Differential Preservation of Cognitive Functions in Geriatric Patients with Lifelong Chronic Schizophrenia: Less Impairment in Reading Compared with Other Skill Areas

Philip D. Harvey, Patrick J. Moriarty, Joseph I. Friedman, Leonard White, Michael Parrella, Richard C. Mohs, and Kenneth L. Davis

Background: Our study examined the differential performance of cognitive skills in geriatric, cognitively impaired schizophrenic patients (n = 165) with a lengthy course of institutional stay and a poor overall functional outcome. Their relative deficits were compared with a sample of healthy elderly individuals.

Methods: Schizophrenic patients were matched one-to-one with healthy individuals of the same age and education and compared on a number of measures of cognitive functioning. The schizophrenic patients’ old-learning performance was also compared with their educational level only.

Results: Mini-Mental State Examination (Folstein et al 1975) scores of the patients were in the moderately demented range (M = 20.36), and these patients underperformed healthy control subjects by more than 1 to slightly less than 3 standard deviations on measures of memory, praxis, and verbal skills. Wide Range Achievement Test—Revised word-recognition reading scores were found to be at the 10th-grade level, although the patients on average had completed 11 years of formal education.

Conclusions: These results suggest that even in schizophrenic patients with significant cognitive impairment, reading scores are relatively consistent with educational attainment. These data indicate that poor performance on measures of cognitive functioning in this population does not necessarily occur on measures of old learning. Biol Psychiatry 2000;47:962-968 © 2000 Society of Biological Psychiatry

Key Words: Premorbid functioning, geriatric, schizophrenia, cognitive functioning, differential deficit, functional outcome

Introduction

Cognitive impairment increasingly has been recognized as a consistent correlate of poor outcome and functional deficit in patients with schizophrenia. Cross-sectional studies reveal that cognitive impairment is more severe in poor-outcome patients than in those with a better overall outcome (e.g., Perlick et al 1995; Serban and Gidynski 1979) and that cognitive dysfunctions are correlated with specific adaptive deficits (Harvey et al 1997; Klapow et al 1997). For example, deficits in cognitive functions have been reported to be related to deficits in social, occupational, and self-care skills (see Green 1996 for a review). Additionally, longitudinal studies have found that cognitive impairment early in the course of illness predicts later poor outcome and interferes with the acquisition of adaptive skills in training programs. Cognitive impairment is common, present in as many as 85% of patients with schizophrenia (Palmer et al 1997). Although recent studies have indicated that some of the novel antipsychotic medications may enhance performance on tests of cognitive functions (Green et al 1997; Jeste et al 1998), the level of improvement shown to date does not suggest that such treatment can normalize the performance of most patients with schizophrenia.

There may be a gradient of impairment across different aspects of cognitive dysfunction in patients with schizophrenia. Some studies have shown that performance on tests of memory or executive functioning is more impaired than other aspects of cognitive functioning, such as perceptual skills (e.g., Heaton et al 1994; Saykin et al 1991). Other evidence indicates that memory is more impaired than are estimates of current intelligence (Gold et al 1992). One study found that intellectual functioning in ambulatory patients with schizophrenia demonstrated minimal evidence of deterioration from premorbid levels during the early stages of the illness (Russell et al 1997). These findings suggest that performance on tests sensitive to...
Premorbid intellectual functioning may be relatively more preserved in patients with schizophrenia than other aspects of cognitive functioning, such as memory performance. It already has been demonstrated that first-episode patients with schizophrenia have impairments in memory, attention, and executive functioning that are, on average, as severe as those in chronic patients (Saykin et al 1994). Therefore, considerable decline in some aspects of cognitive functioning must occur at some point early in the course of the illness.

Studies of poor-outcome patients with schizophrenia consistently have found performance on tests of cognitive functioning that must have deteriorated from premorbid levels. For example, it has been shown that geriatric patients with lifelong schizophrenia living in chronic psychiatric hospitals or nursing homes have performance on global tests of cognitive functioning that places them, on average, into either the severely or extremely demented range (Harvey et al 1998). Many of these patients have completed levels of education (an average of 9–10 years) that are incompatible with the suggestion that their current functioning is their lifelong level of cognitive performance. As a result, an important task in research on schizophrenia is to identify whether there are aspects of cognitive functioning that are differentially preserved in patients with global cognitive impairments. Finding evidence of preserved aspects of cognitive functioning would also argue against the idea that the performance deficits of these poor outcome, chronically institutionalized patients are either completely attributable to some other aspects of their illness, such as negative symptoms, or to their chronic institutional stay and associated demoralization.

Some studies have suggested that skills acquired during the premorbid period, such as long-term factual memory, vocabulary, and word-recognition reading skills are relatively preserved in most patients with schizophrenia (O’Carroll et al 1992). For instance, the average IQ of patients with schizophrenia may be around 90 (Aylward et al 1984; Frith et al 1991), which is only 0.6 SD worse than the population average. An IQ score of 90 is essentially an average IQ. This level of performance stands in contrast to the other cognitive ability areas mentioned above. Previous studies of preservation of premorbid skills did not examine very poor outcome patients, however, where lower levels of premorbid intellectual and educational attainment might be expected. In such patients, the question still arises as to whether there are discrepancies between performance on measures that could be considered “intellectual” or “premorbid” and current performance on other measures of cognition. Recent research has suggested particular preservation of word-recognition reading to a greater extent than the level of preservation seen in other aspects of intellectual functioning, such as full-scale IQ (Tracy et al 1996). There are no data available on the performance of previously learned skills in very deteriorated patients with poor outcome schizophrenia and a history of chronic institutionalization, leaving open the question of the validity of such assessments.

Our study examined the extent that word-recognition reading performance is preserved in very poor outcome patients with schizophrenia. Sampling from a population of patients for whom cognitive decline previously had been demonstrated to be pervasive and severe, we examined the relative preservation of word-recognition reading scores compared with performance on specific tests of cognitive skills, such as memory, verbal skills, and praxis. If word-recognition reading scores were a reasonable measure of premorbid functioning, we hypothesized that there would be no statistically significant difference between the grade level achieved in school and the grade-equivalent performance on the Wide Range Achievement Test—Revised (WRAT-R; Jastrak 1984), even in late-life patients with significant cognitive deficits. We hypothesized that performance on measures of other cognitive functions would be grossly impaired when compared with normal individuals, consistent with previous research suggesting considerable impairment in performance on the part of these patients. Furthermore, we used a battery of cognitive tests that are known to vary both in the amount of persistence required for completion and the amount of cognitive effort required for successful performance.

To perform this study, we used a method that we had employed previously (Davidson et al 1996), sampling from a large-scale database of healthy individuals who were screened for the absence of dementia and examined with a cognitive assessment battery sensitive to dementia and cognitive decline. This sample of normal elderly individuals was collected in the Consortium to Establish a Registry for Alzheimer’s Disease (CERAD; Morris et al 1989) study, which was a large study of the characteristics of early Alzheimer’s disease and the subsequent progression of the illness. Although we were well aware of the inherent problems (Meelh 1977) matching patients with schizophrenia directly to healthy individuals according to education level, we chose to use an exact matching procedure rather than our previous “relative matching procedure” (Davidson et al 1996). This choice was made because direct matching on education would tend to select a sample of normal subjects with relatively lower education status and possibly reduce scores on the cognitive measures, given the well-understood association between current cognitive functioning and education status. Such a sample of less-educated normal subjects would likely underperform relative to the CERAD normal sample in general, reducing the difference between them and the patients with schizophrenia, who might be selected for...
relatively higher levels of education. Such a sample would influence the results against finding discrepancy on the part of patients relative to normative performance in current cognitive functioning.

Several specific questions were addressed:

1. What is the relative level of impairment compared with healthy control subjects on neuropsychological tests of memory, verbal skills, and spatial-praxic skills in patients with poor-outcome chronic schizophrenia?
2. What is the relative level of impairment across different cognitive tests in patients with poor-outcome chronic schizophrenia?
3. What is the level of performance on reading skills in patients with poor-outcome chronic schizophrenia compared with the level of education that they completed?
4. What is the correlation between clinical symptoms, demographic factors, and cognitive test performance in patients with poor-outcome chronic schizophrenia?

Methods and Materials

Subjects

Patient subjects in our study were geriatric individuals with chronic schizophrenia who were long-term patients at a state psychiatric center. These subjects were participants in a longitudinal study of symptomatic, cognitive, and adaptive aspects of late-life schizophrenia. The patients were compared with a sample of healthy control subjects who had served as participants in a large-scale study of the characteristics of patients with Alzheimer’s disease, the CERAD project (Morris et al 1989). In the CERAD project, a large sample of normal individuals was examined with a clinical and functional assessment and a cognitive battery. In our study, we utilized the CERAD database (available from the principal investigator of that study, Albert Heyman, M.D.) to match patients with schizophrenia to healthy comparison subjects on the basis of age, education, ethnicity, and gender.

Data for the patients with schizophrenia came from the database of the Mt. Sinai Mental Health Clinical Research Center. This database consists of geriatric patients with lifelong schizophrenia who were recruited and assessed in a variety of treatment settings, including acute psychiatric hospitals, chronic hospitals, and nursing homes. In our study, only chronically institutionalized and nursing home resident patients were included. Because the measure of premorbid intellectual functioning, the word-recognition subtest of the WRAT-R (Jastrak 1984), was added after the initiation of the study, only those patients who were assessed with instrument were considered for matching.

The schizophrenic patients had been diagnosed with a previously published procedure (Davidson et al 1995). All patients received a lifetime chart review, supplemented by direct interviews with the patients and interviews with their patient care staff. Patients were required to meet diagnostic criteria for schizophrenia for each decade of their life after their first psychiatric contact. Patients were excluded from the overall research database because of diagnoses that ruled out schizophrenia, including affective disorders. In addition, patients with a history of head trauma with loss of consciousness, rapid cognitive decline detected by a neurologist at an annual examination, seizure disorders, substance dependence, or cerebrovascular accidents were also excluded. The Mini-Mental State Examination (MMSE; Folstein et al 1975) was also administered to all subjects; all patients who received scores of 0 were excluded from consideration for matching to healthy control subjects. Likewise, all patients whose scores on the WRAT-R or on any of the measures in the CERAD battery (other than delayed recall) were 0 also were excluded from matching. This criterion was adopted to ensure that all patients had manifested at least minimal cooperation with all aspects of the assessment.

Because there was often more than one possible match for patients with schizophrenia and the CERAD normal subjects, we used a selection criterion based on the time when the patient was enrolled in the study. We tried to match schizophrenic patients with the lowest consecutive subject ID numbers first; if a patient was unmatchable, we moved to the next patient.

There were a total of 887 schizophrenic patients and 860 healthy individuals who were initially eligible for matching. The matching process was performed using demographic databases with the cognitive functioning test scores deleted so that all matches were performed with the researcher performing the matches (PJM) unaware of the test scores. We completed 165 successful matches, and all further analyses had an n of 165 per group.

Assessments

Symptoms of schizophrenia were examined with the Positive and Negative Syndrome Scale (PANSS; Kay 1991). The PANSS contains 30 items, with seven items rating positive symptoms, seven rating negative symptoms, and 16 items assessing “general psychopathology.” The rating procedures and reliability of the assessments in schizophrenic patients have been described previously (Davidson et al 1995). For the purposes of our study, we examined the total scores on the positive and negative subscales as the dependent variables.

Cognitive functioning was assessed with an abbreviated neuropsychological battery for both patients and normal control subjects as previously described (Harvey et al 1998). The tests in the CERAD battery examined a variety of cognitive functions, including verbal fluency, serial learning and delayed recall, confrontation naming, and constructive praxis. The battery was administered in similar form to patients with schizophrenia and the control subjects.

WORD LIST LEARNING AND DELAYED RECALL. In this test, a 10-item list of words is presented to the subject on three separate learning trials. After each trial, free recall of the list is required of the subjects. After a delay, filled by the praxis examination described below, our study required a delayed recall of the word list. The dependent variables for this report were the total number of words recalled over three learning trials and the number of words that were recalled at the delayed recall.
addition, delayed recognition memory was examined as well, with the dependent variable being the total number of correct recognitions of target words and the number of correct rejections of recognition foils. This score could range from 0 to 20.

**PRAXIC DRAWINGS.** For this test, four drawings (circle, diamond, overlapping rectangles, cube) are presented to the subject, who is instructed to copy them exactly. Reproductions are scored according to predetermined criteria that were developed for use in the CERAD study and assign a variable number of points depending on the adequacy of the reproduction. The dependent variable is the total score for all four drawings.

**MODIFIED BOSTON NAMING TEST.** In this test, subjects are presented with 15 line drawings and asked to name the object depicted. Of the 15 drawings, five are of objects with high frequency of occurrence in spoken English, five of moderate frequency, and five of low frequency. The dependent variable is the total number of drawings correctly named.

**CATEGORY FLUENCY.** Subjects were asked to name as many animals as they could in a 1-min period. The dependent variable is the number of unique animals named.

**WIDE RANGE ACHIEVEMENT TEST—REVISED READING.** Finally, reading ability was measured with the WRAT-R (Jastrak 1984) word-recognition reading subtest. In this test, subjects are presented with a list of ascendingly difficult words. They are asked to read them aloud, with the pronunciation scored as correct or not. Testing is terminated after 10 consecutive errors. The WRAT-R—dependent variable was the total score for words read correctly, which was converted to the grade-equivalent score for some of the statistical analyses. Only the schizophrenic patients were tested with this instrument because it was not part of the CERAD battery.

**Data Analysis**

Normal and schizophrenic patients were compared on all of the individual tests in the CERAD battery using a multivariate analysis of variance (MANOVA), with the between-group differences also presented as an effect-size measure, Cohen’s $d$. This measure is the number of standard deviations, based on pooled variance, by which two samples differ in their mean level of performance. By convention, a small effect size is about $d > 0.2$, a moderate effect is about $d > 0.4$, and a large effect size is a $d$ of 0.6 or greater. Follow-up univariate $F$ tests were also performed. The two samples were also compared on the MMSE with a $t$ test. Within the patient sample, analyses of relative levels of impairment across tests were computed. All patients’ scores were converted to standardized (i.e., $z$) scores, using the performance of the healthy comparison subjects as a standard. A MANOVA was used to compare performance across all of the tests and follow-up post hoc tests (Tukey) were used to determine if there were significant differences in the level of impairment relative to healthy comparison subjects. Paired sample $t$ tests were computed between years of education completed and the grade-equivalent score on the WRAT-R for the schizophrenic patients only to examine discrepancy between grade-level scores and years of education completed, with these results also converted to Cohen’s $d$. Finally, correlational analyses were performed to examine the relationship between other features of illness and cognitive performance in the patients with schizophrenia, including clinical symptoms and length of illness.

**Results**

Demographic information on the two samples of subjects is presented in Table 1. As can be seen in the table, the patients and the normal individuals were essentially identical on the matching variables, indicating a successful match between the groups. Both samples of subjects completed an average of 11 years of education, and the schizophrenic patients were found to read at the 10th-grade level.

Cognitive performance is presented in Table 2. A MANOVA comparing patients with normal individuals on all of the aspects of performance on the CERAD battery was statistically significant [Wilks $\lambda = .44$, Rao’s $R(6,325) = 97.80$, $p < .001$]. Schizophrenic patients performed more poorly than did normal individuals on each of the tests in the battery, as indicated by statistically significant univariate $F$ tests. The normal individuals also outperformed the schizophrenic patients on the MMSE [$t(328) = 14.28$, $p < .001$]. As can be seen in Table 2, the smallest effect size difference between the groups on a CERAD battery item was over a full standard deviation, $d = 1.12$, with the largest close to three standard deviations at $d = 2.60$.

When the relative deficits across the different cognitive measures were examined systematically, it was found that there were statistically significant differences in the level of deficit compared with the healthy control subjects across tests. The overall repeated-measures ANOVA was statistically significant [$F(5,825) = 7.121$, $p < .001$]. Post
heterogeneous comparisons revealed that recognition memory was significantly more impaired than learning on the verbal learning test, delayed recall performance, and verbal fluency (which did not differ), and performance on these tests were significantly more impaired than naming and praxic performance, \( p < .05 \), among the patients with schizophrenia.

The paired \( t \) test performed in the schizophrenic patients comparing grade-equivalent scores on the WRAT-R and years of education completed found a statistically significant difference \( [t(164) = 3.21, \ p < .01] \). The effect size of this difference was only moderate, however \( (d = 0.42) \), relative to the level of impairment compared with healthy controls on each of the aspects of the CERAD battery.

Correlations between each of the cognitive measures and each of the symptomatic and demographic variables for the patients with schizophrenia are presented in Table 3. As seen in the table, all correlations between negative symptom severity and performance were significant. Age was generally correlated with performance but accounted for little overlapping variance. Education was significantly, but to a relatively small degree \((r = .28, R^2 = .08)\), correlated with all measures in the CERAD battery, but it was more strongly correlated with WRAT-R reading scores. Finally, positive symptoms were correlated with performance on only one of the tests in the CERAD battery.

### Discussion

In this study, patients with lifelong, poor-outcome schizophrenia were found to underperform normal individuals of the same age and education status on an array of measures of verbal skills, learning, memory, and spatial-praxic ability. The level of impairment ranged from 1 to close to 3 standard deviations across tests. Consistent with earlier reports of much younger and higher functioning patients, deficits in memory and verbal skills were considerably greater than deficits in naming skills and in visual-constructional abilities (Saykin et al 1991). Similar magnitudes of deficit were found on the MMSE. In contrast, the performance of these patients on a test of reading ability was similar to expectations based on the solely on the amount of education completed by the patients in the past. Although the finding that chronically institutionalized patients with schizophrenia perform poorly on multiple tests of cognitive functioning is not new, the finding of relatively spared reading performance suggests that WRAT-R scores are validly obtained in this poor-outcome population. In addition, across the different cognitive skills, the greatest impairment was in the domain of recognition memory. Although recognition memory is commonly not impaired in higher functioning patients with schizophrenia, we recently have found that recognition memory on more difficult tests was impaired in a similar sample of geriatric and nongeriatric poor-outcome patients (Putnam and Harvey 1999).

### Table 2. Cognitive Functioning Scores for Patients and Matched Normal Control Subjects

<table>
<thead>
<tr>
<th>Cognitive measure</th>
<th>Control subjects ((n = 165))</th>
<th>Patients ((n = 165))</th>
<th>(d)</th>
<th>(t)</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CERAD battery scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mini-Mental State Examination score</td>
<td>28.37 5.95</td>
<td>20.36 2.25</td>
<td>1.35</td>
<td>14.28</td>
<td>.001</td>
</tr>
<tr>
<td>Abbreviated Boston Naming total score</td>
<td>14.21 3.30</td>
<td>10.37 1.46</td>
<td>1.16</td>
<td>150.06</td>
<td>.001</td>
</tr>
<tr>
<td>Praxis test total score</td>
<td>9.63 3.06</td>
<td>6.21 1.50</td>
<td>1.12</td>
<td>175.56</td>
<td>.001</td>
</tr>
<tr>
<td>Total learning on word list trials 1–3</td>
<td>20.54 6.51</td>
<td>10.66 4.23</td>
<td>1.53</td>
<td>236.85</td>
<td>.001</td>
</tr>
<tr>
<td>Delayed recall score</td>
<td>6.91 2.43</td>
<td>2.34 2.82</td>
<td>1.92</td>
<td>306.95</td>
<td>.001</td>
</tr>
<tr>
<td>Delayed recognition memory</td>
<td>19.50 0.80</td>
<td>15.34 2.40</td>
<td>2.60</td>
<td>389.64</td>
<td>.001</td>
</tr>
<tr>
<td>Animal naming fluency</td>
<td>16.67 5.09</td>
<td>7.42 5.03</td>
<td>1.80</td>
<td>242.11</td>
<td>.001</td>
</tr>
</tbody>
</table>

\( F \) values are the univariate corrected \( F \) statistics from the multivariate analysis of variance. CERAD, Consortium to Establish a Registry for Alzheimer’s Disease.

### Table 3. Correlations between Demographic and Symptom Variables and Cognitive Performance in the Schizophrenic Patients

<table>
<thead>
<tr>
<th>Cognitive measure</th>
<th>Age</th>
<th>Education</th>
<th>Positive symptoms</th>
<th>Negative symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviated Boston Naming total score</td>
<td>-.23</td>
<td>.29</td>
<td>-.07</td>
<td>-.39</td>
</tr>
<tr>
<td>Praxis test total score</td>
<td>-.25</td>
<td>.22</td>
<td>-.22</td>
<td>-.39</td>
</tr>
<tr>
<td>Total learning on word list trials 1–3</td>
<td>-.15</td>
<td>.17</td>
<td>-.12</td>
<td>-.51</td>
</tr>
<tr>
<td>Delayed recall score</td>
<td>-.17</td>
<td>.19</td>
<td>-.12</td>
<td>-.44</td>
</tr>
<tr>
<td>Delayed recognition</td>
<td>-.21</td>
<td>.21</td>
<td>-.08</td>
<td>-.47</td>
</tr>
<tr>
<td>Animal naming fluency</td>
<td>-.29</td>
<td>.23</td>
<td>-.12</td>
<td>-.48</td>
</tr>
<tr>
<td>WRAT-R raw score</td>
<td>-.14</td>
<td>.64</td>
<td>-.05</td>
<td>-.35</td>
</tr>
</tbody>
</table>

WRAT-R, Wide Range Achievement Test—Revised.
\( ^a p < .05 \), two tailed.
There are several implications of these findings. First, the much more adequate performance on one aspect of cognitive functioning argues against the suggestion that poor cognitive performance is schizophrenia is generically caused by a single extraneous factor, such as severe negative symptoms. This impression is substantiated by the relatively similar levels of correlation between preserved skills (i.e., reading) and deteriorated skills (e.g., memory) and measures of the severity of negative symptoms. Furthermore, the most impaired domain of cognitive functioning in our sample of schizophrenic patients, recognition memory, is generally accepted to be less effortful and to require reduced levels of processing capacity than delayed recall memory. Thus, the level of impaired performance across tests in patients with schizophrenia does not appear to directly track the level of effort or resources required to perform the task. Second, the data suggest that these patients have experienced substantial cognitive decline at some time after they acquired their reading skills. Patients whose MMSE scores are, on average, in the moderately demented range and who underperform normal individuals on tests of learning and memory are reading in a manner consistent with a mid–high-school education. The level of cognitive performance in areas such as verbal learning and memory seems inconsistent with this level of performance on measures of academic achievement. Third, the data are consistent with the results of studies of patients with much less severe cognitive dysfunction, suggesting preservation of old learning across the spectrum of overall functional outcome in schizophrenia (O’Carroll et al 1992; Tracy et al 1996). Finding these similar profiles of spared old learning across patients who vary widely in age and overall outcome status is consistent with our earlier results indicating that correlations between different aspects of schizophrenia were similar across wide differences in functional outcome (Harvey et al 1998).

Several interpretive limitations must be considered in evaluating these results. These results do not tell us about when cognitive decline occurs in these patients. Although continued cognitive and functional decline in patients with schizophrenia has been demonstrated in late life (Harvey et al 1999a, 1999b), it is also likely that some amount of decline occurred earlier in the course of illness as well (Davis et al 1998). There are many other differences between these two samples of subjects, including lifetime histories of somatic treatment, institutionalization, poor functional skills, and many other correlates of schizophrenia. Some of the differences in aspects of cognitive functioning could be related to those other factors. These results may not apply to better outcome patients or patients who are younger. Finally, the patients in this study are considerably higher functioning than are many of the patients in other samples on which we reported previously. It may be possible that the lower functioning patients are different in some way from this subset of patients.

We do not have access to the academic performance of the patients with schizophrenia. As a result, we cannot compare their current level of achievement with their early-life performance. Given the consistent reports of premorbid academic deficit in patients with schizophrenia, it would seem unlikely that this particular group of schizophrenic patients would have been found to perform better on reading skills than the number of years of formal education that they completed. Thus, if anything, these patients would have been expected to underperform on reading while in school, meaning that their low-level reading grade level may be a lifelong deficit. Similarly, the lack of reading scores for healthy comparison subjects means that we cannot examine the differential effect sizes for reading across the two subject samples in the same manner as we examined differences in other cognitive skills.

The argument that poor motivation, uncooperativeness, and other “nuisance” variables fully account for poor cognitive performance in institutionalized patients is inconsistent with these data. Poor motivation or negative symptoms may, in fact, be more likely to affect variables for which greater persistence, effort, or cognitive resources are required. It is difficult to undertake an objective level of difficulty assessment with tasks that vary in the types of cognitive demands. In terms of persistence, the WRAT-R takes longer to complete than does the verbal fluency examination, the praxis test, or the abbreviated Boston Naming test, arguing against differential fatigue effects. In regard to memory performance, patients with schizophrenia performed relatively more poorly on the less effortful recognition memory test than on either the serial learning serial learning or delayed free-recall components. Thus, within memory functions, relative level of performance deficit compared with healthy control subjects does not relate directly to the amount of effort required.

In summary, our data extend previous research supporting the use of tests of word-recognition reading as estimates of cognitive functioning that are not markedly biased by current levels of cognitive impairment. Further, even major cognitive impairments in some domains of functioning in poor-outcome chronic schizophrenia do not indicate that every possible domain of cognitive functioning will be equally impaired. The sparing of certain skills may also provide some clues to biological basis of this cognitive decline. Brain regions involved in the utilization of previously learned material (i.e., crystallized intelligence) would appear to be more highly functional in these patients than regions required for new learning and performance of other verbal and nonverbal tasks. Later research might profit from more comprehensive assess-
ments of the specific cognitive processes that are impaired in these poor-outcome patients, comparing them with better outcome patients of the same age on tasks that examine different elements of information processing that might have direct brain-functioning implications.

This research was supported by the assessment core (Philip D. Harvey, PI) of the Mt. Sinai Mental Health Clinical Research Center (Kenneth L. Davis, PI). The authors thank the following staff members who contributed to this study: Janice McCrystal, Stephanie Bowler, Rita Obwiek, Susan Shady, and Cynthia Blum. We also thank Albert Heyman and the Consortium to Establish a Registry for Alzheimer’s Disease (CERAD) collaborative investigators for their efforts in collecting the normative sample in this study.

References


