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Efficacy of cognitive pragmatic treatment in adults with schizophrenia

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ABSTRACT

Objectives: The study aimed to evaluate the efficiency of cognitive-pragmatic treatment (CPT) in improving cognitive functions and pragmatic language abilities in adults with schizophrenia. *Methods:* 100 individuals with schizophrenia who fulfilled the inclusion criteria were assigned to control (n = 25) and experimental groups (n = 75). Experimental groups received CPT for 3 months, while the control group obtained only routine care. Individuals were tested both before and after the intervention to gauge their progress also 3 months post-intervention, a follow-up evaluation was carried out. Analyses employed parametric and non-parametric statistics. *Results:* The findings revealed significant variations among groups and tests ($p<0.001$), & interaction of groups with tests ($p<0.001$) on two-way Repeated Measures ANOVA. Both the post-test and the follow-up assessment indicated that the experimental group had significantly higher levels of pragmatic language skills and cognitive functioning than the control group. There has been no major influence of age, gender and illness duration on the treatment outcomes by three-way ANOVA. *Conclusions:* The present study showed that CPT improved pragmatic language communication skills & cognitive functioning in adults with schizophrenia.

Keywords: Schizophrenia, cognitive pragmatic treatment, cognitive functioning, pragmatic language impairment, group therapy, social communication impairment.

1. INTRODUCTION

Schizophrenia is the most prevalent mental condition associated with impaired social functioning as per the "National Mental Health Survey" of 2015 to 2016 (Murthy, 2017). The prevalence of schizophrenia in the Indian population is 0.5%. Cognitive and communication impairments are evident in the manifestations of schizophrenia. Speech and language impairments in schizophrenia, typically limit an individual's ability to communicate effectively. Language consists of morphology, semantics, syntax and phonology, the most relevant in terms of social communication is pragmatics. It emphasizes how language is used in relation to objectives and accords that are reached during social interactions. Communicative pragmatics is the

capability to convey meaning in a given context using language or nonverbal expressions like gestures, voice modulation, along with facial expressions (Bublitz and Norrick, 2011; Patil et al., 2022; Alghamdi, 2022). Effective pragmatic language skills improve social communication and are essential for effective social integration and interpersonal ability. Individuals with schizophrenia struggle with the complex use of words despite near-complete syntactic competency. Compromised pragmatic language results in social communication impairment that negatively impacts the quality of life in terms of poorer outcomes, unemployment, higher relapse rates and severe illness. Research studies have indicated that individuals with schizophrenia have decreased pragmatic communication ability. Specific manifestations include adherence to Grice's maxims (Tenyi et al., 2002), difficulties in comprehending irony and other figurative expressions (Langdon et al, 2002; Tavano et al., 2008; Li et al., 2017) and inability to infer the speaker's communicative intention (Parola et al., 2021). Individuals with schizophrenia have difficulty with the prosody and facial expression identification essential for emotional processing (Edwards et al., 2002). They exhibit unusual vocal patterns, including alogia, lengthier pauses, distinct intonation and loudness (Cohen et al., 2016) difficulties in comprehension of narratives (Marini et al., 2008) and lack of coherence in discourse (Kuperberg, 2010). Although they can comprehend literal language, they have difficulty with higher-order language processing (Champagne-Lavau et al., 2006). In a recent study conducted, it was found that individuals with schizophrenia had profound impairment in the ability to comprehend indirect information (inability to make a connection between literal and intended meaning), humor, figures of speech and conversation (Pawełczyk et al., 2020). Research has proposed constructing a pragmatic language treatment program to reduce social communication deficits, particularly if implemented at the onset of the condition (Daud et al., 2020).

Despite the growing evidence that schizophrenia is characterized by pragmatic language deficits, there is lack of research in speech language therapy in schizophrenia (Joyal et al., 2016). This demands a need for more research into therapeutic treatments to establish a scientific evidence base for the benefit of the individual's quality of life (Mac-Kay et al., 2018).

"Cognitive pragmatics" refers to the mutualistic relationship between cognition and pragmatics. It emphasizes the cognitive aspects of context-based meaning interpretation that pertain to language comprehension and production (Bublitz and Norrick, 2011). It is the study of how people’s mind changes through conversation. The aim of the treatment program known as Cognitive pragmatic treatment is to enhance individual's communicative and pragmatic linguistic abilities. The innovative nature of the treatement may be seen in its use of the cognitive pragmatic theory (Bruno, 2011). The theory states that both verbal and nonverbal modalities are all valid means of communicating an intention. CPT works on all components that facilitate efficient communication. The importance of appropriately correlating verbal (linguistic) messages with non-linguistic cues, including facial emotions and bodily gestures, with paralinguistic cues, such as the intonation of one's voice, pitch, accent, loudness, speaking tempo, inflections and fluency are emphasized. They characterize particular pragmatic phenomena such as irony, is also emphasized. The program incorporates activities intended to improve an individual's capacity to draw conclusions and fill the gap between actual and implicit content in routine conversation. Moreover, rehabilitation sessions cover several components of communication. The objective of this research is to study the effectiveness and sustainability of CPT for adults with schizophrenia. At baseline, post intervention and follow-up, pragmatic language skill and associated cognitive processes are evaluated.

2. MATERIALS AND METHODS

Study Participants

The sample size was estimated assuming a 30% difference among the means, 25% as standard deviation, 90% power and 5% significance level. Adding, 20% as a drop out the estimated sample size was 25 each for 4 groups. There was a total of 100 individuals who met the inclusion requirements and were randomly assigned to each group (25 in control and 75 in experimental group, respectively). Both males and females, aged 18–65 years, according to DSM-V diagnosis of chronic schizophrenia with different degrees of autonomy and age of onset of illness between 1 and 30 years were included. They must be native speakers of any Indian language and have a minimum level of education (at least a high school), exhibiting basic cognitive capacity, as determined by MMSE (Mini-Mental-State-Examination) (Folstein et al., 1975) cut-off count of >24/30. Individuals with alcohol or drug abuse, signs of organic brain damage or intellectual disability and acute psychosis were excluded.

Test procedure

To evaluate pragmatic language parameters, the Pragmatic protocol (Prutting and Kirchner, 1987) was used. The test is divided into three parts: Task 1 assesses verbal skills and has 18 individual subparts; task 2, assesses paralinguistic skills and has 5 individual subparts; and task 3, assesses non-verbal skills and has 7 individual subparts. The clinician established a rapport with each participant and made them feel at ease in a ventilated setting. The clinician extended the conversation by asking about themselves,

their routine, employment, hobbies, etc. Each participant communicated for a total of 30 minutes. The speech sample was rated on a 2-point rating scale, where '0' indicated contextually inappropriate answers, "1" represented contextually appropriate responses and "2" represented no opportunities. In addition, Cognitive Linguistic Quick Test (CLQT) (Estabrooks, 2001) was administered both before and after the intervention program. This provides a time-efficient means of assessing proficiency in the 5 cognitive areas of executive functions, memory, attention, visuospatial skills and language. To reduce the possibility of bias, each assessment procedure was coded by a different expert from the one who delivered it.

Methodology

This is a prospective non-randomized study involving pre and post-test assessment. The study was approved on August 6, 2021, by the "Institutional Ethics Committee of Saveetha Medical College and Hospital" (SMCH-IEC) (004/08/2021/IEC/SMCH). The participants and their caretakers were provided with an information sheet regarding the study in English and Tamil and written and oral consent was obtained for participation. Each participant's clinical profile information was recorded using a proforma and confidentiality was preserved. The study was carried out between August and April of 2021-22 at Saveetha Medical College and Hospital and a tertiary care center (Home for schizophrenia).

Pre-test data collection (T0) was done for the control and experimental groups. The experimental group participants were randomly allotted to three groups (25 in each) for a 12-week CPT program. Each group received 24 CPT Sessions over three months. Each session lasted around one hour approximately with optional five-minute break. Each session was organized in a realistic context to practice pragmatic communication skills that could be applied to real-life communication. In each treatment session, comprehension and production activities were targeted at a specific communication modality. Participants were guided through the treatment program with the help of self-monitoring and responses from the clinician and group members. The control group got standard psychiatric care but no form of speech, language or pragmatic communication interventions. After completion of all data collection, the participants of the control group and their caretakers were provided a demonstration of contextual and social communication. CPT framework was adapted from prior research (Gabbatore et al., 2015). Session activities were modified for Indian participants and more pragmatic competence tasks were included. An overview of CPT group therapy sessions is described (Table 1).

Table 1 Overview of CPT group therapy session

Weeks	Sessions	Activities/tasks
1	Introduction, Awareness	This session includes introducing members, discussing session frequency and orienting
2	Linguistic/verbal modality	Use of prerecorded scenes (Comprehension) and simulated activities (Expression)
3	Extra linguistic modality	Prerecorded scenes and real-time simulation, based on the nonverbal mode of expression, Facial expression recognition (Ekman, 1993).
4	Paralinguistic modality	Prerecorded scenes and role-playing. Voice inflection and identification of prosody tasks
5	Social appropriateness skill	Prerecorded scenes and simulated activities concentrated on social & communicative appropriateness in varied contexts
6	Conversational ability	Prerecorded scenes and Role play simulation on conversational rules (turn-taking, topic maintenance, etc.)
7	Telephone conversation	Audio clips and real-time simulation on phone conversation rules (voice only, no paralinguistic and gesture indicators)
8	Executive functioning	Sub-goal tasks both independently and in teams (for ex: Planning household chores, doing laundry, food preparation, Housekeeping, etc.)
9	Theory of mind	Prerecorded scenes as well as role-play with emphasis on the potential to build meta-representations of self and other are mental state
10	Narrative ability	Picture description, storytelling or describing a circumstance with the right amount of information
11	Overall communicative ability	Prerecorded scenes and role play emphasizing pragmatic efficacy across all communication competence modes
12	Post-training awareness	Conclusions and feedback based on session comments of each week

Initially, a few trial sessions were conducted with a group of 5-8 participants for a period of 3 weeks and it was found that they were successful in adapting to the activities and were able to transfer it to daily conversation.

Post-test assessment (T1) was carried out one week after the completion of a treatment program. A three-month follow-up assessment (T2) was also carried out to determine whether the treatment led to beneficial effects over the period. To avoid habituation, the tasks were alternated during the pre & post-test along with follow-up phases of the evaluation.

Statistical Analysis

Sigma Plot 14.5 (Systat Software Inc., San Jose, California, United States) has been utilized for statistical analysis and graph plotting. i) The figures were provided as the mean and SEM (standard error of the mean) and analyzed using 2-way repeated measures analysis of variance (RM ANOVA) for one-factor repetition & Bonferroni 't' test for post hoc multiple comparisons. Factor A, was groups (between-group comparison-control and experimental). Factor B was tests (within-group comparison, i.e., repetition factor – pre/post-test and follow-up), & group X test interaction. A probability less than or equal to 0.05 was considered statistically important. ii) Demographic information was used as the independent variable in a three-way ANOVA following a Bonferroni 't' test for post hoc multiple comparisons factor A, the independent variables (gender, age and duration of illness). Factor B, control & experimental groups and Factor C the tests (pre/post-test and follow-up) and their interaction were studied.

3. RESULTS

Pragmatic communication assessment

Table 2 shows a comparison of control and experimental groups on pragmatic communication skills. There was no statistical significance between the pre/post-test, pre-test and follow-up, as well as post-test and follow-up for the control group (P = 1.00, 1.00 and 1.00, respectively) whereas, the experimental group showed statistical significance (P<0.001 respectively).

Figure 1 shows the mean performance scores achieved at pragmatic protocol at T0 (pre-test), T1 (post-test) and T2 (follow-up) comparing the control and experimental groups; the experimental group showed significance on both post-test and follow-up (P < 0.001, 0.001 and 0.001 respectively).

Table 2 Comparison of control and experimental groups on pragmatic communication skills (Linguistic, Paralinguistic and extra linguistic parameters) by two-way RM ANOVA with Bonferroni t-test

S. No	Groups and comparisons	Tests	Pragmatic Abilities
1	Control	Pre-test	6.8±1.0
	Control	Post-test	6.8±1.0
	Control	Follow-up	6.8 ±1.0
	Experimental	Pre-test	6.3 ± 0.5
	Experimental	Post-test	13.3 ± 0.5
	Experimental	Follow-up	18.0 ± 0.5
2	Significance between Pre-tests (Control and Experimental)		t = 0.454 P = 0.651
	Significance between Post-tests (Control and Experimental)		t = 5.569 P< 0.001
	Significance between Follow-ups (Control and Experimental)		t = 9.573 P<0.001
3	Significance in Control (Pre & post-test)		"t = 0 P = 1.0
	Significance within Control (Pre-test and Follow-up)		t = 0 P = 1.0
	Significance within Control (Post-test) and Follow-up		t = 0 P = 1.0
4	Significance within Experimental (Pre and post-test)		t = 13.206 P< 0.001
	Significance within Experimental (Pre-test and Follow-up)		t = 21.985 P< 0.001

	Significance within Experimental (Post-test and Follow-up)	t = 8.779 P<0.001
n – Control = 25; Experimental = 75		

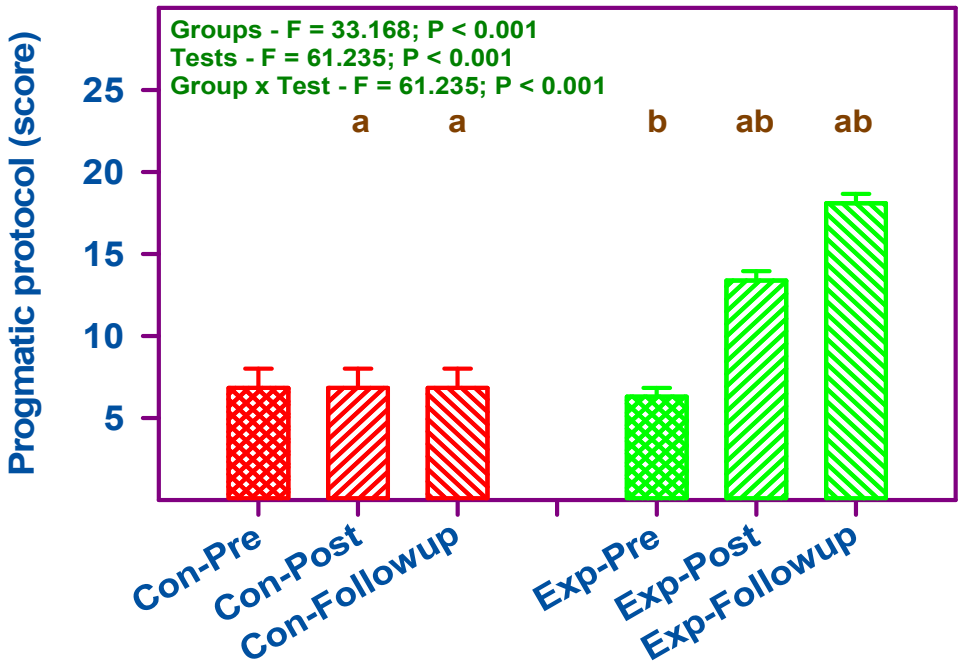

Figure 1 Comparison of control and experimental groups on pragmatic protocol scores values are mean + SE (n= Control = 25; Experimental = 75)

The 'F' and 'P' values are by two-way RM ANOVA with Bonferroni 't' test for groups (Control & Experimental), tests (pre-test, post-test and follow-up) and the group x test interaction.

[a]Significantly different from the respective Pre-test (within a group)

[b]Significantly different from the respective Control (between groups)

Table 2 and Figure 1 illustrate that the experimental group surpassed the Control group in terms of pragmatic protocol parameters during the post-test and follow-up phase. The influence and relationship of gender age and duration of illness on pragmatic protocol parameters were analyzed using 3-way ANOVA (Table 3).

Table 3 The impact and relationship of the independent variables (gender, age and illness duration) on the treatment outcome of pragmatic protocol

S. No.	Statistical analysis 3-way ANOVA	Independent variables		
		Gender (Male/Female)	Age (years) (<40/>41)	Duration (years) (<10/>11)
1	Independent variable (Gender/Age/Duration category)	F=2.209 P=0.138	F=8.214 P=0.004	F=1.349 P=0.246
2	Groups (Control and Experimental)	F=83.561 P<0.001	F=57.031 P<0.001	F=68.956 P<0.001
3	Tests (Pre-test/Post-test/Follow-up)	F=22.641 P<0.001	F=23.508 P<0.001	F=24.584 P<0.001
4	Independent variables x Group	F=11.293 P<0.001	F=4.588 P=0.033	F=0.0889 P=0.766
5	Independent variables x Test	F=0.149 P=0.861	F=0.00157 P=0.998	F=0.0511 P=0.950
6	Group x Test	F=22.641	F=23.508	F=24.584

		P<0.001	P<0.001	P<0.001
7	Independent variables x Group x test	F=0.149 P=0.861	F=0.00157 P=0.998	F=0.0511 P=0.950
N - Total participants = 100 (Control = 25; Experimental = 75) The values of 'F' & 'P' are by three-way ANOVA.				

The Gender X Group X Test interaction was not significant (P = 0.861), indicating that gender had no additional effect and both males and females benefited from the interaction equally. The Age X Group X Test interaction did not show statistical significance (P = 0.998), indicating that age has no additional influence; all age groups benefited equally from the interaction. Similarly, the duration of the illness X Group X Test interaction did not reach statistical significance (P = 0.950), indicating that the illness duration has no additional effect; all participants benefited equally from the interaction.

Cognitive functions Assessment

The mean and SEM of cognitive function measures of executive function, memory, attention, visuospatial skills, language & composite score rating are given in Table 4. The within-the-test comparison of the control group showed no statistical significance between pre-test & follow-up, pre and post-test, and post-test and follow-up (P = 1.0. 1.0 and 1.0 respectively). Whereas the experimental group showed statistical significance between post-test and follow-up, pre-test and follow-up & pre and post-test (P< 0.001, < 0.001 and < 0.001, respectively). This shows that a beneficial effect was observed in the post-test along with the follow-up phase in the experimental group compared to the control group as depicted (Figures 2, 3, 4).

Table 4 Comparison of control and experimental groups on, attention, memory, executive function, language, visuospatial skills (VSS) and composite severity ratings (CSR) by two-way RM ANOVA with Bonferroni t-test

S. No	Groups and comparisons	Tests	Attention	Memory	Executive Function	Language	VSS	CSR
1	Control	Pre-test	122.8±9.9	131.2±6.9	17.5±1.2	18.1±1.2	72.8±4.5	2.5 ± 0.1
	Control	Post-test	122.8±9.9	131.2±6.9	17.7±1.1	18.2±1.2	72.7±4.5	2.5 + 0.1
	Control	Follow-up	122.8±9.9	131.2±6.9	17.5±1.1	18.2±1.2	72.8±4.5	2.5 + 0.1
	Experimental	Pre-test	129.7±5.7	131.0±4.0	17.8±0.6	21.2±0.7	63.3±2.6	2.8±0.07
	Experimental	Post-test	133.6±5.7	135.1±4.0	21.8±0.6	25.9±0.7	64.2±2.6	2.8±0.07
	Experimental	Follow-up	137.9±5.7	139.9±4.0	26.3±0.6	30.7±0.7	65.5±2.6	3.1±0.07
2	Significance between Pre-tests (control & experimental)		t=0.60 P = 0.549	t=0.023 P=0.981	t=0.213 P=0.832	t=2.152 P=0.033	-	t=0.207 P=0.836
	Significance between Post-tests (Control & Experimental)		t = 0.941 P = 0.349	t=0.490 P=0.625	t=3.114 P=0.002	t=5.465 P<0.001	-	t=1.825 P=0.070
	Significance between Follow-ups (Control & Experimental)		t = 1.318 P = 0.191	t=1.088 P=0.279	t=6.734 P<0.001	t=8.929 P<0.001	-	t=4.592 P<0.001
3	Significance within Control (Pre & post-test)		t = 0 P = 1.0	t=0 P=1.0	t=0.773 P=1.0	t=0.044 P=1.0	-	t=0.642 P=1.0
	Significance within Control (Pre-test & Follow-up)		t = 0 P = 1.0	t=0 P=1.0	t=0 P=1.0	t=0 P=1.0	-	t=0 P=1.0
	Significance within Control (Post-test & Follow-up		t = 0 P = 1.0	t=0 P=1.0	t=0.773 P=1.0	t=0.0442 P=1.0	-	t=0.642 P=1.0
4	Significance within Experimental (Pre & post-test)		t = 16.192 P< 0.001	t=19.314 P<0.001	t=22.621 P<0.001	t=9.039 P<0.001	-	t=6.120 P<0.001
	Significance within Experimental (Pre-test & Follow-up)		t = 34.208 P< 0.001	t=41.826 P<0.001	t=47.846 P<0.001	t=18.333 P<0.001	-	t=11.822 P<0.001
	Significance within Experimental (Post-test & Follow-up)		t = 18.016 P< 0.001	t=22.512 P<0.001	t=25.225 P<0.001	t=9.294 P<0.001	-	t=5.702 P<0.001
n – Control = 25; Experimental = 75.								

Figure 2 represents the mean performance total scores obtained for cognitive functions: Attention and memory at pre/post-test and follow-up between the experimental & control group. Figure 3 represents the mean performance total scores gained at cognitive functions: Executive function and language at pre, post-test and follow-up between the experimental and control group. Figure 4 represents the mean performance total scores obtained for cognitive functions: Visuospatial skills and composite rating score at pre/post-test and follow-up between experimental group & control.

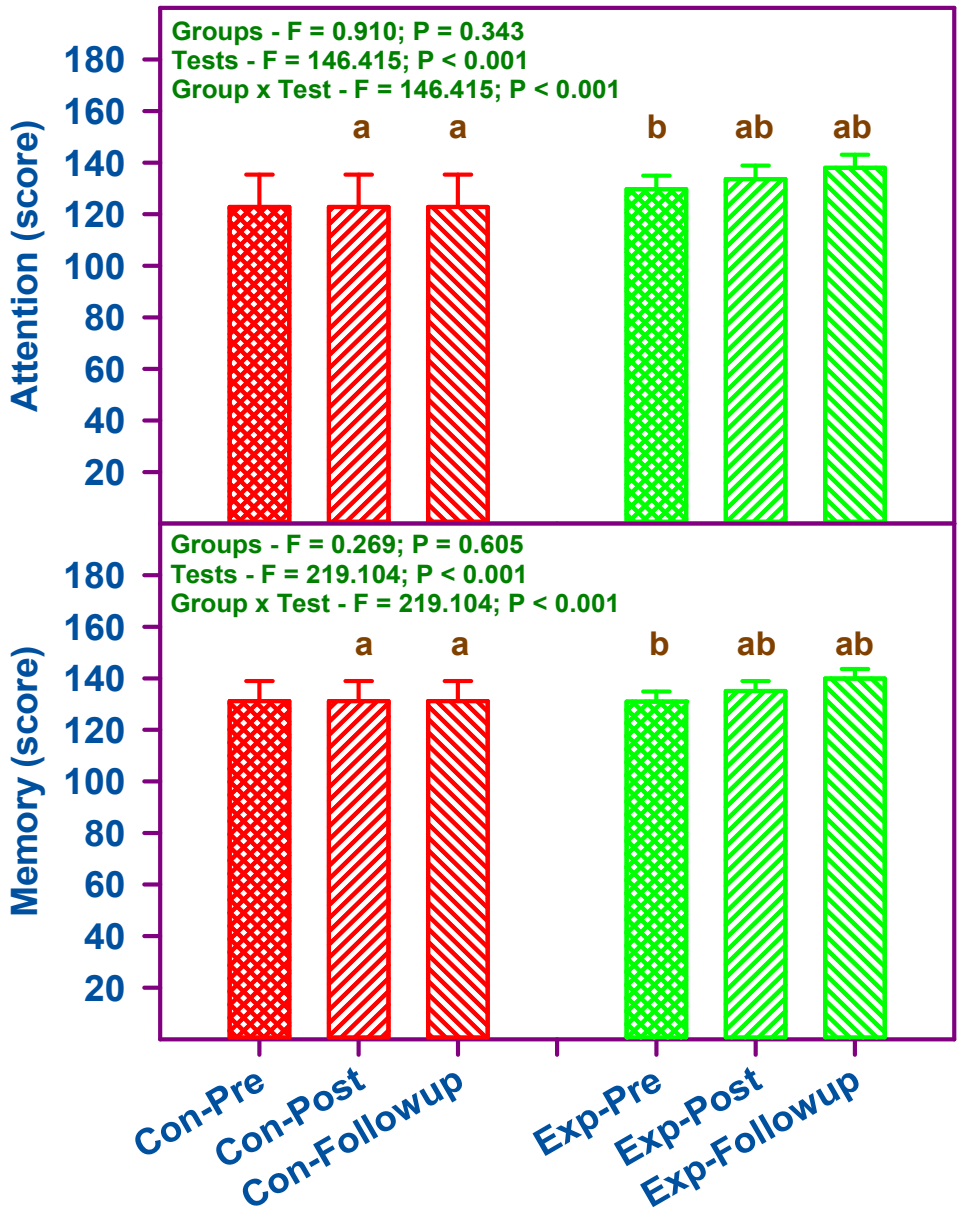

Figure 2 Comparison of control and experimental groups on scores of cognitive functions: Attention and memory
Values are mean + SE (n – control = 25; experimental = 75).

The 'F' and 'P' values are by two-way RM ANOVA with Bonferroni t-test for groups (control & experimental), tests (pre-test, post-test and follow-up) and the group x test interaction

[a]Significantly different from the respective pre-test (within a group)

[b]Significantly different from the respective control (between groups)

Table 4 and Figures 2, 3 and 4 demonstrate a significant effect on cognitive functions: Attention, memory, executive function, language and composite score rating, except for visuospatial skills, which showed no improvement in the post-test along with the follow-up phase of the treatment program in both control and experimental group.

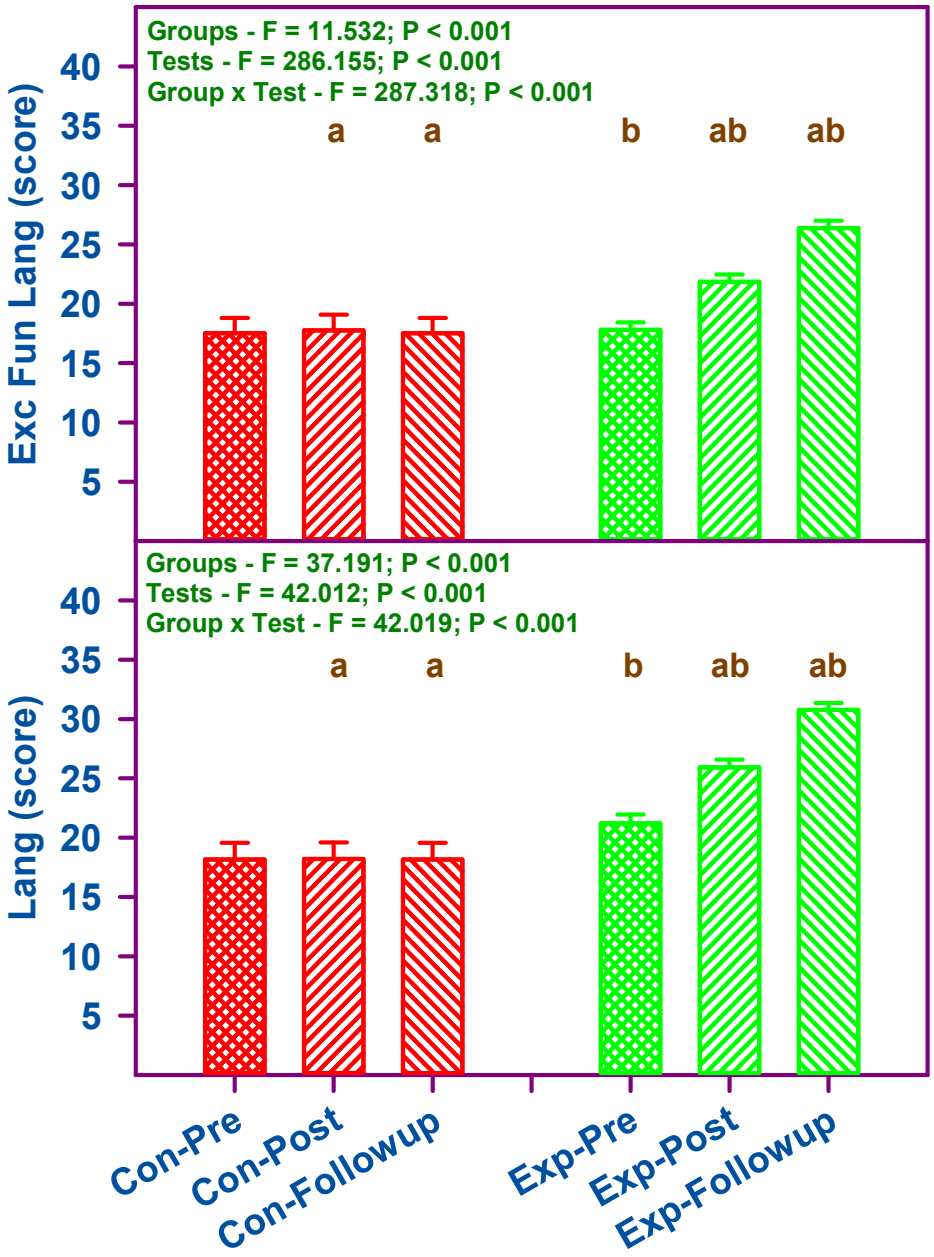

Figure 3 Comparison of experimental & control groups on scores of cognitive functions: Executive function and language
Values are mean + SE (n – Control = 25; Experimental = 75)

The 'F' and 'P' values are by two-way RM ANOVA with Bonferroni t-test for groups (control & experimental), tests (pre-test, post-test and follow-up) and the group x test interaction

[a]Significantly different from the respective pre-test (within a group)

[b]Significantly different from the respective control (between groups)

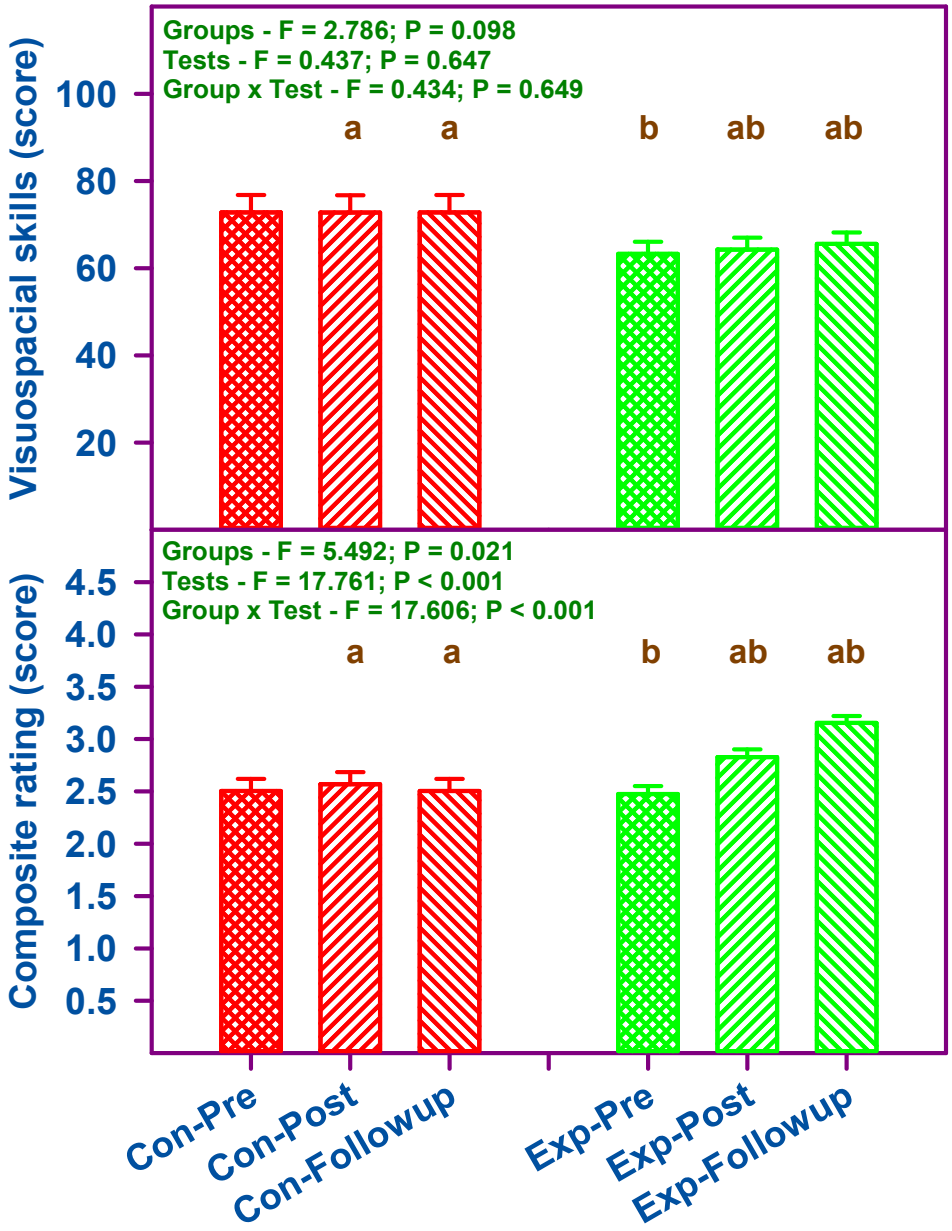

Figure 4 Comparison of control and experimental groups on scores of cognitive functions: Visuospatial skills and the composite rating score values are mean + SE (n – Control = 25; Experimental = 75)

The 'F' and 'P' values are by two-way RM ANOVA with Bonferroni t-test for groups (control & experimental), tests (pre-test, post-test and follow-up) and the group x test interaction

[a]Significantly different from the respective pre-test (within a group)

[b]Significantly different from the respective control (between groups)

4. DISCUSSION

The study evaluated CPT a new intervention program specifically designed for improving pragmatic language abilities in individuals with schizophrenia. The pragmatic protocol determined the intervention program's efficacy. The CPT intervention was well-received by participants, who attended regularly and also easily adopted the structure and content. This implies, despite social communication challenges, they preferred CPT's group activities. CPT uses an interactive paradigm. The use of interactive paradigms facilitates the development of clinical applications for assessing and enhancing social skills in schizophrenia (Billeke and Aboitiz, 2013). Adults with schizophrenia benefit from group therapy that addresses cognitive health and functional rehabilitation (Mendelson et al., 2021). Group treatments like cognitive remediation & social skills training showed improvement & changes in signs of schizophrenia and general functioning (Burlingame et al., 2020). In contrast to the control group, the experimental group

exhibited a beneficial effect in the post-test and follow-up phase in communicative pragmatic language skills and cognitive functions. The participant's ability to integrate different communication modalities (linguistic, extra linguistic and paralinguistic) holistically for effective social communication improved. These results are consistent with prior studies conducted with individuals with schizophrenia (Bosco et al., 2016; Gabbatore et al., 2017) adults with traumatic brain injury (Sacco et al., 2016; Bosco et al., 2018; Parola et al., 2019) and adolescents with an autism spectrum disorder (Gabbatore et al., 2022). The present study showed that the participant's performance in the follow-up phase was much greater than that during the post-test period, demonstrating the program's continued effectiveness. Initially, it was observed that the linguistic aspect of communication was better, however, during the follow-up phase; participants demonstrated improved paralinguistic abilities through the use of fluent and appropriate tone of voice, intelligibility as well as extra linguistic competence in maintaining eye contact, facial expression and body language. Cognitive abilities, such as executive processes and pragmatics, are intricately intertwined in both atypical & typical development (Hyter, 2017). The present study showed a statistically significant improvement in the post-test as well as in the follow-up phase of intervention compared to pre-test scores on cognitive functions, namely attention, memory, executive function and language, except for visuospatial skills which may be attributed to the fact that activities focusing on these skills are not emphasized in the intervention program. Prior studies found compensatory cognitive training as feasible and can produce significant cognitive and social cognition gains in individuals with first-episode schizophrenia (Mendella et al., 2015). The improvement also supports the hypothesis that cognitively stimulating social interaction improves cognitive functioning by enhancing resistance to mental disorders like dementia and by slowing the rate of cognitive decline (Hsu, 2007). Even though cognitive function evaluations are not the primary purpose of CPT, this may be considered as an additional benefit of the treatment. To improve functional outcomes, prior research suggests combining cognitive remediation with other rehabilitation therapies (Bell et al., 2008). CPT combines cognitive and communicative approaches. Antipsychotic medicines have a limited influence on cognitive processes like attention, reasoning, working memory & problem-solving in schizophrenia (Marder, 2006). There is a growing suggestion that long-term and higher-dose antipsychotic medication have negative consequences on cognition (Husa et al., 2014; Knowles et al., 2010), brain structure (Andreasen et al., 2013; Fusar-Poli et al., 2013; Veijola et al., 2014) and brain functioning (Abbott et al., 2013). High dosages of antipsychotics alter the natural progression of schizophrenia in midlife, by inhibiting or delaying cognitive recovery (Husa et al., 2017). Hence, CPT, a non-pharmacological treatment that focuses on pragmatic communication skills, enables people to connect more effectively. In addition, as evidenced by the results, gender, age and illness duration do not have an impact on the intervention's effectiveness. Therefore, it is predicted that individuals between the ages of 18 and 65, both male and female, with duration of illness between 1 and 30 years will benefit from the CPT intervention.

Limitation

This study was confined to a 3-month follow-up period following CPT completion. The efficiency of CPT should be evaluated over a longer period following the completion of the treatment course. Future research should involve neuroimaging techniques to detect neurobiological effects and treatment biomarkers, enabling individualized, evidence-based intervention. Future research should also evaluate CPT's potential to improve communicative pragmatic language abilities in adolescents and adults with pragmatic language impairment such as right hemisphere damage and aphasia.

5. CONCLUSIONS

CPT program address all components of the communicative-pragmatic language competence of individuals with schizophrenia. This study's findings demonstrate that the CPT program is useful in enhancing and sustaining communicative pragmatic language skills. This study emphasizes that CPT can be used in schizophrenia rehabilitation, by Psychologists and Speech-language pathologists.

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Author Contributions

Mrs Anusuya Muthu contributed to the conception, design of the study, review of literature and manuscript writing. Dr Shanthi Nambi contributed to the interpretation and critical review of the draft. Dr Raman Krishnan contributed to the review of the

literature and review of the draft for intellectual content and Dr Rajagopalan Vijayaraghavan contributed to data analysis, statistics and critical review of the article and approved the version to be published.

Ethical approval

The study was approved by the Saveetha Medical College and Hospital Institutional Ethics Committee (SMCH-IEC) (Ethical approval code: 004/08/2021/IEC/SMCH).

Informed consent

Written & oral informed consent was obtained from all individual participants and their caretakers included in the study.

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This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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