International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

Check for updates

Comparative analysis of early versus late interventions on language development in children with autism spectrum disorder in East Africa

Jedidah Brooke Wanjiru [1,*], Ruthie Rono [1], Stella Nyagwencha [1] and Ibrahim Omwom Miruka [2]

[1] *Department of Humanities and Social Sciences, United States International University, Africa.*
[2] *LERIS Hub*

International Journal of Science and Research Archive, 2025, 16(02), 1469-1477

Publication history: Received on 15 July 2025; revised on 20 August 2025; accepted on 23 August 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.16.2.2466

Abstract

Children with Autism Spectrum Disorder (ASD) frequently experience significant challenges in communication, which can manifest as delays in both verbal and non-verbal skills. We did a comparative analysis of early and late interventions on language development in children with autism spectrum disorder in East Africa. We purposively selected two neurodevelopmental centers in Nairobi, Kenya, and Dar es Salaam, Tanzania, and 60 children between 2 and 12 years who had been on therapy for the last 12 months were selected through stratified sampling. The study used children with ASD records collected using standardized tools Receptive-Expressive Emergent Language Scale for assessing both expressive and receptive language skills by health professionals.

The findings revealed that 54.55% were below 5 years and 45.45% were 5 years and above. In terms of country of residence, 56.36% were from Kenya and 43.64% from Tanzania, while 65.45% were male and 34.55% female. For receptive language skills, the difference in average gain between early and late intervention was $B = 2.89$, $SE = 1.32$, $t(106) = 2.19$, $p = .031$. statistically significant. For expressive language, the difference in average gain between early and late intervention was the difference in gains between children in early and late intervention was not significant, $B = 1.23$, SE = 1.54, t (106) = 0.80, p = .427.

The findings highlight the importance of effective early intervention in enhancing receptive language and cognitive skills in children with autism spectrum disorder (ASD). Therefore, clinicians should prioritize early intervention strategies to develop understanding skills.

Keywords: Receptive-Expressive Emergent Language Scale; Receptive language; Expressive language; Late intervention; Early intervention; Autism spectrum disorder

1. Introduction

Autism Spectrum Disorder (ASD) is a complex condition that encompasses difficulties in social interaction, impairments in verbal and non-verbal communication, restricted or repetitive patterns of behavior, and delays in cognitive and adaptive functioning, which are related to brain development [1]. According to [2] reported that some children with ASD may exhibit early signs that set them apart from typically developed (TD) children. These early signs include avoiding eye contact and engaging in conversation with their parents or other caregivers, becoming distant and uninterested in social situations, or even developing a unique obsession with specific objects. A study by [3] observed that the primary characteristics of ASD are deficits in verbal and nonverbal communication behaviors used in social interactions, as well as persistent deficiencies in social reciprocity and the ability to establish and maintain connections with others.

* Corresponding author: Jedidah Brooke Wanjiru

Language developmental delay is a common disorder in childhood, with a higher prevalence observed among males. Most cases occur in children under the age of 3, and as these children grow older, they are at an increased risk of developing global developmental delays. Early and comprehensive intervention can significantly enhance children's developmental status and strengthen their social behavior skills. It is essential to understand the clinical characteristics of language developmental delay and to ensure early diagnosis, along with the implementation of thorough intervention strategies, to assist children in overcoming their language difficulties [4].

Children with ASD frequently experience significant challenges in communication, which can manifest as delays in both verbal and non-verbal skills [5]. According to [6]Children with ASD are less likely to utilize gestures and other non-verbal cues effectively, which can hinder their ability to convey their needs and interact with others. This lack of effective communication strategies can lead to frustration and social isolation, further complicating their developmental trajectory [7]. Additionally, children with ASD typically begin to speak later than their peers, often missing crucial early language milestones such as babbling and their first words [8].

Early intervention plays a crucial role in language development among children with Autism Spectrum Disorder (ASD), initiating language interventions before the age of three significantly enhances linguistic abilities, including receptive and expressive language skills [9] . Children who received early intervention exhibited greater vocabulary acquisition and syntactic development than those who began intervention later [10]. Early intensive speech-language therapy in neurodevelopmental therapy centers led to a marked improvement in functional communication skills [11]. Furthermore, early intervention programs help children with ASD in a variety of ways, including their cognitive development, social skills, communication, adaptive behavior, and symptom severity [12].

Late intervention often results in slower and less comprehensive language development. Children who started language intervention after the age of five showed less pronounced gains in speech production and comprehension [13]. The delayed neural plasticity response, as highlighted by [14], suggests that the optimal period for language acquisition in children with ASD is within the first three years of life. Nonetheless, [15] indicates that even late intervention can yield moderate improvements, particularly in structured therapeutic environments within neurodevelopmental therapy centers.

Additionally, early intensive behavioral intervention (EIBI) programs significantly enhance language outcomes in young children with ASD, whereas later intervention led to more variable results [16]. Furthermore, children receiving early intervention showed improved use of pragmatic language and conversational reciprocity, compared to those who started interventions later, highlighting the long-term benefits of timely language intervention in ASD therapy settings [17]. Children who get language help on time are more likely to learn how to communicate well, which is important for both socializing and doing well in school [18]. Also, being able to communicate well can help with frustration and behavior problems, making the whole experience better for the child and their family.

In Africa, access to diagnosis and treatment for autism remains limited due to several challenges. These include a shortage of specialized healthcare professionals and resources, a lack of awareness and understanding of autism spectrum disorder (ASD) among healthcare providers, and cultural stigma surrounding mental health and developmental disorders [19]. While alternative therapies are often used alongside other treatment options, their effectiveness is frequently unproven. The impact of ASD on families and caregivers in Africa is substantial, as many struggle to access support services and deal with the associated stigma [20].

A case study conducted by [21] in Africa identified four key interventions that are effective in facilitating development for individuals with autism spectrum disorder (ASD): speech therapy, creative endeavors, human-animal interaction, and mentorship. The study concluded that undiagnosed and untreated cases of ASD impose significant psychosocial and economic burdens on families and communities. In Kenya, communicative difficulties, such as delayed speech development, negatively impacted the academic performance of autistic learners [22]. The researchers recommended that education policy makers create and implement comprehensive guidelines and support systems to address issues related to delayed speech development, challenges in using gestures, difficulties in understanding nonverbal cues, and maintaining conversational exchanges.

Additionally, in Kenya, [23] concluded that there was an early median age at presentation and a predominance of the male gender. They identified a lack of awareness and stigma as contributing factors to therapy access and suggested increasing access to speech therapy and other interventions to address intellectual disability and epilepsy. In Tanzania, an expressive language impairment was more prevalent than receptive language impairment and could be easily observed by teachers. However, the impairments were identified later than the ideal age due to cultural influences and

challenges, such as negative attitudes and a lack of teaching and learning resources; these factors hinder the education of children with language impairment [24].

Besides these, there is limited empirical evidence in East Africa to quantify the change between early and late interventions on language ability using standardized, validated scales, such as the receptive-expressive emergent language scale (REELS). In the absence of such evidence, policymakers and clinicians have difficulty in establishing the most efficient period of intervention and the most beneficial language therapy approach for children with ASD in a low-resource setting.

2. Methodology

2.1. Study location

The study was conducted at neurodevelopmental therapy centers located in Nairobi, Kenya, and Dar es Salaam, Tanzania. These centers are pivotal in providing specialized care and interventions for children with Autism Spectrum Disorder (ASD) in East Africa. Nairobi is the capital city of Kenya (Figure 1). Nairobi is home to various neurodevelopmental therapy centers specializing in autism spectrum disorder (ASD) interventions. These centers often provide a range of services, including early intervention programs, speech therapy, and behavioral therapies tailored to the needs of children with ASD. Nairobi's healthcare infrastructure has both private and public institutions that facilitate access to specialized care for families. Dar es Salaam (Figure 2), Tanzania's largest city and commercial hub, hosts several neurodevelopmental therapy centers that cater to children with ASD. These centers are similarly structured to those in Nairobi, ensuring consistency in the intervention methods employed. The centers in Dar es Salaam feature modern facilities that support a variety of therapeutic activities, including group sessions, one-on-one interventions, and family support services.

Figure 1 Map of Nairobi

Figure 2 Map of Dar es Salaam

2.2. Study design

The study adopted a retrospective comparative cohort study design. We utilized secondary data recorded on children with ASD language developmental skills by health professionals at neurodevelopmental centers over a period of 12 months for 60 children with ASD selected through a purposive sampling method in Neurodevelopmental centers in Nairobi and Dar es Salaam.

2.3. Data collection techniques

The data was collected using the Receptive-Expressive Emergent Language Scale (REELS), a standardized tool for assessing both expressive and receptive language developmental skills. The data was collected by a speech therapist through quarterly developmental progress assessment using REELs for 12 months and recorded in the REELS template quarterly. The researcher acquired all the data from all the centers in June and July 2025.

2.4. Sample size and sampling

The study employed purposive sampling to select neurodevelopmental centers and utilized a stratified sampling technique to identify 60 children with Autism Spectrum Disorder (ASD) who had been receiving therapy for the past 12 months at these centers. This approach ensured a representative sample of the broader population, taking into account factors such as age, gender, and symptom severity. The sample consisted of all 60 children, equally divided with 30 from Kenya and 30 from Tanzania. In both countries, participants were categorized into two groups: an early intervention group and a late intervention group, with 15 children in each group. Children diagnosed with Autism Spectrum Disorder (ASD) and aged between 2 to 12 years, currently receiving therapy at selected neurodevelopmental centers, were recruited into the study. The early intervention group consisted of children who began their therapy below 5 years of age, while the late intervention group included those who started at 5 years and above.

2.5. Inclusion and exclusion criteria

Children who were between 2 – 12 years old and had been on therapy for the last 12 months were included in the study. The study excluded records of participants who were less than 2 years old or more than 12 years old. The study also excluded records of children who had been on therapy for less than 12 months.

2.6. Data Analysis

The study utilized both descriptive and inferential statistics to analyze the relationship between early and late interventions on language development in children with autism spectrum disorder. The STATA version 16, a computer software, was used for data analysis. A descriptive analysis was performed to summarize socio-demographic characteristics. Difference in Difference regression analysis was used to determine the relationship between the average gain in skills between early and late intervention. The results generated from the quantitative analysis were presented in tables and textual summaries.

3. Results

3.1. Socio-demographic information

The findings in Table 1 reveal that a total of 55 participants were included in the study. Slightly more than half of the participants (54.55%) were below 5 years of age, while 45.45% were above 5 years. In terms of country of residence, 56.36% were from Kenya and 43.64% from Tanzania. Regarding sex distribution, males constituted the majority at 65.45%, whereas females accounted for 34.55% of the participants.

Table 1 Socio-demographic information

Variables	N	%
Age		
>5 years	25	45.45
<5 years	30	54.55
Country		
Kenya	31	56.36
Tanzania	24	43.64
Sex		
Male	36	65.45
Female	19	34.55

3.2. Difference in Gains Regression Analysis for Receptive Language Skills

The findings in Table 2 revealed that baseline and current scores were not significant predictors of receptive language skills, $B = 1.88$, $SE = 0.97$, $t(106) = 1.93$, $p = .056>0.05$. However, children in the early intervention group demonstrated significantly lower receptive language scores at baseline compared to those in the later intervention group, $B = –3.74$, $SE = 0.93$, $t\ (106) = –4.01$, $p < .001$. However, the interaction between time and age group was significant, $B = 2.89$, $SE =$

1.32, *t* (106) = 2.19, *p* = .031. indicating that children who received early intervention showed greater improvement in receptive language skills compared to children who received late intervention. The finding underscores the long-term benefits of early intervention programs for enhancing receptive language abilities among children with ASD, because it not only narrows initial developmental gaps but also promotes more substantial growth with continued exposure.

Table 2 Difference in Difference Regression Analysis Predicting Receptive Language Skills, Time by Age Group

Predictor	(B)	SE	T	p	95% CI for
Intercept	9.84	0.69	14.29	< .001	[8.47, 11.21]
Time (Baseline vs Current)	1.88	0.97	1.93	.056	[-0.05, 3.81]
Age Group: (Early vs Late Intervention)	-3.74	0.93	-4.01	< .001	[-5.59, -1.89]
Time × Age Group	2.89	1.32	2.19	.031	[0.27, 5.50]

Note. B = unstandardized regression coefficient; SE = standard error; CI = confidence interval.

3.3. Difference in Gains Regression Analysis for Expressive Language Skills

The findings in Table 3 showed that both baseline and current expressive scores were significant predictors, B = 4.04, SE = 1.14, t (106) = 3.56, p = .001, indicating that expressive scores increased over time in both early and late intervention groups. Both intervention timings were also significant, with children in the early intervention group having lower baseline expressive scores than those in the late intervention group, B = –3.53, SE = 1.09, t (106) = –3.25, p = .002. However, the difference in gains between children in early and late intervention was not significant, B = 1.23, SE = 1.54, t (106) = 0.80, p = .427. These findings suggest that intervention timing alone may not be the main factor influencing progress in expressive language skills; instead, other factors such as intervention intensity and duration, individual cognitive abilities, family involvement, quality of therapeutic approaches, comorbid conditions, and the child's social environment may also be important.

Table 3 Regression Analysis Predicting Expressive Time by Age Group

Predictor	B	SE	t	p	95% CI for B
Intercept	10.00	0.80	12.45	< .001	[8.41, 11.59]
Time (Baseline vs Current)	4.04	1.14	3.56	.001	[1.79, 6.29]
Age Group: Early vs Late Intervention	-3.53	1.09	-3.25	.002	[-5.69, -1.38]
Time × Age Group	1.23	1.54	0.80	.427	[-1.82, 4.28]

Note. B = unstandardized regression coefficient; SE = standard error; CI = confidence interval.

4. Discussions

The research highlights the importance of early intervention in enhancing receptive language skills in children with autism spectrum disorder (ASD). The findings clearly show an advantage for children who began their therapy before age five, stressing how prompt support can greatly impact language development. This is vital because receptive language skills lay the foundation for cognitive growth, social interactions, and independence. The results support [17], whose study showed that children receiving early interventions showed better use of pragmatic language and conversational exchanges compared to those who started interventions later. This underscores the long-term benefits of early language intervention in ASD treatment.

Furthermore, receptive language involves more than just understanding words; it is the key to learning. Children with ASD who possess strong receptive skills can engage better in educational settings, follow instructions, and take part in social interactions. For nonverbal children, developing these skills early can lead to significant cognitive progress, helping them succeed despite early communication challenges. By prioritizing receptive skills, children create a solid foundation that promotes academic success, adaptation, and lifelong learning. The findings concurred with [12] who found that timely and effective interventions can lead to significant long-term benefits, emphasizing the importance of prioritizing early support for children with language impairments and ASD.

The study strongly suggests that therapies for children with ASD before they turn five maximize their chances for learning language and being ready for school. However, the finding does not lessen the importance of late intervention. Every child, regardless of when they start therapy, can make significant progress in their language skills. Health professionals, such as speech-language pathologists, should use a holistic approach. They should encourage early interventions while also recognizing the value of late interventions. While early intervention can lead to positive developmental gains, it's important to create an environment where those who start later can also succeed. Effective therapy that meets individual needs can result in meaningful improvements in language skills, cognitive development, and social skills for all children with ASD.

Both early and late interventions led to improvements in expressive language skills, but the lack of significant differences in the outcomes shows that the timing of intervention matters. Early intervention not only brings greater improvements but also builds a stronger foundation for future learning opportunities. The findings concurred with [18] whose study revealed that children who obtain language help on time are more likely to learn how to communicate well, which is important for both socializing and doing well in school. Although children receiving late intervention can make progress, they may not reach the same level of proficiency as their peers who started therapy earlier.

Abbreviations

- ASD: Autism Spectrum Disorder,
- EIBI: Early Intensive Behavioral Intervention, E
- SDM: Early Start Denver Model,
- NACOSTI: National Council for Science, Technology, and Innovation,

5. Conclusion

The study emphasizes the urgent need to focus on early intervention for children with ASD. Early intervention for receptive language skills enhances children's immediate communication abilities and lays the groundwork for their future academic and social success. This proactive approach can significantly help children with ASD reach their full potential and handle life's challenges more effectively.

Compliance with ethical standards

Disclosure of conflict of interest

The authors have declared that there are no competing interests

Statement of ethical approval

The study sought approval from the United States International –Africa-IERC, Ref No. USIU-A/ISERC/US906-2025and the National Council for Science, Technology, and Innovation (NACOSTI), Ref No. NACOSTI/P/25/4176318, who reviewed and approved the study protocol. We obtained additional permits from Neurodevelopmental centers to access children with ASD records, and obtained informed consent from the caregivers to access their children's records. We strictly adhered to the study protocol and informed the participants that giving access to their children's records was purely voluntary and they were free to decline without any consequence. We assigned unique identifiers to the participants, stored their personal information in a password-protected computer database, and secured all paper records in a locked file cabinet.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

Author contributions

The study was put together and designed by JBW, and the first author conducted the study in Dar es Salaam, Tanzania, and Nairobi, Kenya. IOM drafted the manuscript and carried out data analysis. JBW reviewed and prepared the manuscript. RR and SN gave their technical input during the development of the study.

References

[1] Andreini, N., et al., Differentiation and co-occurrence of obsessive-compulsive disorder and autism spectrum disorder in people with intellectual developmental disorder: a case series on symptoms specificities. Advances in Mental Health and Intellectual Disabilities, 2025. **19**(1): p. 61-71.

[2] Posar, A. and P. Visconti, Early motor signs in autism spectrum disorder. Children, 2022. **9**(2): p. 294.

[3] AlSalehi, S.M. and E.H. Alhifthy, Autism spectrum disorder, in Clinical Child Neurology. 2020, Springer. p. 275-292.

[4] Qiu, L. and Z. Huang, Comparative Analysis of Intervention Approaches for Language Developmental Delay in Children Under and Over 3 Years of Age. Alternative Therapies in Health & Medicine, 2024. **30**(12).

[5] Radhakrishnan, M., et al., A hybrid model for the classification of Autism Spectrum Disorder using Mu rhythm in EEG. Technology and Health Care, 2024. **32**(6): p. 4485-4503.

[6] Wong, K.H., et al., Comparing early pragmatics in typically developing children and children with neurodevelopmental disorders. Journal of Autism and Developmental Disorders, 2022. **52**(9): p. 3825-3839.

[7] Jahromi, L.B., et al., Associations between emotional competence and prosocial behaviors with peers among children with autism spectrum disorder. American journal on intellectual and developmental disabilities, 2021. **126**(2): p. 79-96.

[8] Manelis, L., et al., Language regression is associated with faster early motor development in children with autism spectrum disorder. Autism Research, 2020. **13**(1): p. 145-156.

[9] Daniolou, S., N. Pandis, and H. Znoj, The efficacy of early interventions for children with autism spectrum disorders: A systematic review and meta-analysis. Journal of clinical medicine, 2022. **11**(17): p. 5100.

[10] Davidson, L., A. Osman, and A.E. Geers, The effects of early intervention on language growth after age 3 for children with permanent hearing loss. Journal of Early Hearing Detection and Intervention, 2021. **6**(1): p. 1-11.

[11] Venita, Y. and A. Devina, Impact of Speech Therapy on Communication Skills and Social Interaction in Children with Autism Spectrum Disorder. International Journal of Nursing and Midwifery Research, 2024. **2**(3): p. 96-103.

[12] Boccaccio, D., G. Machiavelli, and N. Alighieri, The Impact of Early Intervention Programs on the long-term outcomes of children with Autism Spectrum disorder: A systematic review. Archives of Clinical Psychiatry, 2023. **50**(2).

[13] Vermeij, B.A., et al., Effects in language development of young children with language delay during early intervention. Journal of Communication Disorders, 2023. **103**: p. 106326.

[14] Feldman, H.M., How young children learn language and speech. Pediatrics in review, 2019. **40**(8): p. 398-411.

[15] Lord, C., et al., Autism spectrum disorder. Nature reviews Disease primers, 2020. **6**(1): p. 5.

[16] Lombardo, M.V., et al., Pre-treatment clinical and gene expression patterns predict developmental change in early intervention in autism. Molecular psychiatry, 2021. **26**(12): p. 7641-7651.

[17] La Valle, C., D. Plesa-Skwerer, and H. Tager-Flusberg, Comparing the pragmatic speech profiles of minimally verbal and verbally fluent individuals with autism spectrum disorder. Journal of autism and developmental disorders, 2020. **50**(10): p. 3699-3713.

[18] Fuller, E.A. and A.P. Kaiser, The effects of early intervention on social communication outcomes for children with autism spectrum disorder: A meta-analysis. Journal of autism and developmental disorders, 2020. **50**(5): p. 1683-1700.

[19] Kantawala, B., et al., Exploring the landscape of autism in Africa: challenges in diagnosis, support, and resources–a short communication. Annals of Medicine and Surgery, 2023. **85**(11): p. 5838-5841.

[20] Aderinto, N., D. Olatunji, and O. Idowu, Autism in Africa: prevalence, diagnosis, treatment and the impact of social and cultural factors on families and caregivers: a review. Annals of Medicine and Surgery, 2023. **85**(9): p. 4410-4416.

[21] Oisaghie, O., Autism Awareness in Nigeria, Its Implications and a Call to Action. 2022, Saint Mary's College of California.

[22] Shiundu, S. and R.W. Kikechi, Delayed Speech Development and Academic Performance of Autistic Learners in Special Schools in Bungoma County, Kenya. African Journal of Empirical Research, 2024. **5**(3): p. 119–129-119–129.

[23] Samia, P., et al., Childhood autism spectrum disorder: insights from a tertiary hospital cohort in Kenya. African journal of health sciences, 2020. **33**(2): p. 12-21.

[24] Mligo, I. and S.A. Muhammed, Challenges of Assessment of Learners with Disabilities in Pre and Primary Schools: Experience from Rukwa Region in Tanzania. Gifted: Journal of Early Childhood Education, 2024. **2**(1): p. 29-36.