



# Cognitive deficits and its relation with psychopathology and global functioning in first episode schizophrenia



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## ABSTRACT

**Aim:** The aim was to examine the cognitive deficits profile in first episode schizophrenia patients as well as examine the correlation between cognitive deficits, psychopathology and global functioning. Better understanding of these various facets of this debilitating illness is imperative in planning treatment, thereby limiting decline in global functioning.

**Methods:** Forty-nine schizophrenia patients with illness duration less than two years comprised the sample. A comprehensive battery of neuropsychological tests, the Positive and Negative Syndrome Scale and WHO Disability Assessment schedule were administered to assess cognitive functions, psychopathology and global functioning respectively.

**Results:** Cognitive deficit quotient for each patient was calculated. In this cohort 16.3% of patients had less than 25% of cognitive deficits, 38.8% had 25–50% of cognitive deficits, 36.7% had 50–75% of cognitive deficits and 8.2% of patients had more than 75% cognitive deficits. More than 50% of the patients in the present cohort showed deficits in the domains of attention, executive functions and learning and memory. Psychopathology significantly correlated with global functioning. Negative symptoms significantly correlated with cognitive functions of motor speed, attention and executive functions. Step wise linear regression analysis showed that duration of illness, attention (sustained attention), executive function (response inhibition), negative and positive psychopathology predicted level of global functioning at varied levels.

**Conclusions:** Cognitive deficits in multiple domains were observed in the present cohort. Attention and executive functions predicted global functioning. There is a need for longitudinal studies with larger sample to examine the course of the cognitive deficits with progress in illness.

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## 1. Introduction

Cognitive deficits are considered the very important feature of schizophrenia and not as a consequence to the psychopathology of this illness such as positive symptoms, negative symptoms or due to treatment (Gold and Harvey, 1993; Green et al., 2000; Sharma and Harvey, 2000). Accumulating evidence suggests that decline in cognitive functioning may occur well in advance of clinical symptoms (Caspí et al., 2003; Eastvold et al., 2007). Cognitive deficits are present in the prodromal, psychotic and chronic phases

of schizophrenia (Fioravanti et al., 2012; Hill et al., 2004; Mesholam-Gately et al., 2009; Rund et al., 2004). Cognitive deficits, chiefly in verbal memory, executive functioning, and attention has been observed in first episode of schizophrenia (Addington and Addington, 2002; Addington et al., 2003; Bilder et al., 2000, 2007; Hoff et al., 1992; Mesholam-Gately et al., 2009; Mohamed et al., 1999; Rund et al., 2007; Townsend et al., 2001).

Cognitive deficits are stable over time with progressive deterioration (Rund et al., 2007; Townsend and Norman, 2004). They considered to play a central role in deciding the course and outcome of the illness. Cognitive functions such as verbal memory and executive functions are associated with community functioning, while vigilance is associated with social problem solving abilities (Green et al., 2000a). Cognitive deficits impair global functioning or functional outcome such as work performance, community functioning, social problem solving and social skill acquisition (Brekke et al., 1993; Green, 1996; Green et al., 2000b;

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Milev et al., 2005). In the present study the term 'global functioning' has been used instead of term 'functional outcome'. Both include functioning of an individual in social, occupational and personal domains. Functional outcome includes acquisition and retention of skills that are necessary for social, vocational and community functioning (Brekke et al., 1993; Green et al., 2000b). In the last two decades, the focus of understanding the nature neurocognitive deficits in this illness has shifted from chronic conditions to the prodromal and early phase of the illness (Mesholam-Gately et al., 2009). The growing interest in understanding the relationship between cognitive deficits and functional outcome measures has led to the exploration of treatment methods to ameliorate cognitive deficits using cognitive remediation program during the early phase of the illness, thereby shortening or limiting functional disability, which has been a major concern in the course of this debilitating illness (Eack et al., 2007; Hegde et al., 2012; Ueland and Rund, 2005; Wykes et al., 2007).

The effect of cognitive deficits on global functioning has been well established (Evans et al., 2003; Green et al., 2000, 2004). However, only a handful of studies have been carried out till date examining cognitive deficits profile in schizophrenia from India and these studies have chiefly examined patients in chronic phase of the illness (Ananthanarayanan et al., 1993; Bhatia et al., 2009; John et al., 2001; Sabhesan and Parthasarathy, 2005; Srinivasan et al., 2005) and patients in remission (Krishnadas et al., 2007; Saravanan et al., 2010; Trivedi et al., 2007). Studies from non-developed countries are important as prevalence of schizophrenia is estimated to be lower in 'least developed countries' compared to emerging and developed countries (Saha et al., 2005). The outcome of illness has been reported to be poorer in developed countries compared to developing countries like India (Hopper and Wanderling, 2000). Cognitive deficits profile of patients, an important predictor of outcome of the illness is reported to be similar between countries with different economic status (Ayes et al., 2007). However the numbers of studies are still not very impressive. Despite cognitive deficits in various domains, the level of functional outcome, especially in vocational domain seems to be better when compared those reported from the developed countries (Suresh et al., 2012; Thara, 2004). There is a significant dearth of studies reporting cognitive deficits in first episode schizophrenia patients from India. There are no studies examining the relation between cognitive deficits, psychopathology on global functioning in the early phase of schizophrenia as well. The present study was undertaken to fill the gap by systematically examining the nature of cognitive deficits in first episode schizophrenia patients. We also aimed to examine the relation between cognitive deficits, psychopathology and global functioning. The present study was part of a larger randomized controlled study carried out examine efficacy of home-based cognitive retraining program in first episode schizophrenia patients (Hegde et al., 2012).

## 2. Methods

The study sample consisted of forty-nine patients (34 male and 15 female patients, mean years of age  $\pm$  SD age of  $29.18 \pm 6.87$  years) with a diagnosis of schizophrenia as per the ICD-10 criteria (WHO, 1992). All patients registered at the clinic for schizophrenia at the institute were screened and selected based on the inclusion and exclusion criteria. Based on the clinical history and clinical examination the diagnosis of schizophrenia as per the ICD-10 criteria was made by the psychiatry resident and concurred by the consultant psychiatrist. Duration of illness was less than two years (mean duration of illness:  $12 \pm 8$  months). Patients with a diagnosis of mental retardation, presence of neurosurgical or neurological condition and those who had received electro convulsive therapy

**Table 1**

Showing the neuropsychological tests used and the cognitive function measured.

Tests	Cognitive function
Digit Vigilance Test (1)	Sustained attention
Color Trails Test (2)	Focused attention
Triads Test (3)	Divided attention
Finger Tapping Test (4)	Motor speed
Digit Symbol Substitution (5)	Mental speed
Animal Names Test (1)	Verbal Category Fluency
Verbal N-back – Task (6)	Verbal working memory
Stroop Test (3)	Response inhibition
Tower of London (7)	Planning
Wisconsin Card Sorting Test (WCST) (8)	Concept formation and set shifting ability
Rey's Auditory Verbal Learning Test (RAVLT) (9)	Verbal learning and memory
Rey Osterrieth Complex Figure Test (CFT) (10)	Visual learning and memory

in the past six months were excluded. All patients were on antipsychotic medication at the time of evaluation. Their socio-demographic details, employment status were recorded. Patients were either fluent with English or Kannada or Hindi, had adequate visual and hearing ability and had a minimum education upto 5th grade. Forty-four patients (89.8%) of the sample were diagnosed with paranoid schizophrenia and five (10.2%) were diagnosed with undifferentiated schizophrenia. They had  $11.94 \pm 3.61$  (mean  $\pm$  SD) years of formal education. Of the sample 61.2% patients were gainfully employed, 14.3% were homemakers, 6.1% were students and 18.4% were unemployed. The research study was approved by the Institute's ethics committee. Written informed consent prior to the assessment was obtained from every patient. Authors JT and BNG evaluated and monitored pharmacological treatment. Author SH carried out the neuropsychological assessments. A battery of twelve tests assessing various cognitive domains was administered as part of the neuropsychological assessment. Table 1 shows the list of neuropsychological tests used and the cognitive domain measured. Psychopathology profile was obtained using the Positive and Negative Syndrome Scale (PANSS) (Kay et al., 1987). Disability in global functioning was assessed using the WHO Disability Schedule (WHODAS-II) (WHO, 2002) 36-item interviewer administered version assessing disability in six domains of functioning ((i) understanding and communicating; (ii) getting around; (iii) self care; (iv) getting along with people; (v) life activities; (vi) participation in society) during the past thirty days. The neuropsychological assessment as well as administration of other tools/scales took between 3.5 and 4 h with adequate break when requested by the patient. All tests except Stroop test and Complex Figure Test was administered on all 49 patients. Stroop test could not be administered on two patients who preferred to read words in Urdu and not in Hindi. One patient refused to take the Stroop test and the Complex Figure Test.

### 2.1. Data analysis

The scores on the neuropsychological tests were compared with Indian norms appropriate to that of the subject's gender, age and education (Rao et al., 2004). The 15th percentile score (1 SD below the mean) was taken as the cut off score (Heaton et al., 1995). The total number of patients in the deficit range across the cognitive domains was calculated. Cognitive deficit quotient was calculated for each patient using the formula: total number of neuropsychological variables in the deficit range divided by the total number of neuropsychological variables assessed multiplied by hundred. This formula was devised by the authors to be able to quantify the level of cognitive deficits in each patient. Pearson's correlation was carried to examine the

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