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Expert Opinion Article

Efficacy Of Cognitive Remediation Therapy In Enhancing Verbal Memory In Patients With Schizophrenia: A Baseline, Post-Intervention, And Follow-Up Analysis

Abhilasha Dwivedi[1*] and Dr. Jai Prakash[2]

[1*]PhD Scholar, Department of Clinical Psychology, Ranchi Institute of Neuropsychiatry and Allied Sciences (RINPAS), Kanke, Ranchi. Email ID: abhilasha_dwivedi89@rediffmail.com.
[2]Additional Professor, Department of Clinical Psychology, Ranchi Institute of Neuropsychiatry and Allied Sciences (RINPAS), Kanke, Ranchi.

Abstract: Verbal memory deficits in schizophrenia have a considerable impact on cognitive function, mostly due to impaired encoding ability and increased forgetting rates. Cognitive remediation is the most effective cognitive rehabilitation intervention for cognitive impairment in schizophrenia.
Objective: This study assessed the efficacy of a structured cognitive remediation therapy (CRT) intervention using the Brainwave-R module to improve verbal memory in individuals with schizophrenia.
Method: A cross-sectional design involved 20 inpatients diagnosed with schizophrenia, divided equally into intervention and treatment-as-usual groups. The intervention group participated in a four-week CRT program focused on verbal memory. Verbal memory outcomes were assessed using the Rey Auditory Verbal Learning Test (RAVLT) at baseline, post-intervention, and two-month follow-up for both groups.
Results: The intervention group showed significant improvements in RAVLT performance after the intervention and at follow-up, compared to the treatment as usual group ($p < .05$ and $p < .01$).
Conclusion: CRT using the Brainwave-R module is an effective and sustainable intervention to enhance verbal memory in patients with schizophrenia.

Keywords: Schizophrenia, Verbal Memory, Cognitive Remediation Therapy, Brainwave – R Module, Rey Auditory Verbal Learning Test.

INTRODUCTION

Cognitive deficits are an essential feature of schizophrenia; in particular, those of attention, working memory (Mueller et al., 2013) and executive functions affect 80% of patients with schizophrenia, typically averaging two standard deviations below the levels observed in healthy controls. These cognitive impairments are significant obstacles to individuals' day-to-day life functions, compromising the standard of living, making it difficult to live independently, and increasing the chance of unemployment (Raffard, 2023).

Verbal memory refers to how individuals acquire, store, and recall specific verbal information at a particular time. Patients with schizophrenia often struggle to encode verbal information, such as specific lists of words, short essays, or important events and schedules for the day. This difficulty negatively impacts their daily functioning. A significant cognitive aspect of schizophrenia, whether it occurs in early or late onset, is a deficiency in verbal memory. That's why these cognitive aspects are highly targeted in treatment outcomes (Molina & Tsuang, 2020; Bogie et al., 2024).

Numerous studies have shown that individuals with schizophrenia experience deficits in the temporary storage and manipulation of information essential for complex tasks. These impairments were also evident during their first episode of schizophrenia, as they struggled to identify the appropriate cues and to recall the retrieved information (Liu et al., 2017).

Botero et al. (2013) reported that patients with substantial cognitive deficits performed significantly worse on verbal memory tasks than healthy individuals. These impairments are frequently associated with difficulties in attention and ineffective encoding strategies.

Pharmacological treatments have shown limited effectiveness in improving cognitive symptoms (Keefe et al., 2013; Tsapakis et al., 2015), highlighting the increasing need for cognitive remediation therapy (CRT) as a specific intervention for verbal memory deficits.

In the field of cognitive rehabilitation, Cognitive Remediation Therapy (CRT) is considered a standard gold intervention. It offers effective and sustained treatment for patients with schizophrenia by specifically addressing their cognitive deficits. The therapy targets key cognitive domains, including attention, information processing, verbal memory, and executive functioning (Harvey & Bowie, 2019; Bowie et al., 2020).

Cognitive Remediation Therapy (CRT) is based on neuropsychological and learning theories. It

involves structured cognitive exercises that are organised hierarchically, progressing from simple tasks to more complex ones. These tasks are repeated across multiple sessions to strengthen practice. This approach helps improve cognitive flexibility and processing speed, leading to better functional and social outcomes. Therapists play a vital role in facilitating the transfer of skills by guiding patients in applying cognitive strategies in their everyday social and work environments (Delahunty Morice, 1993; Balzan et al., 2014).
A growing body of literature has demonstrated that cognitive remediation therapy (CRT) interventions, including story recall, paired-associate learning, and verbal repetition, are particularly effective in enhancing verbal memory performance both in the short and long term (Wykes et al., 2011; Eack et al., 2010). These structured tasks enhance the process of encoding and recall while also facilitating the generalization of skills to real-world contexts.

Recent evidence suggests that Cognitive Remediation Therapy (CRT) can lead to lasting improvements in treatment durability. A meta-analysis by Vita et al. (2021) found that cognitive gains, especially in verbal memory, were maintained for 6 to 12 months after the intervention. Additionally, Bocchi et al. (2022) confirmed these results, reporting significantly greater improvements in verbal memory among patients undergoing CRT compared to control groups. Longitudinal data from Li et al. (2015) also indicated that cognitive benefits continued over a two-year follow-up period, with notable enhancements in verbal domains.

Despite these promising findings, there is still a considerable gap in research from India. Few studies have systematically evaluated the effectiveness and long-term outcomes of CRT in improving verbal memory for individuals with schizophrenia. This study aims to fill that gap by assessing both the efficacy and the persistence of improvements following a structured CRT program using the Brainwave-R module.

Objective of the Study: This study evaluates the efficacy and durability of cognitive remediation therapy in enhancing verbal memory deficits in patients with schizophrenia at three time points: baseline (pre-intervention), post-intervention, and follow-up.

MATERIAL AND METHODS

Study Design: This cross-sectional research is conducted in hospital settings and is intervention-based, with baseline, post-intervention and follow-up assessments.

Participants: This study included a sample size of 20 inpatients who were diagnosed with schizophrenia based on the ICD-10-DCR criteria.
Inclusion criteria: (a) aged 30 to 40 years; (b) education of at least 10th grade; (c) duration of illness of at least two years; (d) mild to moderate symptoms based on the Positive and Negative Syndrome Scale (PANSS); and (e) ability to understand Hindi and English.
Exclusion criteria included comorbid psychiatric disorders, neurological conditions, head injury, vision or hearing impairments and substance use.

Participants were recruited through purposive sampling from the Ranchi Institute of Neuro-Psychiatry and Allied Sciences (RINPAS) in Ranchi, where they were randomly assigned to either an intervention group (n = 10) or a treatment-as-usual group (n = 10).

Assessment Tool

- **Sociodemographic and Clinical data sheet:** A self prepared performa captured socio demographic details clinical information from medical case file.
- **Rey's Auditory Verbal Learning Test (RAVLT):** It assessed verbal learning and memory. It evaluates several domains of verbal memory processes, including encoding, retrieval, retention, proactive and retroactive interference, and subjective organization. The Hindi version of the NIMHANS Neuropsychological Battery (2004) was used for this study **(Rao et al., 2004).**

Intervention Package Brainwave – R Module: For four weeks, this research used Brainwave R as a cognitive remediation intervention, as suggested by Malia et al. (2002). The intervention consists of various pen-and-paper exercises organized into five modules that target common cognitive deficits, such as executive functioning, memory, visual processing, attention, and information processing. Each module includes a structured four-week program of exercises that progress from simple to complex. Additionally, there is a printable therapist-client workbook provided for each module. The clinician's workbook outlines module requirements, includes assignments designed to enhance module performance, features a chart for tracking progress, and provides space for self-ratings. Through these exercises, clients are encouraged to practice improving their cognitive abilities and functional performance while gaining insights into their areas of difficulty. Therapeutic sessions were conducted for 45 to 60 minutes.

Memory Module: The Brainwave R memory module focuses on teaching and compensatory strategies rather than just remediation. It enhances

memory indirectly through improvements in rhythm, fatigue management, organizational skills, cognitive processing, information speed and efficiency, and attentiveness. Clients learn about memory processes and compensatory aids, which evolve into natural habits over time. The module consists of four components: the first two sections cover memory strategies, while the last two provide specific objectives and practice activities to implement these methods. Overall, the Brainwave R memory module helps clinicians create customized programs for their clients.

Procedure of the study: The admitted ward inpatients of RINPAS were screened for a diagnosis of schizophrenia according to the ICD-10 DCR. A total of twenty patients were selected through purposive sampling, adhering to specific inclusion and exclusion criteria. These patients were divided into two groups: an experimental group (n=10) and a control group (n=10). The researcher aimed to inform all participants about the study, during which rapport was established. Social, demographic, and clinical data were gathered from case records. To evaluate verbal memory deficits, baseline assessments were conducted using the Rey's Auditory Verbal Learning Test (RAVLT). The intervention group received only cognitive remediation therapy. Following the intervention and a follow-up period, both groups underwent the same cognitive assessments to evaluate their progress.

Statistical Analysis: SPSS version 20.0 was used to analyze the collected data. Group comparisons were conducted using the Mann-Whitney U test (Čaplová & Švábová, 2020).

RESULT

Sample Characteristics: Descriptive statistical analyses conducted using SPSS version 20.0 revealed that the intervention and control groups were comparable in terms of sociodemographic and clinical variables. As shown in Table 1, no statistically significant differences were observed between the groups regarding education level, marital status, occupation, economic status, religion, family structure, or community background.

Table 1: Socio demographic Characteristics of Intervention and Treatment as Usual (TAU) Groups of Schizophrenia Patients (N =20).

Variable	Category	Intervention Group (N = 10)	TAU Group (N = 10)
Education	Intermediate	4 (40%)	4 (40%)
	Graduation	5 (50%)	5 (50%)
	Postgraduation	1(10%)	1(10%)
Marital Status	Single	5 (50%)	5 (50%)
	Married	4 (40%)	4 (40%)
	Divorced	1(10%)	1(10%)
Occupation	Self – employed	1(10%)	1(10%)
	Employed	3 (30%)	3 (30%)
	Unemployed	6 (60%)	6 (60%)
Economic Status	Lower	1(10%)	1(10%)
	Middle	9 (90%)	9 (90%)
Religion	Hindu	9 (90%)	9 (90%)
	Muslim	1 (10%)	1 (10%)
Family Type	Joint	3 (30%)	2 (20%)
	Nuclear	7 (70%)	8 (80%)
Community	Tribal	1 (10%)	9 (90%)
	Non Tribal	9 (90%)	1 (10%)

Clinical Characteristics: As shown in Table 2, there were no significant differences between the groups in terms of age of onset or duration of illness.

Table 2: Clinical Profile of Intervention and Treatment as Usual Groups of Schizophrenia Patients (N =20).

Clinical Variable	Intervention Group (N = 10) Mean ± SD	Treatment as Usual (N = 10) Mean ± SD	Mann–Whitney U	Z-value	Significance
Age of Onset (years)	24.70 ± 4.16	25.60 ± 3.13	44.00	0.462	**Ns**
Duration of Illness	11.60 ± 3.50	11.70 ± 3.59	49.00	0.760	**Ns**

Note : Ns = not significant (p > 0.5).

Verbal Memory Outcomes (RAVLT) : Comparative analyses using the Mann–Whitney U test indicated that the intervention group demonstrated significantly better performance on the RAVLT variables both immediately after the intervention and at follow-up, compared to the TAU group (see Table 3). Noteworthy improvements were observed in Trial 5, List B, Immediate Recall (IR), Delayed Recall (DR), Hits, Omissions, and Commissions.

Table 3: Comparison of RAVLT scores were Between Groups at the Baseline, Post-intervention and follow-up (N = 20).

Variable	Time Point	Intervention Group (Mean ± SD)	Treatment as Usual (Mean± SD)	Mann–Whitney U	Z Score	Significance
AVLT Trial 5	**Baseline**	8.50 ± 3.27	8.50± 3.27	46.50	0.268	Ns
	Post – intervention	12.80 ± 1.55	9.10± 1.85	7.50	3.225	p < 0.01
	Follow up	11.30 ± 1.42	9.70± 1.89	23.50	2.065	p < 0.01
AVLT List B	**Baseline**	4.80 ± 1.03	4.90± 1.52	45.00	0.390	Ns
	Post – intervention	6.50 ± 1.58	5.60 ± 1.27	35.00	1.165	p < 0.05
	Follow up	6.20 ± 1.32	5.00 ± 1.05	24.00	2.044	p < 0.01
AVLT IR	**Baseline**	7.10 ± 2.18	7.80 ± 2.35	40.50	0.731	Ns
	Post – intervention	11.40 ± 1.78	8.60 ± 2.00	15.00	2.667	p < 0.01
	Follow up	10.80 ± 1.87	7.80 ± 1.75	10.50	3.045	p < 0.01
AVLT DR	**Baseline**	6.10 ± 2.42	6.10 ± 1.52	49.50	0.038	Ns
	Post – intervention	9.60 ± 2.50	6.80 ± 1.48	18.00	2.445	p < 0.05
	Follow up	9.20 ± 1.69	7.00 ± 2.26	15.00	2.771	p < 0.01
AVLT Hits	**Baseline**	12.00 ± 2.21	11.80 ± 2.20	46.50	0.272	Ns
	Post – intervention phase	13.90 ± 0.74	11.00 ± 2.91	18.00	2.511	p < 0.05
	Follow up	13.90 ± 1.45	11.20 ± 3.05	24.00	2.025	p < 0.01
AVLT Omissions	**Baseline**	3.20 ± 2.15	3.40 ± 2.55	48.50	0.116	Ns
	Post – intervention	1.10 ± 0.74	4.10 ± 2.89	18.00	2.512	p < 0.05
	Follow up	1.10 ± 1.45	3.80 ± 3.05	24.00	2.025	p < 0.01
AVLT Commissions	**Baseline**	1.10 ± 1.45	1.10 ± 1.45	47.00	0.240	Ns
	Post – intervention	0.20 ± 0.42	0.70 ± 1.46	38.00	1.125	p < 0.05
	Follow up	0.00 ± 0.00	0.60 ± 0.84	30.00	2.166	p < 0.01

Note ; AVLT = Auditory Verbal Learning Test; **IR =** Immediate Recall; DR = Delayed Recall.

At baseline, both groups demonstrated equivalence across all verbal memory variables. The experimental group demonstrated noticeably improved performance in several domains after the intervention. These improvements were largely maintained at the two-month follow-up, suggesting the lasting effects of the Brainwave-R CRT intervention, as shown in Table 3.

DISCUSSION

This study assessed the effectiveness and durability of a structured cognitive remediation intervention (CRT) implemented through the Brainwave-R program, aimed at improving verbal memory in patients with schizophrenia. The results revealed that participants who received CRT exhibited statistically significant improvements across several aspects of verbal memory when compared to those who received treatment as usual (TAU). Notably, these improvements were sustained at the two-

month follow-up, indicating that the intervention group maintained their cognitive gains.

At the beginning of the study, both the intervention group and the TAU group exhibited similar levels of verbal memory impairment, as measured by the Rey Auditory Verbal Learning Test (RAVLT). After four weeks of Cognitive Remediation Therapy (CRT), the intervention group showed significant enhancements in verbal memory, particularly in learning (Trial 5, List B), as well as in both immediate and delayed recall. Additionally, there was a notable reduction in omission and commission errors in comparison to the TAU group. These results provide evidence that CRT utilizing the Brainwave-R module can improve the encoding, storage, and retrieval processes in patients with schizophrenia, thereby contradicting the initial hypothesis

The observed improvements align with prior research demonstrating the effectiveness of Cognitive Remediation Therapy (CRT) in enhancing verbal memory functions. For example, Wykes et al. (2011) and Medalia and Choi (2009) documented significant post-treatment advancements in verbal learning and recall among individuals with schizophrenia. Similarly, Bell et al. (2003) reported lasting improvements in backward recall following ten weeks of verbal memory training, with effects persisting for six months. Our findings extend this evidence to an Indian clinical population, indicating that even a brief, four-week intervention can yield measurable cognitive benefits.

Furthermore, our results are consistent with recent studies examining the durability of CRT. Vita et al. (2021) and Bocchi et al. (2022) highlighted that improvements in verbal memory can last from six to twelve months post-intervention. Although our follow-up period was limited to two months, the sustained improvement suggests the potential for longer-term benefits if additional or booster sessions are implemented. The Brainwave-R module used in this research provides a time-efficient alternative compared to earlier studies that employed longer durations of eight to twelve weeks. Omiya et al. (2016) and Yamanushi et al. (2024) reported similar benefits from extended programs focused on executive and verbal memory functions. Our findings advocate the implementation of shorter CRT programs for routine clinical use, particularly in resource-limited settings.

Limitations & Future Directions: Despite the promising results, it is important to consider several limitations. Firstly, the small sample size (N = 20) diminished statistical power and restricts the generalizability of the findings. Secondly, the follow-up period was relatively short (2 months), which hinders our ability to draw conclusions regarding the long-term durability of the cognitive gains.

Future research should include larger sample sizes and longer follow-up periods to validate and generalize these findings. Additionally, it would be beneficial to explore whether integrating cognitive remediation therapy (CRT) with other psychosocial interventions could enhance both cognitive and functional outcomes.

Conclusion: This study indicates that the Brainwave-R, used as a cognitive remediation therapy (CRT) module, effectively improves verbal memory in patients with schizophrenia. The findings emphasized the importance of structured cognitive remediation in cognitive rehabilitation and suggest that brief interventions can lead to significant and enduring improvements in cognitive functions.

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