Development & Implications of Culturally Based Digital Cognitive Remedial Therapy (CRT) for Developing Communication Skills for Children with Mild Intellectual Disability (ID) in Pakistan

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ABSTRACT

The aim of the current study was to Develop and implement Culturally Based Digital Cognitive Remedial Therapy (CRT) for developing communication skills among children with Mild ID, Pakistan. Communication skills are associated with the children's cognitive, emotional, social and development perspectives. While Children with mild ID often acquire basic language and self-care skills, they frequently exhibit deficits in expressive and receptive communication, pragmatic language use. In the present study Mixed Method Research Design has been used with integration of need analysis conducted through survey and Single Subject Experimental Design (SSED) to assess the effectiveness of Cognitive Remedial Therapy, techniques in culturally adapted digital way to enhance communication skills among children with Mild Intellectual Disability. Furthermore, the need analysis through survey method provided individual or population based insight about stakeholders perspective and other contextual factors that should be integrated in the therapy, while the SEED provided in depth analysis of the effectiveness of the therapy at the individual level. The sample of N=20 children were recruited in the study. Demographic information and Language Assessment form and ABA has been completed before implementing the intervention. Pre and Post analysis has been conducted to check the effectiveness of the intervention among children aged 6 to 13 years with Mild intellectual disability, Pakistan. The intervention has been implemented while using the HeadAPP Neurvitals application consisted on 30-40 sessions, with 3 sessions every week per children. The language domain revealed the most robust gains. "Word it," "Structure it," and "Sequence it" all achieved large trends s (SD= 12.98, SD=11.41, and SD=5.39, respectively), with dramatic increases from baseline to post intervention ("Sequence it" improved from M = 47.10 to M = 94.90). Moreover, "Reason it" and "Vita lang" also displayed significant improvement with moderate trends. These outcomes emphasize the intervention's strong impact on linguistic processing, expressive communication, and logical reasoning skills.

Keywords: Mild Intellectual Disability, Developmental Delays, Communication Skills, Cognitive remedial Therapy, Language Barriers, Receptive Vocabulary

INTRODUCTION

Communication skills are associated with the children's cognitive, emotional, social and development perspectives enhance or imitate the social interaction, effective interaction and expression of needs for their daily livings or to become the part of the society (Qiang, 2023). Communication skills require complex process of cognitive which involves children's attention, focus, memory and executive functioning

(Elmquist et al., 2025). According to the recent researches and surveys indicated that approximately 8 to 11% children has been identified or diagnosed with any language disorder that affects communication skills across the world (Al-Qahtani, 2025). Furthermore, the children with neurodevelopment disorders including intellectual disability also affected from communication skills, which involves receptive or expressive language skills to interact on day to day tasks (National Institute of Health (NIH, 2025).

A systematic review indicates that the prevalence of communication disabilities in Low and Middle Income Countries (LMICs) is common but these problems are usually under reported or comes under the associated symptom of other neurodevelopment disorder (Hill, 2024). According to an estimated study, more than 12.4% of children in LMICs have neurodevelopment disorders and approximately 27% of the children having developmental delays both include intellectual disability, and strongly associated with the impairment of communication among children (Marshall et al., 2025). A recent study conducted in Pakistan (2025) in one region of Punjab, indicated 82% prevalence of speech and language disorder *(Communication Problem)* among children visited to developmental pediatrician (Aftab et al., 2025). Furthermore, another study indicated that complex communication disorders are associated with some common disorders e.g. Cerebral Palsy, Intellectual Disability, Stammering, Autism Spectrum Disorder and Global Developmental Delays (Khatoon, M., Mumtaz, N., & Saqulain, 2024).

Intellectual Disability (ID) is a neurodevelopment disorder associated with early developmental period with significant limitations in adaptive and functioning level of the children (Karmiloff-Smith, A., D'Souza, H., and Thomas, 2021). According to the World Health Organization (WHO), intellectual disability refers to the significant impairment in problem solving, reasoning, planning, abstract thinking, judgment, practical skills, adaptive functioning and in performing everyday tasks (WHO, 2023). Intellectual disability (ID), is a major public concern approximated 3-4% of the children is affected across the world, with high prevalence in Low and Middle Income Countries (LMICs) due to different environmental factors and inability of certain facilities (Olusanya et al., 2023: Maulik et al., 2022). ID is sub categorized according to the severity of the symptoms such as Profound, Severe, Moderate and Mild (WHO, 2019). Mild ID is the most prevalent subtype associated with the most of the cases approximated 70-85% prevalence rate among children (Schalock, R. L., and Luckasson, 2022).

Researches indicated that Mild ID children typically demonstrate intellectual functioning at the lower end of the normal range and experience noticeable challenges in adaptive functioning, particularly in communication, and social interaction (Schalock, R. L., Luckasson, R., & Tasse, 2021). While individuals with mild ID often acquire basic language and self-care skills, they frequently exhibit deficits in expressive and receptive communication, pragmatic language use, attention regulation, and executive functioning, which may significantly interfere with social integration (Tasse et al., 2022: Bertelli et al., 2023).

Cognitive Remedial Therapy (CRT) is a rehabilitation approach specifically designed to improve cognitive process comprising of attention, working memory, processing speed and executive functioning that are essential for effective communication (Sigafoos et al., 2023). Through improvement of these cognitive areas associated areas such as language comprehension, verbal expression, and pragmatic interaction also improved. Different studies indicated that the inattentiveness and executive functioning improves the communication skills of children with Mild Intellectual Disability (ID) (Kirk et al., 2015). A systematic review indicated that CRT techniques significantly improve the cognitive domains which lead to measurable improvements in the underlying or associated symptoms such as language production, strengthening functional communication (Aro et al., 2012).

Recent research highlights those CRT interventions targeting these underlying cognitive domains lead to measurable improvements in functional communication (Cella et al., 2022; Thomas et al., 2023;

Mowszowski et al., 2021). Thus, the aim of the current study is to explore the effectiveness of Cognitive Remedial Therapy (CRT) techniques for improving communication skills among children with mild Intellectual Disability (ID) Pakistan.

Significance of Study

Despite growing efforts to improve communication skills among children with intellectual disabilities in Pakistan, existing research remains limited in several key areas. Most studies have focused on general skill enhancement through video modeling, social stories, or behavior modification programs, but very few have systematically addressed the cognitive underpinnings of communication difficulties in children with mild intellectual disability (MID). Therefore, there is a pressing need for research that not only develops structured CRT based communication intervention protocols but also evaluates their long term effectiveness in naturalistic, culturally relevant contexts.

RESEARCH METHODOLOGY

The present study employed the current research design;

Research Design

In the present study quantitative Method Research Design has been used with integration of need analysis conducted through survey and Single Subject Experimental Design (SSED) to evaluate the effectiveness of Cognitive Remedial Therapy, techniques in culturally adapted digital way to enhance communication skills among children with Mild Intellectual Disability. Furthermore, the need analysis through survey method provided individual or population based insight about stakeholders perspective and other contextual factors that should be integrated in the therapy, while the SEED provided in depth analysis of the effectiveness of the therapy at the individual level. The study has been conducted in three different phases.

Participants

The study was conducted by recruiting two groups of participants these were;

1. Teachers, Parents and Psychologist working in special education school or having children specifically with Mild Intellectual Disability (ID) were included in the surveys for doing need analysis of the current study. Total N=20 participants were invited for need analysis.

2. The Children aged 6 to 13 years with Mild Intellectual Disability recruited in the single subject experimental phase. Total N=20 children who met the criteria of the study were included in the current study.

The data of the participants were collected through Purposive sampling technique. The children with Mild ID were recruited from the Special Education Schools from, Pakistan and for Surveys participants were invited as per their feasibility to share their perspectives on communication difficulties and culturally appropriate intervention requirements as per their experiences. Furthermore, Inclusion and exclusion criteria have been followed as per the study requirements.

Inclusion Criteria for Need Analysis Survey

- Teachers who have minimum 3 years experience working with Children Mild ID associated with Communication disorders were approached to take part in the study.

- Parents having children from 6 to 13 years and also having Mild ID with associated communication problem were recruited for the study.

- Psychologist who has at least 3 years experience as a child/ school psychologist (expert in *IQ assessment and Therapy experience*) were invited for need analysis survey.

Inclusion Criteria for SEED Children

- Children having Mild Intellectual Disability (IQ 50-70) was included in the study.

- Aged 6 to 13 years were included in the study.

- Children with prominent attention difficulties (specifically sustaining attention) *(confirmed from psychologist & parents)* were included in the study.

- Children living in the catchment area of the Lahore were included in the study.

- Those whose parents are willing to give consent to participate in the study.

Exclusion Criteria for SEED Children

- Children having Mild, Severe or Moderate Intellectual Disability were not considered in the study.

- Children with physical illness or having co-existing neurological disorders were disqualified from the participation.

- Children diagnosed with significant sensory deficiencies (vision or hearing) excluded.

- Children having on any medications specifically to improve attention span were excluded from the study.

Instruments

The following instruments has been used in the current study

- **Demographic Information**

The demographic form has been developed to obtain the information from the children's family. The items included age, gender and grade of the children with Mild ID. The form also includes information about family structure, family history and number of siblings. Furthermore, detailed developmental history has been explored such as first cry of the child, developmental milestones (crawling, babbling and physical). Psychological and medical history has been also explored with detailed treatment sessions plan such as (Physical, OT and speech sessions) has been explored.

- **Language Assessment Tool**

For the screening purpose of communication skills in children with mild intellectual disability, Language Assessment was administered to evaluate both receptive and expressive language development in children.

- **ABC Checklist**

The ABC Checklist was used to observe the   exhibiting challenging behaviors of these children in a computer lab of school environment during applying digital therapy. The concerning behaviors consistently encompass refusal of tasks or directions, verbal aggression, crying or yelling, and physical actions such as hitting or throwing objects. The antecedent events that transpired immediately prior to the behaviors were frequently associated with the initiation of academic activities, teacher directives, and the denial of preferred activities.

Phases of the Study

The different phases of the study were as follows;

- **Phase I: Needs Analysis Conducted through Surveys**

The survey method served as the initial phase aimed to examine the perspectives of teachers, school psychologists, and parents of children with mild intellectual disability regarding communication difficulties, the use of digital therapy techniques, and perceived barriers to implementation in educational settings. This needs analysis was essential for informing the development of culturally relevant and contextually appropriate intervention strategies.

The survey instrument consisted of close-ended items structured on a Likert-scale format (Boone & Boone, 2012), enabling systematic and quantifiable data collection suitable for statistical analysis (Creswell, 2014). This approach allowed the researchers to examine patterns related to the utilization of digital therapy, perceived effectiveness, implementation barriers, and associations with teacher demographics and institutional characteristics. The findings from the survey directly informed the design and cultural adaptation of the digital CRT intervention.

- **Phase II: Intervention Development and Validation**

Based on the survey findings and semi-structured inputs from teachers and psychologists, a culturally adapted digital cognitive remedial therapy intervention was developed, targeting cognitive domains associated with communication skills, including attention, working memory, and executive functioning. The intervention techniques were reviewed by experienced school psychologists and special education teachers to evaluate cultural relevance, feasibility, and clinical appropriateness.

Following expert review, the intervention underwent three iterative revisions, ensuring clarity, contextual suitability, and alignment with the communication needs of children with mild intellectual disability. The finalized intervention was delivered through a digital application to ensure standardized presentation and consistent implementation.

- **Phase III: Single-Subject Experimental Design (SSED)**

A single-subject experimental design was employed to evaluate the effectiveness of the developed digital CRT intervention. The design followed a baseline–intervention–post-intervention (A–B–A) structure, allowing for systematic within-participant comparisons across phases.

- **Baseline Phase (A):** Communication skills were assessed prior to intervention using structured assessment procedures embedded within the application to establish initial performance levels.

- **Intervention Phase (B):** The participant received the culturally adapted CRT intervention via the digital application over scheduled sessions.

- **Post-Intervention Phase (A):** The same assessment measures were re-administered to evaluate changes in communication skills following the intervention.

Cognitive Remedial Therapy (CRT)

Cognitive Remedial Therapy (CRT) has been delivered using the digital Platform HeadAPP Neurvitals (2021). This is digital software designed for the neuropsychology assessment of the neurodevelopment disorders (e.g. Autism, ADHD) and core communication domains (e.g. receptive vocabulary). In the current study this digital application has been used to deliver the Cognitive Remedial Therapy. The therapy has been delivered on the laptop to the children after providing them proper trial of the instrument. Total 40 sessions has been delivered by using the digital platform and all the activities including the HeadAPP based to sustain the attention. The duration of the session varies from 35 to 45 minutes as per the length of the activities. Sessions has been delivered thrice in a week as per the feasibility of the children. Furthermore, sessions has been delivered in a calm room with minimum distraction. Pre and Post Analysis has been conducted of the children with Mild ID after taking the detailed Demographic information.

Procedural Fidelity and Intervention Integrity

To ensure procedural fidelity and intervention integrity, a structured checklist detailing all intervention steps was developed for each session. The researchers implemented the intervention manually in strict accordance with this checklist. At least 20% of intervention sessions were independently observed and scored by a second trained observer (school psychologist).

Procedural fidelity was calculated as the percentage of correctly implemented intervention steps, while inter-observer reliability was determined based on the level of agreement between observers. A minimum criterion of ≥85% adherence was established for both fidelity and reliability. This process ensured consistent intervention delivery and strengthened the internal validity of the study by confirming that observed changes in communication skills could be reliably attributed to the intervention.

DATA ANALYSIS

Survey data were analyzed using descriptive and inferential statistical techniques to examine trends related to digital therapy usage, perceived effectiveness, and implementation barriers. Single-subject data were analyzed using visual analysis, focusing on changes in level, trend, and variability across baseline, intervention, and post-intervention phases, consistent with standard SSED analytical practices.

Ethical Considerations

Ethical approval was obtained prior to the commencement of the study. Informed consent was secured from teachers, psychologists, and parents, as well as from guardians of participating children. Confidentiality and anonymity were maintained throughout the research process, and all procedures adhered to ethical guidelines for research involving children and individuals with intellectual disability.

RESULTS

Overall, the intervention demonstrated significant and meaningful improvements across all major cognitive and functional domains. The most notable gains were observed in language structure, memory association, and visual functional matching tasks, reflecting the program's strong potential for enhancing both cognitive and practical abilities. The language domain revealed the most robust gains. "Word it," "Structure it," and "Sequence it" all achieved large trends s (SD= 12.98,SD=11.41, and SD=5.39, respectively), with dramatic increases from baseline to post intervention ("Sequence it" improved from M = 47.10 to M = 94.90). Moreover, "Reason it" and "Vita lang" also displayed significant improvement with moderate trends .These outcomes emphasize the intervention's strong impact on linguistic processing, expressive communication, and logical reasoning skills.These outcomes emphasize the intervention's strong impact on linguistic processing, expressive communication, and logical reasoning skills.

Table 1

Descriptive statistics of Demographic information of the sample (N=20)

Variables	Mean	SD
Child age (years)	10.48	1.76
Order of sibling	2.00	1.00
Mental age of child (months)	78.80	30.58
Child speech age (months)	67.80	21.31
Birth weight (lb)	5.01	0.63

		Frequency	Percentage
Gender			
	Male	11	55.0%
	Female	09	45.0%
Disability			
	Yes	00	0%
	No	20	100.0%
Other sibling with disability			
	Yes	06	30.0%
	No	14	70.0%
Area of residence			
	Farooq Gunj	07	35.0%
	Habib Gunj	05	25.0%
	Industrial	02	10.0%
	Misri Shah	03	15.0%
	Shalamar Bagh	03	15.0%
History of changing school of child			

	Yes	13	65.0%
	No	07	35.0%
Inherited			
	Yes	06	30.0%
	No	14	70.0%
Availability of speech therapist in school			
	Yes	01	5.0%
	No	19	95.0%
Lack of accessibility of school service			
	Yes	15	75.0%
	No	05	25.0%
Does the child receive any specialized service in school			
	Yes	09	45.0%
	No	11	55.0%

Table showed descriptive analysis demographic information of children with mild intellectual disability. The research involved 20 children with an average chronological age of 10.48 years (SD = 1.76). The typical birth order was around the second child in the family (M = 2.00, SD = 1.00). The mean mental age of the children was 78.80 months (SD = 30.58), and the average speech age was 67.80 months (SD = 21.31). In terms of physical growth, the average birth weight was 5.01 lb (SD = 0.63). Regarding gender distribution, 55% of the participants were male (n = 11) and 45% were female (n = 9). None of the children were reported to have a disability themselves; however, 30% (n = 6) indicated having a sibling with a disability, while 70% (n = 14) did not.

Table 2

Descriptive analysis of Diagnosis of intellectual disability of child (N=20)

Variables		Frequency	Percentage
Medical comorbid			
	Anxiety	02	10.0%
	Memory issue	02	10.0%
	Language issue	06	30.0%
	High fever	02	10.0%
	No	08	40.0%
IQ assessment			
	Mild	20	100.0%
IQ score checked by			
	Hospital psychologist	02	10.0%
	School psychologist	18	90.0%
Confirmation			
	Yes, communication problem	20	100.0%
Child mental age in months			
	40	01	5.0%
	42	01	5.0%
	45	01	5.0%
	48	01	5.0%

50	01	5.0%
55	01	5.0%
60	01	5.0%
72	02	10.0%
84	05	25.0%
96	04	20.0%
120	01	5.0%
168	01	5.0%
Age in months when noticed child had speech or language difficulties		
36	02	10.0%
44	01	5.0%
48	03	15.0%
56	01	5.0%
58	01	5.0%
60	01	5.0%
72	05	25.0%
84	02	10.0%
92	01	5.0%
96	02	10.0%
110	01	5.0%

Table summarizes the diagnostic characteristics of the children included in the study. With regard to medical co morbidities, 30% (n = 6) of children presented with language related difficulties, while smaller proportions were reported to have anxiety (10%, n = 2), memory impairments (10%, n = 2), or a history of high fever (10%, n = 2). Notably, 40% (n = 8) of the children had no identifiable medical co morbidities.

In terms of intellectual assessment, more than half of the children (55%, n = 11) had not undergone a formal IQ evaluation. Among those who had been assessed, 45% (n = 9) were classified as having mild intellectual disability. The majority of IQ assessments (90%, n = 18) were conducted by school psychologists, while only 10% (n = 2) were carried out by hospital psychologists. Importantly, all participants (100%, n = 20) were confirmed to have a communication related concern.

The distribution of mental age was heterogeneous, ranging from 40 months (5%, n = 1) to 168 months (5%, n = 1). The most commonly reported developmental levels were 84 months (25%, n = 5) and 96 months (20%, n = 4), followed by 72 months (10%, n = 2). Other mental age points including 42, 45, 48, 50, 55, 60, and 120 months were each reported for one child (5%).

The age at which speech or language difficulties were first identified also demonstrated considerable variation. The highest proportion of children were identified at 72 months (25%, n = 5), followed by 48 months (15%, n = 3). Additional reported ages included 36 months (10%, n = 2), 44 months (5%, n = 1), 56 months (5%, n = 1), 58 months (5%, n = 1), 60 months (5%, n = 1), 84 months (10%, n = 2), 92 months (5%, n = 1), 96 months (10%, n = 2), and 110 months (5%, n = 1).

Table 3

Descriptive analysis of Language assessment of child (N=20)

Variables		Pre	Post
Receptive: vocalizations			
	Yes	17 (85.0%)	20 (100.0%)
	No	3 (15.0%)	0 (0.0%)
Expressive: response to random familiar voice			
	Yes	18 (90.0%)	20 (100.0%)
	No	2 (10.0%)	0 (0.0%)
Receptive: the child gives direct attention to others voice			
	Yes	20 (100.0%)	20 (100.0%)
	No	0 (0.0%)	0 (0.0%)
Expressive: differentiated crying.			
	Yes	15 (75.0%)	20 (100.0%)
	No	5 (25.0%)	0 (0.0%)
Receptive: localizes the speakers			
	Yes	18 (90.0%)	20 (100.0%)
	No	2 (10.0%)	0 (0.0%)
Expressive: Laughs and uses other vocal expressions of pleasure			
	Yes	16 (80.0%)	20 (100.0%)
	No	4 (20.0%)	0 (0.0%)
Receptive: Usually is frightened by angry voices.			
	Yes	17 (85.0%)	20 (100.0%)
	No	3 (15.0%)	0 (0.0%)
Expressive: Babbles regularly or repeats series of some sounds,			
	Yes	19 (95.0%)	20 (100.0%)
	No	1 (5.0%)	0 (0.0%)
Receptive: Responds to his/her own name			
	Yes	18 (90.0%)	20 (100.0%)
	No	2 (10.0%)	0 (0.0%)
Expressive: Expresses anger or displeasure by vocal patterns			
	Yes	18 (90.0%)	20 (100.0%)
	No	2 (10.0%)	0 (0.0%)
Receptive: Stops or withdraws in response to 'no' at least half the number of times			

	Yes	19 (95.0%)	20 (100.0%)
	No	1 (5.0%)	0 (0.0%)
Expressive: Plays and makes pleasurable sounds and noises			
	Yes	18 (90.0%)	20 (100.0%)
	No	2 (10.0%)	0 (0.0%)
Receptive: Responds with appropriate gestures			
	Yes	18 (90.0%)	20 (100.0%)
	No	2 (10.0%)	0 (0.0%)
Expressive: Uses voice sounds to get attention of others			
	Yes	17 (85.0%)	20 (100.0%)
	No	3 (15.0%)	0 (0.0%)
Receptive: recognize the names of some common objects			
	Yes	20 (100.0%)	20 (100.0%)
	No	0 (0.0%)	0 (0.0%)
Expressive: speech like vocalization			
	Yes	15 (75.0%)	19 (95.0%)
	No	5 (25.0%)	1 (5.0%)
Receptive: understand simple verbal requests with gestures.			
	Yes	12 (60.0%)	17 (85.0%)
	No	8 (40.0%)	3 (15.0%)
Expressive: Plays games like patacake or peek aboo with others.			
	Yes	14 (70.0%)	18 (90.0%)
	No	6 (30.0%)	2 (10.0%)
Receptive: Sustains interest in looking at toys or objects			
	Yes	15 (75.0%)	19 (95.0%)
	No	5 (25.0%)	1 (5.0%)
Expressive: Uses some gestures such as shaking head for no			
	Yes	17 (85.0%)	19 (95.0%)
	No	3 (15.0%)	1 (5.0%)
Receptive: Often gives toys or other objects to the parent on verbal request			
	Yes	14 (70.0%)	19 (95.0%)
	No	6 (30.0%)	1 (5.0%)
Expressive: Vocalizations contain more consonants			
	Yes	10 (50.0%)	16 (80.0%)
	No	10 (50.0%)	4 (20.0%)
Receptive: follow simple command like put that down			
	Yes	12 (60.0%)	17 (85.0%)
	No	8 (40.0%)	3 (15.0%)
Expressive: appropriate intonation pattern as if asking questions,			
	Yes	08 (40.0%)	13 (65.0%)
	No	12 (60.0%)	7 (35.0%)
Receptive: Comprehends questions such as How does a car go			

	Yes	10 (50.0%)	13 (65.0%)
	No	10 (50.0%)	7 (35.0%)
Expressive: Speaks first words like dada, mama or name of a pet or a toy			
	Yes	18 (90.0%)	19 (95.0%)
	No	2 (10.0%)	1 (5.0%)
Receptive: understanding by making appropriate verbal responses			
	Yes	15 (75.0%)	17 (85.0%)
	No	5 (25.0%)	3 (15.0%)
Expressive: express the existence of other persons by pointing			
	Yes	11 (55.0%)	14 (70.0%)
	No	9 (45.0%)	6 (30.0%)
Receptive: understand that the speaker is angry, tired, happy, sad			
	Yes	12 (60.0%)	16 (80.0%)
	No	8 (40.0%)	4 (20.0%)
Expressive: Uses more than 3 words			
	Yes	13 (65.0%)	16 (80.0%)
	No	7 (35.0%)	4 (20.0%)
Receptive: Comprehends names of principal body parts			
	Yes	17 (85.0%)	18 (90.0%)
	No	3 (15.0%)	2 (10.0%)
Expressive: Asks for desired objects by using vocalizations			
	Yes	16 (80.0%)	18 (90.0%)
	No	4 (20.0%)	2 (10.0%)
Receptive: simple commands that call for action or			
	Yes	12 (60.0%)	15 (75.0%)
	No	8 (40.0%)	5 (25.0%)
Expressive: Starts naming objects, eatables and animals in baby talk forms.			
	Yes	13 (65.0%)	18 (90.0%)
	No	7 (35.0%)	2 (10.0%)
Receptive: Recognizes and identifies many objects or pictures			
	Yes	05 (25.0%)	8 (40.0%)
	No	15 (75.0%)	12 (60.0%)
Expressive: Starts using two word utterances expressed limited semantic relations.			
	Yes	10 (50.0%)	13 (65.0%)
	No	10 (50.0%)	7 (35.0%)
Receptive: Comprehends question forms by pointing to self/others.			
	Yes	8 (40.0%)	10 (50.0%)
	No	12 (60.0%)	10 (50.0%)
Expressive: Expresses disappearance by using words such as gone			
	Yes	10 (50.0%)	13 (65.0%)
	No	10 (50.0%)	7 (35.0%)
Receptive: consecutive directions with objects upon requests			
	Yes	5 (25.0%)	8 (40.0%)
	No	15 (75.0%)	12 (60.0%)
Expressive: Names more family members and five body			
	Yes	10 (50.0%)	16 (80.0%)

	No	10 (50.0%)	4 (20.0%)
Receptive: Comprehends questions querying actions of agents and responds by naming the action.			
	Yes	7 (35.0%)	10 (50.0%)
	No	13 (65.0%)	10 (50.0%)
Expressive: Uses simple imperatives such as more, throw for action on the part of adults			
	Yes	6 (30.0%)	9 (45.0%)
	No	14 (70.0%)	11 (55.0%)
Receptive: D understanding of distinctions in personal pronouns in commands such as give it to her			
	Yes	10 (50.0%)	12 (60.0%)
	No	10 (50.0%)	8 (40.0%)
Expressive: environmental sounds such as of motors			
	Yes	11 (55.0%)	15 (75.0%)
	No	9 (45.0%)	5 (25.0%)
Receptive: indirect questions that are commands or suggestions			
	Yes	5 (25.0%)	7 (35.0%)
	No	15 (75.0%)	13 (65.0%)
Expressive: Uses same words/phrases to different things/activities.			
	Yes	4 (20.0%)	7 (35.0%)
	No	16 (80.0%)	13 (65.0%)
Receptive: Comprehends which questions and responds appropriately.			
	Yes	1 (5.0%)	4 (20.0%)
	No	19 (95.0%)	16 (80.0%)
Expressive: Child starts using what/ who questions to elicit naming			
	Yes	0 (0.0%)	3 (15.0%)
	No	20 (100.0%)	17 (85.0%)
Receptive: Understands complex sentences.			
	Yes	0 (0.0%)	1 (5.0%)
	No	20 (100.0%)	19 (95.0%)
Expressive: Refers to selfusing his/her own name			
	Yes	15 (75.0%)	18 (90.0%)
	No	5 (25.0%)	2 (10.0%)
Receptive: Understands more number of finer body parts,			
	Yes	17 (85.0%)	18 (90.0%)
	No	3 (15.0%)	2 (10.0%)
Expressive: Expresses denial			
	Yes	2 (10.0%)	6 (30.0%)
	No	18 (90.0%)	14 (70.0%)
Receptive: Comprehends why questions by giving reasons.			
	Yes	2 (10.0%)	5 (25.0%)
	No	18 (90.0%)	15 (75.0%)
Expressive: Asks help for personal needs			
	Yes	4 (20.0%)	7 (35.0%)

	No	16 (80.0%)	13 (65.0%)
Receptive: Understands size differences			
	Yes	5 (25.0%)	5 (25.0%)
	No	15 (75.0%)	15 (75.0%)
Expressive: Expresses concepts such as quantity another			
	Yes	3 (15.0%)	5 (25.0%)
	No	17 (85.0%)	15 (75.0%)
Receptive: Demonstrates understanding of common adjectives.			
	Yes	0 (0.0%)	3 (15.0%)
	No	20 (100.0%)	17 (85.0%)
Expressive: Refers to self by using by (his/her) proper name			
	Yes	12 (60.0%)	16 (80.0%)
	No	8 (40.0%)	4 (20.0%)
Receptive: Can comprehend post position words in instructions			
	Yes	2 (10.0%)	4 (20.0%)
	No	18 (90.0%)	16 (80.0%)
Expressive: Can tell correct gender when asked are you a boy or a girl			
	Yes	12 (60.0%)	16 (80.0%)
	No	8 (40.0%)	4 (20.0%)
Receptive: Can comprehend questions querying imaginary situations.			
	Yes	0 (0.0%)	2 (10.0%)
	No	20 (100.0%)	18 (90.0%)
Expressive: Is able to count up to three objects			

	Yes	5 (25.0%)	10 (50.0%)
	No	15 (75.0%)	10 (50.0%)

Table depicts receptive and expressive language pre and post assessment of the children. Receptive Language: All children (100%, $n = 20$) responded to vocalizations and gives direct attention to other voices attentiveness to familiar voices, indicating foundational auditory responsiveness. In Nearly all participants (100% $n = 20$) recognized familiar objects, and a similar proportion (100%, $n = 17$) maintained sustained attention to verbally described objects. The majority (85%, $n = 17$) showed comprehension of simple requests, while (90% $n = 19$) successfully identified body parts upon verbal prompt. In simple command now and then mostly children demonstrated (85% n= 17). Understanding of emotional tones was evident in (80% $n = 16$) of the children, and 75% ($n = 15$) accurately followed actionoriented commands. However, only 40% ($n = 8$) were able to follow twostep instructions, and comprehension of pronoun distinctions was observed in 65% ($n = 13$). More complex receptive skills showed a decline, with only 35% ($n = 7$) understanding indirect questions, 25% ($n = 5$) comprehending "why" questions or size distinctions, and (35% $n = 7$) recognizing descriptive adjectives. The lowest performance was observed in the comprehension of "which" questions (20%, $n = 4$) and complex sentence structures (5%, $n = 1$).understanding of size differences (25%n=5) children showed inconsistencies similarly, children showed(15% n=3) difficulty in understanding of adjectives. In addition to this, children reduced (20% n=4) comprehend post position words. Only (10% n = 2) children comprehend questions querying imaginary situations.

In terms of expressive abilities, 80% ($n = 16$) of the children produced consonant sounds, whereas 20% ($n = 4$) had not yet reached this developmental stage. Participation in play based vocal interactions such as *peekaboo* was observed in 90% ($n = 18$) of the children. Expressive naming of familiar individuals was achieved by 70% ($n = 14$), and imitation of questions or answers was noted in 65% ($n = 13$). Furthermore, 90% ($n = 18$) could request desired items, while (80% $n = 16$) produced three word combinations and disappearance related words. Expressive naming of identified objects was observed in 40% ($n = 8$), and imitation of environmental sounds in 75% ($n = 15$). More advanced expressive skills appeared less frequent: only 35% $n = 7$) used words phrases ,using what/who questions (15% n = 3), expressing denial statements, (30% $n = 6$), ask help for personal need(35% n =7) used quantityrelated concepts (25% n=5), and merely (10% $n = 2$) began to use basic *what/who* questions. Nonetheless, 50% ($n = 10$) able to count up to three objects.

Table 4

Descriptive therapy goal wise analysis of baseline and intervention phases

	BL n=20	Dur n=20	Post n=20
	Mean (SD)		
Language			
Word it	41.10 (24.91)	63.25 (25.53)	86.75 (12.98)

Structure it	39.95 (22.99)	67.80 (20.92)	86.95 (11.41)
Sequence it	47.10 (26.11)	76.50 (25.62)	94.90 (5.39)
Reason it	57.85 (18.24)	64.65 (16.39)	78.65 (17.81)
Vita lang	60.00 (25.54)	73.45 (18.10)	83.55 (9.70)

Table 4 illustrated the impact of the language domain revealed the language domain revealed significant and robust gains "Word it," "Structure it," and "Sequence it" all achieved large trends s (SD= 12.98,SD=11.41, and SD=5.39, respectively), with dramatic increases from baseline to post intervention ("Sequence it" improved from M = 47.10 to M = 94.90). Moreover, "Reason it" and "Vita lang" also displayed significant improvement with moderate trends .These outcomes emphasize the intervention's strong impact on linguistic processing, expressive communication, and logical reasoning skills. These findings highlight that the intervention was especially effective in enhancing linguistic processing, expressive language, and logical reasoning.
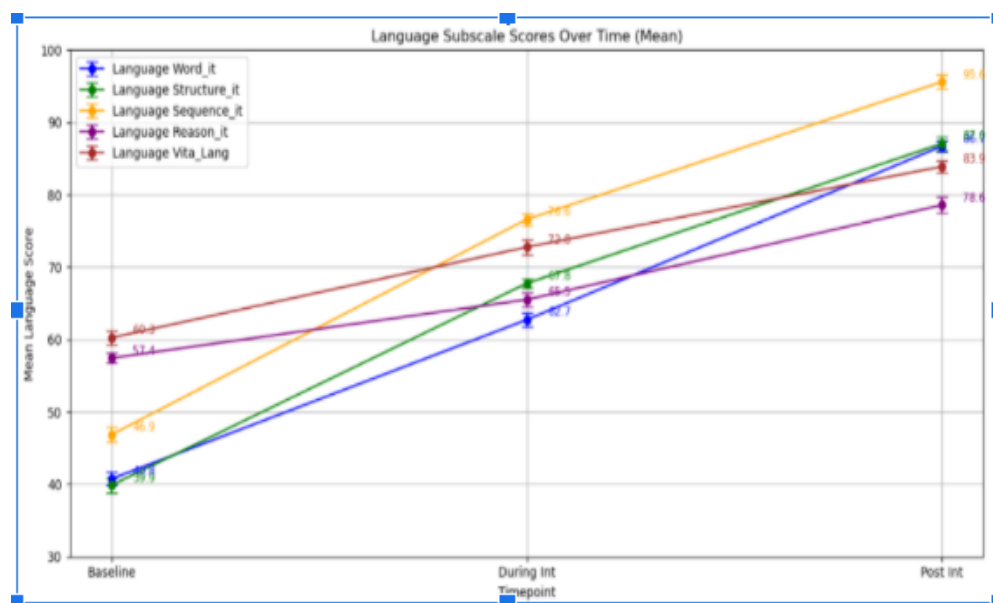
Figure 1

Figure 1 shows trends of pre and post therapy goals of Language *(n=20)*

DISCUSSION

The aim of the research was to screen out major communication problems in children with intellectual disability and to develop cognitive remedial therapy guidelines for Children with MID as intellectual impairments (ID) frequently suffer with attention, according to research, particularly in the early phases of therapy. Working memory, executive function, and cognitive processing deficiencies are mostly to blame for this (Dykens, 2017). According to study effective attention boosting techniques include establishing clear, regular routines, segmenting work into manageable chunks, and utilizing technology or visual cues to keep people interested. In order to keep them engaged, early phases of therapy frequently call for close observation and customized care, which is consistent with the significance of providing specific instructions for sustaining concentration (McCormack, J., Baker, E., & Crowe, K., 2018).

According to research, children with intellectual disabilities may struggle in academic subjects like language and arithmetic because of cognitive limitations (Brodin, 2010). Their skills can be improved with frequent, individualized practice, especially when paired with interactive software and visual aids. Regular practice, constructive criticism, and encouragement improve their comprehension of English grammatical principles and their capacity to tackle simple mathematical tasks. Cognitive training software can help reinforce these concepts because it allows students to work at their own pace and track their progress.

All completed RCTs (as well as important pilot studies) that evaluated cognitive remediation/CCT in kids with mild ID should be extracted and tabulated. This includes the sample, intervention, dose, results (particularly communication measures), and trends s (if any were disclosed).

The use of technology, including smartphones, portable video devices, and applications, facilitates the delivery of instruction, enhances learner engagement, and aids in the maintenance and generalization of skills.

Several studies, along with a minor computerized training research conducted in 2024 targeting adolescents with intellectual disabilities, have documented advancements in social communication and adaptive behavior following cognitive control training (CCT). However, the authors stress that the concept of far transfer is still a topic of debate, and there is a necessity for more rigorous randomized controlled trials (RCTs) (Georgoula & Koustriava, 2024).

Reviews and meta analyses concerning serious games and digital interventions aimed at children with intellectual disabilities indicate that a significant number of studies report cognitive and social benefits (for instance, enhancements in language have been documented in multiple trials (Derks, 2022).

Reading and phonological skills encompass letter sound awareness, phoneme blending, and word reading; however, they tend to be more beneficial for reading and vocabulary development than for comprehensive expressive grammar (Burgoyn, 2012).

This approach emphasizes the importance of meaningful communication, engaging in conversation, responding appropriately, and speaking within context, rather than relying solely on drills (Kalgotra, 2019).

Augmentative and Alternative Communication (AAC), which includes aided systems, picture exchange, and speech generating devices, demonstrates significant and consistent positive effects on enhancing real world communication and participation; early access to AAC facilitates school readiness and promotes social inclusion (Disabil, 2021).

Improvements in single word reading, letter sound recognition, and phoneme blending have been observed, alongside advancements in the expressive understanding of the vocabulary that has been taught. However, there have been no notable improvements in receptive vocabulary or in broader standardized grammar assessments (Burgoyne, 2012).

Targeted oral language programs, which include vocabulary development, decoding skills, and structured language instruction, demonstrate quantifiable improvements. Additionally, literacy linked strategies that combine vocabulary with shared reading are beneficial, as they promote the interdependence of oral and written language (Falth, 2023).

Visual aids such as picture boards, PECS, or basic speech generating devices, when paired with modeling, are essential for training communication partners (teachers, siblings). AAC not only enhances immediate communication but also supports language acquisition (Crowe, 2021). Recent studies and reviews indicate positive outcomes from the integration of Augmentative and Alternative Communication (AAC), visual aids, narrative strategies (for instance, colorful semantics), parent led interventions, telehealth services, and digital assistive technologies particularly when these interventions are tailored to individual needs and include the participation of caregivers and educators. Recent reports have highlighted the effectiveness of digital assistive technology in achieving high success rate (Resina et al., 2025)

RECOMMENDATIONS

Emphasize the importance of generalizing language skills within everyday conversations and practical communication scenarios.

1. Incorporate multimodal language activities that encompass speaking, listening, reading, and writing.

2. Promote interactive social communication through methods such as group discussions or roleplaying to enhance adaptability.

3. Utilize conversational practice, narrative exercises, and realworld communication tasks to generalize these skills.

4. Persist with targeted word retrieval and vocabulary exercises to maintain progress.

5. It is determined after analyzing the research question's results that children with mild intellectual disabilities can benefit from cognitive remedial therapy in terms of improving their communication abilities. Progress toward the research guidelines related to cognitive remedial therapy has been hampered by the breadth and depth of communication skills challenges.

6. Qualified teachers with expertise in supporting children with mild intellectual disabilities and communication challenges should be employed to guide students in effectively integrating technology into their learning and using it alongside therapeutic interventions.

LIMITATIONS

- The study was conducted with a limited number of participants. This delimitation was chosen due to practical constraints (e.g., recruitment feasibility, available resources) and limits the statistical power and generalizability of the findings to broader populations.

- A comparison/second baseline phase was not included. This study therefore uses a single phase pre/post design, which restricts the ability to demonstrate experimental control across phases and reduces strength of causal inference.

- Outcomes were assessed only immediately after the intervention; no extended follow up measurements were collected. As a result, the study cannot determine the durability or long term maintenance of observed gains.

- The investigation did not include a separate control or comparison group. Without a control condition, changes observed may be influenced by maturation, practice effects, or other extraneous variables rather than the intervention alone.

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