ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 12, pp. 22124-22127, December, 2017

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

EFFECT OF COGNITIVE RETRAINING ON ATTENTION AND WORKING MEMORY IN PERSONS WITH SCHIZOPHRENIA

Gayatri Hegde[1] and Vijaylaxmi Aminabhavi[2]

[1]Department of Clinical Psychology DIMHANS, Dharwad 580008, Karnataka
[2]Department of psychology Karnataka University-Dharwad Karnataka

DOI: http://dx.doi.org/10.24327/ijrsr.2017.0812.1205

ARTICLE INFO

Article History:

Received 05th September, 2017
Received in revised form 08th October, 2017
Accepted 10th November, 2017
Published online 28st December, 2017

Key Words:

Schizophrenia, Cognitive Retraining, Attention, Working Memory

ABSTRACT

Background: Cognitive impairment is a core feature of schizophrenia with evidences showing that it is related to functioning of a person in areas such as work, social relationships, and independent living. There are evidences that cognitive retraining helps in reducing cognitive deficits

Objective: To investigate the impact of home based cognitive retraining program on attention and working memory in persons with schizophrenia.

Method: Sample consisted of ten patients with schizophrenia. Pre and post assessment was done with digit vigilance test and verbal N back test from NIMHANS neuropsychology battery and PANSS. Intervention consisted of sessions with patient and family and home based retraining for attention and working memory for three months.

Results: Compared to their base line assessment, there were significant improvement in their scores of attention (time taken = t 3.47 , P <0.01, error committed = t 2.71, P< 0.05) and verbal working memory (1back = t 3.87, p< 0.01 , 2back= t 3.67, p <0.01).

Conclusion: The present study implies that home based cognitive retraining for attention and verbal working memory is effective in persons with schizophrenia.

INTRODUCTION

Schizophrenia is a condition characterized by impairments in a wide range of cognitive abilities. These cognitive deficits present in several cognitive domains in the prodromal, symptomatic, and chronic stages. (Bilder RM *et al* 2000, Goldberg W2000, Rund BR 2007). The 'Measurement and Treatment Research to Improve Cognition in Schizophrenia' (MATRICS) project has identified seven distinct cognitive domains that are impaired in patients with schizophrenia: speed of processing, attention/vigilance, working memory, verbal and visual learning, reasoning and problem solving, and social cognition (Nuechterlein *et al* 2004)

Cognitive impairments are believed to underlie much of the functional impairments that are observed in schizophrenia. Studies have shown that cognitive deficits are related to social deficits and poorer outcomes in different functional domains (Bowie CR 2006, Green MF 2006). Cognitive deficits and negative symptoms impair social functioning, work performance, and community functioning. (Green MF, 2000, Green MF *et al*, 2000, Penades R *et al*, 2003). Hence improvement in cognitive functions has become a relevant target in the care and clinical management of the illness.

Cognitive Retraining in Schizophrenia

Cognitive retraining has emerged as a therapeutic intervention to reduce cognitive deficits, with the expectation that improvement of cognition would result in clinical improvement as well as improvement of psychosocial functioning. (McGurk 2007, Medalia A, Choi J 2009). At Cognitive remediation Experts work shop (CREW) it is defined as "a behavioral training based intervention that aims to improve cognitive processes i.e. attention, memory, executive function, social cognition or meta cognition, with the goal of durability and generalization" (Wykes T *et al* 2011)

The underlying theoretical framework comes from a developmental neuroscience perspective. Most cognitive interventions are based, in principle, on the large literature supporting the concept of brain plasticity and neurogenesis (Eack *et al* 2010). Cognitive science assumes that skills development can occur at any age and can help to enhance or restore the brain's capacity for improving cognitive or social performance (Kaneko Y, Keshavan M.2012). Cognitive

Corresponding author:* **Gayatri Hegde
Department of Clinical Psychology DIMHANS, Dharwad 580008, Karnataka

retraining attempts to improve or restore cognitive functions utilizing a variety of pen and paper or computerized tests or activities requiring cognitive skills.

Several meta-analytic studies have shown moderate to large effect sizes (Twamley *et al* 2003, . Kurtz *et al* 2007, McGurk *et al* 2007). A recent meta-analysis of the available controlled studies of cognitive remediation in schizophrenia performed by Wykes *et al*. (2012) showed a moderate improvement in overall cognitive performance, with some durability of the effects, as shown in further follow-up studies.

Among the cognitive abilities, impairment of attention has been recognized as fundamental aspects of schizophrenia since the time of Kraepelin (1913) and Bleuler (1952). Furthermore, adequate functioning of attention may be an important prerequisite for higher cognitive functions (Shallice, 1988; Corri-gan and Storzbach, 1993). Working memory which is another important cognitive ability includes attending to current events, maintaining and manipulating incoming information and integrating them into long-term memory. It actively processes and stores information (Baddeley, 1992). Since in schizophrenic patients, working memory deficits can be observed in all three traditional subsystems i.e. phonological loop, visuospatial sketchpad and central executive (N. F. Forbes 2009, J. Lee and S. Park, 2005) it is not astonishing that a wide range of behaviors are affected (J. M. Gold2003). In view of this importance, current research study focused on effect of cognitive retraining on attention and working memory in chizophrenia.

MATERIALS AND METHODS

Individuals in the age range of 18 to 30 years, diagnosed as having schizophrenia according to the guidelines of ICD 10 and DSM IV were recruited from Dharwad Institute of Mental Health and Neurosciences (DIMHANS). Ethical clearance was taken from DIMHANS ethical committee. Patients were contacted after they were stabilized with medication. Those who were having illness for more than ten years or having other co morbid medical and psychiatric conditions or having fifteen or above scores on PANSS positive scale were excluded. Those who were educated at least up to seventh standard, having illness for more than six months with insight grade 3 level or above were included in the study. A total of sixteen cases were included in the study and informed consent was taken from them.

A semi structured interview was conducted to collect socio demographic and illness related information. Assessment was done with Digit vigilance Test, Verbal N back test from NIMHANS neuropsychological test battery and positive and negative syndrome scale (PANSS).

The intervention phase initially consisted of two sessions of psychoeducation to patient and family members about illness and cognitive retraining, two sessions of demonstration and training of retraining tasks. Home based cognitive retraining materials were given which was supervised by the care taker. Retraining material consisted of attention training with digit and alphabet pairing task, color tapping task. Working memory training included repeating the digits, repeating names which were arranged in increasing order of difficulty. Drill and practice approach was used for training. Individually tailored activity scheduling was done which included daily activities that require attention and working memory. Monthly follow up sessions were held for three months with monthly revision of tasks and activity schedule. Post assessment was done after three months.

RESULTS

In the period of seven months, among sixteen patients who were recruited, six cases dropped out from the study, as they could not carry out retraining tasks at home. Ten cases could complete three months of cognitive retraining program.

Socio demographic profile and clinical profile

The socio demographic profile of the participants is shown in Table 1. The mean age of the patients was 22.8 years (18 – 29 range). There were 7 males and 3 females and all of them were educated at least up to secondary school with majority (90%) being college educated. One patient was employed, four were students and the rest five were unemployed. All the participants were unmarried. Among them 6 from rural area and 4 were from urban area.

Table 1 Showing the socio demographical details and clinical profile

Variable		Mean (SD)
Age		22.8 (3.81)
Gender	Male	70%
	Female	30%
Education	Primary	Nil
	Secondary	10%
	College	90%
Occupation	Employed	10%
	Unemployed	50%
	Student	40%
Marital status	Single	100%
Domicile	Rural	60%
	Urban	40%
Clinical profile		
Age at onset		20.2 (2.99)
Duration		2.55 (1.79)

According to the clinical profile of the patients the average age at onset of illness was 20.2 years. The mean duration of illness was 2.5 years with the range of 6 months to 6 years.

It is apparent from examination of table 2 that from pre test to post test there is significant improvement in the mean scores of attention and verbal working memory. Attention was measured with digit vigilance test. It is found that the time taken to complete the test decreased after training (pre score mean 859.3seconds and SD 341.39, post score mean 499.1 seconds and SD 119.65).

Table 2 Showing the pre and post assessment findings

Test variables	Mean (SD) Before N=10	Mean (SD) After N=10	t value
Attention - time in sec.	859.3 (341.39)	499.1 (119.65)	3.47**
Attention - Error	47 (64.08)	20.4 (35.47)	2.71*
Verbal 1 back- hits	4.1 (2.76)	6.1 (2.55)	3.87 **
Verbal 1 back -Errors	7.1 (2.55)	4 (3.43)	4.59**
Verbal 2 back- Hits	3.5 (1.95)	5.3 (2.45)	3.67**
Verbal 2 back -Errors	7.7 (2.49)	5 (2.58)	4.26**

* P < 0.05, significant, ** P <0.01, highly significant.

The obtained t value was 3.47 and this is significant at $p < 0.01$ level. There was also decline in the errors committed (pre score mean 47 and SD 64.08, post score mean 20.4 and SD 35.47) . The obtained t value is 2.71 and this is significant at $p < 0.05$. All the scores were found to be statistically significant.

The result of verbal N back test reveals that , there is improvement in the mean score (hits) of both '1 back test' (pre score mean 4.1 SD 2.76, post score mean 6.1 and SD 2.55) and '2 back test' (pre score mean 3.5 and SD 1.95, post score mean 5.3 and SD 2.45). Similarly errors committed were lesser after training compared to their baseline scores in 1 back test (pre score mean 7.1 and SD 2.55, post score mean 4 and SD 3.43) and 2 back test (pre score mean 7.7 and SD 2.49, post score mean 5 and SD 2.58).

Further we can also notice that the obtained t value for verbal 1 back hits was 3.87 with significance level at $p < 0.01$, for verbal 2 back hits ***t*** was 3.67 with $P < 0.01$. For verbal 1 back errors ***t*** was 4.59 with significance level at $p < 0.01$, and for verbal 2 back errors, t value 4.26 with $P < 0.01$. Thus it can be inferred from the above results that there is a significant improvement in the scores of attention and verbal working memory.

DISCUSSION

Attention and working memory are the essential elements of cognition. In the back ground of impairment of cognition in persons suffering from schizophrenia, this study was conducted to see if these can be improved with cognitive retraining. Home based retraining were designed specifically with the intention that it can be combined with daily living activities and with interaction of family members which would work synergistically to bring improvement both in cognition and daily functioning.

In the domain of attention, present study has assessed 'focused attention' and 'sustained attention'. Focused attention requires the capacity to withstand distracters while the sustained attention refers to the capacity to attend to a task in hand for a required period of time. Inability to focus and sustain attention leads to both increased time to complete the test as well as errors.

Result has revealed that before training, patients had taken 859.3 seconds to complete the task and errors were 47 which were very high. Whereas after training, time reduced up to 499.1 seconds with 20.4 errors. All ten patients have shown improvement. One of the patient subjectively reported that initially she would have restlessness and uneasiness while sustaining attention but during post assessment she was calm and had less distractions. Hence findings are in favor of benefit of attention retraining in persons with schizophrenia.

On working memory, patients have improved both in 1 back and 2 back test. The overall improvements were statistically significant.

The above findings provide the initial evidence that home based cognitive retraining of attention and working memory has potential cognitive benefits in persons with schizophrenia. The large effect sizes ($p<0.01$) indicate that the improvement is substantial. These findings are in consistent with the findings of d'Amato T *et al*l (2011) where cognitive performances concerning attention/vigilance and verbal working memory improved significantly in the remediation condition.

Several factors could have played a role in the improvement observed. According a study by Lindenmayer JP et. al(2017), younger age group and high education are two of the factors that predicts positive response to cognitive remediation . Current study consists of samples of younger age with higher education level which could have contributed to the significant improvement after training .Second, only basic cognitive functions such as attention and working memory were targeted in the retraining program. Tasks were arranged in increasing level of task difficulty, thereby not taxing the patient unduly, and sustained their motivation. Third, the supportive sessions held with patient with positive feedbacks would have helped to continue the interest in task. Responsibility that was shared between patient and caretaker would have helped to monitor better.

In this study the number of dropout rates was high which highlights the importance of patient's motivation, compliance and family involvement and support in the successful execution of retraining activities. Medalia and Choi (2009) also have highlighted the fact that motivation mediates adherence and improvement in cognitive functions via cognitive remediation programs.

Clinical observation and interview have also revealed that a basic ability to comprehend the instructions of various tasks by family member and patient is a prerequisite without which the execution of home based cognitive retraining tasks will be very difficult. On a positive side, clinical observation revealed that there was change in their role from passive recipient of treatment to active participant in their process of recovery.

Limitation

The main limitation of this study was purposive sampling method and small sample size. Another limitation is the absence of control group without which no conclusions can be drawn about specific benefit of home based cognitive retraining over other intervention or the natural fluctuations of cognitive function due to the course and severity of illness.

Another limitation is with regard to the socio demographic back ground of the participants. The study comprised of all educated above secondary school, in the age range of 18 to 30 years. All were unmarried. Hence the generalisability to other age groups and educational qualification need further evidence. However these limitations will not adversely affect the utility of results of the study. Because of the above mentioned limitations, the generalisability is limited and the implications need to be determined by future studies involving larger sample size with randomized control design.

The future studies can also consider to analyze the care giver profile as they play an important role in monitoring the practice and progress of home based tasks. Follow up assessments would benefit to see the sustainability of improvement made.

CONCLUSION

The findings of the study suggest that home based cognitive retraining in patients with schizophrenia can significantly improve working memory and attention.

References

Baddeley A. (1992) "Working memory," *Science*, vol. 255, no. 5044, pp. 556-559

Bilder RM, Goldman RS, Robinson D, Reiter G, Bell L, Bates JA, *et al*.(2000) Neuropsychology of first-episode schizophrenia: Initial characterization and clinical correlates. *Am J Psychiatry*, 157:549-59.

Bowie CR, Reichenberg A, Patterson TL, Heaton RK, Harvey PD (2006) Determinants of real-world functional performance in schizophrenia subjects: correlations with cognition, functional capacity, and symptoms. *The American Journal of Psychiatry*. 163(3):418-425.

Corrigan, P., Storzbach, D., 1993. The ecological validity of cognitive rehabilitation for schizophrenia. *Journal of Cognitive Rehabilitation* 11, 14-21.

d'Amato T[1], Bation R, Cochet A, Jalenques I, Galland F, Giraud-Baro E, Pacaud-Troncin M, Augier-Astolfi F, Llorca PM, Saoud M, Brunelin J.(2011) A randomized, controlled trial of computer-assisted cognitive remediation for schizophrenia**.** *Schizophr Res*. 125(2-3):284-90.

Eack SM, Hogarty GE, Cho RY, *et al*. (2010) Neuroprotective effects of cognitive enhancement therapy against gray matter loss in early schizophrenia: results from a 2-year randomized controlled trial. *Archives of General Psychiatry*. 67(7):674-682.

Goldberg W (2000). The course of cognitive impairment in patients with schizophrenia. In: Sharma T, editor. Cognition in Schizophrenia. Oxford: Oxford University Press;. pp. 3–15.

Green MF, Kern RS, Braff DL, Mintz J. (2000) Neurocognitive deficits and functional outcome in schizophrenia: Are we measuring the "right stuff"? *Schizophr Bull*. 26:119-36.

Green MF (2006). Cognitive impairment and functional outcome in schizophrenia and bipolar disoder. *J. Clin Psychiatry*.67 (Suppl 9):3-8.

Green MF (1996) What are the functional consequences of neurocognitive deficits in schizophrenia? *The American Journal of Psychiatry*.153 (3):321-330.

J. Lee and S. Park,(2005) "Working memory impairments in schizophrenia: a meta-analysis," *Journal of Abnormal Psychology,* vol. 114, no. 4, pp. 599-611

J. M. Gold, C. M. Wilk, R. P. McMahon, R. W. Buchanan, and S. J. Luck, (2003) "Working memory for visual features and conjunctions in schizophrenia," *Journal of Abnormal Psychology*, vol. 112, no. 1, pp. 61-71.

Kaneko Y, Keshavan M. (2012) Cognitive remediation in schizophrenia. *Clinical Psychopharmacology and Neuroscience.* 10(3):125-135

Kurtz MM, Seltzer JC, Shagan DS, Thime WR, Wexler BE(2007) . Computer-assisted cognitive remediation in schizophrenia: What is the active ingredient? *Schizophr Res.* 89:251-60.

Lindenmayer JP[1], Ozog VA[1], Khan A[1], Ljuri I[1], Fregenti S[1], McGurk SR[2]. (2017) Predictors of response to cognitive remediation in service recipients with severe mental illness. *Psychiatr Rehabil J.* 40(1):61-69.

McGurk SR, Twamley EW, Sitzer DI, McHugo GJ, Mueser KT (2007). A meta-analysis of cognitive remediation in schizophrenia. *Am J Psychiatry*. 164:1791-802

Medalia A, Choi J. (2009) Cognitive remediation in schizophrenia. *Neuropsychol Rev*. 19:353-64.

N. F. Forbes, L. A. Carrick, A. M. McIntosh, and S. M. Lawrie,(2009) "Working memory in schizophrenia: a meta-analysis," *Psychological Medicine*, vol. 39, no. 6, pp. 889-905.

Nuechterlein KH, Barch DM, Gold JM, Goldberg TE, Green MF, Heaton RK.(2004) Identification of separable cognitive factors in schizophrenia. *Schizophrenia Research.*72(1):29-39

Penades R, Boget T, Catalan R, Bernardo M, Gasto C, Salamero M. (2003) Cognitive mechanisms, psychosocial functioning, and neurocognitive rehabilitation in schizophrenia. *Schizophr Res*. 63:219-27.

Rund BR, Melle I, Friis S, Johannessen JO, Larsen TK, Midboe LJ, *et al*.(2007) The course of neurocognitive functioning in first-episode psychosis and its relation to premorbid adjustment, duration of untreated psychosis, and relapse. *Schizophr Res.* 91:132-40.

Shallice, T., (1988) From Neuropsychology to Mental Structure, Cambridge University Press, Cambridge.

Twamley EW, Jeste DV, Bellack AS.(2003) A review of cognitive training in schizophrenia. *Schizophr Bull*. 29:359-82.

Wykes T, Huddy V, Cellard C, McGurk SR, Czobor P. (2011) A meta-analysis of cognitive remediation for schizophrenia: methodology and effect sizes. *The American Journal of Psychiatry*. 168(5):472-485.

How to cite this article:

Gayatri Hegde and Vijaylaxmi Aminabhavi.2017, Effect of Cognitive Retraining on Attention And Working Memory In Persons With Schizophrenia. *Int J Recent Sci Res.* 8(12), pp. 22124-22127.
DOI: http://dx.doi.org/10.24327/ijrsr.2017.0812.1205

****