Published in final edited form as:

Soc Work. 2012 July ; 57(3): 235–246.

Cognitive Remediation: A New Generation of Psychosocial Interventions for People with Schizophrenia

Shaun M. Eack¹

School of Social Work, University of Pittsburgh

Abstract

Schizophrenia is a mental health condition characterized by broad impairments in cognition, which place profound limitations on functional recovery. Social work has an enduring legacy in pioneering the development of novel psychosocial interventions for people with schizophrenia, and this article introduces cognitive remediation, the latest advance in psychosocial treatments for the disorder designed to improve cognition. First, an overview of the nature of cognitive impairments and their functional consequences in schizophrenia is presented, followed by a description of the theoretical basis and key practice principles of cognitive remediation. Next, the latest biopsychosocial evidence for the efficacy of cognitive remediation in schizophrenia is critically reviewed. Finally, a model cognitive remediation program, Cognitive Enhancement Therapy, which was developed and evaluated by a social work-led multidisciplinary team is presented. Cognitive Enhancement Therapy represents a significant advance in cognitive remediation for schizophrenia, and uses a unique holistic approach that extends beyond traditional neurocognitive training to facilitate the achievement of adult social-cognitive milestones and broader functional recovery. It is concluded that cognitive remediation represents an effective next generation of psychosocial interventions that social workers can use to help improve the lives of many people who live with schizophrenia.

Keywords

Schizophrenia; Psychosocial Treatment; Cognitive Remediation; Social Cognition; Cognitive Enhancement Therapy

Schizophrenia is a mental health condition that places considerable burden on the individuals who suffer from it, their families, and society. The introduction of antipsychotic medications has helped people who live with schizophrenia to control the hallucinations, delusions, and other positive symptoms of psychosis, which has made it possible for many individuals to live in the community. Unfortunately, despite antipsychotic medication, most individuals with schizophrenia continue to experience significant social, functional, and vocational disability leading to a poor quality of life (Swartz et al., 2007). The consistent observation that antipsychotic pharmacotherapy alone is often not enough to address the devastating functional consequences of this condition has highlighted the critical importance of the use of psychosocial interventions to help further support the recovery of people with schizophrenia.

Social workers are the primary providers of psychosocial treatments for people with schizophrenia (Substance Abuse and Mental Health Services Administration, 2001), and

¹Address correspondence to: Shaun M. Eack, Ph.D., School of Social Work, University of Pittsburgh, 2117 Cathedral of Learning, Pittsburgh, PA 15206. Phone: 412-648-9029. sme12@pitt.edu.

have pioneered the development, evaluation, and use of psychosocial interventions in this population. Major contributions of social work have included early forms of social casework (Hogarty et al., 1973), assertive community treatment (Stein & Test, 1980), family psychoeducation (Anderson, Reiss, & Hogarty, 1986), strengths-based case management (Rapp, 1998), personal therapy (Hogarty et al., 1997) and many others. When combined with antipsychotic medication, these interventions have helped lengthen community tenure, prevent psychotic relapse, improve family functioning, and dramatically reduce the disability associated with this condition.

Despite our best efforts and the development of highly effective psychosocial treatments, a complete functional recovery from the illness continues to remain out of reach for the majority of affected individuals. This has led to a concerted effort to identify novel treatment targets that might begin to offer additional hope and relief beyond the current best available interventions. Recently, broad impairments in cognition have emerged as important and often overlooked contributors to functional disability in schizophrenia (Green, Kern, Braff, & Mintz, 2000). Significant impairments have been observed across a variety of cognitive domains (Heinrichs & Zakzanis, 1998; Penn, Corrigan, Bentall, Racenstein, & Newman, 1997), and have been shown to be major contributors to functional disability in the schizophrenia (Brekke, Hoe, Long, & Green, 2007; Couture, Penn, & Roberts, 2006; Green, Kern, Braff, & Mintz, 2000), even more so than the hallmark positive symptoms of psychosis. Unfortunately, to date, these disabling impairments in cognition have been largely unresponsive to pharmacotherapy (Keefe et al., 2007).

While effective medications for improving cognition in schizophrenia have yet to be developed, social workers have collaborated with colleagues from other disciplines to develop psychosocial treatments that can enhance cognition in persons with schizophrenia (e.g., Hogarty et al., 2004; Eack et al., 2009). Collectively, these interventions have become known as cognitive remediation approaches - psychosocial interventions designed to enhance cognition through the use of targeted cognitive exercises and training. This article provides an introduction for social work practitioners and researchers of cognitive remediation for people with schizophrenia. An overview and topology of cognitive impairment in schizophrenia is first introduced, followed by a presentation of the theory and practice principles of cognitive remediation. A critical review of the latest evidence of the effects of cognitive remediation on cognition, the brain, and behavior in schizophrenia is then discussed. Finally, practice principles and the evidence base for cognitive remediation are contextualized in an overview and illustration of Cognitive Enhancement Therapy (Hogarty & Greenwald, 2006), a novel and model approach to cognitive remediation developed by Gerard E. Hogarty, M.S.W. and colleagues that takes a holistic view toward the treatment of cognition and facilitation of functional recovery in schizophrenia.

Cognitive Impairment as a Barrier to Functional Recovery from Schizophrenia

Over the past several decades, investigators have documented a profound array of cognitive impairments in schizophrenia. These impairments have been classified broadly as those associated with *neurocognition* and *social cognition*. Neurocognition is defined by the basic cognitive processes involved in supporting thinking and reasoning, which includes attention, memory, and executive function abilities. Attention is critical for detecting salient and important information to be encoded and processed, and memory is necessary for storing that information. Working memory, in particular, is essential for completing everyday tasks, as it is a form of memory that allows a person to hold a small amount of information in her/his mind to perform a given behavior (e.g., remembering a telephone number to make a call). The executive functions are equally important, as they consist of the high-order

cognitive abilities that direct mental resources (such as attention and working memory) to a given problem, and inhibit cognitive responses when necessary. Well over 200 quantitative studies have now been published on neurocognitive impairment in schizophrenia, and meta-analytic reviews of these studies indicate that individuals with the condition perform on average .50 to 1.00 *SD* below the mean of individuals without the illness (Heinrichs & Zakzanis, 1998). Although every neurocognitive domain that has been tested appears to be affected, areas of greatest impairment include verbal memory and attention.

The study of impairments in social cognition is a relatively recent focus in schizophrenia research. Social cognition refers to the cognitive abilities that support the processing, interpretation, and regulation of socio-emotional information (Newman, 2001). Key domains of social cognition that have been studied include perspective-taking, theory of mind, emotion perception, emotion regulation, social cue recognition, and causal attributions of social phenomena. Most studies indicate medium to large degrees of impairment in these domains among people with schizophrenia compared to those without the condition (see Green et al., 2008 for review). While it is increasingly clear that people with schizophrenia have significant impairments in social cognition, the domains of greatest impairment continue to remain unknown.

The consistent documentation of impairments in neurocognition and social cognition in schizophrenia has led social workers and other researchers to investigate the functional impact of these cognitive difficulties. Logically, difficulties in maintaining attention and holding information in memory would seem to impair the ability to work or effectively carry on a conversation. In addition, interpersonal functioning is highly dependent upon understanding the perspectives of others and non-verbal communication, making social-cognitive impairments likely contributors to the marked social disability experienced by many people with schizophrenia. For over a decade, Brekke and colleagues have shown that broad impairments in neurocognition, as well as emotion perception, are important longitudinal predictors of role functioning and adjustment in individuals with schizophrenia (Brekke, Hoe, Long, & Green, 2007). To date, more than 50 studies have examined the impact of cognitive impairment in schizophrenia on recovery from the illness, and findings are largely consistent with the work of Brekke and colleagues (Green, Kern, Braff, & Mintz, 2000). Most notably, impairments in social cognition appear to have particularly negative effects on functional recovery in schizophrenia, especially impairments in emotion perception, cue recognition, and emotion regulation, which have been broadly associated with poor interpersonal functioning, community adjustment, and vocational functioning (Couture, Penn, & Roberts, 2006; Eack et al., 2010a).

Neuroplasticity and the Science of Brain Change

For many years, social workers have held the proposition that the interaction between biology and the social environment is bidirectional (Germain & Gitterman, 1980). This principle lays the foundation for theories of how certain types of environmental experiences can positively shape biological processes, such as those underlying cognitive impairments in schizophrenia (Keshavan & Hogarty, 1999). The capacity of the brain to change based on environmental experiences is known as *neuroplasticity*. This model of the brain recognizes that the brain is a "plastic", malleable organ that is constantly undergoing reorganization and change (Bruehl-Jungerman, Davis, & Laroche, 2007). Initial evidence for neuroplasticity came from animal studies demonstrating that the mere process of learning induced changes in cortical organization and the interaction between different brain systems (e.g., Kleim, Barbay, & Nudo, 1998).

Based on the emerging field of neuroplasticity and the evidence that learning and environmental experiences can shape cognitive processing at a basic neurobiological level (Bruehl-Jungman, Davis, & Laroche, 2007), researchers began exploring ways to improve brain function, and thus the field of cognitive remediation was born. Initial studies were conducted with individuals who had experienced a traumatic brain injury or stroke. Some observed that those who had lost significant motor skills due to brain injury could not only improve their motor functioning by practicing motor-based exercises, but could also improve brain function in the motor cortex (Robertson & Murre, 1999). As such studies emerged, researchers started formulating different practice principles that could be used to target specific cognitive domains, capitalize on neuroplasticity, and enhance brain function in a variety of disorders (Ben-Yishay, Piasetsky, & Rattok, 1985; Hogarty & Flesher, 1999b). These principles, while diverse, eventually became some of the key guiding practice principles of cognitive remediation for schizophrenia.

Practice Principles of Cognitive Remediation

The group of treatment approaches collectively referred to as cognitive remediation can vary substantially and ranges from completing Sudoku exercises to using highly sophisticated computerized programs designed to enhance specific domains of cognitive function. Some approaches are completed individually, some with a therapist or coach, and some in groups. Some cognitive remediation programs focus only on neurocognition (Fisher, Holland, Merzenich, & Vinogradov, 2009; Wykes et al., 2007), while others focus on social cognition (Horan et al., 2009), and still others focus on an integration of the two during treatment (Hogarty et al., 2004). Despite the diversity of cognitive remediation approaches in schizophrenia, a set of clear practice principles has emerged. While these principles are not universal to all approaches, they do cover the breadth of strategies employed within and across the most effective programs. Regardless of the specific approach, physical exercise is a helpful analogy for cognitive remediation. When individuals have a desire to become physically stronger, they adopt a set of routines designed to exercise the specific areas of the body they wish to strengthen. Cognitive remediation can be thought of as a mental workout designed to strengthen or enhance brain function and cognition.

Table 1 lists some key practice principles of cognitive remediation programs for individuals with schizophrenia. Nearly every cognitive remediation approach makes use of *strategic* and/or *drill and practice* techniques. Although some approaches focus more on strategy than drill and practice or vice versa, many include components of both. Strategic training helps individuals learn to generate strategies for solving cognitive problems and enhancing performance, such as the use of mnemonic devices and the encoding of information in personally meaningful ways. Strategic training is often combined with drill and practice techniques, which consist of completing and practicing a problem or exercise until a peak level of performance is reached. Not everyone has the same cognitive capacity, so peak performance levels vary across individuals. Typically, individuals practice cognitive exercises until their performance has improved beyond their initial performance.

Although not all cognitive remediation programs focus on multiple cognitive abilities, the most effective programs target broad cognitive domains (McGurk, Twamley, Sitzer, McHugo, & Mueser, 2007). Cognitive abilities are not targeted at random, but in a *hierarchical* fashion from lower-order to higher-order cognitive functions. This is based upon information processing models that indicate the need for simple cognitive abilities (e.g., attention) to support more complex information processing, such as reasoning, problem-solving, and other executive functions. The belief is that higher-order cognitive abilities cannot be fully remediated unless the basic building blocks of cognition are also improved.

Some cognitive remediation programs also use *cueing* and *fading* concepts from learning theory to help shape cognitive performance and gradually increase the difficulty of cognitive exercises. Cueing refers to the use of prompts or external aids, usually visual or auditory, to help increase the performance of individuals on a given exercise. For example, when targeting processing speed and attention during cognitive remediation, a typical exercise of this kind requires individuals to respond as quickly as possible to a given stimulus (e.g., a dot on the computer screen) after waiting for a 5 second interval (Ben-Yishay, Piasetsky, & Rattok, 1985). The exercise is made easier by first saturating the cues to the upcoming stimulus to their maximum, which consists of providing an auditory beep for every second during the waiting period. This way, individuals know that at the end of the last (5th) beep they need to respond to the stimulus. Attention is then reliant upon the external cues (auditory beeps) provided by the computer. With improving performance, these cues are reduced or faded (e.g., 3 beeps for the first 3 s and no beep for the final 2 s) and individuals have to learn to internalize the auditory cues that previously helped their performance. In this way, neural circuitry supporting attention is increasingly exercised. The same principles of cueing and fading are also practiced in cognitive exercises focusing on memory, executive functions, and social cognition.

The cueing and fading techniques used in cognitive remediation are designed to adjust or tailor the difficulty of exercises both to each person's initial level of ability and his/her progress. As such, cognitive remediation is usually *adaptive* and focuses on providing enough of a challenge for people with schizophrenia to engage and exercise their cognitive abilities, while not being so challenging that success is impossible. In addition, the most effective cognitive remediation programs use *anchoring* techniques to engage individuals and promote the generalization of cognitive abilities learned during cognitive remediation. Consistent with guidelines for good clinical practice, a clear rationale for each cognitive remediation exercise is given that includes a specific anchor to "real world" behaviors and functioning.

Finally, to maximize the benefits of cognitive remediation, particularly neurocognitive remediation, it is essential to *integrate* these approaches with broader treatments and supports for schizophrenia. Seminal work by Hogarty and colleagues documented the importance of using antipsychotic pharmacotherapy as a foundation for psychosocial treatment in schizophrenia (Hogarty et al., 1973). In addition, recovery from schizophrenia relies on improvement in many areas of community life, and other effective treatments and supports must be provided to help individuals to achieve a better quality of life. This principle is consistent with the larger mental health recovery movement (Davidson, Schmutte, Dinzeo, Andres-Hyman, 2008), which has shown that people with schizophrenia can recover (Harding, Brooks, Ashikaga, Strauss, 1987; Harrow, Grossman, Jobe, & Herbener, 2005), but that recovery does not mean the mere resolution of symptoms (cognitive or otherwise). Recovery also does not mean that one is cured from a particular condition, but refers to the maximization of a person's strengths to achieve a desired and meaningful quality of life (Anthony, 1993). As such, treatments can no longer be viewed as isolated approaches designed to "cure" an individual, but rather are integrated into a larger program of supports to provide a holistic approach designed to enhance all aspects of well-being.

Cognitive remediation approaches have adopted this larger view of mental health recovery in schizophrenia, and recognize that the improvement of such cognitive abilities as attention and memory is of little use in the absence of meaningful life activities that rely on these abilities. Cognitive remediation is seen as a method for helping individuals with schizophrenia to enhance their cognitive abilities so that they can achieve a "functional recovery" - the engagement in those functional activities (e.g., school, employment, living

independently) that are major recovery goals for many people with the condition. However, without integration with other treatment approaches and supports, the opportunity for such a functional recovery based on cognitive improvement alone is limited. In fact, the most innovative and effective programs have integrated other intervention approaches directly within their cognitive remediation programs (e.g., Hogarty et al., 2004; McGurk, Mueser, & Pascaris, 2005), and when cognitive enhancement occurs in the context of meaningful functional activities the level of improvement can be striking. Consequently, while cognitive remediation is an important tool for facilitating the recovery of people with schizophrenia, social work practitioners should not forget that there are other empirically supported treatments available.

Empirical Support

The recognition of cognitive impairments as critical barriers to the functional recovery of individuals with schizophrenia, and the development of practice principles and methods for employing cognitive remediation to address these impairments has led to a number of international efforts to evaluate the efficacy of cognitive remediation in schizophrenia. To date, there have been over 25 independent, randomized-controlled trials of cognitive remediation for people with this condition. The majority of treatment trials have only used neurocognitive remediation and evaluated effects on neurocognition. In these studies, short-term (3 to 6 months) neurocognitive remediation has been shown to be effective at improving attention, processing speed, working memory, and executive functioning - many of the cognitive domains where people with schizophrenia experience the greatest difficulty (Fisher, Holland, Merzenich, & Vinogradov, 2009; Wykes et al., 2007). However, one recent study showed no benefits of neurocognitive remediation on cognition in those with schizophrenia (Dickinson et al., 2010). Overall, meta-analytic reviews indicate an average medium-sized ($d = .41$) level of improvement in basic neurocognitive function across all randomized controlled trials (McGurk, Twamley, Sitzler, McHugo, & Mueser, 2007). Such findings demonstrate that it is feasible to directly enhance such cognitive domains as attention, memory, and problem-solving in schizophrenia with a psychosocial treatment approach.

Fewer studies have targeted social cognition during remediation. A 12-week social cognition training program with 31 individuals with schizophrenia found large, but circumscribed improvements in emotion perception (Horan et al., 2009). Another study with 31 individuals with schizophrenia used a 20-week group-based social cognition training program, and again found significant, although circumscribed benefits for emotion perception (Roberts & Penn, 2009). To date, Cognitive Enhancement Therapy (CET; Hogarty & Greenwald, 2006), a comprehensive approach to the remediation of social and non-social cognitive impairments in schizophrenia, continues to represent one of the most rigorously evaluated and effective cognitive remediation approaches that targets impairments in both neurocognition and social cognition. The approach builds on neurocognitive training strategies initially developed for those with traumatic brain injury, and extends in a novel fashion to incorporate small group-based methods to enhance social cognition. Two large-scale National Institute of Mental Health-supported trials of CET with over 170 individuals with schizophrenia have been conducted. Results have indicated that CET can produce large ($d > 1.00$) and significant improvements in broad social-cognitive domains, including emotion regulation, emotion perception, foresight, supportiveness, and other areas. Improvement in these aspects of social cognition are critical for recovery from schizophrenia, as they provide the foundation cognitive abilities needed to succeed in interpersonal relations and most social situations. Importantly, since CET also targets impairments in neurocognition, significant and sizable ($d = 1.46$ in long-term schizophrenia and $d = .57$ in early course schizophrenia) benefits in this domain have also been observed (Hogarty et al., 2004; Eack et al., 2009; Eack, Hogarty,

Greenwald, Hogarty, & Keshavan, 2007). The integration of neurocognitive and social-cognitive remediation approaches into a single treatment in CET has been viewed as essential (Hogarty & Flesher, 1999a), and may be one of the principle reasons why the approach has been so effective.

The marked effects of cognitive remediation on neurocognition and social cognition has increased interest in the possibility that these psychosocial intervention programs are resulting in direct benefits to the brain of people with schizophrenia. If the principles of neuroplasticity are supported and cognitive remediation is capitalizing on them, then it should be expected that these changes in cognition are reflective of changes in underlying neurobiologic processes. Evidence in this area is only recently emerging. Two early studies using functional magnetic resonance imaging found that after short-term neurocognitive remediation individuals with schizophrenia demonstrated significant increases in frontal brain function (Wexler, Anderson, Fulbright, & Gore, 2000; Wykes et al., 2002), which have been recently replicated (Haut, Lim, & MacDonald, in press). Very recently, it has been shown that CET can prevent the typical brain loss seen in schizophrenia in areas associated with social cognition when applied as an early intervention strategy (Eack et al., 2010b). Together, these findings provide exciting early support that cognitive remediation approaches may enhance the structural and functional integrity of the brain in schizophrenia.

Of course, for social workers and indeed the clients we serve, the improvement of cognition is but a means to an end. All cognitive remediation approaches have held the assumption that if cognition can be broadly improved, meaningful gains in functioning and personal recovery will be achieved. Findings with regard to functional recovery, however, have been mixed. Short-term (3 to 6 months) neurocognitive remediation programs have yielded little, if any benefits on functioning and recovery in the disorder (Dickinson et al., 2010; Fisher, Holland, Merzenich, & Vinogradov, 2009; Wykes et al., 2007). However, evidence does indicate that individuals who participate in these programs are generally satisfied with the cognitive training exercises. In fact, a study specifically examining the consumer perspective during cognitive remediation found high levels of satisfaction among participants (Rose et al., 2008). Further, some studies have demonstrated improvements in such domains as personal autonomy and satisfaction with cognitive abilities (e.g., Lecardeur et al., 2009; Penadés et al., 2006), which may not stem from large functional gains, but nonetheless reflect important improvements in consumer perceptions of their own recovery.

Longer-term programs and those that integrate neurocognitive training with social-cognitive remediation and broader psychosocial treatment strategies, such as CET, have shown much larger benefits to functional and personal recovery outcomes. In CET, large ($d > 1.00$) functional benefits have been observed in social adjustment, activities of daily living, social functioning, and instrumental task performance (Hogarty et al., 2004; Eack et al., 2009), which were durable one year after the completion of treatment (Hogarty, Greenwald, & Eack, 2006; Eack, Greenwald, Hogarty, & Keshavan, 2010). The increased socialization and satisfaction with social relations people experience during CET are critical aspects of recovery from schizophrenia, which open the doors to enhancing social networks, building friendships and intimate partnerships, and becoming more integrated into the community. Further, examinations of perceived and actual benefits on employment, another key domain of recovery for many consumers, have shown that after completing CET individuals were more likely to be employed in competitive jobs, earn more income, and be more satisfied with their employment situation (Eack, Hogarty, Greenwald, Hogarty, & Keshavan, in press). McGurk and colleagues have also combined neurocognitive remediation with supported employment programs and found significant benefits to employment (McGurk, Mueser, Feldman, Wolfe, & Pascaris, 2007). Indeed, a recent meta-analysis found that only those cognitive remediation programs that also included broader psychosocial treatment

strategies demonstrated benefits to functional recovery (McGurk, Twamley, Sitzer, McHugo, & Mueser, 2007). With regard to consumer perceptions of such interventions, high levels of satisfaction have been reported along with perceived relevance to daily life (Horan et al., 2009).

In summary, empirical support for the benefits of cognitive remediation on cognition, the brain, and recovery in schizophrenia is growing. The feasibility of improving cognition in the disorder has now been firmly documented, despite hearty initial skepticism about whether cognition could or needed to be improved in schizophrenia (Bellack, 1992). Increasingly, neurobiologic studies are showing just how much of an impact psychosocial interventions can have on the brain in schizophrenia. However, what has also emerged from this evidence is that the isolated short-term remediation of limited domains of neurocognition is unlikely to translate into meaningful improvements in functional recovery in the condition. Rather, long-term and integrative approaches that take a holistic view of the individual and their recovery, such as CET, appear to be needed to realize the potential functional benefits of cognitive remediation.

Model Program: Cognitive Enhancement Therapy

Cognitive Enhancement Therapy (CET) is a model cognitive remediation program developed by Gerard E. Hogarty, M.S.W and colleagues at the University of Pittsburgh. This intervention illustrates the key practice principles of cognitive remediation for schizophrenia, and how these principles were extended in innovative directions by a social work-led multidisciplinary team to arrive at a uniquely holistic, empowering, and effective intervention for people with the condition.

CET is comprehensive approach to the enhancement of neurocognition and social cognition in schizophrenia that focuses on the achievement of adult social-cognitive milestones (e.g., perspective-taking, social context appraisal) through the shifting of information processing from a reliance on effortful, serial processing that is characteristic of pre-adolescent thinking styles to a more rapid, parallel and "gistful" abstraction of social and non-social information. The treatment is provided over the course of 18 months and consists of 60 hours of computer-based neurocognitive training in attention, memory, and executive function using software developed by Ben-Yishay (Ben-Yishay, Piasetsky, & Rattok, 1985) and Bracy (Bracy, 1994) originally for people with a traumatic brain injury; and 45 social-cognitive group therapy sessions that employ experiential learning exercises designed to further improve neurocognitive abilities and enhance social cognition. Neurocognitive training is conducted weekly for 1 hour, and the social-cognitive group sessions are conducted concurrently every week for 1.5 hours, after participants have completed a few months of neurocognitive training. A complete description of the treatment is available in the training manual (Hogarty & Greenwald, 2006).

Neurocognitive training begins in a hierarchical fashion with training in attention, and then proceeds to memory, and executive function or problem-solving. There are a total of 16 cognitive exercise routines (3 attention, 7 memory, and 6 problem-solving), and Figure 1 presents an example of each type of exercise. In the attention training example (Figure 1a), individuals must react quickly to press the space bar on the keyboard when the center light flashes. An initial cue is given to let the participant know the exercise is beginning, and then a series of adjustable auditory cues are given during a 5 s interval, after which the center light will turn on. Individuals must respond within a short (e.g., 300 ms) window in order to illuminate all 9 of the feedback lights that form a triangle across the screen. Gradually, as individuals master the exercise, the auditory cues are faded and the window of response time is reduced, to provide a progressively more difficult attention exercise. In the memory

training example (Figure 1b), several objects from the bottom of the screen are flashed on the upper part of the screen for a brief period (3 s). Individuals are then asked to remember the objects and their locations. Participants must learn to encode the objects and their locations in meaningful ways, which usually involves inventing a system for naming the objects and a gestalt of their particular arrangement (e.g., a sideways L). In the problem-solving training example (Figure 1c), individuals are asked to place a series of numbers in order. The position of the numbers can be changed by clicking on them with the mouse, which results in the clicked number moving to the beginning of the series and all the numbers to the left of it reversing their position. The key to this exercise is to first figure out the rule or gist for moving the numbers, and then to plan carefully what numbers to click on to solve the task in the shortest number of trials. Together, these and the other exercises in CET help improve the information processing abilities needed for good work performance, organization, mental stamina, and other key functional abilities.

The cognitive difficulties experienced by individuals with schizophrenia are not limited to attention, memory, and problem-solving. Even if these domains were significantly improved, many individuals remain markedly socially disabled due to impairments in social cognition. CET is one of the few, if only cognitive remediation approaches that specifically targets impairments in both neurocognition and social cognition. In the earliest phases of the treatment, CET targets basic problems in social cognition through the use of client pairs in neurocognitive remediation, which embeds the computer-based training in a social context that encourages socialization and provides opportunities to practice giving support. After approximately 3 months of neurocognitive training in attention, 3 to 4 client pairs join to form a social-cognitive group. The group environment is essential for enhancing social cognition. In CET, a broad range of social-cognitive abilities are targeted based on developmental theories of social cognition (Hogarty & Flesher, 1999a; Selman & Schultz, 1990), and range from abstracting the "gist" or main point in social interactions to perspective-taking, social context appraisal, and emotion management. In the initial CET group sessions, each client works with a coach to develop recovery plans that are displayed on poster boards in the CET group and used to anchor personal treatment goals to meaningful functional outcomes (see Table 2).

The social-cognitive groups are a uniquely rich component of CET, and social cognition is directly targeted using psychoeducation, cognitive exercises, and homework. Psychoeducation lectures introduce a new social-cognitive concept (e.g., perspective-taking, cognitive flexibility) to members during the group session. A cognitive exercise is also performed which makes use of experiential learning strategies to practice and enhance social-cognitive abilities. Almost all group exercises require that participants take the perspective of another person, and every exercise relies on multiple aspects of social and non-social cognition. For example, in an exercise called "Condensed Message," two participants are asked to solve a social problem. They are given a written social scenario where an individual has encountered a problem (e.g., his father's wallet was found at a restaurant in the airport) and he must send a brief (e.g., 10 words or less) message through the airport public address system to his father. The participant pair must work together to create a concise message that will get the recipient to act accordingly to solve the problem. This cognitive exercise requires participants to take the perspective of the person encountering the problem, and to generate a gistful, but meaningful message to encourage appropriate and immediate action. Participants must judge the social context (e.g., there could be consequences to announcing over the airport public address system that someone's wallet is available at the restaurant). At the same time, the other group members are given feedback sheets asking questions about the intellectual, emotional, and teamwork performance of the participant pair during the exercise. This feedback is then presented verbally to the peers to practice expressing tactful and supportive feedback, and to facilitate

group-wide engagement. Finally, homework is used to strengthen the everyday application of social-cognitive abilities learned within the group setting, and is based upon a previous psychoeducational talk given by a coach on a new CET concept. Completed homework is presented by every participant in the group, and consistent with the active nature of CET, homework sessions are chaired by a client who calls on her/his peers to present, as well as the coaches to ask questions. Together, these small-group social-cognitive activities are integrated with neurocognitive training to provide a holistic cognitive remediation program that targets the wide array of cognitive impairments that limit recovery from schizophrenia.

Conclusions

Schizophrenia is characterized by marked cognitive impairments that are unresponsive to current pharmacotherapies and place significant limitations on functional recovery from the condition. Social workers are the primary providers of psychosocial treatment to individuals with schizophrenia (Substance Abuse and Mental Health Services Administration, 2001), and have led the effort to develop and test more effective psychosocial interventions for this population. This article has presented an overview of cognitive remediation, a new generation of psychosocial interventions designed to enhance cognition and functional recovery in schizophrenia. As with previous psychosocial advances, social workers have taken a leading role in developing and testing cognitive remediation programs for people who live with this condition.

Evidence, to date, supports the use of cognitive remediation in community and social work practice settings in combination with pharmacotherapy and other psychosocial treatments. Unfortunately, many social work practitioners are not aware of the availability of these approaches and their potential benefits. It is hoped that this overview of the practice principles and evidence supporting cognitive remediation in schizophrenia will encourage practitioners to adopt this considerable advance in schizophrenia treatment. It is also hoped that the presentation of CET as a model cognitive remediation approach will provide practitioners with a concrete example of the principles of cognitive remediation in practice and encourage them to use creative and comprehensive cognitive remediation interventions that are more likely to translate into meaningful functional gains for their clients.

The widespread implementation of cognitive remediation for individuals with schizophrenia is just beginning, and it is the social work workforce that will have the largest impact in bringing this next generation of psychosocial treatments to the many underserved individuals who experience this condition. Practitioners and agency directors interested in implementing cognitive remediation programs should encounter little difficulty. All of the programs that have been developed and tested for schizophrenia are available from the developers, many of which can be obtained online. A comprehensive training manual has also been completed for CET to facilitate its implementation in community settings (Hogarty & Greenwald, 2006). Technological resources are minimal and limited largely to several computers, neurocognitive training software, and standard office supplies. Most training programs will operate adequately on older computers, and many community agencies already provide computer access to their consumers. Some practitioner training is usually recommended, although a number of programs have very complete training manuals that reduce the need for large amounts of directed training. Programs focusing on social cognition usually rely on small group techniques, which is a common area of practice expertise in social work. Our group has also had success in obtaining third-party reimbursement for CET, which is essential for most agencies. As a consequence, social work practitioners interested in implementing cognitive remediation should find the process to be feasible.

In addition to introducing cognitive remediation as a new evidence-based practice that many social workers might find helpful to implement in their agencies, it is hoped that this review of cognitive impairment in schizophrenia will raise awareness of the importance of this domain among practitioners and the availability of effective strategies social workers can use to address impairments in cognition. Finally, it is hoped that the evidence presented on the effects of cognitive remediation on brain impairments in schizophrenia previously thought to be intractable will renew social workers' faith in the power of psychosocial intervention for this population. The strides we have made as social workers in expanding the treatment options for people living with schizophrenia beyond the benefits of antipsychotic medications have helped many realize a greater quality of life and experience of recovery. Cognitive remediation represents the latest advance in this effort, and its inclusion in routine clinical practice could substantially improve the lives of the many individuals who experience this condition.

References

- Anderson, CM.; Reiss, DJ.; Hogarty, GE. Schizophrenia and the family. New York: Guilford; 1986.
- Anthony WA. Recovery from mental illness: The guiding vision of the mental health service system in the 1990s. *Psychosocial Rehabilitation Journal*. 1993; 16:11–23.
- Bellack AS. Cognitive Rehabilitation for Schizophrenia: Is it Possible? Is it Necessary. *Schizophrenia Bulletin*. 1992; 18:43–50. [PubMed: 1553499]
- Ben-Yishay, Y.; Piasetsky, EB.; Rattok, J. A systematic method for ameliorating disorders in basic attention. In: Meir, MJ.; Benton, AL.; Diller, L., editors. *Neuropsychological rehabilitation*. New York: Guilford Press; 1985. p. 165-181.
- Bracy, OL. PSSCogRehab [computer software]. Indianapolis, IN: Psychological Software Services Inc; 1994.
- Brekke JS, Hoe M, Long J, Green MF. How Neurocognition and Social Cognition Influence Functional Change During Community-Based Psychosocial Rehabilitation for Individuals with Schizophrenia. *Schizophrenia Bulletin*. 2007; 33:1247–1256. [PubMed: 17255120]
- Bruel-Jungerman E, Davis S, Laroche S. Brain plasticity mechanisms and memory: a party of four. *Neuroscientist*. 2007; 13:492–505. [PubMed: 17901258]
- Couture SM, Penn DL, Roberts DL. The Functional Significance of Social Cognition in Schizophrenia: A Review. *Schizophrenia Bulletin*. 2006; 32:S44–S63. [PubMed: 16916889]
- Davidson L, Schmutte T, Dinzeo T, Andres-Hyman R. Remission and recovery in schizophrenia: practitioner and patient perspectives. *Schizophrenia Bulletin*. 2008; 34:5–8. [PubMed: 17984297]
- Dickinson D, Tenhula W, Morris S, Brown C, Peer J, Spencer K, Li L, Gold JM, Bellack AS. A randomized, controlled trial of computer-assisted cognitive remediation for schizophrenia. *American Journal of Psychiatry*. 2010; 167:170–180. [PubMed: 20008941]
- Eack SM, Greeno CG, Pogue-Geile MF, Newhill CE, Hogarty GE, Keshavan MS. Assessing social-cognitive deficits in schizophrenia with the Mayer-Salovey-Caruso Emotional Intelligence Test. *Schizophrenia Bulletin*. 2010a; 36:370–380. [PubMed: 18648021]
- Eack SM, Greenwald DP, Hogarty SS, Keshavan MS. One-year durability of the effects of Cognitive Enhancement Therapy on functional outcome in early schizophrenia. *Schizophrenia Research*. 2010; 120:210–216. [PubMed: 20472402]
- Eack SM, Greenwald DP, Hogarty SS, Cooley SJ, DiBarry AL, Montrose DM, Keshavan MS. Cognitive Enhancement Therapy for early-course schizophrenia: Effects of a two-year randomized controlled trial. *Psychiatric Services*. 2009; 60:1468–1476. [PubMed: 19880464]
- Eack SM, Hogarty GE, Cho RY, Prasad KMR, Greenwald DP, Hogarty SS, Keshavan MS. Neuroprotective effects of Cognitive Enhancement Therapy against gray matter loss in early schizophrenia: Results from a two-year randomized controlled trial. *Archives of General Psychiatry*. 2010b; 67:674–682. [PubMed: 20439824]
- Eack SM, Hogarty GE, Greenwald DP, Hogarty SS, Keshavan MS. Cognitive Enhancement Therapy improves Emotional Intelligence in early course schizophrenia: Preliminary effects. *Schizophrenia Research*. 2007; 89:308–311. [PubMed: 17055227]

- Eack SM, Hogarty GE, Greenwald DP, Hogarty SS, Keshavan MS. Effects of Cognitive Enhancement Therapy on employment outcomes in early schizophrenia: Results from a two-year randomized trial. *Research on Social Work Practice*. (in press).
- Fisher M, Holland C, Merzenich MM, Vinogradov S. Using Neuroplasticity-Based Auditory Training to Improve Verbal Memory in Schizophrenia. *American Journal of Psychiatry*. 2009; 166:805–811. [PubMed: 19448187]
- Germain, CB.; Gitterman, A. The life model of social work practice. New York: Columbia University Press; 1980.
- Green MF, Kern RS, Braff DL, Mintz J. Neurocognitive deficits and functional outcome in schizophrenia: Are we measuring the right stuff. *Schizophrenia Bulletin*. 2000; 26:119–136. [PubMed: 10755673]
- Green MF, Penn DL, Bentall R, Carpenter WT, Gaebel W, Gur RC, Heinssen R. Social Cognition in Schizophrenia: An NIMH Workshop on Definitions, Assessment, and Research Opportunities. *Schizophrenia Bulletin*. 2008; 34:1211–1220. [PubMed: 18184635]
- Harding CM, Brooks GW, Ashikaga T, Strauss JS. The Vermont longitudinal study of persons with severe mental illness: II. Long-term outcome of subjects who retrospectively met DSM-III criteria for schizophrenia. *American Journal of Psychiatry*. 1987; 144:727–735. [PubMed: 3591992]
- Harrow M, Grossman LS, Jobe TH, Herbener ES. Do patients with schizophrenia ever show periods of recovery? A 15-year multi-follow-up study. *Schizophrenia Bulletin*. 2005; 31:723–734. [PubMed: 16020553]
- Haut KM, Lim KO, MacDonald A. Prefrontal Cortical Changes Following Cognitive Training in Patients with Chronic Schizophrenia: Effects of Practice, Generalization, and Specificity. *Neuropsychopharmacology*. (in press).
- Heinrichs RW, Zakzanis KK. Neurocognitive deficit in schizophrenia: A quantitative review of the evidence. *Neuropsychology*. 1998; 12:426–445. [PubMed: 9673998]
- Hogarty GE, Flesher S. Developmental theory for a cognitive enhancement therapy of schizophrenia. *Schizophrenia Bulletin*. 1999a; 25:677–692. [PubMed: 10667739]
- Hogarty GE, Flesher S. Practice principles of cognitive enhancement therapy for schizophrenia. *Schizophrenia Bulletin*. 1999b; 25:693–708. [PubMed: 10667740]
- Hogarty, GE.; Greenwald, DP. Cognitive Enhancement Therapy: The Training Manual. University of Pittsburgh Medical Center: Authors; 2006. Available through www.CognitiveEnhancementTherapy.com.
- Hogarty GE, Flesher S, Ulrich R, Carter M, Greenwald D, Pogue-Geile M, Zoretich R. Cognitive enhancement therapy for schizophrenia. Effects of a 2-year randomized trial on cognition and behavior. *Archives of General Psychiatry*. 2004; 61:866–876. [PubMed: 15351765]
- Hogarty GE, Goldberg SC, the Collaborative Study Group. Drug and sociotherapy in the aftercare of schizophrenic patients. One-year relapse rates. *Archives of General Psychiatry*. 1973; 28:54–64. [PubMed: 4345664]
- Hogarty GE, Greenwald DP, Eack SM. Durability and mechanism of effects of Cognitive Enhancement Therapy. *Psychiatric Services*. 2006; 57:1751–1757. [PubMed: 17158490]
- Hogarty GE, Kornblith SJ, Greenwald D, Dibarry AL, Cooley S, Ulrich RF, Flesher S. Three-year trials of personal therapy among schizophrenic patients living with or independent of family: I. Description of study and effects of relapse rates. *American Journal of Psychiatry*. 1997; 154:1504–1513. [PubMed: 9356557]
- Horan WP, Kern RS, Shokat-Fadai K, Sergi MJ, Wynn JK, Green MF. Social cognitive skills training in schizophrenia: an initial efficacy study of stabilized outpatients. *Schizophrenia Research*. 2009; 107:47–54. [PubMed: 18930378]
- Keefe RSE, Bilder RM, Davis SM, Harvey PD, Palmer BW, Gold JM, Lieberman JA. Neurocognitive Effects of Antipsychotic Medications in Patients With Chronic Schizophrenia in the CATIE Trial. *Archives of General Psychiatry*. 2007; 64:633–647. [PubMed: 17548746]
- Keshavan MS, Hogarty GE. Brain maturational processes and delayed onset in schizophrenia. *Development and Psychopathology*. 1999; 11:525–543. [PubMed: 10532623]
- Kleim JA, Barbay S, Nudo RJ. Functional reorganization of the rat motor cortex following motor skill learning. *Journal of Neurophysiology*. 1998; 80:3321–3325. [PubMed: 9862925]

- Lecardeur L, Stip E, Giguere M, Blouin G, Rodriguez JP, Champagne-Lavau M. Effects of cognitive remediation therapies on psychotic symptoms and cognitive complaints in patients with schizophrenia and related disorders: A randomized study. *Schizophrenia Research*. 2009; 111:153–158. [PubMed: 19395240]
- McGurk SR, Mueser KT, Pascaris A. Cognitive training and supported employment for persons with severe mental illness: one-year results from a randomized controlled trial. *Schizophrenia Bulletin*. 2005; 31:898–909. [PubMed: 16079391]
- McGurk SR, Mueser KT, Feldman K, Wolfe R, Pascaris A. Cognitive training for supported employment: 2–3 year outcomes of a randomized controlled trial. *American Journal of Psychiatry*. 2007; 164:437–441. [PubMed: 17329468]
- McGurk SR, Twamley EW, Sitzer DI, McHugo GJ, Mueser KT. A Meta-Analysis of Cognitive Remediation in Schizophrenia. *American Journal of Psychiatry*. 2007; 164:1791–1802. [PubMed: 18056233]
- Newman, LS. What is social cognition? Four basic approaches and their implications for schizophrenia research. In: Corrigan, PW.; Penn, DL., editors. *Social cognition and schizophrenia*. Washington, DC: American Psychological Association; 2001. p. 41-72.
- Penadés R, Catalán R, Salamero M, Boget T, Puig O, Guarch J, Gastó C. Cognitive remediation therapy for outpatients with chronic schizophrenia: a controlled and randomized study. *Schizophrenia Research*. 2006; 87:323–331. [PubMed: 16750611]
- Penn DL, Corrigan PW, Bentall RP, Racenstein J, Newman L. Social cognition in schizophrenia. *Psychological Bulletin*. 1997; 121:114–132. [PubMed: 9000894]
- Rapp, CA. *The Strengths Model: Case Management with People Suffering from Severe and Persistent Mental Illness*. New York: Oxford University Press; 1998.
- Roberts DL, Penn DL. Social cognition and interaction training (SCIT) for outpatients with schizophrenia: A preliminary study. *Psychiatry Research*. 2009; 166:141–147. [PubMed: 19272654]
- Robertson IH, Murre JMJ. Rehabilitation of brain damage: brain plasticity and principles of guided recovery. *Psychological Bulletin*. 1999; 125:544–575. [PubMed: 10489541]
- Rose D, Wykes T, Farrier D, Doran A, Sporle T, Bogner D. What Do Clients Think of Cognitive Remediation Therapy?: A Consumer-Led Investigation of Satisfaction and Side Effects. *American Journal of Psychiatric Rehabilitation*. 2008; 11:181–204.
- Selman, RL.; Schultz, LH. *Making a Friend in Youth*. Chicago, IL: University of Chicago Press; 1990.
- Stein LI, Test MA. Alternative to mental hospital treatment: I. Conceptual model, treatment program, and clinical evaluation. *Archives of General Psychiatry*. 1980; 37:392–397. [PubMed: 7362425]
- Substance Abuse and Mental Health Services Administration. *Mental health, United States: 2000*. Washington, DC: Author; 2001.
- Swartz MS, Perkins DO, Stroup TS, Davis SM, Capuano G, Rosenheck RA, Lieberman JA. Effects of Antipsychotic Medications on Psychosocial Functioning in Patients With Chronic Schizophrenia: Findings From the NIMH CATIE Study. *American Journal of Psychiatry*. 2007; 164:428–436. [PubMed: 17329467]
- Wexler BE, Anderson M, Fulbright RK, Gore JC. Preliminary evidence of improved verbal working memory performance and normalization of task-related frontal lobe activation in schizophrenia following cognitive exercises. *American Journal of Psychiatry*. 2000; 157:1694–1697. [PubMed: 11007730]
- Wykes T, Brammer M, Mellers J, Bray P, Reeder C, Williams C, Corner J. Effects on the brain of a psychological treatment: cognitive remediation therapy Functional magnetic resonance imaging in schizophrenia. *British Journal of Psychiatry*. 2002; 181:144–152. [PubMed: 12151286]
- Wykes T, Reeder C, Landau S, Everitt B, Knapp M, Patel A, Romeo R. Cognitive remediation therapy in schizophrenia. *British Journal of Psychiatry*. 2007; 190:421–427. [PubMed: 17470957]

A

B

C

Figure 1.

Example Attention, Memory, and Problem-Solving Computer Exercises Used in Cognitive Enhancement Therapy for Schizophrenia

^aReprinted with permission from the Orientation Remediation Module, Yehuda Ben-Yishay, Ph.D. (A) and the PSSCogRehab software suite, Odie Bracy, Ph.D. (B–C).

Table 1**Practice Principles of Cognitive Remediation with Individuals with Schizophrenia**

Principle	Description
Strategic	The development of mental strategies to optimize cognitive performance and task completion
Drill and Practice	The repetition of cognitive exercises over many sessions until performance has improved
Hierarchical	The progression of targeted cognitive abilities from the basic to more complex
Cueing	The use of external aids (usually auditory or visual) to support cognitive performance
Fading	The gradual removal of cues and external aids in cognitive exercises to increase difficulty
Adaptive	The adjustment of the difficulty of cognitive exercises so they remain challenging and engaging
Anchoring	The linking of cognitive exercises to "real world" behaviors and areas functioning domains they support
Integration with Other Treatments	The use of additional schizophrenia treatments and supports to maximize the benefits of cognitive remediation

Table 2

Example Recovery Plans Used in Cognitive Enhancement Therapy for Schizophrenia.

Example A		
Goal:	To improve my attention during conversations	
Problem:	Difficulty maintaining attention/easily distracted	
Strategies:	1	Cue myself to pay attention
	2	Take notes in the CET group to avoid distraction
	3	Actively listen and ask questions in conversations
	4	Focus on the gist when talking with others
	5	Paraphrase back to the other person in conversations
	6	Use computer training to boost attention
Example B		
Goal:	To better understand other people	
Problem:	Difficulty with understanding others' thoughts and feelings	
Strategies:	1	Use active listening (observe verbal and non-verbal cues; take the person's emotional temperature; ask open-ended questions).
	2	Evaluate whether this is a good time for the person to talk.
	3	Ask questions to better understand the other person's point of view and check whether my understanding is correct.
	4	Practice active listening and perspective-taking during CET computer and group sessions. Make supportive statements ("I like what you said/did").
	5	After giving my feedback following a CET group exercise, see if my observations of the participants' thoughts and feelings are correct.
Example C		
Goal:	To increase my network of friends	
Problem:	Having a small social network	
Strategies:	1	Assess situations to decide who I want to get to know further. Work on initiating and maintaining conversations.
	2	Use CET strategies: active listening, perspective taking, foresightfulness, social context appraisal.
	3	Make an effort to know new people while keeping up with current friends.
	4	Use humor in conversations. Try to be less serious and more relaxed. Coach myself using positive self-talk.
	5	Express myself more to others – use elaborated speech.