Effect of Teacher-Mediated Discrete-Trial Training in Improving Communication Skills of Children with Autism Spectrum Disorder

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ABSTRACT:

The main purpose of this study was to investigate the effect of teacher mediated discrete trial training in improving the communication skills of children with Autism. The research deployed an ABAB research design, ABAB was divided into 4 phases; A1, B1, A2, and B2. A1 was a baseline, B1 was treatment, A2 was the removal of the treatment, and B2 was the treatment resumed following the break, and at last, a follow-up was conducted. In the study, three children with ASD who fulfilled the inclusionary criteria received Discrete-Trial Training from their teachers. In the study, the instruments used for assessment were social communication questionnaire-Lifetime, Autism diagnostic interview-revised, and Vineland -3 Adaptive behavioral scale (communication domain). To examine the intervention effect on each participant, visual analysis, raw score, v-scale score, and standard score comparisons were used. The study result indicated that teachers successfully learned the procedures of DTT and significantly improved the communication skills of students with ASD. This research shows that when children with ASD require DTT intervention, their teachers receive intensive training to learn and deliver techniques with fidelity. This training also improves the skills of children with ASD.

INTRODUCTION

According to the Centers for Disease Control and Prevention 2014, Autism spectrum disorder (ASD) is a neurodevelopmental disorder that affects communication, social skills, and behavior present in early childhood; children with ASD have difficulties in forming relationships with others and are indifferent to social stimuli. Social interaction and communication are the most important challenges in children with ASD.

Early intervention studies on ASD showed that social interaction and communication skills can be significantly improved at an early age. It is known that teachers have a great role in the development of children with ASD. ABA therapy is one of the evidence based intervention that helps to improve the skills of children with ASD. Discrete trial teaching (DTT) is one of several types of teaching strategies that fall under the umbrella of ABA. DTT is a commonly used instructional methodology for teaching children with autism spectrum disorder (ASD) and other developmental disorders. It consists of a series of direct, systematic instruction methods, used repeatedly until the child acquires the skill. DTT focuses on the analysis of skills into small elements and units. In this method, the skills are individually taught through repeated attempts (Smith, 2001).

In 1999, Smith and Camarata found that using ABA techniques for natural language teaching was effective in improving language use and social interaction among children with autism. Gouvousis (2011) found that implementing ABA in the classroom resulted in statistically significant improvements in teacher behavior such as a child attending, clear opportunity, following the child's lead, turn-taking, and child's choice. The children also improved their ability to speak spontaneously, repeat words, and speak when prompted after receiving PRT intervention.

The issue of autism is extremely neglected due to multiple reasons in the context of Ethiopia. This includes that there is no homegrown tool to identify, assess and intervene children with ASD in the country, in most circumstances, autism manifested simultaneously with other types of mental disorders (Tekola et al., 2016). This complicates the intervention needed for these children. The negative attitude of society toward all types of mental disorders including autism is confusing that people regard such disorders as insanity. Hence the way how society treats these children adversely affects parents' faith in their children; it deprives them to receive appropriate intervention and negatively influences parents to

consider their children as incapable, inadequate, and a burden to their respective families. Insignificant centers have professionals with relevant qualifications and experts who specialize in providing appropriate services/interventions for children with ASD. In the condition of Ethiopia's regular education system entangled with those multifaceted challenges that crippled the participation of children with ASD in education on an equal basis with others.

In Ethiopia, there is a shortage of professionals who can work with individuals with ASD. Therefore, it is crucial to train teachers on how to interact with these students. Early intervention through teacher education can lead to reduced parent stress, improved self-efficacy, and higher satisfaction (Ghobari et al., 2017). Additionally, it can also help improve a child's language communication and social interaction skills. When adopting mediated early intervention, each child with ASD requires a suitable approach to their condition, Individuals with ASD have unique characteristics, which must be identified for the implementation of a multidisciplinary approach.

In Ethiopia children with autism who are admitted to regular schools are also not getting the appropriate intervention due to the absence of ASD expertise in schools, and teachers' limited knowledge and experience to accommodate children with autism (Burton, 2016). Regular teachers face many challenges to support children with autism in the classroom due to limited knowledge and skill on how to interact with children with ASD (Borissov et al., 2022). Many researches confirmed that teachers who teach children with autism lack the knowledge and skills to provide effective treatment for children with autism in and outside the classroom.

It is known that Autism is a lifelong disorder that needs intensive and continuous support. In Ethiopia, some individuals have opened private autism centers, but they are very expensive, making it difficult for parents to afford early intervention services. Mediation services are highly valued and relevant in this context, and there is currently no manual on how to intervene with children with autism in the country. As a result, teachers lack guidance on how to support students with ASD in school settings. Classroom teachers play a crucial role in addressing the individualized needs of students with ASD in the school environment. Therefore, it is important to evaluate the effect of teacher-mediated interventions, as it directly relates to the possibility of student success.

Having that all in mind, this study attended to answer the following research question: Does teaching teachers on how to effectively use discrete trial training (DTT)

enhance the communication skills of children with Autism Spectrum Disorder (ASD)?

METHODS

The study employed Single-Subject Design. The most basic single-subject research design is the reversal design; also called the ABAB design. ABAB research design was implemented for this study. Single-Subject designs can demonstrate clear causal relations between intervention and behavior change with much more efficiency than large-sample designs (Nock et al., 2007). For this research ABAB is divided into 4 phases; A1, B1, A2, and B2 A1 is a baseline, B1 is treatment, A2 is the removal of the treatment, and in phase B2 the treatment resumes following the break. At last, a follow-up assessment was conducted.

In order to select participants who teach children with ASD, purposive sampling was utilized. This type of sampling is suitable for unique circumstances and involves the use of an expert's judgment to select certain cases with a particular objective in mind (Bernard, 2002). Teachers from regular schools who met the inclusion criteria were chosen. These criteria were:

- Teachers who have taught children for a minimum of 2 years;
- Teachers who never took DTT course/training;
- Teachers express willingness to try new procedures (i.e. DTT);
- Teachers willing to commit to the training and implementation process for up to six months;
- Teachers teaching children with autism ages between two and eight years old;

As interventionists, a total of three teachers who fulfilled the above criteria were recruited and participated in the study. The Vineland-3 Adaptive Behavioral Scale communication domain was administered by two independent trained data collectors. Children's communication skill was repeatedly measured during baseline, intervention, withdrawal, re-intervention, and follow-up phases. Children's communication skills were measured by Vineland's comprehensive parent/caregiver semi-structured interview form. The data was collected at the participant's school in different sessions. To determine if scores remain consistent and do not change drastically depending on the interviewer, two independent trained research data collectors independently collect data and assess the inter-interviewers' agreement. The inter-interviewers' agreement was reviewed after the completion of each Vinland-3 communication domain assessment. The

inter-interviewer agreement is defined as 90% or higher.

This research obtained ethical approval from the Institutional Review Committee for the Department of Special Needs Education at Addis Ababa University. Pseudonyms were used for all names mentioned in the research.

Research Instruments

The research used standardized tools to assess the children with ASD. Particularly, social communication questionnaire (Life time) was used to identify suspected children with ASD; ADI-R was administered to diagnose the suspected children with ASD, and Vineland -3 Adaptive Behavioral Scale- third editions administered to assess the children's communication skills. All tools (SCQ, ADI-R, and Vineland -3 Adaptive Behavioral Scale (communication domain) were translated into Amharic due to all the participants' first language is Amharic. Each translation was translated and checked by language experts.

For this study, the Vineland-3 comprehensive semi-structured interview communication domain was used to assess the children's communication skills before and after the interventions. The communication domain measures how well children exchange information with others. The communication domain is based on scores on three sub-domains: receptive, expressive, and written. The receptive sub-domain assesses attending, understanding, and responding appropriately to information from others. Receptive sub-domain content areas are understanding nonverbal communication, understanding words, identifying things, following instructions, and entertaining and informational material. An expressive sub-domain reflects the child's use of words and sentences to express his/her verbally. Expressive sub-domain content areas are pre-language, beginning vocabulary, grammar, identifying self, and expressing self. The written sub-domain conveys an individual's use of reading and writing skills. Written sub-domain content areas are pre-reading, developing reading skills, developing writing skills, and applying reading and writing skills.

Within each subdomain, all items are ordered according to increasing developmental sequence, from easiest to most difficult to master. The lowest-numbered items with scores of 0 (never or almost never performed independently) or 1 (sometimes performed independently) indicate the lowest-level behaviors that the child has not fully mastered; these items identified for intervention. The highest item score is 2 (for fully mastered skill). The interviewers did not read the items to the respondents or ask the respondents to provide item scores. The in-

terviewers used open-ended questioning to prompt the respondents to talk about the examinee's behavior in communication skills. The interviewers then used the information to score the items.

In the Vineland-3 Communication domain, the expressive subdomain has 49 items, the receptive sub-domain has 39 items, and the written sub-domain has 21 items. The communication domain has a total of 109 items. Each child was evaluated on the 109 items.

Data Collection

The researcher, along with trained research assistants, assessed the communication skills of each child at different stages - baseline, intervention, withdrawal, re-intervention, and follow-up. They used the Vineland-3 Adaptive Behavioral Scale communication domain for this purpose. The assessment involved interviewing the child's parent using Vineland's semi-structured interview's extensive semi-structured interview.

Research Procedure

Phase 1: Baseline- In the baseline phase- the communication skills of the selected children were measured by Vineland 3 adaptive scale communication domain. The communication skills of the children were measured by two independent trained data collectors multiple times until the data showed stability.

Phase 2: Teacher training-Pre-intervention phase: Training in DTT was conducted, one week of group sessions for five days a week for three hours each day. In group sessions, teachers were introduced to ASD, ABA, and the ABC pattern of behavior. In addition, the Teachers received training in the implementation of DTT. The teachers received via didactic instruction, video examples, worksheets, and role-plays. In addition, the trainer gave a comprehensive Amharic DTT intervention manual for the teachers.

The DTT intervention manual that the current study used was originally developed by the National Professional Development Center on Autism Spectrum Disorders in The M.I.N.D. Institute, The University of California at Davis School of Medicine. The current study adapted the DTT intervention manual into the Ethiopian context and translated it into Amharic. Furthermore, the researcher offered feedback to the teachers DTT implementation, answered questions, and provided suggestions and feedback on worksheets and role-plays. In addition, teachers received a brief introduction to the assessment of the fidelity of DTT implementation. After each group session, teachers instructed and practiced DTT components.

Teachers' fidelity to the implementation of DTT was measured. After completing training, teachers deliver DTT for the targeted students. The teachers' fidelity to implementation DTT was measured by the implementation checklist for discrete-trial Training developed by National Professional Development Center on Autism Spectrum Disorder. Teachers were required to meet an implementation criterion of 80% accuracy. After completing training, teachers delivered DTT for the targeted children.

Phase 3: Teachers intervention- In subsequent sessions, the researcher provided the teachers with the communication system to be implemented in the sessions and let them interact with their children using the teaching procedures. During the sessions, the researcher didn't coach or model but stayed behind and took notes. The intervention phase of the study terminated after 40 consecutive Teachers-implemented DTT sessions within eight weeks, five days a week, each session had an hour length.

Phase 4: Removal of the intervention- The intervention was removed for four consecutive weeks. In this phase, teachers in the study did not provide any intervention for the targeted children with ASD.

Phase 5: Reintroduction of the intervention- Teachers reintroduced the intervention after four weeks of break. In this phase teachers continued providing the DTT intervention.

Phase 6: Follow-up- Two months following the termination of the intervention, the two independent trained data collectors returned to the participant's schools to evaluate if the children's maintained the teacher mediated DTT. During these frequent visits, the researcher interviewed the teachers multiple times.

Data Analysis

To assess the result of the children's communication skills in the pre-, post-, and follow-up phases, results were assessed and compared with line graphs to indicate changes in the performance of children with ASD. The results of the study were reported concerning the child's outcome data. To achieve this goal, graphs coupled with visual inspection techniques were used to determine trends and response levels that distinguish between baseline, intervention, withdrawal, re-intervention phase, and follow-up. As mentioned before due to the nature of the single-subject research design, data analyses proceed for each child separately. The data was analyzed on individual analysis of the quantitative data in a raw score, v-scale score, and standard score. The subdomains (receptive, ex-

pressive, and written) raw scores are average scores of repeated measures, and, the communication domain score is the composite score of the three subdomains. Subdomains have scaled scores called v-scaled scores (mean of 15 and a standard deviation of 3) within the range of scores from 1 to 24. The communication domain score was expressed in standard scores with a mean of 100 and a standard deviation of 15. Communication domain standard scores greater than or equal to 86 are considered adequate or above adequate. Domain scores from 71-85 are considered moderately low, and domain scores <20-70 are considered as low and indicate the student has a significant skill deficit when compared with similarly aged peers. The effect size of the intervention was analyzed for each student. The effect size of the intervention was calculated by Cohen's D Effect Size for Z-Test. Cohen's d is calculated by subtracting the population mean (before treatment) from the sample mean (after treatment), and then dividing the result by the population's standard deviation (15).

FINDINGS

In this research, as shown in table 1, all the teachers who participated in this study were self-contained and held a bachelor's degree. Additionally, each teacher had five or more years of experience teaching children. table 2 displays that all the children with ASD who were targeted in this study attended the same school throughout the

research. The intervention was targeted towards two females and one male.

Melat's Communication Skills

The communication domain raw score, v-scale score, and standard score are based on scores on three subdomains: Receptive, Expressive, and Written. As table 3 shows, in the baseline sessions, Melat had an average raw score of 37 with a range of 36-38, and a standard score of 8.

After Melat started to take DTT her communication skills gradually improved. The finding of the study shows that Melat's average raw score during the Intervention phase was 56.8 in a range of 40-68 and a standard score of 18. Melat has improved her ability to receive information by paying attention to cues, understanding communication, and responding appropriately. For example, she responds to her name, understands facial expressions, and answers questions. Her verbal communication has significantly improved as well. She was able to make one-word requests, name objects, say her own first and last name, and repeat common words. Melat has also made progress in her written communication skills. She wrote alphabet letters with correct orientation, identify alphabet letters, copy simple words, and wrote both her first and last name.

As figure 1 indicated during the withdrawal phase the communication skill of Melat gradually declined. In the withdrawal phase, Melat scored an average raw score of 51 with a range of 65-60 and a standard score of 15. Mel-

Table 1. Teachers' Demographic Characteristics

Teachers	Melat Teacher	Iyasu Teacher	Tenbit Teacher
Age	27	26	32
Education Level	BA Degree	BA Degree	BA Degree
Year of experience	5	7	10
Teaching Position	Self-contained teacher	Self-contained teacher	Self-contained teacher

Table 2. Targeted Students Demographic Characteristics

Targeted Children	Age Year and month	Sex	No of sibling	School	Diagnosis	Intervention Setting	Any other medical diagnosis
Melat	4:4	Female	1	STEAM School	ASD	School	None
Iyasu	7:3	Male	2	STEAM School	ASD	School	Diabetic
Tenbit	6:2	Female	2	STEAM School	ASD	School	None

at's ability to receive and express information declined as she had difficulty understanding facial expressions and answering questions. She also forgot some words she had learned and struggled to name and request objects. Additionally, she had difficulty identifying alphabet letters.

DTT was re-introduced to Melat during the Re-intervention phase and Melat's communication skills show an improvement again. Melat's average raw score was 67.5 with a range of 57-75 and had a standard score 0f 23. Melat's score in the re-treatment phase was the highest of all phases.

After two months had elapsed after the re-intervention sessions, follow-up sessions were conducted at the participants' school with procedures identical to the baseline, intervention, withdrawal, and re-intervention sessions. In the follow-up phase, Melat scored an average raw score of 60 with a range of 58-60 and got a standard score of 20. Melat's baseline standard score was 8. The

finding indicated there is a significant difference between Melat's baseline and follow-up communication skill scores. Comparing Melat's baseline standard score to her follow-up standard score the intervention had an effect size of 0.8. (figure 1.).

Iyasu's Communication Skills

The communication domain raw score, v-scale score and, standard score are based on scores on three subdomains: Receptive, Expressive, and Written. In the baseline sessions, Iyasu had an average raw score of 91.1 with a range of 89-92 and a standard score of 31.

DTT was introduced to Iyasu in the intervention phase by his teachers. As Figure 2 illustrates While Iyasu was taking the intervention his communication skills gradually increased. Iyasu's average raw score during the Intervention phase was 118.1 with a range of 107-132 and had a standard score of 41. Iyasu has made great
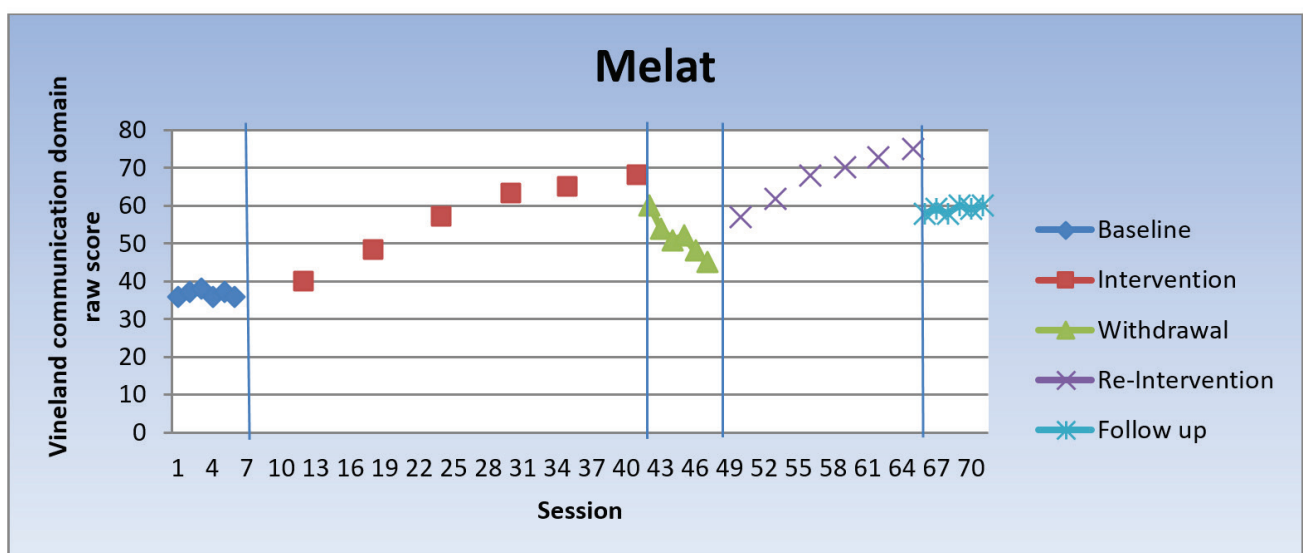

Fig. 1. Melat's Vinland Adaptive Behavior Scale Communication Domain Raw Score

Table 3. **Melat's Communication Skill Score Summary**

Communication Subdomains	Baseline Raw Score	Baseline v-Scale Score	Intervention Raw Score	Intervention v-Scale Score	Withdrawal Raw Score	Withdrawal v-Scale Score	Re-intervention Raw Score	Re- intervention v-Scale Score	Follow-up Raw Score	Follow-up v-Scale Score
Receptive	21.4	1	32.2	2	28.6	4	33	6	28.4	1
Expressive	15.6	1	21.3	1	19.4	1	27.4	1	23.6	1
Written	0	1	3.3	7	3	7	7.1	11	8	11
Overall composite Raw Score	37		56.8		51		67.5		60	
Standard Score	8		18		15		23		20	

strides in improving his communication abilities by paying attention to cues, understanding messages, and responding appropriately. He is now able to follow a story, comprehend words, and interpret gestures. His verbal communication skills have also significantly improved, as he was able to ask questions, name actions, and use phrases with a noun and a verb. Furthermore, he has learned how to use pronouns to refer to him. Iyasu's written communication skills have also progressed, as he has mastered simple writing, recognizing basic signs, and copying phrases.

As Figure 2 shows, when the intervention was removed in the withdrawal phase, the communication skill of Iyasu step by step shows declined. Iyasu scored an average raw score of 108.8 with a range of 100-128 and a standard score of 37. Iyasu's withdrawal phase score was greater than his baseline phase score and less than his intervention phase score. Iyasu struggled with receiv-

ing and expressing information. He found it challenging to follow instructions and comprehend short stories. He also had difficulty recalling some words he had learned and struggled to name actions. Additionally, he faced challenges when it came to writing basic words.

During the time of Re-intervention phase, Iyasu was re-introduced to DTT and his communication skill again shows improvement. As table 4 shows, Iyasu's average raw score was 126.6 with a range of 106-144 and a standard score of 42. Iyasu scores in the re-treatment phase which was the highest of all phases.

After two months had elapsed after the re-intervention sessions, follow-up sessions were conducted at the participants' school with procedures identical to the baseline, intervention, withdrawal, and re-intervention sessions. In the follow-up phase, Iyasu scored an average raw score of 123.1 with a range of 121-125 and had a standard score of 42. The finding confirmed that Iyasu suc-
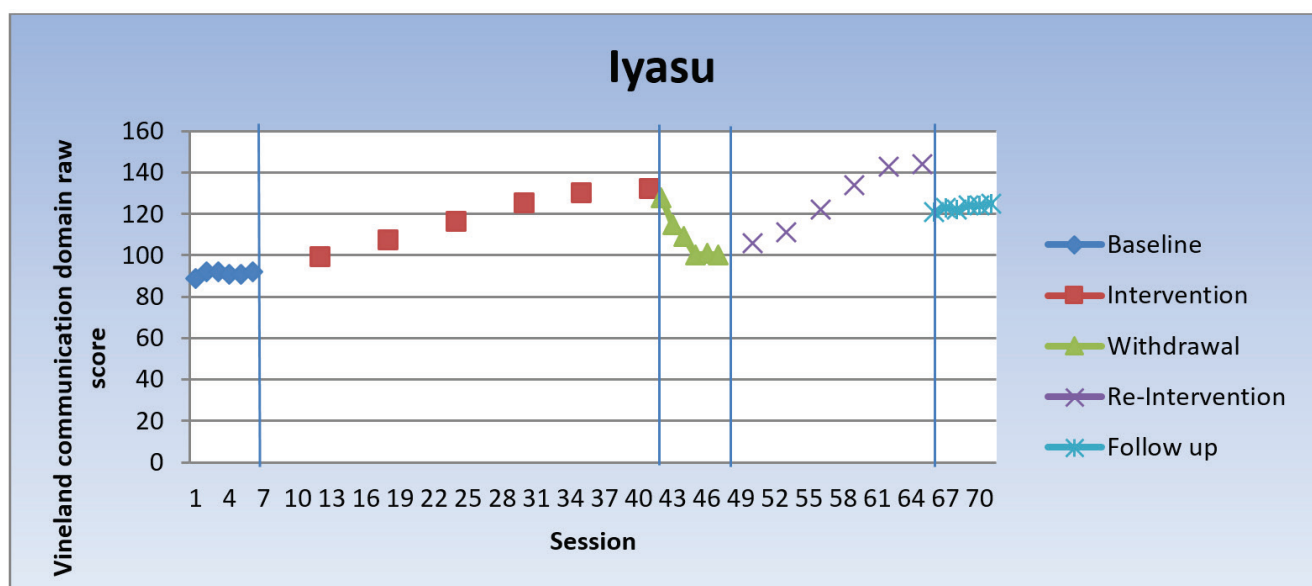

Fig. 2. Iyasu's Vinland Adaptive Behavior Scale Communication Domain Raw Score

Table 4. **Iyasu's Communication Skill Score Summary**

Communication Subdomains	Baseline Raw Score	Baseline v-Scale Score	Intervention Raw Score	Intervention v-Scale Score	Withdrawal Raw Score	Withdrawal v-Scale Score	Re-intervention Raw Score	Re-intervention v-Scale Score	Follow-up Raw Score	Follow-up v-Scale Score
Receptive	43.4	4	55.3	8	52	1	60.1	1	58.6	1
Expressive	37.6	1	45.2	1	41.7	1	42.5	4	41.2	3
Written	10.1	5	17.6	7	15.1	7	24	9	23.3	9
Overall composite Raw Score	91.1		118.1		108.8		126.6		123.1	
Standard Score	31		41		37		42		42	

cessfully maintained the intervention. Comparing Iyasu's baseline standard score to his follow-up standard score the intervention had an effect size of 0.73 (figure 2.).

Tenbit's Communication Skills

The communication domain raw score, v-scale score, and standard score, are based on scores on three subdomains: Receptive, Expressive, and Written. As figure 3 illustrates, in the baseline sessions, Tenbit had an average raw score of 84.5 with a range of 84-86 and a standard score of 29.

After DTT was introduced to Tenbit by her teacher in the intervention phase, Tenbit's communication step by step increased. As Table 5 shows, Tenbit's average raw score during the intervention phase was 119.8 with a range of 93-138 and had a standard score of 41. Tenbit has developed strong receptive skills by actively paying attention, comprehending, and responding appropriately to information from others. For instance, she directs

her attention toward gestures to gain their attention, responds promptly when her name is called, follows instructions, understands gestures, identifies objects and body parts in pictures, answers questions, and identifies actions depicted in images. Additionally, Tenbit's expressive skills have also improved as she used words to express herself more effectively. For example, she repeats common words, names objects, addresses her siblings and peers by their names, says their first name or nickname, says "no", makes one-word requests, says "yes", and names actions. Moreover, Tenbit's writing skills have also improved in reading and writing. She holds a book correctly and turns its pages to read, identifies uppercase and lowercase letters of the alphabet, recognizes simple signs, icons, and symbols, recognizes her name in print, and correctly writes her first name.

As figure 3 shows, during the withdrawal phase, the communication skills of Tenbit little by little declined.
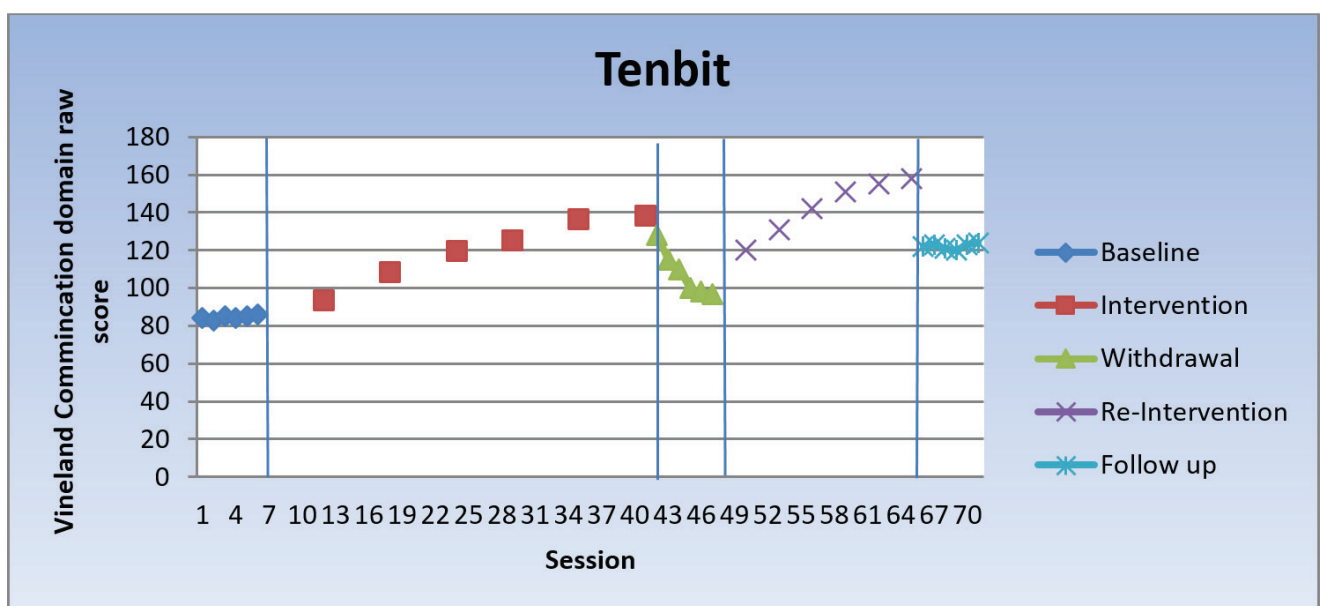

Fig. 3. Tenbit's Vinland Adaptive Behavior Scale Communication Domain Raw Score

Table 5. **Tenbit's Communication Skill Score Summary**

Communication Subdomains	Baseline Raw Score	Baseline v-Scale Score	Intervention Raw Score	Intervention v-Scale Score	Withdrawal Raw Score	Withdrawal v-Scale Score	Re-intervention Raw Score	Re-intervention v-Scale Score	Follow-up Raw Score	Follow-up v-Scale Score
Receptive	46	7	59.5	10	57.1	10	65.4	12	57	10
Expressive	28.3	1	56.1	5	51.1	3	61.1	6	49.9	2
Written	10.2	7	14.2	9	11.6	8	16.3	9	15.2	9
Overall composite Raw Score	84.5		119.8		108		142.8		122.1	
Standard Score	29		41		37		49		42	

Tenbit scored an average raw score of 108 with a range of 97-128, and had a standard score of 37. After the intervention was removed, Tenbit's ability to pay attention and respond appropriately to information from others declined. She struggled to look in the direction of gestures and identify actions depicted in images. Her expressive skills also showed a decline as she had difficulty repeating common words. Tenbit's writing skills also declined as she found it challenging to recognize simple signs, icons, and symbols, identify her name in print, and correctly write her first name.

DTT was re-introduced for Tenbit in the Re-intervention phase and Tenbit's communication skills rapidly improved. Tenbit's average raw score was 142.8 with a range of 120-158. During the re intervention phase, Tenbit got a standard score of 49. The re-intervention phase score was the highest of all phases and the greatest score of all participants in this study.

After two months had elapsed after the re-intervention sessions, follow-up sessions were conducted at the participants' school with procedures identical to the baseline, intervention, withdrawal, and re-intervention sessions. In the follow-up phase, Tenbit scored an average raw score of 122.1 with a range of 120-124 and had a standard score of 42. Comparing Tenbit's baseline standard score to her follow-up standard score the intervention had an effect size of 0.86 (figure 3.).

DISCUSSION

The result of this study indicated that teachers successfully learned the training procedures of DTT and improved the communication skills of students with ASD. This study has similarities with the study conducted by Lovaas (2003). His research has found that DTT was used to help children with ASD to acquire many skills, such as expressive and receptive language, imitation, playing, social, emotional, physical, academic, and daily living skills, etc.

Furthermore, the current finding indicated that when teachers receive appropriate training and feedback, they can train their students to communicate with people around them; this finding goes in line with the finding of Gilligan et al., (2007). Gilligan and the research team concluded that training paraprofessional staff to implement discrete trial instruction has improved the communication skills of children with ASD. A meta-analysis conducted by (Barton & Wolery, 2008) indicated that Teachers in the three studies reviewed were able to use the intervention shown to increase the children's communication skills, and diversity of pretense behaviors.

As the findings of the current study indicated DTT can be given in the school setting and integrated easily into the school setting using already existing resources. The current findings extend the research of Lavie and Sturmey (2002) and Moore with co-authors (2002) who demonstrated that behavior-analytic skills can be learned quickly by non-specialist staff in a school setting.

In Ethiopia, there are few experts in autism intervention, and with more children spending time in preschools and parents working longer hours, preschools have become a natural environment for providing interventions. According to the study, using DTT intervention led to a notable enhancement in communication abilities among children with ASD when their teachers implemented it. Nevertheless, since it has been found communication skills can be taught teachers usually use prompting in forming and teaching communication skills (Myers & Johnson, 2007).

IMPLICATION

Shortages of highly qualified therapists are not likely to resolve shortly, and the population of students with autism spectrum has grown (Christensen et al., 2016); thus more specialized levels of appropriate instruction and supervision are needed for all teachers of children with ASD and paraprofessionals. Teachers undergo intensive training to learn techniques and deliver DTT interventions effectively to children with autism, regardless of the quality or availability of in-person professional development. This training allows for individualized instruction, accommodating varying skill levels and turnover. Effective ABA training can improve access to evidence-based interventions for students with autism, promoting equality across geographic and socioeconomic boundaries. Based on the finding of the study, the following recommendations have been made:

- In order to provide better assistance to children with ASD and their educators, it would be helpful if the government collaborated with NGOs and universities to create a policy that focuses on autism.
- To spread awareness and improve the skills of children with ASD, the government should create intervention manuals in various local languages for teachers who work with children with Autism. This would be a nationwide effort.
- It is strongly advised that teachers who instructed children in this study continue to utilize the knowledge and skills they acquired to assist students with ASD.

- We recommend that teachers and school psychologists, especially those who specialize in special education, utilize our research protocol and DTT intervention manual. This will help them to understand and implement DTT procedures, which can enhance the abilities of students with ASD.
- Future research is warranted for further examination of this intervention protocol with a larger sample size.

CONCLUSION

The study revealed that teachers were able to learn the training procedures of DTT and effectively enhance the communication skills of students with ASD. This finding highlights the importance of providing teachers with proper training and feedback, as they can then train their students to communicate effectively with others. Overall, the teacher-mediated DTT intervention resulted in notable improvements in the communication abilities of children with ASD. Furthermore, all the targeted children maintained the learned communication skills.

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