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Early Implementation of Augmentative and Alternative Communication Supports in Preschool Children with Autism Spectrum Disorder: A Multi-Professional Perspective

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Abstract. The purpose of this study was to examine the relationship between the early use of Augmentative and Alternative Communication (AAC) strategies and expressive communication outcomes of preschool-aged children with Autism Spectrum Disorder (ASD). The analysis of the data showed that use of AAC was statistically significantly associated with estimated improvement in communication and expressive skills (Mann Whitney $U = 48.000$, $p < 0.001$). Also, a positive association was found between initial level of spoken language and success of the intervention (Spearman $p = 0.260$, $p = 0.001$), demonstrating the need for methods to be individualized. According to participants, the PECS method was the most effective form of ECE, while many practitioners reported the frequent use of non-verbal modes of communication such as gaze and gestures. Results suggest that the early introduction of AAC may facilitate the development of expressive communication skills in preschool aged children who have been diagnosed with ASD.

Keywords. Autism, Communication, Speech, Augmentative and Alternative Communication, Preschool children, Developmental Disabilities, Communication Disorders, Interventions

Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition that involves difficulties in social interaction and communication, as well as the presence of repetitive behaviors and narrow interests [1]. There have been significant changes in the occurrence of ASD over the last few decades globally. Recent statistics suggest that around 1 in 36 children in the United States has autism [2]. The Disorder Conference has played a major role in increasing the level of research into diagnosis, treatment, and intervention strategies. Many studies in the neuroscience, genetics, psychology, and education fields have contributed to a more in-depth and multidisciplinary understanding of ASD [3, 4].

Recognizing autism in kids at an early age is essential to their treatment success. According to the study by Lord et al. (2018) [5], the initial signs, like late language development, gaze avoidance, and limited number of interests, can be spotted when children are only 18–24 months old. Screening tools, such as the Modified Checklist for Autism in Toddlers (M-CHAT) and the Autism Diagnostic Observation Schedule (ADOS), are frequently used to catch these early symptoms [6]. Nevertheless, even though a lot of headway has been

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made in the early detection of autism, inequalities in the availability of diagnostic services persist, particularly in areas that are both socially and geographically underprivileged [7]. The social and cognitive development of children with Autism Spectrum Disorder (ASD) that are of preschool age varies considerably due to the severity of their conditions and the level of care they receive. Studies prove that going through intensive care programs can lead to noteworthy progress in speech, social skills, independence, and mobility for kids with ASD [8]. What is more, if they attend programs that involve not only therapy but also joint activities with healthy children, their social skills and the success of their social integration are significantly improved [9].

Studies have indicated that children with autism may experience delays in speech and language development, and around 30% of them are believed to have speaking difficulties throughout their lives [10]. The most common challenges in the area of language are having a limited vocabulary, repeating a particular word or phrase (echolalia), and using unusual intonation. Some children, however, may exhibit hyperlexia, which means they can read words without really knowing what they mean [11]. Meanwhile, the recent application of neuroimaging techniques has revealed that there are differences in the brain systems and mechanism sutilized for language functions in individuals with autism. Data obtained through functional magnetic resonance imaging (fMRI), for example, shows unusual activation patterns in the primary language areas like Broca's and Wernicke's regions [12]. Likewise, variations in the arcuate fasciculus structure, which connects these brain parts, have been identified, suggesting that the connectivity between neurons has been disrupted, thus resulting in language acquisition difficulties [13].

Moreover, it is emphasized that impairments in the sphere of social communication represent a core feature of autism and have a direct and serious impact on language development. A mutual focus of attention, that is the capacity to have the same point of interest with another person, is a reliable indicator of the speaking abilities in children with Autism [14]. Additionally, the limited reaction to social signals, like eye contact and body movements, hinders the acquisition of the pragmatic aspect of language which is indispensable for communication [15].

More to the point, people with ASD have a multitude of problems in communication, ranging from the complete lack of speech to difficulties in the practical use of language. As Wetherby and Prizant (2000) [16] point out, there is a wide variety of communication impairments in autism, including the inability to establish joint attention, delayed language skills and atypical use of gestures. Moreover, pragmatic language impairments, such as problems with understanding figurative language, difficulties with turn-taking and trouble with keeping a conversation going, are also frequent [17]; on top of that, nonverbal communication, such as poor eye contact, facial expressions and body language, has a huge impact on proper social interaction [18].

Broadly speaking, kids with Autism Spectrum Disorder (ASD) often experience dramatic developmental challenges, especially in social communication. The problems lie not only in the actual use of the language, but also in the way the language is utilized. It is of utmost importance to intervene early and to be thoroughly knowledgeable about a child's unique communication style in order for the child to be able to fit in with the rest of society. These difficulties dictate the need to search for other ways of promoting communication. The following chapter presents an in-depth discussion of how to make use of Augmentative and Alternative Communication (AAC) for this purpose. Furthermore, reviews outlining the approaches of interventions for preschoolers with autism in the domain of speech-language

pathology give a lot of exposure to this modality of communication by introducing it in their practice. Binns et al. (2021) [19] highlight that even though preschool autism programs are implementing AAC more frequently nowadays; there is still a lack of extensive study on its long-term benefits as well as on the most optimal methods used for the early introduction of this technique.

Only a few studies have been conducted about the most effective AAC method among children at such young ages (3-6 years), and they are limited to the systematic observation of therapists from different professional backgrounds. The objective of this research is to study the effect of introducing Augmentative and Alternative Communication (AAC) at an early age on the development of expressive communication skills in preschool children who have been diagnosed with Autism Spectrum Disorder (ASD). In particular, the study intends to find out:

i. Whether early introduction of supports is associated with improved expressive communication in preschool children with ASD?
ii. Which AAC methods are perceived by professionals as the most effective in enhancing communication?
iii. Which communication methods (verbal, non-verbal or other means) are most often used by people with communication difficulties?

Methods

For the purpose of identifying the link between the early use of AAC and communication development in preschool children with ASD, this research was conducted using a cross-sectional, observational design. The participants of this study were professionals who were in contact with children diagnosed with ASD and the data provided referred to the use of AAC and its effect on the development of communication skills. The study took place at various clinical sites, where early intervention services were provided and the professionals were selected through a convenience sampling method.

Participants

The study sample consisted of 151 professionals; participants were practicing speech-language pathologists and special educators. They were asked to complete the survey with reference to a single preschool- aged child (index child) aged 3 to 6 years with a formal diagnosis of ASD. Comprehensive demographic and clinical data were collected for each participant and the child they worked with. Professional-level variables included specialty (speech-language therapist or special educator), years of professional experience, and the setting in which they worked, such as public early intervention services, private therapy centers, or inclusive preschools. Professionals were also asked to indicate which AAC method they most frequently used during therapy, including options such as PECS, Makaton, Speech Generating Devices (SGDs), or other individualized systems.

Child-related variables consisted of the gender of the child (either male or female), the child's age (grouped into the 3–6 age bracket), and the kind of ASD, as diagnosed according to the DSM-5, which fell into one of three levels: Level 1 (involving necessary support), Level 2 (involving considerable support), or Level 3 (involving extensive support). In addition, the respondents indicated the child's speaking ability when therapy began.

Data collection process

Questionnaires were distributed and collected by the researcher between October 2024 and April 2025. Data collection was conducted online, using an online Google Form, which

was distributed via email and social media. Also participants were recruited through **convenience sampling,** based on their accessibility and willingness to participate, from a range of educational and clinical settings. Participants were informed in advance of the purpose of the survey and to ensure the anonymity and confidentiality of their responses. Completion of the questionnaire was anonymous, voluntary and without time limitation, taking on average 10-15 minutes. The deadline for submitting responses was 2 days from the day the questionnaire was distributed to each participant. The researcher was made available, prompting them to make contact for instructions and clarifications. The collection took approximately 7 months.

Data collection tools

A set of questions in the questionnaire is taken from the Communication Matrix assessment tool [20]. This assessment tool is meant for the examination of the initial communication skills of individuals facing developmental disorders, for example autism. The questionnaire had both open and closed questions: multiple choices, yes/no and Likert scale ones, which corresponded to the Communication Skills Matrix and helped to evaluate visible communication activities. Occasionally, there were also closed questions, where respondents could provide their answers in an open field, thus justifying or explaining their choices. The questionnaire was set up in such a way as to avoid ambiguity, to ensure that it was easy to answer and to make the questions, which emerged in different cases, as similar as possible.

The Communication Matrix assessment tool [21] has demonstrated strong **content validity and clinical utility**. It was used to collect data in this study, which is designed to identify how individuals in the early stages of communicative development communicate. This tool is suitable for individuals who use any form of communication, including preverbal or alternative and augmentative forms. Furthermore, the Communication Matrix is based on four main reasons why a person communicates and seven levels of communication competence. The four basic reasons are:

1. Refuse: The child's ability to express discomfort, protest or actively reject objects or situations (e.g., yelling, turning his/her head, walking away) is assessed (questions 11, 12, 13).
2. Obtain: examines how the child expresses the desire to obtain something desired, such as asking for more food or a toy that is out of sight (questions 14, 15, 16, 17).
3. Social (Social Interaction): includes questions related to social behavior, such as whether the child shows interest in other people, greets, shows affection, or tries to get someone's attention (questions 18, 19, 20, 21).
4. Information: assesses the child's ability to answer or ask questions, name objects/persons and make comments (questions 22, 21, 22, 23, 24, 25).

The tool provides a detailed picture of the child's communication profile, allowing the assessor to determine what level of communication competence the child is at and to identify possible intervention targets. Data can be collected through direct observation, interviews with caregivers and/or structured activities.

Besides evaluating communication outcomes, the survey consisted of several questions designed to elicit information about the users and the adoption of Augmentative and Alternative Communication (AAC) tools (questions 26, 27, 28, 29, 30). In particular, the participants were asked if they thought that the utilization of AAC strategies facilitated communication either between themselves and the child or between the child and other people. Some questions were focused on the types of AAC tools that were used in the therapy sessions (e.g., PECS, Makaton, SGDs) and the tools that were believed to be the most successful in terms

of improving communication skills. The respondents were also required to indicate the degree of progress they observed in the child's communication and social skills after the implementation of AAC, using a 6-point Likert-type scale running from 0 ("not at all") to 5 ("very much"). The final question aimed to find out how the participants perceived their role in the AAC implementation, specifically whether they saw themselves more in a supportive and advisory position or not.

Statistical analysis

Data analysis was performed with the statistical software IBM SPSS Statistics. First, a normality test was performed using the Shapiro-Wilk test, which indicated deviation from the normal distribution ($p < 0.05$). Therefore, non-parametric tests were used to address the research questions.

As part of the descriptive statistics, means, standard deviations, percentages and frequencies of use of the different forms of Augmentative and Alternative Communication (AAC) were calculated. According to the results, the PECS (Picture Exchange Communication System) method emerged as the most effective, as rated by the majority of practitioners (44%).

The following non-parametric tests were applied to investigate the research questions: The Mann-Whitney U test was used to compare the perceived improvement in expressive communication between children who received early ECE and those who did not. The result was statistically significant ($U = 48.000$, $p < 0.001$), indicating that early intervention was associated with higher levels of expressive communication.

Spearman's rho correlation coefficient was used to investigate the relationship between initial speech level and intervention effectiveness. A positive and statistically significant correlation was found ($r = 0.260$, $p = 0.001$), suggesting that the higher the initial speech level, the greater the effectiveness of the intervention.

The Friedman test was applied to compare the perceived effectiveness of three different forms of AAC (PECS, Makaton and speech generating devices), as the same practitioners evaluated all methods. This test was deemed suitable for the analysis of repeated measures in correlated samples.

Finally, Pearson's Chi-Square test ($\chi^2 = 15.269$, $df = 6$, $p = 0.018$), as well as the Likelihood Ratio test (17.203, $p = 0.009$), indicated a statistically significant correlation between children's age and the type of autism diagnosed according to DSM-5 criteria.

Results

The sample population

The therapists

Specifically, 151 respondents participated in the survey, with a significant overrepresentation of females (97.4%) compared to males (2.6%). In addition, 78 (51.7%) participants work as special educators, while 73 (48.3%) work as speech and language therapists in either a public or private agency. There is a balanced distribution between the two professional groups, which allows for comparisons by specialty. In addition 41.1% of the sample work as parallel support, while 52.3% work in a private context. Also only 4% work in a Centre for Interdisciplinary Assessment, Counseling and Support and only 2% in an integration department. The average number of years of experience held by the participants in the discipline of special education is 6.5 years (SD= 4.6), while the most years of experience according to the responses given is 24 years, but it was only 0.7% (extreme value). In conclusion, the average length of service (6.5 years) suggests a mix of young and moderately

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experienced professionals, with exceptions of people with very high experience. Finally, the wide variation in age, with a standard deviation of 5.6 years, suggests that the sample covers multiple age groups, from young workers (19 years) to experienced professionals (55 years). The characteristics of all the study therapists are shown in Table 1.

Table 1: Demographic characteristics of the therapists who participated in the study (n=)

Characteristics	Therapists working with children on the Autism Spectrum (n=151)	
	N	%
Gender		
Men	4	2.6
Women	147	97.4
Profession		
Speech and Language Therapists	88	58.3
Special education teacher	63	41.7
Experience		
1-5 years	45	29.8
6-10 years	62	41.1
11+ years	44	29.1

The children

As mentioned in the previous section, therapists were asked to complete this questionnaire on the basis of a hypothetical but specifically described case of a child. In order to allow for a comprehensive profile for each case and to enhance the validity of the research process, it was deemed necessary to include key demographic variables. These variables included gender, age, and autism type as defined by the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) classification. The DSM-5, published by the American Psychiatric Association in 2013, is the predominant diagnostic tool for categorizing mental disorders in the United States [1]. In addition, questions were included regarding the presence of functional speech (accessed via a five-point Likert scale), as well as the possible presence of comorbid symptoms.

The analysis of the demographic characteristics of the sample includes a total of 151 children. Regarding the gender of the child, it is observed that 75.5% of the sample are boys (n=114), while 24.5% are girls (n=37). This variable has been numerically coded (0 = boy, 1 = girl), with a mean of 0.25 and a standard deviation of 0.43. Furthermore, the distribution suggests a clear predominance of boys in the sample. In addition, regarding the age of the child, the age distribution ranges from 3 to 6 years old, with a mean of 5.1 years and a standard deviation of 0.9. The majority of children are concentrated in the age groups of 5 and 6 years old, which represent 32.5% and 42.4% of the total sample respectively, covering a cumulative 74.9%. In contrast, the younger ages (3 and 4 years) cover 25.1% of the sample. In conclusion, the sample is characterized by an imbalance in terms of gender and age, with a clear predominance of boys and an over-concentration in the 5 and 6 age groups. The characteristics of all the study children are shown in Table 2.

Table 2: Demographic characteristics of the children with which the therapists work (n=)

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Characteristics	Preschool children on the Autism Spectrum (n=151)	
	N	%
Sex		
Girl	37	24.5
Boy	114	75.5
Age		
3 years	10	6.6
4 years	28	18.5
5 years	49	32.5
6 years	64	42.4
Type of ASD		
Level 1	53	35.1
Level 2	56	37.1
Level 3	42	27.8
Existence of oral speech		
Not at all	4	2.6
Very little	8	5.3
A little	22	14.6
Enough	61	40.4
A lot	33	21.9
Very much	23	15.2
Comorbidity		
Yes	57	37.7
No	94	62.3

In order to investigate a possible correlation between gender and autism type, an independence test (x^2 - x^2) was performed. According to the DSM-5, autism is classified into three categories: people who need support (high functioning), people who need significant support and people who need very significant support (low functioning). The present analysis also examined the possible relationship between children's age and their categorization into their respective type of autism (Level 1, 2 or 3). The investigation was based on frequency tables and statistical tests of independence (x^2) to assess the existence or not of a correlation between the variables.

More specifically, the frequency table shows a variation in the age distribution within the autism type categories. Ages 6 and 5 years record the highest rates of participation in the survey, as already mentioned, but with different rates per type. Type L1 (high functioning) is dominated by 6 year olds (52.8%), type L2 (requires significant support) is dominated by 5 year olds (42.9%), while in type L3 (low functioning) the distribution is more balanced between 4 and 6 year olds. The correlation between age and type of autism is shown in Table 3.

Table 3: Cross tabulation of Child Age by Type ASD

Child Age (Years)	*Type L1*		*Type L2*		*Type L3*	
	(n)	%	(n)	%	(n)	%
3	3	5.7	7	12.5	0	0.0
4	8	15.1	8	14.3	12	28.6
5	14	26.4	24	42.9	11	26.2

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6	28	52.8	17	30.4	19	45.2

Therefore, statistical confirmation of this observation is provided by Pearson's test (x^2) ($x^2 = 15.269$, df = 6, p = 0.018) and the likelihood ratio test (Likelihood Ratio = 17.203, p = 0.009). In conclusion, the statistically significant result ($p < 0.05$) allows rejecting the null hypothesis and accepting that there is an association between age and autism type. It is worth noting, however, that in three cells (25%) the expected frequencies were less than 5, which may affect the reliability of the conclusions. The results shown in the Table 4.

Table 4: Chi-Square Test of Independence Between Child Age and Type ASD

Test	*Value*	*Degrees of freedom (df)*	*Asymptotic Significance (2-sided)*
Pearson Chi-Square	15.269	6	0.018
Likelihood Ratio	17.203	6	0.009
Linear-by-Linear Association	0.416	1	0.519

The following statistical analysis aims to answer the research questions posed. More specifically, the first question is to investigate the relationship between early introduction of Augmentative and Alternative Communication (AAC) and improvement in expressive communication skills of preschool children with ASD. Answering this question is critical as it may help to document the value of early implementation of intervention practices and guide practitioners in designing effective treatment approaches. The following are the results of the analysis conducted.

Quantitative data based on participants' subjective assessments of communication improvement, specifically from Question 29 of the questionnaire. This question asked: "Have you noticed an improvement in the child's communication and social skills after using Augmentative and Alternative Communication methods?" Responses were given on a Likert scale from 0 (not at all) to 5 (very much) (Table 5).

Table 5: Descriptive Statistics and Frequency Distribution of Variable Q_29: "Have you noticed an improvement in the child's communication and social skills after using Augmentative and Alternative Communication methods?"

Descriptive Statistics		*Frequency Distribution*		
N (Valid)	151	*Response Category*	*Frequency*	*Valid Percent %*
Mean	3.19	Not at all	4	2.6
Median	3.00	Very little	8	5.3
Standard Deviation	1.182	A little	22	14.6
Range	5	Moderately	61	40.4
Minimum	0	Much	33	21.9
Maximum	5	Very much	23	15.2

Analysis of the research questions

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Additionally, we explored whether this perceived improvement was linked to responses from Question 26, which asked: "Do you think that the use of alternative communication methods, either by you as therapists or by the child, improves communication between you?" This allowed us to examine whether the perceived effectiveness of these methods in enhancing interpersonal communication also corresponded with observed improvements in the child's communication skills. Since the distribution of responses deviated from normality—confirmed through the Shapiro-Wilk test—we used non-parametric statistical methods for analysis. In particular, the Mann-Whitney U test was employed to identify any significant differences between the subgroups under study.

More specifically, the mean value of the responses given for whether there was an improvement after using the AAC was 3.19 (SD = 1.18), indicating a moderate level of positive evaluation of language and expressive skills. The value of the median (Median = 3.00) confirms the symmetrical distribution of the data in general. In addition, a normality test was performed using the Kolmogorov-Smirnov and Shapiro Wilk tests. The results of both tests were statistically significant ($p < 0.001$), indicating that the distribution of the values of variable Q_29 deviates from the normal distribution (Table 6).

Table 6: Tests of Normality for Variable Q_29: "Have you noticed an improvement in the child's communication and social skills after using Augmentative and Alternative Communication methods?"

Test	*Statistic*	*Degrees of freedom (df)*	*Sig. (p- value)*
Kolmogorov – Smirnov	0.210	151	p<. 0.001
Shapiro –Wilk	0.909	151	p<. 0.001

The non-parametric Mann-Whitney U test revealed a statistically significant difference ($U = 48.000$, $p < 0.001$), with participants who reported using AAC (Augmentative and Alternative Communication) showing significantly higher mean ranks (Mean Rank = 78.67) compared to those who considered AAC to be ineffective (Mean Rank = 11.50). This indicates that the use of AAC is associated with more positive evaluations of the language and expressive skills of the individuals receiving therapy. In conclusion, the analysis confirms a significant relationship between the use of AAC and the development of language and expressive abilities. The results shown in the Table 7.

Table 7: Mann–Whitney U Test Results for Variable Q_29: "Have you noticed an improvement in the child's communication and social skills after using Augmentative and Alternative Communication methods?" by Group Q_26: "Do you think that the use of alternative communication methods, either by you as therapists or by the child, improves communication between you?"

Test statistic	*Value*
Mann-Whitney U	*48,000*
Wilcoxon W	*69,000*

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Z	*-3,850*
Asymptotic Significance (2-tailed)	*0,000*
Group	*Q_26 (Yes/ No)*

Taking into account the findings of the fist research question, a clear positive correlation emerges between the use of Augmentative and Alternative Communication (AAC) and the enhancement of language and expressive skills in children with ASD. The statistically significant differences in the assessments highlight the importance of integrating communication - based interventions into therapeutic settings. As the previous analysis focused on the overall impact of using AAC (Augmentative and Alternative Communication), the next step in this study is to explore the second research question, which centers on the qualitative differences in outcomes depending on the type of AAC method used. Through this analysis, the aim is to identify potential variations in effectiveness among specific intervention approaches—such as PECS, communication software, and symbol-based systems. The findings are expected to contribute to the optimization of practical implementation in the fields of Special Education and Speech and Language Therapy.

More specifically, the descriptive analysis shows that the most commonly reported method was the PECS (Picture Exchange Communication System), with a mean usage of M = 0.44 and a standard deviation of SD = 0.49. The second most frequently used method was MAKATON (M = 0.36, SD = 0.48). Additionally, methods involving card constructions or communication books (M = 0.39, SD = 0.49), as well as communication boards (M = 0.39, SD = 0.49), represent more traditional, non-technological approaches that are still widely applied. In contrast, the least frequently used tools included simple voice recordings (M = 0.05, SD = 0.21) and specialized AAC systems (M = 0.16, SD = 0.36), such as speech-generating devices.

Additionally, the moderate use of AAC applications on digital devices—such as tablets, computers, and AAC apps like Proloquo2Go—is noteworthy, with a mean score of M= 0.26 and a standard deviation of SD = 0.44. Finally, there were also references to other AAC methods (M = 0.13, SD = 0.34), including PODD (Pragmatic Organization Dynamic Display). PODD is specifically designed to organize language and vocabulary in a practical and functional way, aiming to support spontaneous communication in real-life social settings. All descriptive statistics are presented in detail in Table 8.

Table 8: Descriptive Statistics of usage of Augmentative and Alternative Communication (AAC) Methods

AAC Methods	*Frequency (N)*	*Mean (M)*	*Standard Deviation*
PEC (Picture Exchange Communication)	66	*0.44*	*0.49*
MAKATON	55	0.36	0.48
Sing Language	20	0.13	0.34
Communication Books/ Card – Based Systems	59	0.39	0.49

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Communication Boards	45	0.30	0.45
Simple Audio Recordings	7	0.05	0.21
AAC Applications on Tablets/Computers	40	0.26	0.44
Specialized AAC Devices (e.g., SGDs)	24	0.16	0.36
Other (e.g., PODD)	1	0	0

Also, evaluating the practices used in special education and speech-language therapy is especially important, since choosing the right communication method has a direct impact on a person's ability to actively engage in daily interactions, and plays a key role in their success at school and in social settings. For this analysis, descriptive statistics and clustering of the answers to the questions concerning the use of various communication methods by people with communication difficulties were performed. Responses were coded in dichotomous format (Yes/No).

More specifically, responses concerning the functional communication of participants were categorized into three distinct groups: non-verbal communication, intentional communication and verbal/symbolic communication. For each participant, the total number of positive responses ("YES") in each category was calculated, in order to quantify the frequency of occurrence of the individual forms of communication. Accordingly, the results of the descriptive analysis identified nonverbal communication as the most prevalent form, with a mean occurrence M = 5.81 (SD = 1.39) out of a total of 7 possible positive responses. Intentional communication followed with a mean M = 2.93 (SD = 1.38), while verbal/contextual communication was recorded as the least frequent, with a mean M = 1.23 (SD = 1.10). Furthermore, analysis of variance showed a sufficient range of values for all three categories (nonverbal: range = 7, deliberate: range = 5, verbal: range = 3), suggesting the existence of significant heterogeneity within the sample in terms of the forms of communication used.

In addition, for the statistical investigation of differences in the use of the three communication categories, the non-parametric Friedman test (see Table B4) was applied, since these are dependent measurements and the condition of normality of distributions is not met. This test allows the comparison of three or more repeated observations in samples without parametric conditions. Specifically, the results of the test showed a statistically significant difference between communication formats, [χ^2 (2) = 276.72, $p < 0.001$], suggesting that participants do not use the three types of communication equally. The non-verbal communication format showed the significantly higher mean rank (Mean Rank = 2.98), compared to intentional (1.91) and verbal (1.11). In conclusion, the findings of the present measurement suggest that people with communication difficulties rely mainly on non-verbal forms of communication to express basic needs, feelings and intentions. The results shown in the Table 9.

Table 9: Descriptive Statistics and Friedman Test Results for the Three Forms of Communication

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Form of Communication	*Mean (M)*	*Standard Deviation (SD)*	*Range*	*Friedman X^2*	*df*	*p- value*
Non - Verbal	5.81	1.39	7	276.72	2	p<0.001
Pointing	2.93	1.38	5			
Symbolic/ Verbal	1.23	1.10	3			

These findings offer compelling evidence that AAC methods can significantly improve expressive abilities. In the following section, we explore how these results connect with existing theories and previous research.

Discussion

The data analysis was able to establish a positive correlation between Augmentative and Alternative Communication (AAC) use and the improvement of communication skills in preschool children with Autism Spectrum Disorder (ASD). The numbers show that if AAC is used methodically in the therapy process, it can notably improve the kids' verbal and overall language skills, particularly if the approach is adjusted to fit each child's specific characteristics and requirements.

Speaking of the gender distribution of the children, it's quite evident that boys significantly prevail in the sample. This predominance can be easily explained as one of the most consistent findings in research is the much higher rate of autism among boys than girls. According to the results of epidemiological studies, autism diagnoses among boys are 3-4 times more frequent than among girls [22]. Additionally, this fact is consistent with the premises of the psychology of development, which argue that age progression is tightly associated with the growth of cognitive and social skills [23]. Also, various other studies [24, 25] have pointed out that age has a profound impact on the appearance of certain behavioral and learning habits, thus indicating a possible connection with the different types of children found in the current sample. Besides, findings have been indicative of the assumption that age distinctions might be linked to the level of self-control, problem-solving determination, and learning strategies, all of which could be criteria in the categorization of a certain autism subtype. All in all, the analysis hints at age as a factor that sets the children apart in terms of the distribution across autism types, thus confirming the claim that the phase of development has a big influence on the behavioral or learning classification of children.

Moreover, AAC is an evidence-based intervention framework used to facilitate the communication of people with severe communication difficulties, particularly those with little or no verbal ability [26, 27]. The data analyses further indicate that the adoption of AAC tools is linked to the participants' better performance and evaluation of their language and expressive skills. It can be inferred from the analysis that there exists a substantial correlation between the employment of AAC and the improvement of both language and expressive skills. This discovery corresponds with earlier investigations, emphasizing the significance of incorporating AAC technologies for the purpose of developing the communicative competence of people with speech and language challenges [28, 29].

The statistically significant difference between ratings shows the need to include communication measures social-social treatment. Since the main thrust of the analysis was on the general effect of communicative use, further investigation represented by the present study is the exploration of the second research question dealing with the qualitative differentiation of

outcomes depending on the type of implemented AAC. The paper aims to determine the possible differences in the efficacy of various treatment forms, including PECS, communication software, and communication symbols, by facilitating the improvement of practice in the special education and speech and language therapy field through this kind of analysis.

It is also worth noting that PECS has been demonstrated to facilitate spontaneous communication for children with autism spectrum disorders [30, 26] and has been associated with greater instances of social interaction and a decreased rate of problem behaviors. Moreover, while the MAKATON method was connected to language development and a helpful resource for the population of people with an intellectual disability or Down's syndrome, which can lead to greater expressive ability and enjoyment or increased social participation [31], SGDs provided more rapid acquisition rates, were preferred by children, which indicates that technology-enhanced methods might have unique prominence in preschool situations [32].

Approaches that utilize communication boards or books represent one of the oldest forms of communication and a low-tech method that remains broadly applicable. The use of communication boards and books is easy, accessible, and inexpensive - and represents great value for individuals with little understanding or functional communication. Primarily, because they utilize pictures, they do not inherently include the step-by-step and systematic progression toward a more autonomous form of communication such as PECS. However, there is research that suggests using visual symbols in communication portfolios can assist understanding everyday situations and improve decision making skills [33]. The relatively high mean scores for the above methods suggest that the practitioners preferred tools that were characterized by simplicity, with low levels of learning and application, and established long-term use across various profiles [34, 35]. In contrast, the lowest use of novice communicating included the simple recording and advanced AAC systems such as speech-generating devices. The low use of novice communicating, with high-tech progression tools, may be attributed to limitations in the equipment provided, funding for services or time spent training practitioners [28].

Nevertheless, the use of new technologies (tablets, computers, AAC apps such as Proloquo2Go) seen as potentially increasing spontaneous verbal effort and similar communication opportunities, if used with the right instructional approaches, is still relatively low. This low uptake may be attributable to a variety of factors, such as technophobia, a lack of documentation of protocols, or individual variations related to the participants' needs per McNaughton and Light (2013) [36]. In conclusion, the results suggest the participants prefer to use established, effective, and easily accessible AAC devices, as it appears the greater technology is used sparingly and cautiously, likely due to external factors, including training and availability of requisite resources which participants recognized needed to be available for effective use.

Beliefs about AAC remain a barrier in some contexts. Conlon et al. (2025) [37] found that SLPs in Australia have a tendency to view AAC as in the "too hard basket", and further emphasized the need for ongoing professional learning and systemic support to promote early use. In contrast, studies of the use of AAC in preschool classrooms emphasize SLPs actively modeling AAC and collaborating with educators helped to promote more consistent use of AAC by children [38]. What is clear from these studies is that in addition to family involvement, beliefs about professionals have beliefs about AAC that affect if they will use it early and consistently with their clients.

The last significant finding is that people with communication challenges mainly utilize non-verbal forms of communication to communicate basic needs, feelings and intentions. Non-verbal forms of communication in the context of our study these consisted of facial

expression, gestures, and physical posture and they were prominent forms of interpersonal communication expression [28]. While verbal forms, or symbolic communication, were not non-existent, it was a much lesser frequency of communication used, as a result of a person being at limited phonological, cognitive or linguistic level, restricting their ability to utilize speech or symbols [18, 39]. Furthermore, individuals who communicated in fewer ways continued to rely on nonverbal forms of communication reflects that literature internationally also recognizes that there are people with severe communication disorders (autistic spectrum, genetic syndromes, severe ID) rely on mostly physical and extra-linguistic signals for functional communication [40]. Moreover, in these unique cases one alternative using deliberate alternative media (e.g., sign language, digital symbols or technologies such as AAC), is used at a later stage as a form of support to promote autonomy in communication rather than a communicative method [41, 42].

In summary, in conclusion, the data analysis directed a clear positive correlation between the usage of Augmentative and Alternative Communication methods (AAC) with improvement in the communicative development of preschoolers with Autism Spectrum Disorder (ASD), as well as several statistical indicators supporting the arguments that implementing AAC regularly in therapy allows children to improve their language and expressive skills in a short amount of time, more so when individualized for a child depending on the profile and needs of each child. Based on the differences of effectiveness of the individual forms of AAC, with PECS as the most prevalent, highlighted the importance the customization of interventions for complex needs, wherein educators, therapist and families are collaborating on a unique solution for each child. Using a multimodal approach of supporting children's ability to communicate using different formats, including the use of gesture and eye contact, underlines that communication is more than a verbal level of expression and that there are many non -verbal speaking methods that accompany and enhance each other on a parallel basis.

Conclusions

Research signified the need for early and specific introduction of the ECE as an essential part for children with ASD to improve communication functioning. Evaluating the vast range of AAC methods and tools necessitates some flexibility and constant assessment on the part of practitioners for the best adaptive fit with the skill set and needs of each child.

In addition, the importance of the existing language base as an indicator for predicting the effectiveness of the intervention was highlighted, which emphasizes the need for early assessment and intervention. Collaboration between therapists, teachers and families, as well as multidimensional support, proved to be critical elements for the success of the intervention program. Ultimately, AAC emerges not only as a means of developing functional skills, but also as a tool for social inclusion and empowerment of children with autism, reinforcing the interdisciplinary nature of modern interventions.

Research limitations

While undertaking this research, I was mindful of the importance of the ethical principles that guide empirical research in special education and communication interventions. Participants were provided with prior information about the purpose of the study and the nature of the questions and assured of response anonymity, and they were also given the option to voluntarily consent. The electronic questionnaire administered by Google Forms allowed anonymity and the way the survey was set up, eliminated the option of collecting any personal

identifiers which assured privacy. The survey was exclusively administered to professionals (speech language therapists, special educators, etc.) and the professionals were asked to provide their professional opinion and assessment without compromising sensitive information or violating confidentiality about the children they service. The responses were self-reports and therefore had significance (e.g., social desirability effects). The absence of observation or standardized assessment data at the child level affects the objective nature of the findings. The use of convenience sampling limits the generalizability of the results to children with ASD more broadly within the population of children with ASD as discussed it was noted, however, the survey was designed with care to worded in a neutral and non-directive manner.

To conclude, the study adhered to the principles of human research ethics per the APA Code of Ethics [43, 44] and European Union guidelines to foster responsible scientific conduct. No information collected was used for commercial or non-scientific efforts, and the presentation of results considered the plurality of professional experiences.

Suggestions for further Research

The current study documented significant relationships in AAC usage, but there are still lingering questions. The design was cross-systematic, and thus we cannot make causal inferences. Therefore, we recommend longitudinal studies that track children's skills and development over time, particularly with regard to autism.

Secondly, our research relied on the reports of professionals but as any behavioural research relies on self-reported data, it brings with it some subjectivity. Combing self-report data with objective methods of data collection such as observations, videos, and assessments, from multiple sources would increase reliability and would offer us a sampling method as ascertained through objective measurements.

Lastly, future studies should incorporate other parameters that will help us understand more fully, besides use of AAC systems, on variables such as age and level of development/communication at the onset of the usage of AAC systems, and define variables to look at the influence of different factors to improve the efficacy of the individuals using AAC.

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