

The Use of the Picture Exchange Communication System to Improve Expressive Language Skills in Non-Verbal Children with Autism: A Systematic Literature Review

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ABSTRACT

Introduction: Children with non-verbal autism often experience barriers in developing expressive language skills, which impact their ability to communicate and engage in social interactions. The Picture Exchange Communication System (PECS) has been developed as an alternative intervention strategy aimed at enhancing functional communication in individuals with verbal limitations, including children with autism.

Objective: Children with non-verbal autism often experience barriers in developing expressive language skills, which impact their ability to communicate and engage in social interactions. The PECS has been developed as an alternative intervention strategy aimed at enhancing functional communication in individuals with verbal limitations, including children with autism.

Method: This study is a systematic review that explored seven journal databases, PubMed, ProQuest, JSTOR, Garuda, ScienceDirect, CNKI, and Wiley, from 2010 to 2024, with a population of non-verbal children with autism aged 3–12 years who received PECS intervention. The measured parameters included the number of spoken words, picture exchange ability, and functional communication. Three independent reviewers conducted screening using the PRISMA flowchart, quality assessment with the CASP Checklist, and data extraction based on author, intervention, facilitator, setting, sessions, methods, and research topics.

Result: Based on 12 articles involving 158 participants, PECS was found to be effective in enhancing expressive communication in children with non-verbal autism and contributed to improvements in the use of short phrases, comprehension of instructions, as well as the reduction of non-adaptive and aggressive behaviors. PECS therapy with a duration of 30–60 minutes across 129 sessions over 23 weeks proved to be optimal, supported by RCT studies demonstrating its effectiveness in improving individuals' expressive language abilities.

Conclusion: PECS is an effective intervention for improving expressive language skills in children with non-verbal autism. This study emphasizes the importance of assessing a child's developmental progress prior to implementing PECS, in order to tailor the intervention to individual needs. Furthermore, the active involvement of parents and educators is essential to ensure that PECS is implemented consistently and effectively across various settings.

Keywords: autism, expressive language skills, non-verbal communication

Introduction

Mental disorders caused by genetic abnormalities, such as autism, carry a higher risk of morbidity and mortality compared to individuals without such conditions.(Huda et al., 2022) Autism is a neurobiological developmental disorder characterized by limitations in social interaction, communication, and restricted behavioral patterns (Tian et al., 2022). One of the greatest challenges faced by children with autism is the limitation in expressive language skills, particularly for those with non-verbal impairments (Sturrock et al., 2021). Study It is stated that there is a strong correlation between autism and limitations in expressive language skills (Thomas et al., 2021). It is added that without appropriate intervention, limitations in expressive language can worsen communication barriers, cause frustration, and increase the risk of maladaptive behaviors due to difficulties in expressing needs and desires (Armstrong et al., 2015). This reinforces the statement that a lack of expressive language skills can hinder their ability to express needs and desires, as well as to participate in social interactions (Kojovic et al., 2019). Furthermore, stated that communication limitations in autism are often associated with mental retardation, characterized by cognitive difficulties and social adaptation challenges. Individuals with this condition require intensive family support to improve communication skills, help them adapt, and reduce the risk of maladaptive behaviors (Firmansyah et al., 2020). Communication limitations have a broad impact not only on individual development but also on the family and society (Saihu, 2019).

Difficulty in expressing oneself can cause significant emotional stress for both the child and the parents. The frustration experienced due to the inability to communicate often leads to problematic behaviors, such as tantrums, aggression, or self-injury (Nengsih, 2019). This condition highlights the importance of effective interventions in improving expressive language skills in children with autism (Miftahurrohman & Hasibuan, 2024). Several approaches have been developed to enhance the communication skills of children with autism, including speech therapy, behavioral therapy, and the use of communication-based technology (Lordan et al., 2021). It is stated that one of the methods increasingly used and showing results is Picture Exchange Communication System (PECS) (Alsayedhassan et al., 2021). PECS is a picture-based communication system designed to help non-verbal individuals express their needs and desires to others (Taryadi, 2018). This method has been applied as an effective intervention strategy to improve the communication skills of children with autism (Zohoorian et al., 2021). Research conducted by Taryadi (2018) showed that PECS can help non-verbal children with autism develop communication skills, reduce problematic behaviors, and improve their social interactions (Taryadi, 2018). This approach allows children to understand that each symbol used has a specific meaning that can be communicated (Boster & McCarthy, 2018). PECS has been implemented in various educational contexts to assist children with autism in improving their expressive language abilities and reducing barriers to conveying thoughts, feelings, and needs to others. In education, limitations in expressive

language often become a major obstacle hindering the learning process. Children with autism often struggle to construct sentences, understand language structures, and participate in social interactions within the school environment. It is stated that PECS-based interventions help children build more systematic communication patterns, enabling them to express themselves more independently and effectively (Wendt et al., 2019). These expressive language barriers often affect their academic and social development, leading to difficulties in understanding learning materials and interacting with peers. By reviewing empirical evidence, this study evaluates the impact of PECS on the development of expressive language in children with autism. The findings show that this method is proven effective in enhancing the ability to construct and use language both verbally and non-verbally, expanding social interactions, and reducing problematic behaviors caused by limitations in self-expression. The implementation of PECS in various settings, including schools, homes, and therapy clinics, provides significant benefits in helping children build better language skills and increase engagement in everyday communication.

Furthermore, the success of PECS is influenced by various factors, such as consistency of use, involvement of educators and therapists, as well as support from the family environment. Although the effectiveness of PECS in improving expressive language has been widely demonstrated, access to therapy remains a challenge for some families, particularly those with limitations. Financial constraints and the lack of therapy facilities in certain areas are major factors affecting the accessibility of PECS for children with autism. Therefore, active involvement of parents, educators, and professionals in the implementation of PECS is essential to ensure the continuity of interventions and optimal outcomes. Thus, the results of this study not only contribute to the development of evidence-based interventions but can also serve as a basis for formulating more inclusive policies for children with autism.

Objective

This study aims to analyze the effectiveness of the Picture Exchange Communication System (PECS) in improving expressive language skills in non-verbal children with autism through a systematic literature review. In addition, this study evaluates PECS implementation strategies, supporting and inhibiting factors, as well as its implications for research and clinical practice in communication interventions for children with autism.

Method

Study Design

This systematic literature review refers to the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) statement under Registered Number CRD420250645274.

Strategy Search

The literature search spanned from January 1, 2010, to December 31, 2024, and was conducted across multiple databases, including PubMed, ProQuest, JSTOR, Garuda, ScienceDirect, CNKI, and Wiley. The time frame was restricted to the most recent 15 years to ensure the inclusion of current and relevant studies on the topic. Given that scientific knowledge and practices continuously evolve, it was important to prioritize recent publications to achieve a comprehensive overview. This restriction also allowed the researchers to better manage the number of studies selected for evaluation and synthesis.

The search was conducted using the “All Fields” feature and keywords in the advanced search engine, as shown in the appendix (Table 1). This search was carried out by two authors (KSP and DR), who independently searched the aforementioned electronic databases.

Tabel 1. All Fields

Data Sources	Link	Keywords	Number
Pubmed	https://pubmed.ncbi.nlm.nih.gov/advanced/	((Picture Exchange Communication System) AND (children)) AND (autism)	64
ProQuest	https://www.proquest.com/advanced?accountid=193034	(picture communication exchange system) AND autism AND (non verbal AND communication AND children) AND (expressive and language)	935
JSTOR	https://www.jstor.org/action/showAdvancedSearch	((Picture Exchange Communication System) AND (Autism))	384
Garuda	https://garuda.kemdikbud.go.id/journal	Picture Exchange Communication System AND Autism	7
ScienceDirect	https://www.sciencedirect.com/search/entry	Picture Exchange Communication System AND Autism AND Expressive Language	448
CNKI	https://www.cnki.net/kns/AdvSearch?dbcode=CFLS&crossDbcodes=CJFQ,CDMD,CIPD,CCND,CYFD,CCJD,BDZK,CISD,SNAD,CJFN	Picture Exchange Communication System	67
Wiley	https://onlinelibrary.wiley.com/search/advanced	Picture Exchange Communication System AND Expressive Language AND Autism AND non-verbal	1.328
Total			3.233

Inclusion Criteria

Participants

Participants included in this study were children with non-verbal autism aged 3 to 12 years, who had difficulties expressing themselves verbally and required support to improve

their communication skills for social interaction. There were no restrictions based on gender, religion, or race.

Intervention

The PECS is an alternative communication method designed to improve expressive language abilities in individuals with communication disorders, particularly children with autism who are unable to speak verbally. By utilizing a picture exchange system, PECS enables individuals to convey desires, needs, or information through visual symbols, thereby enhancing functional communication, social interaction, and independent communication skills. Implemented through six structured phases, PECS begins with Physical Exchange, where individuals learn to give a picture to a communication partner as a request, followed by Distance and Persistence, which encourages the use of PECS in various settings and with different partners. In Picture Discrimination, individuals choose the appropriate picture for a specific request, while Sentence Structure introduces sentence strips with “I want” followed by the desired object. The fifth phase, Responding to Questions, trains individuals to respond to simple questions, and the final phase, Commenting, develops their ability to make spontaneous comments and communicate more complex ideas. To ensure its effectiveness, PECS should be implemented by trained professionals such as speech therapists or special education teachers.

Controls

Eligible controls were required to receive standard care, usual care, or a placebo.

Outcome

We included studies that measured expressive language skills using various instruments, such as the number of spoken words, picture exchange ability, and functional communication development.

Study design

The analysis considered various study designs, including Randomized Controlled Trials (RCTs), quasi-experimental, longitudinal research, case studies, pre-experimental, and cross-sectional designs, to evaluate the impact of PECS. Publications limited to single-case reports, descriptive analyses, narrative or systematic reviews, and opinion papers were excluded. Furthermore, only articles available in English or Indonesian were taken into account.

Exclusion criteria

Research articles that were not written in English or Indonesian were excluded. Participants older than 12 years and families with members suffering from chronic illnesses over the age of 65 were also omitted from the study. In addition, publications such as single-case reports, case reports, editorials, letters, correspondence, narrative or scoping reviews, literature or systematic reviews, conference proceedings, book chapters, and opinion papers were excluded from consideration.

Study selection and data extraction

Three authors (AIF, KSP, DR) independently reviewed all titles and abstracts according to the previously described design. If consensus between two authors could not be reached, the senior researcher (HS) decided on the inclusion of the disputed article. Three other

authors (AF, AEP, IAR) independently extracted data from each study included in the dataset. The selected study reports for inclusion contained information on authorship, year, country, design, sample size, interventions, instruments, results, and findings.

Assessment of quality of bias

Three researchers (AIF, ISAF AEP) independently conducted quality assessments of the included studies. Differences in assessment were discussed together, and if additional clarification or resolution was needed, it was consulted with the senior researcher (HS). This rigorous process ensured that the quality evaluation was conducted strictly and in accordance with scientific standards.

CASP

The Critical Appraisal Skills Programme (CASP) was applied to evaluate the quality of both primary and secondary outcomes, focusing on several domains, including study design, potential bias, inconsistency, indirectness, imprecision, and additional relevant aspects.

Result

Study selection

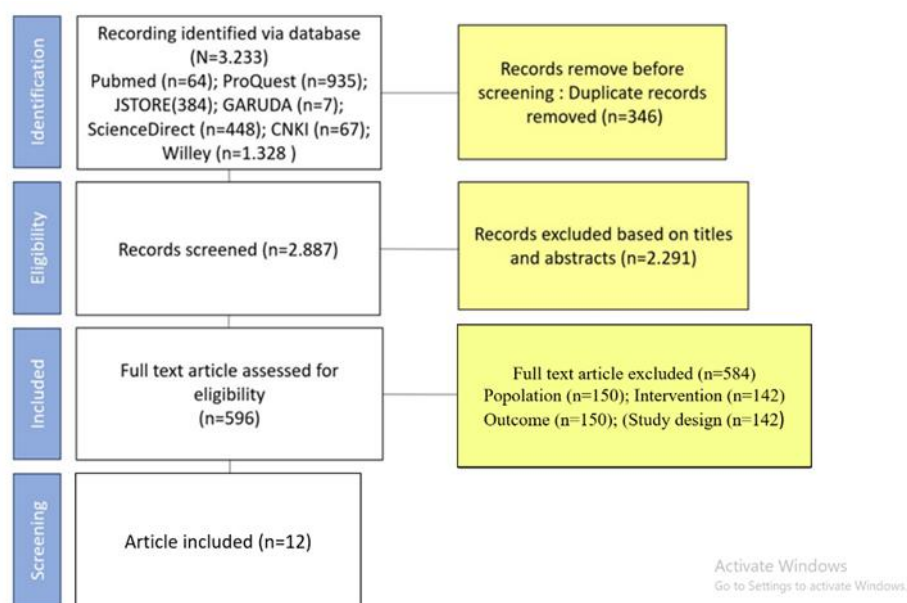


Figure 1. screening process flowchart by PRISMA

In the initial search across various databases, 3,233 articles relevant to the research topic were identified. Following the elimination of 346 duplicate articles, 2,887 articles remained for evaluation in the next stage. Three researchers (AIF, DR, IM) independently conducted further screening based on titles and abstracts, resulting in 596 articles that met the initial criteria. These articles were then further selected through full-text screening, ultimately yielding 12 articles that met the inclusion and exclusion criteria. More detailed information regarding this selection process is presented in Figure 1.

Study Selection

Tabel 2. Characteristics of studies

Author	Intervention, Fasilitator, setting	Number of session	Duration	Method or Media
Listin & Enggar (2024) Indonesian	PECS, trained therapists or educators, home and school	6 sessions	1 hour	Pictures, symbols, and verbal interaction
Santos et.al (2020) Brasil	PECS, NIFLINS-TEA, Department of Speech-Language Therapy, UNIFESP	24 sessions	45 minutes	Visual cards and verbal instructions
Tamanaha et.al (2023) Brasil	PECS, speech-language pathologist, Unified Health System (SUS)	24 sessions	45 minutes	Selecting images, assembling cards
Hu & Lee (2019) China	PECS, teacher, individual therapy room, play area	27 sessions	30 minutes	Pictures, voca l mands'
Travis & Geiger (2010) South Africa	PECS, education for students with special needs in special education schools	18 sessions	30 minutes	Pictures, communication book
Schreibman & Stahmer (2014) USA	PRT and PECS, university-level student therapists	129 sessions over 23 weeks	2 hours per session	PRT using naturalistic approaches, PECS using visual-based approaches
Flanagan & Smith (2019) Canada	NDBI and PECS, therapists as interventionists, home, community, daycare	5 phases	Unexperi eced	Pivotal Response Treatment, Picture Cards, Augmentative and Alternative Communication, Tablet or Electronic Devices
Vistasari & Patria (2019) Indonesian	PECS, researcher not specifically mentioned	12 session	Unexperi eced	Visual support implementation through pictures

Pasco & Tohill (2011) UK	PECS, speech therapists	6 phases	10 minutes	Picture cards and communication boards
Cihak et al. (2012) USA	PECS, VM, special education teachers, teaching assistants, and student teachers, implemented in preschool special education	7 session	30 minutes	Video clips, Picture Exchange Cards
Park et al. (2011) USA	PECS, parents and experts implemented at home	15 session	40-60 minutes	Communication books, visual aids
Anna Lerna et al. (2012)	PECS, therapists, special education teachers, speech therapy clinics	72 sessions over 6 months	30 minutes	Communication books, visual communication aids, object-based reinforcement

The table summarizes studies on the use of the Picture Exchange Communication System (PECS) for children with autism spectrum disorder. Most studies were conducted in Indonesia, Brazil, China, and the United States, using quasi-experimental or case study designs. Interventions generally involved trained therapists, teachers, or parents, focusing on improving expressive language and reducing maladaptive behavior.

Overall, PECS showed positive effects on communication and social interaction, though the level of improvement varied depending on intervention duration, child characteristics, and family involvement. These findings indicate that while PECS is effective, consistent implementation and clearer intervention reporting are still needed.

Table 3. Data Extraction

Author	Design (Sample size)	Intervention (Case)	Intrument (outcomes)	Findings
(Dicky Listin Quarta, 2024)	Quasy- Experime ntal 1	PECS	WPPSI, Denver II	There was an improvement in the subject's ability to use short and clear phrases to refuse food offered by the teacher, greet the teacher and peers, and borrow toys from peers, as evidenced by changes observed before and after the intervention.
(de Almeida Santos et al., 2021)	Longitudin al Study 20	PECS	Autism Behavior Check, SON-R 22-7 and vineland adaptive behavior scale	Picture Exchange Communication System (PECS) has proven to be a highly effective alternative and augmentative communication system for children with non-verbal or minimally verbal autism, as it can significantly improve instruction comprehension and enhance communication exchanges more effectively.
(Tamanaha et al., 2023)	Longitudin al Study 22	PECS	Antecedent-Behavior- Consequence (ABC), Expressive and	Involving 22 children with autism, all participants achieved the first three phases of PECS, with 82% reaching Phase IV.
(Hu & Lee, 2019)	Pre- experimen tal 1	PECS	Vocal, Mands, Aggressive Behavior	A four-year-old child showed an increase in vocal mands from 4 to 39 after implementing the Picture Exchange Communication System (PECS). Aggressive behavior was reduced to nearly zero, and the use of PECS remained high during maintenance sessions, at 83% in therapy and 82% at home and on the playground.
(Travis & Geiger, 2010)	Pre- experimen tal 1	PECS	Vocal Mands, Aggressive Behavior	A four-year-old child showed an increase in vocal mands from 4 to 39 after implementing the Picture Exchange Communication System (PECS). Aggressive behavior was reduced to nearly zero, and the use of PECS remained high during maintenance sessions, at 83% in therapy and 82% at home and on the playground.

(Travis & Geiger, 2010)	Pre-experimental 2	PECS	Frequency of requests, commenting, and verbal utterances	The use of the Picture Exchange Communication System (PECS) increased the frequency of requests in two children with autism spectrum disorder. Although there was growth in intentional communication, results for commenting and utterance length varied. Proper training for educators is essential..
(Schreibman & Stahmer, 2014)	Randomized Controlled Trial 39	PRT, PECS	Overall communication, expressive vocabulary, pictorial communication, parent satisfaction	A comparison of the effectiveness of Pivotal Response Training (PRT) and the Picture Exchange Communication System (PECS) in non-verbal children with autism showed that both improved spoken language abilities, with no significant difference between methods
Flanagan & Smith (2019)	quasi-experimental 23	NDBI, PECS	APPL, language profiles, expressive language domains	The Assessment of Phase of Preschool Language (APPL) was used to evaluate the language development of children aged four to five years with autism spectrum disorder. Results showed that the community-based intervention program improved the language phase in 37% of children, with variations depending on initial language phase and domain.
Vistasari & Patria (2019)	Case Study 2	PECS	Behavior checklist for structured language skills	An evaluation of the effectiveness of the Picture Exchange Communication System (PECS) program in improving structured speaking ability in children with autism showed significant improvement in structured speaking ability after the intervention, supporting the use of PECS as an effective communication tool for children with autism spectrum disorder.
Pasco & Tohill (2011)	Studi retrospektif 23	PECS	PEP-R	The findings of this study indicate that assessing the developmental level of children with autism who are considered candidates for the Picture Exchange Communication System (PECS) can provide valuable information for speech and language therapists as well as other professionals regarding the potential level of individual progress

Cihak et al. (2012)	Quasi-Experimental 4	VM, PECS	Number of independent image exchanges (percentage of independent initiations)	All participants improved independent communication initiation; on average, progress was faster when using VM in conjunction with PECS, reaching the criteria more quickly compared to using PECS alone.
Park et al. (2011)	Quasi-experimental 3	PECS	Independent image exchange Vocalization	All three children successfully performed picture exchanges independently and generalized these skills to different partners. Vocalization showed limited improvement.
Anna Lerna et al. (2012)	Quasi-Experimental 18	PECS, CLT	ADOS, GMDS, VABS, social-communicative variables	PECS significantly improved social-communicative skills more than CLT, particularly in joint attention, requesting, initiating, and cooperative play, but not in eye contact.

The table summarizes data extracted from studies examining the implementation and effectiveness of the Picture Exchange Communication System (PECS) for children with Autism Spectrum Disorder (ASD). The included studies employed various research designs, such as randomized controlled trials, quasi-experimental, longitudinal, and case study approaches, with sample sizes ranging from single participants to 39 children. Interventions generally involved structured PECS sessions facilitated by therapists, educators, or parents, implemented in school, home, and clinical settings.

Most studies reported positive outcomes, indicating that PECS effectively enhances expressive language, increases spontaneous communication, and reduces maladaptive or aggressive behaviors. Improvements were also observed in social interaction and independent communication initiation. However, some studies found that progress in verbal expression was less consistent compared to picture-based communication, suggesting that individual differences and implementation fidelity influence outcomes. Overall, these findings reinforce the role of PECS as a structured and effective augmentative communication method for children with limited verbal abilities.

Table 4. CASP Checklist for the quality of studies

Author/year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
Listin & Enggar (2024)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Santos et.al (2020)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Tamanaha et.al (2023)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Hu & Lee (2019)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Travis & Geiger (2010)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
Schreibman & Stahmer (2014)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Flanagan & Smith	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Vistasari & Patria (2019)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Pasco & Tohill (2011)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Cihak et et al. (2012)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Park et al. (2011)	Y	Y	?	Y	N	Y	Y	Y	Y	Y
Anna Lerna et al. (2012)	Y	Y	?	Y	N	Y	Y	Y	Y	Y

The table above presents a critical appraisal of studies assessing the quality of research on the Picture Exchange Communication System (PECS) using the Critical Appraisal Skills Programme (CASP) 10-item checklist. Each “Y” indicates that the study met the respective quality criterion, while “N” denotes unmet criteria. Overall, most studies fulfilled 9 out of 10 quality indicators, demonstrating strong methodological rigor in terms of research objectives, study design, sample selection, data collection, and clarity of results. However, similar to other behavioral and educational research, several studies did not meet Question 5 (Q5), which concerns randomization or blinding. This limitation is common in intervention studies involving children with autism, where ethical and practical constraints often prevent full randomization. Nevertheless, the consistent fulfillment of the majority of CASP criteria indicates that the included studies maintain high validity and reliability, providing a solid foundation for interpreting the effectiveness of PECS interventions.

Discussion

This systematic review synthesized evidence regarding the role of the Picture Exchange Communication System (PECS) in fostering expressive language among non-verbal children with autism. The findings indicated notable improvements in children’s capacity to initiate requests and generate comments, suggesting a progression in their functional communication abilities. In addition, it helped children construct simple sentences, expand vocabulary, and increase spontaneous communication. However, its effectiveness varied depending on the child’s characteristics, intervention duration, as well as the involvement of parents and educators. In this study, the respondents’ communication abilities prior to the intervention were at a low level. However, after the intervention, the majority of respondents showed significant improvement.

In addition to the PECS intervention, several other interventions are also used to improve the communication and social skills of children with autism. In the study by (Hu &

Lee, 2019), it was stated that Applied Behavior Analysis (ABA) focuses on reinforcing positive behaviors through reward-based strategies (reinforcement) and has been proven effective in improving adaptive behaviors and reducing maladaptive behavior. (Flanagan et al., 2019) also stated that the Naturalistic Developmental Behavioral Intervention (NDBI) combines behavioral analysis and natural interactions to improve communication and social skills in a flexible manner. (Schreibman & Stahmer, 2014) Furthermore, Pivotal Response Treatment (PRT) targets key aspects of child development, such as motivation and response to social cues, which can accelerate language and social skill development. Speech and Language Therapy helps children develop speaking and language comprehension abilities, while Occupational Therapy aims to improve sensory and fine motor skills. Social Therapy through play or group activities also plays an important role in developing social interaction, such as sharing and turn-taking (Malinverni et al., 2017). In addition, alternative therapies such as music therapy and animal-assisted therapy contribute to emotional regulation and social interaction in children with autism (Ang & MacDougall, 2022). The diversity of these interventions shows that there is no single approach suitable for all children, thus a combination of methods is often required for optimal results.

Various studies have shown that the PECS provides significant benefits for children with developmental disorders, particularly in the aspects of communication and behavior. (Dicky Listin Quarta, 2024) stated that it is effective in improving expressive language skills in children with developmental language disorders, enabling them to express their wants and needs in a more structured way. In addition, (de Almeida Santos et al., 2021) added that it has a positive impact on the understanding of verbal and visual instructions, enabling children with autism to better follow directions in various contexts. (Vistasari & Patria, 2019) Supporting evidence states that it can improve structured speech ability in children with autism, with a systematic approach tailored to individual needs. Furthermore, (Travis & Geiger, 2010) provided another perspective by stating that although it can improve picture-based communication, not all children experience significant improvement in verbal speaking skills. This opinion is also reinforced by (Thiemann-Bourque et al., 2016), who stated that the picture exchange communication system has been scientifically proven as an effective and structured method in improving communication in children with language disorders, enabling them to communicate more independently and clearly.

In its implementation, the PECS has a structured procedure as an alternative communication method for individuals with verbal limitations (Moorcroft et al., 2019). This system enables individuals to convey their needs without relying on spoken language. Using a picture-based approach, the PECS improves communication skills, reduces frustration caused by communication difficulties, and strengthens social interaction (López-Bouzas et al., 2024). In addition to training expressive language, it helps children with autism to understand and respond to communication more flexibly according to the situation (Cabiell-Hernandez et al., 2017). However, its effectiveness varies among individuals, influenced by cognitive level, sensory preferences, social environment, and the severity of autism (Kojovic et al., 2019) In addition, the system relies heavily on visual support, which can be a barrier in generalizing communication skills to spontaneous situations (Klein & Kraus de Camargo, 2018).

Systematically, various studies on the PECS highlight both strengths and limitations regarding its effectiveness and implementation in children with Autism Spectrum Disorder (ASD). While several investigations have demonstrated improvements in communication skills, others have reported challenges in its application as well as restrictions related to the

studied populations. Several studies have reported positive outcomes in enhancing communication abilities, whereas others have identified challenges in implementation and noted limitations within the populations examined. Quarta & Wijaya (2024) The results demonstrated an enhancement of expressive language abilities among children with language impairments. By applying a single-subject experimental approach, the research provided in-depth insights, though the restricted number of participants reduced the generalizability of the outcomes, meanwhile Santos et al. (2021) In a longitudinal study involving 20 children with autism, improvements were observed in both visual and verbal instruction comprehension. However, the progress was not consistently evident across all aspects of communication. Tamanaha et al. (2023) The findings revealed that the majority of children progressed to the levels of image discrimination and sentence building, supporting its efficacy in enhancing communicative abilities. Yet, the inability of some children to finish the last stage highlights constraints in its application. In line with this, Hu & Lee (2018) Results demonstrated that the application of PECS contributed to a decrease in aggressive behavior while simultaneously promoting verbal communication, as assessed using a multiple-baseline design.

Systematically, various studies on the PECS have both strengths and limitations in terms of effectiveness and implementation for children with Autism. Some studies show success in improving communication, while others reveal challenges in application and limitations in the studied population. Quarta & Wijaya (2024) found that it can improve expressive language skills in children with language disorders. This study used a single-subject experimental method that allows for in-depth analysis, but the limited sample makes the results difficult to generalize. Meanwhile, Santos et al. (2021) in a longitudinal study involving 20 children with autism showed an increase in the understanding of visual and verbal instructions. However, improvement did not occur evenly in all aspects of communication. Tamanaha et al. (2023) found that most children reached the picture discrimination and sentence construction stages, proving its effectiveness in developing communication skills. However, not all children completed the final stage, indicating limitations in implementation. Similarly, Hu & Lee (2018) showed that the PECS reduced aggressive behaviors and improved verbal communication using multiple baseline settings. This study was methodologically strong but only examined one child, making the results difficult to generalize. Travis & Geiger (2010) used a mixed quantitative and qualitative approach to evaluate the PECS in South Africa. This study proved the effectiveness of PECS in increasing verbal requests. However, results related to commenting and utterance length varied, indicating that its effectiveness is not uniform across all aspects of communication.

On the other hand, Schreibman & Stahmer (2013) compared PECS with Pivotal Response Training (PRT). Both methods showed similar effectiveness, so it could not be concluded which was superior. In mapping language development, Flanagan et al. (2019) found that pragmatic aspects developed more slowly than other aspects. This shows that it is less effective in developing complex social communication skills. Meanwhile, Vistasari & Patria (2019) showed that PECS improves structured speaking skills through an A-B-A experimental design. However, its effect on complex sentences was less significant compared to simple sentences. Pasco & Tohill (2011) found that the child's developmental age affects the success rate of the PECS. This helps practitioners set realistic intervention targets. However, this study did not consider the social factors and child motivation that also play an important role in communication effectiveness (Dicky Listin Quarta, 2024) (de Almeida Santos

et al., 2021) (Tamanaha et al., 2023) (Travis & Geiger, 2010) (Schreibman & Stahmer, 2014) (Pasco & Tohill, 2011).

Overall, the PECS has been proven effective in improving communication in children with autism. However, its effectiveness is influenced by age, family involvement, implementation methods, and the language aspects being developed. Further research is needed to understand the impact of the PECS under various developmental conditions of children with autism. PECS has important clinical implications in communication interventions for children with autism, especially for those with expressive language limitations (Koudys et al., 2023). PECS can be used as a primary strategy in speech and language therapy, helping children express their needs and wants more clearly (Safi et al., 2022). In addition to improving communication, the PECS also plays a role in behavior modification, particularly in reducing tantrums or aggression often caused by communication difficulties (Tedjawidjaja & Hartiani, 2021). The success of implementing the PECS greatly depends on the involvement of professionals and families (Raubenheimer et al., 2024). Therefore, training for therapists, teachers, and parents is crucial so that this system can be applied effectively and consistently (Frank et al., 2020). In addition, combining the PECS with other methods such as Applied Behavior Analysis (ABA) and augmentative-alternative communication (AAC) technology can enhance the overall effectiveness of children's communication (Forbes et al., 2024).

Conclusion

Overall, the synthesis of evidence confirms that the Picture Exchange Communication System (PECS) functions as a reliable augmentative and alternative communication strategy to strengthen expressive language development in children with non-verbal Autism Spectrum Disorder (ASD). Various studies analyzed demonstrate that PECS significantly enhances children's abilities in requesting, commenting, expanding vocabulary, and promoting spontaneous communication. In addition, PECS contributes to reducing aggressive behaviors and increasing social engagement, which positively impacts the development of children's interactions with their surroundings.

However, the effectiveness of PECS is not uniform across all individuals. Several factors influence the successful implementation of PECS, including the child's individual characteristics, the duration of the intervention, family involvement, and professional support. Although proven effective in enhancing picture-based communication, improvements in verbal skills remain variable. Therefore, multimodal strategies, such as combining PECS with Applied Behavior Analysis (ABA) or augmentative and alternative communication (AAC) technologies, are required to achieve more comprehensive intervention outcomes.

The clinical implications of this study underscore the importance of assessing a child's developmental progress prior to the implementation of the PECS to tailor the intervention to individual needs. Furthermore, active involvement of parents and educators is essential to ensure consistent and effective implementation of PECS across different settings. Further research is warranted to explore the factors that can optimize PECS success and to understand its long-term impact on the development of expressive language in children with autism.

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Not applicable.

Authors' contribution

Each author contributed equally in all the parts of the research. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest related to the implementation and publication of this research. All stages of the study from planning, data collection, analysis, to manuscript preparation were conducted independently without any external influence or pressure. The researchers maintained adherence to ethical research principles, ensuring transparency, accuracy, and honesty throughout the process.

Participant involvement in the reviewed studies was voluntary, with respect to confidentiality, privacy, and informed consent as stated in each primary source. The authors affirm that this systematic review was conducted in accordance with academic integrity standards and aims to contribute valid and trustworthy evidence to the development of science and clinical practices in communication interventions for children with autism.

Ethical consideration

Not applicable.

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