Research Article

Management of Echolalia in Children with ASD: Effectiveness of a Novel Behavioural Approach

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Abstract

Background: Echolalia in autism spectrum disorder (ASD) is often characterized as a non-functional, stereotypical behavior that contributes to communication breakdowns and social stigma. As a maladaptive speech pattern, it warrants significant reduction to promote meaningful communication.

Aim: This study evaluates the impact of temporarily reducing florid speech on echolalia in children with ASD.

Methods: An observational study was conducted at a child development center in Mumbai, involving 114 children aged 3–18 years with ASD and echolalia. Caregiver-reported data on echolalia, eye contact, and response to gestural commands were collected at baseline, 4 weeks, and 8 weeks. Participants underwent the New Horizons Developmental Program (NHDP), which focused on parental coaching, non-verbal communication strategies, and elimination of excessive verbal prompting. Descriptive statistics analysed outcomes, and logistic regression assessed predictors of echolalia reduction.

Results: Echolalia reduced in 59.65% of participants by 4 weeks and 71.93% by 8 weeks. Eye contact improved in 75.96% at 4 weeks and 84.62% at 8 weeks. Gestural responsiveness improved in 53.85% at 4 weeks and 82.42% at 8 weeks. Improved eye contact significantly contributed to echolalia reduction (coefficient: +0.4147).

Limitations: The absence of a control group and reliance on caregiver-reported outcomes limit causal interpretation, with potential confounders further influencing the validity of the findings.

Conclusion: Prioritizing non-verbal communication before verbal communication is essential. A transient reduction in florid speech can mitigate echolalia, fostering purposeful language acquisition through a developmentally aligned approach. Further trials are needed to validate these strategies.

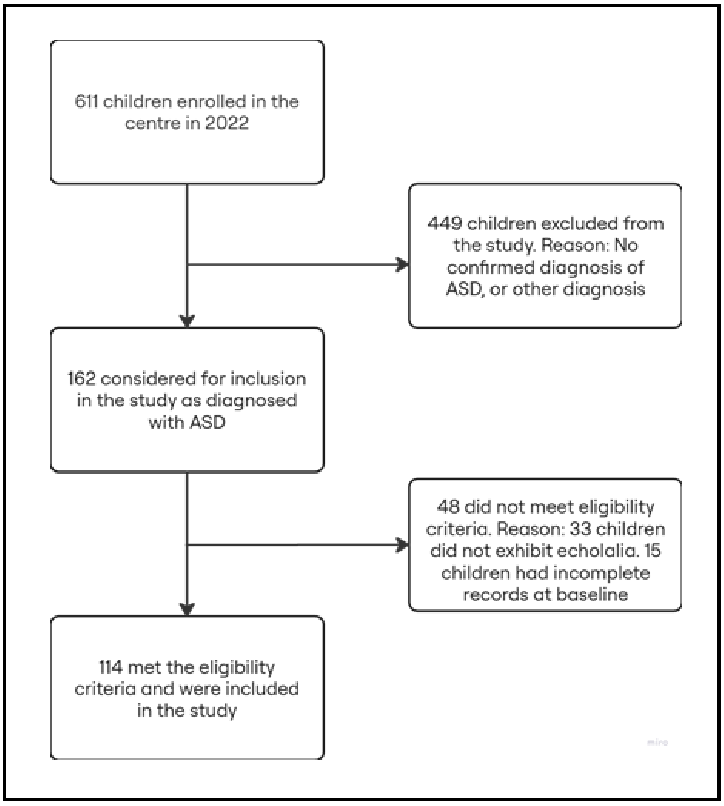
Keywords: Autism spectrum disorder, echolalia, non-verbal communication, eye contact, parental coaching

Introduction

Echolalia, the verbatim repetition of words or phrases previously heard from various sources, is observed across neurocognitive disorders but holds particular significance in autism spectrum disorder (ASD) [1]. While echolalia is a natural phase in early language development, it persists beyond the expected period in children with ASD, often serving as a clinical marker for diagnosis [2,3]. Though some researchers believe echolalia serves a communicative function, it often leads to communication breakdowns and social stigmatization in ASD [4]. Being a maladaptive form of speech that does not serve much useful purpose [5], echolalia needs to be discouraged and stopped [6].

Our observation is that many caregivers, in an effort to stimulate speech, inadvertently reinforce echolalia through persistent verbal prompting. Increased verbal stimulation, rote learning of alphabets, numbers and rhymes due to screen exposure, may contribute to its persistence. Children with ASD may mechanically reproduce words without semantic or pragmatic relevance, further hindering development of communication. Consequently, even during language training, they may echo speech without understanding, as they struggle to distinguish which vocalizations are meant for repetition [7]. Given their inclination to mimic patterned behaviors [8], we hypothesized that excessive verbal stimulation before achieving foundational social engagement, behaviour and non-verbal communication milestones may reinforce echolalia and hinder meaningful language acquisition in ASD [9]. Alleviating the child of persistent pressure to speak should be a primary consideration in managing echolalia in autism. This study investigates the effect of temporary withdrawal of incessant caregiver speech on reduction of echolalia in ASD and proposes a developmentally aligned intervention.

Figure 1. Flowchart depiction of enrolment of study participants



Material and Methods

This observational retrospective study of a cohort of children with echolalia was conducted at a child development centre in Mumbai between January to December 2022. 114 children, aged 36 to 216 months, with a diagnosis of ASD and echolalia based on DSM-V, were eligible for inclusion. Figure 1 presents a flowchart of participant selection, illustrating the process from initial enrolment to final inclusion in the study.

Significant terms (e.g. echolalia, eye contact, gestural commands) were defined and explained to caregivers during their Outpatient Department (OPD) visit (Table 1). At the first visit, caregivers provided information regarding echolalia, eye contact (categorized as good, fair or poor) and response to gestural commands (categorized as not following, following simple commands, or following complex commands) based on their perception. This information was recorded as baseline data. Caregivers were explained about the Developmental Program, including the intervention and the actions to be taken at home. Follow-up assessments were conducted at four and eight weeks, during which caregivers reported changes in echolalia, eye contact, and response to gestural commands. A developmental pediatrician recorded these observations in patient files. Data for this study were obtained from the existing records maintained by the child development center, which systematically collects clinical and intervention data from enrolled patients during routine evaluations. Cases with incomplete data at baseline were excluded, and no data imputation was performed.

The data of participants meeting the eligibility criteria was extracted from case papers, ensuring the removal of personal identifiers such as names and contact details. Once anonymized data sheets were obtained, relevant information was recorded in an electronic case record form (CRF) using Microsoft Excel for Mac (Version 16.43). Key variables collected included age (in months), clinical manifestations, family structure (nuclear or joint), and responses of echolalia and eye contact to intervention. Additionally, the child's reaction to non-verbal and gestural commands was documented in the CRF. The data was collected from three different time points: baseline (at presentation), four weeks, and eight weeks. Data collection adhered to ethical guidelines for retrospective research, ensuring confidentiality and compliance with institutional policies.

The primary outcome measure was the proportion of children demonstrating a significant reduction in echolalia at four and eight weeks of intervention as reported by caregivers. Secondary outcome measures included the proportion of children showing any improvement in eye contact and response to gestural commands at these time points. While potential confounders such as screen time and parental involvement were acknowledged, they were not directly adjusted for in the analysis due to the retrospective nature of data collection. Sample size was determined using the formula: $Z^2 * (p)(1-p) / e^2$. Assumptions included a 95% confidence level ($Z = 1.96$), an expected echolalia reduction rate of 50% ($p = 0.5$), and a margin of error ($e = 0.04$). The resulting minimum sample size was 114 participants, ensuring sufficient statistical power. This selection was informed by previous studies on echolalia interventions, where sample sizes were **often smaller (<50 participants) [10, 11]**, limiting statistical power and generalizability. By including **a larger cohort**, this study aims to provide **more reliable estimates** of intervention effects. [10, 11]. To minimize observer bias, a co-investigator independently reviewed data entries for accuracy using predefined criteria. Additionally, an external referee conducted an independent audit to verify data integrity. Any discrepancies or missing data were cross-checked against the original source records to ensure consistency and reliability. All case record forms and related study materials were securely stored.

Statistical Analysis: Descriptive statistics were used to analyse various parameters, including age, screen time, and number of family members (reported as range, median, interquartile range, mean, and standard deviation). The male-to-female ratio and distribution of nuclear versus joint families were presented as actual numbers and percentages. The severity of various manifestations at presentation and follow-up was documented using actual counts, ratios, and percentages. A two-sample t-test was conducted for continuous variables (e.g., age), while a chi-square test was applied for categorical variables (e.g., gender). A p-value < 0.05 was considered statistically significant.

Table 1: Definition of the terms used in the study

Term	Description/ Definition
Echolalia	A pathological, parrot-like and apparent senseless repetition or echoing of a word or phrase uttered by another person beyond the age of three years
Significant reduction in echolalia	Over 50% reduction in echolalia as compared to the baseline*
Eye contact	The situation or event in which two individuals look at each other's eyes at the same time [20]
No eye or poor eye contact	No eye contact or fleeting eye contact or momentary eye contact
Eye contact, Fair	Better than fleeting eye contact but ill-sustained and sub-optimal*
Eye contact, good	Sustained optimal eye contact*
Gestural commands	Following instructions given non- verbally using gestures
Simple Gestural commands	Child demonstrating following of one-step gestural commands such as come, sit, eat*
Complex Gestural commands	Two- or three step gestural commands like 'give the cup to mum'*
Gestural commands, not followed	Child not following majority of gestural commands*
Simple gestural commands followed	Child following simple one step gestural commands such as come, sit, eat*[21]
Complex gestural commands followed	Child following complex gestural commands (including more than two or three step commands) like 'give the cup to mum' majority of times*

*As assessed and reported by the caregiver/ parent

Results

In 2022, the child development centre provided care to 611 patients with developmental and behavioral disorders; among them, 162 (26.51%) were diagnosed with ASD. Of these, 114 (70.37%) children aged 37–130 months met the eligibility criteria. Boys (n=90) accounted for 78.95% of participants (male-to-female ratio: 3.75:1). The median age was 53.5 months (IQR: 44–70 months), and data on family structure (n=106) showed an equal distribution of nuclear and joint families.

At baseline, most participants exhibited significant deficits in non-verbal communication skills, with 104 (91.22%) having suboptimal eye contact and 91 (79.82%) showing poor responses to gestural commands. Given their chronological age, all participants should have developed appropriate eye contact and the ability to follow simple and complex commands. However, only 23 (20.18%) participants could follow complex gestural commands, while 60 (52.63%) showed no response at all.

Table 2: Outcomes of NHDP Intervention on Echolalia, Gestural Commands, and Eye Contact at 4 and 8 Weeks (N=114)

Outcome Parameter	Baseline n (%)	4 Weeks n (%)	8 Weeks n (%)
Echolalia			
Improved (Reduced)	–	68 (59.65%)	82 (71.93%)
No Change	114 (100%)	46 (40.35%)	30 (26.32%)
Deterioration	–	0 (0%)	2 (1.75%)
Gestural Commands			
Follows complex commands (Optimal)	23 (20.18%)	35 (30.70%)	61 (53.51%)
Follows simple commands (Suboptimal)	31 (27.19%)	57 (50.00%)	44 (38.60%)
Follows no commands	60 (52.63%)	22 (19.30%)	9 (7.89%)
Eye Contact			
Good (Optimal)	10 (8.77%)	27 (23.68%)	57 (50.00%)
Fair (Suboptimal)	26 (22.80%)	75 (65.79%)	50 (43.86%)
Poor	78 (68.42%)	12 (10.53%)	7 (6.14%)

Note: Percentages reflect proportions at each time point (baseline, 4 weeks, and 8 weeks) out of the total study population (N=114)

Table 2 summarizes the outcomes following NHDP intervention, illustrating substantial improvements across echolalia, gestural commands, and eye contact at baseline, 4 weeks, and 8 weeks.

Table 3: Comparison of characteristics of children whose echolalia improved by 8 weeks with others whose echolalia did not improve.

Parameter	Echolalia reduction at 8 wk. (n2= 82)	Echolalia non-reduction at 8 wk. (n3= 32)	Statistical significance
Age range (mo.) *	37- 120	37- 130	NA
Age, Mean+ SD (mo.)	61.25+ 17.34	55.03+ 21.48	P= 0.231*
Boys (%)	63 (76.83)	27 (84.38)	P= 0.527†; $\chi2$= 0.398
No. of participants with Sub-optimal gestural commands at baseline (n4= 91)	63 (76.83)	28 (87.5)	p= 0.283
No. of participants with Sub-optimal eye contact at baseline (n5= 104)	74 (90.24)	30 (93.75)	p= 0.414
No. of participants with optimal eye contact at baseline (n6=10)	8 (9.75)	2 (6.25)	p= 0.33
No. of participants with no improvement in gestural commands at 8 weeks (n7= 9)	6 (7.31)	3 (9.37)	p= 0.478
No. of participants with No improvement in eye contact at 8 weeks (n8= 15)	7 (8.54)	8 (25.00)	p= 0.021
No. of participants with optimal response to gestural commands at baseline (n9= 23)	19 (23.17)	4 (12.5)	p= 0.204
No. of participants who showed improvement in gestural commands at 8 weeks.	53 (64.63)	23 (71.88)	p= 0.152
No. of participants who showed improvement in eye contact at 8 weeks	67 (81.71)	22 (68.75)	p= 0.067

Figures in parentheses indicate percentages
NA: Not applicable
*: Statistical test applied: Two sample t test
†: Statistical test applied: Chi-square test

A significant reduction in echolalia was observed, with improvement reported in 82 participants (71.93%) at 8 weeks. Only two participants (1.75%) experienced deterioration attributed to factors such as increased screen exposure and inconsistent adherence to non-verbal strategies. Responses to gestural commands improved markedly, with optimal command-following increasing from 23 (20.18%) participants at baseline to 61 (53.51%) at 8 weeks. Participants unresponsive to gestural commands decreased from 60 (52.63%) at baseline to 9 (7.89%) at 8 weeks. Similarly, optimal eye contact improved, rising from 10 (8.77%) participants at baseline to 57 (50%) at 8 weeks. Poor eye contact declined from 78 (68.42%) participants to 7 (6.14%) over the same period.

Table 3 highlights significant improvements in communication following echolalia intervention at 8 weeks. Among 82 participants (mean age: 61.25 ± 17.34 months), 76.83% initially had sub-optimal responses to gestural commands, and 90.24% exhibited poor eye contact. Post-intervention, 64.63% showed improved responses to gestural commands and 81.71% demonstrated better eye contact. Only 7.31% and 8.54% showed no improvement in these areas respectively. To evaluate predictors of

echolalia reduction, statistical analysis showed that eye contact improvement trended toward significance (p=0.067), while improvement in gestural command response was not statistically significant (p=0.152). A logistic regression model was applied to assess their combined influence on echolalia reduction. The model showed that better eye contacts improved echolalia (coefficient: +0.4147), while gestural command response had no direct impact (coefficient: -0.4147). This suggests gestural improvements alone are insufficient, and require additional support. The near-zero intercept indicated no bias toward improvement or non-improvement. Overall, the results indicate that most participants experienced a reduction in echolalia and improvements in gestural responses and eye contact within 4 to 8 weeks of NHDP intervention.

Table 4: Comparative Percentage Improvements Across Studies

Study Name	Echolalia Reduction (%)	Eye Contact Improvement (%)	Gestural Command Improvement (%)	Time Frame	Sample Size (n)
NHDP Study	71.93% (82/114)	84.62% (88/104)	82.42% (75/91)	8 weeks	114
Cues-Pause-Point (CPP) Study [7]	65% (varied across children)	Not Reported	Not Reported	6-12 weeks	3
Total Communication Study [22]	72% (Group I) 63% (Group III)	Not Reported	Not Reported	3-9 months	1 (case study)
Tact Training Study [19]	50% - 60%	Not Reported	Not Reported	7 weeks	3
Response Interruption & Redirection (RIRD) Study [23]	Reduction, but data not reported	No improvement	No improvement	Several months	5
Differential Reinforcement of Low Rates (DRL) Study [24]	93% (from 4.7 to 0.3 repeats/min)	Not Reported	Not Reported	18 months	1 (case study)
Computer-Based Intervention Study [25]	Reduction (exact % not reported)	Improved (exact % not reported)	Improved (exact % not reported)	Varied	3
Palilalia Reduction via Tact Corrections [26]	Significant reduction (Exact % not reported)	Not Reported	Increased Mands & Tacts	6 weeks	4
Fenfluramine Study [27]	No Significant Reduction	Not Reported	Not Reported	Varied	10
Functional Verbal Labeling Study [28]	100% elimination (with training)	Not Reported	Not Reported	4 weeks	2
Intraverbal Training Study [29]	Not directly measured	Not Reported	Not Reported	Varied	3

Discussion

Our study evaluated the effect of the NH Developmental Program (NHDP) on reducing echolalia and improving social communication in children with autism spectrum disorder (ASD). Findings demonstrated that after eight weeks of intervention, 71.93% of participants exhibited a reduction in echolalia, while gestural command-following improved from 20.18% to 53.51%, and optimal eye contact increased from 8.77% to 50%. Logistic regression analysis showed that eye contact improvement was positively associated with echolalia reduction (p=0.067; coefficient: +0.4147), though gestural command-following alone did not significantly predict echolalia reduction (p=0.152; coefficient: -0.4147). These findings suggest that while non-verbal communication skills such as gestural communication are crucial, eye contact may play a more direct role in modifying repetitive speech behaviors.

Historically, echolalia and pronoun reversals in children with autism were noted by Kanner in 1943. Successive Diagnostic and Statistical Manual (DSM) editions, included this as and under “peculiar speech patterns” (DSM-III), “stereotyped and repetitive use of language” (DSM-IV), and “restricted, repetitive behaviors” in DSM-V. Early literature viewed echolalia as a disruptive behavior warranting suppression. By the 1980s, it was recognized for its communicative and developmental functions [12]. It was advocated that children with ASD relied on echolalia as a primary linguistic strategy to compensate for their limited communication skills [13]. Some researchers have posited that children with poor receptive language skills produce significantly more echolalic utterances than those with more age-appropriate receptive abilities [14]. Contemporary perspectives remain divided between those considering echolalia pathological and those viewing it as a natural strategy within gestalt language processing [15, 16]. Echolalia is often characterized as a non-functional, self-stimulatory or stereotypical behavior, though some believe it serves various functions for individuals with autism and contributes to language development. The reduction or elimination of echolalia is often set as a therapeutic goal and is generally regarded as a positive intervention outcome [17].

This study has several limitations. The absence of a control group limits the ability to establish a causal relationship between NHDP and observed improvements. Additionally, the reliance on caregiver-reported outcomes introduces potential reporting bias. Other confounding factors, such as baseline cognitive abilities, parental engagement, and environmental factors may have influenced the outcomes. While the study demonstrates short-term improvements, it does not assess the long-term retention of these gains, making follow-up studies essential.

When compared to existing interventions (Table 4), NHDP shows a higher rate of echolalia reduction (71.93%) than Cues-Pause-Point (65%) and Tact Training (50-60%), and is comparable to Total Communication strategies (72%). However, the Differential Reinforcement of Low Rates (DRL) approach reported a 93% reduction, but its findings are based on single-case studies, limiting generalizability. Similarly, Response Interruption and Redirection (RIRD) effectively reduces echolalia, but it does not improve eye contact or gestural communication, making it less effective in promoting holistic language development. Pharmacological interventions such as Fenfluramine failed to show a significant reduction in echolalia, reinforcing the importance of developmental and interaction-based strategies. Notably, technological approaches (e.g., video modeling, computerized interventions) have shown some success, but their impact on real-world social communication skills remains uncertain. [1, 13, 18, 19]

Unlike traditional interventions that primarily aim at verbal imitation, scripted speech, or suppression of echolalia, NHDP prioritizes non-verbal communication and social engagement before targeting speech production. This approach aligns with the natural developmental trajectory of language acquisition, where children typically develop non-verbal communication skills such as eye contact and gestural communication before spoken language emerges. NHDP moves away from rote memorization and repetitive verbal conditioning, instead emphasizing interactive, spontaneous communication. The caregiver-mediated model fosters meaningful parent-child interactions, reinforcing social engagement and reducing passive language exposure. Additionally, the program discourages screen exposure, ensuring that children receive active, real-time social communication input rather than passive, one-way verbal stimulation.

The findings have important implications for clinical practice. Given its home-based, caregiver-driven model, NHDP is highly scalable and feasible for implementation in community settings without requiring intensive professional training or specialized equipment. Unlike structured behavioral interventions that demand direct therapist involvement, NHDP leverages parental coaching to extend intervention benefits beyond clinical settings, making it particularly relevant for resource-limited settings where access to specialized intervention services is limited.

Conclusion

Future research should focus on randomized controlled trials (RCTs) with control groups to further validate NHDP's effectiveness and examine its long-term impact on language development. NHDP provides a developmentally appropriate, caregiver-mediated intervention that effectively reduces echolalia while improving eye contact and non-verbal communication skills. Its scalable, naturalistic approach makes it a viable alternative to traditional echolalia interventions, prioritizing meaningful communication over rote verbal conditioning. Given its promising outcomes, further research is warranted to establish causal efficacy, optimize intervention strategies, and expand accessibility for children with ASD. Our study provides valuable insights to guide targeted interventions focused on reducing echolalia and promoting purposeful language acquisition. It also establishes a foundation for future research to refine intervention strategies for optimal developmental outcomes.

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