correlations were also found between neurocognition and functioning as measured by the PSP (Table 4). Scores on the CVLT, TMT-A, and TMT-B, and on social categories of the PSP, as well as its total score, were significantly correlated, but the correlations were lower than for clinical variables (Table 4). The PSP category of disturbing and aggressive behaviour did not correlate significantly with 11 out of 12 neurocognitive measures, strongly suggesting a weaker association between neurocognitive function and such behaviours.

The reliability of the PSP scale and its four categories was satisfactory, with a Cronbach's alpha of 0.789. Inter-rater reliability assessed by ratings of 6 case-vignettes, with the method of intra-class correlation coefficients (ICCs) with 95% confidence intervals, showed highly significant rater agreement both at the beginning ($r = 0.430$–0.882), and end of the study ($r = 0.475$–0.954) (Table 5).

Regression analysis

Because significant associations were found between functioning and both illness severity and neurocognitive functioning, a multiple regression model was used to further examine these issues. Using the stepwise method, a first block was introduced consisting of the five clinical variables that correlated most with PSP total score (number of admissions, PANSS positive, negative, general and total scores). A second block containing the seven neurocognitive variables that correlated most with functioning (TMT-A, TMT-B, CVLT—list A, free and cued short recall, and free and cued delayed recall) was then introduced. Results are presented in Table 6.

Discussion

Our results confirm previous reports of the psychometric properties of the PSP, evaluated in acutely unwell [1, 10, 12] and stable patients with schizophrenia [1, 9, 12, 13, 24]. They support the Portuguese version of the PSP as a reliable and valid instrument for assessing social functioning, independently of clinical severity or treatment setting.

The degree of inter-rater agreement was satisfactory, but varied according to each dimension. The highest level of agreement was found for socially useful activities and the lowest for disturbing and aggressive behaviours. This was also reported by Apiquian et al. [1], but not by Tianmei et al. [12] or Juckel et al. [10], suggesting that the operational definition of the disturbing and aggressive behaviour domain needs to be clarified in the Portuguese version of the PSP.

The very high correlation coefficients between PSP and GAF scores appear to confirm that the PSP assesses similar or the same constructs as the GAF. This supports its use as a valid measure with which to operationalize psychosocial functioning in patients with schizophrenia. Because the PSP overcomes some of the disadvantages of the GAF, it appears to constitute an important step forward in the measurement of social functioning in schizophrenia [10].

The low number of ratings of poor functioning for the domain of disturbing and aggressive behaviour is likely to be a result of our sample not including severely agitated and aggressive patients as they would not have given consent. However, the high levels of absent or mild ratings in other domains in our sample may suggest that the PSP is not sufficiently sensitive either at higher levels of functioning.

In our study we evaluated both hospitalised patients and those in the community, the former demonstrating lower levels of functioning as measured by the PSP. Unlike Apiquian et al.'s study [1], these differences were not statistically significant. Interestingly, when we compared high- versus low-functioning patients, the differences in symptom levels became more evident. It has previously been reported elsewhere [1, 2, 10, 12, 24] that PSP scores are associated with both CGI-S and PANSS scores, reflecting an association between the severity of psychopathology and the ability to function in social contexts.

Table 4 Spearman's correlations between PSP categories and total score, and clinical and neurocognitive variables

	PSP—socially useful activities, including work and study	PSP—personal and social relationships	PSP—self-care	PSP—disturbing and aggressive behaviors	PSP total score
Clinical variables					
Age	−0.145	−0.108	−0.118	−0.048	−0.173
Educational level	0.108	0.124	0.141	−0.003	0.161
Age at illness onset (years)	0.058	0.097	−0.022	0.098	0.042
Illness duration (years)	−0.183	−0.175	−0.121	−0.081	−0.199
Number of admissions	−0.202*	−0.193	−0.142	−0.150	−0.214*
PANSS positive	−0.542**	−0.573**	−0.577**	−0.325**	−0.596**
PANSS negative	−0.544**	−0.717**	−0.514**	−0.266*	−0.627**
PANSS general	−0.527**	−0.681**	−0.636**	−0.384**	−0.621**
PANSS total score	−0.604**	−0.738**	−0.635**	−0.389**	−0.692**
CGI-severity score	−0.684**	−0.645**	−0.580**	−0.334**	−0.708**
GAF	0.847**	0.745**	0.651**	0.357**	0.899**
Neurocognitive variables					
TMT-A	−0.268**	−0.191	−0.177	−0.024	−0.270**
TMT-B	−0.318**	−0.272**	−0.231*	−0.027	−0.325**
CVLT, list A	0.283**	0.305**	0.205*	0.110	0.259**
CVLT, free short recall	0.210*	0.259**	0.231*	0.163	0.250**
CVLT, cued short-recall	0.397**	0.293**	0.279**	0.204*	0.389**
CVLT, free delayed-recall	0.222*	0.239*	0.199*	0.137	0.259*
CVLT, cued delayed-recall	0.312**	0.272**	0.250*	0.157	0.319**
CVLT, recognition	0.147	0.145	0.134	0.186	0.182
Digit span forward	0.012	0.111	0.125	0.125	0.061
Digit span backward	0.171	0.201*	0.129	0.000	0.178
Digit span total	0.140	0.193	0.159	0.059	0.176
Mental control	0.122	0.034	−0.003	−0.025	0.136

* Correlation is significant at the 0.05 level (2-tailed)

** Correlation is significant at the 0.01 level (2-tailed)

CVLT California Verbal Learning Test, *CGI* clinical and global impression, *GAF* global assessment of functioning, *PANSS* Positive and Negative Syndrome Scale, *PSP* Personal and Social Performance, *TMT-A* Trail-Making Test (part A), *TMT-B* Trail-Making Test (part B)

Although negative symptoms have been consistently reported to be the most strongly correlated to functioning [1, 10, 12, 27, 28], in our sample both positive and negative symptoms showed strong associations with functioning. These correlations were less marked for the disturbing and aggressive behaviour category of the PSP. They appear to reflect a connection between symptomatic severity and the ability to function in a social context [24].

Forming relationships with others and participating in activities may qualitatively differ from the ability to take care of oneself and the presence of disturbing and aggressive behaviours [24]. These may be aspects of social functioning that are more difficult to achieve and can be construed as indications of higher levels of functioning and integration in the community [24]. Interestingly, we found an association for gender, indicating that women may have better skills to achieve better social functioning.

Patients with lower PSP scores presented clinical characteristics which have been associated with a poorer prognosis, particularly longer duration of illness and higher number of admissions. In fact, the number of hospital admissions was an important predictor of functioning, especially in its social domains. Illness duration has been associated with poorer functional outcome [1, 29, 30], possibly due to the consequences of the underlying disease process; however, other authors have not found this association [31]. Interestingly, however, educational level was not found to differ significantly between patients with high versus low functioning, and did not correlate significantly with any PSP category. This is an important finding, since educational level is generally believed to be associated

Table 5 Inter-rater reliability of PSP dimensions (ratings of six case-vignettes)

	PSP dimensions	*N*	ICC	CI	*p*
Ratings before study initiation	Socially useful activities, including work and study	6	0.561	0.269–0.894	<0.01*
	Personal and social relationships	6	0.430	0.157–0.839	<0.01*
	Self-care	6	0.882	0.715–0.979	<0.01*
	Disturbing and aggressive behaviours	6	0.869	0.689–0.977	<0.01*
	Total score	6	0.796	0.559–0.961	<0.01*
Ratings after study termination	Socially useful activities, including work and study	6	0.536	0.246–0.885	<0.01*
	Personal and social relationships	6	0.475	0.193– 0.860	<0.01*
	Self-care	6	0.954	0.876–0.992	<0.01*
	Disturbing and aggressive behaviours	6	0.904	0.760– 0.983	<0.01*
	Total score	6	0.684	0.402– 0.933	<0.01*

* Correlation is significant at the 0.01 level (two-tailed)

Table 6 Regression model for clinical and neurocognitive variables as predictors of functioning in PSP categories and total score

	Variables	Adjusted R^2 (%)	*F*	*p*	Beta
PSP, socially useful activities, including work and study	PANSS total	39.5	19.926	<0.001	−0.530
	Number of admissions				−0.160
	TMT-A				−0.230
PSP, personal and social relationships	PANSS total	61.6	70.971	<0.001	−0.769
	Number of admissions				−0.156
PSP, self-care	PANSS total	47.4	40.231	<0.001	−0.664
	Number of admissions				−0.189
PSP, disturbing and aggressive behaviours	PANSS general	8.5	9.078	0.003	−0.309
PSP total score	PANSS total	53.3	50.561	<0.001	−0.653
	CVLT, Free short-recall				0.196

PANSS Positive and Negative Syndrome Scale, *PSP* Personal and Social Performance, *TMT-A* Trail-Making Test (part A), *TMT-B* Trail-Making Test (part B)

with better working opportunities and better cognitive function, which was found to correlate with functioning in our sample.

We also found significant differences in neurocognitive function between high- versus low-functioning patients, even after controlling for educational level and symptom severity. As previously reported [15–19, 21] executive functions, verbal memory, and processing speed have been found to be strongly correlated with functioning, especially in its social aspects. In the multiple regression models, social functioning was strongly predicted both by symptomatic and neurocognitive variables; together they accounted for up to 62% of the variance. Such associations were less evident for the domain of disturbing and aggressive behaviour, indicating that this dimension of functioning may not be as dependent on neurocognition. The PSP scale appears to be more able than the GAF to adequately distinguish between the different domains of functioning since it does not mix dysfunction in an area such as aggressiveness with low functioning in social contexts that may be due mainly to other factors, such as deficits in neurocognition.

Limitations

Convergent validity was assessed with the GAF only. This may be a weakness but it is difficult to justify the use of more than one instrument to assess subjective indicators of social outcomes in the same study because they are not conceptually distinct and scores of different instruments overlap [32]. Inter-rater reliability was assessed with six case-vignettes (only); however, this allowed us to see that investigators gave similar ratings over a time-interval of about 6 months. The size of our sample and the fact that it was from one geographical location may limit the generalisability of the results to more rural areas, especially concerning social functioning. We did not measure

affective symptoms and therefore were not able to assess the impact of these on social functioning. Depressive symptoms have been consistently described as relevant in the assessment of social functioning [3]. Furthermore, we did not use a measure of social cognition. There are clear and consistent relationships between aspects of functional outcome and social cognition [33]. Indeed, social cognitive deficits are separable from neurocognitive deficits and may be equally or more important in the prediction of social outcomes [34]. Finally, the clinician raters were not blind to diagnosis, clinical rating, and neurocognitive functioning.

The study was strengthened by the exclusion of patients with schizoaffective disorder and other psychotic disorders, as well as those with different clinical and demographic characteristics that could influence social functioning as evaluated by the PSP. Lastly, the use of cognitive measures is innovative, corroborating neurocognition as an important determinant of social functioning.

Conclusions

This study supports the Portuguese version of the Personal and Social Performance scale as a reliable and valid instrument to assess social functioning of schizophrenia patients, in both hospital and community populations.

The PSP scale can be used after a short and simple training and requires little time to be administered. It is a quick, reliable, and valid way to assess personal and social functioning in routine clinical and research settings.

Neurocognition is an important predictor of social functioning, and as mentioned previously [35], we propose that brief assessments focusing upon executive functions, processing speed, and verbal memory should be co-administered with measures of functioning. This may lead to more focused interventions for specific aspects of social functioning, which in turn could lead to improved outcomes for those with schizophrenia.

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