A Comparison of the Allen Cognitive Level Test and the Wisconsin Card Sorting Test in Adults With Schizophrenia

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Objective. This study examines the relationship among executive function, visuospatial problem solving, and measures of occupational functioning in 33 adult men with schizophrenia or schizoaffective disorder.

Method. Three measures were administered in a one-time assessment session. The Wisconsin Card Sorting Test (WCST) was used to measure executive functioning, abstract reasoning, and problem-solving abilities. The Allen Cognitive Level (ACL) Test was used to measure learning, problem solving, and visuospatial abilities. The Routine Task Inventory (RTI) measured the level of performance in activities of daily living.

Results. Using multiple regression controlling for age, the WCST significantly predicted performance on the ACL and the RTI. Perseverative errors on the WCST were negatively correlated with the ACL ($r = -0.47$) and RTI scores ($r = -0.59$). The ACL and RTI were also significantly correlated ($r = 0.67$).

Conclusion. Both the WCST and the ACL are sensitive to similar domains of functioning and are predictive of task performance. The results support the use of the ACL as a quick measure of a person’s cognitive and functional abilities.


Schizophrenia is a severe and persistent psychiatric disorder characterized by abnormalities in perception, delusional ideation, and disruption in affective, cognitive, and social domains (Goldman, Axelrod, & Taylor, 1996) and is associated with major cognitive impairments (Capleton, 1996; Cutting, 1985; Goldberg et al., 1993). Although several neurocognitive domains have been implicated, attention, memory, and executive function have consistently been found to be impaired in schizophrenia (Goldman et al., 1996; Tollefson, 1996). Cognitive impairment is found not only during acute exacerbations of the illness, but also during times of stabilization (Spohn & Straus, 1989). Treatment-naive patients with schizophrenia also demonstrate a pattern of generalized neuropsychological impairment (Saykin et al., 1994). Thus, cognitive impairment is related to the disease process itself and is not simply a product of active psychotic symptoms, neuroleptic medications, or duration of illness.

Chronic schizophrenia often results in severe functional impairment. Persons with schizophrenia typically lack the skills to take care of their basic needs for food, shelter, and independent self-care (McCreadie, 1982; Owens & Johnstone, 1980) and frequently have vocational impairments (Spaniol & Zipple, 1988; Spivak, Siegel, Sklaver, Deuschle, & Garrett, 1982). It has become increasingly
apparent that symptomology alone, particularly regarding positive symptoms, is not directly related to functional deficits (Anthony & Jansen, 1984; Jonsson & Nyman, 1991; Perlick, Mattis, Stastny, & Teresi, 1992). In a review article in which he examined the relationship between neurocognition and functional outcome, Green (1996) found that measures of verbal memory and executive functioning predicted community functioning. Surprisingly, Green found that psychotic symptoms were not significantly related to outcome. Several prospective studies have found a relationship between community functioning and neurocognition, particularly secondary verbal memory and executive functioning (Buchanan, Holstein, & Breier, 1994; Jaeger & Douglas, 1992; Johnstone, Macmillan, Frith, Benn, & Crow, 1990; Lysaker, Bell, & Beam-Goulet, 1995; Wykes, Sturt, & Katz, 1990).

Treatment of persons with schizophrenia requires the use of therapies and techniques from many disciplines to address different aspects of the disease. Although patients once had several treatment plans, each one discipline specific, providers now tend to collaborate with one another. A continuing problem is a lack of understanding of the tools and assessments used by other disciplines. In particular, it is still unclear how specific neuropsychological functions relate to occupational measurements of vocation and rehabilitative potential. This knowledge may improve treatment planning and outcomes.

The purpose of this study was to examine the relationship between two measures of problem solving used by different disciplines when assessing persons with schizophrenia: the Wisconsin Card Sorting Test (WCST; Heaton, Chelane, Talley, Kay, & Cartiss, 1993) commonly used by neuropsychologists, and the Allen Cognitive Level (ACL) Test (Allen, 1985) used by occupational therapists. We hypothesized that the WCST and the ACL would be significantly correlated and that both measures of cognition would be associated with ability to perform activities of daily living (ADL), as measured by the Routine Task Inventory (RTI; Allen, Heimann, & Yerxa, 1989). Furthermore, we hypothesized that these tests would correlate with vocational functioning as measured by the number of hours worked per week.

Method

Participants

Participants were 31 male veterans with schizophrenia and 2 male veterans with schizoaffective disorder who were assessed as part of clinical treatment. All were outpatients involved in treatment activities at a Veterans Administration (VA) Medical Center. The ages ranged from 27 to 71 years ($M = 47.94$ years). Years of education ranged from 11 to 16 ($M = 12.18$ years). Living situations were as follows: 6 participants lived independently, 6 lived with a family member who provided some caregiving services, 20 lived in group or boarding homes, and 1 was living in a domiciliary (homeless) treatment program housing on VA grounds. Sixteen of the participants were not involved in work activities; 1 participant did occasional “odd job”; and the remaining 16 were involved in a therapeutic sheltered work program at the hospital. The average number of hours worked per week was 13.

Instruments

The Allen Cognitive Level Test. The ACL is commonly used by occupational therapists to provide a quick estimate of the capacity to learn and the level of assistance required to perform both routine and novel tasks (Allen, 1985; David & Riley, 1990). The ACL consists of a leather-lacing task in which the person is asked to replicate three different stitches. The latest version of the test yields a single ordinal score ranging from 3.0 to 5.8, which reflects the severity of a person’s disability (Allen, 1990). Earlier versions of the ACL demonstrated excellent interrater reliability, with correlation coefficients ranging from .90 to .99 (Allen, Earhart, & Blue, 1992; Moore, 1978). Several studies have found the ACL to be related to community functioning and ADL (Keller & Hayes, 1998; Velligan, True, Lefton, & Moore, 1995). Previous versions of the ACL have been found to correlate with other measures of cognitive functioning (David & Riley, 1990), social skills (Penny, Mueser, & North, 1995), and symptomology (Moore, 1978) and to discriminate between persons with and persons without psychiatric disorders (Katz, Josman, & Steinmetz, 1988). In addition, the ACL has been significantly related to discharge living situation (Henry, Moore, Quinlivan, & Triggs, 1998) and productive activity in the community (Velligan, Bow-Thomas, Mahurin, Miller, & Halgunseth, 1998).

The Wisconsin Card Sorting Test. The WCST is commonly used by neuropsychologists to assess executive function. This test was designed as a measure of problem solving, abstract thinking, and mental shift in set and is specifically sensitive to frontal lobe brain lesions (Heaton et al., 1993; Milner, 1963). The test requires a person to match up to 128 cards to one of four key cards with varying design and color. Each time, the examiner indicates whether the response is correct or incorrect but does not reveal the intended sorting principle. The examiner varies the sorting principle from color, form, and number. Perseveration on this task refers to an inability to shift set to the correct sorting principle on the basis of feedback from the examiner. A category is successfully completed when a person makes 10 consecutive correct responses. A lower number of perseverative errors and a higher number of categories completed indicate better performance on this measure. Interscorer agreement was found to be excellent for this test, with an intraclass correlation coefficient of .92 for perseverative errors. Consistency of scorers
was also found to be excellent, with an intraclass correlation coefficient of .94 for perseverative errors (Axelrod & Henry, 1992).

Persons with schizophrenia typically perform poorly on the WCST, making an increased number of perseverative errors and completing fewer categories (Abbruzzese, Ferri, & Scarone, 1997; Dieci et al., 1997; Stratta et al., 1997; Van der Does & Van den Bosch, 1992). The WCST has been correlated with task orientation at work, which suggests that it may provide valuable vocational information (Lysaker et al., 1995). The WCST has also been found to predict community functioning in adults with schizophrenia (Goldman et al., 1996; Green, 1996; Jaeger & Douglas, 1992; Johnstone et al., 1990; Lysaker et al., 1995; Wykes et al., 1990).

Routine Task Inventory. The RTI is another occupational therapy measure that describes the impact of neurological and psychiatric disorders on the performance of daily activities. Using direct observation of task performance, interviews with caregivers, and client self-report, information is gathered about a person’s current level of functioning in daily living skills, such as grooming, dressing, bathing, cooking, shopping, taking medications, housekeeping, laundry, money management, and transportation. Task performance is grouped into four scales: self-awareness, situational awareness, occupational role, and social role (Allen et al., 1992). The RTI not only scores whether an activity can be done, but also describes the process and quality of task performance. The RTI has been correlated with the ACL and Mini-Mental Status Exam (Wilson, Allen, McCormack, & Burton, 1989). The reliability of the RTI was supported by excellent interrater reliability coefficients ($r = .987$), test–retest reliability ($r = .906$), and an alpha coefficient of .9402, suggesting an internally consistent instrument (Heimann, et al., 1989). Although reliability and validity appear strong, this measure is limited because of its infrequent use in the research literature.

Work status. Work status was recorded as currently working or not working. Also recorded were the number of hours worked per week and whether this work activity was in supportive or competitive employment.

Procedure
The RTI, the ACL, and the WCST were administered in a one-time assessment as part of a functional evaluation. An occupational therapist, trained and annually certified reliable through peer review, administered the ACL and RTI and collected data on employment status. The WCST was administered by a postdoctoral fellow in psychology trained in psychometric testing and experienced in the administration, scoring, and interpretation of this instrument. Thus, one clinician administered the ACL and RTI, and a separate clinician administered the WCST. Clinicians were blind to each other’s ratings of participants until the assessments were completed.

Results
Multiple regression analyses and controlling for age found that the WCST predicted scores on the ACL and the RTI in both the number of perseverative errors made and number of categories completed (see Table 1) with Pearson correlations coefficients, the ACL was found to be significantly positively correlated with the RTI, positively correlated with categories completed on the WCST, and negatively correlated with perseverative errors on the WCST. The RTI also was significantly positively correlated with categories completed on the WCST and negatively correlated with perseverative errors on the WCST (see Table 2). Number of hours worked per week did not correlate with the ACL, WCST, or RTI.

Discussion
The significant correlation found between the ACL and the WCST suggests that these two measures assess cognitive functioning in a similar manner and that the ACL has a similar ability as the WCST to measure executive functioning. An alternative explanation of these findings is that the ACL, and the WCST may be measuring cognitive dysfunction in different but related domains. Schizophrenia may result in diffuse cognitive impairments that are reflected in both measures.

Both the ACL and the WCST were also significantly correlated with community functioning as measured by the RTI. Because the RTI shares a common theoretical base with the ACL, and both tests are designed to measure and predict task performance, this finding is not surprising. More interesting is the finding that the RTI correlated with both perseverative errors and categories completed on the WCST, suggesting that the WCST is indicative of overall functional abilities. These results indicate that both the WCST and the ACL are predictive of community functioning in outpatients with chronic schizophrenia. Either the WCST or the ACL, therefore, could be useful for planning treatment interventions to address ADL and for evaluating the level of assistance that may be helpful for a person with schizophrenia living in the community.

The findings that neither the ACL nor the WCST were correlated with number of hours worked per week is consistent with previous studies that also did not show a rela-

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Multiple Regression Analyses</th>
</tr>
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<tbody>
<tr>
<td>DV</td>
<td>Variable</td>
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<tr>
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<td>ACL Age</td>
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<tr>
<td>ACL Cat</td>
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<tr>
<td>RTI Age</td>
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<tr>
<td>RTI Persev</td>
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<tr>
<td>RTI Age</td>
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<tr>
<td>RTI Cat</td>
<td>20.40</td>
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</tbody>
</table>

Note. DV = dependent variable; ACL = Allen Cognitive Level Test; RTI = Routine Task Inventory; Persev = number of perseverative errors on the Wisconsin Card Sorting Test; Cat = number of categories obtained on the Wisconsin Card Sorting Test; ns = not significant.
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Table 2: Correlation Matrix

<table>
<thead>
<tr>
<th>Variables</th>
<th>ACL</th>
<th>RTI</th>
<th>Persev</th>
<th>Cat</th>
<th>Work</th>
</tr>
</thead>
<tbody>
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<td>1. ACL</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. RTI</td>
<td>.6*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Persev</td>
<td>.5*</td>
<td>.6*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Cat</td>
<td>.7*</td>
<td>.6*</td>
<td>.73*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Work</td>
<td>.21</td>
<td>.08</td>
<td>.19</td>
<td>.05</td>
<td></td>
</tr>
</tbody>
</table>

Note. ACL = Allen Cognitive Level Test; RTI = Routine Task Inventory; Persev = number of perseverative errors on the Wisconsin Card Sorting Test (lower number of perseverative errors indicate better performance); Cat = number of categories obtained on the Wisconsin Card Sorting Test (higher number of categories obtained indicate better performance); Work = number of hours worked per week.

*p < .01.

This lack of correlation may reflect the fact that many different factors contribute to vocational engagement, including motivation, opportunity, interests, values, and manifestations of the psychiatric disability. At the time of this study, our VA hospital had experienced a decrease in vocational staff and supportive employment opportunities that resulted in a lack of opportunity for supportive employment positions, even for persons wanting to work. The participants also had chronic and persistent illnesses that made them inappropriate for independent competitive employment. Finally, most of the participants were also receiving financial compensation for their disability, possibly decreasing motivation to work. Existing assessments for evaluating employability may be more appropriate for gathering information about cognition and employment status. Future studies exploring the relationship between cognition and work status should include a subgroup of persons with schizophrenia who have obtained competitive employment.

Limitations

Participants represented an older population with a chronic condition of schizophrenia, making generalization to younger persons with first episodes of schizophrenia inappropriate. In addition, because all participants were men, our findings cannot be generalized to women with schizophrenia. This study needs to be replicated, possibly using a larger sample size and a more heterogeneous group of participants to further explore the relationship between the ACL and the WCST in the context of cognitive abilities and community functioning.

Conclusion

The results of this study suggest that the ACL, WCST, and the RTI are correlated. Clinicians from different educational and theoretical backgrounds may be able to use information gained by other disciplines to aid in their understanding and treatment of persons with chronic schizophrenia. Additionally, in a resource-conscious environment, duplication of all three of these assessments may not be necessary. Because the ACL takes the least time to administer, this one test may be a good choice when time and resources are limited. Although the ACL and WCST appear to indicate performance in activities of daily life, they do not predict vocational status. More specialized assessments are needed to assess employment. ▲

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References


