A Randomized Single-Blind Pilot Study of Compensatory Strategies in Schizophrenia Outpatients

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Abstract

In a previous study, we found that cognitive adaptation training (CAT)—a manual-driven program of environmental supports designed to bypass cognitive deficits—improved multiple domains of outcome in schizophrenia patients recently discharged from a State psychiatric facility. The present study examined the efficacy of CAT in a sample of patients who had been in the community at least 3 months. Forty-five medicated schizophrenia patients were randomly assigned for 9 months to one of three conditions: (1) CAT, (2) a condition that controlled for therapist time and provided environmental changes unrelated to cognitive deficits, or (3) followup only. Comprehensive assessments were conducted every 3 months by blinded raters. Results of repeated measures analyses of covariance for mixed models indicated that patients participating in CAT had better adaptive function and quality of life, and fewer positive symptoms than those in the two non-CAT conditions. Results indicate that compensatory strategies may improve various outcomes in schizophrenia outpatients.

Keywords: Schizophrenia, cognitive deficits, compensatory strategies, environmental supports, psychosocial treatment.

Schizophrenia Bulletin, **28(2):283–292, 2002.**

Patients with schizophrenia are known to have significant deficits in multiple domains of cognitive ability that predict adaptive and community functioning (Gold and Harvey 1993; Green 1996; Velligan et al. 1997). Until recently, the use of environmental supports to compensate for or bypass these cognitive deficits in an attempt to improve community outcomes was not systematically studied (Velligan et al. 1999, 2000). In a recent article, we presented the results of a small randomized trial examining the efficacy of CAT* for improving outcomes in schizophrenia patients recently discharged from a State psychiatric facility (Velligan et al. 2000). CAT is a series of environmental supports designed to compensate for deficits in cognitive functioning. Supports include signs, alarms, labels, and organization of belongings to cue and sequence adaptive behavior in the patient's home and work environments. Results of that trial indicated that patients in CAT had better adaptive functioning, symptomatology, and rates of relapse than those in control conditions and suggested that CAT was helpful for patients making the transition from inpatient to outpatient status.

The purpose of the present study was to determine whether CAT would improve adaptive functioning in outpatients who had been living in the community for a minimum of 3 months. In addition, we hoped to improve on the methodology used in our previous efficacy trial in several ways. First, in our previous study, we assessed global functioning using the Global Assessment of Functioning (GAF) (American Psychiatric Association 1994). GAF ratings reflect both level of functionality and severity of symptomatology. In the current study, we used a more unitary measure of global level of adaptive functioning as our primary outcome measure, the Social and Occupational Functioning Scale (SOFAS), which yields a score from 0 to 100 that does not take into account severity of symptomatology in the rating. Furthermore, in the previous study we used a comprehensive interview-based assessment of adaptive functioning on only a subset of patients. In the present study, we included a detailed assessment of adaptive function, the Multnomah Community Ability Scale (MCAS) (Barker et al. 1994), for all subjects. Finally, we improved on our previous study (Velligan et al. 2000) by including an assessment of quality of life.

We hypothesized that patients participating in CAT would have higher levels of adaptive functioning and a better quality of life than patients participating in non-

* CAT (cognitive adaptation training) as used here should not be confused with cognitive analytic therapy (Margison, F. Cognitive analytic therapy: A case study in treatment development. *British Journal of Medical Psychology,* 73:145–150, 2000).

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CAT conditions. This hypothesis is based on evidence that environmental supports have been used successfully in brain-injured and developmentally delayed populations to decrease demands on memory, attention, and planning and to improve functioning and quality of life (Velligan et al. 2000).

In addition, based on our previous study, we hypothesized that levels of positive and negative symptoms would be lower in CAT than in non-CAT conditions. CAT uses environmental supports (e.g., pillboxes, calendars, alarms) to increase medication and treatment adherence. Good adherence to medication regimens and attendance at clinic appointments is likely to help maintain lower levels of positive symptomatology over time. Negative symptom ratings are based in part on activities and social contacts initiated. CAT uses environmental supports (e.g., checklists) to prompt initiation and promote maintenance of leisure and social activities.

Methods

Design. Forty-five patients were randomly assigned to one of the three treatment conditions: (1) standard followup plus CAT, (2) standard followup plus a condition to control for therapist contact time and for environmental changes, or (3) standard medication followup. Treatment groups are described below. In groups 1 and 2, patients were seen weekly for a 9-month period. Contact time for these groups was equivalent. In addition, the same individuals (bachelor's level psychology and social work practicum students) provided treatment for both groups. Patients were assessed prior to randomization and at 3-month intervals throughout the study by independent research personnel who were blind to treatment group. Hospitalizations, clinic visits, and symptom exacerbations were tracked for patients during the 9-month period.

Randomization. Random assignment of individual subjects was based on a computer-generated sequence and made by an independent researcher with no knowledge of the patients. The randomization sequence was concealed from all other research personnel.

Subjects. Subjects were 45 patients recruited from a network of three public psychiatric outpatient clinics in the San Antonio area. All patients had been living in the community for at least 3 months without psychiatric hospitalization. All patients signed informed consent to participate in a study about how outpatient treatment can affect symptoms and functioning. Subjects were interviewed by a master's level research assistant to ensure that they met the following entry criteria: (1) diagnosis of schizophrenia or schizoaffective disorder based on the Structured Clinical Interview for *DSM III–IV* (American Psychiatric Association 1994); (2) age between 18 and 55; (3) no history of seizure disorder, head trauma, mental disorder secondary to a general medical or neurological condition, or mental retardation; (4) willingness to comply with antipsychotic medication and evidence of regular attendance at clinic visits; and (5) evidence of stable residence in an apartment, family home, or boarding facility for the preceding 3 months. We did not exclude patients based on initial levels of cognitive or functional deficits because, in previous studies, over 90 percent of schizophrenia patients recruited from these public outpatient clinics scored one standard deviation (SD) or more below the mean of control subjects on at least one measure of executive functioning and demonstrated less than optimal adaptive functioning.

Of schizophrenia patients followed by the community clinics serving as recruitment sites, approximately 84 percent met inclusion criteria for this study. In total, 113 patients were approached for participation. Of these, 45 agreed to participate in the study and 68 refused. Reasons for refusal given by potential subjects included not wanting someone to visit their home (30/68), not wanting to accept "handouts of free items" (4/68), and not wanting to participate in research or assessments (34/68).

All patients received standard medication followup from the outpatient clinics throughout the 9 months of the study. Medication was prescribed by the patients' own treating physicians. Doses were in the recommended therapeutic range for all patients, with three exceptions: three patients, one from each group, were on more than 20 mg of olanzapine, exceeding the highest recommended dosage identified in the package insert.

Approximately 69 percent of subjects participating in the study (n = 31) had a diagnosis of schizophrenia, and the remainder met criteria for schizoaffective disorder. Almost 65 percent were male (n = 29). Current substance abuse or dependence was diagnosed in just over 13 percent (n = 6) of the sample. However, approximately 40 percent of subjects (n = 18) had had substance abuse or dependence diagnoses in the past. Forty-four percent (n = 20) of subjects were Mexican-American, 44 percent (n = 20) were Anglo-American, and the remainder were African-American, Asian-American, or of mixed ethnicity (n = 5). Mean age of subjects was 39.64 (SD = 7.82) years. Mean age of onset of psychosis was 20.57 (SD = 5.68) years. Years of education averaged 11.12 (SD = 3.51), and socioeconomic status was in the low-income to lower middle range. Tenure in the community ranged from 3 months to 7 years, with an average of just over 18 months. Twenty subjects lived in boarding homes, 11 were living independently or with spouses and children and were responsible for taking care of their own basic needs, and 14 were living with family members who helped care for them.

Treatment Groups

CAT. CAT is a manual-driven series of compensatory strategies based on neuropsychological, behavioral, and occupational therapy principles (Velligan and Bow-Thomas 2000). Prior to participating in CAT, all patients receive comprehensive behavioral, neuropsychological, functional, and environmental assessments. These assessment procedures are described in detail elsewhere (Velligan and Bow-Thomas 2000).

CAT treatment plans are based on two dimensions: (1) level of apathy versus disinhibition, and (2) level of impairment in executive functions (the ability to plan and carry out goal-directed activities). Apathy and disinhibition are scored based on the Frontal Lobe Personality Scale (Grace et al. 1999). Level of executive functioning is based on cognitive test scores. These assessments and development of CAT treatment plans are described by Velligan and Bow-Thomas (2000). Behaviors characterized by apathy can be altered by providing prompting and cuing to initiate each step in a sequenced task. For example, CAT therapists may provide checklists for tasks that involve complex behavioral sequencing or place signs and equipment for daily activities directly in front of the patient (e.g., a job-site checklist of steps for making file folders, signs regarding steps for brushing teeth, toothbrush and toothpaste placed in basket directly attached to bathroom mirror). Individuals who exhibit disinhibited behavior respond well to the removal of distracting stimuli and behavioral triggers and to redirection. For example, to keep the individual focused on a specific work-related task, a CAT therapist may assist the patient in removing distractions in the workplace, such as posters, telephones, or memos. A CAT therapist may help to discourage the wearing of multiple layers of clothing by placing entire outfits (one shirt, one pair of pants, etc.) into individual boxes in the patient's closet, marked with the day of the week. Individuals with mixed behavior (apathy and disinhibition) are offered a combination of these strategies.

Individuals with a greater degree of executive impairment are provided a greater level of structure and assistance and more obvious environmental cues (larger, brighter, more proximally placed). Individuals with less impairment in executive function can perform instrumental skills adequately with less structure and more subtle cues. These general plans are adapted for individual strengths or limitations in verbal/visual attention, memory, and fine motor coordination (e.g., changing the color of signs frequently to capture attention, using Velcro instead of buttons for fine-motor problems). Interventions are explained, maintained, and altered as necessary by brief (30-minute) weekly visits from a CAT trainer. Family members of patients living with their families were invited to collaborate regarding the placement of adaptive equipment (e.g., signs, mirrors) and to discuss increased independence for the patient in performing daily activities (e.g., the patient doing his or her own laundry with supports vs. the parent doing it).

Control. This condition was designed to control for some of the nonspecific effects of CAT treatment (i.e., receiving home visits by caring individuals, novel items for the home environment). Subjects assigned to this condition were seen for home visits on the same schedule as those assigned to CAT and were given adaptations for their environment that were unrelated to cognitive or adaptive function (e.g., posters, plants). All therapists were given an approved list of items that could be chosen. Subjects were able to choose two items per month. Contact time was equivalent to that in the CAT group, and the same individuals provided treatment for the CAT and control conditions.

Followup only. Subjects assigned to this condition were assessed on the same schedule as those in the other two treatment conditions but did not receive any additional intervention.

Therapist Competence and Treatment Adherence. Prior to performing CAT, all therapists were required to pass a test of knowledge at a score of 0.90 or above. Adherence to both the CAT and control treatments during the study was monitored by weekly supervision meetings and assessed using a measure of quality assurance on case notes.

Assessments

Cognitive functioning. A neurocognitive battery was administered. It included card sorting (Lezak 1998), Trails A and B (Lezak 1998), verbal fluency (Lezak 1998), the California Verbal Learning Test (Delis et al. 1988), Digit Span (Lezak 1998), and a continuous performance test (Mahurin 1995). One customary summary score for each test was examined. For details and administration guidelines, please refer to the references cited in parentheses.

Adaptive functioning. Global functioning was assessed using the SOFAS (American Psychiatric Association 1994). This instrument assesses the overall level of function on a scale from 1 to 100 based on social, school, and work functioning. Symptoms are not considered in the rating. Higher scores indicate better adaptive function. The SOFAS score was based on all information obtained about adaptive and social functioning during the assessment.

Detailed interview-based assessment of adaptive functioning was also obtained using the MCAS, a 17-item instrument rated based on an interview with the patient. To increase the validity of ratings, collateral information was obtained from caregivers and relatives. A total score reflects the overall level of community functioning.

Quality of life. The Heinrichs-Carpenter Quality of Life Scale (QLS) (Heinrichs et al. 1984) was used to assess quality of life. This scale contains 21 items assessing interpersonal relationships, occupational role, sense of purpose, and possession of common necessary objects. Items are rated on 7-point scales (0–6), with higher scores indicating better quality of life.

Symptomatology. The expanded version of the Brief Psychiatric Rating Scale (Ventura et al. 1993) is a 24-item instrument assessing a wide range of psychopathology on a series of Likert-type scales (1–7). The psychosis factor score—composed of items assessing hallucinations, unusual thought content, suspiciousness, and conceptual disorganization—was used as a measure of positive symptoms (Ventura et al. 2000). Higher scores indicate higher levels of symptomatology.

Negative symptoms were assessed using the Negative Symptom Assessment (NSA) (Alphs et al. 1989). The NSA has psychometric properties comparable to the Scale for the Assessment of Negative Symptoms (SANS). Scores on the NSA have been found to correlate strongly with scores on the SANS (Alphs et al. 1989). The NSA assesses multiple domains of negative symptomatology, including communication, social behavior, emotion, motivation, cognition, and psychomotor retardation. A total score for the NSA was calculated by summing all items. Higher scores indicate more negative symptoms.

Raters. All of the above assessments were collected by master's level research assistants who were trained to a criterion of 0.80 intraclass correlation coefficient on a set of 10 criterion videotapes for each instrument described above. This training is based on procedures developed by Nuechterlein and colleagues (Ventura et al. 1993) and is conducted on an ongoing basis for all assessment personnel in an established schizophrenia research program. Monthly meetings are conducted to prevent rater drift.

Treatment Blinds. In an effort to maintain treatment blinds, all subjects and collaterals were asked at the beginning of each assessment neither to divulge information about any visits made by staff of the research project nor to refer to any items they may have received as part of the study. If blinds were broken, alternative raters blind to group assignment completed the remaining assessments.

Alternative Treatments. Thirteen percent (n = 2) of patients in CAT, 20 percent of patients in control treatment (n = 3), and 13 percent (n = 2) of patients in followup only participated in group or day treatment during the study.

Missing Observations. Less than 5 percent of the data were missing at followup. High followup rates are common in our research program, which serves a South Texas area with little migration. No payment was provided for participation in assessments. Eight out of 180 assessments (one observation for each of six patients and two observations on one patient) were missing. One patient in the control group was in jail at the time of an assessment. One CAT patient missed two assessments because of chronic alcohol intoxication. One patient in the assessment-only group moved out of State prior to the 9-month assessment. The other four patients (one each from CAT and control, and two from the assessment-only group) could not be reached for one interim assessment each after multiple attempts were made to contact them.

Statistical Methods. All analyses were conducted in a blinded fashion. Repeated measures analysis of covariance (ANCOVA) for mixed models (SAS PROC MIXED; SAS Institute 1990) were used to examine group differences over time (3, 6, and 9 months) by treatment group (CAT, control, and followup only), with baseline scores used as covariates. This procedure makes use of all available data, fits the covariance of repeated measures, adjusts for missing values, and allows us to examine the points at which groups began to diverge with respect to outcome measures. In addition, we examined planned comparisons between CAT and each of the two non-CAT conditions (control and followup only). We examined results for planned comparisons using both uncorrected significance levels and those corrected for experiment-wise error rate using Dunnett's procedure at each time point (Keppel 1991). This procedure is designed to correct for multiple comparisons that examine one treatment in comparison to two others. We used a chi-square log likelihood test to verify that the assumption of compound symmetry as compared to the more general unstructured covariance of repeated measures fit the data for these analyses.

Results

Descriptive and Baseline Data. Demographic variables for the three treatment groups are presented in table 1. There were no statistically significant differences between groups with respect to any of these variables at the time of initial assessment.

Means and SDs for dependent variables (covariates) at baseline by group and across all groups are presented in table 2. Cognitive variables at baseline by treatment group are presented in table 3. There were no significant differences between groups on any of these variables.

Level of Functioning. With respect to adaptive functioning, there were significant main effects for treatment group ($F(2,41) = 6.87$, $p < 0.003$) and time ($F(2,79) =$

Table 1. Demographic variables by group

	CAT (n = 15)	Control (n = 15)	Followup only (n = 15)
% male	53.33 (n = 8)	60.00 (n = 9)	80.00 (n = 12)
% Anglo-American	26.67 (n = 4)	40.00 (n = 6)	66.67 (n = 10)
% Mexican-American	46.67 (n = 7)	53.33 (n = 8)	33.33 (n = 5)
% with schizophrenia	73.33 (n = 11)	73.33 (n = 11)	60.00 (n = 9)
% on atypical antipsychotics	86.67 (n = 13)	66.67 (n = 10)	73.33 (n = 11)
% meeting criteria for current substance abuse or dependence	13.33 (n = 2)	13.33 (n = 2)	13.33 (n = 2)
Age, mean (SD)	39.33 (6.27)	38.93 (9.60)	40.67 (7.68)
Age of onset, mean (SD)	21.50 (6.65)	19.46 (6.55)	21.00 (3.79)

Note.—CAT = cognitive adaptation training; SD = standard deviation. No significant differences were found between the three groups by chi-square analyses or one-way analysis of variance for categorical and continuous measures, respectively.

Table 2. Baseline means and SDs for dependent variables by treatment group and across all groups

	CAT	Control	Assessment only	Average across groups for use in ANCOVAs
SOFAS	34.53 (17.36)	39.67 (12.57)	39.07 (14.55)	37.76 (14.80)
MCAS	60.27 (7.43)	58.93 (7.00)	58.86 (9.00)	59.36 (7.70)
QOL	50.53 (14.57)	53.20 (14.98)	51.20 (12.54)	51.64 (13.82)
BPRS positive	2.62 (1.07)	3.32 (1.26)	3.25 (1.14)	3.03 (1.17)
NSA total	72.47 (15.66)	70.40 (13.37)	68.53 (11.93)	70.47 (13.52)

Note.—ANCOVA = analysis of covariance; BPRS = Brief Psychiatric Rating Scale; CAT = cognitive adaptation training; MCAS = Multnomah Community Ability Scale; NSA = Negative Symptom Assessment; QOL = Quality of Life Scale; SD = standard deviation; SOFAS = Social and Occupational Functioning Scale. No significant differences were found for the three groups by one-way analysis of variance for any of these variables at baseline.

Table 3. Baseline cognitive function scores by treatment group

Test	Score	CAT	Control	Assessment only
CVLT	Total recalled in 5 trials	34.57 (11.34)	28.88 (11.37)	36.13 (17.18)
Trails A	Seconds	74.28 (39.21)	73.71 (39.21)	91.53 (74.19)
Trails B	Seconds	159.36 (91.68)	159.14 (82.44)	183.47 (145.39)
Verbal fluency	Total letters in 3 trials	25.78 (7.07)	22.64 (12.54)	28.40 (13.71)
WCST Nelson Modification	Perseverative errors	10.70 (10.39)	10.64 (11.50)	10.67 (12.27)
Digit Span	Total forward plus backward	10.71 (3.27)	8.79 (3.09)	10.13 (4.05)
CPT[1]	Total misses	18.86 (13.32)	16.93 (14.70)	11.33 (10.83)

Note.—CAT = cognitive adaptation training; CPT = continuous performance test; CVLT = California Verbal Learning Test; WCST = Wisconsin Card Sorting Test.

[1] Identical Letter Pairs version from Neurocog Computerized Battery (Mahurin 1995).

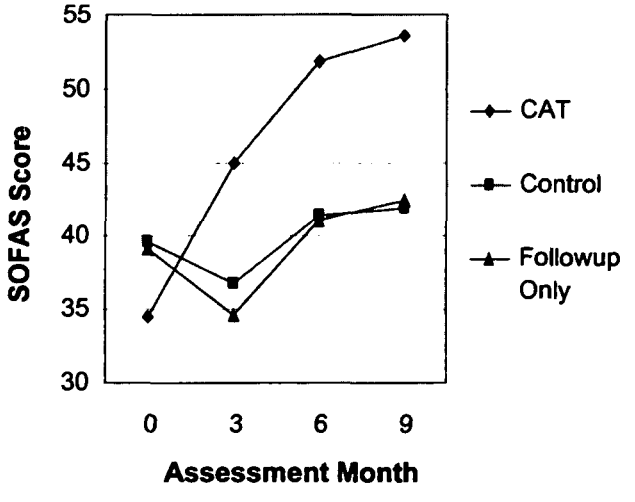
11.34, $p < 0.0001$) and a nonsignificant treatment group by time interaction ($F(4,79) = 0.02$; $p > 0.99$). Hence, the analysis revealed a between-group treatment effect but no differences in slope from months 3 to 9, suggesting that differences between the treatments remained stable throughout the followup period. An inspection of means indicates that patients in the CAT group scored higher in terms of adaptive functioning during the followup period than patients in the control and assessment-only conditions. Planned comparisons at each time point corrected for multiple comparisons using Dunnett's procedure revealed significant differences between the CAT and control treatments by 3 months, which were sustained throughout the study. Means for each time point are displayed in figure 1.

We were also interested in the numbers of patients in each treatment group that experienced clinically meaningful improvement in functioning. With respect to the SOFAS score, differences of 10 points are likely to be clinically meaningful, in that the scale is divided into levels of functioning based on 10-point increments. We examined the proportion of patients who improved using both 10 and 20 points as an indicator of clinical significance. Twelve of 15 patients in CAT improved at least 10 points from baseline, compared with 7 of 15 and 6 of 15 for control and followup only, respectively. Seven out of 15 patients in CAT demonstrated a 20-point improvement from baseline, compared with 2 of 15 and 1 of 15 for control and followup only, respectively. Chi-square tests for CAT versus the other two treatments combined were significant for improvements of both 10 and 20 points ($\chi^2(1) = 5.44$, $p < 0.02$, and $\chi^2(1) = 7.78$, $p < 0.006$, respectively).

We also examined total scores on the MCAS. Results were similar to those reported with the SOFAS. Repeated measures ANCOVA for mixed models indicated a significant main effect for group and nonsignificant effects for time and group by time ($F(2,41) = 3.31$, $p < 0.05$; $F(2,78) = 1.52$, $p > 0.22$; and $F(4,78) = 1.02$, $p > 0.40$, respectively). Planned comparisons revealed statistically significant differences overall between CAT and each of the other two treatment groups. Patients in CAT improved to a greater extent during followup than those in the other treatments. Planned comparisons at each time point revealed that CAT differed significantly from the control group at 3 months and from the assessment-only group at 6 and 9 months. None of the individual comparisons at specific time points was significant when using Dunnett's procedure to correct for multiple comparisons. The apparent discrepancy between the overall group effect and the effect at different time points may be due to reduced power at separate time points compared to the power for all time points combined. These data appear in figure 2.

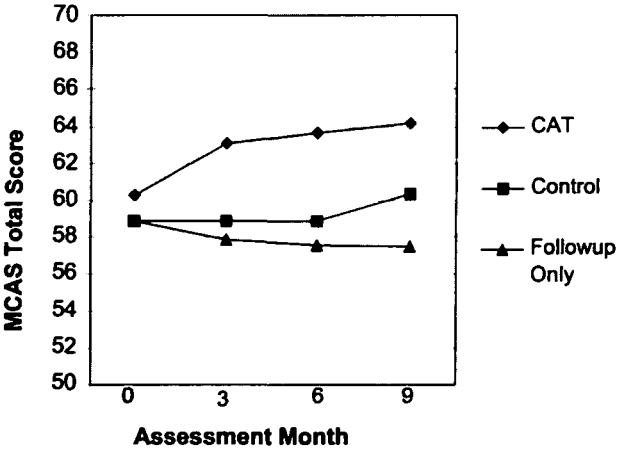
Quality of Life. With respect to quality of life, results of the repeated measures ANCOVA for mixed models for the total QLS score revealed a significant main effect for group, a nonsignificant main effect for time, and a non-

Figure 1. SOFAS scores across time by treatment group



Note.—CAT = cognitive adaptation training; SOFAS = Social and Occupational Functioning Scale. Repeated measures analysis of covariance for mixed models: main effect for group $F(2,41) = 6.87$, $p < 0.003$; main effect for time $F(2,79) = 11.34$, $p < 0.0001$; group by time interaction $F(2,79) = 0.02$, $p < 0.99$.

Figure 2. MCAS scores across time by group



Note.—CAT = cognitive adaptation training; MCAS = Multnomah Community Ability Scale. Repeated measures analysis of covariance for mixed models: main effect for group $F(2,41) = 3.31$, $p < 0.05$; main effect for time $F(2,78) = 1.52$, $p > 0.22$; group by time interaction $F(4,78) = 1.02$, $p > 0.40$.

significant group by time interaction ($F(2,41) = 6.56$, $p < 0.003$; $F(2,75) = 2.20$, $p < 0.11$; and $F(4,75) = 0.81$, $p < 0.52$). Again, this analysis revealed a between-group effect but no differences in slope from months 3 to 9, suggesting that differences between treatments remained stable during the followup period. An inspection of means indicates better quality of life in the CAT group compared to control and assessment-only conditions. Significant differences between CAT and the other two treatments appeared at 6 months and continued throughout treatment. All differences remained significant when using Dunnett's procedure to correct for multiple comparisons. These results appear in figure 3.

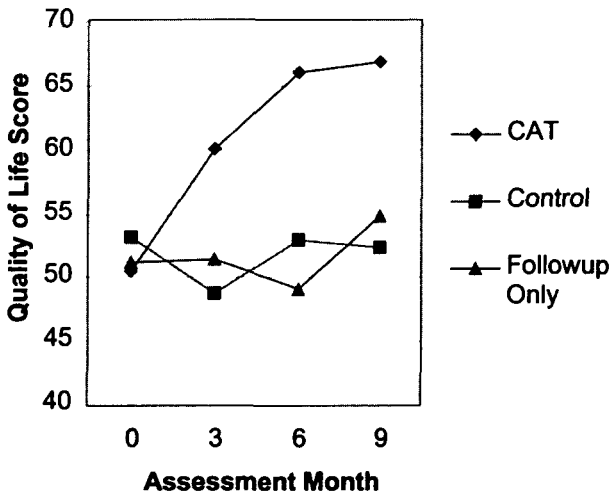
Symptomatology. With respect to positive symptoms, results of the repeated measures ANCOVA indicated a main effect for group ($F(2,41) = 4.12$, $p < 0.02$) and a nonsignificant effect for time ($F(2,76) = 2.26$, $p < 0.11$) and group by time ($F(4,76) = 1.64$, $p < 0.17$). With respect to the group effect, patients in CAT had significantly lower levels of positive symptoms on average across the followup period than patients in either the control or followup groups. With respect to specific time points, differences between the CAT and the control condition were significant at 9 months, and differences between CAT and followup only were significant at 3 months when controlling for multiple comparisons. Means for positive symptoms by group and assessment period are presented in figure 4. Overall, patients in CAT maintained lower levels of symptoms, while symptoms worsened for patients in the other treatment groups.

With respect to negative symptoms, results of the repeated measures ANCOVA revealed nonsignificant main effects for group and time and a nonsignificant group by time interaction ($F(2,41) = 1.67$, $p > 0.19$; $F(2,68) = 0.54$, $p > 0.58$; and $F(4,68) = 1.13$, $p > 0.35$; respectively). Means for negative symptoms by group and assessment period are presented in figure 5.

Additional Analyses. Despite our best efforts, groups appeared to differ somewhat on prognostic indicators such as gender, race, and medication status. While none of these differences reached statistical significance, we conducted a series of ANCOVAs to examine the effects of gender, race, and medication status on treatment group differences. Results for group differences were unchanged when these variables were included as covariates in the statistical model.

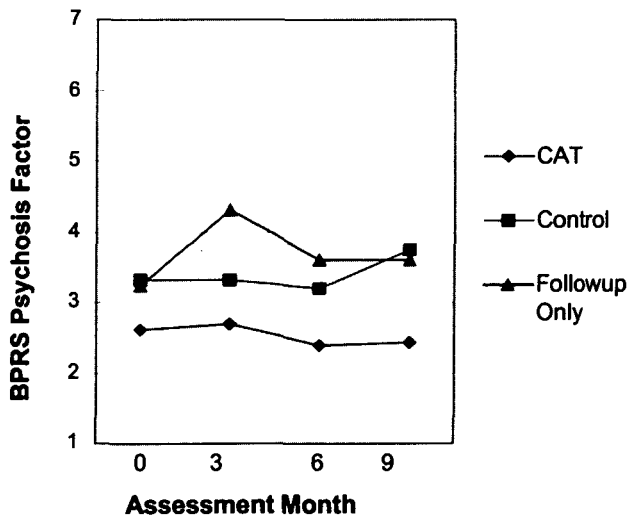
Clinical Impressions. Prior to randomization, most patients stated a preference for the control treatment. While acceptance of the treatment by patients was not assessed systematically during the study, clinical impressions of therapists indicated that patients in both the CAT and control treatments looked forward to visits, enjoyed

Figure 3. QLS scores across time by group



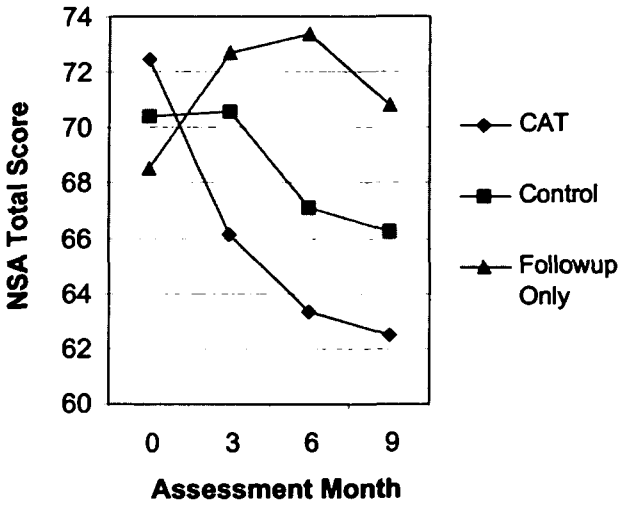
Note.—CAT = cognitive adaptation training; QLS = Quality of Life Scale. Repeated measures analysis of covariance for mixed models: main effect for group $F(2,41) = 6.56$, $p < 0.003$; main effect for time $F(2,75) = 2.20$, $p < 0.11$; group by time interaction $F(4,75) = 0.81$, $p < 0.52$.

Figure 4. BPRS psychosis factor scores across time by group



Note.—BPRS = Brief Psychiatric Rating Scale; CAT = cognitive adaptation training. Repeated measures analysis of covariance for mixed models: main effect for group $F(2,41) = 4.12$, $p < 0.02$; main effect for time $F(2,76) = 2.26$, $p < 0.11$; group by time interaction $F(4,76) = 1.64$, $p < 0.17$.

Figure 5. NSA total scores across time by group



Note.—CAT = cognitive adaptation training; NSA = Negative Symptom Assessment. Repeated measures analysis of covariance for mixed models: main effect for group $F(2,41) = 1.67$, $p > 0.19$; main effect for time $F(2,68) = 0.54$, $p > 0.58$; group by time interaction $F(4,68) = 1.13$, $p > 0.35$.

the interaction with treatment staff, and were greatly appreciative of the items received and the time invested by staff.

Comment

This is the first randomized, controlled pilot study demonstrating that the use of environmental supports can benefit schizophrenia outpatients living in the community without a hospitalization for a minimum of 3 months. While these strategies have been used successfully in other populations, and in patients recently discharged from a State hospital, prior to this study they have not, to our knowledge, been applied in a systematic way to the treatment of outpatients with some tenure in the community (Velligan et al. 2000). Patients in CAT did better in comparison to those in other treatments with respect to adaptive functioning, quality of life, and positive symptoms. Changes in adaptive functioning in CAT as rated by scores on the SOFAS represent clinically meaningful improvements. Improvements in quality of life may be most important from the perspective of patients.

As in our previous study, visiting patients weekly and manipulating the environment in nonspecific ways did not lead to better outcomes. In results that were different from those we obtained in our previous study, patients in CAT did not have fewer negative symptoms than those in other treatments. Patients recently discharged from a State hospital setting, such as those in the first efficacy study of CAT, may have had higher baseline levels of negative symptoms and a greater likelihood of experiencing improvement with intervention than the outpatients who participated in the current study.

Two studies now have suggested that patients in CAT may have lower levels of positive symptoms than those in control conditions. However, this effect may not be consistent over time and should be investigated in larger studies. It may be that the use of environmental supports decreases stress in the lives of individuals with schizophrenia by decreasing demands for planning and remembering, and cuing important behaviors that relieve stress (e.g., talking to a friend or taking a walk as items on a daily checklist). Low levels of stress have been associated with a decreased risk of relapse and symptom exacerbation (Liberman et al. 1995). It is also possible that differences between CAT and the other treatments with respect to symptomatology were mediated in part by medication adherence. CAT encourages and uses adaptations (signs, alarms, and pillboxes) to promote adherence to medication treatments. The effect of CAT on medication adherence should be investigated systematically in future studies. However, previous research indicates that medications are not sufficient for improving *functional* outcomes in patients with schizophrenia (Liberman et al. 1995). It is therefore unlikely that differences in medication compliance alone would have produced differences in adaptive functioning and quality of life between groups. The role of medication compliance is being systematically assessed in an ongoing study.

Differences between CAT and control conditions were more robust for the SOFAS score than for total scores on the MCAS. The MCAS assesses multiple dimensions of adjustment. Some are not likely to change with CAT treatment (e.g., intellectual functioning, mood abnormality, aggressive acting out). We will explore specific domains of adaptive functioning improved with environmental supports in future studies with a larger number of subjects.

The positive results of this pilot study suggest that examining the mechanisms by which CAT treatment may improve community outcomes is important. Additional research should examine whether the comprehensive assessment and individualized interventions of CAT are necessary to produce improvements in community outcomes. It may be that a generic package of environmental supports or compensatory strategies could be devised that would improve outcomes in a significant number of patients. While anecdotal evidence suggests a high degree of satisfaction with CAT treatment, future studies should systematically assess the acceptability of CAT treatment for consumers. In addition, comparing a CAT program focused only on medication compliance to the full CAT

program could address the issue of how much of the improvement in outcome measures is due to improvements in adherence to medication regimens. The rates of utilization of specific environmental supports and the relationship between rates of utilization and outcome should be examined. Similarly, it will be important to establish whether CAT interventions targeted at specific problems in adaptive functioning improve skills specifically in those areas. Finally, the durability of treatment effects in CAT should also be studied. Our clinical impressions suggest that some patients will continue to need support from a CAT therapist (at least monthly) to maintain functional gains, while others will be able to create their own supports for new problems. Studies with these goals are currently under way.

In addition to the issues described above, the current study has methodological weaknesses, including a relatively small sample size and the lack of a "therapeutically active" control condition. Because CAT is a novel intervention, we were interested in determining whether larger scale studies comparing CAT to more active or proven alternative treatments should be pursued. Results of the present study suggest that such research should proceed. While substance abuse was assessed at baseline, we did not examine substance *use* that may have contributed to group differences and should be examined systematically in future studies. In addition, despite our best efforts, there were apparent differences in some prognostic variables across groups. However, none of these differences (for gender, race, and medication status) reached statistical significance or altered results for treatment differences on outcome variables when included in ANCOVAs. Finally, the sample of patients for the present investigation included patients with relatively long histories of schizophrenia and significant cognitive impairment. The results may not generalize to those with a more recent onset of psychosis or less impairment in cognitive functioning.

Even with the limitations of the study mentioned above, the results suggest that the use of environmental supports may add to the growing repertoire of interventions that can help patients lead more productive and satisfying lives.

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Acknowledgments

This research was funded in part by grants from the Friends for Psychiatric Research, the Hogg Foundation for Mental Health, and the National Alliance for Research on Schizophrenia and Depression. Special thanks to Nina Schooler for her mentorship of this project. Thanks to Espie Rangel, Beth Newman, and Luis Castro for assistance in the preparation of this manuscript and to Dawen Sui for assistance with data analysis.

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