

University of Groningen

Improving functional outcomes for schizophrenia patients in the Netherlands using Cognitive Adaptation Training as a nursing intervention

Quee, Piotr J.; Stiekema, Annemarie P. M.; Wigman, Johanna T. W.; Schneider, Harald; van der Meer, Lisette; Maples, Natalie J.; van den Heuvel, Edwin R.; Velligan, Dawn I.; Bruggeman, Richard

Published in:
Schizophrenia Research

DOI:
[10.1016/j.schres.2014.06.020](https://doi.org/10.1016/j.schres.2014.06.020)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2014

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Quee, P. J., Stiekema, A. P. M., Wigman, J. T. W., Schneider, H., van der Meer, L., Maples, N. J., van den Heuvel, E. R., Velligan, D. I., & Bruggeman, R. (2014). Improving functional outcomes for schizophrenia patients in the Netherlands using Cognitive Adaptation Training as a nursing intervention: A pilot study. *Schizophrenia Research*, 158(1-3), 120-125. <https://doi.org/10.1016/j.schres.2014.06.020>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.



Improving functional outcomes for schizophrenia patients in the Netherlands using Cognitive Adaptation Training as a nursing intervention — A pilot study



Piotr J. Quee^{a,b,*}, Annemarie P.M. Stiekema^{a,b,1}, Johanna T.W. Wigman^a, Harald Schneider^b, Lisette van der Meer^{a,b,e}, Natalie J. Maples^d, Edwin R. van den Heuvel^c, Dawn I. Velligan^d, Richard Bruggeman^a

^a Department of Psychiatry, Rob Giel Research Center, University of Groningen, University Medical Center Groningen, The Netherlands

^b Department of Rehabilitation, Lentis Center for Mental Health, Zuidlaren, The Netherlands

^c Department of Epidemiology, University of Groningen, University Medical Center Groningen, The Netherlands

^d Division of Schizophrenia and Related Disorders, Department of Psychiatry, University of TX at San Antonio, USA

^e Department of Neuroscience, University of Groningen, University Medical Center Groningen, The Netherlands

ARTICLE INFO

Article history:

Received 17 December 2013

Received in revised form 6 June 2014

Accepted 9 June 2014

Available online 5 July 2014

Keywords:

Rehabilitation

Schizophrenia

Treatment

CAT

Cognition

Compensation

ABSTRACT

Cognitive Adaptation Training (CAT) improves functional outcomes in schizophrenia outpatients living in the United States. The effectiveness of CAT for patients living outside the US as well as for long-term hospitalized patients remains to be determined. In addition, it has not yet been studied whether CAT can be successful if patients receive the treatment from psychiatric nurses. This pilot study investigated the effectiveness and feasibility of CAT as a nursing intervention in the Netherlands. Thirty schizophrenia patients (long-term hospitalized patients: 63%) participated in this study. Sixteen patients received treatment as usual (TAU) + CAT, and fourteen patients received TAU. Patients in CAT participated in the treatment for eight months, consisting of weekly home-visits by a psychiatric nurse, supervised by a psychologist. After eight months, CAT interventions were integrated in the usual treatment. Outcome measures were the Multnomah Community Ability Scale (MCAS), the Social and Occupational Functioning Scale (SOFAS), and the Negative Symptom Assessment-Motivation subscale (NSA-M). For inpatients, work-related activities were also tracked for 16 months after baseline. Patients receiving TAU + CAT had better scores on the MCAS (trend), compared to TAU patients. Moreover, inpatients' work-related activities increased in TAU + CAT, relative to TAU inpatients, reaching significance after ten months. Improvements on the SOFAS and NSA-M were not significant. These results indicate that CAT as a nursing intervention may improve outcomes in patients with schizophrenia living in the Netherlands, including long-term hospitalized patients. However, since the current study was designed for exploratory purposes, larger randomized controlled studies are needed to confirm our results and to investigate the long-term effects of CAT as a nursing intervention systematically.

© 2014 Elsevier B.V. All rights reserved.

1. Introduction

The majority of patients with schizophrenia show impairments in most cognitive domains (Palmer et al., 2009). These cognitive deficits substantially contribute to a long-term functional disability. In the last decade, treatments addressing cognitive impairment have been receiving increasing attention. While pharmacological treatments have proven successful in reducing the positive symptoms (Leucht et al., 2009), cognitive improvements following antipsychotic treatment have been found to be

small (Keefe et al., 2007). Cognitive remediation programs have shown to be more successful (McGurk et al., 2007), but a recent meta-analysis shows only small to moderate effect sizes for functional outcomes and states that adjunctive therapy is essential for transfer of training to daily life (Wykes and Spaulding, 2011). A different approach in the treatment of cognitive impairment is the use of environmental supports in the living area of the patient. Such treatment programs use compensation strategies and external aids (e.g. alarms, calendars) to bypass cognitive deficits and negative symptoms, and to improve adaptive functioning. Cognitive Adaptation Training (CAT) is based on this approach and has been very successful in doing so in outpatients in the United States (Velligan et al., 2000, 2002, 2008a). However, a number of questions remain unanswered.

First, it is unclear whether patients outside the US can benefit from CAT. The CAT studies conducted in the US have found large effect sizes

* Corresponding author at: Department of Psychiatry & Rob Giel Research Center, University Medical Center Groningen, PO Box 30.001, 9700 RB Groningen, The Netherlands. Tel.: +31 503612034; fax: +31 503619722.

E-mail address: p.j.quee@umcg.nl (P.J. Quee).

¹ These authors contributed equally.

with respect to adaptive functioning (e.g. Velligan et al., 2000) and medication adherence (Velligan et al., 2008b). It can be argued that CAT should also lead to functional improvements in schizophrenia patients living elsewhere (Quee et al., 2012a). However, a recent Danish study found no additional effect of CAT when added to Assertive Community Treatment (ACT) (Hansen et al., 2012), but this study had a number of drawbacks (lower treatment intensity and limited neuropsychological evaluation; Quee et al., 2012b). Therefore, a new study is required which is more comparable with the US studies, in order to determine the efficacy of CAT elsewhere.

Second, it remains unknown whether inpatients can benefit from CAT. In the Netherlands, approximately 11% of the patients with schizophrenia are chronically hospitalized (Wiersma and Pijl, 2008). This institutionalized population may be more treatment-resistant, and characterized by a more severe and persistent course of illness (Uggerby et al., 2011). Cognitive impairments may also be more severe, which may imply that this group could benefit from compensatory strategies and external aids even more. On the other hand, inpatients have already had intensive treatment like an Assertive Community Treatment team and may not demonstrate additional benefits from the compensatory strategies used in CAT. Even though a comparison between in- and outpatients is important, in the current study we focused on the general feasibility of the intervention as provided by psychiatric nurses and in different mental health care settings. Therefore, in the current study we will analyze the results of both groups together. Future studies should specifically investigate possible differential effects of the intervention in in- and outpatients.

Finally, it remains a challenge as to how functional gains can be maintained best in patients who have received CAT (Velligan et al., 2008a). Some form of treatment continuation seems necessary in order to sustain the functional improvements that are the result of the CAT interventions. One study shows that gains after treatment (9 months) can be partly maintained by means of booster sessions (Velligan et al., 2008a). In clinical practice, ongoing support may be required, by means of the involvement of mental health workers, who are in contact with their patients over a longer period of time. In the Netherlands, and countries with a similar mental health care system (e.g. Denmark, Germany, Finland), patients with severe mental illness have frequent contacts with psychiatric nurses. There are several reasons to teach nurses how to provide CAT to their patients. Regular home-visits are already part of the nurses' routine, which fits with the CAT model. Further, nurses often have longer lasting therapeutic relationships with patients compared to psychologists or psychiatrists, increasing the chance that CAT interventions can be integrated and sustained over a longer time period.

Therefore, the aim of the current study was to explore in a pilot investigation the additional value of CAT as a nursing intervention for a Dutch cohort consisting of both inpatients and outpatients with schizophrenia. We expected the addition of CAT to treatment as usual (TAU) to lead to improvements in terms of functional outcome, relative to patients receiving only TAU.

2. Methods

2.1. Design

Thirty patients receiving mental health care in the Netherlands were included in the current study, which was approved by the Medical Ethics Review Committee of the University Medical Center Groningen, the Netherlands. Patients were assigned to one of the two following treatment conditions: 1) treatment as usual plus CAT (TAU + CAT), or 2) treatment as usual (TAU). Assignment to the conditions occurred as follows. For the inpatient clinic, CAT was provided for consecutive patients until 10 patients fully participated; then TAU patients were recruited for baseline with the understanding that CAT would be delivered at a later time. Outpatients were randomly assigned to either

TAU + CAT or TAU and TAU patients were placed on a waiting list for CAT. Treatment groups are described below. CAT consisted of on average 45 minute weekly visits by a psychiatric nurse, for a duration of eight months. The two nurses, one at the outpatient center and one at the inpatient clinic, were supervised by a MSc psychologist (P.Q.). The two nurses who provided CAT had both received a bachelor's degree in education and they both had 16 years of working experience in mental health care. After eight months, responsibility for maintaining and creating CAT interventions was transferred to the patients' case managers. Patients were assessed at baseline, after four months, and after eight months (see Section 2.4). These assessments were conducted by a MSc psychologist who was blind to the treatment condition, as well as the content of CAT. In addition, for the inpatients we also tracked their participation in work-related activities, using the data of a registration system at the residential facility. Data for the work-related activities were analyzed for 16 months, plus one month for the assessment at baseline.

2.2. Subjects

Participants were both outpatients and inpatients with a diagnosis within the schizophrenia spectrum according to the DSM-IV (American Psychiatric Association, 2000). In order to be included, all patients had to be between 18 and 65 years of age, and free of alcohol/drug abuse within six months prior to inclusion. Information about these criteria was obtained via electronic patient records and the patients' clinician.

Outpatients were recruited from the Department of Psychosis of the University Center of Psychiatry, University Medical Center Groningen. This department offers mental health care to patients, predominantly in the early stage of the disease. Recruitment of institutionalized participants took place at Lentis Mental Health Care, Department of Rehabilitation. This department offers on site protected and sheltered living to chronic patients who have insufficiently recovered during earlier hospitalizations.

Initially, 36 participants enrolled in the current study. Patients in both centers were asked to participate in the pilot study if they reported to have difficulties with respect to either cognitive or daily functioning, or a desire to improve their quality of life. Between baseline and the first follow-up, two patients discontinued CAT, and two TAU patients deceased. Further, for two additional TAU + CAT patients it was not possible to make visits on a weekly or biweekly basis due to non-compliance. These patients had missed too many visits, thereby affecting treatment fidelity. Therefore, the final analyses were conducted on 30 patients: 16 patients (ten inpatients) who received TAU + CAT and 14 patients (nine inpatients) who received no additional interventions to treatment as usual (TAU). All patients signed informed consent.

2.3. Treatment groups

2.3.1. Cognitive Adaptation Training

The assessment and treatment procedures of CAT have been described in more detail elsewhere (Velligan et al., 2000). Briefly, CAT is a psychosocial intervention that aims to improve daily functioning by bypassing the impact of cognitive deficits and by stimulating functional behavior (Velligan et al., 2000). The intervention takes place in the patients' living environment. CAT teaches compensation strategies and makes use of environmental supports in several areas of daily living. Individual treatment plans are based upon information about the individual behavioral and cognitive characteristics and specific problem areas in daily life. The patients' behavior type (apathy, disinhibition or mixed) is measured using the Frontal Systems Behavioral Scale (FrSBe; Stout et al., 2003) and determines the kind of intervention strategy that will most likely benefit daily functioning (i.e. cueing and prompting behavior [apathy] or removing distracting stimuli [disinhibition]). The form of the intervention strategy (i.e. size, proximity,

specificity, noticeability) is determined by the level of executive functioning (poor or fair), measured with Modified Card Sorting Task (MCST; Nelson, 1976) and the Controlled Oral Word Association Test (COWAT; Schmand et al., 2008). Functional and environmental problems are assessed with the Environmental and Functional Assessment (Velligan et al., 2010). Commonly used environmental supports for CAT are signs, calendars, pill containers, watches, alarms, and hygiene and cleaning supplies. CAT was additional to the usual treatment.

2.3.2. Treatment as usual

TAU consists of individually orientated care and treatment, delivered and evaluated in a multidisciplinary setting. Besides pharmacotherapy, patients are offered psycho-education, cognitive behavioral therapy, Liberman modules, psychomotor therapy, creative arts therapy, educative projects, several sports groups and peer support groups. For inpatients, work projects at the residential area are offered as part of the TAU, whereas for the outpatients, work rehabilitation is organized according to the Individual Placement and Support (IPS) model. Treatment contact with psychiatric nurses occurred on a daily to weekly basis for the inpatients, and on a weekly to biweekly basis for the outpatients. For all patients, treatment and progress were reviewed annually by a multidisciplinary team. Participation in these several elements of treatment depends on the individual needs and wishes of the patients. Of note, the experimental group was offered CAT in addition to the therapeutic milieu of TAU. The TAU group did not receive any other interventions in addition to the abovementioned.

2.4. Assessments

2.4.1. Descriptives

Demographic information was obtained at baseline (Table 1). The presence and severity of symptoms were assessed using the Positive and Negative Syndrome Scale (PANSS; Kay et al., 1987). This semi-structured interview addresses both psychotic and non-psychotic symptoms, including their impact on behavior. The PANSS consists of three subscales: positive, negative, and general symptoms. For each subscale a score can be computed, as well as a total score. Higher scores reflect more severity of symptoms. The PANSS is a widely used instrument of which the Dutch translation is validated (Wolthaus et al., 2000).

2.4.2. Functional outcomes

Translations of the outcome measures used in the US studies were adopted for means of comparison. The primary outcome was the level of functioning, evaluated using the Multnomah Community Ability Scale (MCAS; Barker et al., 1994) and the Social and Occupational Functioning Scale (SOFAS; American Psychiatric Association, 2000). The MCAS is a 17-item scale assessing a variety of domains of community adjustment following a semi-structured interview with the patient, and with a psychiatric treatment provider. For the MCAS, the total score was used (range 17–85). The SOFAS rates social and occupational functioning on a single-item scale (range 0–100). The score was given by the blind rater. For both the MCAS and the SOFAS, higher scores reflect better functioning.

Secondary outcomes were motivation to engage in activities and time spent in work-related activities. Motivation to engage in activities was assessed using the motivation subscale from the Negative Symptom Assessment, a semi-structured interview (NSA-M; Alphs et al., 1989). On this scale, higher scores reflect lower functioning. For inpatients, the time spent in work-related activities (measured in number of partial days a week; a partial day consisted of 3 hours) was registered monthly. As defined by the Dutch Health Authorities (Nederlandse Zorgautoriteit), these activities are educative or work activities for patients who are not able to function in the community, aimed at rehabilitation and stabilization. In sheltered settings such as a framing center, graphic design and copy center, an agrarian project (care farm), and a greenery project (site and garden maintenance), patients can

Table 1
Baseline characteristics.^a

Variable	TAU + CAT n = 16	TAU n = 14
Demographical		
Diagnosis, #		
Schizophrenia	15	12
Schizoaffective disorder	1	–
Psychotic disorder NOS	–	2
Gender, # male	13	11
Nationality, # Dutch	15	10
Age, years	45.06 ± 12.22	43.50 ± 14.84
Age of onset, years	30.20 ± 12.56	27.71 ± 12.14
Education ^b	4.63 ± 1.36	4.14 ± 1.29
Residential status, # inpatient	10	9
PANSS^c		
Positive	12.67 ± 4.88	15.67 ± 6.01
Negative	19.53 ± 6.38	20.00 ± 8.38
General	33.93 ± 8.82	38.58 ± 9.24
Antipsychotic medication, chlorpromazine equivalent ^d	567.92 ± 402.36	587.37 ± 457.72
Antipsychotic medication^d, name, #		
Clozapine	11	4
Risperidone	2	3
Olanzapine	2	3
Quetiapine	–	2
Haloperidol	1	1
Fluphenazine	1	–
Zuclopentixol	3	3
Flupentixol	1	–
Sulpiride	1	–
No antipsychotics	–	2
Concomitant medication^e, #		
Antidepressants	3	2
Benzodiazepines	5	5
Anticholinergics	5	3
Mood stabilizers	–	2
Anti-epileptics	5	1
Other	1	2
Scores for dependent variables^f		
SOFAS	36.94 ± 10.55	38.07 ± 14.33
MCAS	56.44 ± 10.24	55.29 ± 12.77
NSA-M	16.94 ± 3.99	16.64 ± 5.58
Work related activities	0.35 ± 0.76	0.97 ± 1.41

^a Table represents means ± standard deviation or numbers (#). The age of onset of one of the patients in the TAU + CAT condition was unknown. For three participants (one TAU + CAT, two TAU) the PANSS was not administered, causing the number of subjects on these variables to be smaller.

^b Education (Verhage): range 1 (no education), 4–5 (school diploma) to 7 (university degree).

^c PANSS: Positive and Negative Syndrome Scale.

^d Dose equivalents of chlorpromazine were evaluated using the methods of Andreasen et al. (2010) or using the pharmaceutical manual of the Dutch Care Insurance Board (College voor Zorgverzekeringen (CVZ), 2008); 4 patients in TAU and 7 in TAU + CAT took two different antipsychotics.

^e 2 patients in TAU and 2 in TAU + CAT took two types of concomitant medications, 2 TAU patients and 3 TAU + CAT patients took three types of concomitant medication.

^f SOFAS: Social and Occupational Functioning Scale; MCAS: Multnomah Community Ability Scale; NSA-M: Negative Symptom Assessment-motivation subscale; work related activities: measured in partial days per week (inpatients only).

participate at their own level in activities such as administration, services, greening, techniques, care for animals and plants, maintenance and handling machines and tools.

The Dutch translations of the functional outcome scales have yet to be validated. However, the MCAS and SOFAS are widely used and have been validated in other languages (Goldman et al., 1992; Barker et al., 1994). We chose to administer the same scales as earlier CAT studies to facilitate comparability with earlier CAT studies.

2.5. Statistical analysis

We examined differences between the TAU group and the experimental group (TAU + CAT). Differences between the groups in baseline

demographical and clinical characteristics were examined with the Fisher's exact test for categorical and the Mann Whitney U test for continuous variables. A population average (e.g. modeling mean scores for TAU and mean scores for TAU + CAT) linear mixed model was applied to the outcomes (SOFAS, MCAS, NSA-M, and work-related activities) at each time point after baseline (four and eight months for SOFAS, MCAS and NSA-M; months 1 to 16 for work-related activities). We used restricted maximum likelihood estimation. The analyses were corrected for baseline scores to eliminate the effect of possible (average) differences between TAU + CAT and TAU at baseline. An unstructured correlation structure was selected for the correlation between the two time point points after baseline (four and eight months) for the SOFAS, MCAS, and NSA-M. A (heterogeneous) autoregressive correlation structure was used for work-related activities, to account for the correlation structure between 16 time points. Time was modeled as a categorical variable instead of continuous to avoid unrealistic smooth time profiles. The treatment variable (indicating whether the patient participated in TAU + CAT or TAU) and the interaction of treatment and time were included in the linear mixed model in order to estimate the effect of treatment. The treatment effect was essentially estimated for each time point by subtracting the estimated mean scores of the TAU patients from the estimated mean scores of the TAU + CAT patients. Thus, the effect size reflects the estimated mean difference between the groups at four months and at eight months. These analyses were corrected for baseline scores to eliminate a possible (average) difference between TAU + CAT and TAU in the outcome measures at baseline. The estimated differences between the groups per time point, together with their appropriate confidence intervals, are reported and graphically displayed. All analyses were performed using SAS.

3. Results

3.1. Descriptives

The demographic and clinical characteristics at baseline are shown in Table 1. There were no significant differences between the two treatment groups at study entry.

3.2. Functional outcomes

The results from the linear mixed model for outcomes MCAS, SOFAS, and NSA-M are visualized in Figs. 1, 2, and 3, respectively (and listed in Supplementary Table 1). No statistically significant effect of TAU + CAT with respect TAU was demonstrated at 4 or 8 months of treatment. However, there is a trend for improvement on the MCAS and SOFAS after 4 months, as visualized in Figs. 1 and 2.

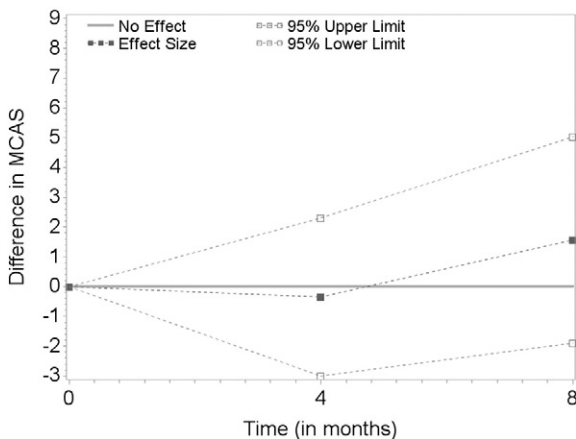


Fig. 1. The effect size at each time point reflects the mean difference in MCAS between the groups (TAU + CAT minus TAU).

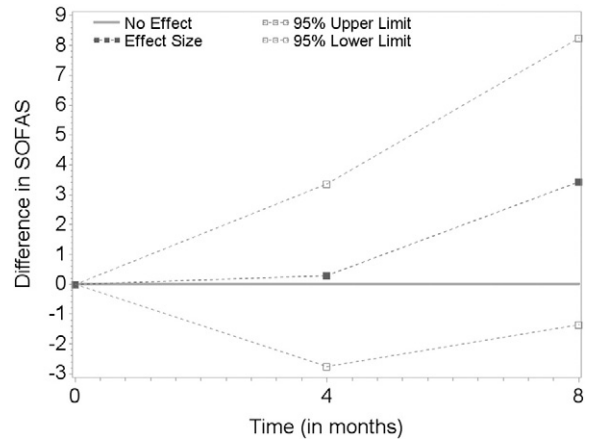


Fig. 2. The effect size at each time point reflects the mean difference in SOFAS between the groups (TAU + CAT minus TAU).

The effects on work-related activities were plotted against the time points as shown in Fig. 4 (and listed in Supplementary Table 1). From the confidence intervals around the effect sizes (i.e. mean differences between TAU and TAU + CAT), it appears that CAT had a significant effect from the tenth month, although a gradual increase began at the fourth month of treatment.

4. Discussion

The current study investigated the efficacy of Cognitive Adaptation Training (CAT) as a nursing intervention for patients with schizophrenia in the Netherlands. CAT was added to the usual treatment and was compared to treatment as usual, a therapeutic milieu in which all patients participate in a customized selection of available treatments that best matches their needs, goals and wishes. The studied population included both outpatients and inpatients. CAT interventions were set up by a psychiatric nurse, additional to the patients' usual care. After eight months, TAU + CAT patients exhibited a trend towards greater improvement in their general functioning compared to the TAU group. In addition, TAU + CAT inpatients spent significantly more time in work-related activities; after four months a trend was visible, and a significant effect at ten months.

This is the second European study investigating CAT for schizophrenia patients (Hansen et al., 2012). Our findings show promise for CAT as a nursing intervention in long-term hospitalized patients, and they encourage a larger study investigating the efficacy of CAT for schizophrenia patients living in a country with a different mental health care system

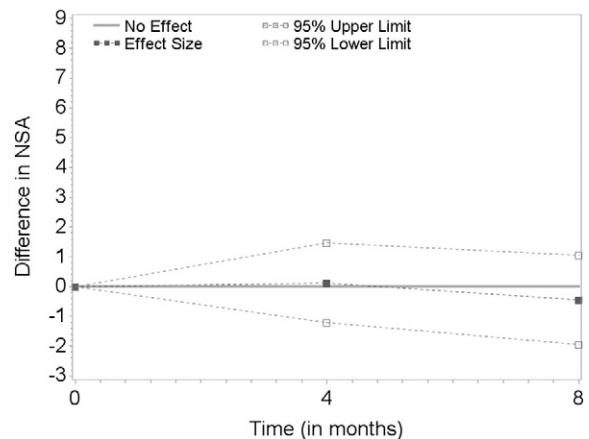


Fig. 3. The effect size at each time point reflects the mean difference in NSA-M between the groups (TAU + CAT minus TAU).

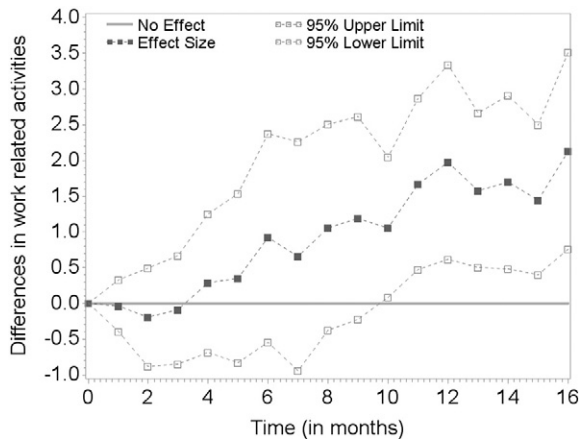


Fig. 4. The effect size at each time point reflects the mean difference in work related activities between the groups (TAU + CAT minus TAU).

than the US, where the treatment was developed. Patients showed a trend towards greater improvement in functioning. This is possibly due to the fact that in our study the frequency of CAT visits, the outcome assessments, and the neuropsychological evaluation were comparable to the US studies. Moreover, the principal investigator of the current study was trained in the application of CAT in the US prior to conducting the study. Our expectation is that the improvements on MCAS scores would have reached statistical significance if measured over a longer time period, as is the case for the work-related activities in the inpatient group. This needs to be investigated by further research.

Earlier CAT studies have only included outpatients. In our study, 63% of the included cohort consisted of long-term hospitalized patients with schizophrenia. TAU + CAT inpatients engaged more in work-related activities with time. The fact that these differences became and remained significant after the initial study period (Fig. 4), is in line with the suggestion of Onken et al. (2002) that rehabilitation in chronically ill patients is possible, but slow. An earlier study conducted in the US has shown that improvements in general functioning can be sustained, but that some continuation of the interventions is necessary for this (Velligan et al., 2008a). Since the current pilot study suggests that it is feasible for CAT to be carried out by nurses, it would be interesting to investigate whether implementation of CAT into the nurses' daily working routine leads to sustainable and long-term improvements in general functioning of patients.

Inherent to the explorative nature of this pilot study, we should mention a number of limitations that need to be addressed in future studies. First, although outpatients were randomly allocated to either TAU + CAT or TAU, inpatients were not, possibly causing selection bias. However, TAU inpatients did express their willingness to participate in CAT (and were told that they would receive CAT in the nearby future). Therefore, differences between the inpatient TAU + CAT and TAU groups may be minimal. Nevertheless, the results should be interpreted with caution. Furthermore, we do not have information on the aspecific effects of CAT (e.g. increased attention), which may partly explain the trend in improvements on the outcome measures. Since the usual care in the Netherlands is already very rich and all patients have contact with nurses on a regular basis, we do not expect this to have affected the results. At the same time, as a consequence of the rich usual care, the adopted outcome measurements may not have been sensitive enough to fully capture these small improvements. The SOFAS for example is a rather global scale that may be less sensitive to change in residential patients. In addition, we did not have follow-up measurements of the primary outcome measure (MCAS) after the initial study period of 8 months. We argue that statistically significant improvements may be present after that period, which is supported by our finding that differences in work-related activities reached statistical significance after the

initial study period, namely after 10 months. Finally, the small sample size limits generalizability of findings. This also left us unable to make comparisons between the inpatient and outpatient group.

Due to the abovementioned study limitations, we should interpret the findings of the current pilot study with caution. The results do show promise for CAT as a nursing intervention. More research in the form of randomized controlled trials is necessary for both inpatients and outpatients in countries with other health care systems than in the US, addressing the abovementioned limitations.

Supplementary data to this article can be found online at <http://dx.doi.org/10.1016/j.schres.2014.06.020>.

Role of funding body

Funding of the study was provided in part by Lentis and the University Medical Center Groningen. The funding source played no role in the preparation of the manuscript.

Contributors

PJQ designed the study. DIV and RB gave helpful input in the experimental design. APMS, JTWW and ERH undertook the statistical analysis. PJQ and APMS wrote the first draft of the manuscript. All authors have contributed to and have approved of the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

Acknowledgments

The authors thank the patients for participating in this study, the psychiatric nurses Saskia van Slogteren (Lentis) and Amy Dekker (UMCG) for carrying out CAT, Durk Wiersma (UMCG) for his help with setting up the pilot study, and Kees Rietberg (Lentis), Marieke Pijnenborg (UMCG), Nanko Brattinga (Timer B.V.), and all other involved staff members at Lentis and the UMCG for their help in this study.

References

- Alphs, L.D., Summerfelt, A., Lann, H., Muller, R.J., 1989. The negative symptom assessment: a new instrument to assess negative symptoms of schizophrenia. *Psychopharmacol. Bull.* 25 (2), 159–163.
- American Psychiatric Association, 2000. *Diagnostic and Statistical Manual of Mental Disorders*, fourth ed. American Psychiatric Publishing, Washington, DC (DSM-IV-TR).
- Andreasen, N.C., Pressler, M., Nopoulos, P., Miller, D., Ho, B.C., 2010. Antipsychotic dose equivalents and dose-years: a standardized method for comparing exposure to different drugs. *Biol. Psychiatry* 67 (3), 255–262.
- Barker, S., Barron, N., McFarland, B.H., Bigelow, D.A., 1994. A Community Ability Scale for chronically mentally ill consumers: part I: reliability and validity. *Community Ment. Health J.* 30 (4), 363–383.
- College voor Zorgverzekeringen (CVZ), 2008. *Farmaceutisch Kompas*. Bohn Stafleu van Loghum, Houten, The Netherlands.
- Goldman, H.H., Skodol, A.E., Lave, T.R., 1992. Revising axis V for DSM-IV: a review of measures of social functioning. *Am. J. Psychiatr.* 149 (9), 1148–1156.
- Hansen, J.P., Østergaard, B., Nordentoft, M., Houngaard, L., 2012. Cognitive adaptation training combined with assertive community treatment: a randomised longitudinal trial. *Schizophr. Res.* 135 (1–3), 105–111.
- Kay, S.R., Fiszbein, A., Opler, L.A., 1987. The positive and negative syndrome scale (PANSS) for schizophrenia. *Schizophr. Bull.* 13 (2), 261–276.
- Keefe, R.S., Bilder, R.M., Davis, S.M., et al., 2007. Neurocognitive effects of antipsychotic medications in patients with chronic schizophrenia in the CATIE Trial. *Arch. Gen. Psychiatry* 64 (6), 633–647.
- Leucht, S., Corves, C., Artner, D., Engel, R.R., Li, C., Davis, J.M., 2009. Second-generation versus first-generation antipsychotic drugs for schizophrenia: a meta-analysis. *Lancet* 373 (9657), 31–41.
- McGurk, S.R., Twamley, E.W., Sitzer, D.I., McHugo, G.J., Mueser, K.T., 2007. A meta-analysis of cognitive remediation in schizophrenia. *Am. J. Psychiatry* 164 (12), 1791–1802.
- Nelson, H.E., 1976. A modified card sorting test sensitive to frontal lobe defects. *Cortex* 12 (4), 313–324.
- Onken, S.J., Dumont, J.M., Ridgway, P., Dornan, D.H., Ralph, R.O., Onken, S.J., Dumont, J.M., Ridgway, P., Dornan, D.H., Ralph, R.O., 2002. Mental health recovery: what helps and what hinders? A national research project for the development of recovery facilitating system performance indicators. Phase One Research Report: A National Study of Consumer Perspectives on What Helps and Hinders Mental Health Recovery. NASHMHPD, National Technical Assistance Center (NTAC), Alexandria, VA.
- Palmer, B.W., Dawes, S.E., Heaton, R.K., 2009. What do we know about neuropsychological aspects of schizophrenia? *Neuropsychol. Rev.* 19 (3), 365–384.
- Quee, P.J., Schneider, H., van Slogteren, S., Wiersma, D., Bruggeman, R., Velligan, D.I., 2012a. Cognitive adaptation training provided to chronically hospitalized patients with schizophrenia in the Netherlands: two case reports. *Case Rep. Psychiatry* 2012, 596162.
- Quee, P.J., Wiersma, D., Sytema, S., Bruggeman, R., 2012b. Cognitive adaptation training combined with assertive community treatment: a randomised longitudinal trial—a comment. *Schizophr. Res.* 140 (1–3), 264–265.

- Schmand, B., Groenink, S.C., van den Dungen, M., 2008. Letterfluency: Psychometrische eigenschappen en Nederlandse normen (Dutch). *Tijdschr. Gerontol. Geriatr.* 39 (2), 64–76.
- Stout, J.C., Ready, R.E., Grace, J., Malloy, P.F., Paulsen, J.S., 2003. Factor analysis of the Frontal Systems Behavior Scale (FrSBe). *Assessment* 10 (1), 79–85.
- Uggerby, P., Nielsen, R.E., Correll, C.U., Nielsen, J., 2011. Characteristics and predictors of long-term institutionalization in patients with schizophrenia. *Schizophr. Res.* 131 (1–3), 120–126.
- Velligan, D.I., Bow-Thomas, C.C., Huntzinger, C., et al., 2000. Randomized controlled trial of the use of compensatory strategies to enhance adaptive functioning in outpatients with schizophrenia. *Am. J. Psychiatry* 157 (8), 1317–1323.
- Velligan, D.I., Prihoda, T.J., Ritch, J.L., Maples, N., Bow-Thomas, C.C., Dassori, A., 2002. A randomized single-blind pilot study of compensatory strategies in schizophrenia outpatients. *Schizophr. Bull.* 28 (2), 283–292.
- Velligan, D.I., Diamond, P.M., Maples, N.J., et al., 2008a. Comparing the efficacy of interventions that use environmental supports to improve outcomes in patients with schizophrenia. *Schizophr. Res.* 102 (1–3), 312–319.
- Velligan, D.I., Diamond, P.M., Mintz, J., et al., 2008b. The use of individually tailored environmental supports to improve medication adherence and outcomes in schizophrenia. *Schizophr. Bull.* 34 (3), 483–493.
- Velligan, D.I., Maples, N.J., Ritch, J.L., 2010. *Cognitive Adaptation Training: The Use of Compensatory Strategies in the Psychosocial Rehabilitation of Patients With Schizophrenia (Manual)*. UTHSCSA, Department of Psychiatry, San Antonio, TX.
- Wiersma, D., Pijl, Y.J., 2008. Langverblijvers in de psychiatrie. Een epidemiologische beschouwing over hun omvang en samenstelling (Dutch). *Tijdschrift voor rehabilitatie en herstel van mensen met psychische beperkingen*, pp. 4–12.
- Wolthaus, J.E., Dingemans, P.M., Schene, A.H., Linszen, D.H., Knegtering, H., Holthausen, E. A., Cahn, W., Hijman, R., 2000. Component structure of the positive and negative syndrome scale (PANSS) in patients with recent onset schizophrenia and spectrum disorders. *Psychopharmacology* 150, 399–403.
- Wykes, T., Spaulding, W.D., 2011. Thinking about the future cognitive remediation therapy—what works and could we do better? *Schizophr. Bull.* 37 (Suppl. 2), S80–S90.