REPORT

Neuropsychological Impairment in Forensic Psychiatric Patients with Schizophrenia Spectrum Disorders

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Neuropsychological assessments are often used to document the nature and extent of cognitive problems in people with schizophrenia spectrum disorders (Johnson-Greene & Adams, 1998). Assessment results are also used for treatment and discharge planning. Information derived from the evaluations can be used for educational, vocational, and social planning. This information can also be used to estimate whether the person has cognitive problems that would interfere with independent living or medication management.

Cognitive impairment in schizophrenia is well established and appears to be relatively severe and independent of positive psychotic symptoms (Bilder, 1997; Green & Braff, 2001; Green et al., 2002). The range of deficits is broad and includes specific impairments in perception, attention, verbal learning and memory, executive functioning, psychomotor skills, fluency, and information-processing, in addition to generalized cognitive decline (Bilder, 1997; Good et al., 2002; Green & Braff, 2001; Green et al., 2002; Velligan & Miller, 1999). Performance tends to fall 1 to 2 standard deviations below healthy adults (Bilder, 1997; Velligan & Miller, 1999). Cognitive problems occur in the majority of patients to some degree, and they tend to persist even after positive symptoms have been alleviated (Bilder, 1997; Green & Braff, 2001; Velligan & Miller, 1999).

There is emerging consensus that cognitive deficits have a negative impact on long-term functional outcome in people with schizophrenia (Addington & Addington, 2000; Green, Kern, Braff, & Mintz, 2000). Researchers have documented that cognitive deficits are more strongly associated with functional outcome than are positive symptoms (Bilder et al., 2002; Green & Braff, 2001). Impaired cognitive functioning has been associated with deficits in social, vocational, and community adjustment (Bilder, 1997; Green & Braff, 2001; Velligan & Miller, 1999). Thus, cognitive impairments can have important implications for ongoing psychosocial rehabilitation and community integration of patients with schizophrenia spectrum disorders.

The majority of research relating to cognitive impairment in people with schizophrenia has been with civil psychiatric inpatients and outpatients. Far less research has been conducted with forensic psychiatric patients, and direct comparisons between civil and forensic patients are rare. Schulz (1996) suggested that there is a perception, particularly amongst the public, that insanity acquittees are more dangerous and more psychiatrically impaired than civil psychiatric patients. In terms of severity of illness, there has been limited research comparing these two groups and the available evidence is somewhat mixed. In general, however, researchers have not found major differences in psychiatric status between these groups (Beran & Hotz, 1984; Heilbrun, Golloway, Shoukry, & Gustafson, 1995; Schulz, 1996; Shah, Greenberg, & Convit, 1994). We have been unable to locate any studies that have been designed to determine whether forensic patients differ in cognitive status from civil psychiatric patients.

From a clinical and commonsense perspective, one could easily adopt the perspective that forensic psychiatric patients are likely to be more cognitively impaired than civil psychiatric patients. Some might believe that forensic psychiatric patients who commit violent crimes are likely to be more psychiatrically ill, and thus more cognitively impaired. There seems to be a relationship between severity of illness and severity of cognitive impairment (e.g., Bilder et al., 2000). In addition, co-morbid substance abuse is very common in our Forensic Psychiatric Hospital. Thus, the adverse effects of substance abuse on cognitive functioning might contribute to further differentiation of this group. Moreover, traumatic brain injuries, mostly in the mild range of severity, are also common in our facility (Ward, 2003). The combination of mental illness, substance abuse, and traumatic brain injury obviously places this population at high risk for cognitive impairment.

The purpose of this study was to document cognitive impairments in an approximately random sample of patients with schizophrenia spectrum disorders from the Forensic Psychiatric Hospital (FPH) in British Columbia, Canada. This 211-bed facility serves adults referred by the Courts for specialized assessment and treatment. Patients are predominantly individuals who have been found not criminally responsible because of a mental disorder, the Canadian equivalent of being found not guilty by reason of insanity. We hypothesized that this patient population might have more severe cognitive deficits than civil psychiatric patients with similar diagnoses. Therefore, we also conducted exploratory analyses to determine if these forensic patients differed from civil psychiatric patients presented in the literature.

Method

Participants

The sample included 25 men selected approximately randomly from the hospital census. This group represents a subsample of

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a larger study designed to examine the prevalence of traumatic brain injury in this population. Consent was obtained from all participants, and ethics approval was granted by the Simon Fraser University ethics review board and the FPH Research Committee.

All patients had a diagnosis of a schizophrenia spectrum disorder. Comorbid substance abuse diagnoses were common (i.e., 64%), and a substantial minority reported a history of traumatic brain injury (i.e., 36%). Their average age was 35.1 years (SD = 9.2; Range 22 – 51). The majority (i.e., 72%) were Caucasian, 24% were of First Nations descent, and 4% were of unknown ethnicity. Forty-eight percent had 10 or less years of education, 32% had 11 or 12 years, and 20% had more than 12 years of education. Nearly all patients had a history of some type of violent offence (i.e., 96%). The majority had a history of a serious violent offence, such as homicide, attempted murder, assault, or sexual assault (i.e., 72%). Two-thirds of the patients were repeat offenders (including a history of violent or nonviolent offences). Most of the patients were unemployed at the time of admission (i.e., 88%). The breakdown of their marital status was as follows: single = 80%, married or common-law = 12%, or separated or divorced = 8%.

Measure

All patients completed the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) as part of the larger study examining the incidence and prevalence of traumatic brain injury in this population. The RBANS is a neuropsychological screening battery designed to measure attention/processing speed, expressive language, visual-spatial and constructional abilities, and immediate and delayed memory. This adult screening battery takes 20-40 minutes to administer. The normative sample (N = 540) ranges in age from 20-89, with 90 subjects in each of the following age groups: 20-39, 40-49, 50-59, 60-69, 70-79, and 80-89.

The RBANS was designed to screen for dementia in the elderly, to identify potential neuropsychological deficits in acute care and rehabilitation settings, and to track changes in functioning over time. Based on data presented in the manual, the RBANS Index Scores and Total Score appear to be quite sensitive to neuropsychological problems associated with a variety of neuropathologies, such as Alzheimer's disease, vascular dementia, HIV dementia, Huntington's disease, Parkinson's disease, schizophrenia, and traumatic brain injury. Good reliability and convergent validity have been demonstrated in a number of subsequent studies (Gold, Queern, Iannone & Buchanan, 1999; Hobart, Goldberg, Bartko, & Gold, 1999; Weber, 2003; Wilk, Gold, Bartko, et al., 2002). Hobart et al. (1999) demonstrated strong correlations between RBANS total scores and WAIS-III, WMS-III, and a composite z-score derived from 22 standard measures of intelligence, memory, language, motor, attention, and executive function.

Researchers have demonstrated the usefulness of this battery in general psychiatry. Gold et al. (1999) demonstrated that persons with schizophrenia perform poorly on the RBANS. Their Index scores are between one and two standard deviations below the mean. Their total score was 71.4 (SD = 15.7). These results are very similar to the findings from the schizophrenia sample in the RBANS manual (Total Score = 72.8, SD = 16.6). Hobart et al. (1999) compared patients with schizophrenia with patients with bipolar disorder, and found consistently greater deficits in the schizophrenia group on a battery of neuropsychological tests that included the RBANS. The largest differences were on the total score (d = .55, medium effect size) and the Immediate Memory Index (d = .63, medium effect size).

Results

Descriptive statistics for the RBANS Index scores are provided in Table 1. Relative to the general population, this sample demonstrated statistically significant and clinically meaningful deficits in all cognitive domains assessed. The RBANS is normed with a mean of 100 and a standard deviation of 15. As a group, they demonstrated large deviations from the healthy normative mean in immediate memory (d = 1.8), delayed memory (d = 1.7), visual-spatial and constructional skills (d = 1.4), expressive language (d = 1.2), attention/processing speed (d = 1.5), and the total score (d = 2.0). These are all very large effect sizes (Cohen's effect sizes typically are expressed in pooled, weighted standard deviation units; no weighting was necessary for these calculations). These average cognitive deficits are illustrated in Figure 1. As seen in this figure, the average scores for the patients were much lower, falling in the impaired to borderline impaired range for all indexes except the Language Index, which fell in the low average range. The error bars represent the 80% prediction interval. That is, 80% of subjects in each group are predicted to score within that range.

Exploratory dependent sample t-tests were used to compare the Language Index to the other four primary index scores. The patients scored significantly higher on the Language Index than the Immediate Memory Index ($t = -3.4$; $p < .003$), Delayed Memory Index ($t = 3.0$; $p < .007$), and the Attention Index ($t = 2.5$; $p < .022$).

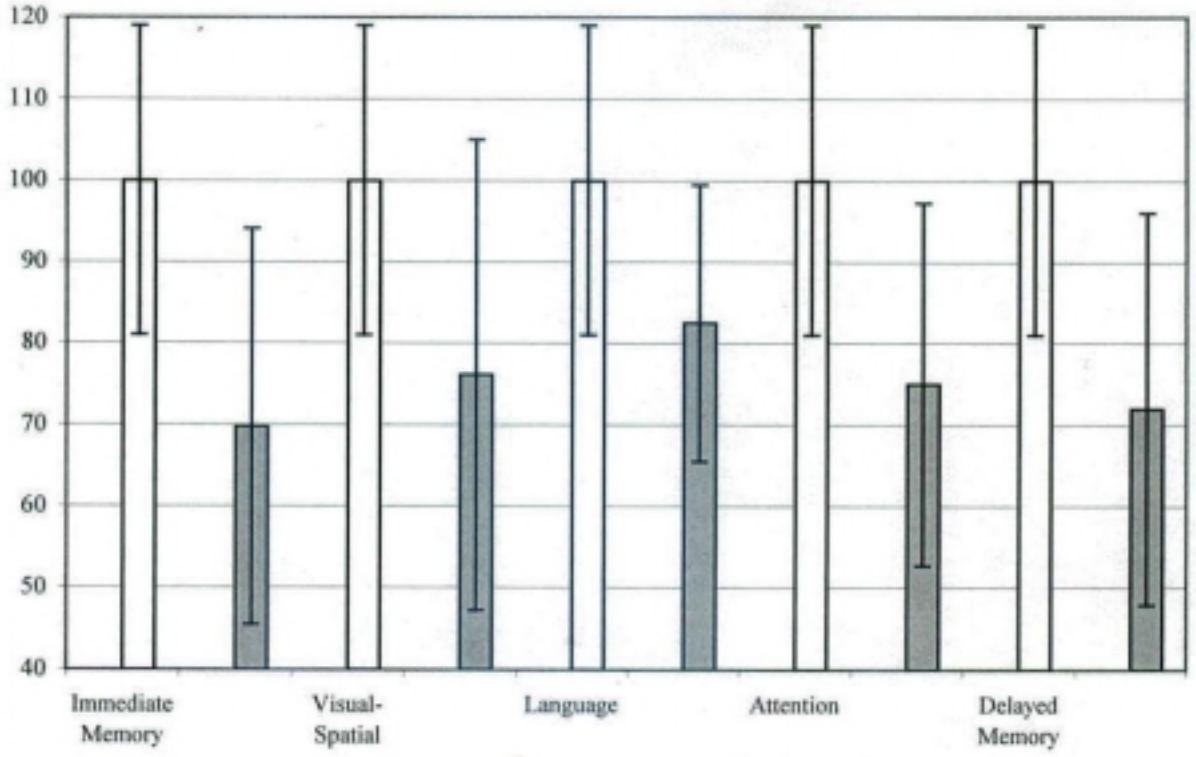

Figure 1. Comparison of the patients to the normative sample.
The white bars respresent the normative sample, with a mean of 100. The gray bars represent the mean scores for the current sample. The error bars were created by multiplying each standard deviation by 1.28, creating an 80% prediction interval surrounding the mean scores.

There was no significant difference between the Language Index and the Visual-Spatial/Construction Index. Thus, the cognitive deficits associated with schizophrenia are more pronounced on the Memory Indexes and the Attention Index than on the Language Index. This pattern of cognitive deficits is roughly consistent with the other patient groups presented in Table 1 (Gold et al., 1999; Randolph, 1998; Wilk et al., 2002) and with the more general neuropsychological literature (e.g., Braff et al., 1991; Goldberg et al., 1990; Saykin et al., 1994).

The average scores from the current sample were compared to several patient groups from the literature in Table 1. Each of these samples was comprised of community-dwelling outpatients with schizophrenia spectrum disorders. Independent sample t-tests, using summary statistics, were used to compare the performance of the current inpatient forensic sample to each of the outpatient samples. When compared to the patients presented in the RBANS manual (N = 59; Randolph, 1998), the two groups did not differ on the five Index scores or on the total score (all p's > .05). Similarly, the present sample did not differ on any index score from two large samples of community dwelling outpatients with schizophrenia spectrum disorders (N = 129, Gold et al., 1999, all p's > .05; N = 181, Wilk et al., 2002, all p's > .05).

Discussion

This unselected sample of forensic psychiatric inpatients had pronounced cognitive deficits across multiple domains, consistent with the literature on neurocognitive deficits associated with schizophrenia. However, these forensic patients did not have *more* pronounced cognitive deficits than presumed higher functioning, community-dwelling outpatients with schizophrenia spectrum disorders. This is particularly noteworthy given the relatively high rate of comorbid substance abuse (64%) and history of traumatic brain injury (36%) in this sample. As an independent risk factor, neuropsychological deficits have been associated with long-term abuse of cocaine (e.g., Ardila, Rosselli, & Strumwasser, 1991; Beatty, Katzung, Moreland, & Nixon, 1994; Hoff et al., 1996; O'Malley, Adanise, Heaton, & Gawin, 1992; Paraherakis, Charney, & Gill, 2001; Rosselli & Ardila, 1996), benzodiazapines (e.g., Paraherakis et al., 2001), heroin (e.g., Strang & Guyrling, 1989), alcohol (e.g., Akshoomoff, Delis, & Kiefner, 1989; Beatty et al., 1994; Errico, Nixon, Parsons, & Tassy, 1990; Gordon, Kennedy, & McPeake, 1988; Grant, 1987; Kramer, Blusewicz, Robertson, & Preston, 1989; Long & McLachlan, 1974; Muuronen, Bergman, Hindmarsh, & Telakivi, 1989; Nixon, 1999; Paraherakis et al., 2001; Parsons, 1987, 1998; Parsons & Nixon, 1993; Rourke & Loberg, 1996; Ryan & Lewis, 1988; Sander, Nixon, & Parsons, 1989; Selby, & Azrin, 1998; Yohman, & Parsons, 1987), and polysubstances (e.g., Meek, Clark, & Solana, 1989; Morris & Lawson, 1998; Rosselli & Ardila, 1996; Selby & Azrin, 1998).

This study has several clear methodological limitations. The comparison samples were samples of convenience, drawn from the literature. We did not have access to the original data. The statistical comparisons were based on data presented in the published articles. Education and ethnicity are factors that are important for interpreting neuropsychological test results, and

Table 1.
RBANS descriptive statistics for several clinical groups with schizophrenia spectrum disorders.

Index	Current Sample (N = 25)	RBANS Manual (N = 59)	Gold et al. (1999) (N = 129)	Wilk et al. (2002) (N = 181)
Immediate Memory	69.8 (16.2)	73.8 (18.3)	72.4 (18.9)	72.2 (18.0)
Visual Spatial / Constructional	76.1 (20.2)	82.5 (21.1)	79.1 (18.8)	80.6 (17.9)
Language	82.5 (13.3)	83.5 (17.5)	84.7 (14.3)	84.7 (14.9)
Attention	75.0 (17.4)	77.2 (17.5)	74.7 (18.3)	75.4 (17.4)
Delayed Memory	72.0 (18.8)	74.9 (19.1)	74.9 (18.8)	74.0 (18.7)
Total Score	69.2 (16.2)	72.8 (16.6)	71.4 (15.7)	71.8 (14.9)

Mean is on the first line and standard deviation is in parentheses.

these were entirely uncontrolled and unanalyzed in this study. The predominant ethnic minority group in the studies derived from the literature was African Americans, whereas our sample had a number of patients of First Nations descent. Although the First Nations patients, on average, performed 6 – 17 points below the Caucasians, we did not do between group statistical comparisons given the very small sample sizes. Finally, we were unable to compare the rates of comorbid substance abuse or history of traumatic brain injury across samples.

To our knowledge, this is the first study to document neuropsychological deficits using the RBANS in forensic psychiatric patients with schizophrenia spectrum disorders. Given the obvious methodological limitations, the comparisons between our forensic patients and the civil patients should be considered preliminary and exploratory. The findings ran counter to our expectation and suggest that forensic inpatients with schizophrenia might not show more pronounced neurocognitive deficits, despite their high rate of comorbid substance abuse, histories of violent criminal behavior, and a fairly common history of self-reported traumatic brain injury. However, more methodologically sophisticated studies are needed to address these issues more definitively.

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