

DOI: <https://doi.org/10.56663/rop.v14i1.98>

Factors Influencing the Development of Expressive Language in Children with Autism Spectrum Disorder: A Descriptive Study

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Abstract

The study aimed to identify the relationships between cognitive functioning, receptive–expressive language, and communication level in children with Autism Spectrum Disorder (ASD). The research involved a homogeneous sample of 60 children aged 5–6 years, with a mean diagnostic age of 3.6 years. Standardized cognitive-verbal and language assessment tools were used. Nonparametric analyses were applied due to non-normal data distributions. Findings revealed a global developmental delay (cognitive-verbal age \approx 27 months) and a receptive profile superior to expressive. Strong positive correlations were found between IQ and communication ($\rho = .934$), confirming cognition as a key predictor of adaptive language. All girls exhibited severe forms, while 25% of participants showed developmental regression. Overall, results support the cognitive–linguistic unity hypothesis and highlight the need for structured speech therapy focused first on receptive comprehension, followed by expressive language expansion and the use of augmentative and alternative communication (AAC) systems.

Keywords: autism spectrum disorder (ASD), cognitive-linguistic development, receptive-expressive language, augmentative and alternative communication (AAC), speech-language intervention

Introduction

The literature highlights that language delay is an early marker of emergent autism (Garrido et al., 2017, pp. 1737-1750). Longitudinal studies that have analyzed the development of children diagnosed early with autism spectrum disorder (ASD) indicate that, although the preschool period is characterized by considerable variability, linguistic development trajectories tend to stabilize after the age of 6 years (Pickles et al., 2014, pp. 1354-1362).

According to the speech-motor integration theory, the premotor cortex and primary motor cortex contribute significantly to perceptual processing and natural speech production, as well as to the generation of complex vocal sounds (Hickok & Poeppel, 2007, pp. 393-402).

From the specialized literature, we decipher the connection between the cognitive style characteristic of this population segment and some essential characteristics of communication. From this perspective, we understand that the aspects that have guided the research of specialists in relation to the elimination or improvement of the difficulties that affect the communication and relationship of these people are not accidental, although the perspectives of approach and analysis are different. However, there is a consensus among specialists regarding the existence of minority groups whose brain development and functioning is different and responsible for the deficient interaction of individuals, as well as the different way of experiencing the surrounding world. To highlight this reality, the specialized literature refers to neurodiversity in order to make our peers

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aware that, among us, there are people with neurological differences that we must accept because they are a natural part of human diversity that needs the initiation and implementation of steps that lead to an increase in the level of inclusion. Being in full agreement with the existence of neurodiversity, we strive for innovations that can bring added efficiency in education, learning and social inclusion regarding neurodiversity from the perspective of human operating systems and not of labels, as a result of the assigned diagnosis. Currently, the manifest behavior of many typical young people towards their atypical peers "is incorrect, illegitimate and not validated by society" (Stroescu, January 2025, p. 28) and tends to increase through Bullying and Cyberbullying behaviors that can become antisocial phenomena whose source of inspiration is some visible characteristics, such as the specific communication of children with ASD, responsible for "thinking in images", because "The brain is first and foremost an extraordinarily flexible organism, which knows how to maximize its chances of success even when faced with intimidating limitations" (Silberman, 2016, p. 385). It is an extraordinary characteristic of the human brain and that is why we join the creative thinking of those specialists who address the issue of strategies for stimulating communication specific to ASD, consider and analyze the psychological mechanisms necessary for the development of language and verbal communication, focusing speech therapy interventions on effective solutions. Among the specialists who have approached with great interest and professional expertise the issue of communication specific to people with autism and who have provided us with tools for the actual intervention and useful working tools in autism for the development, implementation, monitoring and review of personalized intervention plans, we mention Viorel Agheana (2022), Christopher Barber (2013), Mary Lynch Barbera (2022), Georgeta Burlea (2007), Claudia Crișan (2021, a), Theo Peeters (2009), Doru-Vlad Popovici (2002), Ecaterina Vršmaș (2007), Traian Vršmaș (2010) who took into account the existence of significant differences between the verbal relationship of the typical and atypical child with the environment. The act of speech in children with ASD is marked by negative feelings, inscribed in the patterns of permanent disability (Păunescu, 1978), a phenomenon explainable by the impossibility of the intellectual task to overcome the capacity to respond to external stimuli, and from an internal point of view, the cerebral cortex does not determine strong excitations, supported by cortico-subcortical tone or positive affective tone. Even with these specific peculiarities, any child with autism has the same fundamental needs that any typical child has, but new, individual, particular and specific needs are added to them and therefore it is necessary to satisfy the natural needs and necessities so that we can offer them a certain level of physical and psychological comfort that will bring them social fulfillment, relationships and communication because, by nature, man is and remains a social being. Outside of the fundamental needs, no one can exist if they are deprived of social-group relationships (Maslow, 2013, pp. 167-179) because "between communication and the values of the person, an interaction relationship is objectively established and operates in a subjective-objective way, which reveals the nature of both communication and the nature of socialization" (Druguș, 2024, p. 15).

Since the problems of children with ASD are very complicated, they encounter major difficulties in satisfying absolutely natural needs and for this reason, in order to overcome them, they need family, specialist and community help as a whole. In this regard, the authorities and personnel invested in providing help to these people must consider structuring all interventions on the social model that "does not deny or minimize the very real difficulties and problems that people with autism have in their daily lives" (Barber, 2013, p. 28) but rather aim to eliminate the obstacles in the social environment that are the basis of misunderstandings and non-acceptance by our peers of

the difficulties in the field of neurodevelopment that exist and must be overcome. Humanity being specific to humans, we have the obligation to form a common front to modify non-conforming perceptions and attitudes. Let us be concerned with what each of us can do, so as to reduce their communication deficit, constantly asking ourselves what strategies we can adopt so as to improve their imagination and social interaction, how to intervene effectively to help them eliminate/reduce their verbal and motor stereotypes. We have a human and moral duty to identify adequate solutions and even "alternative pedagogies that lead to new constructions and innovations in theory and practice" (E. Vrașmaș et al, 2005, p.11) constantly bearing in mind the phrase "[...] each disabled child or student has a psychological structure that differentiates him from the normal one, or rather that deviates greatly from the rule of normality" (Vlad & Meran, 2011, p.19). It is a reality that requires education adapted to the needs of each person, the key element for solving the problem being interdisciplinary, which makes us understand how necessary it is to adapt education to the natural needs of each child.

Method

The general objective of the research is to analyze the relationship between cognitive development and language development. To achieve this objective, the following specific objectives were formulated:

O1. Investigating the relationship between expressive and receptive language in older preschool children.

O2. Analyzing the relationship between cognitive development and receptive-expressive language in the same age group.

The general hypothesis claims that identifying cognitive and linguistic peculiarities in preschool children diagnosed with ASD can facilitate a more precise understanding of their educational and therapeutic needs.

The derived operational hypothesis is the following:

H1. There is a statistically significant relationship between cognitive development, expressive language and receptive language in older preschool children diagnosed with ASD.

The variables of the ascertainment experiment are:

Independent variable: level of cognitive development.

Dependent variable: level of expressive development.

Research design. The ascertainment study was conducted during September-October 2024 and included the following stages:

1. Establishment of the sample and the research group.
2. Analysis of scientific materials that address the cognitive-linguistic relationship in children with ASD.
3. Evaluation of cognitive and linguistic development characteristics, both from the perspective of parents and through direct testing.
4. Analysis and interpretation of the results.
5. Formulation of conclusions and applicable recommendations.

Data collection procedures:

- a. Informed consent was obtained from parents and recovery institutions.
- b. Questionnaires addressed to parents were completed.
- c. Children were informed, in a playful manner, that they would participate in game activities (to maintain a positive emotional state).
- d. Standardized tests from the selected batteries were applied.
- e. Data were encrypted and anonymized in an Excel file, accessible exclusively to the evaluator.
- f. Statistical analysis was performed with SPSS v.22 and JAMOVI, applying the Spearman test and descriptive analyses (means, standard deviations, frequencies, percentages).

Research methods and tools:

1. The questionnaire-based survey method was used to obtain information on attitudes, opinions and behaviors (O’Brien et al., 2014).

2. Psychological and speech therapy assessment methods

Determination of diagnosis and severity of symptoms:

ASRS (Autism Spectrum Rating Scales): standardized scales for measuring behaviors associated with ASD;

- Rimland E2 questionnaire (French adaptation): addressed to parents, targets developmental history and behavioral abnormalities up to the age of 6 years. In this study, the first 12 items and the DSM-IV-TR scale from ASRS were used to establish the history and severity of symptoms.

b) Assessment of intelligence level:

Snijders-Oomen Nonverbal Intelligence Test (SON-R 2½–7): used to assess general cognitive abilities. The global score obtained by summing the subscales was transformed into an intelligence quotient (IQ).

c) Assessment of verbal communication and behaviors:

PEP-3 (Psychoeducational Profile – TEACCH): applied for the individualized assessment of communication and maladaptive behaviors. The investigated domains include:

- Performance scale (Expressive language, Receptive language, Verbal and nonverbal cognition);

- Maladaptive behavior scale (attention, repetitive behaviors, relationship difficulties).

The application was carried out through playful activities, with materials from the standard PEP-3 kit (images, objects, toys).

d) Assessment of nonverbal language:

The word meaning mimicking test (Racu A. & Stroescu D.-I., 2024; apud Popovici, 2002) allows the assessment of the level of performance in nonverbal communication and the identification of individualized intervention needs. The global score reflects the child's nonverbal communication skills.

Advantages of the methodology. Assessment through games and attractive activities allows capturing real skills, contributing to a complex picture of the way of communication and interaction. By integrating data obtained from multiple sources, the methodology provides a valid triangulation of information.

Description of participants. The study involved 60 children (42 boys and 18 girls), of which: 15 children aged 5 and 15 children aged 6, for whom: M=5.5 and standard deviation SD=0.50, according to Table 1-3, the subjects being selected according to diagnosis, chronological age (5-6 years) and intellectual level IQ.

Table 1. Pre-, peri- and postnatal data

N	Valid	60
	Missing values	0
	M age at diagnosis	3,60
	SD age at diagnosis	,612
	M chronological age	5,50
	SD chronological age	,504
	Minimum chronological age	5
	Maximum chronological age	6
	Good postnatal adaptation	50
	Poor postnatal adaptation	10
	IVF	3
	APGAR 9	10
	APGAR 10	50
	Caesarean section	60
	Regression 1.5-3 years	15

Table 1 shows that the group is homogeneous in age, consisting of preschool children (5-6 years), diagnosed around the age of 3.6 years, good neonatal condition, without major complications, according to APGAR scores and postnatal adaptation. Cesarean section is present in all participants and raises interest in the correlative analysis between the type of birth and subsequent language development. 25% of the children registered developmental regression, severe biological factors are minimal and suggest that the higher share of the identified disorders is more of a **neurodevelopmental** nature.

Table 2. Number of participants by chronological age

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid5	30	50,0	50,0	50,0
6	30	50,0	50,0	100,0
Total	60	100,0	100,0	

The data in Table 2 highlight a balanced distribution of the sample according to chronological age: 30 participants (50%) are 5 years old, and the other 30 (50%) are 6 years old. The choice of these consecutive age groups allows for the comparative analysis of differences in linguistic and cognitive maturation. The uniform distribution (50%:50%) provides the premises for a balanced and rigorous analysis, ensuring the comparability of the results and the relevance of the conclusions obtained.

Table 3. Number of participants by gender

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
ValidM	42	70,0	70,0	70,0
F	18	30,0	30,0	100,0
Total	60	100,0	100,0	

In Table 3, the distribution of participants highlights a predominance of boys (70%, n = 42), compared to girls, a percentage difference consistent with the specialized literature, which mentions a higher incidence of communication disorders and autism spectrum disorders in the male population. Although the female group is numerically inferior, its inclusion ensures the possibility of analyzing specific gender differences in language and communication development.

Table 4. Sample structure by age and gender

Chronological age	Boys (M)	Girls (F)	Total	Percentage (%) of sample
5 years	21	9	30	50,0
6 years	21	9	30	50,0
Total	42	18	60	100,0

Table 4 shows a balanced distribution of the sample by age and gender, reflecting the higher prevalence of communication disorders in boys and allowing for comparability between groups regarding developmental and gender differences, relevant in studies on communication development at preschool age.

Findings

Table 5. Number of participants according to IQ and symptom severity

IQ	symptom severity		Total
	severe	moderate	
50	16	0	16
51	12	0	12

Table 5. Number of participants according to IQ and symptom severity

IQ	symptom severity		Total
	severe	moderate	
52	8	0	8
53	0	8	8
54	0	16	16
Total	36	24	60

Table 5 shows an inverse relationship between IQ level and symptom severity, indicating that lower cognitive level correlates with more severe symptoms, and slightly higher cognitive level correlates with less severe symptoms. The results are consistent with the literature (APA, 2022; Rutter, 2017), which emphasizes that the level of cognitive functioning is an essential predictor of the severity of clinical manifestations and the potential for speech therapy recovery.

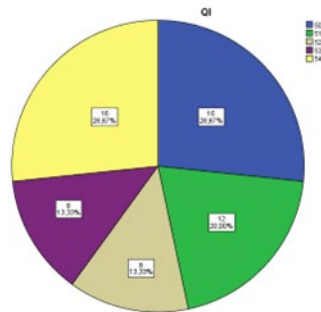


Figure 1. Number of participants by QI

In Figure 1 it is observed that the general distribution indicates a concentration of the majority of participants (60%) in the range of $IQ \leq 52$, which corresponds to levels of mild deficiency and explains the severity of the observed symptoms. The structure of the sample emphasizes the heterogeneous character and the need to adapt educational and speech therapy interventions to the cognitive particularities of each child.

Table 6. Number of participants according to symptom severity

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid severe	36	60,0	60,0	60,0
moderate	24	40,0	40,0	100,0
Total	60	100,0	100,0	

Table 6 indicates the predominance of severe forms, reflecting the clinical character of the sample, the complexity of communication and adaptation difficulties specific to children with ASD. The distribution obtained emphasizes the need to apply differentiated speech therapy intervention programs, adapted to the severity of symptoms. In conclusion, the distribution by severity levels is uneven, the prevalence of severe forms is 60%, a proportion that reflects the clinical reality of populations with ASD. The results support the correlation between IQ and symptom severity, previously highlighted in the analysis of Table 5.

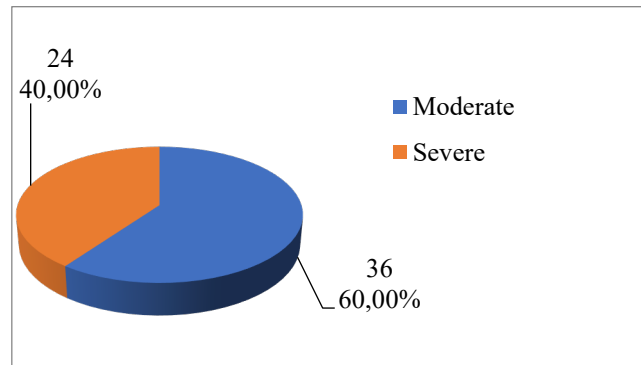


Figure 2. Number of participants according to symptom severity

The graphic representation in Figure 2 highlights a clear imbalance between categories, indicates the prevalence of severe cases and confirms the inversely proportional relationship between IQ and symptom severity, the conclusion being that cognitive level significantly influences the severity of behavioral and linguistic manifestations and provides a balanced and clear overall picture, highlighting the heterogeneity of the sample and the need for differentiated speech therapy and psychopedagogical programs.

Table 7. Number of participants by gender and severity of symptoms

Gender	symptom severity		Total
	severe	moderate	
M	18	24	42
F	18	0	18
Total	36	24	60

The data in Table 7 provide a clear picture of the interaction between gender and degree of impairment, revealing important trends for the analysis of gender differences in autism spectrum disorders (ASD).

Most boys (n=24) present moderate forms, suggesting better cognitive functioning and higher learning and communication capacity. All girls (n=18) have severe forms, indicating a more pronounced manifestation of symptoms, stronger global impairment and lower cognitive functioning, compared to boys. It can be interpreted by: a) diagnostic bias (Lai et al., 2015; Rutter et al., 2017); b) neurodevelopmental differences; c) differences in the communicative profile.

From a clinical and psychopedagogical point of view, the results show a clear difference between the sexes in terms of symptom severity. The distribution highlights the interaction between gender, IQ, and severity, indicating that the female gender is more severely affected when the disorder manifests clinically.

Table 8. Distribution of values of the variable Verbal/preverbal cognitive - standard score

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	6	13	21,7	21,7
	7	31	51,7	73,3
	8	15	25,0	98,3
	9	1	1,7	100,0
Total	60	100,0	100,0	

Table 8 suggests the following conclusions: a) the distribution of scores shows a moderate central tendency, with predominantly medium-low scores, specific to populations with ASD; b) subjects with scores of 6 show significant deficits in symbolization and imitation that limit the development of expressive language; c) scores of 7-8 suggest possibilities for progress; d) the Verbal/preverbal cognitive variable is an essential predictor of language development and response to therapy, correlating with the IQ level and severity of symptoms.

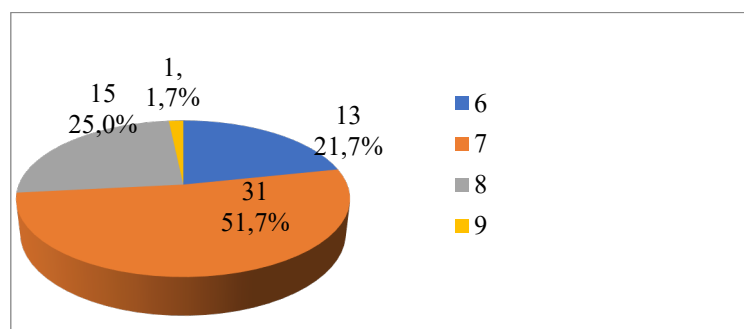


Figure 3. Distribution of values of the variable Verbal/preverbal cognitive - *standard score*

Figure 3 suggests cognitive heterogeneity and a clear trend towards moderate and lower levels of performance and delays in language development. The dominant score (7) highlights a lower-middle cognitive level, specific to children with ASD who show limited communication but potential for progress. The high proportion of scores 6-7 (73.4%) confirms the need for intensive intervention to stimulate symbolic thinking and verbal communication. The narrow distribution around the mean values (8-9) emphasizes the rarity of typical cognitive functioning in the sample. The results support the hypothesis of a positive correlation between IQ and the cognitive-verbal score, as well as an inverse relationship with the severity of symptoms.

Table 9. Distribution of values of the variable Verbal/preverbal cognitive - *age in months*

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	23	1,7	1,7	1,7
	24	4,7	6,7	8,3
	25	7,7	11,7	20,0
	26	7,7	11,7	31,7
	27	15,0	25,0	56,7
	28	10,0	16,7	73,3
	29	1,7	1,7	75,0
	30	5,0	8,3	83,3
	31	5,0	8,3	91,7
	32	1,7	1,7	93,3
	33	4,7	6,7	100,0
Total	60	100,0	100,0	

Table 9 reflects the age equivalent of cognitive performance. The most common value is 27 months, which shows that the subjects are functioning cognitively at the level of a 2-year-old and 3-month-old child. Most values are between 25-28 months and indicate a cognitive age between 2 years and 2 months - 2 years and 4 months. The minimum values (23-24 months) indicate severe forms of delay, equivalent to a mental age of approximately 2 years, and the maximum values (32-33 months) are rare and indicate a cognitive level above the group average, equivalent to the age of 2 years and 8-9 months. The estimated mean of the equivalent age is 27-28 months, i.e. 2 years and 3-4 months, significantly below the chronological age. The 3-year difference between chronological and cognitive-verbal age confirms the global delay in the development of communication and symbolization, denotes deficits in the formation of verbal concepts, difficulties in associating language with action; delays in functional imitation and understanding of cause-effect relationships. The low and deficient heterogeneity of the sample is confirmed. The results support the conclusion that the cognitive-verbal level of most children is equivalent to the preverbal stage, requiring interventions based on visual stimuli, gestures, modeling and action-sound association.

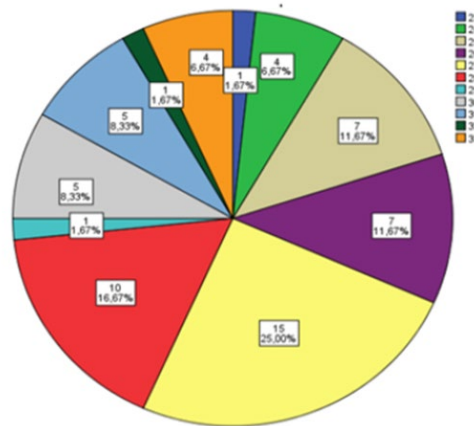


Figure 4. Distribution of values of the variable Verbal/preverbal cognitive - age in months

Figure 4 illustrates the level at which the child actually functions cognitively and symbolically, compared to the standards of the applied test (PEP-3). The dominant segment corresponds to the cognitive age of 27 months, followed by 28 months, which indicates an average level of mental functioning of approximately 2 years and 3-4 months. Frequent values between 25 and 28 months (inclusive) suggest a central concentration of the distribution around this period. Extreme values (23, 29, 32 months) are isolated and indicate atypical cases, with very low or slightly higher levels. Values 30-33 months mark the subgroup with more advanced cognitive functioning, corresponding to children with moderate symptoms. The distribution is concentrated between 25-28 months, highlights a mean mental age of ≈ 27 months and significant discrepancy with chronological age, suggests a global delay of ≈ 3 years in cognitive-verbal development confirming the delayed developmental profile. The results confirm the inverse correlation between IQ and severity. Therefore, the equivalent cognitive-verbal age is an indicator of therapeutic prognosis (higher in children with moderate forms).

Conclusions. The typical profile of the sample is that of a 2-year-old and 3-month-old child in terms of symbolic thinking and communication. The figure highlights the predominantly preverbal character of development and justifies the application of interventions focused on primary cognitive-verbal stimulation.

Table 10. Distribution of values of the variable Expressive language - standard score

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	5	12	20,0	20,0
	6	14	23,3	43,3
	7	7	11,7	55,0
	8	27	45,0	100,0
Total	60	100,0	100,0	

The data in Table 10 reflect the child's ability to use language functionally and symbolically. The distribution highlights the heterogeneous profile, with a central tendency towards score 8, which reflects **the progress of some children in the formation of functional language**. The distribution is *slightly asymmetric to the right*, the center of gravity around score 8 and a significant proportion of subjects who did not reach the average level, which indicates *a large diversity of expressive performances*, specific to populations with ASD.

Conclusions. The variable *Verbal/Preverbal Cognitive* in the previous tables has a similar distribution, which shows that the symbolic and expressive levels evolve correlatedly. The results confirm *the direct correlation between cognitive-verbal development and language expressiveness*, as well as the *dependence on IQ and symptom severity*.

Table 11. Distribution of values of the variable Expressive language - age in months

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid 10	2	3,3	3,3	3,3
12	3	5,0	5,0	8,3
13	7	11,7	11,7	20,0
18	7	11,7	11,7	31,7
19	7	11,7	11,7	43,3
20	7	11,7	11,7	55,0
21	21	35,0	35,0	90,0
22	6	10,0	10,0	100,0
Total	60	100,0	100,0	

Table 11. *The distribution is heterogeneous*, with values between 10 months and 22 months and suggests the existence of significant differences in the pace of expressive language development.

Conclusions. The mean expressive age is centered around 21 months, the distribution *is negatively asymmetrical*, with agglomeration at higher values (21–22 months) and suggests a tendency to recover or advance in a significant part of the subjects. The development of expressive language, as a whole, is relatively delayed compared to the probable chronological age of the sample, but there is a constant progression around the 21-month stage, considered a landmark of dominant expressive development.

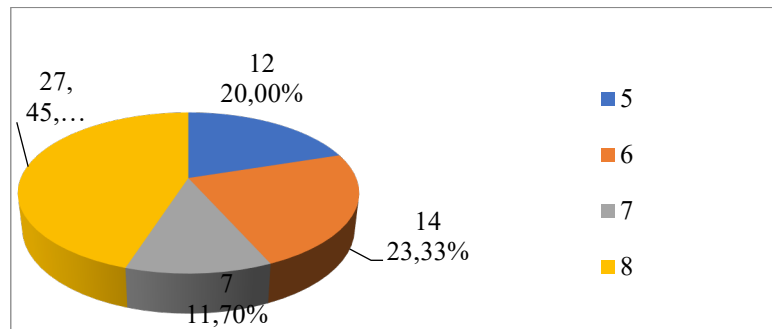


Figure 5. Distribution of values of the variable Expressive language - standard score

Figure 5 illustrates an uneven distribution, with a visible concentration of frequencies around the value 8, which has the highest weight. The distribution *is positively asymmetric*, with the concentration of values towards the upper area (score 8), which reflects a tendency of progress in the verbal expression of the subjects, at the same time it is also noted that approximately 43% of the subjects have scores between 5 and 6, which suggests *the need for differentiated intervention* depending on the particularities of each child.

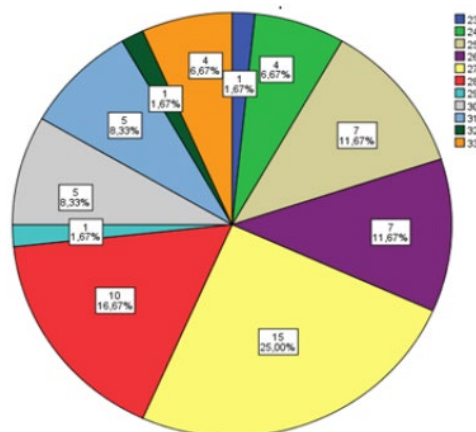


Figure 6. Distribution of values of the variable Expressive language - age in months

Figure 6 highlights an *asymmetric distribution*.

Conclusions. The majority of subjects present expressive language development corresponding to the age of 21 months and constitute the reference value of the group. Subjects with expressive ages between 10 and 13 months indicate significant delays and suggest possible difficulties in verbal communication or stimulation. The distribution confirms *the positive trend* and the concentration of values in the 18-22 month range, which can be interpreted as general progress of the sample, although notable differences between individuals persist.

Table 12. Distribution of values of the variable Receptive language - standard score

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	4	7	11,7	11,7
	5	21	35,0	46,7
	6	32	53,3	100,0
Total	60	100,0	100,0	

Table 12. The data show a negatively skewed distribution with values clustering at score 6, which indicates a predominance of good performances at the receptive language level.

Conclusions. The dominant mean score (6) represents the standard level of the group, suggesting a good general capacity for receptive language. Almost half of the children (46.7%) show moderate difficulties, being in intermediate stages of receptive development. A generally positive trend is observed, with a significant concentration of results in the upper range, but also a moderate variability that requires individualization of strategies to stimulate verbal comprehension.

Table 13. Distribution of values of the variable Receptive language - chronological age

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	9	7	11,7	11,7
	10	4	6,7	18,3
	12	6	10,0	28,3
	14	6	10,0	38,3
	15	5	8,3	46,7
	16	8	13,3	60,0
	18	10	16,7	76,7
	19	9	15,0	91,7
	20	5	8,3	100,0
Total	60	100,0	100,0	

Table 13 highlights the linguistic maturation characteristics of the evaluated group.

Conclusions. The average chronological age for receptive language is between 16 and 18 months and reflects emergent receptive maturity. Subjects with chronological ages between 9-12 months constitute the vulnerable group, requiring early speech therapy intervention. Most subjects achieve stable receptive performance by 18 months, indicating general progress and positive evolution in language comprehension.

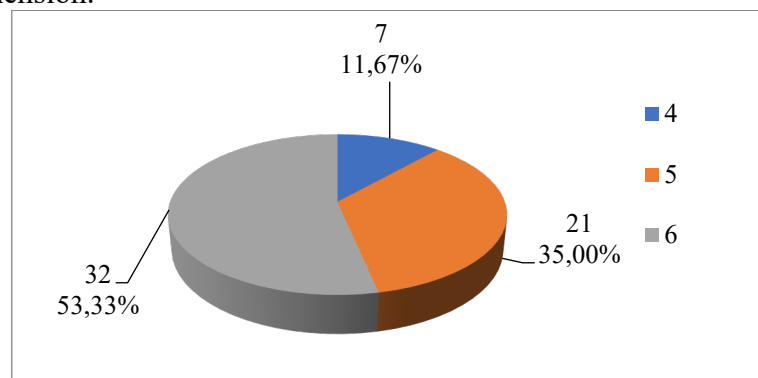


Figure 7. Distribution of values of the variable Receptive language - standard score

Figure 7. The distribution *is skewed to the right*, clustered at score 6, reflecting the dominant tendency of the sample towards higher performance.

Conclusions. Most subjects (53.33%) are at an optimal level of receptive language development. Approximately one-third (35%) are at an average level, requiring activities to consolidate verbal comprehension. A minority group (11.7%) is below the group average, highlighting *the need for individualized speech therapy intervention*.

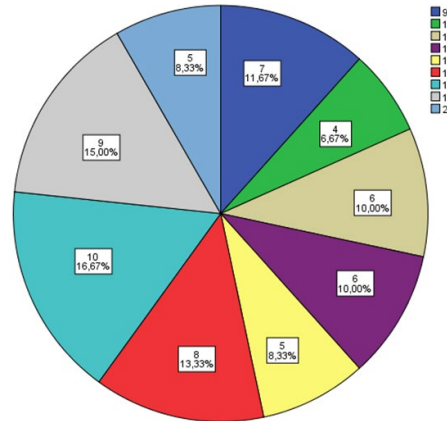


Figure 8. Distribution of values of the variable Receptive language - age in months

Figure 8 shows a balanced distribution, with a major concentration around the values of 16-19 months and indicates the dominant stage of receptive development of the sample.

Conclusions. The average age of receptive development is between 16 and 18 months, being considered the optimal period for the acquisition of basic verbal comprehension. Most subjects (approx. 45%) are in the range of 16-19 months, which indicates a positive trend and a constant evolution of receptive language. Subjects in the range of 9-12 months (approx. 28%) represent the vulnerable segment, with possible receptive delays or deficits in auditory-verbal processing.

Table 14. Distribution of values of the Communication variable - percentile

	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Valid	1	2	3,3	3,3
	2	2	3,3	6,7
	3	4	6,7	13,3
	4	4	6,7	20,0
	6	1	1,7	21,7
	7	6	10,0	31,7
	11	6	10,0	41,7
	14	4	6,7	48,3
	18	4	6,7	55,0
	23	6	10,0	65,0
	26	5	8,3	73,3
	31	7	11,7	85,0
	34	3	5,0	90,0
	36	6	10,0	100,0
Total	60	100,0	100,0	

Table 14 illustrates the distribution of children according to the percentile obtained when evaluating the **Communication** variable, which reflects each child's position in relation to age-specific developmental norms.

Conclusions. The distribution *is relatively dispersed*, with a positive trend towards the upper centiles, suggesting a favorable evolution of communication skills in a significant part of the subjects. Centiles 18-26 constitute the central area of the distribution, representing the typical level of the studied group. Almost half of the subjects are below the normative average and confirm the need for personalized interventions. Approximately a quarter of the children (26.7%) achieve above-average performance (31-36 centile), demonstrating significant progress and effective

verbal adaptation. Overall, the data indicates a *high variability in communication skills*, specific to heterogeneous groups with possible developmental delays.

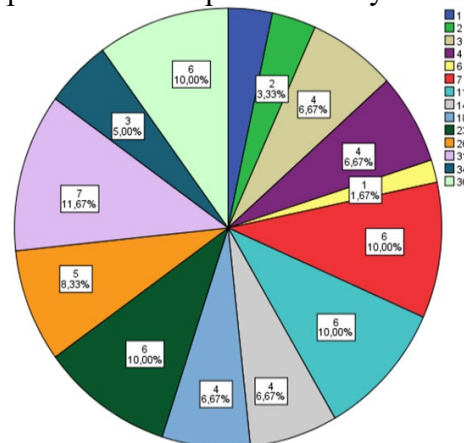


Figure 9. Distribution of values of the Communication variable expressed in percentiles

Figure 9 reflects a heterogeneous distribution, with multiple and relatively balanced segments.

Conclusions. The sample presents large variations in communicative level reflecting significant individual differences. Approximately half of the children are below the normative average, requiring personalized intervention programs. The upper segment (centiles 23-36) confirms the existence of subjects with positive evolution and high potential for recovery.

Table 15. Normality Test

	Kolmogorov-Smirnov Shapiro-Wilk					
	Statistics	df	Sig.	Statistics	df	Sig.
IQ	,189	60	,000	,843	60	,000
Verbal/Preverbal Cognitive1	,142	60	,004	,952	60	,019
Expressive Language -pretest	,103	60	,042	,955	60	,027
Receptive Language -pretest	,148	60	,002	,935	60	,003
Communication	,116	60	,043	,961	60	,053

Conclusion. Table 15 highlights that most of the variables do not follow a normal distribution, the only partial exception being the variable **Communication**, where the values approach the significance threshold, suggesting a *semiparametric distribution*. Consequently, the normality hypothesis is rejected in most cases.

Table 16. Spearman correlation

		Spearman r	p	
Verbal_cognitive_preverbal1	-	Expressive_Language1	0.878	< .001
Verbal_cognitive_preverbal1	-	Receptive_Language1	0.833	< .001
Verbal_cognitive_preverbal1	-	Communication	0.795	< .001
Verbal_cognitive_preverbal1	-	QI	0.905	< .001
Expressive_language1	-	Receptive_Language1	0.848	< .001
Expressive_language1	-	Communication	0.824	< .001
Expressive_language1	-	IQ	0.871	< .001
Receptive_language1	-	IQ	0.797	< .001
Communication	-	IQ	0.934	< .001

Table 16 presents the results of the Spearman correlation coefficient (p), a type of analysis chosen because, according to the normality test, the data does not follow a normal distribution, which justifies the application of **non-parametric methods**. All correlations are positive, very strong

and statistically significant, confirming the interdependence of cognitive, linguistic and communicative development. The results validate *integrative theoretical models* (of the Vygotsky or Bruner type).

Discussions

1. *Sample profile and data validity.* The sample is homogeneous (5-6 years; M=5.50; SD=0.50), has no missing values, provides robustness to the analysis, increases the internal validity of the results and allows for consistent statistical comparisons (Lord et al., 2022, p. 3). Perinatal indicators show APGAR scores of 9-10 for all participants, suggesting a good neonatal condition, in agreement with the conclusions of Salehi et al. (2024, p. 6). The proportion of cesarean deliveries is higher than the values reported internationally (World Health Organization, 2021, p. 2) and those reported in Romania (Radu et al., 2024, p. 3), a feature that describes a possible obstetric selection bias. The developmental regression in 25% of children is consistent with the range reported in recent literature (Hu et al., 2022, p. 5). These values *confirm the regressive phenotype* recognized in ASD.
2. *Gender and clinical severity.* Gender distribution follows the global epidemiological ratio of 3-4:1 (Maenner et al., 2023, p. 2), an asymmetry consistent with the literature that emphasizes the risk of underdiagnosis in girls, caused by more subtle phenotypic forms (Lai et al., 2023, p. 121), highlighting the need for gender-differentiated screening tools capable of capturing neurocognitive particularities.
3. *Cognitive level and severity.* The results confirm the inverse relationship between IQ and severity, an association supported by international literature, which shows that IQ is the major predictor of functional adaptation (Totsika et al., 2021, p. 919). The choice of non-parametric tests is justified (Field, 2022, p. 144).
4. *Cognitive-verbal and preverbal profile.* Standard scores for cognitive-verbal/preverbal correspond to an equivalent mental age of 25-28 months (mode=27 months). The discrepancy of approximately 3 years from chronological age confirms the global delay in symbolization, a delay that reflects early deficits in joint attention and incipient verbal reasoning (Mundy and Jarrold, 2021, p. 1386).
5. *Expressive and receptive language.* The gap between the scores confirms the need for interventions that prioritize receptive, followed by expressive expansion. Receptive is better than expressive - a profile consistently found in the specialized literature: "Receptive language often develops earlier and more robustly than expressive in ASD" (Eigsti et al., 2022, p. 2357).
6. *Communication.* The centile distribution highlights communicative heterogeneity, with over 60% of children falling between the 18th and 36th centiles, indicating basic functional communication. Similar data reported by Kasari et al. (2023, p. 628) show that one-third of children with ASD remain minimally verbal and require augmentative interventions. For children in the 1st to 4th centile range, CAA strategies are recommended, which can stimulate communicative intent (Ganz et al., 2022, p. 784).
7. *Cognitive and linguistic correlations.* All Spearman correlations are positive, strong, and significant. The strongest association is between IQ and communication, confirming the observations of Tager-Flusberg and Kasari (2023, p. 425), according to which general cognitive level predicts the trajectory of expressive and receptive language.
8. *Synthetic similarities and differences* are presented in Table 17.

Table 17. Synthetic similarities and differences

Domain	Similarities with literature	Observed differences
Age at diagnosis	43 months – consistent with meta-analyses	—
Gender	Ratio 3–4:1 confirmed	Girls only in severe form
Regress	25% Regression – in the range of 20–30%	—
Cesarean section	Possible associated factor	100% CS – atypical
Cognitive	QI predictive for language	Accentuated non-normal distribution
Receptive–Expressive	Receptive > expressive – typical	—
Spearman correlations	$\rho > .79$ – strong	—
Methodology	Appropriate non-parametric tests	—

9. *Speech therapy implications and explanations.* The results support the implementation of the “Receptive before expressive” strategy (Sandbank et al., 2023, p. 512), using simple commands (1-2 steps), routine vocabulary and gradual verbal expansion, according to the principles of NDBI. For children with scores below the 14th centile and expressive ages ≤ 18 months, CAA (PECS) is recommended, integrated into structured TEACCH programs and generalized in natural contexts. Daily parent coaching (30-45 min) and fragmented micro-sessions are empirically validated as methods of consolidating learning (Lord et al., 2022, p. 6).

Limitations and future directions

- 1) Clinical sample, possible *selection bias* (including 100% cesarean section), which limits generalizability.
- 2) Cross-sectional design; *longitudinal follow-ups* at 6/12 months are needed for developmental trajectories and estimation of gain rate (equivalent months/month).
- 3) Lack of contextual covariates (socio-economic status, parental education, sensory/medical comorbidities).

In essence, the data outlines a coherent profile: global cognitive and cognitive-verbal functioning shape receptive and expressive language, and through these determine the level of communication. The most effective interventions will be *integrated, staged, and visually supported* ones, which start from strengthening receptive and symbolizing, progress to expressive, and culminate in *functional, generalized communication*.

Conclusions

The results obtained by applying the Spearman correlation coefficient (ρ) confirm the existence of positive, very strong and statistically significant relationships between the cognitive and linguistic variables. The choice of the Spearman test was methodologically justified by the lack of normality of the distributions, a fact confirmed by the Kolmogorov-Smirnov test, which recommends the use of non-parametric analyses in small samples and with asymmetric dispersion (Field, 2022, p. 144).

1. Interdependence of cognitive, linguistic and communicative development

All correlations are positive and statistically significant ($p < .001$), indicating a direct association between global cognitive functioning and linguistic performance. The strongest association ($\rho = 0.934$) was identified between IQ and Communication, suggesting that general intelligence is the major predictor of communicative competence. This relationship is in full agreement with recent studies, which have shown that cognitive level determines the trajectory of expressive and receptive language acquisition in children with ASD (Tager-Flusberg & Kasari, 2023, p. 425).

The correlations between *cognitive-verbal/preverbal and expressive language* ($\rho = 0.878$), respectively *receptive language* ($\rho = 0.833$), confirm the integrative hypothesis according to which *the development of symbolization and verbal thinking* constitutes the basis of linguistic expression and understanding. In terms of Vygotsky's (1978) sociocognitive theory, "language is the main

instrument of thinking and mental development" (p. 56), and its internalization determines the emergence of higher mental functions.

2. Receptive-expressive ratio and therapeutic implications

The very strong correlation between *Receptive and Expressive Language* ($\rho = 0.848$) confirms the principle of reciprocal development between comprehension and expression, consistently observed in the literature: "Receptive language often develops earlier and more robustly than expressive in ASD" (Eigsti et al., 2022, p. 2357). This gap suggests that speech therapy interventions should follow a functional hierarchy, starting from the consolidation of receptive and gradually moving towards expressive. The "*Receptive before expressive*" strategy, described by Sandbank et al. (2023, p. 512), involves the use of simple commands, repetition of the verbal model and gradual propositional expansion (S-V-O). In addition, the results support the effectiveness of naturalistic integrated interventions (NDBI), which combine structured instruction with functional play and immediate social context (Lord et al., 2022, p. 6). Children in the lower ranges (centiles 1-4) require support through Augmentative and Alternative Communication (CAA), such as PECS, to stimulate communicative initiation and form verbal intention (Ganz et al., 2022, p. 784).

3. Global Intelligence as a Predictor of Verbal Performance

The high correlations between IQ and the linguistic dimensions - Expressive Language ($\rho = 0.871$), Receptive Language ($\rho = 0.797$) and Communication ($\rho = 0.934$), confirm the conclusions of Totsika et al. (2021, p. 919), according to which IQ is the most stable predictor of functional adaptation in children with ASD. In this sense, general intelligence acts as a catalyst for linguistic acquisition, and cognitive advances automatically generate improvements in verbal comprehension and expression.

4. Internal consistency and construct validity

The very high correlation between Verbal/Preverbal Cognitive and IQ ($\rho = 0.905$) validates the internal consistency of the measurements and confirms that the cognitive-verbal assessment faithfully reflects the general structure of intelligence. This convergence is essential in the interpretation of psychoeducational tests (PEP-3, SON-R 2½-7), which assess both nonverbal reasoning and symbolic emergence (Mundy & Jarrold, 2021, p. 1386).

5. Integrative theoretical model

The correlational chain *Cognitive* → *Receptive* → *Expressive* → *Communication* reflects the natural developmental sequence, supported by the theoretical models of Bruner (1983) and Vygotsky (1978), according to which social interaction precedes and shapes verbal acquisition. In this context, language is not just a means of communication, but a psychological tool of development (Vygotsky, 1978, p. 89).

Bruner (1983) emphasized that scaffolding mechanisms provided by adults facilitate the transition from concrete action to symbolic representation. This perspective explains the significant relationships between cognitive and linguistic dimensions observed in the present study.

6. Conceptual synthesis

The results indicate a cognitive-linguistic coevolution, in which the development of one dimension stimulates and strengthens the others. As the child acquires mental representation and joint attention capacities, the premises for receptive processing and verbal production appear. This interdependence is illustrated by the high correlations, all of which are above the threshold of $\rho = .79$.

Overall, the data confirms the hypothesis that language and cognition are interconnected processes, which evolve synergistically in a social and interactional context. Thus, effective therapeutic interventions must be *integrated, visual and staged*, progressively pursuing *symbolization – receptive – expressive – generalized functional communication*.

The results obtained confirm the patterns described in the international literature regarding the cognitive-linguistic profile of children with ASD.

Global cognitive and cognitive-verbal functioning are determining factors of linguistic and communicative performance in children with ASD.

Receptive language is an essential premise for the development of expressive language, confirming the natural order of acquisition.

Functional communication is conditioned by general intelligence and the capacity for symbolization.

Therefore, a relatively more developed receptive, a global delay in symbolization, but also a strong correlation between IQ and communication are highlighted.

The sample presents a significant potential for progress, and the application of strategies based on receptive-expressive and CAA/AAC can generate visible functional increases in the short term.

At the same time, the obstetric structure (100% CS) requires caution in extrapolating the data.

Therapeutic interventions must be based on cognitive progression and use visual support, predictable routines and naturalistic training.

These results make a significant empirical contribution to understanding the relationship between *thinking, language and interaction*, confirming the validity of sociocognitive models and the importance of early, multimodal and individualized intervention.

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