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Facilitating Recovery of Daily Functioning in People With a Severe Mental Illness Who Need Longer-Term Intensive Psychiatric Services: Results From a Cluster Randomized Controlled Trial on Cognitive Adaptation Training Delivered by Nurses

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Background: **Feasible and effective interventions to improve daily functioning in people with a severe mental illness (SMI), such as schizophrenia, in need of longer-term rehabilitation are scarce.** ***Aims:*** **We assessed the effectiveness of Cognitive Adaptation Training (CAT), a compensatory intervention to improve daily functioning, modified into a nursing intervention.** ***Method:*** **In this cluster randomized controlled trial, 12 nursing teams were randomized to CAT in addition to treatment as usual (CAT; *n* = 42) or TAU (*n* = 47). Daily functioning (primary outcome) was assessed every 3 months for 1 year. Additional follow-up assessments were performed for the CAT group in the second year. Secondary outcomes were assessed every 6 months. Data were analyzed using multilevel modeling.** ***Results:*** **CAT participants improved significantly on daily functioning, executive functioning, and visual attention after 12 months compared to TAU. Improvements were maintained after 24 months. Improved executive functioning was related to improved daily functioning. Other secondary outcomes (quality of life, empowerment, negative symptoms) showed no significant effects.** ***Conclusions:*** **As a nursing intervention, CAT leads to maintained improvements in daily functioning, and may improve executive functioning and visual attention in people with SMI in need of longer-term intensive psychiatric care. Given the paucity of evidence-based interventions in this population, CAT can become a valuable addition to recovery-oriented care.**

Key words: outcome/cognitive remediation/cognition/treatment/schizophrenia

Introduction

People with a severe mental illness (SMI) are, ideally, treated through outpatient services, both from a patient perspective (eg, social inclusion/role functioning) as well as a societal perspective (avoiding costly hospitalization).[1,2] Although outreach treatment is sufficient for many people with SMIs, a relatively small group (17%) copes with severe and persistent cognitive deficits, negative symptoms, behavioral difficulties, or co-morbid disorders that significantly affect their daily functioning.[3–5] This so-called "low volume, high needs group" requires continuous and intensive psychiatric care and support.[3–5] Though the setting in which this support is provided

varies internationally,[6] people often live in residential psychiatric facilities (eg, long-stay wards or sheltered housing). Support in these settings is usually provided by nursing staff, the majority of whom have a postsecondary education below bachelor level.

Until recently, this group received little attention due to the belief that recovery was unlikely, if not impossible. Today, the field holds the more optimistic view that recovery is possible and that facilities should provide services that support this process.[7] However, nurses often lack guidance on how to support people with SMIs with (re)learning skills and enhancing independence. In a pilot study, we showed that Cognitive Adaptation Training (CAT), a manualized in-home cognitive compensational training, may fill the need for practical tools to be used by nurses to improve functioning in people with SMIs in a hospital setting.[8] Rather than improving cognition as a drill-and-practice restorative training program, CAT aims to bypass cognitive deficits. CAT starts with an individual assessment of functional skills, the role of the environment, specific cognitive strengths/weaknesses, and overt behavior.[9–11] Based on the assessment, CAT interventions are set up in the form of environmental supports and rearrangements of belongings, to support people to achieve their individual goals and wishes. CAT was originally designed to support outpatients using medication, who were recently discharged from psychiatric facilities after treatment for acute deterioration of their psychosis.[10] In several studies with CAT being delivered by psychologists to outpatients with schizophrenia, CAT proved to be superior in improving daily functioning, preventing relapse, and improving quality of life compared to treatment as usual (TAU),[12,13] active control conditions,[10,12] and several less-comprehensive adaptations of CAT.[10,13,14] When delivered by nurses, CAT has shown promising results for outpatients,[8,15] and people in a hospital setting.[8]

The current study elaborates on previous research by taking into account that continuous support seems to remain necessary to maintain the improvements made.[13,14] Through providing CAT as a nursing intervention, opportunities for embedding the intervention in daily, routine care increase. Providing continued support with CAT to maintain improvements becomes possible. Moreover, to reflect a realistic implementation scenario, no extra time or personnel were allocated to teams delivering CAT. We evaluate whether CAT, added to TAU and delivered by nurses, compared to TAU, improves daily functioning in a hospital setting. Based on the pilot study, we hypothesized that functional improvements of CAT compared to TAU would occur between 9 and 12 months after the start of the treatment and that these improvements could be maintained or enhanced in the year thereafter. We hypothesized that cognition would not change with this compensatory training, but included cognition to explore possible effects.

Methods

Design

In this multicenter cluster randomized controlled trial, the effectiveness of CAT+TAU compared to TAU is assessed. Long-stay departments (all open wards) of 3 Dutch psychiatric institutions participated: Lentis Psychiatric Institute, Parnassia Noord-Holland Psychiatric Institute, and GGz Drenthe. Twelve nursing teams were equally cluster-randomized to either CAT or TAU, at the level of institution (cluster 1) and nursing team (cluster 2) (see supplementary methods S1.1 for more details regarding randomization procedure). Data collection took place at the level of the participants. The TAU group served as a wait-list control condition, with a possibility to receive CAT after 1 year. An independent staff member blindly drew a ticket from a basket containing a CAT ticket and a blank ticket. Sample size calculation based on a 0.79 effect size,[9] power of 0.9, and significance level of 0.5 showed that at least 35 participants per group had to complete the study to have a probability of 0.9 or higher of detecting a significant change on the Multnomah Community Ability Scale (MCAS[16]). The Medical Ethics Committee of the University Medical Center Groningen approved the study design and procedures.[9] No changes were made to the methods and procedure after trial commencement. The trial is registered in the Dutch Trial Registry (NTR2720, www.trialregister.nl).

Participants

All adults admitted to the participating departments were people with an SMI according to the definition of Delespaul and colleagues.[17] This includes people with a persistent psychiatric disorder that causes severe difficulties in multiple life domains and for whom coordinated longer-term care by professionals is necessary. All residents were approached for participation, except those who participated in the pilot study[8] or were deemed unable to provide informed consent by their clinician. No further eligibility criteria were considered. Participants provided written consent after receiving a description of the study.

Groups

CAT Group. The intervention and procedures are described in detail in the published study protocol.[9] In short, CAT is an in-home training aimed at bypassing cognitive deficits that hinder daily life activities. Individual CAT plans and compensational strategies are based on a systematic assessment of everyday life domains (Environmental and Functional Assessment;

EFA[18]), strengths/weaknesses in several cognitive functions (see "outcomes") and the behavior type (apathy, disinhibition, or a combination of both) underlying the unadaptive behavior (Frontal Systems Behavior Scale; FrSBE[19]). The CAT manual[18] was translated to Dutch and slightly adapted for practical use by psychiatric nurses. Nurses in the CAT group received didactic training by authors APMS and JER, who were trained by the group of author DIV (developers of CAT). Additional training sessions were provided for new nursing staff. Nurses in the intervention teams were responsible for the interventions of 1 to 3 participants, under the supervision of authors APMS and JER. The whole team was responsible for supporting participants in using the CAT interventions. CAT visits took place during the regular contacts between nurses and patients, so there was no extra contact time between nurses and patients in the CAT group. Additionally, no extra time or personnel were allocated for CAT; rather, organization of the compensational strategies and environmental aids was done during the regular shifts of the nurses. Additional information on the delivery of CAT and participant and nurse perspectives are provided in the supplementary methods (S2.0 & 3.0).

TAU Group. At each institution, TAU was delivered according to Dutch guidelines[20] (matching international guidelines[21]) and consisted of a combination of therapies and daily activities that best match the person's needs, goals, and wishes.

Outcomes

Demographical information was obtained at baseline through medical records and baseline assessment. In the first year, primary outcomes of daily functioning were measured at baseline, 3, 6, 9, and 12 months. Secondary outcomes included quality of life, empowerment, negative symptoms, and cognition (measured at baseline, 6, and 12 months). In the follow-up phase, the sustainability of expected improvements in CAT was investigated by assessments on everyday functioning for the CAT group only (at 15, 18, 21, and 24 months); within-group analyses were applied for these data. We purposefully chose not to follow-up on the TAU group to enable this group to receive the intervention after 1 year rather than 2 years.

To investigate possible differences between people consenting and refusing to participate in the patient-reported assessments, we asked refusers if they were willing to sign informed consent for collecting baseline demographic information and baseline data on functional outcomes (Social Functioning Scale [SFS][22] and Life Skills Profile [LSP],[23] see below). Assessors were third- or fourth-year psychology students or recently graduated psychologists. They were blind to participant allocation and the content of the intervention. In case the blind was broken, another rater finished the assessment.

Primary Outcome

Daily functioning was measured with several instruments. The Multnomah Community Ability Scale (MCAS[16]) is a 17-item semi-structured interview of community adjustment (total score range: 17–85). The Social and Occupational Functioning Assessment Scale (SOFAS[24]) measures social, occupational, and interpersonal functioning on a scale from 0 (grossly impaired functioning) to 100 (excellent functioning). The SFS[22] measures several aspects of functioning in society (total score range: 0–223). The LSP[23] measures successful community or hospital living (total score range: 39–156). The SFS and LSP are observational measures and require the respondent to be well aware of the participant's daily functioning. Therefore, the case manager was asked to fill out both instruments, and blinding of the respondents was not possible. All scales have good psychometric properties,[22,25–27] with higher scores indicating better functioning.

Secondary Outcomes

Secondary outcome measures include quality of life, empowerment, negative symptoms, and cognition. Quality of life is measured with the Short-Form Health Survey (SF-12[28]). The SF-12 is a self-report questionnaire with 12 items measuring subjective physical, psychological, and social well-being. Three out of 6 subscales of the Dutch Empowerment Questionnaire (DEQ[29]), professional help, self-knowledge, and belonging, were used to assess empowerment. Negative symptoms were measured with the avolition-apathy subscale of the Scale for the Assessment of Negative Symptoms (SANS[30]) and the motivation subscale of the Negative Symptom Assessment (NSA[31]). The psychometric properties of these scales are moderate to good.[29,30,32] As a neuropsychological assessment is part of the CAT intervention protocol, we included cognitive functioning as a secondary outcome measure in the current trial to assess (unexpected) changes in cognitive functioning. Cognitive tests include a modified card sorting test (MCST)[33] and letter fluency task (LFT)[32] (executive functioning), picture completion (PC) (visual attention),[34] digit span forward (auditory attention) and backward (working memory),[34] and the word-learning task (WLT)[35] (verbal short-term memory).

Statistical Analysis

Demographic and baseline differences between groups were examined with SPSS Statistics 24[36] using Pearson's Chi-Square tests for categorical variables and independent samples *t*-tests for continuous variables ($\alpha = .05$). Multilevel modeling (MLwiN[37]) was used to assess the improvement of CAT over time with Model A, 0 to 12 months and compared with TAU, and Model B, 12 to 24 months (within CAT group), while including covariates only when statistically significant ($P < .05$).

For each, a 2-level model was built with subjects (level 2) and time of assessment (level 1). Time of assessment was modeled as a continuous variable, since time between measurements varied between and within individuals. Modeling time in this manner would most neatly account for these variations. Random effects were included for the intercept at level 2 and the residuals at level 1. In Model A, 2 separate linear time predictors were used: baseline to 9 months (0, 3, 6, 9; "0–9 months effect") and the differential effect from baseline to post-treatment (0, 12; "12-month effect"). Our primary interest was the latter (12-month effect), as this would indicate the post-treatment effect. However, to gain insight into changes preceding 12 months and to form some idea of the moment at which changes in outcome become apparent, we assessed the 0–9 months effect separately. To examine possible differential effects across locations, we included the location at baseline and interactions between time and condition for every outcome measure. To explore whether CAT treatment effects interacted with client characteristics, we included condition differences at baseline, and 3-way interactions between time, condition, and, respectively, age, gender, level of education, and chlorpromazine equivalent (the equivalent of the dosages of different types of antipsychotic medication) as covariates, and preserved these when significant. Significance of the fixed regression effects was tested using the appropriate t-test ($\alpha = .05$). In the follow-up Model B, the model was constructed analogously to Model A, now with one-time predictor representing time between 1 and 2 years after baseline (12, 15, 18, 21, 24; "follow-up effect"). Effect sizes for the significant 12-month effects between CAT and TAU were calculated using Cohen's d[38]. Since we used multilevel statistics, calculation of Cohen's d deviates slightly from the regular calculation. More details are available in the supplementary methods section 4.0.

Since previous studies demonstrated a relationship between cognitive and daily functioning,[39] we performed a post hoc explanatory analysis to assess the relationship between the measures on which the CAT group improved significantly more than the TAU group and the different measures of cognition using Pearson's r correlation.

Results

Participant Flow and Attrition

All 261 eligible participants were approached between September 2012 and June 2015, of whom 89 consented to participate (CAT: 42; TAU: 47). The most common reasons for not participating were no interest, or not willing to participate in the interviews or tests. Participant flow is displayed in figure 1. Full-consenters ($n = 89$) and those who consented to baseline staff-rated data ($n = 22$) differed only with regard to age; younger people were more likely to fully participate ($t(109) = -2.291$, $P = .024$). Additionally, participants who completed the trial showed lower levels of positive symptoms compared to non-completers ($t(49) = -2.524$, $P = .014$).

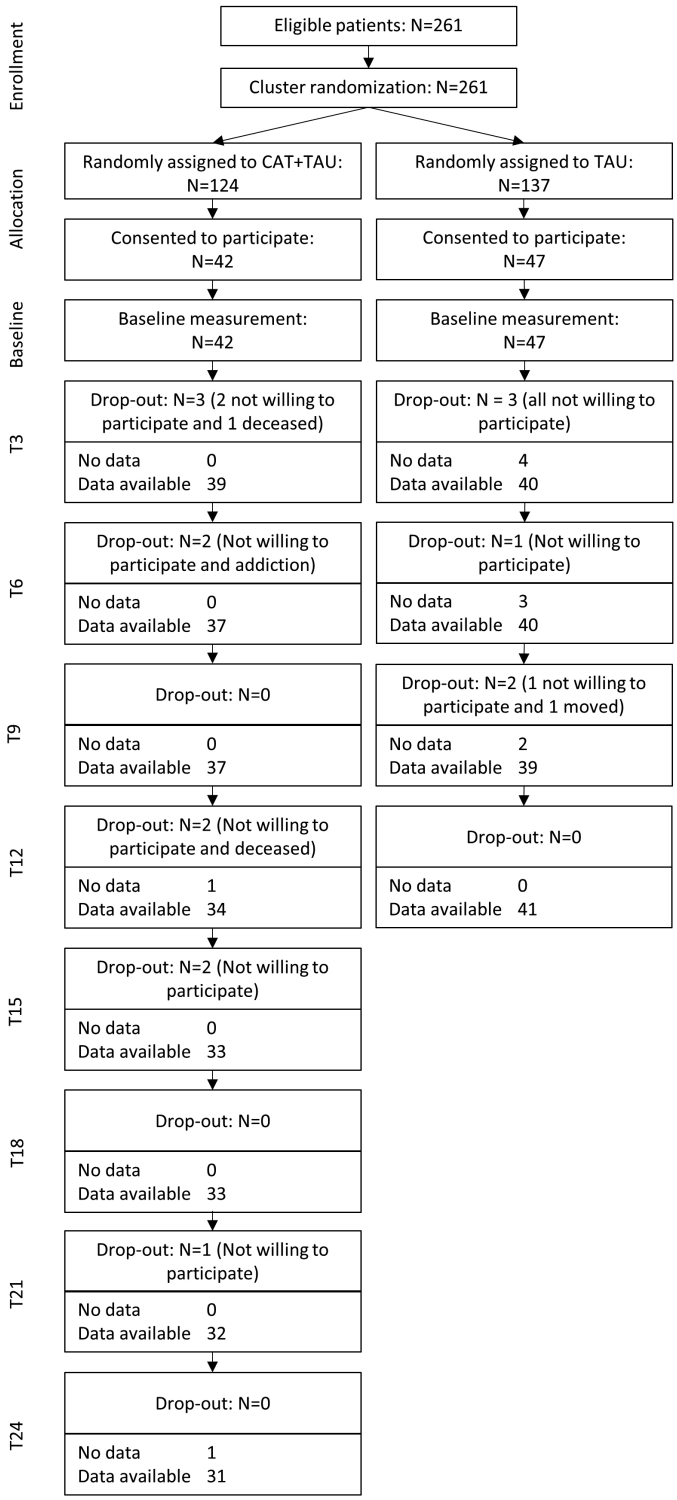

Fig. 1. Flowchart of study recruitment, treatment allocation, attrition, and available data per measurement.

Clinical and Demographical Information

Demographic characteristics and baseline scores for primary outcomes are presented in table 1. The average age was over 50 years for both groups, indicating that this was an older sample of service-users. The CAT group was significantly older ($t(87) = -2.187$, $P = .031$) and had poorer functioning as measured with the SFS ($t(82) = 2.849$, $P = .006$).

Primary Outcome Measures

In table 2, 0–9 months and 12-month effects (Model A) are presented. Means and standard deviations per measurement are depicted in supplementary table S1 and follow-up effects (12–24 months, within-group CAT) in supplementary table S2 (Model B). Described below are the results of analyses accounting for significant covariates.

Regarding the LSP, significant differences in favor of CAT were found for the 12-month effect ($t(67) = 2.331$, $P = .011$) with a small effect size ($d = .36$). Neither the MCAS, SFS nor the SOFAS revealed significant group differences at the 0–9 months or 12-month effect. However, the CAT group demonstrated significant within-group improvements at follow-up on the SOFAS ($t(23) = 1.800$, $P = .042$) and a sustained within-group effect on the LSP ($t(25) = -1.190$, $P = .123$).

Secondary Outcome Measures

While no significant group differences over time were found in quality of life, empowerment or negative symptoms (supplementary table S3), effects were found in cognitive functioning (table 3). Described below are the results of analyses accounting for significant covariates.

The CAT group significantly improved on the MCST-perseverative errors, LFT, and PC compared to TAU after 12 months (MCST: ($t(53) = -2.198$, $P = .016$); LFT: ($t(59) = 5.133$, $P < .001$); PC: ($t(51) = 2.762$, $P = .004$)). The effect size for the MCST-perseverative errors and PC are medium (MSCT: $d = 0.68$; PC: $d = 0.55$) to large (LFT: $d = 0.84$). Regarding the Digit Span-forward and Digit Span-backward, the CAT group declined significantly compared to the TAU group at the 0–9 months effect (Digit Span-forward: [$t(47) = -1.983$, $P = .027$); Digit Span-backward [$t(50) = -1.935$, $P = .029$]). However, these effects were no longer significant after 12 months.

No significant effects were found on the MCST-correct responses and the WLT between the CAT group and the TAU group.

Post Hoc Analysis

Bivariate correlational analysis revealed a significant negative correlation between change scores on the LSP and MCST-perseveration ($r = -.392$, $P = .020$).

Table 1. Comparison of Baseline Scores and Demographic Characteristics Between CAT and TAU

Baseline Characteristic	TAU	*N*	CAT	*N*	*P* *t*-test/χ^2
Diagnosis, #		47		42	.646
Schizophrenia	26		25		
Schizoaffective disorder	6		2		
Bipolar disorder	6		4		
Depressive disorder	3		2		
Personality disorder	3		3		
Other	3		6		
Gender (m/f), #	30/17	47	29/13	42	.603
Age, y (mean, SD)	50.79 (11.41)	47	55.52 (8.64)	42	.031*
Education, #		45		39	.253
Low	17		10		
Middle	23		20		
High	5		9		
PANSS (mean, SD)		36		25	
Positive	15.47 (6.94)		15.92 (5.17)		.785
Negative	17.42 (7.47)		17.46 (6.38)		.980
General	33.56 (9.05)		33.42 (8.22)		.953
Chlorpromazine equivalent (mean, SD)	570.42 (503.05)	41	520.12 (311.62)	40	.591
Scores for the dependent variables					
MCAS, (mean, SD)	57.84 (7.38)	43	58.62 (6.71)	39	.620
SOFAS, (mean, SD)	37.93 (9.93)	42	37.56 (8.34)	39	.600
SFS, (mean, SD)	99.83 (22.98)	42	85.64 (22.67)	42	.006*
LSP, (mean , SD)	119.64 (13.87)	42	115.26 (13.74)	42	.250

Note: CAT, Cognitive Adaptation Training; TAU, Treatment As Usual; PANSS, Positive and Negative Syndrome Scale; MCAS, Multnomah Community Ability Scale; SOFAS, Social and Occupational Functioning Assessment Scale; SFS, Social Functioning Scale; LSP, Life Skills Profile.
*$P \leq .05$.

Table 2. Model A: Fixed and Random Effects on Primary Outcome Measures

Parameter	MCAS Beta (SE)	SOFAS Beta (SE)	SFS Beta (SE)	LSP Beta (SE)
Fixed effects				
Intercept[a]	59.656 (0.987)***	35.357 (0.917)***	103.359 (4.164)***	121.455 (1.986)***
Intercept × CAT	...	...	−13.229 (4.671)***	…
Intercept × location (Castricum)	−0.624 (1.621)	2.295 (1.469)	−7.168 (5.347)	−5.040 (3.076)
Intercept × location (Assen)	−0.519 (1.667)	2.372 (1.501)	−4.570 (5.575)	−6.036 (3.243)*
0–9 months effect × CAT	−0.169 (0.180)	−0.078 (0.116)	−0.314 (0.249)	0.313 (0.189)
12-month effect × CAT	0.064 (0.077)	0.316 (0.199)	−0.126 (0.188)	0.317 (0.136)*
0–9 months effect × CAT × age[b]	…	…	…	−0.033 (0.018)*
0–9 months effect × CAT × middle education[c]	0.489 (0.215)*	…	…	…
0–9 months effect × CAT × higher education[c]	0.377 (0.242)	…	…	…
12-month effect × CAT × middle education[c]	…	−0.322 (0.232)	…	…
12-month effect × CAT × higher education[c]	…	−0.700 (0.270)**	…	…
Random effects (variances)				
Level 2 - intercept	31.063 (5.659)	21.856 (4.634)	415.115 (66.370)	135.592 (22.545)
Level 1 - residual	17.586 (1.521)	28.917 (2.509)	102.811 (8.394)	56.420 (4.607)

Note: SE, standard error; CAT, Cognitive Adaptation Training; MCAS, Multnomah Community Ability Scale; SOFAS, Social and Occupational Functioning Assessment Scale; SFS, Social Functioning Scale; LSP, Life Skills Profile; Symbol: … = the effect appeared not to be significant and was therefore removed from the model. *How to read this table*: eg, the total average score of the CAT and TAU group at baseline is 121.455 for the LSP (see Beta LSP Intercept). The total average score of CAT and TAU in "Castricum" is 5.040 points lower than in "Zuidlaren" (see Beta LSP Intercept × location [Castricum]). For the 0–9 mo effect, the total average score on the LSP increases 0.313 points each month (slope; see Beta LSP 0–9 mo effect × CAT) up to 9 mo for the people in the CAT group compared to the people in the TAU group. For the 12-mo effect, the total average score on the LSP increases 0.317 points each month (slope; see Beta LSP 0–12 mo effect × CAT) up to 12 mo for the people in the CAT group compared to those in the TAU group.
[a]Intercept: total mean score at baseline in location "Zuidlaren".
[b]Age is mean-centered at 53 y.
[c]Education: level of education compared to low level of education (≤primary school).
*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$.

Discussion

This is the first randomized controlled trial evaluating the effect of CAT as a nursing intervention in people with SMI who need longer-term intensive psychiatric care. Results showed that CAT improved daily functioning compared to TAU after 12 months, measured with the LSP. The follow-up assessment (2 years) demonstrated no significant decline, suggesting maintained improvements within the CAT group at follow-up. Improvements on one of the other functional outcome measures (SOFAS) were observed at follow-up, as shown by within-group data for the CAT group. While there was no evidence that CAT improved quality of life, empowerment or negative symptoms, CAT participants unexpectedly improved on executive functioning and visual attention. Moreover, improvements in executive functioning were related to improvements in daily functioning. Thus, as a nursing intervention, CAT can improve daily functioning, and may also improve executive functioning and visual attention in people with SMIs who need longer-term intensive psychiatric care.

The LSP indicated improvements on functioning in the first year in the CAT group, while improvements on the MCAS, SOFAS, and SFS were not observed. This discrepancy may be explained by differences in the level of functioning measured. The LSP closely measures basic activities of daily living (eg, "Does this person wash himself/herself without reminding?" or "Can this person generally prepare (if needed) his/her own food/meals?")[23] and may, therefore, be most suitable for measuring change in the goals of the target group. These goals mostly pertain to becoming more independent from staff in performing basic activities of daily living (eg, keeping a clean living environment, maintaining personal hygiene). In contrast, in outpatients, functional areas affecting other life domains may (also) be targeted (eg, learning skills to undertake social activities, finding/keeping a paid job). Previous studies with outpatients using either the MCAS,[40,41] the SOFAS,[13,14,42] or both[10,12,40] have repeatedly shown sensitivity to change of these scales in an outpatient population, with the exception of the MCAS in a study comparing several treatments[41] and modifications of CAT.[40,43] However, these scales and the SFS use more global items, such as "How well does the client perform independently in day-to-day living?" or a single item scale (SOFAS) and may not be sensitive enough to detect the subtler changes relating to the goals set in the inpatient population. Furthermore, the MCAS contains domains that are not likely to change with CAT, such as mood abnormality or physical functioning.[12] Measuring the effect of interventions through assessing goal attainment (eg, using Goal Attainment Scaling) has provided the strongest evidence for functional improvements with CAT[15] as well as other rehabilitative interventions.[44]

Table 3. Model A: Fixed and Random Effects on Measures of Cognition

Parameter	$MCST_{correct}$ Beta (SE)	$MCST_{pers}$ Beta (SE)	PC Beta (SE)	WLT Beta (SE)	LFT Beta (SE)	Digit $Span_{forward}$ Beta (SE)	Digit $Span_{backwards}$ Beta (SE)
Fixed effects							
Intercept[a]	21.729 (1.613)***	12.235 (1.690)***	14.281 (0.800)***	26.306 (1.759)***	22.130 (1.490)***	7.271 (0.353)***	4.036(0.302)***
Intercept × CAT	…	…	…	…	…	1.435 (0.449)**	1.153 (0.371)**
Intercept × location (Castricum)	0.001 (2.684)	0.008 (2.769)	−1.102 (1.281)	−2.771 (2.942)	−3.661 (2.349)	−0.683 (0.488)	−0.080 (0.402)
Intercept × location (Assen)	−1.147 (2.684)	1.897 (2.770)	−1.194 (1.339)	−5.117 (3.030)*	−2.692 (2.476)	−0.169 (0.495)	0.115 (0.418)
0–9 months effect × CAT	−0.783 (0.483)	−0.302 (0.322)	0.006 (0.116)	−0.225 (0.269)	0.310 (0.185)*	−0.232 (0.117)*	−0.089 (0.046)*
12-month effect × CAT	−0.284 (0.251)	−0.710 (0.323)*	0.174 (0.063)**	−0.376 (0.284)	0.503 (0.098)***	0.023 (0.033)	−0.020 (0.024)
0–9 months effect × CAT × middle education[c]	1.594 (0.588)**	…	…	…	…	0.230 (0.131)*	…
0–9 months effect × CAT × higher education[c]	0.906 (0.660)	…	…	…	…	0.259 (0.144)*	…
12-month effect × CAT × age[b]	…	…	…	−0.048 (0.015)***	−0.028 (0.009)***	−0.006 (0.003)*	…
12-month effect × CAT × middle education[c]	0.718 (0.303)*	0.496 (0.384)	…	0.697 (0.326)*	…	…	…
12-month effect × CAT × higher education[c]	0.357 (0.353)	0.955 (0.447)*	…	0.826 (0.372)*	…	…	…
Random effects (variances)							
Level 2 - intercept	77.463 (15.072)	69.597 (16.120)	18.988 (3.641)	87.533 (17.405)	71.137 (12.624)	2.032 (0.479)	1.611 (0.345)
Level 1 - residual	34.610 (4.598)	65.038 (8.617)	7.781 (1.062)	32.498 (4.798)	22.164 (2.749)	1.747 (0.244)	1.100 (0.151)

Note: SE, standard error; CAT, Cognitive Adaptation Training; $MCST_{correct}$, Modified Card Sorting Test-correct scores; $MCST_{pers}$, Modified Card Sorting Test-perseveration scores; PC, Picture Completion; WLT, 15 Word Learning Task; LFT, Letter Fluency Task; Symbol: … = the effect appeared not to be significant and was therefore removed from the model. *How to read this table*: eg, the average number correct responses of the LFT is 22.130 for CAT and TAU group at baseline (see Beta LFT Intercept). The average number of words on the LFT for CAT and TAU in "Castricum" is −3.661 points lower than in "Zuidlaren" (see Beta LFT Intercept × location (Castricum)). For the 0–9 mo effect, the average number of words on the LFT increases 0.310 points each month (slope; see Beta LFT 0–9 mo effect × CAT) up to 9 mo in the CAT group compared to the TAU group. For the 12-mo effect, the average number of words on the LFT increases 0.503 points each month (slope; see Beta LFT 0–12 mon effect × CAT) up to 12 mo in the CAT group compared to the TAU group.

[a]Intercept: total mean score at baseline in location "Zuidlaren".

[b]Age is mean-centered at 53 y.

[c]Education: level of education compared to low level of education (≤primary school).

*$P \leq .05$; **$P \leq .01$; ***$P \leq .001$.

With regard to clinical significance, we conclude that the change scores found in our study (mean difference LSP at 12 months: 6,1 for CAT and 1,5 for TAU; group difference LSP at 12 months: 3,8 based on the multilevel model) are consistent with previous studies on rehabilitative interventions in this population (4 points in 12 months[45] and 6 points in 18 months[46]). The follow-up effect for the LSP is consistent with our hypothesis that with CAT as a nursing intervention, we would be able to maintain functional improvements when the intervention is continued. That is, we expected that nurses would internalize the CAT method and continue to provide CAT to the people in their caseload. Indeed, our results suggest that by implementing CAT as a nursing intervention we achieved continued delivery of the intervention, and, thereby, maintenance of the improvement. Nevertheless, due to a lack of follow-up data in the control group, we cannot draw definitive conclusions with regard to sustained improvements in the control condition.

Reports on the effects of CAT on negative symptoms have been inconsistent.[10,12,15] Based on our study, it seems that compensational strategies may be insufficient for bringing about change in negative symptoms. Nevertheless, the results point out that despite persistent negative symptoms functional improvements can be achieved. Furthermore, we did not find significant effects on empowerment (regaining identity, self-esteem, and control over one's life[47]). Possibly, small functional improvements do not lead to a significant increase in feelings of empowerment. It is also possible that CAT goals do not always reflect an intrinsic motivation of the service-users, which may contribute to a lack of significance for empowerment and control.[48] Though we intended to design-CAT-plans and interventions based on goals set by the service-users themselves, this was difficult for some service-users (eg, due to many years of institutionalization). In these cases, the nursing staff chose a goal derived as much as possible from the answers that were provided by the service-user at other intake instruments of CAT (eg, the environmental assessment). Finally, since the sensitivity to change of the DEQ is unknown, a limited ability to detect differences with the DEQ could also be an explanation for these results.

Even though CAT is not designed to improve cognitive functioning,[9] CAT participants improved on executive functioning and visual attention. Moreover, improvements on executive functioning were related to better daily functioning (LSP). A previous CAT study suggested that functional improvements led to better performance on cognitive tasks not after 1 year but after 2 years. This may suggest that cognition improves as a result of functional improvements or an increase in activities.[49] This also may be the case in our study, since functional improvements (LSP) preceded improvements in cognition. Others have argued that improved cognition could facilitate the ability to benefit from rehabilitative interventions.[50] However, it is also possible that improved cognition is not necessarily the result of the intervention per se, but (partly) due to stimulation to think about goals in daily life and active engagement in reaching these goals.

Strengths and Limitations

Strengths of this study are the generalizability of results, since participants were recruited from different sites across the Netherlands and because we kept our exclusion criteria to a minimum (instead of focusing on people with a diagnosis of schizophrenia only). In addition, CAT visits were planned within regular service-user/nurse contact, to increase implementation success, which we consider a strength. We did observe that the time nurses needed to embrace and deliver CAT varied among the nursing staff. This may be due to individual differences between nurses in adopting a recovery-oriented attitude, CAT skills, general attitude towards evidence-based interventions, differences in caseload characteristics, and other factors. Another strength is the longitudinal design, addressing previous findings of diminished functioning when CAT sessions are no longer taking place, since CAT sessions took place during regular nurse-patient contacts and were continued in the second year of the trial.[13,14] Finally, considering the average age of the participants, demonstrated improvements in an older sample of service-users provide an argument for functional recovery, regardless of age.

Some methodological weaknesses should also be mentioned, such as the lack of a fidelity instrument and lack of information regarding the time the nurses spent on organizing CAT procedures and CAT-assessments. Furthermore, since expected effects were small considering the functional impairments of the target group, the lack of other significant results may be due to a lack of power. Additionally, functional gains measured by the LSP could (partly) be explained by a confirmation bias, as the LSP was also filled out by nurses who provided CAT. Also, though purposefully designed so that the control group could receive CAT after 1 year, the lack of follow-up data for TAU requires caution in interpreting the follow-up effect for CAT as they may reflect nonspecific effects. In addition, we were not able to replicate our earlier findings regarding the increase of daytime activities[8] as these were not registered in all institutions. Finally, though nonspecific effects were kept to a minimum, it would be advisable in future studies to include an active control condition.

The study also has some clinical implications to consider as the results indicate that as age and positive symptoms increase, people are less likely to participate in and complete the treatment. Although it is not uncommon that drop-out rates for psychosocial interventions are higher for older people and people with more

positive symptoms,[51,52] it may be that CAT is not suitable for those people.

Conclusion

The results of this study suggest that CAT, as a nursing intervention, leads to maintainable improvements in daily functioning and may improve executive functioning and visual attention in people with SMI who need longer-term intensive psychiatric care. Considering the lack of interventions aimed at improving functioning in this population, CAT seems to be a valuable addition to the support given in residential settings. The next challenge will be to implement CAT in such a way that it is available to everyone who may benefit from it. The implementation of CAT into routine care may then be an important contributor in facilitating the recovery of people in need of longer-term intensive psychiatric care.

Supplementary Material

Supplementary material is available at *Schizophrenia Bulletin* online.

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