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Parent-reported benefits, barriers, and experiences of augmentative and alternative communication use among children with autism in Nablus, Palestine: a cross-sectional study

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Abstract

Background Children with autism may have communication needs that require individualized support. Augmentative and Alternative Communication (AAC) can support functional communication, but little is known about parent-reported AAC implementation in Palestine. This study examined parent-reported perceived benefits, barriers, and experiences of AAC use among children with autism in Nablus, Palestine.

Methods A descriptive cross-sectional study was conducted among 75 parents or primary caregivers of children with autism who were using or receiving structured AAC training. Participants were recruited from specialized autism centers in Nablus. Data were collected using a structured questionnaire covering child and family characteristics, perceived AAC benefits and barriers, and experiences during AAC implementation. The perceived benefit score was calculated from six yes/no items. The final AAC experience score was calculated from seven positively worded items after two negatively worded acceptance-difficulty items were analyzed separately. Descriptive statistics, Mann–Whitney U tests, Kruskal–Wallis tests, and Spearman's correlations were used.

Results The perceived AAC benefit score had a median of 6 (IQR 4–6) out of 6. The most frequently endorsed perceived benefit was increased communication opportunities (73/75, 97.3%), followed by perceived better behavior-related interaction inside the home (65/75, 86.7%) and improved understanding of the child's needs (64/74, 86.5%). Reported barriers included difficulty integrating AAC into daily routines (53/75, 70.7%) and difficulty accessing AAC programs (51/75, 68.0%). Awareness of alternative AAC systems was limited (25/75, 33.3%), and 23/74 parents/caregivers (31.1%) agreed that AAC systems are suitable for all children. The seven-item AAC experience score showed good internal consistency (Cronbach's $\alpha = 0.841$) and had a median of 16.0 (IQR 12.75–19.0) out of 21. A positive correlation was observed between perceived benefit score and AAC experience score ($rs = 0.426$, $p < 0.001$).

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Conclusion Parents/caregivers commonly reported AAC-related perceived benefits, but barriers to access and daily integration were frequent and awareness of alternative systems was limited. Findings should be interpreted cautiously because of the cross-sectional parent-report design, but they support structured parent education, individualized AAC selection, and continued professional follow-up.

Keywords Augmentative and Alternative Communication, AAC, Autism, Parent-reported outcomes, Perceived benefits, Barriers, Caregiver experiences, Palestine

Introduction

Effective communication is essential for early child development, social participation, learning, family interaction, and overall well-being [1]. Communication can be particularly challenging for children with autism spectrum disorder and other developmental or neurological conditions associated with complex communication needs [2]. Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by persistent difficulties in social communication and social interaction, together with restricted, repetitive patterns of behavior, interests, or activities [3]. Recent estimates from the Centers for Disease Control and Prevention indicate that approximately 1 in 31 children aged 8 years has been identified with autism spectrum disorder, compared with 1 in 59 children in 2014 [4, 5]. This increase may partly reflect greater awareness, changes in diagnostic practices, and broader access to assessment services [6]. Nevertheless, communication support remains a central concern, as a proportion of children with autism are minimally verbal or have limited functional speech [7].

Augmentative and Alternative Communication (AAC) refers to a range of strategies and systems used to support communication when natural speech is limited, insufficient, or not consistently functional. AAC includes unaided methods, such as gestures, signs, and facial expressions, as well as aided methods, such as picture cards, communication boards, visual symbols, the Picture Exchange Communication System, speech-generating devices, tablet-based systems, and mobile applications [8, 9]. AAC may be used to supplement existing speech or provide an alternative means of communication, with the goal of supporting functional communication across home, educational, and therapeutic settings.

AAC has been increasingly studied among children with autism and complex communication needs. Importantly, evidence does not support the concern that AAC prevents speech development. Schlosser and Wendt reported that AAC interventions did not impede speech production in children with autism, and White and Ayres similarly summarized evidence on AAC and speech production among individuals with autism spectrum disorder [10, 11].

Romski and Sevcik also challenged common myths about AAC in early intervention, emphasizing that AAC can be considered across ages, developmental levels, and communication profiles when individualized to the child's needs [12]. Ganz further highlighted the importance of continuing AAC research among individuals with autism spectrum disorder, including issues related to implementation, individualization, communication outcomes, and future research priorities [13].

AAC systems differ substantially in complexity, cost, accessibility, and implementation requirements. Low-technology approaches, such as picture cards, communication boards, visual supports, and PECS-based systems, may be more feasible in resource-limited settings, while high-technology systems, including speech-generating devices and mobile applications, may provide expanded communication options but require device access, technical support, user training, and culturally appropriate language content. Technology-based AAC examples also demonstrate the importance of usability and cultural-linguistic adaptation. Hijab and Al-Thani et al. developed the MAAN multimodal messaging application, which incorporated text-to-speech, speech-to-text, and communication-symbol features to support communication among adults with autism spectrum disorder in an Arabic-speaking regional context [14]. An and Feng et al. developed and evaluated Yuudee, a speech-generating AAC mobile application for minimally verbal children with autism in Mainland China, illustrating how app-based AAC can be adapted to specific language and service contexts [15].

Parents and caregivers play a central role in AAC implementation because AAC use must extend beyond clinical or educational sessions into daily routines, family interactions, and natural communication opportunities. Parental acceptance, confidence, training, and perceived usefulness can influence whether AAC is used consistently and meaningfully. Berenguer and Martínez et al. reported that parents' perceptions and experiences with AAC are shaped by perceived child benefit, emotional adjustment, professional guidance, and daily implementation demands [2]. Donato and Spencer et al. identified barriers and facilitators to AAC use among children with autism and their communication partners, including access to support, training, attitudes, system suitability, and integration into everyday contexts [16].

Despite growing international evidence, limited research has examined AAC use among children with autism in Palestine and similar Arabic-speaking or

resource-limited settings. Local factors, including availability of specialized services, affordability, professional training, Arabic-language AAC resources, access to high-technology systems, and family routines, may shape how parents experience AAC implementation. Understanding these perceptions is particularly important in contexts where AAC services may be limited to selected centers and where families may rely heavily on professional guidance to integrate AAC into home routines.

Therefore, this study aimed to examine parent-reported perceived benefits, barriers, and experiences of AAC use among children with autism in Nablus, Palestine. Specifically, the study described perceived AAC-related benefits, reported access and integration barriers, parental knowledge of alternative AAC systems, perceived general suitability of AAC, parent-reported experiences during AAC implementation, and exploratory associations between these scores and selected child and family characteristics.

Methods

Study design, setting, and population

This was a descriptive cross-sectional study conducted in Nablus, Palestine, among parents and primary caregivers of children with autism who were using or receiving structured training in Augmentative and Alternative Communication (AAC) systems. The study examined parent-reported perceived benefits, barriers, and experiences related to AAC use. Because the study used a cross-sectional parent-report design, it did not objectively measure intervention effects or changes in child communication, behavior, or family interaction over time.

Participants were recruited from specialized autism centers in Nablus, Palestine that provide diagnostic and intervention services for children with autism and implement AAC systems within their clinical and educational programs. These centers were selected because they had direct access to the target population of children currently receiving AAC-related services.

Participants and eligibility criteria

The study included parents or primary caregivers of children with autism who were actively using or undergoing structured training in AAC systems at the time of data collection. Children were eligible if they had been exposed to AAC services for at least six months before the survey, allowing parents or caregivers to report on their experience with AAC implementation.

Autism diagnosis was documented by the participating specialized autism centers and was based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) criteria. Diagnoses were made through multidisciplinary assessment by qualified specialists, including pediatric neurologists or developmental pediatricians, clinical psychologists or psychometricians, speech-language pathologists, and special education specialists, according to the assessment procedures used in the participating centers. Children without documented evidence of autism diagnosis were not eligible for inclusion. The participating children had varying expressive language abilities. Both verbal and minimally verbal children were eligible for inclusion because AAC was used to support functional communication according to each child's individual communication profile. However, verbal status was not collected as a separate categorical variable in the questionnaire; therefore, the study could not compare parental perceptions or experiences according to verbal ability.

Parents or caregivers were eligible if they were actively involved in the child's daily care and communication routines, lived in Nablus city or surrounding areas, and were able to understand and complete the questionnaire. Families were excluded if the child had not yet started AAC use or training, had discontinued AAC before the study period, lived outside the study area, or if the questionnaire responses were insufficient for analysis.

AAC systems and implementation context

AAC was defined broadly to include aided and unaided communication methods used to support functional communication. In the participating centers, AAC implementation was predominantly based on low-technology systems. The most commonly used AAC approaches included the Picture Exchange Communication System, communication boards, picture cards, visual symbols, whiteboards, and other visual support materials. Simple gestures or basic manual signs were also used in some cases as supplementary communication strategies. A small number of children used standard tablet devices with basic speech-output or text-to-speech applications; however, dedicated high-technology speech-generating devices were limited.

AAC systems were implemented through a multidisciplinary approach. Speech-language pathologists primarily introduced and trained children in AAC use during therapy sessions. Special education staff supported the integration of AAC into educational activities and structured routines within the centers. Parents also received guidance from the clinical team to support AAC use at home and reinforce communication strategies in daily routines.

Sample size

No formal local registry was available for the number of children with autism using AAC systems in Nablus. Based on local center estimates, the accessible population of children with autism receiving AAC-related services was approximately 80. The minimum required sample

size was calculated using an online sample-size calculator [17] assuming a 95% confidence level, a 5% margin of error, and an expected response distribution of 50% to provide the most conservative estimate. The minimum required sample size was 67 participants. The final sample included 75 parents or primary caregivers, exceeding the minimum calculated sample size.

Data collection

Data were collected using a structured questionnaire administered in both paper-based and electronic formats. Questionnaires were distributed through the participating autism centers. Some parents completed paper questionnaires at the centers, while others received the questionnaire electronically through the centers or therapists and returned it after completion. This approach was used because direct contact with all eligible parents was not consistently feasible and because parents' attendance schedules varied.

The questionnaire consisted of three sections. The first section collected sociodemographic and child-related information, including child age, child gender, parental education, additional child disorders, number of children in the family, and duration of AAC training. The second section assessed parent-reported perceived benefits of AAC use, barriers to AAC access and daily integration, parental knowledge of alternative AAC systems, and perceived general suitability of AAC systems. The third section assessed parent-reported experiences during AAC implementation, including professional support, follow-up, confidence using AAC, perceived individual fit, team cooperation, and consideration of the child's and family's emotional and psychological needs.

Questionnaire development, pilot testing, content validity, and reliability

The questionnaire was developed after reviewing relevant literature on AAC use, parental perceptions and experiences, family acceptance, barriers and facilitators to AAC implementation, and communication- and behavior-related AAC outcomes among children with autism and complex communication needs [2, 10, 12, 13, 16, 18–20]. The initial item pool was designed to cover domains aligned with the study objectives, including perceived communication-related benefits, behavior-related perceptions, family interaction, parental acceptance, access barriers, and implementation experience.

The draft questionnaire was reviewed by a panel of five experts in speech-language pathology, special education, and clinical assessment. The expert review focused on item relevance, clarity, clinical appropriateness, cultural suitability, and content coverage. Based on expert feedback, some items were reworded and the questionnaire structure was refined.

A pilot test was conducted with 10 parents of children with autism from the same target population. Pilot participants were not included in the final analysis. The pilot test assessed clarity, comprehensibility, feasibility of administration, and item wording. Minor revisions were made before final data collection.

Internal consistency was assessed using Cronbach's alpha for the constructed scores. The perceived benefit score, calculated from six positively worded benefit items, showed acceptable internal consistency (Cronbach's $\alpha = 0.75$). The nine-item experience scale showed low internal consistency after inclusion of the two negatively worded acceptance-difficulty items (Cronbach's $\alpha = 0.553$). Therefore, these two negatively worded items were analyzed separately as acceptance-difficulty items and were not included in the total experience score. The final AAC experience score was calculated from seven positively worded experience items and showed good internal consistency (Cronbach's $\alpha = 0.841$). The seven-item score ranged from 0 to 21, with higher scores indicating more favorable parent-reported AAC experiences (Supplementary file 1).

Variable definitions and scoring

The perceived AAC benefit score was calculated by summing six yes/no items related to perceived communication opportunities, understanding the child's needs, behavior-related interaction inside and outside the home, frustration or behavioral-emotional expression, and independence. Each endorsed perceived benefit was scored as 1, and non-endorsement was scored as 0. The total perceived benefit score ranged from 0 to 6, with higher scores indicating a greater number of parent-reported perceived AAC-related benefits.

Barrier items were analyzed separately and were not included in the perceived benefit score. These included difficulty integrating AAC into the child's daily routine and difficulty accessing AAC programs. Parent knowledge of alternative AAC systems and perceived general suitability of AAC systems were also analyzed as separate items.

The AAC experience items were rated using four ordered response options: never, sometimes, mostly, and always. The final AAC experience score was calculated from seven positively worded experience items, scored from 0 to 3. The total score ranged from 0 to 21, with higher scores indicating more favorable parent-reported AAC experiences. The two negatively worded acceptance-difficulty items were not included in the total experience score because their inclusion reduced internal consistency; instead, they were reported separately at the item level.

For inferential analyses, child age was analyzed in three groups: less than 3 years, 4–5 years, and 6–12 years.

Additional child disorders were collapsed into two categories: no additional disorder and any additional disorder. Father's and mother's education levels were collapsed into three categories for inferential analysis: secondary/diploma or less, bachelor's degree, and postgraduate education. These collapsed categories were used to reduce sparse subgroup counts.

Statistical analysis

Data were analyzed using IBM SPSS Statistics version 26. Categorical variables were summarized using frequencies and percentages. Percentages were calculated using valid responses for each variable because some items had missing responses. Continuous and ordinal variables were summarized using medians and interquartile ranges.

The Kolmogorov–Smirnov and Shapiro–Wilk tests were used to assess the normality of continuous score variables. Because the variables were ordinal or non-normally distributed, non-parametric tests were used. The Mann–Whitney U test was used for comparisons between two independent groups, and the Kruskal–Wallis test was used for comparisons involving three independent groups. Spearman's rank correlation was used to assess associations between ordinal or non-normally distributed continuous variables, including associations between perceived benefit score, AAC experience score, number of children in the family, and duration of AAC training.

All inferential analyses were exploratory. A p-value of less than 0.05 was considered statistically significant. Because multiple exploratory comparisons were conducted and some subgroups were small, isolated statistically significant findings were interpreted cautiously.

Ethical approval

The study was approved by the Institutional Review Board of An-Najah National University (IRB reference: HSP. Dec. 2023/8). Participation was voluntary, and informed consent was obtained before questionnaire completion. No identifiable personal data were included in the analysis dataset, and all responses were handled confidentially. This was an observational cross-sectional study and did not involve any clinical trial intervention; therefore, clinical trial registration was not applicable.

Results

Sociodemographic and child-related characteristics

A total of 75 parents or primary caregivers participated in the study. Among children with valid age data, 38/74 (51.4%) were aged 6–12 years, 30/74 (40.5%) were aged 4–5 years, and 6/74 (8.1%) were younger than 3 years. Among children with valid gender data, 51/73 (69.9%) were male and 22/73 (30.1%) were female.

Table 1 Characteristics of participating children and families

Variable	Frequency	Percent (%)
Child Age ($n=74$)		
Less than 3 Years Old	6	8.1
4–5 Years old	30	40.5
6–12 Years old	38	51.4
Child Gender($n=73$)		
Male	51	69.9
Female	22	30.1
Father Education Level		
Secondary Education	23	30.7
Diploma	1	1.3
Bachelor	41	54.7
Master	8	10.7
PhD or higher	2	2.7
Mother Education Level		
Secondary Education	19	25.3
Diploma	2	2.7
Bachelor	45	60.0
Master	7	9.3
PhD or higher	2	2.7
Does your child suffer from any other disorders or problems in addition to autism spectrum disorder? ($n=73$)		
No	53	72.6
Cognitive	13	17.8
Auditory	3	4.1
Others	4	5.5

Table 2 Continuous child and family characteristics

Variable	Median	Interquartile Range (Q1–Q3)	Unit
Age of children	6	4–12	years
Number of children in family	3	2–4	—
Length of AAC training($n=72$)	24	12–24	months

Regarding parental education, 41/75 fathers (54.7%) and 45/75 mothers (60.0%) had a bachelor's degree. Most children had no parent-reported additional disorder besides autism (53/73, 72.6%). Among those with additional disorders, cognitive disorders were the most frequently reported (13/73, 17.8%). The median number of children in the family was 3 (IQR 2–4). The median duration of AAC training was 24 months (IQR 12–24) among participants with available data. Sociodemographic and child-related characteristics are shown in Tables 1 and 2.

Parent-reported perceived benefits, barriers, AAC knowledge, and general suitability

Parents/caregivers commonly reported perceived AAC-related benefits. The perceived AAC benefit score had a median of 6 (IQR 4–6) out of 6. The most frequently endorsed perceived benefit was increased

Table 3 Parent-reported perceived benefits, barriers, AAC knowledge, and general suitability

No.	Item	Yes *n* (%)	No *n* (%)
	Perceived benefits		
1	AAC systems increased my child's communication opportunities.	73 (97.3)	2 (2.7)
2	AAC systems helped me understand my child's needs and interact with my child.	64 (86.5)	10 (13.5)
3	AAC systems helped improve my child's behavior-related interaction inside the home.	65 (86.7)	10 (13.3)
4	AAC systems helped improve my child's behavior-related interaction outside the home.	54 (72.0)	21 (28.0)
5	AAC systems helped reduce my child's frustration or behavioral-emotional difficulties.	60 (80.0)	15 (20.0)
6	AAC systems helped my child become more independent, such as making choices or expressing wishes.	61 (81.3)	14 (18.7)
	Barriers to AAC use and access		
7	I had difficulty integrating AAC systems into my child's daily routine.	53 (70.7)	22 (29.3)
8	It was difficult for my child to access AAC programs.	51 (68.0)	24 (32.0)
	Parent knowledge of alternative AAC systems		
9	I know about other AAC systems that could be used in addition to my child's current system.	25 (33.3)	50 (66.7)
	Perceived general suitability of AAC systems		
10	AAC systems are suitable for all children.	23 (31.1)	51 (68.9)

Variable	Median (IQR)	Possible range
Perceived AAC benefit score	6 (4–6)	0–6

Percentages were calculated using valid responses for each item. The perceived AAC benefit score was calculated from the six perceived-benefit items and ranged from 0 to 6, with higher scores indicating a greater number of parent-reported perceived AAC-related benefits

AAC Augmentative and Alternative Communication

communication opportunities (73/75, 97.3%), followed by improved behavior-related interaction inside the home (65/75, 86.7%) and improved understanding of the child's needs (64/74, 86.5%).

Reported barriers were also common. Difficulty integrating AAC into the child's daily routine was reported by 53/75 parents/caregivers (70.7%), and difficulty accessing AAC programs was reported by 51/75 (68.0%). Awareness of alternative AAC systems was limited, with 25/75 parents/caregivers (33.3%) reporting knowledge of other systems that could be used in addition to the system used by their child. In addition, 23/74 parents/caregivers (31.1%) agreed that AAC systems are suitable for all children (Table 3).

Parent-reported experiences during AAC implementation

The final AAC experience score was calculated from seven positively worded items after excluding the two negatively worded acceptance-difficulty items from the total score. Among participants with complete data for the seven experience items, the median AAC experience score was 16.0 (IQR 12.75–19.0) out of 21. The seven-item experience score showed good internal consistency (Cronbach's $\alpha = 0.841$). The two acceptance-difficulty items were retained in Table 4 as descriptive items but were not included in the total experience score.

At the item level, the highest "Always" response was reported for receiving appropriate guidance and support from specialists or trainers (46/71, 64.8%), followed by specialists or trainers being responsive to the child's changing needs and making necessary adjustments (37/72, 51.4%) and providing continuous assistance and follow-up (35/72, 48.6%). Initial difficulty accepting AAC for the child was also reported, with 31/72 parents/caregivers (43.1%) responding "Always" to this item. Continued difficulty accepting AAC after some time had passed was less frequently reported as "Always" (13/72, 18.1%) (Table 4).

Exploratory associations with parent-reported perceived AAC benefit score

Exploratory analyses showed no statistically significant differences in parent-reported perceived AAC benefit scores according to child gender, child age group, presence of an additional child disorder, father's education level, or mother's education level. Median perceived benefit scores were generally high across all examined subgroups (Table 5).

Spearman correlation analysis showed a weak positive correlation between the number of children in the family and the perceived AAC benefit score ($rs = 0.231$, $p = 0.046$). The length of AAC training was not significantly correlated with the perceived benefit score ($rs = 0.136$, $p = 0.254$) (Table 6).

Exploratory associations with the seven-item AAC experience score

Exploratory analyses showed no statistically significant differences in the seven-item AAC experience score according to child gender, child age group, presence of an additional child disorder, father's education level, or mother's education level. Although parents/caregivers in the secondary/diploma-or-less education groups had slightly higher median experience scores than other education groups, these differences did not reach statistical significance and should be interpreted cautiously because of the exploratory nature of the analyses and small subgroup sizes (Table 7).

Spearman correlation analysis showed no statistically significant correlation between the seven-item AAC experience score and either the number of children in the family ($rs = 0.180$, $p = 0.137$) or the length of AAC training ($rs = -0.102$, $p = 0.408$) (Table 8).

Table 4 Parent-reported experiences during AAC implementation

No.	Item	Never *n* (%)	Sometimes *n* (%)	Mostly *n* (%)	Always *n* (%)
1	I'm getting appropriate guidance and support from the competent authorities (specialists or trainers) in training my child on this system.	1 (1.4)	9 (12.7)	15 (21.1)	46 (64.8)
2	I had difficulty accepting this system for my child at first.	5 (6.9)	10 (13.9)	26 (36.1)	31 (43.1)
3	I still have problems accepting this system for my child even though some time has passed since he started training on it.	10 (13.9)	23 (31.9)	26 (36.1)	13 (18.1)
4	The specialists and trainers on this system are responsive to my child's changing needs and make adjustments in the system in accordance with his needs.	1 (1.4)	10 (13.9)	24 (33.3)	37 (51.4)
5	The specialists and trainers on this system provide continuous assistance and constant follow up to the use of, and understand this system as required.	2 (2.8)	11 (15.3)	24 (33.3)	35 (48.6)
6	I feel confident and able to use these systems effectively to communicate with my child.	2 (2.8)	19 (26.4)	23 (31.9)	28 (38.9)
7	Augmentative or alternative communication (AAC) systems suit the individual needs of my child.	2 (2.8)	11 (15.3)	38 (52.8)	21 (29.2)
8	There is good understanding and effective cooperation between the work team in the application of this system.	0 (0.0)	22 (30.6)	22 (30.6)	28 (38.9)
9	The emotional and psychological needs of my child and family are taken into account when implementing this system.	5 (7)	25 (35.2)	15 (21.1)	26 (36.6)
	Variable	**Valid n**	**Median (IQR)**	**Possible range**	
	AAC experience score, 7 positive items	70	16.0 (12.75–19.0)	0–21	

Valid responses varied by item. The AAC experience score was calculated from seven positively worded items and ranged from 0 to 21. The two acceptance–difficulty items were analyzed separately and were not included in the total score

Table 5 Exploratory associations between parent-reported perceived AAC benefit score and child/family characteristics

Variable	Category	Valid *n*	Median (IQR)	Mean rank	*p*-value
Child gender	Male	51	6 (5–6)	37.77	0.599
	Female	22	6 (4–6)	35.20	
Child age group	< 3 years	6	5.5 (3.5–6)	34.67	0.761
	4–5 years	30	6 (4–6)	36.05	
	6–12 years	38	6 (5–6)	39.09	
Additional child disorder	No additional disorder	53	6 (4–6)	36.30	0.614
	Any additional disorder	20	6 (5–6)	38.85	
Father's education	Secondary/diploma or less	24	6 (5–6)	40.98	0.501
	Bachelor	41	6 (4–6)	37.65	
	Postgraduate	10	5 (4.75–6)	32.30	
Mother's education	Secondary/diploma or less	21	6 (5–6)	44.38	0.214
	Bachelor	45	5 (4–6)	35.22	
	Postgraduate	9	6 (3.5–6)	37.00	

Perceived AAC benefit score ranged from 0 to 6, with higher scores indicating a greater number of parent–reported perceived AAC benefits. Mann–Whitney U test was used for two–group comparisons, and Kruskal–Wallis test was used for comparisons involving three groups. Percentages and analyses were based on valid responses

Table 6 Spearman correlations between continuous factors and parent-reported perceived AAC benefit score

Variable	Valid *n*	Spearman's rho	*p*-value
Number of children in family	75	0.231	**0.046**
Length of AAC training, months	72	0.136	0.254

Spearman's rank correlation test was used. Perceived AAC benefit score ranged from 0 to 6, with higher scores indicating a greater number of parent–reported perceived AAC benefits

Significant *p*–values are shown in bold

Relationship between perceived AAC benefit and AAC experience

Spearman correlation analysis showed a statistically significant positive correlation between the perceived AAC benefit score and the seven-item AAC experience score ($rs = 0.426$, $p < 0.001$). Parents/caregivers who reported a greater number of perceived AAC-related benefits also tended to report more favorable experiences during AAC implementation (Table 9).

Discussion

This cross-sectional study examined parent-reported perceived benefits, barriers, and experiences of AAC use among children with autism in Nablus, Palestine. Overall, participating parents and caregivers commonly reported perceived AAC-related benefits, particularly in relation to communication opportunities, understanding the child's needs, behavior-related interaction inside the home, reduced frustration or behavioral-emotional difficulties, and independence. At the same time, reported barriers to AAC access and integration into daily routines were common, and parental awareness of alternative AAC systems was limited. The seven-item AAC experience score showed good internal consistency, and a positive association was observed between the perceived

Table 7 Exploratory associations between the seven-item AAC experience score and child/family characteristics

Variable	Category	Valid *n*	Median (IQR)	Mean rank	*p*-value
Child gender	Male	47	15.0 (13.0–19.0)	34.14	0.821
	Female	21	16.0 (11.5–19.0)	35.31	
Child age group	< 3 years	6	17.5 (6.75–19.5)	35.50	0.804
	4–5 years	26	16.0 (13.75–19.0)	36.92	
	6–12 years	37	15.0 (12.0–19.5)	33.57	
Additional child disorder	No additional disorder	50	16.0 (13.0–19.0)	35.19	0.630
	Any additional disorder	18	15.5 (10.5–19.0)	32.58	
Father's education	Secondary/diploma or less	22	17.0 (13.75–21.0)	41.82	0.206
	Bachelor	39	15.0 (11.0–18.0)	32.33	
	Postgraduate	9	16.0 (10.5–18.0)	33.78	
Mother's education	Secondary/diploma or less	20	17.0 (14.5–21.0)	44.23	0.073
	Bachelor	44	15.0 (11.0–18.75)	32.19	
	Postgraduate	6	16.0 (10.5–16.75)	30.67	

The AAC experience score was calculated from seven positively worded items and ranged from 0 to 21, with higher scores indicating more favorable parent–reported AAC experiences. The two negatively worded acceptance–difficulty items were analyzed separately and were not included in the total score. Mann–Whitney U test was used for two–group comparisons, and Kruskal–Wallis test was used for three–group comparisons. Analyses were based on valid responses

AAC benefit score and the AAC experience score. These findings should be interpreted as parent-reported perceptions and experiences rather than objective evidence of AAC intervention effects.

The high endorsement of perceived communication-related benefits is consistent with the broader AAC literature, which supports AAC as a communication approach for individuals with complex communication needs. Importantly, previous evidence does not support the concern that AAC prevents speech development. Schlosser and Wendt [10] reported that AAC interventions did not impede speech production in children with autism, and White and Ayres [11] similarly reviewed evidence on AAC and speech production among individuals with autism spectrum disorder. Although the present study did not objectively measure speech, communication, or behavioral outcomes, the high proportion of parents who perceived AAC as increasing communication opportunities suggests that families may view AAC as a useful support for functional communication in daily life.

Table 8 Spearman correlations between continuous factors and seven-item AAC experience score

Variable	Valid *n*	Spearman's rho	*p*-value
Number of children in family	70	0.180	0.137
Length of AAC training, months	68	−0.102	0.408

Spearman's rank correlation test was used. The AAC experience score was calculated from seven positively worded items and ranged from 0 to 21, with higher scores indicating more favorable parent–reported AAC experiences. The two negatively worded acceptance–difficulty items were analyzed separately and were not included in the total score

Table 9 Correlation between parent-reported perceived AAC benefit score and seven-item AAC experience score

Variables	Valid *n*	Spearman's rho	*p*-value
Perceived AAC benefit score vs. seven-item AAC experience score	70	0.426	**< 0.001**

Spearman's rank correlation test was used. The perceived AAC benefit score ranged from 0 to 6, with higher scores indicating a greater number of parent–reported perceived AAC benefits. The AAC experience score was calculated from seven positively worded items and ranged from 0 to 21, with higher scores indicating more favorable parent–reported AAC experiences. The two negatively worded acceptance–difficulty items were analyzed separately and were not included in the total score

Significant *p*–values are shown in bold

Parents also commonly reported perceived benefits related to understanding the child's needs, behavior-related interaction inside the home, reduced frustration or behavioral-emotional difficulties, and greater independence. These findings align with previous work suggesting that AAC may support communication functions and reduce challenging behavior when communication needs are better addressed. Drager and Light [19] described the role of AAC interventions in supporting communication and language among young children with complex communication needs, while Walker and Snell [20] reported that AAC interventions may be associated with reductions in challenging behavior. However, the present findings should be interpreted cautiously because this study relied on parent report and did not include direct observation of AAC use or objective behavioral assessment. Therefore, the results indicate perceived AAC-related benefits within this sample rather than measured changes attributable to AAC.

A notable finding was that only about one-third of parents reported knowledge of alternative AAC systems, and a similarly small proportion agreed that AAC systems are suitable for all children. These findings may reflect limited awareness of the range of AAC options, but they may also indicate that parents recognize the need for individualized AAC selection. Romski and Sevcik [12] challenged common myths about AAC and emphasized that AAC can be considered across ages and developmental profiles when individualized to the child's needs. Ganz [13] also highlighted the importance of research on AAC implementation, individualization, communication outcomes, and future directions among individuals

with autism spectrum disorder. In the current setting, where AAC implementation was predominantly based on low-technology systems and high-technology speech-generating devices were limited, parental knowledge of alternative AAC options may be shaped by service availability, professional counseling, cost, and access to culturally and linguistically appropriate AAC resources.

The high frequency of reported barriers to integrating AAC into daily routines and accessing AAC programs is consistent with previous literature on AAC implementation. Donato and Spencer [16] identified barriers and facilitators to AAC use among children with autism and their communication partners, including limited training, access barriers, attitudes, system suitability, and difficulty embedding AAC into everyday contexts. Similarly, Andzik and LaRouech [18] emphasized that parents' perspectives from assessment to implementation are shaped by professional guidance, communication-partner support, and the practicality of using AAC across settings. In the present study, barriers were reported despite high perceived benefits, suggesting that positive parental perceptions alone may not be sufficient for successful AAC implementation. Families may require practical coaching, repeated follow-up, and coordinated support across home, therapy, and educational environments.

Parents' reported experiences during AAC implementation were generally favorable, particularly regarding guidance and support from specialists, responsiveness to the child's changing needs, and continuous follow-up. These domains are important because AAC implementation depends not only on selecting a communication system but also on training communication partners and adapting the system to the child's evolving needs. Berenguer and Martínez [2] reported that parents' experiences with AAC are shaped by perceived child benefit, emotional adjustment, professional support, and daily implementation demands. Gardiner and Bowden [21] also highlighted that parents' perceptions and emotional responses to AAC are closely linked to how AAC affects communication, family interaction, and the parent-child relationship. The present findings support the importance of family-centered AAC services in which parents are active partners in implementation rather than passive recipients of recommendations.

The two negatively worded acceptance-difficulty items provided additional insight into parental adjustment to AAC. Many parents reported initial difficulty accepting AAC for their child, while fewer reported continued difficulty after some time had passed. This pattern may suggest that acceptance can evolve with exposure, professional support, and perceived child benefit. However, because this was a cross-sectional study, changes in acceptance over time could not be assessed. The decision to analyze these acceptance-difficulty items separately was also methodologically important, as their inclusion reduced the internal consistency of the experience scale. Reporting these items separately allowed the study to retain clinically meaningful information about parental acceptance while maintaining a more reliable seven-item experience score.

Most exploratory subgroup analyses showed no statistically significant differences in perceived benefit or experience scores according to child gender, child age group, additional child disorder, or parental education. These findings suggest that, within this sample, parent-reported perceived benefits and experiences were broadly similar across the examined child and family characteristics. However, these analyses were exploratory, and some subgroup sizes were small; therefore, the absence of statistically significant differences should not be interpreted as evidence that these factors are unimportant. AAC suitability and family experience are likely influenced by more specific factors that were not measured in this study, such as verbal status, expressive language level, cognitive profile, communication goals, type of AAC system used, intensity of training, school support, and family resources.

The weak positive association between number of children in the family and perceived AAC benefit score should be interpreted cautiously. Although this association reached statistical significance, the correlation was small and may reflect unmeasured family-level factors rather than a direct relationship. In contrast, the number of children and the length of AAC training were not significantly associated with the seven-item AAC experience score. These findings do not support strong conclusions about family size or AAC training duration as determinants of parent-reported AAC experience. Longer duration of AAC exposure alone may not necessarily translate into better experience if training quality, follow-up, system fit, and daily integration remain variable.

The positive correlation between perceived AAC benefit score and the seven-item AAC experience score suggests that parents who reported more perceived AAC-related benefits also tended to report more favorable experiences during AAC implementation. This finding is consistent with the broader parent-experience literature. Berenguer and Martínez [2] reported that perceived child benefit and professional support are important elements of parental AAC experience, while Gardiner and Bowden [21] emphasized the emotional and relational dimensions of parent experiences with AAC. Joginder Singh and Mohd Ayob [22] also reported that parental perceptions of AAC use are linked to perceived usefulness, communication support, and family experience among children with complex communication needs. Nevertheless, the cross-sectional design prevents determining whether perceived benefits lead to better experiences, whether

more positive implementation experiences increase perceived benefits, or whether both are influenced by other factors such as professional support, child communication profile, or family engagement. Therefore, this association should be interpreted as exploratory and non-causal.

The findings have particular relevance for Palestine and similar resource-limited Arabic-speaking settings. Although high-technology AAC systems and mobile applications are increasingly described internationally, access to such technologies may be limited by cost, availability, training needs, and cultural-linguistic adaptation. Hijab and Al-Thani [14] developed the MAAN multimodal messaging application in an Arabic-speaking regional context, while An and Feng [15] developed and evaluated Yuudee, a speech-generating AAC mobile application for minimally verbal children with autism in Mainland China. These examples highlight the importance of culturally and linguistically appropriate AAC design. In the present study context, AAC implementation was mainly based on low-technology systems, which may be more feasible but still require structured training and consistent support. The findings therefore highlight the need to strengthen family education, increase awareness of AAC options, and support professionals and caregivers in integrating AAC into daily routines using systems that are realistic for the local service environment.

Overall, this study contributes local evidence on parent-reported AAC experiences among children with autism in Nablus. The findings suggest that participating parents generally perceived AAC positively, but they also reported important barriers related to access, routine integration, and limited awareness of alternative systems. These results support the value of family-centered AAC services that combine individualized system selection, parent training, professional follow-up, and culturally appropriate communication resources. Future research should use longitudinal and mixed-methods designs to examine how parent perceptions and experiences change over time and to evaluate child communication, behavior, and family-interaction outcomes using objective or observational measures.

Strengths and limitations

This study has several strengths. It addresses an under-researched topic in the Palestinian context and provides local data on parent-reported perceived benefits, barriers, and experiences of AAC use among children with autism. The study also examined multiple practical dimensions of AAC implementation, including perceived communication-related benefits, access and integration barriers, knowledge of alternative AAC systems, perceived general suitability, and parent-reported experiences with professional support and follow-up. In addition, the questionnaire was developed based on relevant literature, reviewed by experts, pilot-tested before data collection, and assessed for internal consistency. The final perceived benefit and AAC experience scores showed acceptable to good reliability, and the scoring approach was revised to avoid combining negatively worded acceptance-difficulty items into an unreliable total experience scale.

This study also has limitations. First, the cross-sectional design prevents causal inference and does not allow assessment of changes in child communication, behavior, family interaction, or parental acceptance over time. Second, the findings are based on parent/caregiver self-report and may be affected by recall bias, social desirability bias, and subjective interpretation of AAC-related changes. Third, the use of convenience sampling from specialized autism centers in Nablus may limit generalizability to all families of children with autism in Palestine, particularly families without access to AAC services or specialized centers. Fourth, the sample size was modest, and some subgroup analyses included small numbers; therefore, exploratory association findings should be interpreted cautiously. Fifth, although the questionnaire underwent expert review, pilot testing, and internal consistency assessment, it was not a formally validated psychometric instrument. In addition, although the sample included children with varying expressive language abilities, verbal status was not collected as a separate categorical variable; therefore, differences in parent-reported AAC perceptions and experiences between verbal and minimally verbal children could not be examined. Finally, the study did not include direct observation of AAC use, objective measures of child communication or behavior, clinician-rated outcomes, or longitudinal follow-up.

Conclusion

In this cross-sectional study of parents and primary caregivers of children with autism using AAC in Nablus, Palestine, parents commonly reported perceived AAC-related benefits, particularly in relation to communication opportunities, understanding the child's needs, behavior-related interaction inside the home, frustration, and independence. At the same time, reported barriers to daily integration and access were common, and parental awareness of alternative AAC systems was limited.

The seven-item AAC experience score showed good internal consistency, and parents who reported a greater number of perceived AAC-related benefits also tended to report more favorable AAC implementation experiences. However, most exploratory subgroup analyses were not statistically significant, and the findings should be interpreted cautiously because of the cross-sectional parent-report design, modest sample size, and convenience sampling approach. Overall, the findings support the need for family-centered AAC services, structured parent education, and

continued professional follow-up to improve AAC implementation in resource-limited settings.

Recommendations

The findings suggest several practical implications for AAC service delivery in Nablus and similar resource-limited settings. First, the high level of parent-reported perceived benefits indicates that AAC is generally viewed positively by participating parents and caregivers. However, the reported barriers to daily integration and access suggest that AAC implementation should not be limited to introducing the system itself; it should also include structured parent training, follow-up, and practical guidance on how to use AAC during everyday routines at home, in educational settings, and in community contexts.

Second, the limited parental awareness of alternative AAC systems highlights the need for family education about the range of available AAC options, including low-technology systems such as picture cards, PECS-based approaches, communication boards, and visual supports, as well as higher-technology options when feasible. Parent counseling should also address common concerns, including the misconception that AAC replaces or prevents speech, and should emphasize that AAC selection should be individualized according to the child's communication profile, family context, and available resources.

Third, the positive association between perceived AAC benefits and more favorable parent-reported AAC experiences suggests that families who perceive more benefits may also experience AAC implementation more positively. Although the cross-sectional design does not allow conclusions about directionality, this finding supports the importance of family-centered AAC programs that strengthen parental confidence, provide continuous professional support, and help families recognize achievable communication goals.

Finally, future research should use longitudinal or mixed-methods designs to examine how parental perceptions and experiences change over time and to assess child communication, behavioral, and family-interaction outcomes using objective or observational measures. Further studies should also explore barriers to AAC access in Palestine, including cost, availability of trained professionals, Arabic-language resources, and access to high-technology AAC systems.

Abbreviations

AAC	Augmentative and Alternative Communication
ASD	Autism Spectrum Disorder
DSM-5	Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
IQR	Interquartile Range
IRB	Institutional Review Board
SPSS	Statistical Package for the Social Sciences

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Clinical trial registration

Not applicable. This was an observational cross-sectional study and did not involve a clinical trial intervention.

Authors' contributions

HJ contributed to the study conception, research idea, overall supervision, and critical revision of the manuscript. LM contributed to the main manuscript writing, statistical analysis, interpretation of results, and critical revision of the manuscript. AM, MO, ND, RA, SD, SMK, and ZAS contributed to data collection, questionnaire administration, data organization, and initial drafting of selected manuscript sections. All authors reviewed and approved the final manuscript and agreed to be accountable for all aspects of the work.

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Data availability

Due to privacy concerns, the datasets used and/or analyzed during the current inquiry are available from the associated authors upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of An-Najah National University (IRB reference: HSP. Dec. 2023/8). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Participation was voluntary, and informed consent was obtained from all participants before questionnaire completion. Participants were informed about the study objectives, the voluntary nature of participation, confidentiality of responses, and their right to decline participation. No identifiable personal data were included in the analysis dataset, and all data were handled confidentially and used only for research purposes.

Consent for publication

Not applicable. This manuscript does not contain any individual person's identifiable data.

Competing interests

The authors declare no competing interests.

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References

1. Lima Antão JYF, Oliveira ASB, Almeida Barbosa RT, Crocetta TB, Guarnieri R, Arab C, et al. Instruments for augmentative and alternative communication for children with autism spectrum disorder: a systematic review. Clin (Sao Paulo Brazil). 2018;73:e497.
2. Berenguer C, Martínez ER, De Stasio S, Baixauli I. Parents' perceptions and experiences with their children's use of augmentative/alternative communication: a systematic review and qualitative meta-analysis. Int J Environ Res Public Health. 2022. https://doi.org/10.3390/ijerph19138091.
3. Association AP. Autism Spectrum Disorder American Psychological Association (APA) web page. 2025. Available from: https://www.apa.org/topics/autism-spectrum-disorder.
4. (CDC) CfDCaP. Data and Statistics on Autism Spectrum Disorder. 2025. Available from: https://www.cdc.gov/autism/data-research/index.html.

5. Prevention CfDCa. Prevalence of Autism Spectrum Disorder Among Children Aged 8 Years — Autism and Developmental Disabilities Monitoring Network, 11 Sites, United States, 2014 Morbidity and Mortality Weekly Report (CDC Surveillance Summary).2018. Available from: https://www.cdc.gov/mmwr/volumes/67/ss/ss6706a1.htm.
6. Aresti-Bartolome N, Garcia-Zapirain B. Technologies as support tools for persons with autistic spectrum disorder: a systematic review. Int J Environ Res Public Health. 2014;11(8):7767–802.
7. Kolaski K. Are communication interventions effective for minimally verbal children with autism spectrum disorder? A Cochrane review summary with commentary. Dev Neurorehabil. 2020;23(8):557–9.
8. Communication ISAA, About AAC. What is AAC? ISAAC – International Society for Augmentative and Alternative Communication. 2023. Available from: https://isaac-online.org/english/about-aac/.
9. Beukelman DR, Light JC. Augmentative and Alternative Communication: Supporting Children and Adults with Complex Communication Needs. Baltimore, MD: Paul H. Brookes Publishing Co.; 2020.
10. Schlosser RW, Wendt O. Effects of augmentative and alternative communication intervention on speech production in children with autism: a systematic review. Am J Speech Lang Pathol. 2008;17(3):212–30.
11. White EN, Ayres KM, Snyder SK, Cagliani RR, Ledford JR. Augmentative and alternative communication and speech production for individuals with ASD: a systematic review. J Autism Dev Disord. 2021;51(11):4199–212.
12. Romski M, Sevcik R. Augmentative communication and early intervention: myths and realities. Infants Young Child. 2005;18:174–85.
13. Ganz JB. AAC interventions for individuals with autism spectrum disorders: state of the science and future research directions. Augmentative and alternative communication (Baltimore, Md : 1985). 2015;31(3):203–14.
14. Hijab MHF, Al-Thani D, Banire B. A Multimodal Messaging App (MAAN) for Adults With Autism Spectrum Disorder: Mixed Methods Evaluation Study. JMIR Form Res. 2021;5(12):e33123.
15. An S, Feng X, Dai Y, Bo H, Wang X, Li M, et al. Development and evaluation of a speech-generating AAC mobile app for minimally verbal children with autism spectrum disorder in Mainland China. Mol Autism. 2017;8(1):52.
16. Donato C, Spencer E, Arthur-Kelly M. A critical synthesis of barriers and facilitators to the use of AAC by children with autism spectrum disorder and their communication partners. Augmentative and alternative communication (Baltimore, Md : 1985). 1985;34(3):242–53.
17. Calculator.net. Sample Size Calculator. Available from: https://www.calculator.net/sample-size-calculator.html.
18. Andzik N, LaRouech A, Gladfelter A. Parents' perspectives of augmentative and alternative communication: from assessment to implementation. Perspect ASHA Spec Interest Groups. 2023;9:201–14.
19. Drager K, Light J, McNaughton D. Effects of AAC interventions on communication and language for young children with complex communication needs. J Pediatr Rehabil Med. 2010;3(4):303–10.
20. Walker VL, Snell ME. Effects of augmentative and alternative communication on challenging behavior: a meta-analysis. Augment Altern Commun. 1985;29(2):117–31.
21. Gardiner S, Bowden C, Kennedy S, Waddington H. A systematic qualitative review of parent perceptions and experiences of augmentative and alternative communication for their autistic children. Rev J Autism Dev Disord. 2025. https://doi.org/10.1007/s40489-025-00515-z.
22. Joginder Singh S, Mohd Ayob N, Hassan FH. Parents' perception on the use of augmentative and alternative communication by children with complex communication needs in Malaysia. Disabil Rehabil Assist Technol. 2023;18(1):118–26.

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