American Journal of Psychiatric Rehabilitation, 12: 57–72
Taylor & Francis Group, LLC © 2009
ISSN: 1548-7768 print/1548-7776 online
DOI: 10.1080/15487760802615798

Routledge
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The Effects of Task Engagement and Interpersonal Rapport on *WCST* Performance in Schizophrenia

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Individuals with schizophrenia typically perform poorly on measures of executive function. This poor performance is widely attributed to disease-related cognitive deficits; however, the influence of task engagement and interpersonal rapport has not been adequately evaluated. In the present study, 30 individuals with schizophrenia completed two trials each of the *Wisconsin Card Sorting Test* (*WCST*), a measure of executive function. Between trials, half of the participants received enhanced instructions (i.e., explanation of the underlying rules and strategy coaching). It was hypothesized that the enhanced instruction group would achieve better *WCST* scores, and that this group difference would be mediated by participants' self-reported task engagement on the *WCST* and rapport with the experimenter. Results showed significantly improved *WCST* performance in the enhanced-instruction group, but the groups did not differ in task engagement or rapport. Task engagement showed a trend-level association with *WCST* performance across all participants. These findings suggest that further research is necessary to understand potential motivational mechanisms underlying executive functioning performance in schizophrenia.

Keywords: *Executive functioning; Motivation; Schizophrenia*

Individuals with schizophrenia exhibit poor performance in a variety of neurocognitive domains, including memory, attention, language processing, motor speed, and executive functioning (Kern

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& Green, 1998). Performance in these areas correlates with individuals' current functioning and long-term outcome (Green, 1996; Penn, Corrigan, & Racenstein, 1998). Among neurocognitive domains, executive functioning (EF; most often assessed with the *WCST*) has proven to be a particularly robust predictor of community outcomes in schizophrenia (Green, 1996; Green, Kern, Braff, & Mintz, 2000) and has received a great deal of attention, particularly from cognitive rehabilitation programs (Kurtz, Moberg, Gur, & Gur, 2001).

Given the apparent importance of EF to functioning in schizophrenia, it is necessary to understand the mechanisms underlying poor performance on the *WCST* and other EF measures. Several lines of research support the hypothesis that poor performance on EF measures reflects a stable, disease-related, cognitive deficit. Whereas non-ill individuals exhibit increased dorsolateral prefrontal metabolism and blood flow while performing EF tasks, individuals with schizophrenia typically do not (Liu, Tam, Xie, & Zhao, 2002). In addition, poor EF performance has been found to predate disease onset (Erlenmeyer-Kimling et al., 2000; Shenkel & Silverstein, 2004), remain relatively stable over time (Albus et al., 2002), and persist while the disorder is in remission (Heaton et al., 2001; Kurtz, Seltzer, Ferrand, & Wexler, 2005).

Despite support for the cognitive-deficit model, research suggests several other factors that may contribute to EF performance in schizophrenia. One such factor is intrinsic motivation. Intrinsic motivation is the internally generated impetus toward action associated with an activity being experienced as rewarding in and of itself. An instrumental component of intrinsic motivation is task engagement, one's interest or enjoyment in performing the task. This contrasts with extrinsic motivation, in which actions are compelled by external forces, such as reward and punishment (Ryan & Deci, 2000). Research in educational psychology supports the role of intrinsic motivation over extrinsic motivation in facilitating learning (Terrell & Rendulic, 1996). Students with greater interest in a topic exert greater effort to understand the topic, leading not only to greater retention of surface facts, but to efforts to gain a broader understanding of the area (Benware & Deci, 1984; Hidi, 1990; Renninger, Hidi, & Krapp, 1992). Accordingly, topic interest shows a consistent, moderate association with learning (Tobias, 1994, as reviewed in Schiefele, 1991). This association persists beyond the influence of cognitive ability and prior knowledge, the two most

heavily studied contributors to learning (Alexander, Kulikowich, & Schulze, 1994).

Within schizophrenia research, most of the studies that have investigated motivational factors have focused on manipulation of monetary reinforcement, arguably a test of extrinsic rather than intrinsic motivation (Bellack, Mueser, Morrison, Tiernery, & Podell, 1990; Green, Satz, Ganzell, & Vaclav, 1992; Hellman, Kern, Nielson, & Green, 1998). By and large, these studies did not support a role for extrinsic motivation in *WCST* performance (although, see Summerfelt et al., 1991). A weakness of these studies is that they failed to directly measure motivation, but, rather, inferred participants' motivational level based on manipulation of cash payment. Thus, there remains a need to directly measure components of task motivation in this population.

We are aware of only one study that has examined the relationship of task engagement to performance in schizophrenia. Medalia, Revheim, and Casey (2001) modified an educational computer program to remediate problem-solving deficits. The intervention aimed at maximizing task engagement by making the content personally relevant to participants and providing them with control over their learning. The results showed that this novel intervention led to significantly greater improvement in problem-solving skills relative to comparison groups. Thus, there is evidence that task engagement may affect task performance in schizophrenia, but controlled research is needed that measures this construct directly.

A second factor that might contribute to EF performance is the rapport between the experimenter and participant. Indirect support for this factor comes from psychotherapy outcome research, which shows that therapeutic alliance has a modest effect on treatment outcome (see meta-analyses by Horvath & Symonds, 1991; Martin, Garske, & Davis, 2000). In schizophrenia, alliance is associated with improved global functioning, reduced symptom severity, better quality of life, improved social functioning, and better medication compliance (Frank & Gunderson, 1990; Gehrs & Goering, 1994; Neale & Rosenheck, 1995; Olfson, Glick, & Mechanic, 1993; Solomon, Draine, and Delaney, 1995; Svensson & Hansson, 1999). More direct evidence is garnered from older research showing that students who are prompted to complete a task in the presence of an interpersonally aloof stranger demonstrate lower levels of intrinsic motivation than those who are in the presence of a warm, friendly

stranger (Anderson, Manoogian, & Reznick, 1976). Similarly, students who perceive their teachers as uncaring and/or controlling have been shown to have lower levels of intrinsic motivation and effort in their school work, a tendency to blame teachers for negative outcomes (Ryan & Connell, 1989; Ryan & Grolnick, 1986), and poorer scholastic performance (Black & Deci, 2000). Similar effects have been demonstrated among mentally handicapped children (Fuchs, 1987), and among adults in work settings (Baard, Deci, & Ryan, 2004; Word, Zanna, and Cooper, 1974).

Within schizophrenia, an older literature supports the effect of interpersonal factors on task performance (e.g., D'Alessio & Spence, 1963; Gelburd & Anker, 1970; Meichenbaum, 1966), but the topic has received little recent attention. A notable exception is Park, Gibson, and McMichael's (2006) recent finding that social reinforcement in the form of human and video-based interaction improved spatial working memory performance in schizophrenia relative to asocial reinforcement techniques. Thus, there is preliminary evidence that interpersonal factors may impact performance on cognitive measures in individuals with schizophrenia.

The current study is a preliminary examination of the role of task engagement and participant-experimenter rapport in *WCST* performance in schizophrenia. A frequently-used paradigm was replicated in order to ensure between-group differences in *WCST* performance and participant-experimenter interaction. Participants were randomly assigned to one of two conditions: an experimental group that, following an initial baseline *WCST* administration, received enhanced task instructions from the experimenter on a second trial, and a control group that received standard instructions across two trials. Enhanced instructions comprised a brief tutorial explaining the logic of the task, as well as trial-by-trial strategy coaching. We hypothesized that, replicating previous findings, the group receiving enhanced-instructions would improve *WCST* performance significantly more from first to second trial than the standard-instructions group. We further hypothesized that this difference would be partially mediated by self-reported task engagement and by rapport with the experimenter, as these factors contribute to motivation. In regard to rapport, we reasoned that experimental participants would feel supported by the helpful test administrator, whereas control participants would feel relatively alienated. Regarding task engagement, we reasoned that

experimental participants' learning and successfully implementing appropriate *WCST* strategy would be associated with increased interest in the task, whereas most control participants would remain unaware of the underlying nature of the task and would remain relatively cognitively unengaged.

METHODS

Participants

Participants were 30 adults diagnosed with the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-IV*; APA, 1994) schizophrenia or schizoaffective disorder. All participants were receiving antipsychotic medications and none were experiencing an acute exacerbation of the illness at the time of testing. Nineteen participants were patients from long-term inpatient units. Eleven participants were outpatients. Inclusion criteria were: (1) diagnosis of schizophrenia or schizoaffective disorder as determined by chart review, clinician report, and corroboration through *PANSS* administration (i.e., for current symptoms); (2) never having met *DSM-IV* criteria for a substance dependence disorder; (3) no self or clinician report of cognitive impairment due to substance use; (4) no substance abuse within the past month; (5) no traumatic head injury with loss of consciousness totaling 15 minutes; (6) ability to provide informed consent; (7) reading level above third grade, as determined by the *Wide Range Achievement Test – Revised Reading* (Jastak & Wilkinson, 1984). Participant clinical history was assessed through chart review, preliminary interview, and consultation with clinical staff.

Measures

Executive Functioning was assessed using the 64-card, computer-administered version of the *WCST* (Heaton, Latshaw, & Leitten, 1990). The *WCST* was administered by trained research assistants following a script modeled on the technique used by Bellack and colleagues (1990) for both the experimental and control conditions (described below). The 64-card version was used instead of the 128-card version in order to minimize the chance that participant fatigue would depress engagement and performance during Trial 2.

The primary dependent variables in the current study were the *number of categories achieved* and *total number of cards correctly sorted*. *Perseverative errors* was not included as a dependent variable because, as applied in schizophrenia, it is thought to reflect an inhibition deficiency with specific neural underpinnings in the frontal cortex (Everett, Lavoie, & Gagnon, 2001). In contrast, *categories achieved* and *total number of cards correctly sorted* are more molar outcome variables that are likely to capture both neurologically- and psychologically-mediated factors, including task engagement and rapport with the experimenter. Thus, we reasoned that including *perseverative errors* as an outcome variable would have inflated risk of Type I error without enhancing the likelihood of real findings on our psychological variables of interest. Nor were existing methods for analyzing effort on the *WCST* included. These approaches (reviewed in King, Sweet, Sherer, Curtiss, & Vanderploeg, 2002) are designed to discriminate dichotomously between sufficient and insufficient effort, primarily among individuals with motive to malinger. In contrast, hypotheses in the present study regard continuous variation in effort among participants without known motive to malinger.

Task Engagement and *Participant/Experimenter Rapport* are domains for which no standard measures have been validated among individuals with schizophrenia; therefore, items from existing measures (described below) were adapted for the current study to create two scales, which were then combined into a single questionnaire (see Appendix).

Existing measures of task engagement include behavioral indices (such as task performance, free-choice behavior, and time to initiate an action; Wiersma, 1992), ratings by others, and self-reported interest/enjoyment (Cameron & Pierce, 1994; Tang & Hall, 1995). Behavioral ratings of internal feeling states have questionable validity in schizophrenia due to cognitive deficits and affective flattening in this population (Kring, 1999); therefore, we elected to use self-reported interest/enjoyment as our measure of task engagement.[1] Based on previous scales and theoretical concepts of task interest (Schiefele, 1991), an initial pool of eight items was generated for

[1]The *WCST* administrator completed a behavioral measure of effort and cooperation for each participant. Because findings were consistent with the self-reported data, and because measurement of these items was not standardized, these data are not reported.

the current study. These items were developed as statements, following Mitchell (1993), and to be consistent with the structure of the rapport subscale (discussed below). These items were then shared among four colleagues and assessed for clarity and construct accuracy. Based on this review, four items were removed, leaving a final subscale of four items. These items were rated on eight-point, Likert-type scales, with higher scores signifying greater task engagement (see Appendix), and the scale demonstrated adequate internal consistency ($\alpha = .859$).

Participant/experimenter rapport was measured using a modified form of the *Working Alliance Inventory—Client Version* (*WAI-C*) (Horvath & Greenberg, 1989). The *WAI-C* is a self-report measure of psychotherapy clients' impression of the quality of the working relationship with their therapist. Preliminary evidence suggests that it is a reliable instrument among individuals with schizophrenia (Couture et al., 2006). The *WAI* includes 36 Likert-type items in which self statements are provided about the therapist/client relationship, and response options range from 1 (''Never'') to 7 (''Always''). After inverting reverse-scored items, higher scores signify better working alliance. The *WAI* has been found to consist of three factors: (1) shared goals, (2) a shared view of the tasks necessary to reach these goals, and (3) interpersonal bond. Eight of the 12 *WAI-C* items from the *Interpersonal Bond* factor were adapted for the present measure because they are most applicable to experimenter/participant rapport. The modified rapport scale demonstrated adequate internal consistency ($\alpha = .850$; see Appendix).

Symptoms were measured using the *Positive and Negative Syndromes Scale* (*PANSS*), a valid and reliable instrument for measuring the positive and negative syndromes of schizophrenia and general psychopathology in this population (Kay, Opler, & Lindenmayer, 1988). The *PANSS* was administered by a graduate student who was trained to reliability to a gold-standard criterion (ICC $\geq .70$).

Reading ability and premorbid cognitive ability were estimated with the *Wide Range Achievement Test-Revised: Reading* (*WRAT-R*). Reading ability has been found to function as an estimate of premorbid cognitive ability in schizophrenia (Dalby & Williams, 1986; Goldberg et al., 1995), and the WRAT-R has been used for this purpose (Weickert et al., 2000). The WRAT-R was used to exclude individuals with generalized cognitive disabilities (such as mental retardation) and as a gross measure to evaluate the relationship of cognitive functioning to *WCST* performance.

Procedures

After informed consent was obtained, each participant was administered a baseline trial of the *WCST* by a trained research assistant who was blind to each participant's group assignment until after administration of the baseline *WCST*. After baseline *WCST*, participants in the control group were asked to wait for ten minutes while the experimenter completed some paperwork. Participants in the experimental condition received ten minutes of enhanced instruction from the experimenter, following the procedures used by Bellack and colleagues (1990). This consisted of an explanation of the underlying rules of the task, including the three rules by which cards may be sorted (color, number, shape), the random selection of which rule would be used, and the automatic switching of rules after ten correct responses. During the second trial, experimental participants also received enhanced card-by-card instructions. Specifically, after each incorrect answer, the participant was told the possible reasons for her error, and directed toward the appropriate strategy to use with the next, as yet unseen, card. Administrators never indicated specifically which sorting rule to use or to which pile the key card should be matched.

Upon completion of the second *WCST* trial, the administrator was replaced in the room by another experimenter, who administered the task engagement and rapport questionnaire, and then the *PANSS*. This second experimenter administered the questionnaires in order to minimize any perceived demand characteristics to respond positively on the rapport items. Before participants completed the questionnaire, the experimenter told them, ''Some of these questions are about how you got along with the person who just did the computer puzzles with you. S/he will never see your responses to these questions, and your answers won't affect him/her in any way. So I would like it if you could answer all these questions as freely and honestly as possible.'' The experimenter also told participants to respond to the questionnaire based on their overall experience, not just the first trial or the second trial of the *WCST*.

Upon completion of the final questionnaire, outpatient participants received $15, whereas inpatient participants, in accordance with the ethical guidelines of the participating hospital, were provided with refreshments but no monetary remuneration.

RESULTS

Demographic and clinical characteristics of the two study groups are summarized in Table 1. ANOVA and chi-square analyses revealed that neither the experimental/control group nor the inpatient/outpatient groups differed significantly on any of the demographic or clinical variables; thus, we collapsed across inpatient/outpatient status, and focused on the experimental versus control group differences for the primary analyses.

Bivariate correlations between *WRAT-Reading* scores and all *WCST* performance variables were non-significant (all r's $< .15$), indicating that variation in participants' intelligence likely did not affect study results.

To test the hypothesis that enhanced instruction would lead to greater improvement in *WCST* performance compared to standard instructions, a one-way (Group) Analysis of Covariance (ANCOVA) was conducted on Trial 2 number of correct responses, with Trial 1 number of correct responses as a covariate. An analogous analysis was conducted on number of categories achieved (see Table 2). Results revealed that participants in the enhanced instruction group performed significantly better on Trial 2 than did participants in the

Table 1. Demographic and clinical information

	Control (n = 13)		Experimental (n = 17)	
	Mean	*SD*	Mean	*SD*
Age	32.2	10.85	34.47	11.29
Female (number)	6	n/a	11	n/a
Ethnicity (number)				
African American	8	n/a	8	n/a
Caucasian	5	n/a	7	n/a
Other	0	n/a	2	n/a
Inpatient (number)	7	n/a	12	n/a
Diagnosis (number)				
Schizophrenia	4	n/a	12	n/a
Schizoaffective	8	n/a	4	n/a
Psychosis NOS	1	n/a	1	n/a
Positive symptoms	13.7	5.26	15.2	3.82
Negative symptoms	15.7	7.75	16.1	4.31
General symptoms	28.8	6.94	32.1	5.11
WRAT-Reading	44.5	5.93	41.7	6.76

Note. No significant group differences were observed.

Table 2. Wisconsin card Sorting Test performance

	Control ($n = 13$)		Experimental ($n = 17$)	
	Trial 1 Mean (SD)	Trial 2 Mean (SD)	Trial 1 Mean (SD)	Trial 2 Mean (SD)
Raw number correct**	34.38 (15.04)	37.08 (14.61)	27.75 (11.71)	47.53 (10.19)
Number of categories achieved*	1.62 (1.45)	1.92 (1.78)	1.00 (1.41)	2.88 (1.87)

*$p < .05$; **$p < .005$.

standard instruction group, both in the number of correct *WCST* responses ($F = 12.46$; $p < .005$; $\eta^2 = 0.42$) and the number of categories achieved ($F = 5.91$; $p < .05$; $\eta^2 = 0.23$).

To test the hypothesis that this group difference was partially mediated by task engagement and rapport, we followed the steps for mediational analysis specified by Baron and Kenny (1986). Step one was satisfied by the finding that the predictor variable (group assignment) was associated with the outcome variable (*WCST* performance). The second step is to demonstrate that the predictor variable is associated with the mediator variable(s). Because intrinsic motivation and rapport were significantly correlated in our sample ($r = .63$; $p < .001$) we conducted a one factor (Group) MANOVA on the intrinsic motivation and rapport variables together. This MANOVA yielded a nonsignificant result (Wilk's $\lambda = .908$; $F = 1.27$; $p = .29$; $\eta^2 = .09$). This insignificant finding thus obviated the need for additional mediational analyses.

Supplemental Analyses

As an exploratory analysis, we examined whether intrinsic motivation and rapport were associated with *WCST* performance independent of enhanced instruction. Following Wiedl (1999), we differentiated ''learners'' (improvement of 15 points or more from pre- to posttest) and ''initial high-scorers'' (initial score of 43 or above out of 64) from ''nonlearners'' (initial score below 43 and improvement of less than 15 points). We conducted a one factor (Group: learners and initial high scorers [n = 18] by nonlearners [n = 12]) MANOVA on self-reported intrinsic motivation and rapport. This test approached statistical significance (Wilk's $\lambda = .830$; $F = 2.46$; $p = .11$; $\eta^2 = .17$). Individual ANOVAs showed that learners and high scorers reported higher intrinsic motivation (24.56;

SD = 4.84) than nonlearners (19.60; SD = 8.81) at a trend level of statistical significance ($F = 3.74$; $p = .06$; $\eta^2 = .13$). Learners and high scorers also reported stronger rapport (42.61; SD = 5.47) than nonlearners (37.89; SD = 12.09); although, this was not statistically significant ($F = 1.99$; $p = .17$; $\eta^2 = .08$).

DISCUSSION

The present study examined mechanisms underlying performance on the *WCST* in individuals with schizophrenia. We hypothesized that the relationship between enhanced instruction and *WCST* performance would be partially mediated by participants' self-reported task-engagement and rapport with the experimenter. Our results replicated the association of enhanced instruction with improved *WCST* performance. Findings did not support the mediating role of task engagement or rapport on these enhanced instruction effects; however, the results provided preliminary evidence of a mediating role for task engagement on *WCST* performance independent of enhanced instructions.

Our findings are consistent with the previous conclusion that providing enhanced instruction is a robust strategy for improving short-term *WCST* performance in this population (Bellack et al., 1990; Goldberg, Weinberger, Berman, Pliskin, & Podd, 1987; Goldman, Axelrod, & Tompkins, 1992; Metz, Johnson, Pliskin, & Luchins, 1994; Nisbet, Siegert, Hunt, & Fairley, 1996). Our null finding regarding the role of task engagement and rapport may be due to a number of factors, including methodological limitations. Despite efforts to minimize demand characteristics, rapport means in both the control (M = 43 out of a possible 48) and experimental group (M = 39 out of 48) suggest possible ceiling effects on this measure. Future research should be conducted to validate the measures used in this study by examining their convergence with other measures of task engagement and rapport that use different modalities (e.g., free-choice behavior, behavioral ratings). Alternatively, the current null findings may validly support the implication of previous *WCST* research: that enhanced instruction works by way of cognitive compensation (whereby one type of cognitive ability takes over for another) and environmental support (Wilson, 2002).

The post-hoc findings, while exploratory, are more interesting, and showed a trend toward greater task engagement among

individuals who performed better on the *WCST*. This finding is consistent with the literature linking intrinsic motivation to performance. It is also consistent with the view that interest emerges out of the interaction between the individual and the task, and is not susceptible to external manipulation (Shiefele, 1991). Indeed, theories of intrinsic motivation (e.g., Ryan & Deci, 2000) would predict that individuals who are neither engaged by the *WCST* nor naturally skilled at the task may experience both the control and experimental conditions as externally pressuring, leading to depressed performance. Future laboratory research should evaluate the differential effects of task engagement and subjectively experienced extrinsic pressure on task performance in schizophrenia.

Our post-hoc findings also support Medalia and colleague's (2001) development of remediation programs designed to maximize intrinsic motivation. This area is particularly promising because clients who are intrinsically motivated to participate may be more likely to attend training regularly, and a strong dose-response effect has been observed in cognitive remediation for schizophrenia (Choi & Medialia, 2006).

A notable limitation of this study is that tests other than the main effect of enhanced instructions were underpowered. This methodological limitation may explain the marginal statistical significance of the post-hoc finding. Alternatively, the marginal significance may suggest that any actual link between task engagement and cognitive performance in schizophrenia is subtle. Future research will likely require both larger samples and more sensitive measurement than were used in this preliminary study to clarify this issue.

Last, it is possible that task engagement data were affected by participants' perception of their *WCST* performance because the data were collected after *WCST* completion. An alternative method would have been to measure task engagement between *WCST* trials, so that it could more truly be understood as a temporal predictor of performance on Trial 2. However, it was judged that this approach would not solve the problem, as engagement ratings still may have been affected by perceived performance on Trial 1, and moreover, this approach could create the additional problem of intertrial assessment influencing performance on Trial 2. Thus, valid measurement of task engagement remains an important topic for future research.

In conclusion, the present study provided further support for the robust finding that enhanced instruction can be used to improve

WCST performance in schizophrenia. The results suggest that such improvements are not mediated by task engagement or rapport with the experimenter, but that task engagement may influence performance independent of enhanced instruction.

REFERENCES

Albus, M., Hubman, W., Scherer, J., Dreikorn, B., Hecht, S., Sobizack, N., & Mohr, F. (2002). A prospective 2-year follow-up study of neurocognitive functioning in patients with first episode schizophrenia. *European Archives of Psychiatry and Clinical Neuroscience*, *252*, 262–267.

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173–1182.

Bellack, A. M., Mueser, K. T., Morrison, R. L., Tiernery, A., & Podell, K. (1990). Remediation of cognitive deficits in schizophrenia. *American Journal of Psychiatry*, *147*, 1650–1655.

Cameron, J., & Pierce, D. (1994). Reinforcement, reward, and intrinsic motivation: A meta-analysis. *Review of Educational Research*, *64*, 363–423.

Choi, J., & Medalia, A. (2006). Factors associated with a positive response to cognitive remediation in a community psychiatric sample. *Psychiatric Services*, *56*, 602–604.

Couture, S. M., Roberts, D. L., Penn, D. L., Cather, C., Otto, M., & Goff, D. C. (2006). Do baseline client charateristics predict the therapeutic alliance in the treatment of schizophrenia? *Journal of Nervous and Mental Disease*, *194*, 10–14.

Dalby, J. T., & Williams, R. (1986). Preserved reading and spelling ability in psychotic disorders. *Psychological Medicine*, *16*, 171–175.

Everett, J., Lavoie, K., Gagnon, J.-F., & Gosselin, N. (2001). Performance of patients with schizophrenia on the Wisconsin Card Sorting Test (WCST). *Journal of Psychiatry & Neuroscience*, *26*, 123–130.

Frank, A. F., & Gunderson, J. G. (1990). The role of the therapeutic alliance in the treatment of schizophrenia. *Archives of General Psychiatry*, *47*, 228–236.

Gehrs, M., & Goering, P. (1994). Alliance and rehabilitation outcomes of schizophrenia. *Psychosocial Rehabilitation Journal*, *18*, 43–54.

Gelburd, A. S., & Anker, J. M. (1970). Humans as reinforcing stimuli in schizophrenic performance. *Journal of Abnormal Psychology*, *75*, 195–198.

Goldberg, T. E., Torrey, E. F., Gold, J. M., Bigelow, L. B., Ragland, R. D., Taylor, E., & Weinberger, D. R. (1995). Genetic risk of neuropsychological impairment in schizophrenia: A study of monozygotic twins discordant and concordant for the disorder. *Schizophrenia Research*, *17*, 77–84.

Goldberg, T. E., Weinberger, D. R., Berman, K. F., Pliskin, N. H., & Podd, M. H. (1987). Further evidence for dementia of the prefrontal type in schizophrenia? A controlled study of teaching the Wisconsin Card Sorting Test. *Archives of General Psychiatry*, *44*, 1008–1014.

Goldman, R. S., Axelrod, B. N., & Tompkins, L. M. (1992). Effect of instructional cues on schizophrenic patients' performance on the Wisconsin Card Sorting Test. *American Journal of Psychiatry*, *149*, 1718–1722.

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.

Green, M. F., Satz, P., Ganzell, S., & Vaclav, J. F. (1992). Wisconsin Card Sorting Test performance in schizophrenia: Remediation of a stubborn deficit. *American Journal of Psychiatry*, *149*, 62–67.

Heaton, R. K., Gladsjoe, J. A., Palmer, B. W., Kuck, J., Marcotte, T. D., & Jeste, D. V. (2001). Stability and course of neuropsychological deficits in schizophrenia. *Archives of General Psychiatry*, *58*, 24–32.

Heaton, R. K., Latshaw, R. J., & Leitten, C. L. (1990). *WCST-64: Computer Version for Windows—Research Addition*. Odessa, FL: Psychological Assessment Resources, Inc.

Hellman, S. G., Kern, R. S., Neilson, L. M., & Green, M. F. (1998). Monetary reinforcement and Wisconsin Card Sorting performance in schizophrenia: Why show me the money? *Schizophrenia Research*, *34*, 67–75.

Horvath, A. O., & Greenberg, L. S. (1989). Development and validation of the working alliance inventory. *Journal of Counseling Psychology*, *36*, 223–233.

Horvath, A. O., & Symonds, B. D. (1991). Relation between working alliance and outcome in psychotherapy: A meta-analysis. *Journal of Counseling Psychology*, *38*, 139–149.

Jastak, S., & Wilkinson, G. S. (1984). *The wide range achievement test—revised: Administration manual*. Wilmington, DE: Jastak Associates.

Kay, S. R., Opler, L. A., & Lindenmayer, P. P. (1988). Reliability and validity of the Positive and Negative Syndrome Scale for schizophrenics. *Psychiatry Research*, *23*, 99–110.

Kern, R. S., & Green, M. F. (1998). Cognitive remediation in schizophrenia. In K. T. Mueser & N. Tarrier (Eds.), *Handbook of social functioning in schizophrenia* (pp. 342–354). Boston: Allyn and Bacon.

King, J. H., Sweet, J. J., Sherer, M., Curtiss, G., & Vanderploeg, R. D. (2002). Validity indicators within the Wisconsin Card Sorting Test: Application of new and previously researched multivariate procedures in multiple traumatic brain injury samples. *The Clinical Neuropsychologist*, *16*, 506–523.

Kring, A. M. (1999). Emotion in schizophrenia: Old mystery, new understanding. *Current Directions in Psychological Science*, *8*, 160–163.

Kurtz, M. M., Moberg, P. J., Gur, R. C., & Gur, R. E. (2001). Approaches to cognitive remediation of neuropsychological deficits in schizophrenia: A review and meta-analysis. *Neuropsychology Review*, *11*, 197–210.

Kurtz, M. M., Seltzer, J. C., Ferrand, J. L., & Wexler, B. E. (2005). Neurocognitive function in schizophrenia at a 10-year follow-up: A preliminary investigation. *CNS Spectrums*, *10*, 277–280.

Liu, Z., Tam, W. C. C., Xie, Y., & Zhao, J. (2002). The relationship between regional cerebral blood flow and the Wisconsin Card Sorting Test in negative schizophrenia. *Psychiatry and Clinical Neurosciences*, *56*, 3–7.

Martin, D. J., Garske, J. P., & Davis, M. K. (2000). Relation of the therapeutic alliance with outcome and other variables: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, *68*, 438–450.

Medalia, A., Revheim, N., & Casey, M. (2001). The remediation of problem-solving skills in schizophrenia. *Schizophrenia Bulletin*, *27*, 259–267.

Meichenbaum, D. (1966). Effects of social reinforcement on the level of abstraction in schizophrenics. *Journal of Abnormal Psychology*, *71*, 354–362.

Metz, J. T., Johnson, M. D., Pliskin, N. H., & Luchins, D. J. (1994). Maintenance of training effects on the Wisconsin Card Sorting Test by patients with schizophrenia or schizoaffective disorders. *American Journal of Psychiatry*, *151*, 120–122.

Mitchell, M. (1993). Situational interest: It's multifaceted structure in the secondary school mathematics classroom. *Journal of Educational Psychology*, *85*, 424–436.

Neale, M. S., & Rosenheck, R. A. (1995). Therapeutic alliance and outcome in a VA intensive case management program. *Psychiatric Services, 46*, 719–721.

Nisbet, H., Siegert, R., Hunt, M., & Fairley, N. (1996). Improving schizophrenic in-patients Wisconsin card-sorting performance. *British Journal of Clinical Psychology*, *35*, 631–633.

Olfson, M., Glick, I. D., & Mechanic, D. (1993). Inpatient treatment of schizophrenia in general hospitals. *Hospital and Community Psychiatry*, *44*, 40–44.

Park, S., Gibson, C., & McMichael, T. (2006). Socioaffective factors modulate working memory in schizophrenia patients. *Neuroscience*, *139*, 373–384.

Penn, D. L., Corrigan, P. W., & Racenstein, J. M. (1998). Cognitive factors and social adjustment in schizophrenia. In K. T. Mueser & N. Tarrier (Eds.), *Handbook of social functioning in schizophrenia* (pp. 213–223). Boston: Allyn and Bacon.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist*, *55*, 68–78.

Schiefele, U. (1991). Interest, learning, and motivation. *Educational Psychologist*, *26*, 229–323.

Shenkel, L. S., & Silverstein, S. M. (2004). Dimensions of premorbid functioning in schizophrenia: A review of neuromotor, cognitive, social, and behavioral domains. *Genetic, Social, and General Psychology Monographs*, *130*, 241–270.

Solomon, P., Draine, J., & Delaney, M. A. (1995). The working alliance and consumer case management. *Journal of Mental Health Administration*, *22*, 126–134.

Summerfelt, A. T., Alphs, L. D., Wagman, A. M. I., Funderburk, F. R., Hierholzer, R. M., & Strauss, M. E. (1991). Reduction of perseverative errors in patients with schizophrenia using monetary feedback. *Journal of Abnormal Psychology*, *100*, 613–616.

Svensson, B., & Hansson, L. (1999). Therapeutic alliance in cognitive therapy for schizophrenic and other long-term mentally ill patients: Development and relationship to outcome in an inpatient treatment programme. *Acta Psychiatrica Scandinavica*, *99*, 281–287.

Tang, S., & Hall, V. C. (1995). The overjustification effect: A meta-analysis. *Applied Cognitive Psychology*, *9*, 365–404.

Weickert, T. W., Goldberg, T. E., Gold, J. M., Llewellen, B. B., Egan, M. F., & Weinberger, D. R. (2000). Cognitive impairments in patients with schizophrenia displaying preserved and compromised intellect. *Archives of General Psychiatry*, *57*, 907–913.

Wiedl, K. H. (1999). Cognitive modifiability as a measure of readiness for rehabilitation. *Psychiatric Services, 50*, 1411–1413.

Wiersma, U. J. (1992). The effects of extrinsic rewards on intrinsic motivation: A meta-analysis. *Journal of Occupational & Organizational Psychology*, *65*, 101–114.

Wilson, B. A. (2002). Towards a comprehensive model of cognitive rehabilitation. *Neuropsychological Rehabilitation*, *12*, 97–110.

Word, C. O., Zanna, M. P., & Cooper, J. (1974). The nonverbal mediation of self-fulfilling prophecies in interracial interaction. *Journal of Experimental Social Psychology*, *10*, 109–120.

APPENDIX

Items on the Task Engagement and Rapport Questionnaire

Note: Items below are listed in nonrandomized order to show subscale groupings. Reverse-scored items are marked with asterisks.

Task engagement items

1. This puzzle was interesting to me.
2. I was bored by this puzzle.*
3. I liked this puzzle more than most puzzles or board games I have played.
4. I had fun doing this puzzle.

Rapport items

5. I believe the first examiner appreciated me.
6. I got the feeling that when I got the wrong answers, the examiner was unhappy with me.*
7. I believe the first examiner liked me.
8. I felt uncomfortable with the first examiner.*
9. I did not trust the first examiner.*
10. The first examiner made me nervous.*
11. I believe the first examiner was genuinely concerned for my welfare.
12. I respect the first examiner.