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Abstract

Objective: To examine the effects of psychosocial cognitive rehabilitation on employment outcomes in a randomized controlled trial for individuals with early course schizophrenia. **Method:** Early course schizophrenia outpatients ($N = 58$) were randomly assigned to cognitive enhancement therapy (CET) or an enriched supportive therapy (EST) control and treated for 2 years. Comprehensive data on cognition and employment were collected annually. **Results:** Individuals treated with CET were significantly more likely to be competitively employed, had greater earnings from employment, and were more satisfied with their employment status by the end of treatment compared to EST recipients. Mediator analyses revealed that improvements in both social and nonsocial cognition mediated CET effects on employment. **Conclusion:** CET can help facilitate employment in early schizophrenia by addressing the cognitive impairments that limit functioning in the disorder. Inclusion of cognitive rehabilitation in social work practice can support more optimal functional recovery from schizophrenia.

Keywords

individual intervention, mental health, psychosocial treatment, RCT, rehabilitation

Schizophrenia is a chronic and disabling mental disorder that places significant burden on the individuals who suffer from it, their families, and society (Thaker & Carpenter, 2001). Although the advent of antipsychotic medications has helped people with schizophrenia move beyond the confines of the mental hospital and experience a greater control over hallucinations, delusions, and paranoia, evidence indicates that such individuals continue to experience significant disability in the community even when the cardinal symptoms of psychosis have been well controlled (Swartz et al., 2007). The limitations of antipsychotic therapy highlight the importance of providing adjunctive psychosocial treatment to facilitate a greater level of functional recovery among this population (Hogarty, Goldberg, Schooler, & the Collaborative Study Group, 1974).

Social work has and continues to play a major role in the development, testing, and implementation of psychosocial treatments for people with schizophrenia. Some notable efforts led by social workers include major role therapy (one of the first rigorously tested forms of social casework among this population; Hogarty, Goldberg, Schooler, Ulrich, & the Collaborative Study Group, 1974), assertive community treatment (Stein & Test, 1980), Family Psychoeducation (Anderson, Hogarty, & Reiss, 1980; Hogarty et al., 1986), strengths-based case management (Rapp, 1998), and Personal Therapy (Hogarty, 2002). All of these interventions have been shown to be highly effective in

reducing psychotic relapse and hospitalization and increasing community tenure when used in conjunction with antipsychotic medication. Most of these psychosocial treatments focus on increasing the availability of community supports and resources through assertive outreach or buffering the impact of stress through applied coping techniques and family alliance. In addition to treatment development and evaluation efforts, social workers continue to be the primary providers of psychosocial services to individuals with schizophrenia (Substance Abuse and Mental Health Services Administration, 2001).

Although previous psychosocial treatment efforts have been met with success by further reducing the need for hospitalization and increasing community tenure, a great deal of residual disability remains in the majority of individuals, even after the implementation of effective psychosocial treatment. Hogarty, Greenwald, et al. (1997) noted at the end of their 3-year trials of Personal Therapy and Family Psychoeducation that while

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adjustment had significantly improved and psychotic relapse had reached its likely floor (13% over 3 years; Hogarty, Kornblith, et al., 1997) “these clinically meaningful but relative improvements would not qualify as optimal recovery from schizophrenia (p. 1523).” Residual disability in employment has been particularly problematic for individuals with schizophrenia (Rosenheck et al., 2006). While the majority of people with the disorder demonstrate a desire to work, studies estimate that only approximately 20% are able to achieve competitive employment (Mechanic, Blider, & McAlpine, 2002). Supported employment programs have helped to remediate this problem to a degree (Bond, Drake, & Becker, 2008); however, the achievement and maintenance of independent competitive employment remains a serious problem. Helping individuals return to work after the development of schizophrenia is a high priority for both policy makers and practitioners, and there is an urgent need to identify novel treatment targets for the disorder and apply effective new approaches as early as possible to enhance employment and other functional outcomes.

Cognition as a Critical Target for Psychosocial Intervention in Schizophrenia

Cognition has emerged as a promising new target for addressing the residual functional limitations that many people with schizophrenia experience, including employment difficulties (Green et al., 2004). While cognitive impairments have been observed and studied in schizophrenia for many years (Heinrichs & Zakzanis, 1998), only recently have concerted efforts begun to develop methods of improving cognition in the disorder. To date, research has shown that individuals with schizophrenia experience a wide range of cognitive impairments that have been broadly separated into two categories: neurocognition and social cognition. Neurocognitive impairments represent difficulties in basic cognitive processes, such as attention, memory, and problem-solving skills. Individuals with chronic schizophrenia have repeatedly been shown to perform nearly 1 *SD* below the mean of healthy individuals on a variety of neurocognitive tests (Heinrichs & Zakzanis, 1998), although no single domain appears to be particularly affected, indicating a generalized impairment in basic cognitive processing.

Social cognition refers to those higher order cognitive processes that specifically support interpersonal interactions. Definitions of social cognition vary but most consider the processing and interpretation of socioemotional information in oneself and others to be central (Wyer & Srull, 1994). Under this rubric falls such widely studied constructs as perspective taking (Taylor, 1988), theory of mind (Premack & Woodruff, 1978), emotion perception (Ekman, 1993), social context appraisal (Hilton, 1995), and emotion regulation (Gross, 1998). Social cognition is known to develop over the life span (Selman & Schultz, 1990), with adolescence being a particularly critical time period for the refinement of various social–cognitive abilities. It has

been proposed that the onset of schizophrenia during late adolescence disrupts the development of critical aspects of social cognition that are needed for effective transition to adulthood (Keshavan & Hogarty, 1999). Although research on social–cognitive impairments in schizophrenia is only recently emerging, a variety of studies exist showing that people with this disorder have substantial difficulty in taking the perspective of others (Brune, 2005), recognizing emotional and social cues (Corrigan & Green, 1993), and regulating stress and negative emotions (Zubin & Spring, 1977).

Related impairments in both neurocognition and social cognition have emerged as potentially critical targets for intervention in schizophrenia for a variety of reasons. As discussed above, difficulties are observed in many of these cognitive domains among persons with schizophrenia. In addition, evidence indicates that these impairments in cognition begin early (Saykin et al., 1994), persist throughout the course of the disorder (Hoff, Svetina, Shields, Stewart, & DeLisi, 2005), and have a limited response to antipsychotic medications (Keefe et al., 2007; Sergi et al., 2007). Most importantly, however, research has repeatedly shown that these difficulties in cognitive processing are among the strongest predictors of functional recovery from the disorder, even more so than the symptoms of psychosis (Brekke, Kay, Lee, & Green, 2005; Couture, Penn, & Roberts, 2006; Green, Kern, Braff, & Mintz, 2000). Vocational impairments, specifically, have shown stronger relations with cognitive difficulties (Eack et al., 2010; Nuechterlein et al., 2008), and a large study by Rosenheck and colleagues (2006) found that individuals with schizophrenia who demonstrated better cognitive function were significantly more likely to be employed. This is not surprising given that limited attentional capacity, poor working memory, and an inability to understand the perspective of others and identify important cues from the social context makes it exceedingly difficult for a person to succeed at work. Although efforts to develop novel pharmacotherapeutics to address cognitive impairments are underway, thus far improvements from molecular cognitive enhancers have been limited (Buchanan et al., 2007; Buchanan et al., 2008). A psychosocial approach that addresses these disabling and untreated impairments in cognition would be of substantial benefit for individuals with schizophrenia, and perhaps support the achievement of competitive employment in this population.

Cognitive Enhancement Therapy (CET): A Psychosocial Treatment for Cognitive Impairment in Schizophrenia

The recognition of cognitive impairments as a significant barrier to functional recovery from schizophrenia has hastened the development and application of psychosocial cognitive rehabilitation methods in an attempt to address these problems. The underlying assumption behind cognitive rehabilitation is that environmental experiences can affect how the brain processes information, and that the provision of enriched environmental

experiences can improve brain function and associated cognitive abilities (Keshavan & Hogarty, 1999). Such enriched experiences usually consist of novel cognitive exercises, sometimes computer-based, that resemble exercise programs for the brain. For many years, researchers in the field of traumatic brain injury have observed the beneficial effects of cognitive rehabilitation on people with focal brain injuries (Ben-Yishay et al., 1985), but these treatments have only recently been extended to individuals with psychiatric disorders.

CET is a comprehensive cognitive rehabilitation approach that was developed by the late social work researcher G. E. Hogarty and his colleagues for addressing cognitive impairments in schizophrenia (Hogarty et al., 2004; Hogarty & Greenwald, 2006). CET was designed for individuals with schizophrenia in the recovery phase of their illness (i.e., individuals stabilized on antipsychotic medication). Unlike the majority of cognitive rehabilitation methods, CET is uniquely integrated and explicitly targets problems in both neurocognition and social cognition. Neurocognitive impairments are addressed through 60 hours of computer-based exercises designed to improve attention, memory, and problem-solving abilities. Impairments in social cognition are targeted during the course of 45, 1.5 hour social–cognitive group therapy sessions, where participants learn various social–cognitive abilities (e.g., perspective taking, social context appraisal, and recognizing emotional cues) and apply these abilities during in vivo cognitive exercises, homework, and unrehearsed social situations in the group setting (see Methods for more details regarding CET).

To date, CET has been tested in two National Institute of Mental Health (NIMH) funded randomized controlled trials. The initial study was conducted with 121 individuals with long-term schizophrenia (average illness duration = 15.70 years). Participants were randomly assigned to 2 years of treatment with CET or an active enriched supportive therapy (EST) control condition. Results indicated that by the end of treatment, participants in CET demonstrated significant and large improvements in both neurocognitive and social–cognitive domains. Most importantly, CET effects were not limited to improved cognitive testing scores, but as hypothesized, generalized to significant improvement in social adjustment, particularly work readiness, instrumental task performance, and social and major role functioning (Hogarty et al., 2004). A 1-year posttreatment follow-up study of 106 of the 121 individuals who completed the trial demonstrated that both the cognitive and functional gains made by CET participants were maintained even a year after the treatment had ended (Hogarty, Greenwald, & Eack, 2006). To date, this remains the largest and longest study of cognitive rehabilitation for schizophrenia and highlights the promise of psychosocial interventions for addressing persistent cognitive impairments in the disorder.

We recently completed a second study of CET, with 58 individuals in the early course of schizophrenia (average illness duration = 3.19 years). It was hypothesized that early intervention with CET might capitalize on cognitive resources that were more preserved during the initial phases of the disorder and that the functional benefits of CET might be even greater

when applied to a less chronic sample. Preliminary 1-year effects from this trial comparing CET to EST again showed strong improvements in social cognition favoring CET (Eack, Hogarty, Greenwald, Hogarty, & Keshavan, 2007). After 2 years of treatment, highly significant and robust differential effects were observed in neurocognition, social cognition, symptomatology, and social adjustment. As suspected, functional improvement was even larger in this early course trial, with individuals treated with CET demonstrating over 50% improvement in functioning, with strong effects on social functioning, global adjustment, activities of daily living, and even competitive employment (Eack et al., 2009).

Strong effects on social functioning and global adjustment were expected in this study, given previous results (Hogarty et al., 2004); however, improvements in competitive employment were surprising, given that CET is not an employment program. The broad number of domains investigated in this trial precluded us from more closely examining the effects of CET on employment outcomes, beyond a cursory analysis of the proportion of individuals who gained competitive employment (Eack et al., 2009). Of particular importance, it also remains unclear whether improvements in the primary target of CET (cognition) served as a mechanism for these important vocational gains. Using data collected during this early course trial, we now seek to more closely assess the effects of CET on employment by examining several critical employment outcomes in the same participants and evaluating the degree to which specific gains in neurocognition and social cognition contributed to improved employment in CET recipients.

Method

Study Design and Setting

This research consisted of a 2-year randomized controlled trial comparing CET to EST. Each treatment condition was provided for a total of 2 years, and participants were assessed on a variety of employment and cognitive measures prior to participation and every year following the initiation of psychosocial treatment. Participants were randomized to CET or EST using a 1:1 ratio by way of computer-generated random numbers. The study was located in a specialty outpatient clinic in the comprehensive care service at the University of Pittsburgh Western Psychiatric Institute and Clinic, which serves the community mental health needs of the majority of the schizophrenia population in Pittsburgh, PA. All treatments and data collection efforts occurred in this specialty outpatient research clinic. This research was conducted between August 2001 and September 2007, with recruitment ending in November 2005.

Participants

Individuals in the early course of schizophrenia were recruited to participate in a 2-year study of CET versus EST. Eligible participants were those with a diagnosis of schizophrenia, schizoaffective, or schizophreniform disorder, confirmed by the Structural Clinical Interview for *Diagnostic and Statistical*

Manual of Mental Disorders, Fourth edition (DSM-IV; First, Spitzer, Gibbon, & Williams, 2002), who were stabilized on antipsychotic medications, and had experienced the onset of their first psychotic symptom within the past 8 years, an intelligent quotient (IQ) ≥ 80 , an absence of significant substance abuse within the past 2 months prior to study enrollment, and exhibited significant social and cognitive disability, as assessed using the Cognitive Styles and Social Cognition Eligibility Interview (Hogarty et al., 2004). The resulting sample consisted of 58 individuals with schizophrenia ($n = 38$) or schizoaffective disorder ($n = 20$) who were randomized and had some exposure to their psychosocial treatment condition. Individuals were young, with an average age of 25.92 ($SD = 6.31$) years, the majority were male ($n = 40$) and Caucasian ($n = 40$), and although most had attended some college ($n = 39$), few were employed at baseline ($n = 15$). Treated participants had been ill an average of 3.19 ($SD = 2.24$) years since their first psychotic symptom.

Measures

Employment outcomes. Employment characteristics were assessed using the Major Role Adjustment Inventory ([MRAI]; Hogarty, Goldberg, Schooler, and the Collaborative Study Group, et al., 1974), a clinician-rated interview-based assessment of social, role, and vocational functioning developed for people with schizophrenia. The MRAI consists of 32 items covering the domains of vocational, role, and social functioning. Items are rated on variable scales depending on the domain assessed, with some rated on Likert scales ranging from 1 (*functioning well*) to 5 (*functioning poorly*) and others rated using nominal or ordinal categorical scales. For the purposes of this research, 5 employment items covering employment status (working [e.g., returned to former employer, working for new employer], prevocational I [e.g., involved in ≥ 10 hr of volunteer work], prevocational II [e.g., involved in vocational rehabilitation], and prevocational III [e.g., too ill to work]), weekly wages earned, weekly hours worked (“35+,” “20–34,” “1–19,” “0,” and “homemaker”), job category (“professional,” “clerical/sales,” “skilled manual labor,” “semi-skilled manual labor,” “unskilled labor,” “not employed,” and “student/homemaker”), and satisfaction with employment (rated from 1 = *very satisfied* to 7 = *very dissatisfied*) were used. Categories for employment status were collapsed into competitive versus noncompetitive/no employment; job categories were collapsed into professional, clerical/sales, skilled manual labor, and unskilled labor; and weekly hours worked were collapsed into full-time (≥ 35 hr/week) or part-time (< 35 hr/week) work for the purposes of analysis. The MRAI has been used as a core measure of role functioning among individuals with schizophrenia for many years, including the first controlled trial of social casework and antipsychotic medication (Hogarty, Goldberg, et al., 1974). Previous research has found the MRAI to have adequate test–retest reliability and to converge with other measures of functional outcome in schizophrenia including the Social Adjustment Scale-II, the Global

Assessment Scale, and the Social Security Administration’s work disability criteria (Eack et al., 2009; Hogarty et al., 2004).

Cognitive assessments. A comprehensive battery of social and nonsocial cognitive assessments was collected as part of the larger study on which this investigation is based to examine the effects of CET on various cognitive domains. The nonsocial cognitive or neurocognitive domains of attention, memory, and executive functioning were assessed using items from the Revised Wechsler Memory Scale (Wechsler, 1987), California Verbal Learning Test (Delis, Kramer, Kaplan, & Ober, 1987), Revised Wechsler Adult Intelligence Scale (Wechsler, 1981), Trails B (Reitan & Waltson, 1985), Wisconsin Card Sorting Test (Heaton, Chelune, Talley, Kay, & Curtiss, 1993), Tower of London (Culbertson & Zillmer, 1996), and Neurological Evaluation Scale (Buchanan & Heinrichs, 1989). Social–cognitive domains of emotional (e.g., perception of emotional cues, emotion management) and social processing (e.g., reciprocity, foresightfulness, social context appraisal) were assessed using the Mayer-Salovey-Caruso Emotional Intelligence Test (Mayer, Salovey, Caruso, & Sitarenios, 2003), Social Cognition Profile (Hogarty et al., 2004), and components of the Cognitive Styles and Social Cognition Eligibility Interview (Hogarty et al., 2004). All of these measures have been shown to have adequate psychometric properties among individuals with schizophrenia, and their use in this study has been described in detail in previous reports (Eack et al., 2007; Eack et al., 2009). Due to the large number of cognitive measures used in this research, two composite indexes of neurocognition and social cognition were constructed by averaging across measures of social and nonsocial cognition after placing them on a standardized (z) metric. The internal consistency of both the neurocognition ($\alpha = .87$) and social cognition composites was adequate ($\alpha = .72$).

Treatments

Medications. All participants were maintained on antipsychotic medications approved by the Food and Drug Administration for the treatment of schizophrenia or schizoaffective disorder and prescribed by a study psychiatrist. Participants also met at least biweekly with a clinical nurse specialist to assess efficacy, tolerability, and adherence to pharmacotherapy. Medication changes were allowed throughout the course of the study, although every effort was made to stabilize participants on an efficacious and acceptable antipsychotic regime before the initiation of psychosocial treatment. The majority ($> 98\%$) of participants received second-generation antipsychotic medications, and there were no significant differences in chlorpromazine-equivalent dosages or clinician-estimated adherence between study groups at baseline, 1-, or 2 -years of treatment (Eack et al., 2009).

CET. CET (Hogarty & Greenwald, 2006) is a comprehensive, integrated psychosocial treatment for addressing the social and nonsocial cognitive impairments that limit functional recovery from schizophrenia. Over the course of 2 years,

CET provides 60 hr of computer-based neurocognitive rehabilitation designed to improve attention, memory, and problem solving; which is integrated with 45 social–cognitive group therapy sessions that employ in vivo learning experiences to foster the development of social wisdom and success in interpersonal interactions. Neurocognitive rehabilitation relies on the use of standard personal computers utilizing Ben-Yishay's Orientation Remediation Module (Ben-Yishay, Piasetsky, & Rattok, 1985) and Bracy's memory and problem-solving software (Bracy, 1994), and is administered in participant pairs with facilitation by a CET therapist/coach. Based on developmental theories of social cognition (Hogarty & Flesher, 1999), a broad range of social–cognitive abilities are targeted in the CET groups, such as learning how to take the perspective of others, appraising the social context, managing emotions in oneself and others, and gleaning the main point or “gist” of social situations. Participants actively engage in the social–cognitive groups by responding to unrehearsed social exchanges, presenting homework, participating in cognitive exercises that focus on experiential learning, providing feedback to peers, and chairing homework sessions. Unlike cognitive–behavior therapy, which seeks to correct faulty self-schemas through cognitive restructuring and behavioral techniques, CET focuses on addressing incorrect or incomplete schemas about others and the social world. In addition, CET does not attempt to provide individuals with strict behavioral rules for social interactions but rather attempts to facilitate effective interpersonal behavior in unrehearsed social situations through the acquisition and application of higher order social–cognitive abilities (e.g., perspective taking, social context appraisal, giving support). CET begins with approximately 3 months of weekly 1-hr computer-based neurocognitive rehabilitation in attention, after which individuals begin the weekly 1.5-hr social–cognitive group therapy sessions, which proceed concurrently with neurocognitive training throughout the duration of the treatment. No part of CET is explicitly focused on gaining competitive employment, and CET therapists do not provide supported employment services. However, if a CET participant has the goal of employment, the individual's treatment plan is tailored to address the cognitive problems that limit his or her ability to reach that goal. A complete description of the theory, practice principles, and methods of CET has been provided elsewhere (Hogarty & Greenwald, 2006).

EST. EST is an illness management and psychoeducation approach based on components of the basic and intermediate phases of the demonstrably effective personal therapy (Hogarty, 2002). The treatment consists of individual therapy sessions where people with schizophrenia learn about and practice stress management techniques designed to enhance adjustment and forestall late post-discharge relapse. EST consists of two phases, which are individually tailored to the person's level of recovery. In Phase I, the treatment focuses on basic psychoeducation about schizophrenia, the role of stress in the disorder, and ways to avoid/minimize stress. In Phase II, individuals learn more about the identification and management of

stressors that pose particular challenges to their own social and role functioning. Some therapeutic techniques used in EST include the identification of early warning signs of stress and psychotic relapse, diaphragmatic breathing, healthy passive and active relaxation strategies, prosocial behavior, and conflict avoidance. No aspect of EST is specifically focused on employment, although methods of managing stress that might interfere with employment were taught to individuals who expressed employment as a goal. Although individuals move through the two phases of EST at their own pace, each phase is typically provided for a year, with Phase I provided on a weekly basis and Phase II on a biweekly basis. No attempt was made to match CET and EST approaches with regard to hours of treatment. EST was chosen as the active control for this trial, in part, to account for the potential effects of illness management and education interventions on outcome (Hogarty, Greenwald, et al., 1997; Hogarty, Kornblith, et al., 1997), which is provided in both CET and EST. In addition, a state-of-the-art manualized approach was judged to be a more desirable and beneficial control than treatment as usual.

All individuals who expressed interest in employment were referred to the Office of Vocational Rehabilitation, regardless of whether they were assigned to CET or EST. The administration of psychosocial treatments was performed by master's-level practitioners who were trained and supervised by the treatment developers in both CET and EST. The use of treatment manuals, weekly supervision, and audio/video recording of treatment sessions were employed to ensure treatment adherence and prevent diffusion between treatment groups. Study clinicians carried an approximately equal number of cases assigned to CET or EST at random.

Procedures

Participants were recruited from inpatient and outpatient services at Western Psychiatric Institute and Clinic, Pittsburgh, PA, and several nearby community clinics. After recruitment, participants were screened for eligibility criteria in consensus conferences based on video-taped interviews. Eligible participants were then randomly assigned to CET or EST by a project statistician using computer-generated random number sequences that were implemented by the study clinician assigned to the patient and overseen by the principal investigator. Following randomization, participants were assessed annually using the aforementioned measures of employment and cognition and treated for up to 2 years. Neurocognitive and some social–cognitive assessments were administered via computer-based tests or by trained neuropsychologists, and the remaining measures were collected by master's-level study clinicians who had been extensively trained in their use and were not blind to treatment assignment. In total, 67 participants were randomized, 58 of whom received some exposure to CET ($N = 31$) or EST ($N = 27$). After 1 year, 49 (85%; 25 in CET, 24 in EST) participants remained in treatment, and 46 (79%; 24 in CET, 22 in EST) completed the entire 2 years of the study. The most frequent reasons for attrition included relocation, the

emergence of clinical and medication nonadherence issues, and withdrawal of consent for participation. There were no significant differences between treatment groups with regard to attrition, demographics, employment status, or baseline symptom characteristics (Eack et al., 2009). Participants were reimbursed by the study for the time needed to complete research assessments but no monetary incentives were provided for participation in CET or EST. For individuals who could not afford transportation costs, transportation reimbursement was provided regardless of treatment assignment. All individuals provided written informed consent prior to participation, and this research was reviewed and approved annually by the University of Pittsburgh Institutional Review Board. No significant adverse events were reported during the course of this research.

Data Analysis

Analyses for this investigation focused on characterizing differences in employment outcomes among the 46 individuals who completed 2 years of CET or EST. Critical outcomes included the number of individuals who were competitively employed, weekly earnings, whether the work was full- or part-time, type of occupation engaged in, and satisfaction with one's employment status. Significant differences in these outcomes were tested using likelihood ratio and independent *t* tests where appropriate, and Mann-Whitney *U* tests in the presence of highly skewed continuous (i.e., weekly earnings) data. In addition, secondary analyses were conducted with all 58 participants who received any treatment in the study to identify the degree to which cognitive improvement during CET mediated any potential effects of the treatment on obtaining competitive employment. These analyses used linear mixed-effects models and the mediator analytic framework for clinical trials of Kraemer, Wilson, Fairburn, and Agras (2002) with the intent-to-treat sample of 58 individuals who received any exposure to the two psychosocial treatments. The focus was to characterize the associations between improved neurocognition, social cognition, and movement toward competitive employment and to examine the degree to which improvements in these cognitive domains served as mechanisms of CET effects on increased engagement in employment. Mixed-effects models of cognitive growth adjusted for the confounding effects of age, gender, IQ, illness duration, and medication dose. In addition, error terms were allowed to correlate across time periods with descending magnitude via a first-order autoregressive error structure most appropriate for longitudinal models (Raudenbush & Bryk, 2002). Mixed models of movement toward competitive employment used the binary competitive employment variable from the MRAI as the dependent variable, made use of penalized quasi-likelihood estimation to model binary outcomes (Breslow & Clayton, 1993), and did not adjust for demographic, illness, or medication characteristics, as they were not associated with employment. Penalized quasi-likelihood estimation is a method of maximum-likelihood (ML) estimation used to construct ML estimates for nonnormal generalized linear mixed-effects models. In such

models, ML estimation based on normal theory can lead to substantially biased parameter estimates, and thus an alternative "quasi-likelihood" estimation is needed. Continuous variables were placed on a *z*-metric for the computation of odds ratios for these models. The size and significance of indirect effects was tested using the products of coefficients approach, with asymptotic tests for statistical significance (MacKinnon, Lockwood, Brown, Wang, & Hoffman, 2007; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002).

Results

Effects of CET on Employment Outcomes

We began our analyses by examining the effects of 2 years of CET treatment on a variety of employment outcomes compared to individuals who received 2 years of EST. As can be seen in Table 1, consistent with our previous report (Eack et al., 2009), a greater proportion of individuals receiving CET were competitively employed in paid jobs after 2 years of treatment compared to those receiving EST. Furthermore, individuals receiving CET earned significantly more money per week and were more satisfied with their employment status at the end of treatment. No significant differences emerged between treatment groups with regard to full-time employment, but CET participants were more likely to work on a part-time basis. Analysis of work patterns over the 2 years of study indicated that a significantly greater number of individuals receiving CET obtained new employment compared to EST, whereas the majority of participants treated with EST who were working were not able to maintain employment. In addition, a greater proportion of individuals receiving CET engaged in more skilled work, particularly clerical/sales jobs, although this difference with EST participants was only significant at a trend level ($p = .110$). Together, these findings suggest that not only did CET improve the likelihood that early course individuals with schizophrenia would engage in employment, but participation in CET also resulted in greater income and satisfaction with employment.

Cognitive Mechanisms of Improvement in Employment Outcomes

After finding that receiving CET produced significant benefits on a variety of employment outcomes, we proceeded to examine the degree to which the social-cognitive and neurocognitive effects of the treatment contributed to the beneficial effects of CET on employment. Table 2 presents direct and indirect relations between changes in cognition and movement to competitive employment across the 2 years of treatment. As expected, there was little overall growth in employment for the group of participants as a whole, but a significant Treatment \times Time interaction was present favoring CET with regard to the probability of becoming competitively employed. When examining the effects of changes in social cognition on employment, a significant

Table 1. Employment Characteristics Among Individuals With Early Schizophrenia Treated for 2 Years With Cognitive Enhancement Therapy or Enriched Supportive Therapy

Variable	CET (N = 24)		EST (N = 22)		Test	p	ES
	N	%	N	%			
Competitively employed	13	54	4	18	LR = 6.34	.009	$\phi = .37$
Job status							
Full time	6	25	3	14	LR = .96	.327	$\phi = .14$
Part time	7	29	1	5	LR = 5.40	.020	$\phi = .33$
Employment pattern					LR = 14.30	.003	V = .50
Achieved employment	10	42	2	9			
Maintained employment	3	12	2	9			
Lost employment	0	0	6	27			
Job category ^a					LR = 7.53	.110	V = .38
Professional	1	5	0	0			
Clerical/sales	5	23	1	5			
Skilled manual labor	1	5	0	0			
Unskilled labor	4	18	3	14			
	M	SD	M	SD			
Weekly earnings	207.92	337.97	69.77	156.47	U = 1044	.044	d = .53
Satisfaction with employment status ^b	2.46	1.56	3.77	1.69	t = -2.74	.009	d = -.81

Note. CET = cognitive enhancement therapy; ES = effect size; EST = enriched supportive therapy.

^a Job category data were missing for two employed individuals who received CET.

^b 1 = very satisfied; 2 = moderately satisfied; 3 = mildly satisfied; 4 = neutral; 5 = mildly dissatisfied; 6 = moderately dissatisfied; 7 = very dissatisfied.

Table 2. Direct and Indirect Effects of Cognitive Improvement on Probability of Employment (N = 58)

Variable	B	OR	SE	t	p ^a
Base Model					
Direct effects					
Treatment assignment (-I = EST, I = CET)	-0.65	0.52	.55	-1.17	.245
Time	0.66	1.93	.38	1.74	.086
Treatment Assignment × Time	0.99	2.69	.38	2.62	.010
Social Cognition Mediator Model					
Direct effects					
Treatment assignment (-I = EST, I = CET)	-0.74	0.48	.57	-1.31	.196
Time	-0.11	.90	.50	-0.21	.832
ΔSocial cognition	1.12	3.06	.48	2.34	.022
Treatment Assignment × Time	0.69	1.99	.38	1.80	.075
Indirect effect					
ΔSocial cognition	0.27	-	.13	-	.018
Neurocognition Mediator Model					
Direct effects					
Treatment assignment (-I = EST, I = CET)	-0.68	0.51	.62	-1.08	.283
Time	0.44	1.55	.43	1.03	.307
ΔNeurocognition	1.22	3.39	.43	2.84	.006
Treatment Assignment × Time	0.93	2.53	.42	2.20	.030
Indirect effect					
ΔNeurocognition	0.16	-	0.09	-	.017

Note. Mixed-effects models are based on an intent-to-treat analysis with all 58 individuals who received either CET or EST, regardless of treatment exposure. CET = cognitive enhancement therapy, EST = enriched supportive therapy.

^a p values for indirect effects are based on asymptotic distribution tests outlined by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002).

relationship emerged indicating that increases in social cognition were predictive of a greater probability of becoming employed, with individuals who experienced large (1 SD) improvements in social cognition being over 3 times more likely to engage in competitive employment. Analyses of the indirect effect of social-cognitive enhancement with respect to CET effects on

employment indicated that improved social cognition significantly mediated the beneficial effects of CET on employment status, and when taken into account, the direct effect of CET on employment was reduced to marginal levels.

With regard to neurocognitive change, which was also robust but more modest than social-cognitive improvement during this

trial (Eack et al., 2009), significant relations were observed between improvement in the overall neurocognitive composite and competitive employment. Inspection of model odds ratios indicated that individuals who experienced 1 *SD* of improvement in neurocognition were over 3 times more likely to become competitively employed. Furthermore, analyses of the indirect effects of CET on employment through neurocognitive improvement indicated that changes in neurocognition significantly mediated CET effects on employment status. However, this neurocognitive mediational effect appeared smaller than the effects of improved social cognition, which was evidenced by a more modest indirect effect size and a continued significant direct effect of CET on employment after adjusting for improved neurocognition. These results point to improvements in both social and nonsocial cognition as potential treatment mechanisms for improving competitive employment among individuals in the early course of schizophrenia.

Discussion and Applications to Practice

Cognition has emerged as a critical treatment target for individuals with schizophrenia. Numerous studies have shown that the cognitive difficulties experienced by this population place significant limitations on functional recovery from the disorder (Couture et al., 2006; Green et al., 2000). Unfortunately, antipsychotic medications and newer pharmacotherapies have little effect on these persistent cognitive impairments (Buchanan et al., 2007; Buchanan et al., 2008). At the same time, social workers and allied professionals have begun developing and adapting psychosocial cognitive rehabilitation methods to address this important unmet therapeutic need (Hogarty et al., 2004). In this study, we examined the effects of CET when applied in the early course of schizophrenia on a critical domain of functioning—employment. Results indicated that participants who received CET were significantly more likely to be competitively employed, earned more wages, and were more satisfied with their employment status by the end of 2 years of treatment. Effects on employment and wages earned were of medium magnitude, and effects on employment satisfaction were large, supporting the clinical significance of these findings for CET participants. Furthermore, these improvements in employment were attributable, in part, to the cognitive gains made by such individuals during CET treatment. Such findings suggest that addressing impairments in both neurocognition and social cognition may serve as critical mechanism for greater functional recovery from schizophrenia and that social work practitioners and treatment developers need to attend to these problems with their clients. In addition, these results continue to support the use of social work interventions as key adjuncts to pharmacotherapy and the ability of psychosocial treatment to affect the biopsychosocial aspects of the schizophrenia.

To date, this is the first study to point to active cognitive improvements as a mechanism for enhancing employment outcomes among individuals with schizophrenia. It is particularly important to note that both neurocognitive and social—cognitive

improvements contributed to improved employment in this study, which suggests both domains of cognition need to be targeted and integrated into treatment. Previous studies of short-term rehabilitation programs that only address problems in neurocognition have yielded little effects on functioning in this population (Fisher, Holland, Merzenich, & Vinogradov, 2009; Wykes et al., 2007), and CET remains the only cognitive rehabilitation approach that currently integrates the treatment of social and nonsocial cognition. Given the importance of the social context and social information processing to community adjustment, it is not surprising that social cognition plays a key role in helping individuals secure and maintain work. As such, social work rehabilitation programs seeking to optimize work outcomes with their clients might profitably incorporate treatments, such as CET, to address difficulties in social cognition.

Although this work has important implications for social work practice, several limitations should be noted. First, the sample size included in this research was modest. The *a priori* objective sample size for this research was 30 participants per treatment group, based on the large effect sizes observed in our previous study of CET (Hogarty et al., 2004), and with 58 participants studied, sufficient power was available to detect differences in a variety of employment outcomes. Second, no information was available regarding on-the-job functioning, so while CET was able to help individuals become employed and more satisfied with their employment status, it is unclear whether such individuals were succeeding in their work. However, it seems likely that the large improvements in social adjustment observed in this study would have also contributed to enhanced work performance in this sample (Eack et al., 2009). Third, the durability of these effects is not addressed in this research, and it is unknown whether CET can improve not only the attainment of but also tenure in competitive employment. Previous studies of supported employment and individual place and train programs have demonstrated very high rates of obtaining initial employment, only to later find short job tenure and frequent turnover. In this study, individuals who received CET and became employed mid-treatment were all employed at the end of treatment 1-year later. Perhaps by addressing a core psychological impairment in schizophrenia, CET can better facilitate the maintenance of employment gains. Currently, a 1-year posttreatment follow-up is being completed with individuals who participated in this trial to examine this possibility. Fourth, assessments were not conducted by raters who were blind to treatment assignment. Although this could bias functional ratings, employment outcomes such as hours worked and weekly earnings are relatively objective measures that leave little room for rater bias. Fifth, inclusion in this trial precluded individuals who used substances and had comorbid developmental disabilities, which limits the applicability of these findings to those populations. Finally, it is important to remember that CET is not an employment intervention. Although the treatment appears to have had beneficial effects on several employment outcomes, 46% of the people who received CET were still unemployed at the end of treatment. The primary focus of CET is cognition, and

improving cognitive functioning is likely to be necessary but not sufficient for helping some individuals return to work. The integration of CET with other vocational rehabilitation programs might serve as a particularly effective treatment package for improving employment outcomes among people with schizophrenia.

In summary, this research found significant improvements in competitive employment, wages earned, and satisfaction with employment status among outpatients in the early course of schizophrenia treated with CET compared to an active supportive control. Mediator analyses showed that improvements in cognition served as potential mechanisms for achieving greater rates of competitive employment among individuals treated with CET. These findings highlight the beneficial effects of cognitive rehabilitation on employment in early schizophrenia and begin to identify its active mechanisms. Social workers seeking to enhance functional recovery among the individuals with schizophrenia that they treat should collaborate with colleagues and administrators in their agencies to incorporate such methods into their practice. Future research will need to determine whether the effects of CET on employment are durable, generalize to work performance, and result in longer job tenure in this population.

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