



APPLICATION OF EXECUTIVE FUNCTION TRAINING AND ITS IMPACT ON COGNITIVE INSIGHT IN PATIENTS WITH SCHIZOPHRENIA

Neuropsychology

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ABSTRACT

Aim: To assess the effect of executive function re-training on cognitive insight among patients with Schizophrenia. **Methodology:** 10 patients with schizophrenia (diagnosed as per ICD-10 criteria) having significant cognitive deficits and compliant to intervention were assessed on Executive dysfunctions (Stroop test), and Beck's Cognitive insight Scale (BCIS). These were followed by Executive function training to the participants randomly assigned to the Experimental Group while the remaining 5 formed the control group. Both the groups went through post assessment on the same variables. **Result:** In the test of executive functioning the experimental group who had received executive function training had performed significantly better than the control group of patients in the study ($p < 0.05$), and that on BCIS the domains of self-reflectiveness, self-certainty and composite index showed significant improvement post intervention as compared to control group ($p < 0.01$). **Conclusions:** The present study suggests that in patients with schizophrenia having poor cognitive flexibility and executive dysfunction, the executive function retraining improves the executive functioning and significantly impacts the cognitive insight.

KEYWORDS

Schizophrenia, Executive Function, Cognitive Insight

INTRODUCTION:

Years of research suggest that the patients with schizophrenia have cognitive dysfunctions, so intense that it renders them disabled. In fact, more than positive or negative symptoms, its the cognitive deficits that cause impairment in their daily functioning and are considered to contribute most to chronic disability and in effect, unemployment [1,2]. Unlike the psychotic symptoms, the cognitive deficits do not quite improve during periods of remission and antipsychotic medications have minimal effect on them [3].

Cognitive remediation (CR) has been demonstrated to improve overall (global) cognition as well as specific domains, including attention, executive function, working memory, verbal learning and memory, processing speed, and affect recognition [4]. The Executive Functions module of Brainwave-R is one such retraining plan for the purpose of remediation and rehabilitation [5].

It has been suggested that lack of awareness of illness in schizophrenia may result from deficits in executive function [6]. Studies focusing on the association of cognitive insight and executive functioning in schizophrenia, suggested a significant relationship between the domains of Beck's cognitive insight and cognitive flexibility [7,8].

A number of cognitive rehabilitation programs have been developed in order to remediate executive impairments in people with schizophrenia. Cognitive enhancement interventions programs have been achieving importance and interest because they may provide direct benefits to patients with executive dysfunctions [9]. In Schizophrenia patients short-term intervention targeting higher-order cognitive functions may prime further cognitive and functional improvement [10].

Therefore the present study was conducted with an aim to determine the effect of executive dysfunction on the cognitive insight of patients with schizophrenia and to improve it through executive function training.

MATERIALS AND METHODS:

This study was conducted at a tertiary care hospital in Eastern India. The patients who were diagnosed as suffering from schizophrenia disorder as per International Classification of Diseases (ICD) – 10th edition, by the consultant at the outpatient level, and admitted, were selected based on purposive sampling technique. Patients were selected according to inclusion and exclusion criteria. Fourteen patients were found appropriate for the study, however two of them did not give consent for the study, and the rest of the twelve were taken for the study. Two patients were reported as dropouts due to discharge during the intervention period. Finally 10 patients completed the study whose data is being presented and analyzed.

The inclusion criteria comprised of diagnosis of schizophrenia by the Psychiatrists as per DCR of ICD-10, atleast 2 years of duration of illness, age range 25-50 years, on the maintenance dose of anti-psychotic medication, educated upto atleast 12th standard or intermediate, having significant cognitive deficits and being compliant to intervention. Meanwhile, Patients with co-morbid psychiatric disorders, having history of alcohol or substance abuse, head injury, seizures, were excluded from the study. The ethics committee of the Institute approved the study and the study participants were recruited after obtaining written informed consent.

Instruments Used:

Stroop Neuropsychological Screening Test (SNST)

The Stroop test is a popular neuropsychological test that measures executive control [11]. Strong Stroop interference is commonly interpreted in neuropsychology as a diagnostic marker of impairment in executive control, possibly reflecting executive dysfunction. The standardized version of the Stroop consists of two parts, the Color Task and the Color-Word Task.

Beck's Cognitive Insight Scale (BCIS)

The Beck Cognitive Insight Scale (BCIS) was devised to measure patients' capacity for distancing themselves from and re-evaluating anomalous beliefs and misinterpretations [12]. The BCIS is a 15-item self-report measure, composed of 2 subscales: 9 Self-Reflectiveness items that assess objectivity, reflection, and openness to feedback and 6 Self-Certainty items that tap certainty about being right and resistance to correction. The authors derived a composite cognitive insight index score (Composite Index) by subtracting the Self-Certainty score from the Self-Reflectiveness score.

Executive Function Training:

The Executive Functions module of Brainwave-R [5] was the intervention used to treat the patients with identified deficits in executive functioning. This module of Brainwave-R is designed to provide the therapist with specific methods that may lessen patients' executive functioning deficits. The module emphasizes the establishment of routines, development of well-rehearsed strategies, and the acquisition of compensatory techniques through training and homework.

Statistical Package for the Social Sciences Windows version 23 (SPSS version 23) was used to analyze the data.

To analyze group differences between experimental and control groups at baseline level, Mann Whitney U test was applied. To analyze group differences between experimental and control group Mann Whitney U test was applied to the difference between pre and post intervention data for executive functioning and cognitive insight.

RESULTS:

None of the groups on any of the variables were found to be significantly different (Table 1). For both experimental and control group, 80% of the sample belonged to the age group of 25-35. 40% of the subjects of both the experimental and control group were educated upto graduation level. 80% of the subjects of both the experimental and control group belonged to middle socio economic status and their age of onset was between 20-30 years of age. On the variable of duration of illness, 60% of the subjects of both the experimental and control group had duration of illness within 0-5 years and 40% of them had duration of illness of 6-10 years. None of the groups on any of the variables were found to be significantly different.

The demographic and clinical profile of the study sample is shown in table 1

Variables	Subject	Experimental Group		Control Group		Chi square value
		No.	Percentage	No.	Percentage	
Age	25-35 years	4	80%	4	80%	.00 NS
	36-45 years	1	20%	1	20%	
Education	Intermediate	3	60%	3	60%	.00 NS
	Graduate and above	2	40%	2	40%	
Socio-economic status	Middle	4	80%	4	80%	.00 NS
	Lower	1	20%	1	20%	
Age of Onset	20-30 years	4	80%	4	80%	.00 NS
	31-40 years	1	20%	1	20%	
Duration of Illness	0-5 years	3	60%	3	60%	.00 NS
	6-10 years	2	40%	2	40%	

Comparison of Pre and Post intervention assessments:

Table 2: Assessment Of Experimental And Control Group On Stroop Neuropsychological Screening Test

Area of Assessment	Intervention Group			Control Group			Mann Whitney U Test			
	Mean ± S.D			Mean ± S.D			Mean Rank			
	Pre	Post	Difference Pre-Post	Pre	Post	Difference Pre-Post	Intervention Group	Control Group	U	Z- Score
Color Task	79.40± 31.00	93.20± 12.68	14.20± 19.68	67.20± 4.28	70.76± 4.34	03.56± 10.06	8.00	3.00	.00	2.62*
Color Word Task	85.20± 17.36	94.10± 13.26	09.10± 4.10	76.40± 6.46	68.24± 2.38	03.28± 0.08	7.70	3.30	.20	2.43*

* Significant at 0.05 level

Table 2 shows the difference in performance on Stroop Neuropsychological Screening Test for both the experimental and control group after intervention. The table exhibits that the experimental group performed better than the control group of patients in the study, who did not have any executive function training, in both color task (U= 0.00, p<0.05) and color word task (U= 0.00, p<0.05). The control group's performance have remained almost constant and without any improvement.

Table 3: Assessment Of Experimental And Control Group On Cognitive Insight Using Beck's Cognitive Insight Scale

Variables	Experiment group			Control Group			Mann Whitney U test			
	Mean S.D			Mean S.D			Mean Rank			
	Pre	Post	Difference Pre-Post	Pre	Post	Difference Pre-Post	Intervention Group	Control Group	U	Z score
Self Reflectiveness	8.60± 1.14	13.80± 1.79	7.20±0.84	7.80± 1.64	6.60± 1.82	2.80±1.30	8	3	.00	2.61*
Self Certainty	13.2± 0.45	8.20± 2.17	10±2.24	12.2± 2.77	13.80± 2.59	3.40±1.52	8	3	.00	2.62*
Composite Index	4.6± 1.14	5.60± 1.34	14.20±1.48	-6.40± 1.82	-7.20± 1.92	3.20±2.28	8	3	.00	2.63*

* Significant at 0.01 level

Table 3 shows the comparison of the cognitive insight variables for the experimental and control group on the Beck's Cognitive Insight Scale after intervention. The results indicate that the domains of self-reflectiveness, self-certainty and composite index (U= 0.00) showed significant improvement post intervention. Whereas for the control group there has been no significant improvement in the same domains, for self reflectiveness, self certainty and composite index there is further deterioration with the passage of time during which no intervention was provided for the control group.

DISCUSSION:

The present study aimed to see the effectiveness of executive function training on patients with schizophrenia and see its impact on cognitive insight.

In the study both the experimental and the control groups subjects were matched on the socio-demographic characteristics and clinical variables and did not have any statistically significant difference between the two groups. Furthermore, baseline assessment of both the experimental and control group on all assessment parameters, namely the domains of positive, negative and general psychopathology of the Positive and Negative Symptom Scale of Schizophrenia.; the executive function tests – SNST and CTMT; and the cognitive insight. The results show no significant difference between the experimental and the control group on any of the above mentioned parameters. These findings were consistent with several similar studies [7,13].

There was impaired performance on the stroop test. Schizophrenia patients have slower speed and a greater number of errors on the interference task [14]. The experimental group who had received the intervention performed better than the control after the interventional gap, in both color task and color word task. The control group's performance has almost remained constant and shown a negligible change if any, on the other hand there have been significant improvement in the performance of the tasks for the experimental group and this difference is clearly visible post intervention performance. Perhaps training initially allows for more efficient disintegration of color and word information, and thereafter just generally increases attention to task, yielding improvements in reaction time on interference score, indicative of training-induced inhibition gains [15].

In this study there has been significant improvement in the cognitive insight, on all of its three variables for the experimental group due to intervention as compared to the control group in which case the level of insight on the variables either remained constant or further deteriorated. The self-certainty dimension reflects decision-making regarding mental products: certainty about being right and resistance to correction, over-confidence in decision making [12]. Furthermore, it has also been suggested that diminished functioning of the prefrontal cortex, which is responsible for impaired mental flexibility, mental abstract reasoning and self-reflection, could lead to impairment in insight [16]. In another recent study assessing the correlation between cognitive functions and insight in schizophrenia patients, a significant correlation was found between all cognitive domains (including working memory and processing speed) and Scale to Assess Unawareness of Medical Disorder (SUMD) [17]. Lack of insight is strongly correlated with cognitive functioning, including executive functioning, the degree of insight has been found to be significantly associated with the performance on WCST and poor neuro-cognition was associated with poor cognitive insight [8].

CONCLUSION:

The present study indicates that the executive function deficits in the patients with schizophrenia improve with remediation techniques, which involve repeated practice and drills. Therefore, along with pharmacological management, inpatients should be exposed to the neuropsychological rehabilitation. it would ensure their better functioning in their daily lives. Also, the improvement in cognitive insight variables through executive function training can help the patient as specific cognitive therapies may be planned for such patients in future. We however feel that more research on patients with schizophrenia is needed to study the durability of executive functions acquired through training and therefore a long term follow up study is required. It is important to study the role of family members in future studies; it would help in generalizing the effect of executive function training at home and work place.

Conflict of Interest: None

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