

Effectiveness of dynamic cognitive intervention in rehabilitation of clients with schizophrenia

N Hadas-Lidor Department of Occupational Therapy, Tel Aviv University, Tel Aviv, **N Katz** School of Occupational Therapy, Hebrew University Jerusalem, Jerusalem, **S Tyano** Geha Psychiatric Hospital, Petah-Tiqva and **A Weizman** Geha Psychiatric Hospital, Petah-Tiqva and Felsenstein Medical Research Center, Beilinson Campus, Petah-Tiqva, Israel

Received 1st September 2000; returned for revisions 23rd January 2001; revised manuscript accepted 16th March 2001.

Objective: To examine the efficacy of dynamic cognitive treatment in rehabilitation of schizophrenic clients.

Subjects: Fifty-eight schizophrenic clients that were matched equally into two groups: a study group ($n = 29$) (treated by Instrumental Enrichment) and a control group (treated with traditional occupational therapy methods).

Setting: The subjects were treated in a day rehabilitation centre in the community.

Study design: The programme lasted one year, the same schedule was provided for both groups. Subjects were randomly assigned and assessed before and after intervention with the same battery and at a follow-up six months later, work and residence status were evaluated.

Main outcome measures: Instruments included: (1) memory and thought processes, measured by a battery of structured tests from the Learning Potential Assessment Device (LPAD), Raven Progressive Matrices and General Aptitude Test Battery (GATB); (2) functional outcomes, instrumental activities of daily living (IADL), measured by a questionnaire; work and residence status; (3) self-concept measured with Fitts questionnaire.

Results: Results showed significant differences between the groups on almost all the cognitive tests (MANOVA revealed significant differences between the two groups for both memory and thought process ($F(2.52) = 13.75, p < 0.001$; and $F(1.46) = 7.28, p < 0.001$, respectively) as well as in work ($\chi^2 = 14.30, p < 0.001$), and residence ($\chi^2 = 3.86, p < 0.05$) status. There were no significant differences in IADL questionnaire or the self-concept scale.

Conclusions: The successful outcome points to the importance of including long-term cognitive intervention in rehabilitation of schizophrenic clients. This work suggests that the classic view of schizophrenia as a progressive irreversible decline that cannot be altered may be wrong.

Address for correspondence: N Hadas-Lidor, Department of Occupational Therapy, Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel.

Introduction

As Green *et al.*¹ state ‘there has been a surge of interest in the functional consequences of neurocognitive deficits’ (p.119). However, only few research studies dealing with the use and impact of cognitive intervention approaches applied to clients with schizophrenia have been reported.²⁻⁵ Green *et al.*,¹ in their second updated review in the last five years about the associations of neurocognitive deficits and functional outcomes in schizophrenia, found that published studies have doubled. The new review confirms their original findings that significant relationships exist between cognitive deficits and various areas of functional outcomes. However, they further ask the important question how neurocognition is related to function, suggesting that one of the explaining variables may be ‘learning potential’ assessed dynamically. The present study uses Feuerstein’s Dynamic Cognitive approach^{6,7} as the basis for intervention and assessment, thus contributing a first account of learning potential of schizophrenic individuals.

A different review prepared recently for the Cochrane Library^{8,9} regarding the impact of cognitive rehabilitation (CR) found only three studies which met their inclusion criteria of randomized trials compared to another intervention with control groups.¹⁰⁻¹² Two of these studies compared cognitive rehabilitation with a placebo treatment and one with occupational therapy treatment.¹² All three studies showed improvement following either intervention, however, none of them found conclusive evidence for the effectiveness of CR over the compared treatment. The majority of studies excluded from the review were single cases or intervention without comparisons (see review by Hayes and McGrath⁸ for an extensive list). However, Wykes *et al.*¹² comparing neurocognitive remediation (NCR) ($n = 17$) with occupational therapy ($n = 16$) found that neurocognitive remediation six months post was more effective in some of the executive function measures and in self-esteem. This study has some similarities to the current study, hence their results will be discussed further in comparison to ours.

In addition, Spaulding *et al.*¹³ found that significant improvement was made on attention,

memory and executive functioning after six months of cognitive treatment.

The present research, in line with both above reviews, aimed to study the effectiveness of Feuerstein’s Dynamic Cognitive approach for clients with schizophrenia in the community. The uniqueness of this approach is in its combination of two classical cognitive approaches: the remedial and the adaptive approaches.^{7,14} The study compared cognitive and traditional occupational therapy treatments given to two randomized and matched groups of schizophrenic clients.

Cognitive dysfunctions – which have been identified across a variety of domains including memory, attention, language and frontal systems functioning – are the most typical disorders in schizophrenia. Attention deficits in schizophrenic clients are related both to selective¹⁵ and sustained¹⁶ attention. These deficits appear to be related to difficulties in organization and distractibility. Deficit in verbal memory and learning appear to be more severe than in other areas of cognitive functioning.¹⁷ It is suggested that memory dysfunctions are related to the deficit that exists in the encoding stage due to inefficiencies in organization.¹⁸ It is speculated that disorder of thoughts and language in schizophrenia are related to dysfunction of the left hemisphere.^{19,20} Frontal system functioning has revealed dysfunction in schizophrenia manifested by difficulties in abstraction, sequential organization, fluency and planning. In addition, behaviourally, some schizophrenic clients show a lack of motivation, others demonstrate impulse control problems, and some may engage in bizarre behaviour.²¹

Feuerstein’s theory of Structural Cognitive Modifiability (SCM) maintains that individual cognitive structures can be changed at any age and in any health status^{6,7,22} using the Mediated Learning Experience (MLE) interventional approach. According to Feuerstein, human learning occurs either by direct exposure to a stimulus or indirectly via a human mediator between the stimulus and the individual or between the individual and his/her outcome.²³ Insufficient opportunity to experience mediated learning will result in deficient cognitive functioning or performance in the environment. Affected persons can be helped by exposure to MLE designed

specifically to meet their needs.^{14,22} Therapy is based on four main elements: Reciprocity and intention; Transcendent nature of the mediated interaction; Mediation of meaning; and Mediation of competence.^{22–24} Several components are used within the theoretical model for evaluation and treatment: (1). The Learning Potential Assessment Device (LPAD)⁶ is a battery of tests for dynamic assessment. It was developed to alter the cycle of failure that low performers experience on traditional intelligent tests: (2). Instrumental Enrichment (IE) an intervention programme of more than 500 pencil-and-paper exercises.^{7,22} (3) The third component is the environmental context, namely the framework within which the person conducts his/her life. The aim of this component is to adapt or create an environment that is as close as possible to a natural community environment.¹⁴

The theoretical model of dynamic cognitive intervention through MLE in schizophrenia is presented in Figure 1. The process relates to cognitive functioning, instrumental components of activities of daily living (ADL) both at work and in society, and self-concept. Its underlying assumption is that an improvement in learning ability leads to an increase in motivation, cognitive and functional skills.

The purpose of the present study was to examine the efficacy of dynamic cognitive treatment using IE for clients with schizophrenia in a community day rehabilitation programme. We hypothesized that after about one year those clients who underwent IE would show significantly greater improvement in cognitive and functional abilities and self-concept than those who received conventional treatment.

Methods

Subjects

Seventy-two clients with schizophrenia in different stages of rehabilitation were initially enrolled in the study. This includes all the clients that were treated in the rehabilitation centre. Clients participated in a community day rehabilitation centre at Petah-Tiqva in Israel. The main goal of the centre is to find and adapt for the clients a suitable occupation and residence place

in the community. Subjects were diagnosed according to the *Diagnostic and statistical manual of mentally disordered*, fourth edition – revised (DSM-IV)²⁵ criteria by the treating psychiatrists. All the 72 participants were receiving stable medication and agreed to take part in this study after signing an informed consent. For the purposes of the study, the cohort was randomly assigned into two equal groups matched for gender, age, family status, education and subcategory of schizophrenia diagnosis. Eight clients were later excluded because of a change in their medication or hospitalization, and six failed to complete the programme (which slightly altered the matching). The final sample included 58 clients, 29 in each group, all of them agreed to participate in the study (Figure 2). Their demographic characteristics are shown in Table 1. The age range of the participants was 18–64 years, (mean 36, SD = 10.29). *T*-test analysis showed no significant difference between groups. Chi-square analysis yielded no significant between-group differences in gender, level of education, number of hospitalizations or years in rehabilitation.

Table 1 Demographic characteristics of the study (Instrumental Enrichment programme) and control (traditional treatment) subjects with schizophrenia

Variables	Study group		Control group	
	Number	%	Number	%
Gender				
Male	16	55.2	19	65.5
Female	13	44.8	10	34.5
Education				
Elementary	8	28.6	6	20.7
Secondary	14	50.0	20	69.0
Higher	7	21.4	3	10.3
No. of hospitalizations				
1	10.7		6.9	
2	17.9		31.0	
3	50.0		34.5	
4	21.4		27.6	
Years in rehabilitation				
Up to one year	9	32.1	12	41.4
Up to two years	9	32.1	7	24.1
More than two years	11	35.7	10	34.5

No significant between-group differences were found by χ^2 analysis.

Procedure and instruments

The procedure comprised a pretest, intervention, and two stages of post-testing.

Pretest

Pretest was given to both groups by an occupational therapist and psychologist other than the ones who were involved in the intervention. The test battery included the following instruments:

- Demographic questionnaire (gender, family status, education, working place, psychiatric diagnosis and number of hospitalization).
- Three types of cognitive tests:
 - 1) Two from the LPAD: (a) The complex figure drawing test (figural memory), which is a dynamic version of Rey's Complex Figure (RCF). This test consists of a complex geometric figure, composed of 18 elements, with

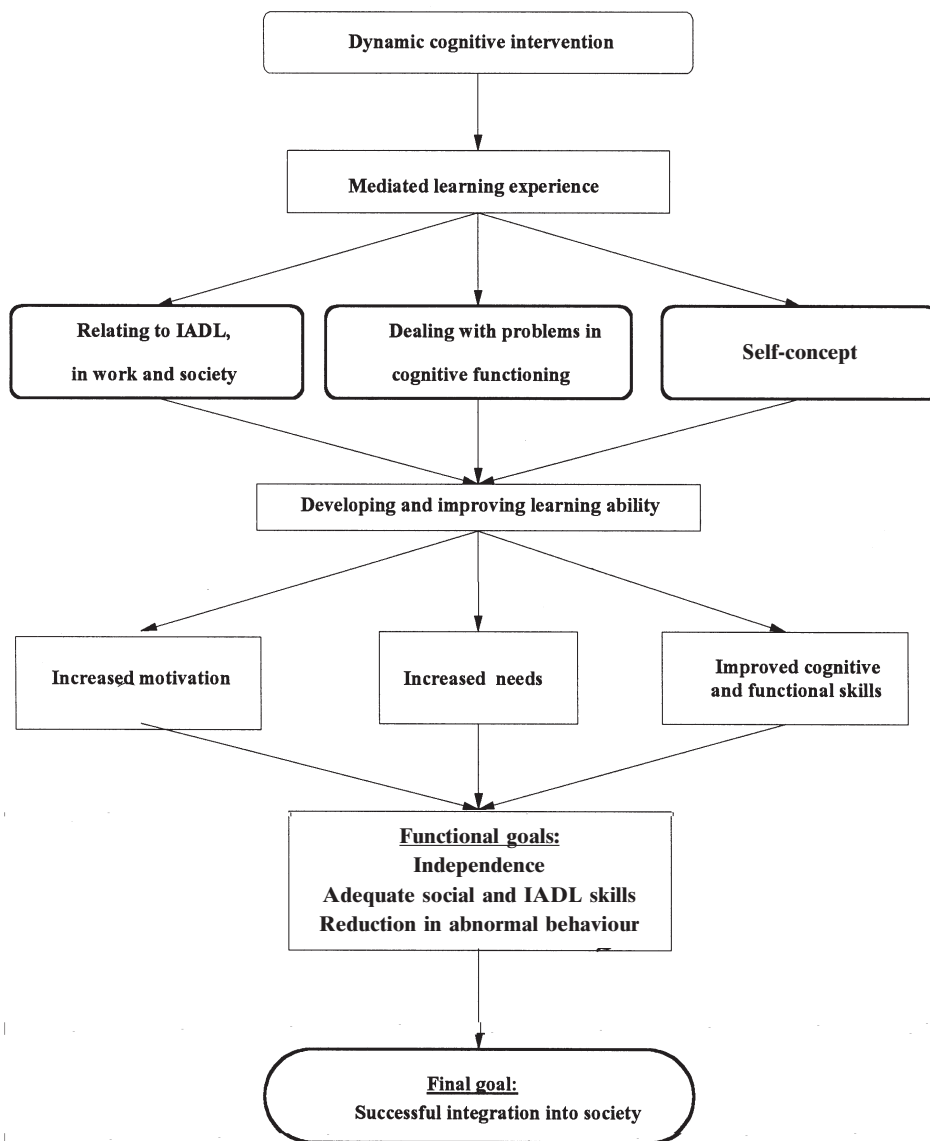


Figure 1 Model of dynamic cognitive intervention with schizophrenia.

both internal and external details.^{6,26} (b) A word memory test (verbal memory), which is a dynamic version of Rey's 16-word memory test. This test consists of 16 words grouped into four categories.^{6,26}

- 2) The Raven Progressive Matrices (RPM) test (thought process).^{27,28}
- 3) Four of the nine tests of the General Aptitude Test Battery (GATB) (thought

process) standardized in Israel,²⁹ proof-reading, arithmetic exercises, arithmetic problems and shape perception. (According to the manual, these tests can be used separately to determine general aptitude.)

- Two functional outcome measures:
 - 1) Instrumental ADL (IADL) questionnaire.³⁰
 - 2) Work and Residence status scales:

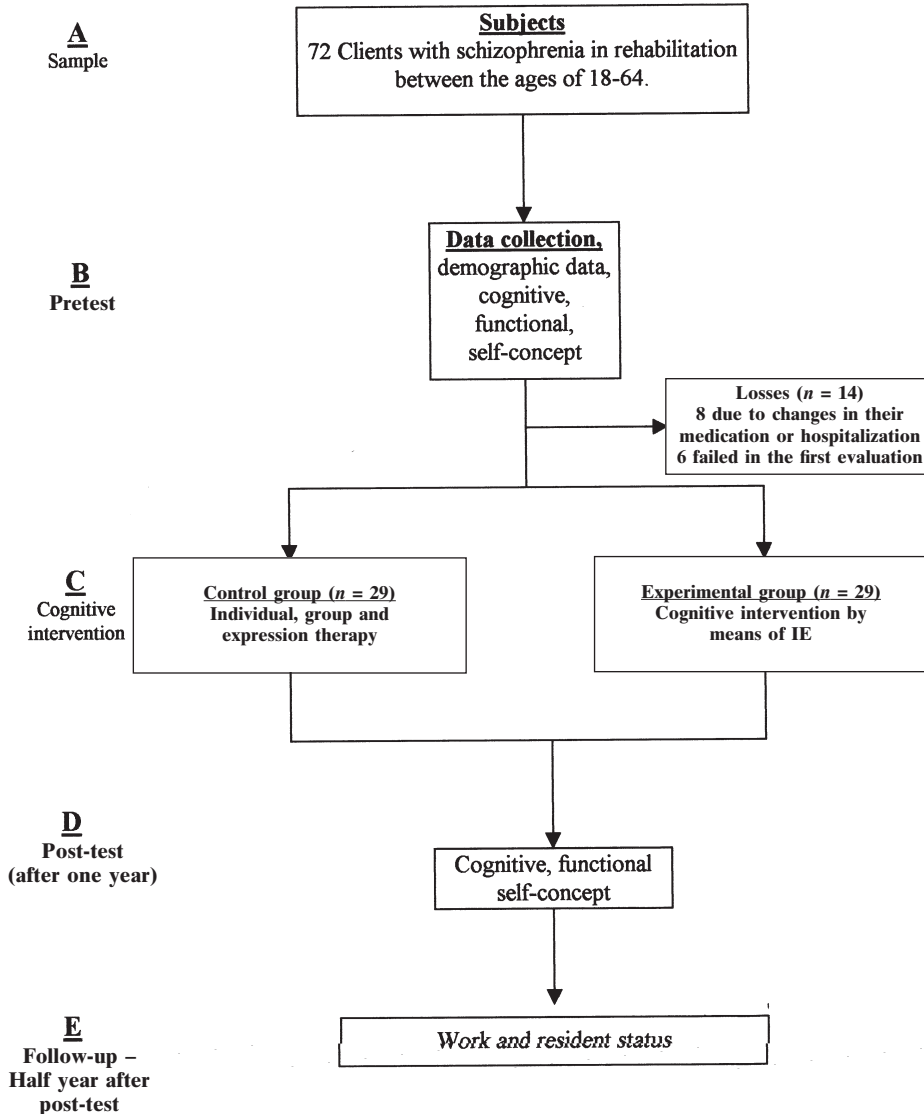


Figure 2 The study flow chart.

Regarding work status, prior to the start of the intervention, all participants were working at the adaptation unit in the rehabilitation centre. Therefore, work status was rated according to three categories: (i) remained in the adaptation unit; (ii) moved to an advanced rehabilitation unit; (iii) hired on the open market. Regarding residence status, the scale included living either (i) in a sheltered house; (ii) with parents; or (iii) independently.

- Fitts Self-Concept Scale.³¹

Intervention

Intervention for the study group consisted of two- to three-weekly one-hour sessions of IE in the rehabilitation centre. The IE is divided into 15 tools (Table 2), each focusing on a specific cognitive deficiency, while at the same time relating to the acquisition of the necessary conditions and skills required for learning.^{7,22} Treatment was given by occupational therapists trained in this method on an individual basis and was adapted to each subject's abilities and needs, as determined by the pretest evaluation. The goals were to improve the subject's cognitive adaptive ability and independence (IADL and occupational) and to sharpen their awareness of their abilities. Each session was divided into three parts: The first part included cognitive exercises

to improve special cognitive skills, like categorization, organization, orientation in space, etc. The client was given one or two paper-and-pencil exercises out of the available IE exercises (Table 2). The second part included an analysis of the paper-and-pencil exercise performance by both the client and the therapist. The third part included examples from the client's daily living situations, like work, residence or social skills, and demonstrated how the first exercise can or did improved daily function. For example, if the first part deals with comparison and categorization, the third part can deal with organizing a shopping day.

Group treatment was also offered according to need every few weeks and not always with the same participants.³² The goals of group intervention were to enable the subjects to share a common theme and enhance group belonging, develop their ability to see problems from different perspectives, and develop their communication skills. The duration of the programme was one year.

The control group received traditional occupational therapy treatment (functional tasks and expressive activities), individually and in groups, by experienced occupational therapists, according to the same schedule and time frame as the study group.

Table 2 The cognitive areas, instruments and modalities included in the Instrumental Enrichment programme

Cognitive area/components	Instrument	Modality
Organization	Organization of dots Analytic perception	Graphic Graphic
Comparison and categorization	Comparison Categorization Transitive relation Syllogism	Verbal, graphic, painting Verbal, graphic, painting, numeric Verbal, painting, Verbal, painting,
Orientation in space	Orientation in space I Orientation in space II	Verbal, graphic Verbal, graphic
Relations	Temporal relations Family relations Numerical relations Instructions relations	Verbal, graphic, painting Verbal, graphic, painting Verbal, graphic, painting, numeric Verbal, graphic
Social skills	Illustrations (cartoons)	Painting
Integrative thinking	Stencil design	Graphic

Post-testing

Post-testing by the same testers was conducted in two stages: stage one was conducted towards the end of the programme after about one year with the same instruments as pre-testing. Stage two included a follow-up interview that was conducted six months after completion of the programme to evaluate work and residence status.

Results

Results are presented according to the three areas studied.

Cognitive ability

Table 3 presents the means and standard deviations of the scores of the two groups on the two memory indices (figural and verbal) and the five thought process indices (Raven matrix and four GATB tests) before and after treatment. MANOVA revealed significant differences between the two groups for both memory and thought process favouring Instrumental Enrichment ($F(2.52) = 13.75$, $p < 0.001$; and $F(1.46) = 7.28$, $p < 0.001$, respectively). Separate post-test

ANOVAS of each index showed significant differences between groups on the change from before to after treatment in all indices except arithmetic exercises (Table 3).

Daily function

The first functional measure, IADL, rated before and immediately after treatment, showed no between-group difference at either time point. Differences were significant, however, for work and residence status, measured before treatment and at follow-up six months after termination of the programme (at 18 months). Figure 3 and Table 4 show that approximately 30% of the control group (nine subjects) remained in the adaptation unit, though none of the study group did; 46% of the control group (14 subjects) moved to other advanced rehabilitation units compared with 69% of the study group (20 subjects); and 14% of the control group (five subjects) were working in the open market compared with 31% of the study group (nine subjects). These differences were significant by 3×2 chi-square analysis ($\chi^2 = 14.30$, $df = 2$, $p < 0.001$).

Regarding residence status, by the end of the programme, 44.4% of the study group (13 sub-

Table 3 Scores for the cognitive measures for both groups before and after intervention (mean \pm SD) and post-test ANOVA for the mean difference in each index

Measures	Study group ($n = 29$)		Control group ($n = 29$)		Analysis of variance $F(1.52)$
	Before	After	Before	After	
LPAD: Complex figure drawing test	15.40 (6.42)	19.18 (7.79)	11.32 (4.24)	13.39 (5.49)	5.47*
LPAD: Word memory test	6.30 (2.51)	10.71 (2.81)	6.82 (2.84)	7.89 (2.54)	19.11**
Raven Progressive Matrices	35.45 (9.94)	38.04 (7.45)	28.89 (11.54)	29.11 (10.69)	205.07***
GATB:					
Proofreading	33.54 (16.04)	37.77 (15.83)	23.04 (12.29)	23.04 (11.16)	7.29*
Shape perception	10.85 (4.38)	13.77 (6.59)	8.12 (4.24)	7.62 (4.40)	10.51**
Arithmetic problems	7.85 (3.56)	9.19 (4.03)	6.50 (3.67)	6.42 (3.20)	5.92*
Arithmetic exercises	16.12 (5.89)	19.58 (5.42)	12.85 (5.03)	12.92 (5.68)	0.79

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

LPAD, Learning Potential Assessment Device.

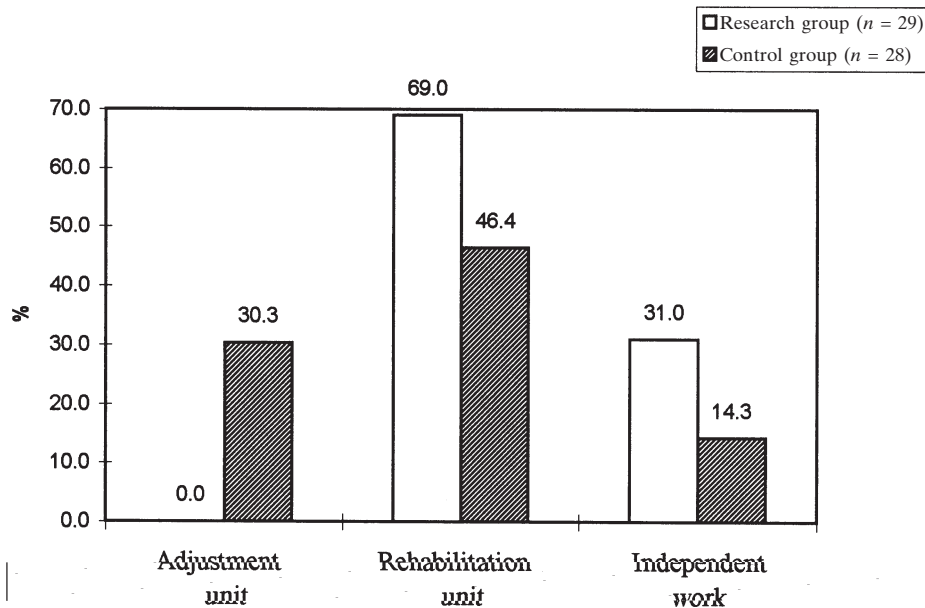


Figure 3 Work status changes in study and control group at follow-up. χ^2 (2 groups, 3 work status) = 14.30, $df = 2$, $p < 0.001$.

Table 4 Work status changes in study and control group at follow-up

	Research group (n)	Control group (n)
Adjustment unit	0	9
Rehabilitation unit	20	14
Independent work	9	5

χ^2 (2 groups, 3 work status) = 14.30, $df = 2$, $p < 0.001$.

jects) had moved to a hostel or independent residence compared with only 17.4% of the control group (five subjects) ($\chi^2 = 3.86$, $df = 1$, $p < 0.05$) (Figure 4 and Table 5).

Self-concept

No significant differences were found on the Fitts Self-Report Scale scores either before or after treatment for any of the groups. It is noteworthy that comparison of the mean score of self-concept of each of the groups (278.61 and 278.77) with the normative mean (345.57)³¹ showed that in both, self-concept was lower than the norm. These findings are in accord with the data of Fitts on the self-concept profile of subgroups of clients

with schizophrenia and validate our inclusion criteria.

Discussion

The unique contribution of this study is the successful use of a structured cognitive intervention model in a schizophrenic population in community rehabilitation. The study hypotheses were supported for almost all cognitive components and for work and residence status. The hypotheses in relation to IADL and self-concept were not supported, raising also the issue of schizophrenic clients' self report.

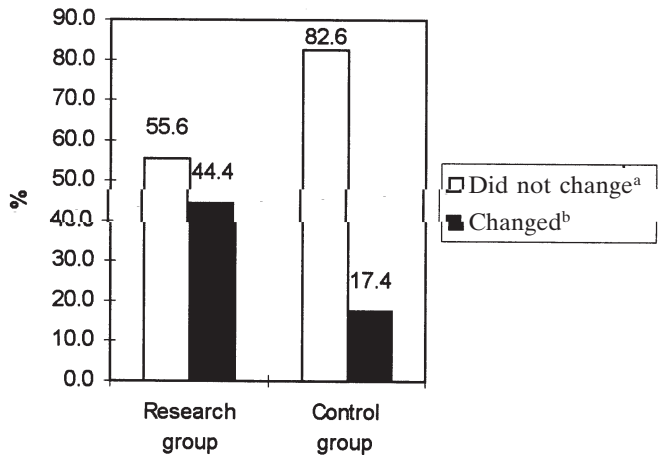


Figure 4 Residence status in study and control group at follow-up. ^aLived in sheltered house or with their parents. ^bMoved from their parents' house to a hostel or independent dwelling. χ^2 (2 groups, 2 residence status) = 3.86, $df = 1$, $p < 0.05$.

Table 5 Residence status in study and control group at follow-up

	Research group (n)	Control group (n)
Changed ^a	13	5
Did not change ^b	16	24

^aLived in sheltered house or with their parents.

^bMoved from their parents' house to a hostel or independent dwelling. χ^2 (2 groups, 2 residence status) = 3.86, $df = 1$, $p < 0.05$.

Clinical messages

- The Mediated Learning Experience (MLE) approach is applicable to all rehabilitation areas (work, residence and social skills) and not only to the cognitive area.
- The Instrumental Enrichment (IE) programme should be included as a permanent part of the therapeutic programme for schizophrenic clients in remission, in heterogeneous environments.
- Clinicians need to provide these clients with a more varied community system to ease their gradual progression to more intellectually stimulating and heterogeneous environments, in accordance with their progress.

This work has important theoretical and clinical implications. To the best of our knowledge, this study is the longest (one year, 100 hours of treatment) controlled intervention study reported in the literature. Previous works have described only short-term protocols or case studies.^{13,21,33} As such, our results question the classic view of schizophrenia as a disease with continuous deterioration in cognitive performance that cannot be altered, and agrees with Feuerstein's theory of structural cognitive modifiability that changes can be achieved with long systematic cognitive dynamic intervention. In the same vein, Wykes *et al.*¹² also demonstrate some improvements six months post neurocognitive intervention.

Our intervention study also demonstrates what Green *et al.*¹ referred to by focusing on learning

potential as the mediating variable between cognitive deficits and functional outcomes. The findings provide experimental support of the efficacy for this dynamic structured intervention compared with traditional treatment. After about one year of IE, significant differences between the study and control groups were found for almost all cognitive measures and in work and residence status. Although changes also occurred in the traditional treatment, the structured dynamic cognitive programme helped the clients to improve their thinking strategies and processes and thereby possibly to improve their everyday occupational functioning and living status.

No significant between-group differences were found in the IADL or self-concept scales. Both these domains were measured by self-report questionnaire. This may be a limitation and an inappropriate method for evaluating the schizophrenic population, which is characterized by low self-esteem and feelings of incompetence, even in the face of real progress. This gap between clients' actual performance and their perception of it dictates the need for long periods of time for these individuals to accept and acknowledge changes. We suggest that for more precise determination of change, self-report questionnaires be replaced by performance tests with structured rating scales conducted under close observation such as the Assessment of Motor and Process Scales (AMPS).³⁴ However, we need also to consider the opposite findings of Wykes *et al.*¹² who found improvement in self-esteem using the Rosenberg Self-esteem Scale following their intervention. Further investigation into the issue of the impact of cognitive interventions on self-concept or self-esteem in schizophrenia has to be undertaken.

In summary, we present an existing model of cognitive intervention that has been implemented for the first time in treating individuals with schizophrenia who are in the process of rehabilitation in the community. The significant improvement of the participants in cognitive ability and in some aspects of work and residence provides strong support for the possibility of effecting cognitive functional changes in this population by means of instrumental enrichment.

Acknowledgements

We gratefully acknowledge the support and assistance of Michal Avrech Bar for reading the drafts of the article and editing it. We want to thank the staff and clients of the rehabilitation centre at Petah-Tiqva.

References

- Green MF, Kern RS, Braff DL, Mintz J. Neurocognitive deficits and functional outcome in schizophrenia: are we measuring the 'right stuff'? *Schizophr Bull* 2000; **26**: 119–36.
- Spaulding WD, Fleming SK, Reed D, Sullivan M, Storzbach D, Lam M. Cognitive functioning in schizophrenia: implication for psychiatric rehabilitation. *Schizophr Bull* 1999; **25**: 275–90.
- Hogarty GE, Flesher S. Development theory for a cognitive enhancement therapy for schizophrenia. *Schizophr Bull* 1999; **25**: 677–92.
- Hogarty GE, Flesher S. Practice principles of cognitive enhancement therapy. *Schizophr Bull* 1999; **25**: 693–708.
- Bellack AS, Gold JM, Buchanan RW. Cognitive rehabilitation for schizophrenia: problems, prospects and strategies. *Schizophr Bull* 1999; **25**: 257–74.
- Feuerstein R, Rand Y, Hoffman MB. *The dynamic assessment of retard performance, the learning potential assessment device. Theory instruments and techniques*. Baltimore: University Park Press, 1979.
- Feuerstein R, Rand Y, Hoffman MB, Miller R. *Instrumental enrichment. An intervention program for cognitive modifiability*. Baltimore: University Park Press, 1980.
- Hayes RL, McGrath JJ. *Review: cognitive rehabilitation for people with schizophrenia and related conditions*. Cochrane Library, 2000.
- Hayes RL, McGrath JJ. Cognitive rehabilitation for people with schizophrenia and related conditions: a systematic review and meta-analysis. *Schizophr Res* 2000; **41**: 221–22.
- Medalia A, Aluma M, Tryon W, Merriam AF. Effectiveness of attention training in schizophrenia. *Schizophr Bull* 1998; **24**: 147–52.
- Tompkins LM, Goldman RS, Axelrod BN. Modifiability of neuropsychological dysfunction in schizophrenia. *Biol Psychiatry* 1995; **38**: 105–11.
- Wykes T, Reeder C, Corner J, Williams C, Everitt B. The effects of neurocognitive remediation on executive processing in patients with schizophrenia. *Schizophr Bull* 1999; **25**: 292–307.
- Spaulding WD, Reed D, Sullivan M, Richardson C, Weiler M. Effects of cognitive treatment in psychiatric rehabilitation. *Schizophr Bull* 1999; **25**: 657–76.

- 14 Hadas-Lidor N. Feuerstein's theory of cognitive modifiability and its applications to occupational therapy. *Isr J Occup Ther* 1996; **5**: 1–11.
- 15 Oltmanns TF, Neale JM. Schizophrenic performance when distractors are present: attentional deficit or differential task difficulty? *J Abnorm Psychol* 1975; **84**: 205–209.
- 16 Cornblatt B, Lenzenweger MF, Erlenmeyer-Kimling L. The continuous performance test, identical pairs version: II. Contrasting attentional profiles in schizophrenic and depressed patients. *Psychiatry Res* 1989; **29**: 65–85.
- 17 Saykin AJ, Gur RC, Gur RE *et al.* Neuropsychological function in schizophrenia. *Arch Gen Psychiatry* 1991; **48**: 618–24.
- 18 Kay SR. Conceptual disorder in schizophrenia as a function of encoding orientation. *J Nerv Ment Dis* 1987; **170**: 154–63.
- 19 Gur RE, Resnick SM, Alavi A *et al.* Regional brain function in schizophrenia: I. A positron emission tomography study. *Arch Gen Psychiatry* 1987; **44**: 119–25.
- 20 Suddath RL, Casanova MF, Goldberg TE, Daniel DG, Kelsoe JR, Weinberger DR. Temporal lobe pathology in schizophrenia: a quantitative magnetic resonance imaging study. *Am J Psychiatry* 1989; **146**: 464–72.
- 21 Kern RS, Green MF. Cognitive prerequisites of skill acquisition in schizophrenia: bridging micro- and macro-levels of processing. In: Spaulding WD ed. *Cognitive technology in psychiatric rehabilitation*. Nebraska: University of Nebraska Press, 1994: 49–67.
- 22 Feuerstein R, Klein PS, Tannenbaum AJ. *Mediated Learning Experience (MLE): theoretical psychosocial and learning implication*. London: Freund Publishing House, 1991.
- 23 Hadas-Lidor N, Katz N. Dynamic model for cognitive modifiability: application in occupational therapy. In: Katz N ed. *Cognition and occupation in rehabilitation: cognitive models for intervention in occupational therapy*. Bethesda, MD: The American Occupational Therapy Association, 1998: 281–304.
- 24 Lidz CS. *Dynamic assessment*. London: The Guildford Press, 1987.
- 25 American Psychiatric Association. *Diagnostic and statistical manual of mentally disordered*, fourth edition – revised. Washington DC: American Psychiatric Association, 1994.
- 26 Lezak M. *Neuropsychological assessment*, third edition. New York: Oxford University Press, 1995.
- 27 Raven J. The progressive matrices and Mill Hill vocabulary scale in western societies. In: Irvine SH, Berry JW eds. *Human assessment and cultural factors*. New York: Plenum Press, 1983.
- 28 Raven J, Court JH. *Manual for Raven's progressive matrices and vocabulary scales*. London: HK Lewis, 1985.
- 29 *General Aptitude Test Battery (GATB): manual for the uses*. Washington, DC: US Department of Labor, 1970.
- 30 Yaacobi Vakrat R, Katz N, Hoffien D. Implications of traumatic brain injury on the level of activity of daily living: a retrospective follow-up study. *Isr J Occup Ther* 1999; **8**: E3–21.
- 31 Fitts WH. *Tennessee (Department of Health) Self-Concept Scale (Manual)*. Nashville, Tennessee: Counselor Recordings and Tests, 1965 (Hebrew edition, 1970).
- 32 Matan A, Hadas-Lidor N. Group therapy using instrumental enrichment with clients suffering from schizophrenia. *Isr J Occup Ther* 1996; **5**: 12–28.
- 33 Goldberg JO. Cognitive retraining in a community psychiatric rehabilitation program. In: Spaulding WD ed. *Cognitive technology in psychiatric rehabilitation*. Nebraska: University of Nebraska Press, 1994: 67–87.
- 34 Fisher AG. *Assessment of motor and process scales (AMPS)*, second edition. Fort Collins, CO: Three Star Press, 1997.

Copyright of Clinical Rehabilitation is the property of Sage Publications, Ltd. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.