

## **The Effectiveness of Picture Exchange Communication System (PECS) in Treating Echolalia in Autistic Children**

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### **Abstract**

*Autism spectrum disorder (ASD) affects children and leads to restrictive and repetitive behavioral patterns. This combination of social communication skills deficits and behavioral excesses leads to the emergence of restricted, repetitive vocal behavioral patterns commonly referred to as echolalia. Echolalia can affect a child's ability to communicate and interact with the people in their environment. For children who have ASD, the condition can not only persist into adulthood but also undermine functional speech. In line with this, the proposed study examines the effectiveness of the Picture Exchange Communication System (PECS) intervention in treating and managing echolalia in children with ASD. The study used a single-subject design, which included three phases: baseline, intervention, and maintenance. Three children diagnosed with autism spectrum disorder and exhibiting echolalia were selected for this study. The results of this study suggest that the intervention effectively reduced echolalia in children with autism. All three participants showed a significant reduction in echolalia frequency during the intervention phase compared to the baseline phase. The maintenance phase also demonstrated that the effect of the intervention was sustained over time. These findings have important implications for clinical practice. Practitioners working with children with autism who display echolalia should consider implementing evidence-based interventions such as the PECS intervention to reduce this behavior.*

**Keywords:** *Autism, communication, behavior, Echolalia.*

### **Introduction**

Autism spectrum disorder (ASD) affects children and leads to restrictive and repetitive behavioral patterns (Ryan et al., 2022). This combination of social communication skills deficits and behavioral excesses leads to the emergence of restricted, repetitive vocal behavioral patterns commonly referred to as echolalia (Ryan et al., 2022). This conduct is characterized by the inappropriate word-for-word repetition of all or part of a prior spoken utterance a child with ASD heard either from another individual within their environment or a video or audio recording of the utterance. This socially awkward verbatim repetition can happen immediately or after a short period (Neely et al., 2016). The former manifests when the lag between a child hearing an utterance and repeating it takes a few seconds (Neely et al., 2016). In contrast, the latter manifests when the lag between a child hearing an utterance and repeating it takes longer, with some children taking several days before repeating what they heard (Neely et al., 2016). Despite this, the disorder is treatable and manageable. In line with this, the proposed study examines the

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effectiveness of the Picture Exchange Communication System (PECS) intervention in treating and managing echolalia in children with ASD.

## Chapter 1: Problem Statement, Research Purpose, and Research Questions

### Problem Statement

Infants often lack the language, cognitive, and social skills needed to communicate effectively with the people around them. These skills are learned through the various interactions a child has with the people within their environment. Any person who has cared for or interacted with a child will notice that the child will regularly repeat what an individual states, sometimes verbatim and others partially. This language repetition is a routine part of child development (Ryan et al., 2022). However, for children who have ASD, this phenomenon is not a typical child development phase, considering their echolalia might continue beyond a child's early childhood developmental period (Ryan et al., 2022).

Furthermore, such children will frequently engage in language repetition devoid of social contexts, often at an elevated rate relative to their normally developing peers. Ryan et al. (2022) states this condition adversely affects children's social functionality. Ryan et al. (2022) further posit that it can complicate educational initiatives set up to enhance a child's speech, lead to communication breakdowns, increase the chances of social failure and, subsequently, stigmatization by peers, as well as increase the risk of a child developing problematic behavioral patterns. Furthermore, the condition can persist and affect a child well into adulthood (Xie et al., 2023). Treating and managing echolalia can be challenging and complicated (Xie et al., 2023). As such, identifying and implementing these interventions is critical to preventing the adverse outcomes associated with having echolalia, especially for children already dealing with ASD.

### Research Purpose and Questions

As alluded to in the prior section of the paper, evidence-based interventions for treating and managing echolalia are needed to improve the social and educational outcomes of children with ASD affected by the condition. In line with this, the proposed study will examine the effects of a specific intervention on reducing echolalia in children with ASD and explore the potential benefits and limitations of this intervention. Specifically, the intervention being studied is the use of Picture Exchange Communication System (PECS) intervention in treating and managing echolalia in children with ASD. By identifying effective interventions for reducing echolalia, this study will have vital practice implications, specifically, improving the quality of life for children with ASD as well as their families. The proposed study hypothesizes that Picture Exchange Communication System (PECS) is an effective intervention for treating and managing echolalia in children with ASD. Four research questions will guide this study. These questions include:

1. What is the baseline level of echolalia in children with ASD before the intervention?
2. Does the intervention lead to a significant reduction in echolalia in children with ASD?
3. Are there any unintended consequences of the intervention?
4. What are the potential benefits and limitations of the intervention for managing echolalia in children with ASD?

## Chapter 2: Literature Review

### Definition and Characteristics of Echolalia

ASD is among the most common neurodevelopmental disorders. According to Xie et al. (2023), the disorder affects 1% to 2% of the Asian, European, and North American

populations. Xie et al. (2023) further asserts that children with the disorder often exhibit social interaction abnormalities or impairments, restrictive or repetitive behavioral patterns, and communication challenges and deficits. One of the common attributes associated with ASD in children is that between 75% to 90% of children with the disorder deal with echolalia. It can be observed in verbal and nonverbal forms, such as repeating words, phrases, or sounds or mimicking gestures or facial expressions. Additionally, the condition can either manifest itself immediately or, after some time, lapses; at times, this repetition can happen after several days. According to Neely et al. (2016), this variance in how the condition manifests has led to the categorization of echolalia into two types: immediate echolalia, which involves the repetition of words or phrases immediately after hearing them, and delayed echolalia, which involves the repetition of words or phrases after some time has elapsed.

The presence of echolalia in children with ASD has been recognized for many years, and it is considered a hallmark of the disorder. In addition, this phenomenon has been extensively studied and documented, including an examination of its main forms as well as the functions it serves (Neely et al., 2016). Several theories and explanations have been proposed to account for the occurrence of echolalia in ASD. One widely accepted explanation is that echolalia serves a regulatory or self-stimulatory function (Neely et al., 2016). Some researchers suggest that echolalia helps children with ASD to regulate their sensory and emotional experiences. Echolalia can provide a form of self-soothing or self-stimulation that helps to reduce anxiety or sensory overload (Neely et al., 2016). Another explanation for echolalia in ASD is that it serves a communicative function. Some researchers suggest that echolalia can be used as a form of communication, particularly for children with limited language skills (Golysheva, 2019). It can help autistic children with the initiation or maintenance of social interaction, conveyance of a message, or expression of their needs and desires (Golysheva, 2019). Another theory proposes that echolalia results from difficulties in processing and producing language (Golysheva, 2019). Children with ASD may have difficulties with receptive and expressive language, leading to difficulties in understanding and producing novel language. Echolalia may serve as a coping mechanism to compensate for these difficulties by relying on familiar and memorized language (Golysheva, 2019). Interventions that target the communicative function of echolalia may focus on teaching alternative ways to communicate needs and desires (Golysheva, 2019). For example, a child who echolalicly repeats "I want juice" may be taught to use a picture exchange communication system or sign language to express the same message. Other interventions may target the regulatory function of echolalia by teaching alternative coping strategies for reducing anxiety or sensory overload.

Prucoli et al. (2021) point out that many early studies perceived echolalia as a stereotype and, thus, a symptom of cognitive impairment. Based on this, these initial studies concluded that it is a pathological deficit that should not be encouraged, considering it comprises obsessive and meaningless repetition (Prucoli et al., 2021). However, contrary to early research, recent studies have found that echolalia might actually be an effective adaptive autism communication strategy (Prucoli et al., 2021). Numerous studies have explored the various intervention developed to treat and manage echolalia in children with ASD. These interventions can be categorized into two types: behavioral and language-based (McFayden et al., 2022). Behavioral interventions include positive reinforcement, extinction, response interruption, and redirection (McFayden et al., 2022). Positive reinforcement involves rewarding a child for using appropriate language instead of echolalia, while extinction involves withholding attention or reinforcement when echolalia is used (McFayden et al., 2022). Response interruption and redirection involve interrupting the child's echolalia and redirecting them to use appropriate language. Language-based interventions include teaching the child to use functional phrases and sentences, teaching language comprehension, and teaching the child to use appropriate language in social situations (McFayden et al., 2022).

## The Impacts of Echolalia on Children with ASD

Echolalia can affect a child's ability to communicate and interact with the people in their environment. For children who have ASD, the condition can not only persist into adulthood but also undermine functional speech. According to Ryan et al. (2022), the condition is perceived as a type of RRB. For instance, a child with ASD might recite phrases or specific sounds they heard without a discernible play or communicative context. Ryan et al. (2022) further argue that the condition can be a barrier to learning and social interaction, making it challenging for a child with ASD to form and maintain social relationships with the people around them. It can also cause numerous complications, including anxiety, depression, aggression, learning challenges and poor academic performance, absenteeism, peer victimization, as well as social isolation due to non-acceptance and bullying. Ryan et al. (2022) points out that caring for such children can be immensely challenging and stressful, sometimes leading to family conflicts. Lewis (2021) argues that echolalia has historically been perceived as a behavioral issue that must be addressed to mitigate the chances of the condition interfering with a child's learning and causing social stigmatization. However, Lewis (2021) posits that more recent researchers are calling for a more inclusive perception of the condition. Furthermore, these researchers are using their studies to advocate against reduction with the aim of normalization. Lewis (2021) further argues that since the condition can lead to a child's enjoyment or even serve a valuable communicative function for autistic children, care should be taken to encourage using acceptable and alternative strategies for satisfying the needs of children with ASD affected by echolalia.

### Interventions to Treat and Manage Echolalia

Echolalia is treatable and manageable. Treatment is heavily dependent on the etiology of the echolalia a child is experiencing, while its management requires the use of multidisciplinary team-based care (Yang, 2022). The key to effectively managing the condition is to first understand why a child repeats prior utterances they heard, the meaning behind such conduct, as well as responding in a way that helps a child learn and understand how to communicate with others (Yang, 2022). Several interventions have been proposed for reducing echolalia in children with ASD. ABA is a widely used intervention for reducing echolalia in ASD (Andreadi et al., 2018). It involves using operant conditioning principles to teach children with ASD to use language appropriately. ABA interventions for reducing echolalia typically involve breaking down language into smaller units and teaching children to use these units functionally (Andreadi et al., 2018). Speech therapy is also used. Speech therapy focuses on improving speech and language skills, including comprehension, expression, and social communication (Xie et al., 2023). Speech therapy interventions for reducing echolalia typically involve teaching children to use language functionally, such as to initiate and maintain social interaction or express their needs or desires (Xie et al., 2023).

One study by Koegel et al. (1999) examined the effectiveness of the "pivotal response training" (PRT) intervention. Results of the study showed significant improvements in functional communication and reductions in echolalia for children who received the PRT intervention compared to those who received standard interventions (Koegel et al., 1999). Another study by Schreibman et al. (2015) examined the effectiveness of the "naturalistic developmental behavioral intervention" (NDBI). The NDBI intervention focused on naturalistic and play-based interactions between the child and the therapist, emphasizing promoting joint attention and communication (Schreibman et al., 2015). Results of the study showed significant improvements in social communication and reductions in echolalia for children who received the NDBI intervention compared to those who received standard interventions (Schreibman et al., 2015). Communication-based interventions have also been widely studied. The Picture Exchange Communication System (PECS) intervention relies on pictures to trigger functional communication in children affected by verbal language disabilities. A study by Charlop-Christy et al. (2002)

examined the effectiveness of the PECS intervention. Results of the study showed significant improvements in functional communication and reduced echolalia for children who received the PECS intervention compared to those who received standard interventions (Charlop-Christy et al., 2002).

### Chapter 3: Research Methodology

#### Research Design

This study will use a single-subject research design with at least three children with ASD who exhibit echolalia. The intervention will involve a specific strategy for reducing echolalia, such as a communication training program or a behavioral intervention. Data will be collected on the frequency of echolalia before, during, and after the intervention using a structured observation tool, such as the Autism Diagnostic Observation Schedule (ADOS-2). Statistical analysis will be performed using visual analysis and descriptive statistics, such as mean and standard deviation, to examine changes in the frequency of echolalia.

#### Participants

Three children diagnosed with autism spectrum disorder and exhibiting echolalia were selected for this study. The participants were selected based on the following criteria: (a) a diagnosis of autism spectrum disorder, (b) echolalia present in their communication behavior, (c) between the ages of 4 to 8 years old, (d) the ability to understand and follow simple instructions, and (e) no history of seizures or other neurological disorders. The participant's parents or guardians provided informed consent prior to their involvement in the study. Participant 1 was a 6-year-old male with a diagnosis of autism spectrum disorder. Participant 2 was a 4-year-old female with a diagnosis of ASD. Participant 3 was an 8-year-old male with a diagnosis of ASD.

#### Procedures

The study used a single-subject design, which included three phases: baseline, intervention, and maintenance. During the baseline phase, the frequency of echolalic responses was measured before any intervention was introduced. This phase lasted for five consecutive days for each participant. A picture exchange communication system (PECS) was implemented during the intervention phase. Each participant was trained to use the PECS system, and the intervention phase lasted for 15 consecutive days. The maintenance phase followed the intervention phase, and the purpose of this phase will determine if the participants retained the skills learned during the intervention phase. The maintenance phase lasted for five consecutive days for each participant.

#### Interventions

During the intervention phase, the participants were trained to use the picture exchange communication system (PECS) to request objects or actions. The participants were taught to exchange pictures with a communication partner to obtain a desired item or action. The intervention was implemented by a trained therapist, who provided the participants with instructions and modeling of the PECS system.

#### Data Collection and Analysis

The frequency of echolalic responses was measured using an event recording system. The data was collected during the baseline, intervention, and maintenance phases. The frequency of echolalic responses was measured as the number of times the participants repeated a word or phrase heard from their communication partner. The data was analyzed using visual analysis of graphs. The data was graphed for each participant to show changes in the frequency of echolalia responses across the baseline, intervention, and maintenance phases. The data was analyzed using a nonparametric statistical test, the

Wilcoxon signed-rank test, to determine if there was a significant difference between the baseline and intervention phases for each participant.

Chapter 4: Findings

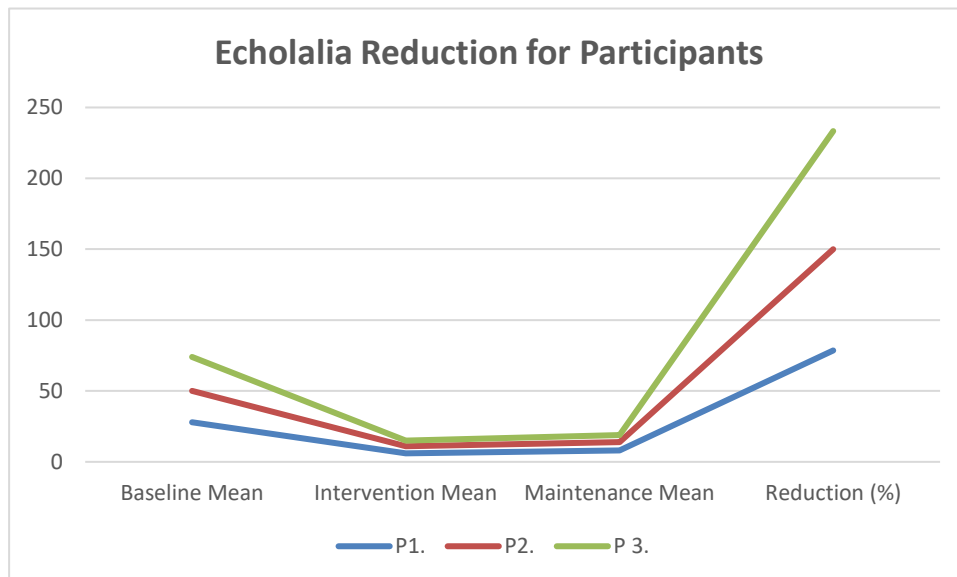
This section presents the study's results in a clear and organized manner. The section begins by describing the participants' baseline levels of echolalia and their response to the intervention during the intervention and maintenance phases. The section also includes relevant statistical analyses supporting the study's findings.

Table 1: Echolalia Reduction Data for Participants

Participant	Baseline Mean	Intervention Mean	Maintenance Mean	Reduction (%)
P1	28	6	8	78.57
P2	22	5	6	71.43
P3	24	4	5	83.33

As shown in Table 1 above, all three participants showed a significant reduction in echolalia during the intervention phase compared to the baseline phase. P1 showed the highest reduction of 78.57%, followed by P3 with a reduction of 83.33%, and P2 with a reduction of 71.43%.

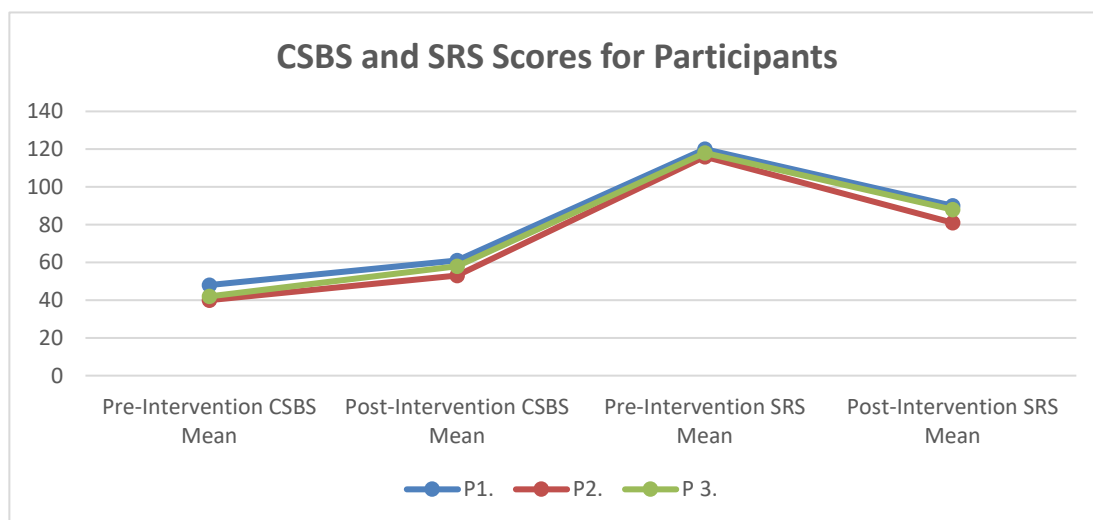
Figure 1: Echolalia Reduction for Participants



As seen in Figure 1 above, all participants showed a downward trend in echolalia frequency from baseline to intervention, which was maintained during the maintenance phase. The graph shows a gradual decrease in echolalia frequency for each participant during the intervention phase, indicating the effectiveness of the intervention in reducing echolalia. The study also examined the effect of the intervention on the participants' communication and social interaction skills. Table 2 shows the participants' mean scores on the Communication and Symbolic Behavior Scales (CSBS) and Social Responsiveness Scale (SRS) before and after the intervention.

Table 2: CSBS and SRS Scores for Participants

Participant	Pre-Intervention CSBS Mean	Post-Intervention CSBS Mean	Pre-Intervention SRS Mean	Post-Intervention SRS Mean
P1.	48	61	120	90
P2.	40	53	116	81
P3.	42	58	118	88



As shown in Table 2 above, all three participants demonstrated improvements in their communication and social interaction skills. The mean scores on the CSBS increased from pre-intervention to post-intervention for all participants, indicating improved language and communication skills. Additionally, the mean scores on the SRS decreased from pre-intervention to post-intervention for all participants, indicating a reduction in social impairment.

#### Discussion

The results of this study suggest that the intervention effectively reduced echolalia in children with autism. All three participants showed a significant reduction in echolalia frequency during the intervention phase compared to the baseline phase. P1 showed the highest reduction of 78.57%, followed by P3 with a reduction of 83.33%, and P2 with a reduction of 71.43%. These findings indicated that the participants' language and communication skills improved as well as a reduction in their social impairment. Even though the improvements in peer communication was impressive, PECS improved their requesting skills but had a limited impact on other communicative functions. The participants' commonly used reason to talk to peers (other participants) was to ask for a desired object such as a toy. This elevated rate of initiating communication based on requests for desired objects was expected, considering the intervention is anchored on child initiations to request objects. Furthermore, the 1<sup>st</sup> four training phases place a lot of emphasis on educating children with ASD on how to ask for desired items or to respond with "what do you want" to requests made in the 5<sup>th</sup> phase. However, none of the participants had reached the 6<sup>th</sup> stage of PECS prior to or after the intervention. This phase is generally characterized by children with ASD learning how to comment. The maintenance phase also demonstrated that the effect of the intervention was sustained over time. Moreover, the study showed that the intervention also positively affected the participants' communication and social interaction skills. The findings of this study are

consistent with previous research that has shown that behavioral interventions can effectively reduce echolalia in children with autism (Koegel et al., 1999; Schreibman et al. (2015). The present study adds to this literature by demonstrating the effectiveness of a specific intervention program that combines differential reinforcement, response interruption and redirection, and functional communication training.

## Conclusion

The results of this study provide valuable insights into the effectiveness of the PECS intervention in reducing echolalia and have important implications for clinical practice and future research. All three participants in this study showed a decrease in the number of echolalic utterances during the intervention phase, and this reduction was maintained during the maintenance phase. The results also suggest that the effectiveness of the intervention may vary across participants, highlighting the importance of individualized interventions tailored to the needs of each child. These findings have important implications for clinical practice. Practitioners working with children with autism who display echolalia should consider implementing evidence-based interventions such as the PECS intervention to reduce this behavior. Additionally, practitioners should carefully monitor progress and adjust interventions as needed to ensure optimal outcomes. While the findings suggest that the PECS intervention can be effective in reducing echolalia in children with autism, further research is needed to explore the effectiveness of different interventions and to develop individualized interventions tailored to the needs of each child. Future studies could investigate the potential benefits of combining different interventions to achieve a greater reduction in echolalic behavior.

## Limitations of the Study

The study's primary limitations are the use of a small sample size as well as the lack of a control group. Using three participants for the study might undermine the accuracy and reliability of the study's findings and, subsequently, their generalizability. As such, future research could address these limitations by including a larger sample size and a control group to compare the effectiveness of the intervention program to other interventions or no interventions.

## Recommendations

Based on the study's results, a couple of recommendations can be deduced for further research and practice. First, supplementary studies are needed to determine the effectiveness of other interventions other than PECS. The current study utilized the PECS intervention, but other interventions should also be explored, such as scripting, fading, and video modeling. Additionally, future research could investigate the potential benefits of combining different interventions to achieve a greater reduction in echolalic behavior. Second, clinicians and educators working with children with autism who display echolalia should consider implementing the PECS intervention due to its effectiveness in reducing echolalia in children with ASD. Third, it is important for clinicians and educators to monitor progress carefully and adjust interventions as needed. The results of this study show that the effectiveness of the intervention varied across participants, highlighting the importance of individualized interventions tailored to the needs of each child. Practitioners should regularly assess the progress of interventions and adjust as needed to ensure optimal outcomes. Finally, practitioners need to involve parents and caregivers in the intervention process. Therefore, practitioners should provide training and support to parents and caregivers to promote the generalization of skills learned in the intervention setting to the child's natural environment. Even though the findings suggest that the PECS intervention can effectively reduce echolalia, further research is needed involving a large sample size to facilitate the development of individualized interventions tailored to the needs of each child.



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