Multimodal Cognitive Therapy: Combining Treatments That Bypass Cognitive Deficits and Deal With Reasoning and Appraisal Biases

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The process of recovery in schizophrenia involves resolving persistent symptoms, addressing cognitive impairments, and improving functional outcomes. Our research group has demonstrated the efficacy of cognitive adaptation training (CAT)—a home-based psychosocial treatment utilizing environmental supports such as medication containers, signs, checklists, and the organization of belongings to bypass deficits in cognitive functioning and cue and sequence adaptive behavior) for improving adherence to medications and functional outcomes in schizophrenia. Early CAT pilot studies utilizing some therapists with training in cognitive behavior therapy (CBT) techniques for psychosis found significant improvements in positive symptoms. More recent larger scale randomized clinical trials failed to replicate this finding with CAT therapists not trained in CBT techniques. Persistent psychotic symptoms substantially impair patients' ability to adapt to life in the community. Cognitive behavior therapy for psychosis (CBTp) is an evidence-based practice for addressing persistent positive symptoms and the distress associated with them. CBTp decreases symptomatology and minimizes the negative effect of persistent symptoms upon individuals with this disorder. We now describe a home-delivered, multimodal cognitive treatment targeting functional outcomes and persistent positive symptoms for individuals with schizophrenia by utilizing both CAT and CBT techniques. We discuss the advantages and challenges of combining these 2 interventions, present a small retrospective data analysis to support their combination into a multimodal treatment, and describe the design of an ongoing randomized trial to investigate efficacy.

Key words: cognitive adaptation training/cognitive behavior therapy for psychosis/schizophrenia/psychosocial treatment

Introduction

Schizophrenia is a complex illness characterized by multiple signs and symptoms. Many treatments developed for schizophrenia target specific behaviors rather than the constellation of problems associated with the illness. For example, supported employment programs have been successful in assisting patients in finding employment. However, symptoms of psychosis or social skills are not systematically improved by these interventions. Multimodal interventions may be more successful in improving a broader range of outcomes. This article discusses the advantages and challenges of combining 2 interventions for schizophrenia that have been shown to improve outcomes, cognitive adaptation training (CAT) and cognitive behavior therapy for psychosis (CBTp). We present a retrospective data analysis to support the combination of the 2 modalities and describe an ongoing randomized controlled trial to investigate efficacy.

Cognitive Behavior Therapy for Psychosis

Positive symptoms are core features of schizophrenia targeted by antipsychotic medications, and while medication treatments significantly reduce these symptoms, many patients treated with antipsychotic medications continue to experience positive symptoms such as delusions and/or hallucinations.7,11 These persistent positive symptoms can be extremely distressing and negatively impact daily functioning.7,12 A series of prospective, randomized controlled clinical trials have demonstrated the efficacy of CBTp for the treatment of persistent positive symptoms, impaired insight, negative symptoms, and functional outcomes in patients with schizophrenia.13-18 CBTp is explained in detail in another article in this theme issue.19 CBT is designed to address cognitive problems associated with appraisal biases, distortion, and
understanding the intentions of others. Briefly, during CBT targeting positive symptoms, in the context of a strong therapeutic alliance, the client and therapist discuss and evaluate the specific content of delusions and hallucinations. The therapist works with the client in a collaborative manner first to thoroughly understand the client’s perspective as to how the positive symptoms have developed (eg, “The Secret Service started tapping my phone after I broke up with my girlfriend.”), and eventually helping the individual to conduct behavioral experiments to test explanations (eg, asking trusted family members whether they hear the clicks on the phone line) and suggest alternative explanations for events.

This process slowly allows the client to evaluate their own explanatory model for their experiences and to consider other possible explanations and interpretations of events and to gain a sense of control over these events. The process is a collaborative one, with the therapist and client working together to make sense of the client’s experiences.

While there are many studies that support that CBTp may improve additional outcomes other than positive symptoms including functioning, the effect sizes for improvements in functional outcome with CBTp are modest relative to those for CAT (discussed below). A recent meta-analysis reports that for CBTp studies with better vs poorer methodology, effect sizes for functioning were 0.51 and 0.15, respectively.14 CAT studies with better vs poorer methodology, effect sizes for functioning were 0.51 and 0.15, respectively.14 Moreover, she found that improvements in negative symptoms and functional outcomes were correlated with changes in positive symptoms. This raises the possibility that the negative symptoms and functional outcomes that do improve are secondary to psychosis (eg, withdrawal due to paranoia or being overwhelmed by hearing voices). Effect sizes for positive symptom improvements with CBT were significant even in the more methodologically rigorous trials. These data suggest the possibility that CAT strategies may provide added benefit for functioning over CBTp alone.

Cognitive Adaptation Training

Given the pervasiveness of neurocognitive deficits and their relationship to functional outcomes in schizophrenia patients, interventions to improve or bypass problems in neurocognition are particularly relevant to rehabilitation.25–27 Cognitive remediation attempts to directly alter attention, memory, processing speed, and/or problem-solving abilities through a series of computerized or pen-and-paper exercises.4,5 Rather than attempting to alter neurocognitive function per se, compensatory strategies attempt to bypass cognitive deficits by establishing supports in the environment that cue and direct behavior. CAT is a series of manual-driven compensatory strategies and environmental supports (signs, checklists, electronic cueing devices, and the organization of belongings) to bypass cognitive impairments and to cue and sequence adaptive behavior in the home. CAT has been found to improve specific target behaviors (eg, self-care, medication adherence) and to improve motivation on the Negative Symptom Assessment suggesting increasing engagement and interest in activities.22 Individuals in CAT also improve with respect to social and occupational functioning and community adjustment and have a longer time to relapse or symptom exacerbation.21–24 In a recent study, over 65% of patients in CAT treatment survived the 15 months without a relapse or a significant exacerbation of symptoms vs only 19% of individuals in standard treatment.23

Treatment plans in CAT are based upon a comprehensive assessment of cognition, functional abilities, behavior, and the environment. CAT bases interventions for each functional deficit on 2 dimensions: (1) levels of impairment in executive functions and (2) whether the overt behavior of the individual is characterized more by apathy (poverty of speech and movement and the inability to initiate and follow through on behavioral sequences), disinhibition (distractibility and behavior that is highly driven by external cues in the environment), or a combination of these styles.21,28 According to the CAT model, individuals with poor executive functioning need high levels of structure and more obviously placed environmental cues, while those with somewhat better executive functioning need less structure and more subtle cues. Individuals with apathetic behavior benefit from environmental supports that cue and sequence behavior. Those with disinhibition benefit most from the removal of distracting stimuli and the reorganization of belongings. Those with mixed behavior benefit from a combination of these strategies. Examples of CAT interventions appear in figure 1.

While CAT is effective in promoting target behaviors, increasing motivation and engagement with activity, and improving functional outcome in the community, CAT has few strategies that are able to address the positive symptoms of schizophrenia. In CAT, persisting positive symptoms are addressed using psychoeducation, supports for medication adherence, and supports to prompt better communication with the treating physician. Many
patients could certainly benefit from the exploration of positive symptoms provided in CBTp.

**Integration of CAT and CBT—Why a Multimodal Cognitive Treatment?**

Dealing with multiple cognitive (Mcog) deficits offers the possibility of improving a broader range of outcomes for a larger group of individuals. Both CBTp and CAT attempt to deal with cognitive problems in different ways. CAT uses supports in the environment to bypass formal neurocognitive deficits and cue and sequence functional behaviors.\(^{28}\) CBT seeks to identify and alter emotional processes, information-processing deficits, and reasoning and appraisal biases that contribute to the formation and maintenance of positive symptoms and functional problems.\(^{20}\) The integration of treatment primarily aimed at reducing positive symptoms, and improving insight with another designed-to-cue behavior in the home is a novel multimodal approach that we have called Mcog.\(^{29}\)

There are both theoretical and practical reasons to integrate these treatments. On a theoretical level, Frith\(^{30}\) has proposed a neuropsychological model of schizophrenia that may be best addressed by an integrated therapy such as Mcog. According to Frith,\(^{30}\) negative symptoms and associated functional impairments arise from deficits in the mechanisms underlying generation of “willed” action. CAT supports are thought to function as an ancillary frontal lobe system such that intentions-to-perform (agreed upon) actions and the sequence of actions do not need to be generated by the person.\(^{28}\) While there are deficits in “willed” action, the mechanisms underlying stimulus-driven action (actions which are cued by stimuli in the environment) are intact.\(^{30}\) These latter mechanisms are used in CAT to promote desired behavior. Complex behaviors can be accomplished within this system as long as they are appropriately specified by the environment.\(^{30}\) Also, included in Frith’s model is the notion that positive symptoms such as delusions and hallucinations arise out of problems in self-monitoring in which the individual is not aware of the sense of effort or intention that accompanies thought or willed action and has difficulties in understanding and monitoring the intentions of others.\(^{30}\) These monitoring deficits lead individuals to view actions and thoughts as arising from outside of themselves and to misrepresent the intentions of others. CBTp addresses these cognitive problems by purposefully engaging with the patient to examine and process emotions, thoughts, and evidence surrounding specific people and events. An integrated Mcog model allows the mechanisms described by Frith\(^{30}\) that maintain the positive and negative symptoms of the disorder and the functional consequences of these symptoms to be addressed.

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*Fig. 1. Interventions in Cognitive Adaptation Training. A: Calendar, watch, and alarm to cue and orient individual to day, time, and prompt appointment attendance. B: Pill container to assist person in remembering whether or not medication has been taken on a specific day. For someone with apathy, this is used with a voice alarm to prompt taking medication at an appropriate time. C: Waist pack with all items needed to take the bus. For someone with disinhibition, belongings are attached to waist to avoid leaving them at locations visited. D: Schedule to cue basic hygiene and daily activities.*
From a more practical standpoint, both CBTp and CAT are designed to customize treatments to the needs of the individual. CBTp accomplishes this by developing an individual problem list collaboratively with the consumer, developing an individual case formulation regarding how symptoms are formed and maintained, and customizing homework to deal with a specific aspect of the problems identified. CAT accomplishes this by assessing cognition, functional skills, overt behavior, and environmental triggers and customizing the environment and supports based upon these dimensions. Because these treatments address different aspects of
...to hallucinations that the client is concerned will worsen outside, the delusional thought that people outside are trying to kill the patient, cognitive deficits that cause the individual to become easily lost, apathy that prevents the person from initiating walking although this is a stated goal. Because different individuals may demonstrate the same problematic behavior for different underlying reasons, Mcog treatment is customized to the client’s needs. A client who is in denial of having an illness may not be helped to take medication by a psycho-educational approach and supports such as alarms and pill containers but may respond better to CBTp approaches that would allow exploration of the meaning of being labeled as “ill” and understanding the effects of medication from the perspective of the client. A client who accepts their need for medication but regularly forgets to take their evening dose of medication leading to an exacerbation in psychosis may be more likely to benefit from an approach using environmental supports to cue medication taking in the evening. A client may not take the bus because they are easily lost due to planning and memory deficits. Another client may not be willing to ride the bus because of their notion that people on the bus mean them harm. A third client may have both difficulties. For such clients, the willingness to take the bus can be addressed by guided discovery and homework in CBTp. However, the client may continue to demonstrate the effects of planning and memory problems on difficult routes. These later issues could be addressed utilizing CAT supports. Having both CBTp and CAT at their disposal allows the therapist to respond most effectively to the problem.

There are specific ways in which integration of CAT and CBTp could be accomplished. Homework assignments are regularly assigned in CBTp. Mcog therapists can furnish the supplies necessary to do specific assignments and set up cues to increase the likelihood that homework would be completed. For example, an Mcog therapist could provide a diary with a pen attached that would easily fit in a pocket to increase its use in the client’s everyday environment. In addition, an Mcog therapist could add “put your voice diary in your pocket” to the patient’s reminder list for behaviors to do each morning. Moreover, the Mcog therapist can provide supports to reinforce the work in CBTp. For example, the Mcog therapist could provide a recorder and headphones such that auditory tapes of therapeutic sessions exploring the evidence for delusional beliefs may be utilized in the very situations in which individuals have the greatest trouble coping (e.g., riding the bus, standing in line). In addition, some of the work done in CBTp sessions (e.g., pie charts for delusional conviction) could be placed by an Mcog therapist and the client on the wall near where the problem beliefs typically occur (e.g., by the television if the client is bothered by messages coming from the television). This may allow a client to

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**Fig. 3. Changes in Psychosis Symptoms Over Time in Cognitive Adaptive Training (CAT) Alone Vs CAT Conducted by Individuals With Cognitive Behavior Therapy Training.** In mixed effects regression analyses with baseline scores used as covariates, differences between groups on levels of hallucinations and delusions were significant after 9 months of treatment \( F_{1,11} = 7.88, P < .01 \) and \( F_{1,11} = 6.10, P < .04 \); while differences on level of suspiciousness were not \( F_{1,11} = 0.07, P > .7 \).
hold on to gains made in the session in the settings that are most difficult. An Mcog therapist could discuss feelings and thoughts associated with environmental supports and their effects on behavior. This may allow processing of self-defeating attitudes that get in the way of functioning. While it is possible that opportunities for functioning provided in CAT alone may reduce distress surrounding delusions without utilizing CBT to process these issues, it is possible that many individuals with schizophrenia would have trouble integrating the new information in a manner that changes behavior in the longer term. By processing behavioral changes and their impact on the individual, it is possible that treatment gains may be better able to be maintained.

With respect to resources, CAT is a comprehensive in-home treatment. CBT has also previously been conducted on home visits. It is possible that combining CAT with CBT into one in-home treatment would allow a broader focused therapy without greatly increasing economic burden. Of course, this depends upon the specific level of training of therapist performing treatment. Duration of Mcog sessions might be longer (10–15 min) than either CBTp or CAT sessions alone to allow time to follow the structure of a traditional CBTp session, review and suggest homework, and train and establish supports. However, travel time to and from the individual’s home and reimbursement for travel expenses would be the same. Particularly, for those with negative symptoms, cognitive deficits, and poverty who may find frequent visits to clinic burdensome, home visits may make therapy more regularly available. In addition, for individuals with more ambivalence, home visits may be initially able to promote engagement in therapy that would not have been possible if the client had to come into clinic to receive intervention.

**Challenges to the Integration of CAT and CBT**

While there are compelling reasons to integrate CBTp and CAT, there are also significant challenges. While CAT can be quite directive, CBTp focuses on a collaborative conceptualization of the client’s problems that incorporates the history and interpretation of his or her difficulties. An integration of these treatments necessitates altering CAT to ensure an increased focus on developing a therapeutic alliance and incorporating more guided discovery and questioning about the client’s perspective. In addition, the focus of treatment must be flexible enough to allow interventions from each modality to be used in ways that address the specific problems identified by the participant and their likely underlying causes. We believe that we have resolved many of these challenges in the development of multimodal cognitive treatment described below. While training in both models can be more challenging, our Mcog therapists report an appreciation for the increased number of techniques available to them to address specific problems.

**Multimodal Cognitive Treatment**

We have combined CBT for psychosis and CAT into an intervention that we call Mcog treatment. Mcog is designed to address both the reasoning and appraisal biases typically addressed in CBTp and establish supports to bypass cognitive deficits and increase adaptive behaviors. The method is described in figure 2.

Phase I of treatment involves primarily rapport building and utilizing techniques weighted toward CBTp to form a good working alliance with the patient. An initial discussion of goals and problems is carried out. In addition, the components of Mcog treatment are discussed. Phase II involves typical assessments conducted in CAT as well as obtaining a history and timeline on which a typical CBTp case formulation is based. In phase III, the results of the assessments are discussed with the individual focusing on strengths as well as areas that could benefit from. In keeping with the CBTp model, the therapist would ask the client to guide the session in terms of external supports which areas to discuss first and where to focus. In phase IV, while initial problems have been identified throughout early sessions, a working problem list is collaboratively developed, and this provides the basis for the types of interventions to be utilized throughout treatment. Phase IV and remaining phases occur many times in the treatment as goals and the problem list are reformulated over time. In phase V, the therapist works with the individual to help them identify factors contributing to the problems on their list. An understanding of factors underlying each specific problem (eg, cognitive limitations, persistent delusion, apathy) helps the therapist to identify the interventions most likely to be helpful for that problem. If a problem is primarily based upon delusional thinking and hallucinatory experiences, CBTp techniques may be used primarily to address the issue. In this scenario, CAT interventions would complement the treatment with supports to assist the person in completing homework assignments or remembering to take supplies needed for collecting data during the day. If a specific problem is based in large part on cognitive impairments, disorganization, or negative symptoms, CAT supports may be used initially to assist the individual by cueing and simplifying tasks so that they can be successfully completed and in providing needed structure and reorganization of belongings to facilitate goal attainment. In this case, CBT techniques are utilized during the establishment of supports (eg, organizing drawers) to engage the client and to elicit specific feelings and thoughts about the supports and to process thoughts and feelings that accompany attempts and completion of prompted behaviors. For each specific problem, the weight of the intervention may tilt more toward CBTp.
or toward CAT; however, there is a constant integration of interventions designed to address both automatic and controlled processes to help the client attain their treatment goals. The phases of treatment are presented in figure 2.

**Retrospective Data Analysis**

Two early pilot studies indicated that patients in CAT improved to a greater extent with respect to positive symptomatology than patients in control or assessment-only conditions.\(^{21,22}\) This result was not replicated in 2 of the most recent larger scale trials funded by the National Institute of Mental Health.\(^{23,24}\) Results for mean level of positive symptoms from the Brief Psychiatric Rating Scale (BPRS) did not indicate treatment group differences in either of the most recent studies. One interpretation of these results could be that later studies were more methodologically rigorous than these early smaller scale trials. However, each of the CAT trials was rated in the range of the more methodologically rigorous trials on the Clinical Trial Assessment Measure by the measures developers.\(^{14,34}\) (Early trials were both rated 92 points out of 100, and later trials were rated 91 and 94).

Another possible interpretation of these results is that in early studies\(^{21,22}\) a number of the CAT therapists had been previously trained or were being concurrently trained in CBT techniques such as normalizing and examining evidence for beliefs as part of their non–trial-related duties. Later studies utilized almost exclusively individuals who were excellent CAT therapists but who were not trained in these specialized psychotherapy techniques for positive symptoms.\(^{23,24}\) In the early studies, it was not uncommon for a CAT therapist to discuss symptoms and insight-related issues, examine evidence for specific beliefs, or discuss the impact and potential control of the effect of auditory hallucinations while working with the patient to set up environmental supports. The trained therapists did not turn off these valuable therapy skills when interacting with the patients in their homes. Therefore, in early studies, the positive effect on symptoms of psychosis in the CAT group may have been due to these techniques rather than to the CAT therapy per se. To test this hypothesis, we reanalyzed data from the 2 older trials of CAT examining outcomes for individuals who received CAT from therapists with CBT training vs those who had not been trained in the model.\(^{21,22}\) Because there were some therapists who were receiving ongoing training in CBT techniques for dealing with psychosis while they worked on the trial, we examined the symptomatic outcomes only for participants whose therapists could be distinguished on CBT training (trained vs not trained) for the duration of the patient’s treatment. This resulted in the identification of 18 participants. Seven participants had CBT trained therapists, and 11 had therapists with no CBT training. Of these 11, a statistician blind to the purpose of the study extracted 7 cases to match groups on gender, ethnicity, and therapist level of training. One therapist in each condition had a PhD, and one had a bachelor’s degree and was working toward his/her master’s degree. Average age of subjects was 37.0 years (SD = 8.2); 5 in each group were male, and 2 were female; 4 in each group were Hispanic and 3 were non-Hispanic white. Average education was just below high school (11.9, SD = 2.4). There were no significant differences between these groups with respect to any of these demographic variables. Progress notes were examined blindly by a quality assurance assessor trained in CBT techniques, and therapists with some experience with CBT showed greater evidence of the use of CBT techniques including normalization of psychotic symptoms and their relationship to stress, assisting the patient in examining evidence and finding alternative explanations for events, and suggesting homework to help gather evidence. These same techniques are described in Turkington et al.\(^{31}\)

On average, across 9 months of CAT treatment, 1.4 (SD = 0.81, median = 1.1) CBT techniques were noted per session by the CBT-trained therapists as compared with 0.10 (SD = 0.23, median = 0.0) for those not trained in these techniques. We examined BPRS scores for hallucinations, delusions, and suspiciousness after 9 months of treatment using mixed effects regression (SAS PROC MIXED) with baseline scores used as a covariate. We found significant differences between groups on levels of hallucinations and delusions ($F_{1,11} = 7.88$, $P < .01$ and $F_{1,11} = 6.10$, $P < .04$) but no group differences with respect to paranoia ($F_{1,11} = 0.07$, $P > .7$). There were also significant within-group differences in all symptoms over time for CAT patients seen by a therapist trained in CBT techniques ($t = 3.03$, $P < .03$; $t = 2.52$, $P < .05$; and $t = 3.58$, $P < .02$) for hallucinations, delusions, and suspiciousness, respectfully). No significant differences were found within subjects for psychosis symptoms in the group with therapists was not utilizing CBT techniques (all $P’s > .25$). Difference scores appear in figure 3. Positive scores reflect improvement over time, while negative scores reflect deterioration.

While the data presented above are consistent with the hypothesis that combining CBT and CAT techniques could prove helpful, there are also many other possible interpretations of the results of this reanalysis. It is possible that individuals seen by therapists who had not been exposed to CBT techniques were applying but not documenting similar techniques. It is possible that individuals trained in CBT techniques also had better training in psychological techniques overall. However, there were no differences in level of education and training. There could be other nonspecific effects of treatment that were not controlled (eg, better rapport building by CBT-trained therapists. Moreover, it is difficult to judge the extent to which training received by these therapists in CBT
would fit with CBTp as it is currently practiced. A randomized, controlled trial comparing CAT alone with CAT + CBT would be a way to address this question directly. The design of an ongoing trial is discussed below.

A Prospective Trial of Mcog

We are currently running a prospective randomized controlled trial that will ultimately enroll 148 patients randomized to 1 of 4 treatment groups for a period of 9 months, (1) CAT, (2) CBT, (3) Mcog treatment, and (4) standard treatment as usual (TAU). Assessments will be conducted at baseline, each 3 months during treatment, and 3 and 6 months after treatment visits have stopped. All active treatments will be conducted in the individuals' homes. Primary outcome variables will be the positive symptom subscale from the BPRS and the score on the Social and Occupational Functioning Scale (SOFAS, Diagnostic and Statistical Manual of Mental Disorders [Fourth Edition] [DSM-IV]). By examining both single-modality treatments (CAT and CBTp alone), we will be able to determine the extent to which each treatment addresses the problems that are its primary targets (positive symptoms for CBTp and functional outcome for Mcog). Based upon the focus of each intervention, we anticipate that treatments that include CBTp as a component (ie, CBT and Mcog) will lead to greater improvements earlier in treatment in positive symptoms and insight than treatments that do not have CBTp as a component (ie, CAT and TAU). We anticipate that interventions that have CAT as a component (CAT and Mcog) will lead to greater improvements earlier in treatment in functional outcomes than treatments that do not have CAT as a component (CAT and TAU). The design will allow us to examine the effects of combining techniques from single-modality treatments. We anticipate a synergistic effect between CAT and CBTp techniques such that individuals receiving Mcog will do better and demonstrate improvements earlier in treatment that will be more likely to be sustained after treatment with respect to both positive symptoms and functional outcomes compared with those in single-modality treatments. The TAU group is included to allow us to compare active treatments in terms of efficacy with what is currently available in the treatment delivery system for these patients.

While the original sample size was decreased from 200 for budgetary reasons, power for the reduced sample appears below. Our own previous studies support medium to large effect sizes for the single-modality treatments for the variables of primary interest (functional outcome for CAT and symptomatology/related distress for CBT). Because of the complexity of the design, which includes use of a baseline covariate, multiple pairwise contrasts, and repeated measures with autoregressive structure, power was estimated empirically using simulation. The simulation studies each were based on 100 replications with varying sample sizes, specifying effects as described below in terms of standardized effect sizes. In each replication, we ran SAS PROC MIXED using the same design planned for the study and estimated power by counting the number of statistically significant results looking both at unadjusted and multiple comparison-adjusted P values. Based upon our prior data in CAT studies, we assumed a baseline mean of zero for TAU, no or minimal effects for the nonrelevant single-modality treatment (eg, positive symptoms for CAT, d = 0), medium to large effects (0.7) for the relevant single-modality treatment (CAT or CBT for relevant variable), and a difference between the multimodal and single-modality treatments of +0.4. While the proposed effect sizes for CBTp may be either optimistic (for effects on positive symptoms) or underestimates (for effects on functional outcomes) based upon the most recent meta-analysis, they are consistent with published research. We assumed an autocorrelation of 0.40 based upon data from previous studies and included a baseline covariate. Power to detect even moderate effect sizes (0.5) for an overall group effect (with df = 3) was above 0.95 with a sample size of 37 per group. We then examined power for the primary planned comparisons, each with df = 1. First, power for a main effect of treatment type, ie, treatment including CAT (or treatments including CBT) vs treatment not including CAT (or CBT) was greater than 0.95 with a sample size of 37 per group. To examine the possibility of synergistic effects of Mcog and detect a difference between 2 active treatments for the variable of interest, ie, Mcog vs the relevant single-modality treatment for the variable of interest (our second planned comparison), a sample size of 37 yields a power of 0.72. With an effect size of 0.45, the power would be 0.78. In conclusion, we will have adequate power to detect moderate differences in outcomes between groups on our primary outcome measures.

Frequency of contact in all groups will be weekly for 9 months, and contact time will be as similar as possible among groups keeping in mind that visits for Mcog may run an additional 10–15 minutes. Different therapists have been trained to provide CAT, CBT, and Mcog. Training and supervision in CBT and the CBT components of Mcog are being provided by the last 2 authors. Therapist competence and treatment fidelity measures have been developed for treatment to ensure competent delivery across treatment conditions and will be utilized to identify contamination of CAT with CBT and vice versa. Mcog therapists and quality assurance personnel listening to sessions will identify the percentage of Mcog sessions that is based upon CAT vs CBT.

Participants will be males and females who have given informed consent. They will be between the ages of 18 and 60 years and have a diagnosis of schizophrenia or schizoaffective disorder according to DSM-IV criteria.
In addition, they will be receiving treatment with oral antipsychotic medication other than clozapine, have stable living arrangements, have at least moderate levels of positive symptoms on the BPRS-Expanded Version \(^{35}\) and at least moderate impairment in functioning as identified from the SOFAS and DSM-IV. We will exclude individuals with a history of significant head trauma, seizure disorder, or mental retardation and individuals being seen by an assertive community treatment team.

This design will allow us to examine the efficacy of multimodal treatment as well as single-modality treatments on symptoms and functional outcomes and to clarify the mechanisms underlying clinical improvement in these interventions. Home visits can be costly. Costs of treatment delivery will be assessed throughout the trial. Maximizing the benefits to patients by providing more than one modality in the home may depending upon the level of education of the therapists improve multiple domains of outcome with only modest increases in cost.

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**References**


