

• Original article •

Symptom severity is more closely associated with social functioning status in inpatients with schizophrenia than cognitive deficits

Sai ZUO¹, Linda K. BYRNE^{2*}, Daihui PENG¹, David MELLOR², Marita McCABE², Jie ZHANG¹, Jia HUANG¹, Yifeng XU^{1*}

Background: Prior research has determined that impairment in neurocognition and psychiatric symptoms contribute to reduced occupational and social functioning in schizophrenia.

Objective: Evaluate the relationships of neurocognition, psychiatric symptoms, and psychosocial functioning in male inpatients with schizophrenia in China.

Methods: Fifty-one male patients currently hospitalised at the Shanghai Mental Health Center with a diagnosis of schizophrenia were recruited and 40 of them were included in the final analysis. Participants were assessed with Chinese versions of the Personal and Social Performance Scale (PSP), Clinical Global Impression-Severity (CGI-S) scale, Positive and Negative Symptom Scale (PANSS), Letter-Number Sequencing Task, and Hong Kong List Learning Test.

Results: Robust negative correlations were found between three clinical subscale scores derived from the PANSS and the global measures of social function (the total PSP score and the CGI-S score). Performance on the neurocognitive tasks was not associated with either symptoms or social functioning status.

Conclusions: Among inpatients in the acute phase of schizophrenia, the severity of the clinical symptoms—not the degree of the neurocognitive impairment—is closely associated with the level of social functioning.

1. Introduction

Neurocognitive deficits and the expression of symptoms in schizophrenia contribute to the chronic disability in psychological, social and occupational functioning experienced by sufferers.^[1-3] The relative contribution of symptoms versus neurocognition is complex and still not fully understood. Some studies indicate the primacy of neurocognitive variables over symptoms^[4] whereas others support a mediation model whereby symptoms at least partially mediate the relationship between neurocognition and outcome.^[5]

At least seven areas of neurocognitive functioning (speed of processing, attention/vigilance, working memory, verbal learning, visual learning, and reasoning and problem solving) are commonly impaired in schizophrenia.^[6] Verbal memory and working memory deserve special consideration for neurobiological reasons and because of their relationship to functional outcome.^[7] A 2004 review and meta-analysis by Green and colleagues^[4] concluded that immediate (working) and secondary verbal memory are the most potent

neurocognitive predictors of functional outcome. These findings have been confirmed by a more recent meta-analysis^[5] and a large scale study of older patients with schizophrenia.^[8] However, not all research has confirmed this relationship. For example, Addington and colleagues^[9] found no significant associations between cognitive measures and social functioning. One study^[10] found that secondary memory and verbal IQ correlated with some outcome measures, but immediate memory did not.

Functional outcome has been measured in a variety of ways including activities of daily living and general community functioning. It can also be assessed in terms of success in rehabilitation programs or in terms of general problem solving abilities. Hsieh and colleagues^[11] recently studied the relationship between performance and neurocognition in a Taiwanese sample using a battery of neurocognitive variables and functional measures, including the Personal and Social Performance scale (PSP) and the Activities of Daily Living (ADL) scale. They found significant correlations between verbal memory performance and total PSP

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¹ Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine, Shanghai, China

² School of Psychology, Deakin University, Melbourne, Australia

*Joint corresponding authors: Linda K. BYRNE, linda.byrne@deakin.edu.au; Yifeng XU, hyyyyb@gmail.com

score. Baseline measures of verbal memory have been found to predict functional outcomes from one month^[12] up to seven years.^[13] Current performance on these neurocognitive measures has also been found to be a strong predictor of functional disability in people with schizophrenia who are symptomatically stable,^[14] this recent study found that working memory predicted work and educational functioning while verbal memory predicted skills at independent living.

Symptoms in schizophrenia also have a significant role to play in predicting functional outcomes. The three factor model of positive, negative and disorganised symptoms in schizophrenia is currently the most widely applied^[15-17] although this structure is not universally accepted.^[18] Recent studies emphasize the role of negative symptoms as predictors of poorer social and occupational outcomes.^[5,13,14] At least one study found that disorganised symptoms predict social functioning.^[19] There has been limited research support for the role of positive symptoms as predictors of functional outcomes, though one older study^[20] reported that baseline levels of positive symptoms—especially thought disturbance—predicted poor outcomes for patients with chronic schizophrenia.

The relationship between symptoms and neuro-cognition is complex. Generally, in cross-sectional studies negative symptoms have produced the strongest correlations with neurocognitive deficits.^[5] Prominent negative symptoms have been linked to poorer performance on verbal memory tasks^[21] and on verbal working memory.^[22] There is some support for the

role of disorganised thinking or behaviour in impairing neurocognitive performance, particularly on complex executive processes such as working memory.^[23] Less convincing is the evidence that positive symptoms are related to impaired neurocognitive abilities. One study found increased perseverative errors and a bias towards false alarms on a list learning task,^[24] but a recent meta-analysis^[5] found virtually no relationship.

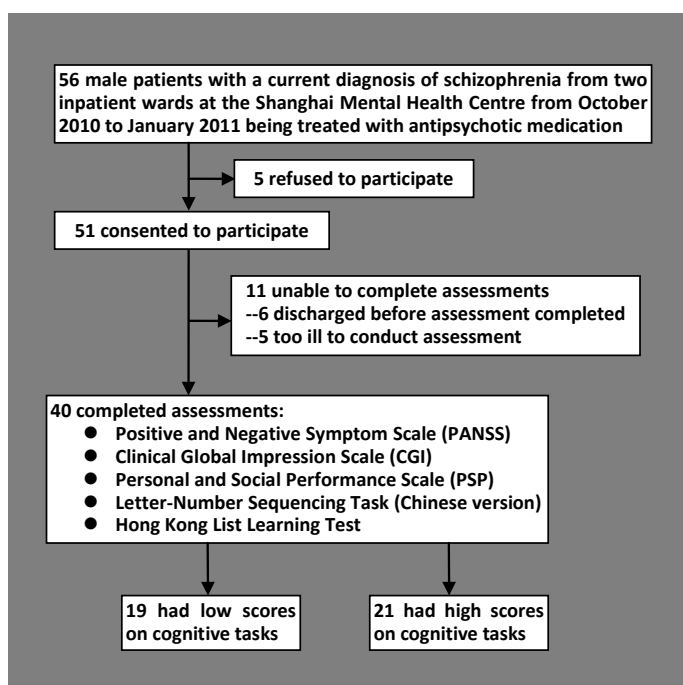
The aim of the current study is to investigate the relationships among clinical, cognitive and functional variables in a sample of Chinese inpatients with schizophrenia. We were particularly interested in examining the relationship between these variables in this population before they were clinically stable as most work to date has examined how baseline neurocognition and symptoms predict future functioning. We hypothesized that measures of social functioning would be more strongly correlated to cognitive measures of verbal memory and verbal working memory than to measures of psychiatric symptoms. Further, we hypothesized that the measures of psychomotor poverty (negative) symptoms would be more strongly correlated to cognitive performance than measures of positive symptoms or disorganized symptoms.

2. Methods

2.1 Participants

The enrolment of participants is shown in Figure 1. The study was conducted at two acute-care male wards

Figure 1. Flowchart of enrolment in the study



of the Shanghai Mental Health Center, one ward has 50 beds with an average stay of 45 days and the other has 90 beds with an average stay of 60 days. Patients were eligible to participate in the study if they were treated on one of the two wards from October 2010 to January 2011, were 18-55 years of age, had a current DSM-IV diagnosis of Schizophrenia or Schizoaffective Disorder, and did not have a co-morbid substance use disorder. As shown in Figure 1, 40 of the 54 eligible patients completed the assessments of their clinical, cognitive and functional status. Their characteristics are presented in Table 1. They were primarily middle-age males who had, on average, been ill for more than 20 years. All 40 patients were being treated with antipsychotic medication during the time of the assessment (35 on atypical antipsychotics, 1 on typical antipsychotics, and 4 on a combination of typical and atypical antipsychotics), and were clinically stable (i.e., not actively psychotic).

All participants provided written informed consent. The study received institutional ethics approval from Deakin University and from the Shanghai Mental Health Center.

2.2 Assessments

2.2.1 Clinical Symptoms and Social Functioning

All participants were rated on three clinical scales

measuring symptoms, global functioning, and social functioning by one of two experienced psychiatrists (JZ, JH) trained in the consensus ratings of these measures.

A Chinese version of the Positive and Negative Symptom Scales (PANSS)^[25] was administered to all participants. The PANSS items were subdivided into three syndromes (reality distortion [5 items], psychomotor poverty [7 items] and disorganised [4 items]) based on Liddle's 1987^[15] description of these three syndromes of schizophrenia. This method of categorizing symptoms was chosen because it has been supported by factor analysis of the PANSS^[15,26,27] and been used in other studies examining neurocognition and symptoms in schizophrenia.^[25] In addition to the Liddle syndrome scores, we computed the total PANSS score (based on all 30 items) according to the PANSS manual to allow comparison with other studies that have examined the reliability and validity of the Chinese version of the PANSS.^[11,28]

The Clinical Global Impression Scale (CGI) is a widely used tool of global functioning that yields three measures; severity of illness, global improvement and an efficacy index. It is widely used in China.^[29,30] The Severity of Illness (CGI-S) item requires clinicians to rate the severity of participants' illness at the time of assessment on a 7-point scale, from 1 (normal, not at all ill) to 7 (among the most severely ill).

Table 1. Demographic, clinical and cognitive characteristics of 40 male inpatients with schizophrenia included in the study

	Mean	sd	Range
Age (years)	46.2	8.3	22-56
Education (years)	10.7	2.1	9-24
Duration of Illness (years)	23.1	10.1	1-39
Chlorpromazine equivalent dose (mg/day)	422	350	11-1876
Clinical Global Impression-Severity (CGI-S)	4.5	1.0	2-6
Hong Kong List Learning Test (HKLT)	14.9	7.0	4-29
Letter-Number Sequencing Task (LNS)	2.6	1.6	0-6
Positive and Negative Symptom Scale (PANSS)			
PANSS Reality distortion	11.5	6.2	5-33
PANSS Psychomotor poverty	20.2	5.8	7-35
PANSS Disorganised	7.8	2.7	4-14
PANSS Total	67.3	18.6	32-110
Personal and Social Performance Scale (PSP)			
PSP – Socially useful activities	4.1	0.6	3-5
PSP – Personal and social relationships	3.8	0.9	2-5
PSP – Self-care	2.2	0.9	1-5
PSP – Disturbing and aggressive behaviour	2.0	1.2	1-6
PSP – Overall Score	45.1	14.2	20-70

The Personal and Social Performance Scale (PSP)^[31] uses a 100-point rating scale to assesses four domains of social functioning including (a) socially useful activities, such as work and study; (b) personal and social relationships; (c) self-care; and (d) disturbing and aggressive behaviours. The total score, which is a composite measure of the four domains, is divided into three levels: a score of 71-100 indicates mild difficulties across the domains; 31-70 indicates varying degrees of impairment and disability; and 0-30 indicates poor functioning that requires intensive support or supervision. Assessment of a Chinese version of the PSP^[28] in a combined sample of inpatients and outpatients demonstrated robust construct validity and good internal consistency (Cronbach's alpha=0.84), test-retest reliability (intraclass correlation coefficient=0.95) and inter-rater reliability (kappa value=0.82). However, the PSP has not previously been used exclusively with an inpatient sample.

2.2.2 Cognitive assessments

Cognitive assessments were brief; they included a measure of verbal working memory and a measure of verbal memory and learning. The letter-number sequencing task has established credentials and is a robust, yet quick and easily administered test of verbal working memory.^[32] A Chinese version of this task^[33] was used in the current study. The longest sequence achieved and total score were recorded. The longest sequence achieved was chosen as the variable of interest that was employed in the subsequent analysis as it best reflects working memory capacity.

The verbal memory task employed was Form B of the Hong Kong List Learning Test,^[34] a Chinese verbal learning and memory test that has been well validated in a variety of populations including people with schizophrenia.^[35] Form B has 16 words from four categories: clothing and accessories, music, flowers, and occupations. Participants are informed about the four categories and about the total number of items before the names of the items are presented. After the researcher reads the words, participants are asked to recall as many of the items as possible (in any order). The total score for the test is used as the measure of verbal memory in the subsequent analysis.

These cognitive tasks were administered by a trained research assistant and took between 10 and 15 minutes to complete.

2.3 Statistical methods

The relationship of the three different types of measures—clinical, cognitive, and functional—was assessed using Pearson correlation coefficients. The internal consistency of the various measures was assessed using Cronbach's alpha. The chlorpromazine-equivalent daily dosage of the participants was not normally distributed so a log transformation of this

variable was used in the statistical analyses.

To assess whether or not the relationship of cognitive functioning with social functioning varied for persons with different levels of impairment, we conducted a post-hoc analysis by splitting the sample based on whether they were 'high' or 'low' in cognitive functioning. This was achieved by forming a composite cognitive z-score for each participant from the two cognitive measures (LNS and HKLT) and then classifying the 21 patients with a positive composite z-score to the 'high' cognitive functioning group and the 19 patients with a negative composite z-score to the 'low' cognitive functioning group.

3. Results

Internal consistency of the three factor scores derived from the PANSS used in this analysis were as follows: reality distortion alpha=0.83, psychomotor poverty alpha=0.90; and disorganisation alpha=0.48. The internal consistency of the total PANSS score was 0.915. Internal consistency of the overall PSP score using Cronbach's alpha was 0.77.

Table 2 presents the bivariate Pearson's product moment correlations of the symptom and cognitive variables with the PSP and CGI. Also included are possible confounding variables such as years of education and the log transformed medication dosage variable. Spearman rho correlations produced a similar pattern so they are not reported here. Given that there are a large number of correlations considered, the level of statistical significance was set at 0.01 rather 0.05 to reduce the risk of Type 1 error.

The two cognitive variables (the Letter-Number Sequencing task and the Hong Kong List Learning Test) were not significantly related to any of the clinical or social functioning variables but they were positively related to the educational level of the participants. There was, however, a non-significant trend association between the working memory variable (LNS) and the disturbing or aggressive behaviour PSP subscale score ($r=0.33$, $p=0.038$). The two global functioning measures (CGI-S and the PSP total score) were both closely correlated with the three clinical measures derived from the PANSS (r -values all greater than 0.50) and strongly correlated with the overall PANSS score ($r=-0.73$, $p<0.001$). The score of the PSP subscale on personal and social relationships was also closely related to all three clinical measures. But the scores of the PSP subscales on socially useful activities and self-care were only significantly related to the PANSS psychomotor poverty measure and the score of the PSP subscale on disturbing or aggressive behaviour was not significantly related to any of the clinical measures (though there was a trend correlation with all three clinical measures).

We conducted a stratified post-hoc analysis (dividing the sample into those with high cognitive functioning

and low cognitive functioning) to assess whether or not the failure to identify a relationship between the cognitive measures and the functioning measures was due to the admixture of patients with widely differing

cognitive states. No statistically significant relationships were found in the correlation analysis of cognitive measures with social functioning measures in either the high cognitive functioning group or the low cognitive

Table 2. Pearson correlations and associated p-values of clinical, cognitive and social functioning variables in 40 inpatients with schizophrenia^a

	DEMOGRAPHIC FACTORS		CLINICAL FACTORS			SOCIAL FUNCTIONING FACTORS					COGNITIVE FACTORS		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
DEMOGRAPHIC FACTORS													
(1)Years of education	1	-.002 (.989)	-.146 (.370)	-.111 (.497)	-.150 (.356)	-.241 (.134)	-.163 (.316)	-.252 (.117)	-.189 (.244)	.063 (.697)	.208 (.198)	.426 (.007)	.478 (.002)
(2)Log transformation of CPZ-equivalent dose		1	-.148 (.364)	.172 (.289)	.023 (.888)	.215 (.183)	-.134 (.409)	.082 (.614)	.011 (.949)	-.034 (.836)	-.014 (.931)	.047 (.776)	-.189 (.250)
CLINICAL FACTORS													
(3)Disorganized (from PANSS)			1	.453 (.003)	.774 (<.001)	.596 (<.001)	.353 (.026)	.549 (<.001)	.289 (.071)	.398 (.011)	-.505 (.001)	-.055 (.741)	-.158 (.337)
(4)Reality distortion (from PANSS)				1	.370 (.019)	.734 (<.001)	.241 (.134)	.598 (<.001)	.241 (.134)	.319 (.045)	-.598 (<.001)	.037 (.821)	-.020 (.902)
(5)Psychomotor overtury (from PANSS)					1	.586 (<.001)	.481 (.002)	.587 (<.001)	.441 (.004)	.308 (.053)	-.580 (<.001)	-.138 (.403)	-.157 (.340)
SOCIAL FUNCTIONING FACTORS													
(6)Clinical Global Impression-Severity (CGI-S)						1	.581 (<.001)	.824 (<.001)	.391 (.013)	.472 (.002)	-.823 (<.001)	-.021 (.897)	-.125 (.449)
(7)Socially useful activities (from PSP)							1	.717 (<.001)	.332 (.036)	.343 (.030)	-.806 (<.001)	-.076 (.644)	-.139 (.397)
(8)Personal and social relationships (from PSP)								1	.477 (.002)	.478 (.002)	-.905 (<.001)	-.001 (.993)	-.195 (.233)
(9)Self-care (from PSP)									1	.566 (<.001)	-.555 (<.001)	.043 (.795)	.017 (.918)
(10)Disturbing or aggressive behaviour (from PSP)										1	-.553 (<.001)	.334 (.038)	.087 (.598)
(11)PSP total score											1	-.044 (.790)	.083 (.617)
COGNITIVE FACTORS													
(12)Letter-number sequencing task (LNS)												1	.415 (.009)
(13)Hong Kong List Learning Test (HKLTL)													1

PANSS= Positive and Negative Symptom Scale; PSP= Personal and Social Performance Scale; CPZ=chlorpromazine

^a Given the large number of correlations assessed, statistical significance is set at $p < 0.01$. Statistically significant correlations are shown in **bold**.

functioning group, though the relationship between the LNS score and the disturbing/aggressive PSP subscale score in the low cognitive functioning group was significant at a trend level ($r=0.47$, $p=0.042$). Moreover, there were no statistically significant differences between the high and low cognitive functioning groups in the magnitude of the correlation coefficients for the cognitive and functioning measures. (Data not presented).

4. Discussion

4.1 Main Findings

Our original hypotheses were not confirmed. In this sample of male inpatients with schizophrenia we found little evidence of a relationship between neurocognitive variables and either symptoms or functional measures, with the exception of a non-significant trend relationship between decrements in verbal working memory performance and increased scores on the disturbing or aggressive behaviour subscale of the PSP. These findings are out of step with most prevailing literature in the area which has consistently found that verbal memory and, to a lesser extent, working memory are associated with functioning.^[4] Our findings are, however, similar to the early findings of Addington and colleagues^[9] who found no relationship between neurocognition and functioning (as assessed by the social dysfunction index and the social adjustment scale). They hypothesized that their negative findings were the result of specific characteristics of their sample; given the high level of impairment of the patients in their sample, they suggested that the relationship between neurocognitive variables and functional outcome may only hold true for higher functioning individuals. To assess this possibility we conducted a post-hoc analysis of our data dividing the sample into two groups, one group with relatively high cognitive functioning and one with relatively low cognitive functioning. We found no significant relationships between our cognitive measures (LNS and HKLT) and the social functioning PSP measures in either of the groups, so our results do not support Addington's hypothesis.

We did, however, find robust correlations between all three symptom domains derived from the PANSS and our global functioning measures (CGI-S and overall PSP score). These correlations were substantially stronger than those reported by Patrick and colleagues;^[36] they reported a correlation of PSP total score and PANSS total score of -0.32 , versus the -0.73 correlation found in the current study. This difference may have occurred because our sample was less symptomatic at the time of assessment; unlike Patrick and colleagues we did not require elevated PANSS scores for inclusion in the study. In our study the personal and social relationships

subscale of the PSP was also closely associated with all three symptom domains. The relationship between the psychomotor poverty dimension of the PANSS and the personal and social relationships subscale of the PSP mirrors the findings of others.^[37]

4.2 Limitations

There were a number of limitations to our study. The modest sample size reduced the power to detect statistical significance. The large number of correlations presented in Table 2 (78 correlation coefficients) increased the possibility of Type I errors (i.e., inappropriately considering a chance difference as statistically significant). The three-factor model of the PANSS used in the study has not been validated in China and the internal consistency of the disorganization dimension of the PANSS was weak ($\alpha=0.48$). Several of the items in the PSP related to social functioning were difficult to assess reliably in the inpatient setting; this may have resulted in a restriction in the range of scores of the related subscales. Only two relatively simple measures of neurocognitive functioning were included; a more comprehensive assessment would have provided more convincing proof of our finding of a lack of relationship between cognitive function and social function. The mean duration of illness of the sample was 23 years; the results may have been different for a less chronic sample. Finally, this is a cross-sectional study so we are only able to evaluate associations, not the cause-effect relationship of the variables considered.

4.3 Implications

The findings presented here add to the substantial body of work examining the relationships among neurocognition, symptoms and functional status in schizophrenia. We failed to replicate what many others have found in regard to a strong relationship between neurocognition and functional status. We also failed to replicate the common finding of a relationship between increased negative symptoms and poorer cognitive functioning. It may be that this is the result of some limitations in the study such as too few neurocognitive variables or a small sample size. However, it may also be an indication that the extent to which neurocognition influences the social functioning of an individual is moderated by the severity of their psychological symptoms and the setting in which they are assessed. It appears, at least in this sample, that when individuals with schizophrenia are suffering from acute symptoms that require hospitalisation it is the symptoms, not neurocognitive variables, that are more important to personal and social functioning. Perhaps neurocognitive factors become more important as symptoms resolve. To test this idea one would need to follow patients over time and determine whether or not the relative

strength of the relationship between cognitive measures and personal and social functioning increases as the severity of clinical symptoms decreases.

Conflict of Interest

The authors report no conflict of interest related to this paper.

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• 论著 •

症状严重程度比认知缺损更与精神分裂症住院患者的社会功能状况密切相关

左赛¹ Linda K. BYRNE^{2*} 彭代辉¹ David MELLOR² Marita McCABE² 张洁¹ 黄佳¹ 徐一峰^{1*}

¹上海交通大学医学院附属精神卫生中心

²澳大利亚墨尔本Deakin大学心理学院

*共同通信作者: Linda K. BYRNE, linda.byrne@deakin.edu.au; 徐一峰, hyyyyb@gmail.com

摘要

背景 以往研究表明精神分裂症患者的神经认知缺损和精神病性症状会导致其职业和社会功能降低。

目的 评估中国精神分裂症男性住院患者的神经认知和精神病性症状与社会心理功能之间的关系。

方法 选取上海市精神卫生中心的51例住院男性精神分裂症患者, 其中40例患者最终完成了个体和社会功能量表(Personal and Social Performance Scale, PSP)中文版、临床疗效总评量表-病情严重程度量表(Clinical Global Impression-Severity, CGI-S)、阳性和阴性症状量表(Positive and Negative Symptom Scale, PANSS)、字母-数字排序以及香港文字记忆学习测试等项目的评定。

结果 患者PANSS量表的3个临床分量表的分值和社会功能总体评估(PSP总分和CGI-S分值)之间存在明显负相关。患者的神经认知测定结果与症状或社会功能状况均无关。

结论 对于急性期住院精神分裂症患者而言, 临床症状的严重度一而非神经认知缺损程度, 与其社会功能水平密切相关。