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Evaluating the Impact of Picture Exchange Communication System on Social Skills in Autism: A Single-Case Experimental Design Analysis

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Abstract

This study explored how the Picture Exchange Communication System (PECS) impacts social skills in children aged 7 to 10 years with autism spectrum disorder (ASD). Using a single-case experimental design (AB) with follow-up, four children with ASD were selected through convenience sampling from a rehabilitation center in Tehran. Their cognitive and social skills were assessed with Raven's Colored Progressive Matrices (RCPM) and the Autism Social Skills Profile (ASSP), respectively. Each child participated in twelve individual PECS sessions, each lasting 45 minutes. After the intervention, assessments were repeated with the ASSP, and follow-up evaluations were conducted one month later. Data analysis included visual analysis, recovery percentages, and Cohen's D effect size, using SPSS version 24. Results showed significant improvements in social skills due to PECS, with instructor-reported effect sizes of 1.6, 1.4, 1.2, and 1.6. Notably, gains were observed in social reciprocity (effect sizes: 1.4, 1.08, 0.98, 1.6) and social participation (effect sizes: 1.91, 1.77, 1.56, 1.73), while detrimental social behaviors decreased (effect sizes: 1.07, 1.1, 1.4, 1.2). Parental reports confirmed these improvements, highlighting enhanced social skills and fewer negative behaviors. Overall, the study suggests that PECS is an effective tool for improving social skills and reducing problematic behaviors in children with ASD, supporting their vital social development.

Keywords: Autism, Picture Exchange Communication System, Single-Case, Social Skill

Highlights

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1. PECS significantly enhanced social skills in children with ASD (ages 7-10).

2. Study used a single-case experimental design with four ASD participants.

3. Twelve 45-minute PECS sessions were conducted for each participant.

4. Notable improvements in social reciprocity and participation were observed.

5. PECS reduced negative behaviors, supporting children's social development.

Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental disorder that affects communication and social interaction in children, often characterized by restricted behaviors, interests, and activities that significantly hinder academic and social functioning (Association, 2022). Previously classified under separate categories, the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) now encompasses various conditions including Autism, Asperger Syndrome, Rett Syndrome, Childhood Disintegrative Disorder, and Pervasive Developmental Disorder Not Otherwise Specific (PDD-NOS) (Grant & Nozyce, 2013). According to the Centers for Disease Control and Prevention (CDC), the prevalence of ASD among children aged 4-8 years is approximately 1 in 44, with a male-to-female ratio of 4.2:1 (Maenner et al., 2021). In Iran, a study revealed that the prevalence of autism stands at 0.1% (10 per 10,000) among 31,000 children aged 6-18 years, with a male-to-female ratio of 2:1 (Mohammadi et al., 2019). Social impairments are often the most pronounced challenges associated with ASD. Children with this condition frequently struggle with eye contact, understanding facial expressions, utilizing gestures, and engaging in cooperative or imaginative play (Gould, Tarbox, O'Hora, Noone, & Bergstrom, 2011). These deficits can adversely influence emotional development (Pourmohamadreza-Tajrishi, Ashouri, Afrooz, Arjmandnia, & Ghobari-Bonab, 2015), autonomy, and the ability to form and maintain friendships (Boesch, Wendt, Subramanian, & Hsu, 2013; Jasmin et al., 2009).

Numerous interventions have been developed to enhance social skills and mitigate the symptoms of ASD, with varied success rates (Boesch et al., 2013; Pourmohamadreza-Tajrishi et al., 2015). Recent evidence indicates a growing trend in utilizing assistive technologies in the treatment and rehabilitation of ASD through interactive environments aimed at improving the quality of life for affected individuals (Moraiti, Fotoglou, Stathopoulou, & Loukeris, 2023).

Augmentative and Alternative Communication (AAC) methods, including the Picture Exchange Communication System (PECS), communication boards, and gestures, serve as critical tools for improving communication in children with ASD (Abono et al., 2023).

(Zisk & Dalton, 2019).

Traditional behavioral approaches often emphasize verbal training, which may not align with the differing needs and abilities of all children on the spectrum (Hughes-Lika & Chiesa, 2021). Many children with ASD face challenges in processing abstract auditory information, leading to missed opportunities for learning. Conversely, visual training has demonstrated effectiveness in enhancing communication skills and socialization (Bondy, 2012).

Developed by Bondy and Frost, PECS employs visual aids—such as pictures and symbols—to facilitate communication in children with ASD (Paul, 2012). This protocol is based on the principles of Applied Behavior Analysis (ABA) and is designed to teach functional communication through a structured sequence of phases. The six phases of PECS encompass: 1) Physical Exchange; 2) Expanding Spontaneity; 3) Picture Discrimination; 4) Sentence Construction; 5) Appropriate Symbol Response; and 6) Responsive Comments and Vocabulary Expansion (Zohoorian, Zeraatpishe, & Matin sadr, 2021). Research has consistently affirmed the efficacy of PECS in enhancing various skills among individuals with ASD, such as improving learning outcomes, communication abilities, and behavioral adjustments (Ganz & Simpson, 2004; Khoiriyah, 2021; Tanner et al., 2015).

Furthermore, cultural factors and local adaptations have received less focus, which are essential for optimizing intervention outcomes.

Given that PECS aims primarily to enhance the communication capabilities of children with ASD, it stands out as a progressive method to mitigate the disorder's symptoms. Numerous publications attest to the international research community's interest in PECS; however, some studies have misrepresented its protocols or focused solely on limited phases (Bondy, 2012; Moodie-Ramdeen, 2008; Tanner et al., 2015). While PECS has garnered worldwide attention, there is a notable paucity of research examining its effectiveness specifically improvements or

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limited phases of PECS without a comprehensive evaluation across all stages (Mohammadi et al., 2019). Furthermore, cultural factors and local adaptations have received less focus, which are essential for optimizing intervention outcomes. Our study aims to address this gap by systematically analyzing how each phase of PECS influences communication skills in Iranian children with ASD. This approach can enhance culturally sensitive practices and improve personalized intervention strategies, ultimately supporting better social and communicative development for children affected by ASD in Iran (Ganz, Davis, Lund, Goodwyn, & Simpson, 2012).

Materials & Methods

This study employed a single-case experimental AB with follow-up design to evaluate the effectiveness of the Picture Exchange Communication System (PECS) on social skills among four children with high-functioning autism, aged 7 to 9. Human ethics were considered according to the Deputy of Research and Technology of the University of Social Welfare and Rehabilitation Sciences at Tehran, Iran. All children' mothers signed the written consent for participating children to the research. There was no funding for the present research. Participants engaged in 12 PECS sessions, with data collected via two assessment tools, amid COVID-19 constraints.

Raven's Colored Progressive Matrices (RCPM)

The Raven's Colored Progressive Matrices (RCPM) was utilized to assess mental age and IQ in children aged 5 to 9. Featuring 36 colored geometric images, it measures perceptual reasoning and deductive skills independent of language. The RCPM has a validity coefficient of 0.73 (Vigneau & Bors, 2005) and a test-retest reliability of 0.62, normalized for Iranian children.

Autism Social Skills Profile (ASSP)

The Autism Social Skills Profile (ASSP), created by Bellini and Hopf in 2007, is a 49-item assessment tool to evaluate social skills in children and adolescents with autism spectrum disorder (ASD). It includes components for social reciprocity, social participation, and detrimental social behavior, rated on a four-point Likert scale(Bellini & Hopf, 2007). The tool demonstrates high reliability and internal consistency, with a confirmed factor structure in its Persian version(Rajabi, 2008). In the current study, the ASSP was completed by parents and instructors.

Research Procedure

Following formal approval from the University of Social Welfare and Rehabilitation Sciences and the Welfare Organization in Tehran, a study was conducted targeting children with autism spectrum disorder (ASD) within the first educational district. A rehabilitation center was randomly selected, and from there, ten children diagnosed with ASD through psychiatric interview were identified. Out of these, four children were chosen based on the study's inclusion criteria. To be eligible for the program, a child must have a confirmed diagnosis of ASD documented in their psychiatric records, an IQ of at least 70 on the Raven's Colored Progressive Matrices, be between the ages of 6 and 10, and have the ability to speak. Children with significant sensory issues such as being overly sensitive or under-sensitive to stimuli, were not eligible. Additionally, missing two consecutive training sessions or participating in similar training programs at the same time could lead to withdrawal from the program. Ethical considerations included obtaining informed consent from parents, ensuring confidentiality, and permitting participant withdrawal. The research comprised three phases: a three-week baseline (A), a six-week Picture Exchange Communication System (PECS) intervention (B), and a follow-up phase. During the baseline, data on children's social skills were gathered weekly from parents and instructors. The PECS intervention included twelve sessions, with social skills assessed post-session using the Autism Social Skills Profile (ASSP). Follow-up assessments were conducted two and four weeks after intervention completion, without additional instructions.

PECS is grounded in Skinner's "Verbal Behavior," focusing on teaching verbal skills through cues and reinforcement to enhance independent communication, while intentionally minimizing verbal cue dependency (Paul, 2012). A structured intervention protocol included identifying preferred items to engage children, alternating their presentation to reduce side preferences, and emphasizing collaborative facilitation to optimize outcomes. The six structured phases of PECS fostered effective non-verbal communication using symbolic cards, reinforcing positive exchanges through rewards(Zamani & Mohamad, 2023), and were analyzed using SPSS version 24.

Table 1. Content of the PECS sessions

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Session	Phase	Purpose	Content and practice
1	First	Introduction and trial initiation	Encourage child participation using three roles: child as sender, mother/instructor as receiver, facilitator for support.
2		Physical exchange	Display preferred items, encourage selection, with facilitator support and varied verbal reinforcement.
3	Second	Increasing spontaneous request	Increase distance from child, then therapist, followed by child chasing therapist for picture card exchange
4		Exchange generalization	Child selects image from "Communication Book", increases distance from facilitator, chases facilitator, maintains book themselves
5	Third	Picture differentiation	Child undergoes picture discrimination training to enhance correct picture selection through feedback.
6		Corrective strategies	Implement corrective strategies like modeling, practice, change, and repetition for picture card differentiation
7	Fourth	Sentence making	Begin sentence-making with "I want," place "I want" picture card near favorite picture card
8		Continuity of sentence making	Continue making sentences with "I want" picture card
9	Fifth	Ability to request	Use "What does he want?" phrase, make sentence with "I want" picture card to get favorite object
10		Practice asking	Continue focusing on verbal request skills, complete sentence-making and requesting
11	Sixth	Ability to answer	Focus on child's ability to comment, ask questions "What do you see?" and "What do you want?"
12		Practice commenting	Assist child in clearly expressing understanding and needs through communication

Results

The study involved four children with autism spectrum disorder (ASD), aged 7-10 years (Mean ± SD: 8.2 ± 0.73 years), comprising three boys and one girl. Their IQ scores ranged from 71 to 78 (M±SD: 74.00 ± 3.16). Parental educational levels varied, with a prevalence of bachelor's degrees (50%). An A-B-C experimental design was utilized in a single-case study, employing visual analysis for data processing, which included intrastate and interstage evaluations. The analysis was conducted in two main parts: Intrastate and Interstage Analysis.

1. Intrastate Analysis. included metrics such as estimated convergence (assessing the slope of the data path, with positive, negative, or stable trends), level range (the difference between the highest and lowest data points), and level stability (the proportion of data points within the stability range).

2. Interstage Analysis. evaluated level change by comparing the final data point of one phase to the initial and final points of the subsequent phase.

C Statistics were employed to assess whether changes in data across phases were significant, using Z-values to determine stability; significant Z-values indicated substantial changes in stage data. Overall social skills scores for the four subjects were compiled across the three phases (baseline, PECS intervention, and maintenance), as detailed in Table 2.

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Table 2. Social skills of the overall performance analysis table of each stage according to instructor and parent's measures

		(A1)	(B1)	(C1)	(A2)	(B2)	(C2)	(A3)	(B3)	(C3)	(A4)	(B4)	(C4)
Instructor	Stage length	3	5	2	3	5	2	3	5	2	3	5	2
	Estimated trend	+	+	-	+	+	+	+	+	-	+	+	+
	Trend stability	3/3 100% stabilize	5/5 100% stabilize	2/2 100% stabilize	3/3 100% stabilize	5/5 100% stabilize	2/2 100% stabilize	3/3 100% stabilize	5/5 100% stabilize	2/2 100% stabilize	3/3 100% stabilize	5/5 100% stabilize	2/2 100% stabilize
	Average value	77.3	93.8	111	82.3	101	119	87.0	107	122	72.7	85.4	105
	Level range	2	34	1	2	35	1	3	32	1	5	35	1
	Level change	2	34	-1	2	35	1	3	32	-1	-5	35	1
	Level stability C	Stabilize	Instability	Stabilize	Stabilize	Instability	Stabilize	Stabilize	Instability	Stabilize	Stabilize	Instability	Stabilize
	Z	2.4*	2.9*	0.00	1.2	2.8*	0.00	1.4	2.8*	0.00	0.95	2.6*	0.00
Parent	Stage length	3	5	2	3	5	2	3	5	2	3	5	2
	Estimated trend	+	+	-	+	+	-	+	+	-	+	+	-

Trend stability	3/3	5/5	2/2	3/3	5/5	2/2	3/3	5/5	2/2	3/3	4/5	2/2
	100% stabilize	100% stabilize	100% stabilize	100% stabilize	100% stabilize	100% stabilize	100% stabilize	100% stabilize	100% stabilize	100% stabilize	80% stabilize	100% stabilize
Average value	74.3	94.6	103	76.7	92.2	104	73.3	79.8	86.0	82.7	108	123
Level range	1	20	2	5	25	2	4	12	2	6	32	1
Level change	1	20	-2	5	25	-2	4	12	-2	6	32	-1
Level stability												
C	Stabilize	Instability	Stabilize	Stabilize	Instability	Stabilize	Stabilize	Instability	Stabilize	Stabilize	Instability	Stabilize
Z	1.8	2.2*	0.00	1.8	2.9*	0.00	0.97	0.54	0.00	1.4	2.8*	0.00

*Note. A = Baseline B = Intervention C = Maintenance *P>0.05, Z test significance level 0.05*

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The first part of the results of Table 2 reports assessments of four children using the Autism Social Skills Profile (ASSP). Each child showed steady, stable scores during the baseline, with upward trends indicating they were ready for the PECS intervention. For example, Subject A's social skills increased from a mean of 77.3 to 93.8 after intervention, then to 111 during follow-up, with statistical analysis confirming significant improvements. Similar patterns appeared with Subjects B, C, and D, all showing stable baseline scores that improved significantly after PECS, with skills maintained during follow-up.

The second part of the results covers assessments by parents of the same children. Again, all children showed consistent baseline stability, with scores increasing notably after the intervention—from modest gains to significant improvements—confirming PECS's effectiveness. During follow-up, scores remained stable, indicating that social skills were well-maintained over time.

Overall, both assessments suggest that the PECS intervention led to meaningful, sustained improvements in social skills across all children involved (Table 3 and Table 4).

Table 3. The status of all subjects in the social skills and its components based on the evaluation of the instructor

Subject	Variable	Baseline (A)				Intervention (B)						Follow-up (C)		
		1	2	3	Mean	1	2	3	4	5	Mean	1	2	Mean
Subject A	Social reciprocity	39	38	40	39	39	43	50	56	61	49.8	62	60	61
	Social participation	20	22	21	21	22	24	29	34	39	29.6	40	38	39
	Detrimental social behavior	17	18	17	17.33	17	16	14	13	12	14.4	13	11	12
	Social skills	76	78	78	77.33	78	83	93	103	112	93.8	113	111	112
Subject B	Social reciprocity	42	44	43	43	44	49	55	59	66	54.6	68	64	66
	Social participation	20	20	22	22.33	23	27	31	35	41	31.4	41	41	41
	Detrimental social behavior	19	19	18	18.66	17	16	16	13	12	14.8	12	12	12
	Social skills	81	83	83	82.33	84	92	102	107	119	100.8	120	118	119
Subject C	Social reciprocity	45	47	47	46.33	48	50	59	67	71	59	72	70	71
	Social participation	22	25	24	23.66	26	28	34	39	41	33.6	41	41	41
	Detrimental social behavior	18	16	17	17	17	15	14	14	11	14.2	12	10	11
	Social skills	85	88	88	87	91	93	107	120	123	106.8	124	122	123
Subject D	Social reciprocity	41	37	38	38.66	37	40	46	51	62	47.2	62	62	62
	Social participation	20	18	18	18.66	19	20	23	27	33	24.4	34	32	33

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Detrimental social behavior	15	16	15	15.33	16	15	14	12	12	13.8	12	12	12
Social skills	76	71	71	72.66	72	75	83	90	107	85.4	108	106	107

Table 4. The status of all subjects in the social skills and its components based on the evaluation of parent

Subject	Variable	Baseline (A)				Intervention (B)						Follow-up (C)		
		1	2	3	Mean	1	2	3	4	5	Mean	1	2	Mean
Subject A	Social reciprocity	37	37	38	37.33	45	49	52	53	58	51.4	59	57	58
	Social participation	22	21	21	21.33	23	27	28	31	33	28.4	33	33	33
	Detrimental social behavior	15	16	16	15.66	16	16	15	14	13	14.8	14	12	13
	Social skills	74	74	75	74.33	84	92	95	98	104	94.6	105	103	104
Subject B	Social reciprocity	38	39	42	40.33	42	45	47	51	56	48.2	57	55	56
	Social participation	19	22	21	20.66	22	25	29	33	35	28.8	36	34	35
	Detrimental social behavior	17	16	17	16.66	16	16	15	15	14	15.2	14	14	14
	Social skills	74	77	79	77.65	80	86	91	99	105	92.2	105	105	105
Subject C	Social reciprocity	39	40	42	40.33	42	48	44	44	50	45.6	51	49	50
	Social participation	17	15	18	16.66	17	17	19	19	24	19.2	23	25	24
	Detrimental social behavior	16	17	16	16.33	16	16	16	14	13	15	13	13	13
	Social skills	72	72	76	73.33	75	81	79	77	87	79.8	87	87	87
Subject D	Social reciprocity	43	44	46	44.33	52	57	60	70	73	62.4	73	73	73
	Social participation	22	26	25	24.33	26	30	34	39	40	33.8	41	39	40

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Detrimental social behavior	14	14	14	14	13	12	12	11	10	11.6	10	10	10
Social skills	79	84	85	82.66	91	99	106	120	123	107.8	124	122	123

In the baseline phase, Subject D exhibited the lowest mean social skills score (72.66), while Subject C had the highest (87). Notably, Subject D also had the lowest scores in social reciprocity, participation, and detrimental behavior. All subjects showed improvement from baseline to intervention, with Subject C demonstrating the greatest gain (+19.8) and Subject D the least (+12.74). During follow-up, all subjects maintained these improvements, with Subject D experiencing the highest change (+21.6) and Subject C the smallest (+17). Changes in specific components also varied across subjects, indicating differentiated impacts of the intervention.

Table 4 presents the parent evaluations of social skills for four subjects, assessed using the Autism Social Skills Profile (ASSP). In the baseline stage, Subject C exhibited the lowest overall score (73.33), while Subject D had the highest (82.67). The components showed variances, with Subject A having the lowest social reciprocity score (37.33) and Subject D the highest (44.33). For social participation, Subject C scored lowest (16.66), and Subject D scored highest (24.33); meanwhile, Subject D and Subject B had the lowest scores in detrimental social behavior (14 and 16.66, respectively). Progress was observed for all subjects during the intervention phase. Subject D showed the greatest improvement (+25.14), whereas Subject C had the least (+6.47). All subjects demonstrated sustained improvements in the follow-up phase, with Subject D showing the most significant change (+15.2) and Subject C the least (+7.2) across various social skills components.

Table 5. The results of Cohen's effect size test from the comparison of baseline, intervention, and follow-up for instructor

Subject	Variable	Mean of Baseline (A)	Mean of Intervention (B)	Mean of Follow-up (C)	Recovery percentage	Effect size	Reliable change index
Subject A	Social reciprocity	39	49.18	61	56.41	1.4	2.4
	Social participation	21.00	29.6	39	85.71	1.91	4.6

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	Detrimental social behavior	17.33	14.4	12	30.75	1.07	2.4
	Social skills	77.33	93.8	112	48.83	1.6	3.3
	Social reciprocity	43	54.6	66	53.48	1.08	2.1
Subject B	Social participation	22.33	31.4	41	83.6	1.77	4.2
	Detrimental social behavior	18.66	14.8	12	35.69	1.1	2.8
	Social skills	84	100.8	119	41.66	1.4	4.2
	Social reciprocity	46.33	59	71	53.24	0.98	3.2
Subject C	Social participation	23.66	33.6	41	73.28	1.56	3.7
	Detrimental social behavior	17	14.2	11	35.29	1.4	2.0
	Social skills	87.00	106.8	123	41.37	1.2	4.8
	Social reciprocity	38.66	47.2	62	60.38	1.6	3.7
Subject D	Social participation	18.66	24.4	33	76.84	1.73	3.5
	Detrimental social behavior	15.33	13.8	12	21.72	1.2	3.1
	Social skills	72.65	85.4	107	47.28	1.6	3.8

Table 5 presents the evaluation of social skills performance among subjects using Cohen's effect size test, based on instructor assessments. The reliable change indices for social skills scores were 3.3, 4.2, 4.8, and 3.8 for Subjects A, B, C, and D, with recovery percentages of 48.83%, 41.66%, 41.37%, and 47.28% and effect sizes of 1.6, 1.4, 1.2, and 1.6, respectively. For social reciprocity, indices were 2.4, 2.1, 3.2, and 3.7, with recovery percentages and effect sizes reflecting significant improvements. Social participation scores yielded indices of 4.6, 4.2, 3.7, and 3.5, with high recovery rates and substantial effect sizes. All indices surpassed the 1.96 threshold, indicating significant enhancements in social skills due to PECS intervention for children with autism spectrum disorder.

Table 6. The results of Cohen's effect size test from the comparison of baseline, intervention, and follow-up for parent

Subject	Variable	Mean of Baseline (A)	Mean of Intervention (B)	Mean of Follow-up (C)	Recovery percentage	Effect size	Reliable change index

Subject A	Social reciprocity	37.33	51.4	58	55.35	1.5	3.8
	Social participation	21.33	28.4	33	54.71	1.11	3.7
	Detrimental social behavior	15.66	14.8	13	16.98	1.27	2.5
	Social skills	74.33	94.6	104	39.91	0.95	2.1
Subject B	Social reciprocity	۴۰/۳۳	48.2	56	38.85	1.08	2.9
	Social participation	20.66	28.8	35	69.40	1.27	3.2
	Detrimental social behavior	16.66	15.2	14	15.96	1.2	2.8
	Social skills	76.65	92.2	105	35.22	0.99	3.4
Subject C	Social reciprocity	40.33	45.6	50	23.97	0.93	2.2
	Social participation	16.66	19.2	24	44.05	0.88	2.2
	Detrimental social behavior	16.33	15	13	20.39	0.85	3.1
	Social skills	73.33	79.8	87	18.64	0.87	3.2
Subject D	Social reciprocity	44.33	62.4	73	64.67	1.8	3.3
	Social participation	24.33	33.8	40	64.40	1.74	4.1
	Detrimental social behavior	14	11.6	10	28.57	1.9	4.1
	Social skills	82.66	107.8	123	48.8	1.4	2.7

Table 6 analyzes parental assessments of subjects' social skills using Cohen's effect size test. The reliable change indices for overall social skills scores were 2.1, 3.4, 3.2, and 2.7 for Subjects A, B, C, and D, respectively, with effect sizes of 0.95, 0.99, 0.87, and 1.4, all indicating a large effect. Improvements in specific areas included: social reciprocity (indices of 3.8 to 2.2, effect sizes from 0.93 to 1.8), social participation (indices of 3.7 to 4.1, effect sizes from 0.88 to 1.74), and reduced detrimental behavior (indices of 2.5 to 4.1, effect sizes from 0.85 to 1.9). All changes were statistically significant, supporting the effectiveness of PECS in enhancing social skills among children with autism spectrum disorder. Mean scores of subjects' social skills and

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components (reciprocity, participation, detrimental behavior) are illustrated across baseline, intervention, and follow-up phases.

The performance of all subjects in social skills and its components is illustrated in Figures 1 to 4.

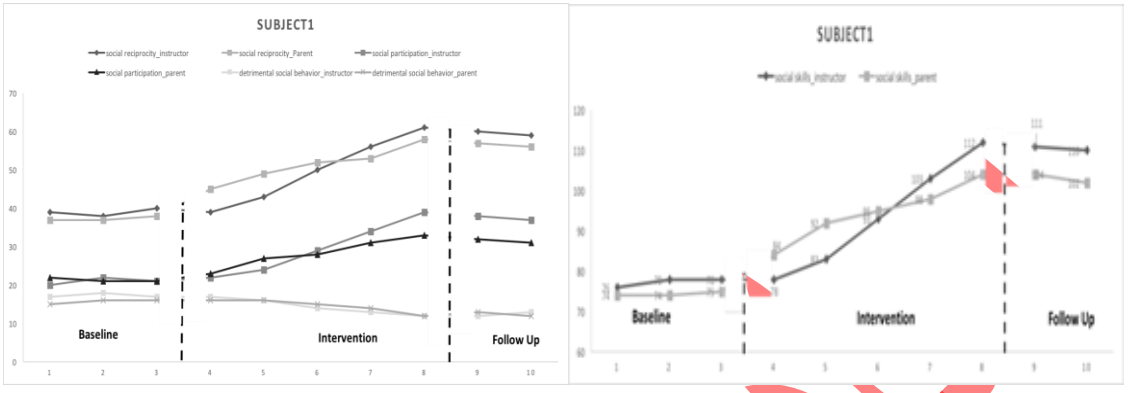

Figure 1. The performance of the Subject A (Case 1) in social skills and its components

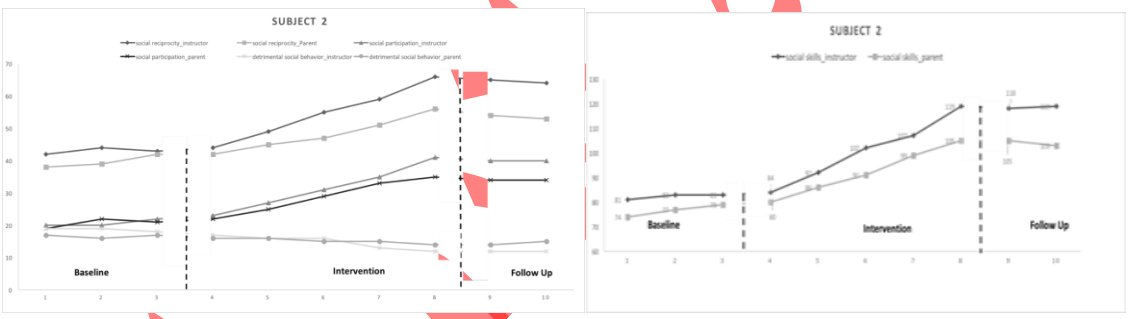

Figure 2. The performance of the Subject B (Case 2) in social skills and its components

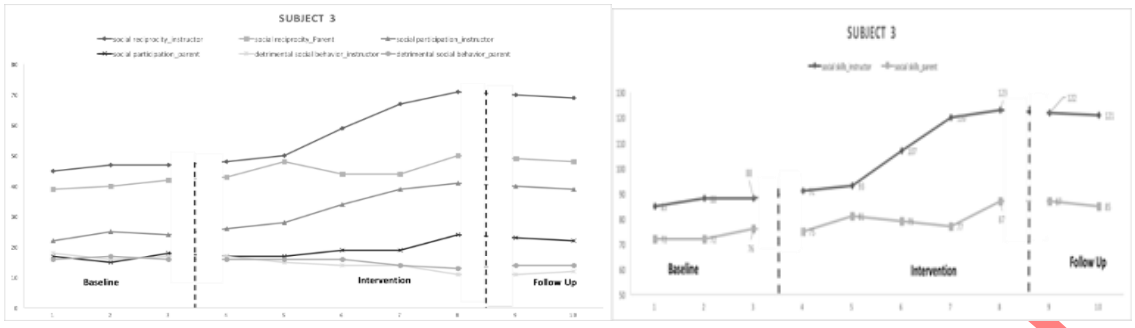

Figure 3. The performance of the Subject C (Case 3) in social skills and its components

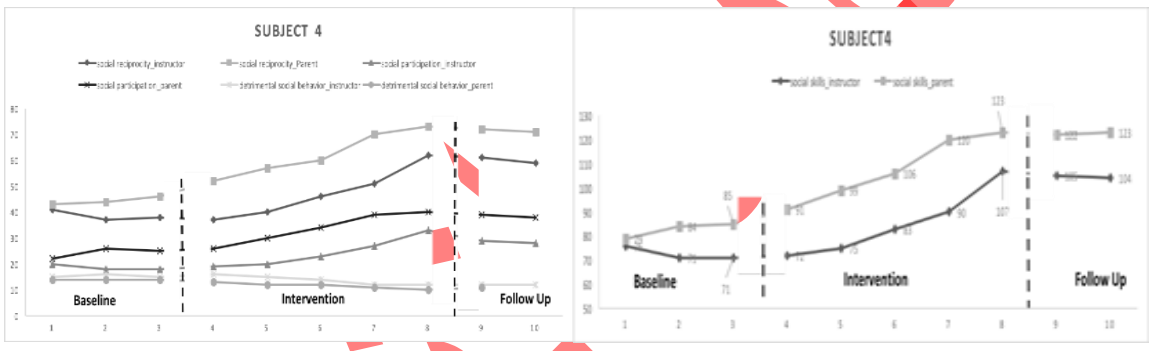

Figure 4. The performance of the Subject D (Case 4) in social skills and its components

Discussion

Children with autism spectrum disorder (ASD) often struggle with social skills, affecting their development. This study assessed the effectiveness of the Picture Exchange Communication System (PECS) on the social skills of four children with ASD. Significant improvements in social reciprocity, participation, and overall skills were noted, along with reduced detrimental behaviors, supporting existing literature (Bondy, 2012; Moghim-Islam, Pourmohammadreza-Tajrishi, & Haghgou, 2014; Moodie-Ramdeen, 2008). Subject A, a 7-year-old boy with an IQ of 75, demonstrated gains of 56% in social reciprocity and 70% in social participation.

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Discrepancies between parent and instructor assessments emphasized the need for comprehensive evaluations in interventions.

After twelve sessions of the Picture Exchange Communication System (PECS), Subject B, a 9-year-old boy with an IQ of 70, showed improvements of 46% in social reciprocity and 76% in social participation. Discrepancies in progress assessments were observed between parents and instructors regarding his social skill enhancements.

After twelve sessions of the Picture Exchange Communication System (PECS), Subject C, an 8-year-old girl with an IQ of 70, demonstrated improvements of 39% in social reciprocity, 59% in social participation, and 30% in overall social skills. Disparities in evaluations were noted, with minimal behavioral changes reported at home, indicating challenges in skill generalization.

After twelve sessions of the Picture Exchange Communication System (PECS), Subject D, an 8-year-old boy with an IQ of 78, showed significant improvements: 62% in social reciprocity, 73% in social participation, 25% in detrimental behaviors, and 48% in overall social skills, as reported by instructors and parents. Discrepancies in evaluations highlighted differences in perceived social behavior recovery.

Individuals with autism spectrum disorder (ASD) exhibit diverse impairments in social interaction, repetitive behaviors, and restricted interests, which significantly impact their social skills(Gould et al., 2011). Challenges in understanding eye contact, gestures, and vocal tones hinder emotional reciprocity and peer relationships(Bush, Williams, Mendes, & disorders, 2021; Dadkhah, Mohammadkhani, Banigamali, & Peyvastegar, 2014). This study found notable improvements in social skills, particularly in eye contact and initiating interactions, with varying progress among subjects regarding skill generalization and emotional understanding.

The study demonstrates that the Picture Exchange Communication System (PECS) enhances spontaneous communication via visual supports and behavioral techniques. Ganz et al. (2012) found that PECS benefits extend to improving social interaction and reducing behavioral issues. Primarily, it fosters assertiveness and self-expression, promoting skill generalization in diverse contexts(Ganz et al., 2012).

During PECS sessions, positive behavioral support and consistent verbal and non-verbal reinforcements enhanced foundational communication skills in children(Bondy, 2012). A unique aspect of PECS is the use of physical assistance and body gestures to encourage independent symbol selection while minimizing distractions(Stansberry-Brusnahan & Collet-Klingenberg,

2010). This intervention significantly improved communication skills, responsiveness, and reduced behavioral challenges(Bush et al., 2021; Cummings, Carr, & LeBlanc, 2012; Mohammadi et al., 2019).

Social skills are crucial for socialization and adaptation in children with autism spectrum disorder (ASD), encompassing cooperation, relationship initiation, and acknowledgment of others. Despite their ability to learn these skills, children with ASD often struggle with understanding the underlying logic, which can hinder generalization. Visual training methods may be more effective than verbal approaches in enhancing communication and facilitating interactions(Bondy, 2012; Gomez-Campos et al., 2022).

The main limitations of this study were the lack of adequate parent involvement and the absence of participation in some intervention sessions .Although results suggest children can effectively acquire PECS, individual preferences for augmentative and alternative communication (AAC) methods may vary. Additionally, the lack of long-term follow-up hinders the assessment of PECS's lasting impact on social skills. Future research should include larger samples, long-term evaluations for skill retention, and assess the influence of various instructors on social interactions.

Conclusion

The PECS intervention significantly improved targeted behaviors in four children with ASD, leading to a reduction in problem behaviors and enhanced social interactions. Our reason for emphasizing these findings is that PECS has consistently demonstrated the ability to improve social communication and reduce problematic behaviors in children with ASD. For instance, Abono (Abono et al., 2023) found that PECS significantly increased communicative initiations and social engagement while reducing maladaptive behaviors. These results support the idea that PECS not only enhances communication skills but also positively impacts related behaviors, which aligns with our observed outcomes in these four children. Additionally, this case study underscores the value of non-pharmacological approaches in autism management, particularly techniques like differential reinforcement that promote the reinforcement of adaptive behaviors.

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While these findings are promising, larger-scale studies with longer follow-up periods are needed to fully establish PECS's long-term effectiveness.

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