Ethiopian Journal of Behavioral Studies, 2023, 6(2), 56-85

Effect of Parent-Mediated Pivotal Response Treatment 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 parent-mediated pivotal response treatment in improving the communication skills of children with Autism Spectrum Disorder (ASD). The research deployed an ABAB research design, ABAB was divided into 4 phases; three children with ASD who fulfilled the inclusionary criteria received pivotal response treatment from their parents. The instruments used for assessment included a social communication questionnaire, Autism Diagnostic Interview-Revised, and Vineland-3 Adaptive Behavioral Scale for communication. Visual analysis, raw score, v-scale score, and standard score comparison were used to examine the intervention's effect on each participant. The result indicates that parents successfully learned the procedures of Pivotal Response Treatment (PRT), and significantly improved the communication skills of their children with ASD. This research shows that when PRT intervention is substantial for children with ASD, the parents obtain intensive training to learn techniques and deliver interventions with fidelity. Training further allows parents to improve the skills of children with ASD.

***Keywords**: Autism spectrum disorder, Pivotal response treatment, Parent Mediated Intervention, Communication skill*

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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. Children with Autism often struggle with developing effective communication. Communication skills are how well the child exchanges information with others. Communication is based on the child's ability in three domains: Receptive, Expressive, and Written. The Receptive is attending, understanding, and responding appropriately to information from others. The expressive reflects the child's use of words and sentences to express the child verbally. The written conveys an individual's use of reading and writing skills.

Pivotal Response Treatment (PRT) is a system that helps to improve the communication skills of children with ASD (Coolican et al., 2010). PRT builds and improves on the basic principles of behavior modification on motivation, response to multiple cues, self-management, and initiation of social interactions; it uses a child's natural motivations (toys, games, and activities that a child wants and cares about) to teach and reinforce new, pro-social behaviors (Koegel et al., 2012). PRT is not just limited to mental health centers and educational settings; it can also be effectively implemented by parents in community settings such as homes due to its emphasis on natural environments (Hardan et al., 2015). Parent-mediated Pivotal Response Treatment refers to when a practitioner/researcher seeks to support a child by teaching

the child's parent how to teach the child using PRT strategies and acting as the child's intervention provider.

It is worth re-emphasizing that the cultural diversity in Ethiopia contributes to different conceptualizations about the cause and treatment of ASD in children. The various conceptualizations of symptoms require a culturally sensitive diagnostic procedure and treatment protocol. Once a child is diagnosed as autism, there are limited services in Ethiopia that can provide psycho-education and referral to specialized schools (Ali & Kumar, 2022).

There are no diagnostic or educational services in rural areas, where 80% of the Ethiopian population lives. In these areas, autism usually remains undetected because of limited health care, low levels of awareness, and stigma (Tekola et al., 2016). In addition, Autism-type symptoms are often seen as a punishment from God as a result of sin or the curse of the parents (Zeleke et al., 2018). In accordance with (Zeleke et al., 2018), parents hide their children with autism away from the community due to the fear of social exclusion and negative attitudes/judgments from others. The country's education and training policy of 1994 aimed to teach handicapped and gifted learners based on their potential and capacity (MOE, 1994). However, autism is not given enough attention by governmental or social stakeholders although it affects nearly 500,000 children in Ethiopia and has a significant impact on their overall well-being (Burton, 2016).

Parents of children with autism face challenges, especially managing their children's behavior, accessing assessment and early intervention services. They are also unable to effectively interact with their children. When this problem is coupled with poverty, it becomes unbearable for families (Ali & Kumar, 2022). In addition to

the lack of access to trained professionals in schools, there is no support system for families of children with autism since there are limited specialized centers that provide support for children with autism, it is the responsibility of parents or caregivers to provide interventions for ASD management (Zeleke et al., 2020).

It is known that there are many children with autism staying at home without intervention and schooling in Ethiopia due to financial constraints, lack of awareness, shortage of assessment and intervention centers, schools' refusal to admit children with autism, and poor-quality service by schools (Ali & Kumar, 2022).

In Ethiopia, there is a shortage of autism therapists in the country (Tekola et al., 2016). It is known that Autism is a lifelong disorder that needs intensive and continuous support. Currently, it is observed that some individuals are opening private autism centers in Ethiopia; however, they are very expensive, and as a result, many parents cannot afford the cost of early intervention services in private mental health centers. It is believed that mediation service is highly valued and relevant in the context of Ethiopia.

With this in mind, this study sought answers to the following research question: Does teaching parents how to effectively use pivotal response treatment (PRT) enhance the communication skills of their children with Autism Spectrum Disorder (ASD)?

Research Methods

Design

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 efficiently

demonstrate causal relations between interventions and behavior changes (Nock, Matthew, Michel, & Photos, 2007). For this research, ABAB was 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.

Participants

The study was conducted in Addis Ababa, Ethiopia, where a significant number of children with ASD reside. The children and the parents selected for the study were purposively chosen from targeted schools in Addis Ababa. The schools were targeted due to the reason that they admit children who are thought to have autism. The school first identified twelve children who were struggling with language, communication, and social interaction. A social communication questionnaire (SCQ) was administered to the twelve identified children. Five students who scored ≥15 (the cut-off score for further assessment) on the SCQ were referred for ASD assessment. The screened children underwent an Autism Diagnostic Interview-Revised, and three children diagnosed with ASD were targeted for the current study.

The PRT intervention was carried out by parents in the participants' homes. Purposive sampling was applied to select the targeted participants who had children with ASD. Purposive sampling is an acceptable kind of sampling for special situations. It uses the judgment of an expert in selecting cases or it selects cases with a specific purpose in mind (Bernard, 2002). Parents that fulfilled the inclusionary criteria were selected from regular schools. The inclusionary criteria were:

- Parents/Guardians willing to diagnose their children
- Parent/ Guardian who never took PRT before this research

- Parents/ Guardian willing to commit to the training and implementation process for up to 15 weeks;
- Parents or guardians who do not wish to enroll their children with ASD in specialized therapies such as speech or ABA therapy, in addition to the current study intervention, from the beginning to the end of the study.
- Parents/ Guardian having children with autism ages between two and eight years old;
- Parents/Guardian who completed grade 12

Research Instruments

The research used standardized tools to assess the children with ASD. The social communication questionnaire (SCQ, Lifetime Form), Autism Diagnostic Interview-Revised (ADI-R), and Vineland -3 Adaptive Behavioral Scale- third edition were administered. All tools (SCQ, ADI-R, and Vineland -3 Adaptive Behavioral Scales (communication domain) were translated into Amharic, which was the participants' first language. The translation was made by two language experts.

The SCQ was used as a screening instrument to identify children with a possible autism spectrum disorder. It was not meant to provide a detailed diagnosis, but to indicate whether a child needs a more careful and in-depth evaluation. The SCQ consisted of forty yes-or-no questions, which could be scored by an administrator in less than 5 minutes. Each item in the SCQ requires a dichotomous “yes”/“no” response, and each scored item receives a value of 1 point for abnormal behavior (Yes) and 0 (No) points for absence of abnormal behavior/normal behavior.

Total scores of 15 or greater on the SCQ Lifetime form indicate a possible autism spectrum disorder (ASD) and, therefore, the need for a comprehensive evaluation.

Autism Diagnostic Interview-Revised (ADI-R) was used as an assessment tool to diagnose the ASD screened students and there was no other co-morbid condition. The interview of ADI-R was divided into five sections: opening questions, communication questions, social development and play questions, repetitive and restricted behavior questions, and questions about general behavior problems

For this study, the dependent variable (communication skill) was measured by Vineland-3 comprehensive semi-structured interview. 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 ideas 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 and writing skills, and applying these 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 were used for the intervention. The highest item score is 2 (for fully mastered skill). The interviewers (independent trained research assistances) did not ask the respondents (parents) to provide item scores. The interviewers 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.

Research Procedures

***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 within one month by two independent trained research data collectors multiple times (6x) at the participants' home until the data showed stability. Conduct the parent interview took 40 minutes to cover all 109 items.

Phase 2: Parent training-Pre-intervention phase: Training in PRT was conducted for the parents for five days, three hours each day. In the training, parents were trained on the basics of Autism Spectrum Disorder, Antecedent Behavior and Consequence pattern, and Applied Behavioral Analysis. In addition, the parents

received training in the implementation of PRT. The parents received instruction in antecedent PRT components (gaining the student's attention, presenting clear and appropriate cues, interspersing maintenance and acquisition tasks, sharing control, and using multiple cues), prompting, and consequent PRT components (providing direct and contingent reinforcement and reinforcing attempts) via didactic instruction, video examples, worksheets, and role-plays. In addition, the trainer gave a comprehensive Amharic PRT intervention manual for parents.

The PRT intervention manual that was current in the current study 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. For the present study, the PRT intervention manual was adapted to make it to fit the Ethiopian context. The PRT intervention steps were translated into Amharic without any alterations. However, the examples of each PRT step were adjusted to the Ethiopian context to enhance parents' comprehension.

Furthermore, the researcher offered feedback to the parents on PRT implementation, answered questions, and provided suggestions and feedback on worksheets and role-plays. In addition, the parents received a brief introduction to the assessment of the fidelity of PRT implementation. After each group session, the parents were instructed to practice PRT components.

Parents' fidelity to the implementation of PRT was measured. After completing the training, the parents delivered PRT to the targeted children. The Parent's fidelity to the implementation PRT was measured by the implementation checklist for pivotal response treatment developed by National Professional Development Center on Autism Spectrum Disorder. The fidelity of the parents to

implementing PRT was translated into Amharic without adaptation as it was consistent with the PRT training. The parents were required to meet an implementation criterion of 80% accuracy, for three consecutive sessions. After completing training, parents delivered PRT for the targeted children. Table 6 presents the results of the parents' implementation fidelity.

***Phase 3: Parents intervention*:** In subsequent sessions, the researcher provided the parents 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 and trained research assistants did not coach or model but stayed around and took notes. The intervention phase of the study ended after eight weeks. Parent-implemented PRT sessions for five days a week. Each session lasted an hour. The intervention was administered in each participant's home between 4:30 and 5:30 p.m. In order to control external factors, the researcher informed the parents about the study's objectives and procedures. Additionally, the children who participated in the study DID not receive specialized therapies such as speech or ABA therapy.

Phase 4: Removal of the intervention- The intervention was completely halted for four weeks. During this phase, the parents involved in the study did not provide any intervention for their children with Autism Spectrum Disorder. They were informed that the intervention would resume once the removal phase was over, and they were instructed not to provide any PRT to their children during this period.

Phase 5: Reintroduction of the intervention- The Parents reintroduced the intervention after four weeks of break. In this phase, the parents continued providing

the PRT intervention for four weeks, five days a week, an hour each day. The intervention was administered at home between 4:30 and 5:30 p.m.

Phase 6: Follow-up- Two months following the termination of the intervention, the two independent trained data collectors, and the researcher returned to the participant's homes to evaluate if the children had maintained the parent-mediated PRT. During these frequent visits, the researcher interviewed the parents 6 times.

Data Collection

As interventionists, three parents 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 research data collectors. Children's communication skills was measured during baseline, intervention, withdrawal, re-intervention, and follow-up phases. The data was collected at the participants' home in different sessions. Sessions are the specific times when trained data collectors interview respondent parents, and when parents provide PRT intervention for their children (Intervention phase and Re-intervention phase). The study consisted of 72 sessions. Each child underwent a baseline assessment (A1) six times, which was conducted during sessions one to six. The baseline phase lasted 47 days, with interviews conducted every seven days.

Data were collected six times during the intervention phase (B2) which began in session seven and ended in session 42. The data were collected every six sessions, specifically in sessions 13, 19, 25, 31, 36, and 42. Similarly, the withdrawal phase data (A2) was collected six times as well. The intervention involved a withdrawal period of one month, during which the withdrawal phase interview was conducted

every three days. The withdrawal phase data was collected in sessions 43, 44, 45, 46, 47, and 48.

The re-intervention phase, also known as B2, lasted one month, starting from session 49 to session 66. During the B2 sessions, data was collected every three sessions, specifically in sessions 51, 54, 57, 60, 63, and 66. The final phase of the research was the follow-up phase, which involved measuring the children's communication skills in sessions 67 to 72. Follow-up data was collected once a week for six consecutive weeks.

To determine if scores remain consistent and do not change drastically depending on the interviewer, two trained data collectors independently collect data and assess the inter-interviewers' agreement. The inter-interviewers' agreement was reviewed after completing each Vinland-3 communication domain assessment. The inter-interviewer agreement is defined as 90% or higher.

Data Analysis

To assess the results of the children's communication skills in the pre-, post-, and follow-up phases, the results were assessed and compared with line graphs to indicate changes in the performance of the children with ASD. The results of the study concerning the children's outcome data were reported. To achieve this goal, graphs, coupled with visual inspection techniques, were used to determine trends and response levels that distinguish 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 data. Quantitative data analysis was done using a raw score, v-

scale score, and standard score. The subdomains (receptive, expressive, 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 (*M =15 and SD = 3*) within the range of scores from 1 to 24. The communication domain score was expressed in standard scores with *M = 100 and SD =15*. Communication domain standard scores greater than or equal to 86 were considered adequate or above adequate. Domain scores from 71-85were considered moderately low, and domain scores <20-70 were considered as low and indicate the child as a significant skill deficit when compared with similarly aged peers. The effect size of the intervention was analyzed for each child. The effect size of the intervention was calculated by Cohen's D Effect Size for Z-Test. Cohen's d was 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).

Ethical Considerations

This researcher secured a Certificate of Ethical Clearance from Addis Ababa University; Department of Special Needs and Inclusive Education Institutional Review Committee. The names that are mentioned in this article are all pseudo-names. The research participants were informed about the objective of the study, and all of the training was given based on their informed consent. In this research, the participants were notified about their right to decide of their free will and to withdraw or drop out after training/intervention began if discomforted. Parents were informed about the confidentiality of the information they would provide and that their privacy would be fully respected.

Results

Three mothers of children with Autism participated in the study as interventionists.. The age range of the parents' was 28-35.

The result of each child is discussed separately. The findings are described and presented in figures and tables based on the children's intervention outcome. The scores of each child in different sessions and phases are shown in Figures 1, 2, and 3. The baseline phase took place from sessions one to six. The intervention phase started with session seven and lasted until session 42. The withdrawal phase began in session 43 and ended in session 48. Re-intervention was introduced in session 49 and lasted until session 66. Finally, the follow-up session was conducted from sessions 67 to 72. Tables 3, 4, and 5, display the communication skills raw scores, v-scale scores, overall composite raw scores, and standard scores.

Table 1

Parents' Demographic Characteristics

Parents	Yakob Mother	Feven Mother	Elias Mother
Age	32	28	35
Education Level	BA Degree	Diploma	BA Degree
Occupation	Accountant	Tailor	Unemployed
Relationship with the child	Biological Mother	Biological Mother	Biological Mother
No of Children	2	1	3

Table 2

Targeted Children Demographic Characteristics

Targeted Children	Age Year and month	Sex	Diagnosis	Intervention setting	Interventionist	Any other medical Diagnosis
Yakob	4:1	Male	ASD	Home	Mother	Low vision
Feven	4:5	Female	ASD	Home	Mother	None
Elias	5:2	Male	ASD	Home	Mother	None

Yakob's Communication Skill

Yakob's communication abilities were assessed in three areas: Receptive, Expressive, and Written. These scores were used to determine his communication domain raw score, v score, and standard score. During the baseline sessions, Yakob scored below average in receptive, expressive, and written language skills. However, his written score was higher than his receptive and expressive scores. Yakob's average raw score was 35, with a range of 33-36, and a standard score of 8. However, as depicted in Figure 1, Yakob's communication skills significantly improved during the Intervention phase, with an average raw score of 71.5, a range of 42-93, and a standard score of 24. This raw score was twice as high as the baseline score.

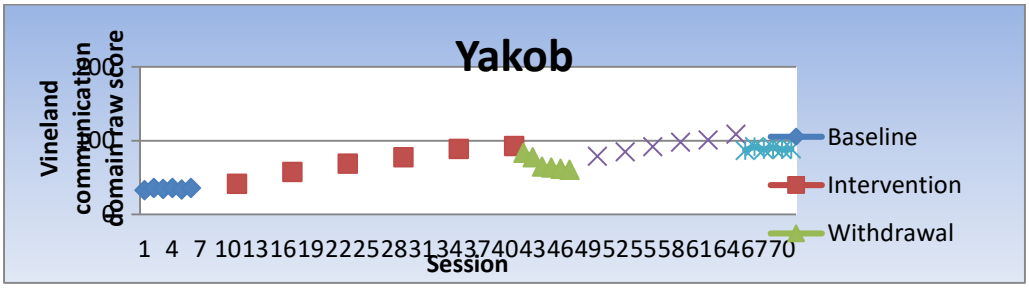

Figure 1: *Yakob Vinland Adaptive Behavior Scale Communication Domain Raw Score*

Yakob's ability to receive information from others improved by attending to cues, understanding communication, and responding appropriately. This includes following his parent's gaze or pointing when they wanted his attention, understanding gestures, identifying objects and body parts in pictures, answering questions, and recognizing actions shown in pictures. Yakob's ability to communicate verbally

improved significantly. After the intervention, he could use common words more fluidly, named objects, and addressed his siblings and peers by name. Additionally, he was able to say his name, use one-word requests, and describe actions. Yakob also made progress in his written communication skills. Furthermore, He was able to hold a book and turn pages correctly while reading. He recognized simple signs, icons, and symbols, and was able to identify his name in printed form. Furthermore, he was able to write his name correctly by copying it.

During the Withdrawal phase, Yakob's communication skills declined, with an average raw score of 69, a range of 61-84, and a standard score of 23. His ability to understand and respond to cues and information from others declined after the removal of the intervention. He had difficulty identifying objects and body parts in pictures and answering questions. Additionally, he lost some words he had learned and struggled to address his siblings and peers by name. Yakob also had difficulty saying his name and describing his actions. He even forgot some simple symbols and had trouble writing his name.

However, during the re-intervention phase, Yakob's communication skills improved, with an average raw score of 94, a range of 79-109, and a standard score of 32. This phase had Yakob's highest score of all phases. Two months later, follow-up sessions were conducted at the participants' homes using the methods previously used. The results indicate that Yakob persisted in applying the communication intervention although the follow-up score was not precisely the same as the intervention phase. Throughout the follow-up phase, Yakob achieved an average raw score of 89.1, ranging from 87 to 92 and a standard score of 30. The study revealed a significant

contrast between Yakob's initial and follow-up communication ability scores, with an intervention effect size of 1.4

Table 3

Yakob 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	19	1	36	7	36	7	48	10	45.1	9
Expressive	15	1	30.5	2	28	2	38	5	36	7
Written	3	9	5	11	5	11	8	12	8	12
Overall composite Raw Score		37		71.5	69		94		89.1	
Standard Score		8		24	23		32		30	

Feven's Communication Skills

Feven's communication skills were assessed based on three subdomains: Receptive, Expressive, and Written, which contributed to the calculation of her communication domain raw score, v-score, and standard score. As indicated in Table 4, during the baseline sessions, Feven scored below average in receptive, expressive, and written language skills. However, her written score was higher than her receptive and expressive scores. Feven's average raw score was 37.6, falling within the range of 36-38, and her standard score was 8. However, after the intervention began, Feven's communication abilities significantly improved as indicated by her average raw score

of 72.5 during the Intervention phase, with a range of 48-95. Her standard score during this phase was 25. Compared to her baseline score. Her intervention phase score was almost double, demonstrating excellent progress.

Feven developed excellent receptive skills by paying attention, comprehending, and responding appropriately to information from others. For example, she looked in the direction of her parents' gestures to gain their attention, responded promptly when her name was called, followed instructions, understood and gestures, identified objects and body parts in pictures, answered questions, and identified actions depicted in images. Furthermore, Feven's expressive skills also improved as she used words to express herself more effectively. For instance, she repeated common words, names objects, called siblings and peers by their names, said their first names or nicknames, said "no", made one-word requests, says "yes", and names actions. Moreover, Feven's reading and writing skills also improved. She held a book correctly and turned 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.

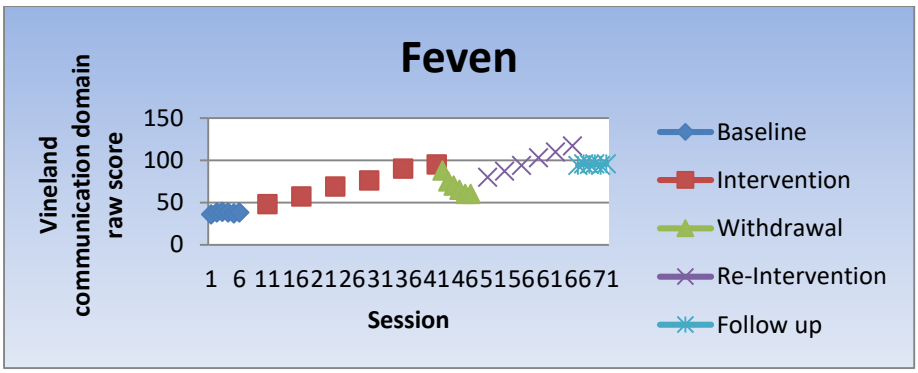

Figure 2: *Feven's Vinland Adaptive Behavior Scale Communication Domain Raw Score*

Feven's communication skills appeared to decline during the withdrawal phase, with an average raw score of 69.6 (range: 60-88) and a standard score of 23. After the intervention was removed, her ability to pay attention and respond appropriately to information from others declined. She had trouble looking in the direction of her parent's gestures and identifying actions depicted in images. Her expressive skills also showed a decline as she had difficulty naming objects. Feven's writing skills also declined as she struggled to identify uppercase and lowercase letters of the alphabet, recognize simple signs, icons, and symbols, recognize her name in print, and correctly write her first name.

During the re-intervention phase, Feven's communication skills improved significantly, with an average raw score of 98.5 (range: 80-117) and a standard score of 33. It is worth noting that Feven's highest raw score was achieved during the re-treatment phase, which surpassed all previous phases. The participants had follow-up sessions at their homes after two months. The procedures were the same as the baseline, intervention, withdrawal, and re-intervention sessions. Feven did well during this phase, with an average raw score of 95.1 and a range of 94-96. Her standard score increased to 32, which was more than twice her baseline score of 8. The intervention had a significant impact, with an effect size of 1.6, indicating improvement from Feven's baseline to the follow-up standard score.

Table 4

Feven'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	18.4	1	40	5	38.5	7	56.2	8	56	8
Expressive	14	1	24.5	1	23.1	1	30.3	2	29	1
Written	5.2	9	8	11	8	11	12	13	10.1	12
Overall Composite Raw Score	37.6		72.5		69.6		98.5		95.1	
Standard Score	8		25		23		33		32	

Elias's communication skill

The scores for the communication domain are based on three subdomains: Receptive, Expressive, and Written. As Table 5 shows, during the baseline phase, Elias scored below average in receptive, expressive, and written language skills. However, his written score was higher than his receptive and expressive scores. Elias had an average raw score of 39.6 in the baseline sessions, with a range of 38-40 and a standard score of 9. However, when the intervention began, Elias's communication skills improved significantly. During the Intervention phase, his average raw score was 63.6, with a range of 45-75, and a standard score of 21.

Since Elias received intervention, his receptive skills have improved significantly. He can now attend to information from others, understand it, and respond appropriately. Furthermore, he could now follow instructions, interpret gestures, identify objects and body parts in pictures, answer questions, and identify

actions in pictures. Elias's expressive skills also enhanced, and he could now use words to express himself verbally. He was able to repeat common words, name objects, call his siblings and peers by their name, say his first name, say "no," make one-word requests, say "yes," name actions, and state his age when asked. In addition, Elias's written skills improved, and he used reading and writing skills effectively, including holding a book and turning pages correctly, recognizing simple signs, icons, and symbols, his name in printed form, identifying alphabet letters (both upper- and lowercase), and copying his first name correctly.

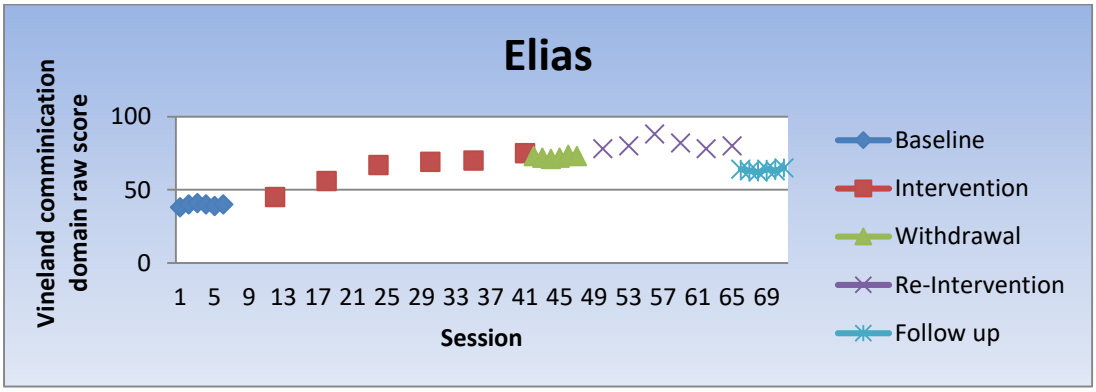

***Figure 3**: Elias Vinland Adaptive Behavior Scale Communication Domain Raw Score*

The withdrawal phase showed that Elias's communication skills remained stable, with an average raw score of 72.5 and a standard score of 25. During the Re-intervention phase, Elias's communication skills improved again, with an average raw score of 81 and a standard score of 28, which was the highest score of all phases. Two months later, the follow-up sessions showed that Elias maintained the intervention, with an average raw score of 63.5 and a standard score of 21. Comparing Elias's baseline standard score to his follow-up standard score, the intervention had a significant effect size of 0.8.

Table 5

Elias'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	18.2	1	33.3	4	37.1	6	40.5	7	30.4	3
Expressive	15.4	1	20.1	1	24.4	1	27.3	1	21	1
Written	6	7	10.2	9	11	10	13.2	11	12.1	11
Overall composite Raw Score		39.6		63.6	72.5		81		63.5	
Standard Score		9		21	25		28		21	

Table 6

Fidelity Assessment

Trainee	Yakob Mother	Feven Mother	Elias Mother
Fidelity of Implementation: trial 1	81%	83%	82%
Fidelity of Implementation: trial 2	83%	85%	83%
Fidelity of Implementation: trial 3	85%	86%	86%

Note. Parents' fidelity to the implementation of PRT was measured before the intervention began. Parents demonstrate PRT with children who were not the target of this research. The above scores of each parent are the scores of three consecutive sessions.

Discussion

The parents who participated as interventionists in this study were mothers. They were active, dedicated, and hardworking participants throughout the study. The mothers' role was often emphasized as a participant in both autism research and early intervention service delivery (Flippin & Crais, 2011). Flippin and Crais indicate that fathers are underrepresented in autism intervention research A study by Seung et al. (2003) showed fathers of children with ASD engaged in less parallel play than mothers, being more directive and less consistently responsive.

Parents play an integral role in improving the communication skills of children with ASD. The PRT method involves parents in the delivery process and recognizes them as major intervention agents (Koegel & Koegel, 2006). Parents of children with ASD require ongoing training to comprehend autism, their child's unique requirements, and how to provide adequate support. A recent study has shown that parents can be trained effectively to implement PRT and support their children with ASD. This study aligns with previous research conducted in 2020 by Erbas and their team, where parents demonstrated increased self-confidence, and self-efficacy, and decreased anxiety and stress levels. The study also concluded that parents displayed more responsive interactions with their children, improving vocabulary, receptivity, and language development.

The current study found that parents who used PRT with their children with ASD significantly improved their communication skills, including receptive, expressive, and written communication. These results were consistent with previous research conducted by Garnett et al. (2022a). Their study showed that parents who underwent autism intervention training influencing successfully their child's

communication skills, with improved responsive communication. Children also demonstrated better social communication, including initiating and responding to communication more frequently, and increased joint attention. Parents also reported feeling more confident and aware of their interactive behavior due to the training.

Specifically, this study showed that participating children improved their expressive skills by using words and sentences to communicate verbally. Sokum et al. (2017) concluded that parents who participated in the parent-mediated program increased their use of responsive interaction strategies, such as simplified language, fun physical contact, imitations, and expansions, more than parents in the control group. Children in the parent intervention group demonstrated significant improvements in communication, receptive and expressive language, and overall progress compared to the control group.

The children who participated in the study also demonstrated improved receptive skills. The children were able to understand and respond appropriately to the information given to them. Following the PRT intervention by the parents, the vocabulary and language skills of children with ASD also showed improvement. Girolametto et al. (2007) conducted similar research and found that parent-mediated intervention programs led to parents using more responsive interaction strategies. This, in turn, resulted in children having larger vocabularies, communicating more frequently, and participating in turn-taking routines more often.

It is important to introduce children to reading and writing at an early age in a fun and engaging way. In the current study, the participating children improved their reading and writing skills by practicing them. Kashinath et al. (2006) conducted a study that examined the effect of teaching strategies implemented by parents in daily

routines at home. The study found that parents could implement these strategies and generalize them across different activities, including reading and writing.

The current study found that all children with ASD who participated in the program improved and maintained their communication skills. A follow-up study by Suhrheinrich et al. (2013) on children with autism who received intensive behavioral intervention noted positive gains in those who received intervention from their trained parents. Empowering and training parents to interact with their children is a cost-effective strategy for improving the skills of children with autism, as children are more likely to respond to their parents.

The current study highlighted the importance of valuing family sociocultural environments and daily routines when planning effective interventions. Embedding the intervention within family activities and daily routines provides great social communication and behavioral learning opportunities. It also enhances positive interaction among family members. Parents play a crucial role as the primary caregivers for their children. Direct parent involvement is an essential component of early intervention programs for children with ASD as it leads to increased skill development. Teaching parents to support communication and social interaction for their children with ASD in their homes is feasible and desirable. Jull and Mirenda (2011) found that parents can learn the skills required to become skilled communication facilitators in their homes. In Ethiopia, there is a shortage of autism therapists in comparison to the number of children with autism (Tekola et al., 2016). In countries where this is the case, mediated therapy is highly recommended. Communication skills are a crucial area in which children with autism struggle.

Conclusion

This study aimed at investigating the impact of parent-mediated PRT on improving the communication abilities of children diagnosed with ASD. The findings revealed that parent-mediated PRT had a significant effect on enhancing the communication skills of children with ASD. Specifically, the results showed that this intervention improved the children's receptive language, which included their ability to attend, understand, and respond appropriately to information from others. Additionally, it enhanced expressive language, which pertains to the child's use of words and sentences to express themselves verbally, and written language skills, which involve the use of reading and writing. Notably, children who received parent-mediated PRT retained the learned communication skills.

Implication

A recent study has shown that children with ASD experience significant improvement when receiving parent-delivered Pivotal Response Treatment (PRT). The study found that implementing these interventions led to improved receptive, expressive, and written communication skills in children with ASD. Improved communication skills can also positively impact behavior and social interaction. Additionally, the study found that children with ASD could maintain the communication skills they learned. Access to effective Applied Behavior Analysis (ABA) training can also help ensure that all students with autism have access to evidence-based interventions, regardless of geographic or socioeconomic barriers.

It is unlikely that there will be a quick solution to the shortage of highly qualified teachers and therapists, while the number of students with autism spectrum

disorder continues to increase (Christensen et al., 2012). Therefore, parents of children with ASD require specialized levels of appropriate instruction and supervision. As discussed above, research has shown that when Pivotal Response Treatment (PRT) interventions are deemed necessary for a student with autism, parents receive intensive training to learn techniques and deliver interventions with fidelity. Training parents on interventions can substantially improve their understanding of autism characteristics and how to address their children. This training is essential regardless of the availability or quality of in-person professional development and enables parents to enhance the skills of children with ASD.

The findings of this study have important implications for other researchers. As the study was conducted with only three participants, the results cannot be applied directly to the wider population. It is, therefore, important to replicate the intervention for children with disabilities in general, and specifically for children with ASD. Early intervention programs aimed at improving communication skills are crucial, as they have a significant impact on the overall development of children with ASD. In order to generalize results to all students with ASD in Ethiopia, further research is needed on mediated intervention and the recommendations that can be drawn from it. However, the findings of this study suggest that parent-mediated PRT were effective in enhancing the communication abilities of children with ASD.

Declaration of interest statement

We have no conflicts of interest to disclose.

We declare that the authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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