Cognitive and clinical predictors of success in vocational rehabilitation in schizophrenia

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Abstract

Cognitive impairments in schizophrenia appear to be associated with social problem solving, social and vocational functioning, and psychosocial skill acquisition. The present study examined the relationship of cognitive functioning, as well as clinical symptoms, to vocational outcomes among individuals with schizophrenia. One hundred and twelve participants with DSM-IV schizophrenia spectrum diagnoses underwent a comprehensive neuropsychiatric evaluation after enrolling in one of several employment programs. The neuropsychological evaluation examined verbal learning and memory, attention, speed of information processing, and executive functioning. Clinical symptoms were evaluated with the Positive and Negative Syndrome Scale (PANSS). Vocational outcomes were assessed 4 months after baseline assessment and included both measures of employment outcome (e.g., earnings) and of work performance as assessed by the Work Behavior Inventory (WBI). Negative symptoms, learning and memory performance, processing speed, and executive functioning were related to hours, weeks, and wages earned on the job. Stepwise multiple regression analyses found that among baseline clinical and cognitive predictors, only verbal learning and memory and cognitive disorganization symptoms were significant predictors of work behaviors 4 months later. Learning and memory were the only significant predictors of integrated employment at 4 months. These results suggest specific aspects of cognition may be modestly predictive of vocational outcomes.

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1. Introduction

Cognitive impairments are gaining attention for their possible role in the social and occupational deficits that accompany schizophrenia. Recent re-
views of the literature have suggested these cognitive impairments as “rate-limiting” factors in success in both social and occupational domains of outcome (Green, 1996; Green et al., 2000). Several lines of investigation into adaptive function in schizophrenia have documented relationships between cognitive functioning and performance of everyday activities (Brekke et al., 1997; Green, 1996; Harvey et al., 1998). Specifically, these studies have noted that executive functioning abilities, verbal memory, and vigilance are related to work performance, social functioning, and performing basic self-care activities. Several dimensions of adaptive function have been studied in relationship to cognitive performance, including work performance and occupational goals (Bell and Lysaker, 1995; Lysaker et al., 1995a,b), social skills performance (Corrigan and Green, 1993; Patterson et al., 1997; Smith et al., 1999), and community outcomes (Brekke et al., 1997; Green et al., 2000). Most of this work has found that cognitive function is associated with concurrent measures of adaptive function such as work performance; however, relatively few studies have attempted to examine the predictive utility of cognitive performance on future vocational success.

Bellack et al. (1999) found that cognitive functioning was related to competitive employment among a group of psychiatric outpatients. Specifically, processing speed and social judgment were related to good vocational outcomes among a large community sample. Other studies have also found significant relationships among work outcomes and performance on neuropsychological tests. Results of these studies have determined that aspects of adaptive functioning are multi-determined and as such are necessarily associated with multiple domains of cognitive ability (Bryson et al., 1998; Velligan et al., 2000a).

McGurk and Meltzer (2000) have examined the relationship of both cognitive and clinical domains to vocational outcomes and have found that cognitive functioning was associated with employment status. Specifically, full-time employment was associated with better performance on measures of executive functioning, working memory, and vigilance, compared to unemployed participants. This study also found that poor premorbid function (as assessed by educational level), negative symptoms, and cognitive impairments were significantly related to employment success among people with schizophrenia. Gold et al. (2002) found that among clients enrolled in a vocational program who achieved employment, several different measures of cognitive performance were related to the total number of hours of employment. However, cognitive measures did not predict who would work at all. This study suggests that cognitive measures are most predictive of employment outcomes among those who are motivated enough to start a job.

A recent study by McGurk et al. (2003) suggests that the type of vocational interventions and supports that are given to clients influences the relationship between cognitive impairment and work outcomes. She found that individuals with cognitive impairments were capable of competitive employment, but that they required more intervention by the vocational staff than less impaired clients. Therefore, the relationship between cognitive function and measures of employment outcomes (e.g., attainment of a competitive job, hours worked, and job tenure) may be moderated by the level of support and other factors, such as employer accommodation of work limitations (McGurk et al., 2003). Other researchers have concluded that an effective goal of rehabilitation programs might best be directed toward teaching clients compensatory strategies for their cognitive deficits rather than trying to directly remediate these deficits (Velligan et al., 2000b).

Another type of vocational measure concerns actual behavior in the work place or observed in pre-vocational work settings (e.g., work quality and quantity, punctuality, dependability, cooperativeness, etc.). These measures of work performance may be more proximally related to cognitive status and be measured in non-paid work situations, rather than employment status measures (i.e., getting a job, hours worked, job tenure, etc.) that may be more dependent on external factors outside of the individual. For example, the benevolence of the employer, economic conditions, and work accommodations made at the job may determine employment status. Bell and Bryson (2001) found that neuropsychological performance was significantly associated with work performance and was moderately predictive of improvements in work performance for participants in a 6-month vocational rehabilitation program. Specifically, aspects of attention, executive functioning, and working memory were related to improvements in performance.
at work. In addition, clinical symptoms were not predictive of these improvements. A recent study by these researchers found that aspects of attention were related to initial improvements in work performance and learning, and memory was related to later improvements in work performance in this same 6-month rehabilitation program (Bryson and Bell, 2003). It may be that cognitive measures are more closely linked to actual performance on the job than to employment outcomes. Research has also shown that supervisor ratings of work performance are related to employment outcomes (Bond and Friedmeyer, 1987; Bryson et al., 1999).

The purpose of the present study is to examine the predictive ability of baseline neuropsychological performance and clinical symptoms on the vocational outcomes of a group of schizophrenia spectrum clients enrolled in vocational services who were participating in a longitudinal study comparing the effects of atypical neuroleptic medications with traditional medications. In addition, we examined both employment outcomes (e.g., hours worked) as well as research staff ratings of behaviors. We hypothesized that better clinical symptom control and neuropsychological performance at baseline would be correlated with and predictive of better vocational outcomes 4 months later.

2. Method

2.1. Subjects

The sample consisted of 112 clients recruited as part of a longitudinal study to examine the effects of atypical antipsychotic medications on vocational rehabilitation outcomes (Bond et al., in press). Inclusion criteria for the study were as follows: (1) diagnosis of schizophrenia spectrum disorders based on DSM-IV criteria and confirmed with the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I, Research Version); (2) stable phase of disorder as defined as having no hospitalizations, changes in housing, or changes in medication within the past month; (3) no diagnosis of mental retardation, neurological disorder, or insult to the brain that might affect their cognitive performance; (4) unemployed at time of program admission; (5) between the ages of 18 and 64; (6) expressed a goal of paid employment and currently prescribed an antipsychotic medication. On average, participants were 40 years old, had 12.6 years of education (range 6–20), had 7.0 lifetime psychiatric hospitalizations (S.D. = 10.7), and were ill for a mean of 16.5 years (S.D. = 10.4). Most participants were male (60.7%). The sample consisted of primarily African-American (44.0%) and Caucasian (52.0%) clients.

All clients were prescribed one or more antipsychotic medications, including 14.0% on a traditional antipsychotic and 54.2% were receiving an atypical neuroleptic and 31.8% receiving a combination. There were generally no associations between type of medication and any of the predictor or outcome measures, so medications were not used as a statistical control in the current study.

2.2. Procedures

Study participants were recruited from among new admissions to day programs at five sites of Thresholds in Chicago (N = 83), and four community mental health centers in Indianapolis (N = 29) from March 1999 to January 2001. Thresholds is a psychiatric rehabilitation agency providing intensive vocational services in a stepwise manner, including unpaid work crews, group and individual placements arranged between Thresholds and employers, enclaves, agency-run businesses, and independent jobs. This vocational model has been dubbed the “diversified placement approach” (DPA) (Koop et al., in press). The Indiana programs used an individual placement model of supported employment, although not strictly adhering to all the principles of evidence-based supported employment (Bond et al., 2001). A minority (N = 18) of study participants from Thresholds also received individual placement supported employment in lieu of the stepwise vocational services. Because of the differences in the program philosophies, the study sample was divided into two subsamples: DPA (N = 65) and supported employment (N = 47) for some analyses.

Clients giving informed consent were enrolled in the study within 120 days of admission to Thresholds or to the Indianapolis programs. Diagnosis was confirmed using either the Structured Clinical Interview for DSM-IV (SCID-I) (First et al., 1995) or the
computerized version of the Composite International Diagnostic Interview (CIDI-A) (World Health Organization, 1997a,b). Participants then completed a comprehensive evaluation that included an examination of clinical symptoms, neuropsychological performance, side effect rating scales, and ratings of vocational performance. For the current study, client vocational outcomes were examined 4 months after the initial baseline assessments. Interviewers completing the diagnostic assessments, clinical ratings, and neuropsychological assessments were trained and supervised by licensed clinical psychologists (JDE and PHL) familiar with the instruments.

2.3. Measures

Clinical ratings of symptoms: The Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987) is a 30-item rating scale completed by trained research staff. Scores for positive, negative, cognitive disorganization, emotional discomfort, and hostility/excitement symptoms were derived from factor-derived scoring published by Bell et al. (1994). Internal consistency ratings ranged from \( \alpha = 0.40 \) for hostility symptoms to 0.73 for negative symptoms. The PANSS total score \( \alpha = 0.79 \).

Neuropsychological evaluation: All participants completed a brief neuropsychological evaluation. The following is a listing of neuropsychological measures grouped by the cognitive domain that each is intended to measure.


Secondary verbal memory: CVLT short-delay free recall and long-delay free recall; percent retention – ((long-delay free recall raw score/Monday trial 5 raw score) \times 100).

Executive functioning: Wisconsin Card Sorting Test—perseverative responses, and categories correct (WCST; Heaton et al., 1993), and Part B of the Trailmaking Test (Reitan and Wolfson, 1993).

Short-term memory: WAIS-III Digit Span subtest (Wechsler, 1997).

Speed of information processing/psychomotor speed: WAIS-III Digit Symbol, WAIS-III Symbol Search subtests (Wechsler, 1997), and Part A of the Trailmaking Test (Reitan and Wolfson, 1993).

Raw scores of the neuropsychological tests were converted into age-corrected scaled scores with a mean of 10 and a standard deviation of 3 (WAIS-III scores) or demographically corrected \( T \)-scores with a mean of 50 and a standard deviation of 10 (CVLT, WCST, and Trailmaking test) scores (Heaton et al., 1993; Norman et al., 2000).

Work performance: The Work Behavior Inventory (WBI; Bryson et al., 1997) is a standardized work performance assessment instrument specifically designed for people with severe mental illness. The instrument is a 36-item inventory with five subscales and one global item: Cooperativeness, Work habits, Work quality, Social skills, and Personal presentation. Each scale comprises 7 items individually assessed on a 5-point scale where “1” represents “consistently inferior performance” and “5” represents “consistently superior performance.” The range for each subscale score ranges from 7 to 35. A total score is calculated as the sum of the five subscale scores (range of scores from 7 to 175). Participants in appropriate work settings were rated by a research assistant who was trained by one of the developers of this scale (PHL) and who followed the author’s ratings protocol, making direct observation of each client’s behavior at the work site and conducting a brief interview with their immediate supervisor. WBI ratings were completed on only those clients in employment and prevocational work settings in which a research assistant could directly observe work behavior. This requirement excluded some competitive jobs. The WBI ratings were limited to the Thresholds DPA sample. Mean substitution of the WBI scores were used for missing data points (less than 5% of all responses) in the following analyses. The WBI had excellent internal consistency in this sample (WBI total score \( \alpha = 0.97 \); Social skills \( \alpha = 0.89 \); Cooperativeness \( \alpha = 0.84 \); Work habits \( \alpha = 0.93 \); Work quality \( \alpha = 0.96 \); Personal presentation \( \alpha = 0.89 \)).

Employment outcome measures: Employment status at follow-up was coded according to a modified version of the Work Placement Scale (Meyer et al., 2002), consisting of a 5-point gradient: (5) integrated employment, which included both competitive employment (a regular community job, with non-disabled coworkers, paying minimum wage), and individual placement (agency-contracted community job), (4) group placement: paid community job at a
site working alongside other clients, or an agency-run business: paid work activity at a business owned and run by the rehabilitation agency, (3) sheltered workshop/volunteer work: paid work activity licensed by the Department of Labor and paid on a piece-rate basis, or unpaid work activity in a community employment site, (2) prevocational training: unpaid work training at the rehabilitation agency, and (1) unemployed: not engaged in any vocational activity. Higher scores reflect more independent employment activity. Other employment outcome measures included weeks worked, total hours worked, and total wages earned during follow-up.

2.4. Statistical methods

Prior to analyses, data were examined for normality and homogeneity of variance. The WBI outcome data met parametric assumptions. Violations of normality were noted in the PANSS negative, cognitive, and hostility factor scores, total wages earned, total hours and total weeks worked, as well as the WAIS-III digit symbol subtest scores indicating moderate positive skew in these variables. However, parametric tests have been shown to be robust to violations of non-normality; therefore, all analyses used parametric tests on untransformed variables (Linton and Gallo, 1975; Tabachnick and Fidell, 1996). Nevertheless, to confirm the robustness of the findings, we also conducted appropriate nonparametric tests (e.g., Spearman rank order correlations) and found a similar pattern of results. Employment status was examined through two dichotomies: integrated employment vs. other and supported employment (SE) vs. diversified placement (DPA). This was done due to the different emphasis placed on approaches to job placement in the two programs. We examined all of the predictor and outcome variables by program (supported employment vs. diversified placement), and conducted all of the hypothesized analyses by program type. T-tests were conducted to compare the baseline clinical and cognitive predictors of those achieving integrated vs. nonintegrated employment. In addition, a series of multivariate analyses of variance (MANOVAs) were run on the baseline demographic, clinical, and neuropsychological variables to determine if there were any differences by program type. In addition, Pearson product moment correlations between the dependent variables (objective vocational data and WBI scores) and the independent variables (clinical rating scales and neuropsychological scores) were computed for the two employment programs. Independent variables having significant or near-significant \( p < 0.2 \) correlations were entered into multiple regression analyses to determine if the relationships persisted after simultaneous adjustment (Dales and Ury, 1978). An alpha level of 0.05(two-tailed) was used to define significance for all analyses.

3. Results

3.1. Baseline characteristics

Among demographic variables, there were no significant differences between the two groups in terms of age, education, or duration of illness. Both groups were about 39 years of age, had been ill about 16 years, and completed about 12 years of school.

There were also no differences in clinical or neuropsychological variables between the Thresholds program and the Indiana programs at baseline (Table 1). The clinical ratings of illness at baseline suggest that the participants had mild levels of symptoms, as measured by the PANSS. In terms of cognitive performances at baseline, the sample was mildly to moderately impaired across the various domains, (i.e., \( T \)-scores < 40). Specific deficits were seen in verbal learning and memory performances on the CVLT. Speed of information processing was also moderately impaired compared to published normative data (Wechsler, 1997). There was a fair degree of variability in all symptom and cognitive measures within the population, providing good potential to detect how baseline differences might affect outcomes.

3.2. Vocational outcomes

Four months into the study, an examination of the WPS found that there were significant differences in work placements as a function of employment program. (See Table 2). The overall chi-square was significant for WPS placement by employment program \( \chi^2(4) = 37.4, p < 0.001 \). This is probably a consequence of the diversified placement approach
An examination by employment program found that integrated employment in the DPA programs was associated with better education (12.5 vs. 14.7, \( t(63) = -2.4, p = 0.02 \); lower hostility symptoms (1.36 vs. 1.0, \( t(55) = 6.3, p = 0.000 \)); better CVLT Monday total recall (28.8 vs. 35, \( t(63) = -1.89, p = 0.06 \)); better CVLT short-delay recall (32.7 vs. 44.0, \( t(63) = -3.39, p = 0.001 \)); and CVLT long-delay free recall (32.2 vs. 40.6, \( t(63) = -2.51, p = 0.015 \)). However, none of these differences were significant in the supported employment programs.

Work performance ratings were obtained for 49 (75.3%) of 65 clients who were receiving vocational services at 4 months in the DPA program (see Table 3). These 49 participants were in the following placements: 7 were in integrated placements, 15 were in group placements, and 27 were in sheltered workshops or prevocational programs at Thresholds. There were no significant differences in WBI performance as a function of work level. Furthermore, among these clients, their work performance on the job was found to be consistent with published norms (e.g., within 1 standard deviation) suggesting moderate to good work performance (Bryson et al., 1997).

3.3. Correlates of work performance

Given the differences in work level as a function of placement, we analyzed the correlates of performance by employment program. We first looked at three demographic variables. Of these variables, only the following reached significance. For those clients in supported employment, age was positively related to weeks worked (\( r=0.38 \)). For the diversified placement sample, duration of illness was negatively associated with total paid wages (\( r = -0.25, p = 0.051 \)).

<table>
<thead>
<tr>
<th>Table 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work placement scale scores by employment program</td>
</tr>
<tr>
<td>Vocational level</td>
</tr>
<tr>
<td>Integrated employment</td>
</tr>
<tr>
<td>Group placement</td>
</tr>
<tr>
<td>Sheltered workshops</td>
</tr>
<tr>
<td>Prevocational crews</td>
</tr>
<tr>
<td>Unemployed</td>
</tr>
</tbody>
</table>

SE = supported employment; DPA = diversified placement approach.
Pearson correlations between the 4-month employment outcomes and both the PANSS and neuropsychological scores are presented in Table 4. Altogether, 5 of a possible 42 correlations were statistically significant for the supported employment sample. There was a trend for hostility symptoms on the PANSS to be negatively associated with wages earned. In terms of neuropsychological variables, retention on the CVLT was positively associated with total hours worked, and there was a trend for long-delay free recall to be related to hours on the job, as well. There was also a modest trend of worse performance on digit symbol being negatively related to total weeks worked.

When examining the DPA group, however, a different pattern of results was seen. A total of 9 of a possible 42 correlations were statistically significant. Specifically, negative symptoms were inversely related to total wages earned and total hours worked for this group.

Table 3
WBI scores at 4 months

<table>
<thead>
<tr>
<th>WBI subscales</th>
<th>All clients (N=49)</th>
<th>Integrated employment (N=7)</th>
<th>Group placement (N=15)</th>
<th>Sheltered workshop (N=27)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(M ± S.D.)</td>
<td>(M ± S.D.)</td>
<td>(M ± S.D.)</td>
<td>(M ± S.D.)</td>
</tr>
<tr>
<td>Work habits</td>
<td>25.0 ± 6.7</td>
<td>25.9 ± 5.6</td>
<td>27.5 ± 4.9</td>
<td>23.3 ± 7.7</td>
</tr>
<tr>
<td>Personal presentation</td>
<td>25.7 ± 5.3</td>
<td>26.3 ± 2.2</td>
<td>26.7 ± 4.9</td>
<td>25.0 ± 6.0</td>
</tr>
<tr>
<td>Work quality</td>
<td>24.1 ± 6.5</td>
<td>23.9 ± 4.2</td>
<td>24.5 ± 5.8</td>
<td>23.9 ± 7.5</td>
</tr>
<tr>
<td>Social skills</td>
<td>21.6 ± 5.7</td>
<td>23.0 ± 4.4</td>
<td>22.7 ± 4.2</td>
<td>21.0 ± 6.5</td>
</tr>
<tr>
<td>Cooperativeness</td>
<td>24.8 ± 4.8</td>
<td>25.4 ± 3.2</td>
<td>25.3 ± 4.8</td>
<td>24.3 ± 5.5</td>
</tr>
<tr>
<td>WBI total score</td>
<td>121.2 ± 25.2</td>
<td>124.4 ± 17.1</td>
<td>126.7 ± 20.8</td>
<td>117.6 ± 29.6</td>
</tr>
</tbody>
</table>

WBI = Work Behavior Inventory.

* Range of subscales 7–35; higher scores = better performance.

Table 4
Correlations of 4-month work outcomes with baseline clinical and neuropsychological variables

<table>
<thead>
<tr>
<th></th>
<th>SE N=47</th>
<th>DPA N=65</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total weeks worked</td>
<td>Total wages earned</td>
<td>Total hours worked</td>
<td>Total weeks worked</td>
</tr>
<tr>
<td>PANSS subscales</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>-0.21</td>
<td>-0.17</td>
<td>-0.12</td>
<td>-0.10</td>
</tr>
<tr>
<td>Negative</td>
<td>0.43**</td>
<td>0.16</td>
<td>0.09</td>
<td>-0.24*</td>
</tr>
<tr>
<td>Cognitive</td>
<td>0.05</td>
<td>-0.07</td>
<td>-0.16</td>
<td>-0.09</td>
</tr>
<tr>
<td>Emotional</td>
<td>-0.18</td>
<td>-0.18</td>
<td>0.03</td>
<td>-0.11</td>
</tr>
<tr>
<td>Hostility</td>
<td>-0.21</td>
<td>-0.28*</td>
<td>-0.23</td>
<td>-0.20</td>
</tr>
<tr>
<td>PANSS total</td>
<td>-0.01</td>
<td>-0.15</td>
<td>-0.10</td>
<td>-0.21</td>
</tr>
<tr>
<td>List A total T-score</td>
<td>0.11</td>
<td>-0.12</td>
<td>0.10</td>
<td>0.27*</td>
</tr>
<tr>
<td>Short-delay free T-score</td>
<td>-0.06</td>
<td>-0.05</td>
<td>0.10</td>
<td>0.24*</td>
</tr>
<tr>
<td>Long-delay free T-score</td>
<td>0.04</td>
<td>-0.10</td>
<td>0.28*</td>
<td>0.17</td>
</tr>
<tr>
<td>CVLT % retention score</td>
<td>0.09</td>
<td>0.25</td>
<td>0.30*</td>
<td>0.03</td>
</tr>
<tr>
<td>WCST T-score</td>
<td>0.04</td>
<td>0.13</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>WCST categories</td>
<td>0.04</td>
<td>0.22</td>
<td>0.04</td>
<td>0.19</td>
</tr>
<tr>
<td>Trails A T-score</td>
<td>-0.21</td>
<td>-0.06</td>
<td>0.11</td>
<td>0.04</td>
</tr>
<tr>
<td>Trails B T-score</td>
<td>-0.06</td>
<td>0.08</td>
<td>0.12</td>
<td>0.19</td>
</tr>
<tr>
<td>Symbol search (SS)</td>
<td>-0.19</td>
<td>-0.08</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>Digit symbol (SS)</td>
<td>-0.30*</td>
<td>-0.17</td>
<td>-0.04</td>
<td>0.12</td>
</tr>
<tr>
<td>Digit span (SS)</td>
<td>0.05</td>
<td>0.07</td>
<td>0.05</td>
<td>-0.04</td>
</tr>
</tbody>
</table>

SE = supported employment; DPA = diversified placement approach; PANSS = Positive and Negative Syndrome Scale; CVLT = California Verbal Learning Test; WCST = Wisconsin Card Sorting Test; SS = age-corrected scaled scores.

* p < 0.05.

** p < 0.01.

* trend p ≤ 0.06.
There was also a trend for more negative symptoms to be associated with fewer weeks on the job. In addition, the PANSS total score was associated with total wages earned. In terms of cognitive performance, both learning and short-delay free recall on the CVLT were significantly related to total weeks worked. There was also evidence for both of these measures to be related to total hours on the job as well.

Within the DPA sample, the correlations of both clinical symptom scores and neuropsychological variables with the WBI subscales are presented in Table 5. The cognitive subscale of the PANSS was significantly related to the social skills, cooperativeness, and work quality subscales of the WBI, as well as the WBI total score. In addition, perseverative responses, learning and memory, and speed of information processing were related to performance on the WBI (see Table 5). The WBI scores at 4 months were not related to hours, weeks, or wages earned in this sample.

### 3.4. Prediction of WBI scores and occupational status

In order to determine the relative importance of the clinical and neuropsychological variables, we conducted a multiple regression analysis with the total WBI score as the dependent variable (see Table 6). We used a stepwise analysis with the following variables as predictors in the analysis: PANSS cognitive and negative subscale scores, learning and memory variables (Monday total T-score, both short-delay and long-delay free recall T-scores; % retention), perseverative responses, learning and memory, and speed of information processing were related to performance on the WBI (see Table 5). The WBI scores at 4 months were not related to hours, weeks, or wages earned in this sample.

#### Table 6

Prediction of WBI total score at 4 months

<table>
<thead>
<tr>
<th>Variables to enter</th>
<th>Beta</th>
<th>Step 2 beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVLT long-delay T score</td>
<td>0.36*</td>
<td>0.37*</td>
</tr>
<tr>
<td>PANSS cognitive score</td>
<td>-0.35*</td>
<td>-0.35*</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.132</td>
<td>0.257</td>
</tr>
<tr>
<td>$R^2$ change</td>
<td>0.125</td>
<td>0.125</td>
</tr>
<tr>
<td>$F$(1,42)</td>
<td>6.39*</td>
<td>7.09**</td>
</tr>
<tr>
<td>$F$(2,41)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WBI = Work Behavior Inventory; PANSS = Positive and Negative Syndrome Scale; CVLT = California Verbal Learning Test; WCST = Wisconsin Card Sorting Test; SS = age-corrected scaled scores.

* $p<0.05$.
** $p<0.01$.  

*non significant trend, $p$-value = 0.054.
responses from the WCST, and a composite processing speed variable (mean of WAIS Digit Symbol, Symbol Search, and Trails A scores). This found a significant model ($F(2,41)=7.09, p=0.002$), accounting for 22% of the variance, with the cognitive subscale of the PANSS and the CVLT long-delay free recall score as the only significant predictors of WBI total score performance 4 months later. We then ran stepwise analyses using the CVLT variables, the processing speed composite score and PANSS cognitive subscales as predictors in each of the WBI subscales.

In the stepwise analyses, significant results were seen in the WBI work quality, social skills, work habits, and cooperativeness subscales. The multiple $R$s ranged from 0.44 (work habits) to 0.53 (cooperativeness) accounting for 18–25% of the variance in these functional parameters. Examination of the individual weights among tests suggested differential contributions of cognitive abilities and clinical symptoms in each of these domains. Specifically, both PANSS cognitive disorganization symptoms and long-delayed recall predicted uncooperativeness and poor work quality. PANSS cognitive disorganization symptoms were the only significant predictor of poor social skills and poor work habits.

Given these findings, we next tried to predict employment outcomes using significant baseline demographic, clinical, and neuropsychological variables. We used the integrated vs. nonintegrated employment categories and ran a logistic regression analysis to predict group membership ($N=96$). We entered predictors in blocks, with age, duration of illness, education, and gender entered first, followed by PANSS negative and cognitive symptoms in the second block, and finally the CVLT measures, processing speed composite score, and WCST perseverative response $T$-score. The overall model was significant ($\chi^2=23.7, p=0.014$), and the significant predictors in the final equation included education ($Wald=5.44, df=1, p=0.020$), the learning index (Monday total trials 1–5 $T$-score) from the CVLT ($Wald=5.32, df=1, p=0.021$), and CVLT long-delay free recall ($Wald=4.60, df=1, p=0.032$). However, the improvement in classification rate was modest (from 80.2% at step 1 to 81.3% at step 3). None of the clinical symptoms as assessed by the PANSS were significant in the model.

4. Discussion

The results of the present study found modest evidence for the relationship of better neuropsychological performance being predictive of vocational outcomes among clients with schizophrenia receiving comprehensive vocational rehabilitation services. We found that among aspects of work behavior, verbal learning and memory performance, speed of information processing, executive functioning, and cognitive disorganization symptoms were predictive of better employment outcomes. In addition, better learning and memory performances were predictive of objective measures of work status, namely, integrated vs. nonintegrated employment. Furthermore, among both programs, aspects of learning and memory were associated with hours, weeks, and wages earned. The most interesting finding, however, was that these relationships were more prominent in the diversified placement approach than compared to the supported employment program.

We found a significant difference in baseline neuropsychological performance on the CVLT as a function of work outcome. Those people who achieved employment in integrated placements had performed slightly better on this measure of cognitive performance than those who were not in integrated settings. However, we did not find any other significant differences in baseline clinical or neuropsychological domains as a function of employment status. This is consistent with the pattern of findings in two recent studies involving clients enrolled in vocational programs (Gold et al., 2002; McGurk et al., 2003). We speculate that clients in the current study benefited from the structure and support of the vocational services to the extent that they were successful in starting some form of paid employment despite their level of cognitive impairment, but their actual performance on the job was more directly affected by cognitive impairments.

The only relationships between the neuropsychological measures and employment outcome were seen in the domains of learning and memory, processing speed, and executive function. Other studies have found that multiple aspects of cognition were related to improvements in work behaviors (Bell and Bryson, 2001; Brekke et al., 1997; Green and Nuechterlein, 1999; McGurk et al., 2003). Specifically, much of the
prior work found a relationship of executive functioning and verbal learning and memory to aspects of vocational outcome (McGurk, 2000; McGurk et al., 2003).

In terms of clinical correlates of vocational outcome, negative symptoms were related to total weeks worked, total hours, and total wages earned, and hostility symptoms were modestly related to total wages earned. This is consistent with previous work (McGurk and Meltzer, 2000). However, we did not find that cognitive disorganization symptoms were related to other measures of vocational status. Furthermore, none of these clinical symptoms were predictive of integrated employment status 4 months later. This lack of a relationship was also seen in the Bryson and Bell (2003) study.

Although the relationship of clinical and neuropsychological variables to employment status was modest, some relationships with work performance were strong. We found that better verbal memory, improved executive functioning, processing speed, and less cognitive disorganization symptoms predicted aspects of behaviors on the job. Other studies have also found that neuropsychological performance was predictive of these work behaviors (Bell and Bryson, 2001; Bryson and Bell, 2003; Green et al., 2000; Lysaker et al., 1995a).

The present findings suggest that cognitive abilities may be important to employment outcomes. In addition, the compensatory nature of the vocational rehabilitation program may lessen or ameliorate the negative impact of the cognitive deficits seen in schizophrenia. It may be that once an individual obtains a vocational placement, aspects of work behavior determine job tenure and maintenance. Another study found that the WBI was predictive of total hours worked on the job 6 months after leaving a vocational rehabilitation program (Bryson et al., 1999). This suggests that the cognitive impairments have their greatest impact on these work behaviors, not on work status (Bryson and Bell, 2003; Gold et al., 2002).

There are several limitations to the current study that should be addressed. First, although this is a predictive study, the length of follow-up is only 4 months. Thus, the chance to secure employment was limited by setting issues and speed of placement. It should be noted, however, that 66% of the sample were engaged in some form of work activity, and at 4 months, 37% were in fact, in paid employment settings. A second limitation is the problem of alpha inflation and spurious correlation as a result of the large number of correlations. A third limitation is the restriction of range in symptoms, making it difficult to find significant correlations between PANSS scores and vocational outcomes. The study sample is representative, however, of many stable, outpatient clients living in the community.

In conclusion, this study found modest support for a link between cognitive functioning and vocational outcomes. This link was strongest between the more proximal measures of work performance and barely present when examining the correlations with employment outcomes. Vocational services seem best equipped to help people get jobs, but do not necessarily help clients in the performance of their duties on the jobs. Therefore, these programs may not always succeed in helping clients maintain paid jobs once they have obtained them. Consequently, for clients with schizophrenia to succeed in the vocational sphere, both elements are necessary: professional support to find the jobs and the appropriate work behaviors and skills necessary to maintain a competitive level of employment.

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