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Journal of the American Psychiatric Nurses Association 2007 13: 93

DOI: 10.1177/1078390307303111

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Self-report of Cognitive Functioning and Learning in Schizophrenia

Danelle L. Hake, Edna Hamera, and Melisa Rempfer

BACKGROUND: A method to assess cognitive functioning in clinical settings is needed so clinicians can modify teaching strategies to match clients' cognitive abilities. **OBJECTIVE:** The purpose of the study was to explore the relationship between executive functioning and self-report of cognitive limitations in people with schizophrenia. **DESIGN:** The Wisconsin Card Sorting Test, which assesses learning potential (a person's ability to improve performance after coaching), and the Subjective Scale to Investigate Cognition in Schizophrenia were administered to 20 individuals. **RESULTS:** Analysis showed that participants who performed well and those who improved with coaching reported fewer subjective cognitive complaints than those who did not improve with coaching. **CONCLUSIONS:** In this sample subjective report of executive cognitive functioning appears to differentiate individuals who have difficulty learning complex information, and therefore, it may be clinically useful in identifying individuals needing only minimal skill training. *J Am Psychiatr Nurses Assoc*, 2007; 13(2), 93-100. DOI: 10.1177/1078390307303111

Keywords: schizophrenia; learning potential; self-report of cognitive functioning

An increasing body of research has developed that indicates that cognitive deficits, more than psychotic symptoms, account for problems in daily living and integration into the community for individuals with schizophrenia (Green, Kern, Braff, & Mintz, 2000). Additionally, recent innovations in psychopharmacology and psychosocial interventions designed to improve cognition have led the National Institute of Mental Health (NIMH) to call for increased research on more accurate measurements of cognition in schizophrenia (Buchanan et al., 2005).

Cognition is typically assessed using neuropsychological tests that objectively measure domains such as memory, attention, and executive functioning. Whereas traditional neuropsychological assessment emphasizes measurement and normative comparisons, there is an increasing emphasis on moving

beyond merely documenting the presence of cognitive dysfunction to gain an understanding of real-world functioning (Groth-Marnat, 2000). A related limitation of traditional cognitive testing is that it provides only a snapshot of functioning, and thus, it assumes cognitive ability is static and unchanging.

An alternative method of assessing cognitive functioning is dynamic assessment of learning potential, which has emerged recently in the psychiatric literature (Wiedl, 1999). Dynamic assessment uses cognitive measures to assess how much individuals are able to learn with minimal coaching. In contrast to static assessment of cognition, this approach may be a more promising measure because it more closely mirrors how functioning in everyday life requires continual adaptation and learning. An example of this is asking the bus driver where to get off to connect with another bus line after missing your stop.

Another approach to assessing cognitive functioning uses subjective methods such as interview and self-report, which are more practical in clinical settings. Although the validity of these methods has been questioned, one measure in which individuals are asked to rate their ability to carry out cognitive tests in everyday situations shows moderate correlations with objective cognitive tests (Stip, Caron, Renaud, Pampoulova, & Lecomte, 2003). The present study examines the relationship between a dynamic

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Research for this work was done as an honors project for Danelle Hake's completion of the Honors Program at the University of Kansas School of Nursing.

test of executive functioning and self-report of cognitive limitations in people with schizophrenia.

LITERATURE REVIEW

Cognitive Deficits in People With Schizophrenia

Cognition, the mental process of knowing, is made up of several functional domains including memory, attention, perception, abstraction, and problem solving (e.g., Groth-Marnat, 2000; Lezak, 1995). Impairment in cognition is a key feature of schizophrenia, and cognitive deficits contribute to functional impairment in people with schizophrenia (e.g., Green, 1996). One area of impaired cognition includes generalized deficits and lowered full-scale IQ, related to a reduced capacity for information processing (Lewis, 2004). The other area includes disproportionately greater deficits in attention and sustained attention and vigilance, memory, and executive functioning (Lewis, 2004). Executive functioning is the ability to absorb and interpret information and make decisions based on that information. Although cognition appears to remain relatively stable as a patient ages and the illness progresses, some aspects of cognition are more stable than others. The most stable deficits include verbal skills (word meaning, word association, verbal fluency), memory (long- and short-term, spatial, and visual), and preattentive information processing. Less stability has been found in complex attention and concentration, set-response shift, and attention span (Rund, 1998).

Deficits in vigilance (the ability to fix and maintain attention) affect memory and the ability to learn. These problems are most strongly associated with difficulty acquiring daily life skills such as personal care and employment that are essential for people's community integration and well-being (Green et al., 2000).

Cognitive impairment in schizophrenia occurs across a continuum of neurocognitive function. At the mild end, a patient's neurocognitive function is relative to his or her own potential and may overlap with levels of function obtained by many healthy individuals. At the severe end, a patient may have cognitive and neurological abnormalities that are completely distinguished from individuals without a diagnosed mental disorder (Heinrichs & Zakzanis, 1998).

Measurement of Cognitive Deficits

Standard clinical neuropsychological measures were developed to distinguish individuals with

impaired abilities (e.g., Groth-Marnat, 2000). Research on the cognitive functioning of people with schizophrenia has primarily focused on cross-sectional evaluation of static cognitive abilities (Rempfer, Hamera, Brown, & Bothwell, 2006; Wiedl, 1999). This research documents that persons with schizophrenia have difficulties in a variety of cognitive domains when compared to control participants (e.g., Fioravanti, Carlone, Vitale, Cinti, & Clare, 2005). However, it is also true that there is much variability in cognitive functioning among persons with schizophrenia. Not all individuals with schizophrenia demonstrate cognitive impairments, and there is no specific pattern of performance even among those with cognitive impairments (e.g., Palmer et al., 1997; Wykes, Reeder, Corner, Williams, & Everitt, 1999). Furthermore, although research confirms that cognition is related to functional outcome, little is known about the nature of this relationship (e.g., Green, 1996; Green et al., 2000; Velligan, Bow-Thomas, Mahurin, Miller, & Halgunseth, 2000).

Neurocognitive constructs consistently related to functional outcome include secondary and immediate memory, vigilance, executive functioning, verbal fluency, early visual processing, and psychomotor skills. Outcomes relevant to schizophrenia include success in psychosocial rehabilitation programs, social problem solving measured by laboratory assessment or analog measures of instrumental skills, and behavior in community outcome and activities of daily living (Green et al., 2000).

Dynamic Assessment of Learning Potential

Dynamic assessment is a developing body of research and requires feedback between the examiner and the test taker with repeated assessments. Karl Wiedl (1999) and his colleagues developed a dynamic approach using cognitive measures to assess learning capacity. The Wisconsin Card Sorting Test (WCST), a test of concept formation related to frontal-lobe functioning that categorizes individuals in terms of learning capacity, was used. Wiedl found that people with schizophrenia could be classified into three groups according to their modifiability in concept formation: high scorers, learners, and nonlearners. High scorers start out performing well and continue to perform well after instruction. Learners start out performing poorly and improve after instruction. Nonlearners start out performing poorly and continue to perform poorly after instruction. With this learning-potential-assessment approach, the modifiability of cognitive functions can be assessed

(Wiedl, 1999). Recent studies have shown that learning potential may be associated with specific cognitive abilities such as attention and memory. Wiedl, Wienobst, Schöttke, Green, and Nuechterlein (2001) found that sustained attention distinguished high scorers from nonlearners, whereas learners had intermediate sustained-attention scores. Learning potential has also been related to verbal and working memory (Rempfer et al., 2006; Wiedl, Schöttke, Green, & Nuechterlein, 2004). Other recent research has shown that learning potential is related to work skills (Sergi, Kern, Mintz, & Green, 2005) and rehabilitation readiness (Fiszdon et al., 2006). Although few studies have applied dynamic assessment to studying schizophrenia, emerging research has shown its promise, and Green and colleagues (2000) have argued for the need to understand the role of learning potential in functional outcomes.

Subjective Cognitive Complaints in People With Schizophrenia

The sole reliance on performance measures to assess cognitive functioning has been challenged (Keefe, Poe, Walker, Kang, & Harvey, 2006; Yon & Laos, 2000). Self-interview, informant interview, and self-report can provide evidence of the relationship of cognition with real-world functioning. Whereas Medalia and Lim (2004) found poor concordance between self-report of cognition, clinician report, and neuropsychological assessment of cognition, Keefe and colleagues (2006) found that interview-based ratings of clients by informants were correlated with ratings of real-world functioning and a composite score from a battery of performance measures. Medalia and Lim (2004) and Keefe and colleagues (2006) noted that the accuracy of self-report may be better with questions that are tied to more specific problems.

Measurement of Subjective Cognitive Complaints

Several tools and scales have been developed to measure the subjective experiences of people with schizophrenia. The Frankfurt Complaint Questionnaire, originally a German scale to assess subjective experience of cognitive dysfunction, has been translated into several languages and is widely used in Europe (Loas, Yon, & Brien, 2002). Other instruments have included items that assess subjective cognitive experiences along with other subjective experiences. Six of 21 items in Liddle and Barnes' article "The Subjective Experience of Deficits in

Schizophrenia" (1988) focus on cognitive symptoms such as slowed thinking. More recently, Medalia and Lim (2004) compared a Web-based screening tool of self-report of attention and memory between individuals with schizophrenia and clinicians' ratings and found low but significant correlations between client self-ratings and performance on an objective cognitive test and poor correlations between clients' and clinicians' classifications of clients' memory and attention. The small number of cognitive self-report items in this study did not adequately address the accuracy of self-report.

A more recently developed scale, the Subjective Scale to Investigate Cognition in Schizophrenia (SSTICS; Stip et al., 2003), is a 21-item cognitive-complaints questionnaire that imbeds the items within the context of daily events. This approach may facilitate more accurate responses because respondents can link problems with difficulties they encounter in daily experiences. Using this measure, Stip and colleagues (2003) found a significant correlation between results of the SSTICS and objective data concerning memory and attention, indicating that subjective complaints of patients in those areas do correspond to cognitive deficits.

A new interview-based assessment of cognitive function, the Schizophrenia Cognition Rating Scale (ScoRS), has also been specifically designed to study schizophrenia (Keefe et al., 2006). This assessment not only relies on patients' self-reports and clinicians' impressions of patients' cognitive deficits but also includes informant (family member, friend, social worker, etc.) reports of patients' cognitive deficits and the degree to which the deficits affect day-to-day functioning. The study found that informant reports were related to cognitive performance and real-world functioning.

In summary, an alternative method of assessing cognitive functioning, dynamic assessment of learning potential, holds promise of providing information on the quality and amount of rehabilitation required for skill attainment and community functioning. Of the methods of assessing cognitive functioning in community settings, a self-report instrument such as the SSTICS (Stip et al., 2003) is the most feasible clinically because it can be easily administered with little formal training required.

PURPOSE

The purpose of this pilot study was to investigate the relationship between a dynamic test of executive functioning and self-report of cognitive limitations

in people with schizophrenia. The specific research question of interest is what is the relationship between ability to learn from coaching on the WCST and subjective cognitive complaints measured by the SSTICS?

METHODS

Participants

Individuals with schizophrenia or schizoaffective disorder were recruited from case-manager referrals and announcements at consumer meetings from two community mental-health centers in the Kansas City area. Individuals with comorbidities that would affect cognition (e.g., a diagnosis of mental retardation) or other significant physical comorbidities that would affect task performance (e.g., blindness) were excluded from the study. Ten participants had a diagnosis of schizophrenia and 10 had schizoaffective disorder. Diagnoses were confirmed using the Structured Clinical Interview for DSM-IV (First, Spitzer, Gibbon, & Williams, 1997), which was administered by advanced graduate students in clinical psychology who were trained by the third author to competency and supervised to maintain reliability. Of the 20 participants, 11 were women and 9 were men; 14 were African American or Black, 4 were Caucasian or White, 1 was Hispanic, and 1 was Asian. They ranged in age from 34 to 55 years, with an average age of 43.5 years. Twelve participants lived independently, 5 lived with relatives (but are largely independent for personal care), 1 lived with relatives but was heavily dependent for personal care, 1 lived in supervised-care housing, and 1 was homeless. Seven participants had some high school education, 6 had some college, 5 were high school graduates or had their general equivalency diploma (GED), 1 had an eighth-grade education, and 1 had a bachelor's degree. Seventeen participants were currently unemployed. All but 2 participants were prescribed neuroleptic medications. Four were taking typical antipsychotic medications, Prolixin and Haldol, whereas 15 were on one or more atypical antipsychotic medications: Abilify, Risperdal, Geodon, Zyprexa, and/or Seroquel.

Instruments

The cognitive measure selected for this study was the WCST (Heaton, Chelune, Talley, Kay, & Curtiss, 1993). The WCST is a test of concept formation and problem solving and is a measure of executive

functioning often used in studies of people with schizophrenia. Successful performance on this task requires abstract thought, conceptual flexibility, and the ability to monitor one's own behavior and learn from feedback. The WCST was selected because it has been related to community functioning and schizophrenia in several studies and has established dynamic assessment methodology developed by Wiedl and colleagues (Green et al., 2000; Wiedl, 1999).

The SSTICS was selected to measure participants' subjective cognitive complaints (Stip et al., 2003). The 21 items were constructed to assess memory, attention, executive functions, and praxia. The SSTICS demonstrates good test-retest reliability ($r = .82$) in 78 participants who completed the scale 2 to 22 days after the first administration ($M = 11$ days). Internal consistency ($\alpha = .86$) with 113 participants demonstrates that the items are measuring the same construct. Factor analysis yielded six subjective domains; sustained executive function, memory of information, consciousness of effort, daily life, distractibility, and alertness explained 57.5% of the variance. Four questions, numbers 16 to 19, specifically address executive function. Subjects are asked to rate the frequency of their cognitive difficulties using a 4-point scale (0 = *never*, 4 = *very often*).

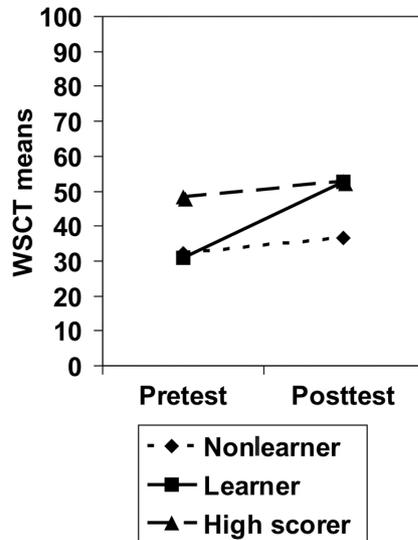
Total scores on the SSTICS were significantly different in participants with schizophrenia and participants without a psychiatric disorder (Mancini et al., 2002). The SSTICS global score was correlated with explicit memory ($r = .244$, $p = .009$), and the memory-of-information factor was correlated with long-term memory ($r = -.193$, $p = .04$). The SSTICS was significantly related to the general ($r = .26$, $p = .005$) and negative ($r = .228$, $p = .015$) scores of the Positive and Negative Syndrome Scale, and it was negatively correlated with insight ($r = -.181$, $p = .055$), although not significantly.

In summary, the SSTICS demonstrates construct validity and modest convergent correlations with a few objective measures of cognitive functioning and negative symptoms. As predicted, scores differ between individuals with schizophrenia and individuals without a psychiatric disorder. Further testing is needed to determine if the SSTICS is sensitive enough in identifying clients with cognitive deficits in clinical settings.

The SSTICS (Stip et al., 2003) was originally developed and administered to French-speaking patients in Montreal. The questionnaire was back-translated into English, but for this study, the wording in questions 10, 11, and 17 was changed to accommodate possible cultural differences. In question 10, *Prime*

TABLE 1. Means and Standard Deviation by Learner Status for Pretest, Posttest, and Gain Scores on the Wisconsin Card Sorting Test

Learner status	Pretest		Posttest		Gain Score	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
High scorer	48.14	4.45	52.71	2.43	4.57	5.00
Learner	31.00	4.52	52.83	6.05	21.83	4.71
Nonlearner	32.29	9.74	36.71	9.48	4.43	7.23

**FIGURE 1. Changes in Wisconsin Card Sorting Test pretest to posttest among nonlearners, learners, and high scorers.**

Minister of Canada was changed to *President of the United States*; in question 11, *national capitals* was changed to *state capitals*; and in the example qualifiers for question 17, *charting an itinerary* was changed to *planning a daily schedule*.

Procedure

Participants were enrolled in a larger study examining learning potential, which was approved by the relevant institutional review boards. After participants were given information about the study, informed consent was obtained. The measures examined in this study were administered at baseline as part of a larger study that included additional measures of cognition and functioning. Within this larger test battery, the order in which the WCST was administered was counterbalanced across participants.

Consistent with the Wiedl (1999) dynamic-assessment procedures, the 64-card version of the WCST was administered three times in a pretest–training–posttest sequence, all within one session. The

pretest used standard administration instructions (Heaton et al., 1993). Participants were asked to sort the 64 cards, which had symbols varying according to shape, color, and number on them, by matching each card to one of four “key” cards provided. Participants were not explicitly informed of the matching principle, but after each match, they were told whether their response was right or wrong. After 10 consecutive correct matches, the matching principle was changed without informing the participant.

On the second (training) administration of the WCST, participants were given additional assistance. The three sorting rules (color, shape, and number) were explained, and the participants proceeded with the task. After each sort, participants were given feedback as to why their sort was right or wrong. Participants were also informed of the changes in matching principle.

Immediately following the mediated instruction, the posttest was administered. The posttest was given with the same standard administration procedures used in the pretest.

After completing the WCST, the SSTICS (Stip et al., 2003) was administered to determine participants’ subjective cognitive complaints. Participants were told they were going to be asked a series of questions on memory and concentration problems that they may have experienced while going about their everyday activities, and they were asked to estimate how often they had noted such problems recently. Participants were given a Likert-type scale to indicate how often each problem had occurred (4 = *very often*, 3 = *often*, 2 = *sometimes*, 1 = *rarely*, 0 = *never*).

RESULTS

The pretest, posttest, and gain scores on the WCST are shown in Table 1. Participants were classified as learners, nonlearners, or high achievers based on the classification system developed by Wiedl (1999; Wiedl et al., 2001). Participants were thus designated as high scorers if they scored 43 or higher on the pretest and posttest, as learners if

they improved their scores from pretest to posttest by 15 points, and as nonlearners if they failed to meet criteria for high scorers or learners. Of the 20 participants, 7 were high scorers, 6 were learners, and 7 were nonlearners (see Figure 1).

Possible scores on the SSTICS range from 0 to 84. The higher the score, the more subjective cognitive complaints are reported. Nonlearners had the highest total average subjective complaints by learner status ($M = 46$, $SD = 12.29$), followed by learners ($M = 37$, $SD = 14.59$) and then high scorers ($M = 36$, $SD = 14.40$). One-way analysis of variance showed there was not a significant difference among the three learner groups ($F[2, 17] = 1.10$, $p = .35$) in total SSTICS mean scores. The scores of learners and high scorers who had similar means were combined to see if they differed from the scores of nonlearners. Results of the independent sample t test were non-significant ($t [df = 18] = -1.52$, $p > .15$).

Possible scores for the executive-functioning questions on the SSTICS range from 0 to 16. When comparing the mean scores from the questions that address executive function (questions 16, 17, 18, and 19) by learner status, nonlearners reported more subjective cognitive complaints ($M = 10$, $SD = 2.50$) than learners ($M = 7$, $SD = 3.49$) and high scorers ($M = 6$, $SD = 4.56$), but the difference among the groups was not significant ($F[2, 17] = 2.75$, $p = .09$). Because results between the high scorers and learners were similar, high scorers and learners were combined into one group ($M = 6$, $SD = 4.00$). An independent sample t test was then used to analyze whether the mean value of subjective cognitive complaints of executive function differed significantly between high scorers and learners and nonlearners. Results were found to be significant ($t [df = 18] = 2.29$, $p = .03$).

DISCUSSION

The findings show that individuals with schizophrenia who improve with coaching on a cognitive test of executive functioning (i.e., learners) were able to reach a level of performance equivalent to that of individuals who initially scored highly and maintained their high score (i.e., high scorers). This suggests that learners would need less-specialized cognitive remediation than nonlearners, whereas nonlearners may require more intensive rehabilitation. Furthermore, when high scorers and learners were combined, they reported significantly fewer subjective cognitive complaints of executive functioning than did nonlearners. If learner status shows similar differences in future studies of self-reported

cognitive complaints, self-reports might be used clinically as a proxy for cognitive tests, which are difficult to administer in clinical settings.

These findings extend research that reports that dynamic assessment predicts such outcomes as rehabilitation readiness and work-skill acquisition. The findings indicate that participants are able to rate their subjective cognitive complaints and that items assessing higher level cognitive skills such as planning daily activities are related to learning proficiency.

The fact that only subjective items assessing executive functioning, not the total scale score on the SSTICS, were related to learner status suggests that these items may require more sustained attention than others, and thus, they are more likely to relate to a cognitive-performance measure that assesses executive functioning. However, it is possible that with a larger sample, total SSTICS scores may also be related to learner status. Another possible explanation is that the WCST, which assesses higher functioning, corresponds best to the executive-functioning items of the SSTICS.

The relationship between subjective complaints about executive functioning and learner status suggests that dynamic assessment may be a more promising method than static cognitive testing in assessing the validity of subjective scales because it is similar to learning from experience in planning and organizing daily activities and adapting to changes as needed. Previous research assessing validity with the SSTICS used a static cognitive test and found that cognitive complaints in individuals with schizophrenia generally corresponded with visual memory rather than specific SSTICS factors corresponding to participants' equivalent performance measures (Prouteau et al., 2004).

Formal cognitive testing is not clinically relevant for ordinary clinical practice. It requires special training, and test batteries can be time consuming. As such, there is a need for a quick, easy cognitive assessment that would indicate which clients are able to learn from minimal intervention. Self-report of subjective cognitive problems is a promising area to explore further—especially the SSTICS, because its items are grounded in specific activities of daily living. However, the SSTICS is a relatively new instrument, and replication of the factor structure and other properties is warranted.

The findings of this study must be tempered with the fact that this was a pilot study and that a significant relationship was found only when high scorers, those who performed well before and after assistance,

were combined with learners, those who improved with assistance, and compared to nonlearners, those who did not improve with prompting. The results may not be supported with a larger sample. A broader limitation of this study is that only the dynamic version of the WCST was used, and other cognitive processes may also relate to self-report of cognitive complaints. Additionally, the sample was composed of relatively stable adults who live independently in the community. Self-report in less stable individuals may not correspond to cognitive performance, and informant ratings may be a more accurate indicator of cognitive functioning. In addition, other factors such as insight may need to be considered as mediating the relationship between cognitive performance and the self-report of cognitive functioning.

CONCLUSION

Results of this pilot study are promising but need replication. Dynamic testing may be a better standard for assessing the validity of a clinical measure such as the SSTICS, and additional research into the relationship between learning potential and cognitive limitations is needed. If results of this study are replicated, more information will be available to determine whether self-report of cognitive difficulty is associated with learning potential.

REFERENCES

- Buchanan, R. W., Davis, M., Goff, D., Green, M. F., Keefe, R. S. E., Leon, A. C., et al. (2005). A summary of the FDA-NIMH-MATRICES workshop on clinical trial design for neurocognitive drugs for Schizophrenia. *Schizophrenia Bulletin*, *31*(1), 5-19.
- Fioravanti, M., Carlone, O., Vitale, B., Cinti, M. E., & Clare, L. (2005). A meta-analysis of cognitive deficits in adults with a diagnosis of schizophrenia. *Neuropsychology Review*, *15*, 73-95.
- Fiszdon, J. M., McClough, J. F., Silverstein, S. M., Bell, M. D., Jaramillo, J. R., & Smith, T. E. (2006). Learning potential as a predictor of readiness for psychosocial rehabilitation in schizophrenia. *Psychiatry Research*, *143*, 159-166.
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. W. (1997). *Structured clinical interview for DSM-IV Axis I disorders, research version*. New York: Biometrics Research, New York State Psychiatric Institute.
- Green, M. F. (1996). What are the functional consequences of neurocognitive deficits in schizophrenia? *American Journal of Psychiatry*, *153*, 321-330.
- Green, M. F., Kern, R. S., Braff, D. L., & Mintz, J. (2000). Neurocognitive deficits and functional outcome in schizophrenia: Are we measuring the "right stuff"? *Schizophrenia Bulletin*, *26*, 119-136.
- Groth-Marnat, G. (2000). Introduction to neuropsychological assessment. In G. Groth-Marnat (Ed.), *Neuropsychological assessment in clinical practice* (pp. 3-25). New York: Wiley.
- Heaton, R. K., Chelune, G., Talley, J. L., Kay, G. G., & Curtiss, G. (1993). *Wisconsin Card Sorting Test manual*. Odessa, FL: Psychological Assessment Resources.
- Heinrichs, R. W., & Zakzanis, K. K. (1998). Neurocognitive deficit in schizophrenia: A quantitative review of the evidence. *Neuropsychology*, *12*(3), 426-445.
- Keefe, R. S. E., Poe, M., Walker, T. M., Kang, J. W., & Harvey, P. D. (2006). The schizophrenia cognition rating scale: An interview-based assessment and its relationship to cognition, real-world functioning, and functional capacity. *American Journal of Psychiatry*, *163*(3), 426-432.
- Lewis, R. (2004). Should cognitive deficit be a diagnostic criterion for schizophrenia? *Journal of Psychiatric Neuroscience*, *29*(2), 102-113.
- Lezak, M. D. (1995). *Neuropsychological assessment*. New York: Oxford University Press.
- Liddle, P. F., & Barnes, R. R. E. (1988). The subjective experience of deficits in schizophrenia. *Comprehensive Psychiatry*, *29*(2), 157-164.
- Loas, G., Yon, V., & Brien, D. (2002). Dimensional structure of the Frankfurt Complaint Questionnaire. *Comprehensive Psychiatry*, *43*(5), 395-403.
- Mancini, A., Stip, E., Prouteau, A., Caron, J., Lecomte, Y., & Pampoulova, T. (2002). Subjective experience of cognitive deficits in schizophrenia. *Schizophrenia Research*, *53*, 144.
- Medalia, A., & Lim, R. W. (2004). Self-awareness of cognitive functioning in schizophrenia. *Schizophrenia Research*, *71*, 331-338.
- Palmer, B. W., Heaton, R. K., Paulsen, J. S., Kuck, J., Braff, D., Harris, M. J., et al. (1997). Is it possible to be schizophrenic yet neuropsychologically normal? *Neuropsychology*, *11*, 437-446.
- Prouteau, A., Verdoux, H., Briand, C., Lesage, A., Lalonde, P., Nicole, L., et al. (2004). Self-assessed cognitive dysfunction and objective performance in outpatients with schizophrenia participating in a rehabilitation program. *Schizophrenia Research*, *69*, 85-91.
- Rempfer, M., Hamera, E., Brown, C., & Bothwell, R. J. (2006). What are the cognitive characteristics associated with learning proficiency on the Wisconsin Card Sorting Test? Cognition and learning potential in people with serious mental illness. *Schizophrenia Research*, *87*, 316-322.
- Rund, B. R. (1998). A review of longitudinal studies of cognitive functions in schizophrenia patients. *Schizophrenia Bulletin*, *24*(3), 425-433.
- Sergi, M. J., Kern, R. S., Mintz, J., & Green, M. F. (2005). Learning potential and the prediction of work skill acquisition in schizophrenia. *Schizophrenia Bulletin*, *31*(1), 67-72.
- Stip, E., Caron, J., Renaud, S., Pampoulova, T., & Lecomte, Y. (2003). Exploring cognitive complaints in schizophrenia: The subjective scale to investigate cognition in schizophrenia. *Comprehensive Psychiatry*, *44*(4), 331-340.
- Velligan, D. I., Bow-Thomas, C. C., Mahurin, R. K., Miller, A. L., & Halgunseth, L. C. (2000). Do specific neurocognitive deficits predict specific domains of community function in schizophrenia? *Journal of Nervous and Mental Disease*, *188*(8), 518-524.
- Wiedl, K. (1999). Cognitive modifiability as a measure of readiness for rehabilitation. *Psychiatric Services*, *50*(11), 1411-1419.
- Wiedl, K. H., Schöttke, H., Green, M. F., & Nuechterlein, K. H. (2004). Dynamic testing in schizophrenia: Does training change the construct validity of a test? *Schizophrenia Bulletin*, *30*(4), 703-711.

- Wiedl, K., Wienobst, J., Schöttke, H., Green, M., & Nuechterlein, K. (2001). Attentional characteristics of schizophrenia patients differing in learning proficiency on the Wisconsin Card Sorting Test. *Schizophrenia Bulletin*, *27*(4), 687-695.
- Wykes, T., Reeder, C., Corner, J., Williams, C., and Everitt, B. (1999). The effects of neurocognitive remediation on executive processing in patients with schizophrenia. *Schizophrenia Bulletin*, *25*, 291-307.
- Yon, V., & Loas, G. (2000). Relationships between subjective experiences of deficit and other psychopathological features in schizophrenia. *Psychopathology*, *33*, 110-114.