

Language functioning in Autism Spectrum Disorder: A scoping review

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ABSTRACT

Purpose: to map and synthesize scientific evidence on language functioning in children and adolescents with autism spectrum disorder.

Methods: this scoping review aimed at mapping and synthesizing scientific evidence on language functioning in children and adolescents with Autism Spectrum Disorder. A research question, article selection, and compilation of results were used as research strategies. The selection criteria were studies with samples of children and adolescents, addressing Autism Spectrum Disorder, speech-language-hearing therapy, communication, language, and functioning. After independent evaluators read the titles, keywords, abstracts, and full texts, they recorded the following data for the review: year of publication, type of study, country of origin, sample size, age of participants, instruments used, language subsystems assessed, and results.

Literature review: the search found 1,056 articles, of which 536 were read in full, and 16 were included. There was great variability in assessment instruments and few studies involving adolescents. Individuals with Autism Spectrum Disorder had changes in language functioning related to pragmatics, morphosyntax, semantics, and phonology.

Conclusion: the preliminary evidence map indicates that children and adolescents with Autism Spectrum Disorder have a variety of language changes.

Keywords: Child Language; Autism Spectrum Disorder; Speech, Language and Hearing Sciences; International Classification of Functioning, Disability and Health; Communication Barriers



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INTRODUCTION

Autism spectrum disorder (ASD) is complex and heterogeneous, with a wide range of changes and varying degrees of severity¹. This complexity makes it difficult to treat and understand each subject's demands and necessary adaptations in different social environments².

The language functioning of individuals with ASD has been investigated around the world. There is great variation in the language acquisition pattern of children with ASD³. Studies indicate that the main language changes are observed in the pragmatic subsystem (use of language according to the context), due to difficulties in motivation and social interaction^{3,4}. The literature also shows losses in the use of linguistic structures essential for oral language, such as pronouns, verbs, adjectives, and conjunctions⁴.

The biopsychosocial approach is the most complete way to conceptualize human development and disability, combining medical, social, and functional perspectives⁵. It addresses functioning (function performance) and disability (function impossibilities or limitations) as products of the interaction between health conditions and the individual and social context⁶. From the perspective of functioning, it is possible to better understand the language capabilities and limitations of individuals with ASD, thus improving the management of communication needs, target intervention, and, consequently, quality of life^{7,8}.

Currently, there is no specific standard for evaluating changes in ASD. The procedures to be used, whether tests, exams, questionnaires, or observation of linguistic aspects in a spontaneous situation, are defined by the evaluator based on diagnostic criteria and family complaints⁹. Core sets and rating scales have also been developed for individuals with ASD for research purposes and to complement the evaluation, classify functioning, define behaviors, and measure results¹⁰.

This study aimed to map and synthesize scientific evidence on the language functioning of children and adolescents with ASD, in order to help clinical assessment and the functional classification of language, and provide guardians, caregivers, and professionals with a better understanding of the complexity and heterogeneity of changes in individuals presented with ASD.

METHODS

This review was developed by the scoping review methodology proposed by the Joanna Briggs Institute (JBI)¹¹. Scoping reviews propose a rigorous and transparent methodology and have been widely used in health research, mainly aiming to map and summarize the evidence, explore the extent of literature, and inform future research on a key concept in a field of study. The protocol was not registered in the Open Science Framework for scoping reviews, as it is not mandatory for the development of scoping reviews. After defining the objective and methods, the authors filled out the institution's library search form¹². The scoping review article was written based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses – Extension for Scoping Reviews (PRISMA-ScR)¹³.

Research strategy

The research question was defined according to the PCC components (Population, Concept, and Context), as follows: “Which studies produced worldwide describe the functional aspects of the language of children and adolescents with ASD?”.

Then, the following descriptors for data collection were defined according to the thematic axes, in Portuguese, English, and Spanish, based on the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH): “Child”, “Adolescent”, “Autistic Disorder”, “Autism Spectrum Disorder”, “Language Development”, “Child Language”, “Communication Barriers”, “Speech Therapy”, “International Classification of Functioning, Disability and Health”, and “Disability Assessment”. The descriptors were used together in search equations, adding the free term “functioning”. The same descriptors were used for the search in English and Spanish.

Seven electronic databases were selected for the literature search, and specific strategies were outlined for each database (Chart 1). A free search was also carried out in unconventional academic materials (gray literature) to find studies that met the criteria. The review involved all scientific knowledge produced until May 2023.

Chart 1. Databases and search strategies

Database	Strategy
VHL	(Child OR Niño OR Criança OR Crianças OR Adolescent OR Adolescente OR Adolescente OR Adolescentes OR Adolescência OR Jovem OR Jovens OR Juventude) AND ("Autistic Disorder" OR "Trastorno Autístico" OR "Transtorno Autístico" OR Autismo OR "Autismo Infantil" OR "Síndrome de Kanner" OR "Autism Spectrum Disorder" OR "Trastorno del Espectro Autista" OR "Transtorno do Espectro Autista" OR "Transtorno de Espectro Autista" OR "Transtorno do Espectro do Autismo") AND ("Language Development" OR "Desarrollo del Lenguaje" OR "Desenvolvimento da Linguagem" OR "Child Language" OR "Lenguaje Infantil" OR "Linguagem Infantil" OR "Linguagem da Criança" OR "Communication Barriers" OR "Barreras de Comunicación" OR "Barreiras de Comunicação" OR "Speech, Language and Hearing Sciences" OR Fonoaudiología OR Fonoaudiologia) AND ("International Classification of Functioning, Disability and Health" OR "Clasificación Internacional del Funcionamiento, de la Discapacidad y de la Salud" OR "Classificação Internacional de Funcionalidade, Incapacidade e Saúde" OR "CIF" OR "Disability Evaluation" OR "Evaluación de la Discapacidad" OR "Avaliação da Deficiência" OR Funcionalidade OR Functionality)
MEDLINE via PubMed	(Child OR Adolescent) AND ("Autistic Disorder" OR "Autism Spectrum Disorder") AND ("Language Development" OR "Child Language" OR "Communication Barriers" OR "Speech, Language and Hearing Sciences") AND ("International Classification of Functioning, Disability and Health" OR "Disability Evaluation" OR Functionality)
COCHRANE	(Child OR Adolescent) AND ("Autistic Disorder" OR "Autism Spectrum Disorder") AND ("Language Development" OR "Child Language" OR "Communication Barriers" OR "Speech, Language and Hearing Sciences") AND ("International Classification of Functioning, Disability and Health" OR "Disability Evaluation" OR Functionality)
CINAHL	(Child OR Adolescent) AND ("Autistic Disorder" OR "Autism Spectrum Disorder") AND ("Language Development" OR "Child Language" OR "Communication Barriers" OR "Speech, Language and Hearing Sciences") AND ("International Classification of Functioning, Disability and Health" OR "Disability Evaluation" OR Functionality)
SCOPUS	(Child OR Adolescent) AND ("Autistic Disorder" OR "Autism Spectrum Disorder") AND ("Language Development" OR "Child Language" OR "Communication Barriers" OR "Speech, Language and Hearing Sciences") AND ("International Classification of Functioning, Disability and Health" OR "Disability Evaluation" OR Functionality)
Web of Science	(Child OR Adolescent) AND ("Autistic Disorder" OR "Autism Spectrum Disorder") AND ("Language Development" OR "Child Language" OR "Communication Barriers" OR "Speech, Language and Hearing Sciences") AND ("International Classification of Functioning, Disability and Health" OR "Disability Evaluation" OR Functionality)
EMBASE	(Child OR Adolescent) AND Autism AND ('Language Development' OR 'Communication Barrier') AND 'International Classification of Functioning, Disability and Health'

Chart 2. Delimitation of the population, concept, and context: inclusion and exclusion criteria

Parameters	Population	Concept	Context
PCC strategy	WHO childhood (0 to 11 years, 11 months and 29 days) and adolescence (12 to 20 years)	Functioning	Scientific production worldwide
Inclusion criteria	Children and adolescents Both sexes ASD diagnosis	Functional aspects of language Assessment of communicative and linguistic aspects	Clinical context (clinical environments, offices, home assessment) National health systems School context
Exclusion criteria	Children with a suspected diagnosis or complaint	Addressing behavioral and motor aspects only Other speech and language changes not associated with ASD	Research with self-reported data (questionnaires) Survey

Captions: PCC = Population, Concept, and Context; WHO = World Health Organization; ASD = autism spectrum disorder.

Eligibility criteria

The inclusion and exclusion criteria (Chart 2) were discussed by the team to ensure their clarity.

After using the search strategies to survey the list of articles, their titles, keywords, and abstracts were organized in an Excel spreadsheet and made available for independent reading by two researchers. They (authors 1 and 3) independently screened the titles and abstracts and determined whether the studies met the inclusion criteria. The results were compared, and disagreements were resolved by consensus, with the participation of a third reviewer (author 2).

At this stage, articles that met the following criteria were chosen for full reading: studies whose samples included children and adolescents, addressing ASD, encompassing speech-language-hearing therapy, communication, language, or speech, and addressing functioning.

The selected articles were read in full (author 1). Those that met the following criteria were included in the study: articles that had full text in English, Spanish, or Portuguese and that described the functional aspects of language in ASD, regarding its difficulties and functionalities. Opinion articles, letters to the editor, experience reports, and studies that did not answer the research question were excluded. No publication time limits were established.

Data analysis

After reading the titles, keywords, and abstracts, the evaluators judged whether to include the article, according to the said criteria, responding with “yes”, “no”, or “maybe”. Articles that received only “yes” or “yes” and “maybe” were included in the next stage. Those that received only “no” or “no” and “maybe” were excluded from the next stage. If the evaluators diverged about an article, its title, keywords, and abstract were judged by a third researcher, in a consensus meeting, to determine based on the criteria whether it would be included for reading. At this stage, the evaluators were a speech-language-hearing pathologist and an undergraduate speech-language-hearing student, to ensure conceptual alignment regarding the study topic.

A single evaluator read in full and judged the studies. Those that met the criteria were included in the review.

The studies included in the review were recorded in a spreadsheet based on the analysis protocol created for this review. Thus, the following data were recorded for the review: year of publication, type of study, country of origin, sample size, age of participants, instruments and procedures used for evaluation, language subsystems evaluated, and main results.

The article selection stages in this review are summarized in the flowchart in Figure 1. It shows the number of studies on ASD produced by the scientific community to understand the variability and complexity of language changes in children with ASD.

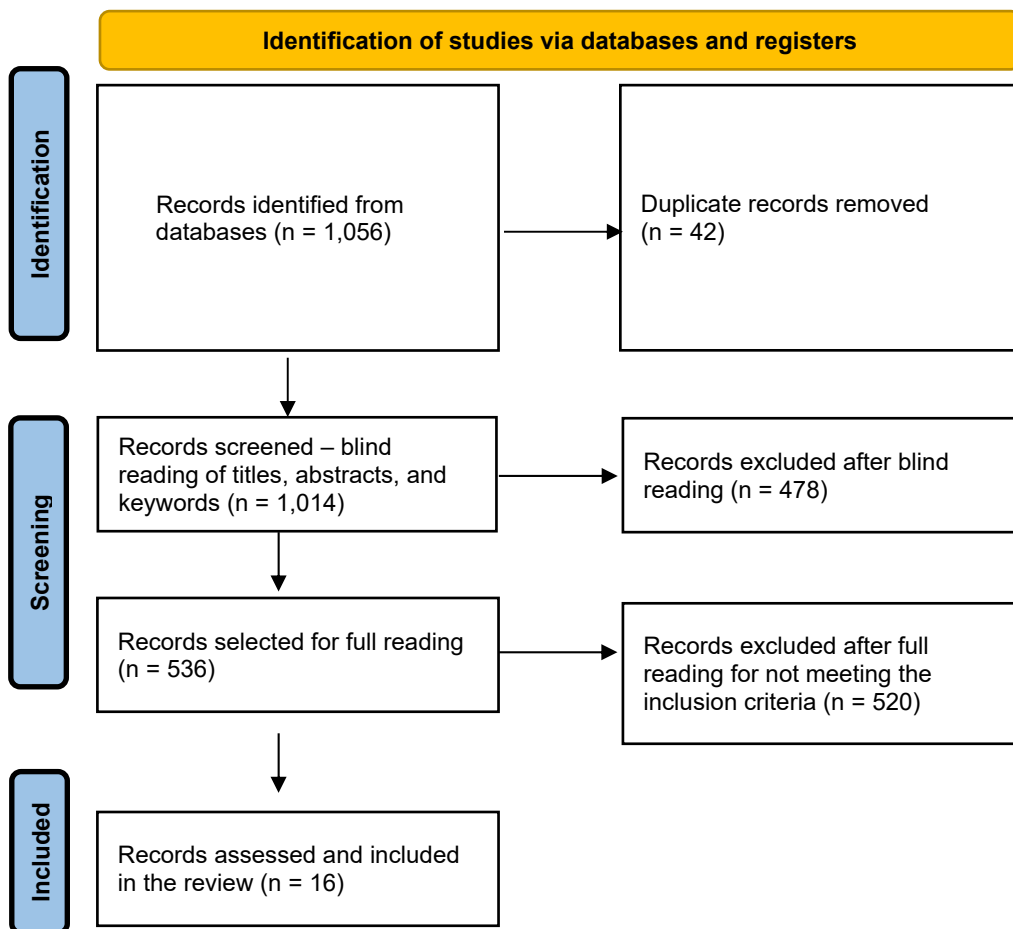


Figure 1. Flowchart of the study selection process¹³.

LITERATURE REVIEW

Results in the databases

The initial search resulted in 1,056 articles, 915 of which were found in the MEDLINE database, 21 articles in the VHL, 43 articles in COCHRANE, two in CINAHL, 65 in SCOPUS, one in Web of Science, and three in EMBASE. After excluding duplicates, 1,014 articles were submitted to the first stage of analysis.

Of the 1,056 article titles and abstracts, 536 (50.8%) were selected for full reading. Of these, only 16 (1.5%) met the criteria and answered the research question, being included in the review. The flowchart in Figure 1 demonstrates the study selection process for this review.

Analysis of selected studies

Of the 16 studies selected for analysis, 12 (75%) were cross-sectional analytical observational studies¹⁴⁻²⁵, two were narrative reviews^{4,26} of the literature on language in ASD, one was a cross-sectional,

descriptive, observational study²⁷, and one was a longitudinal descriptive observational study¹⁵. None of them was experimental.

The search identified 17 observation protocols for language assessment, a free activity behavioral observation, and a spontaneous speech sample. There was great variability in the tests used. The pragmatic subsystem was the most evaluated, in 15 studies^{4,14-19,21-28}, followed by the morphosyntactic, in five studies^{4,14,16,19,21}, the semantic, in four studies^{4,14,26,28}, and the phonological, in only two studies^{14,19}.

Ten studies had a control group of typically developing children^{15-22,24}. Other disorders have also been cited, such as attention-deficit/hyperactivity disorder (ADHD)²⁰, pervasive developmental disorder-not otherwise specified²², and language delay²⁵. The review included empirical studies from America^{21-23,26,27} (38.46%), Europe^{15-17,19} (30.77%), Asia^{18,20} (15.38%), and Oceania²⁴ (15.38%). The United States of America (USA) stood out with 31.25% of the studies.

The topic was addressed in different regions of the world to understand the clinical manifestations of ASD

better, as the review included studies from the United States, Brazil, South Korea, Italy, Australia, Spain, and Denmark.

The samples had four to 52 children with ASD, mostly boys in all studies.

There was great variability in language assessment instruments. Altogether, 17 different tests and protocols were used, among which it was impossible to find validation of the Prelinguistic Communication Assessment (PCA) test, which was used in a North American study in 1997²⁷. The Korean test (Korean Autism Social Language Task [KASLAT]), the Danish test (Dansk Impressiv Morfologisk [DIM]), and the Russian tests (Russian Child Language Assessment Battery, phoneme detection test from the Russian Test of Phonological Processing, and Custom-made Word repetition test) are specific to the culture and language of origin. The Pragmatics Test – ABFW was used in a Brazilian study. The Australian test (Clinical Evaluation of Language Fundamentals, Preschool, Second Edition [CELF Preschool – 2]) and one of the American ones, the Children’s Communication Checklist 2 (CCC-2), have translation and validation into English and Spanish and translation into Portuguese Brazilian. The most used among them was the CCC-2, in two Italian studies with children with ASD aged 8 to 10 years¹⁵ and 3.7 to 10.3 years¹⁶, and a Spanish one with children with ASD aged 7 to 11 years¹⁷.

To evaluate language, two studies used two tests to map changes: the Danish study²⁰, which used CELF Preschool – 2 and DIM in children aged 4 to 6 years and 5 to 6 years, and the Australian one²⁵, which used the Test of Nonverbal Intelligence-Second Edition (TONI-2) and the Test of Language Competence-Expanded Edition (TLC-E) in children aged 9 to 17 years, both with children with ASD and typically developing ones.

The results of the studies analyzed in this review are described in Table 1, in descending chronological order of publication, including their main characteristics, such as authors, design, language subsystem, and functional aspects.

Research into aspects of language functioning in this population is still limited. Therefore, there should be greater investment in studies that combine functioning, language, and ASD.

According to the literature, the USA is the country with the highest prevalence of children with ASD – one in every 54 children born²⁹ –, which highlights the need for research with this population.

Regarding the research design, more than 80% of the articles included in the review are cross-sectional analytical observational studies. The literature points out that the lack of variability in research processes leads to limited information³⁰. This data may indicate that intervention is not being evaluated and the evolution of children and adolescents with ASD is not being monitored from the perspective of functioning. Therefore, studies with other research designs are necessary, such as clinical trials³¹ (making it possible to understand factors associated with functional gains and/or losses in language and evaluate the effectiveness of the intervention through comparative analysis between tests and measures before and after intervention) and longitudinal studies³² (describing and monitoring the language development of children with ASD).

In general, the studies had convenience samples³³, which are little expressive, not representing the range of language changes in ASD. Larger-scale studies are therefore necessary to further advance the understanding of the phenotypic variety and increase the possibility of generalizing the results.

The range of protocols corroborates the literature^{34,35} and shows that the entire scientific community doesn’t need to use the same instruments to address functioning. The ones already established in clinical practice can be used to analyze functional aspects. Furthermore, the literature on ASD screening and diagnostic assessment instruments has been growing in Brazil^{23,26,34,35}, although few protocols have gone through all the validation stages.

The pragmatic language subsystem was present in most studies, which shows that the main changes in ASD are related to pragmatic aspects³⁵, which refers to the social use of language – i.e., the use of discourse in different social contexts³⁶.

This function enables dialogue, maintains interactions, allows the expression of communication needs, and perceives others as communication partners³⁵. Studies have indicated that children with ASD have difficulty interpreting nonverbal aspects of communication and understanding inferential language and figurative language, such as irony, metaphor, and emotions, within the context of communication^{15-18,20,24}. They also have difficulty in being reciprocal and maintaining dialogue²², tend to respond in excessively literal terms^{20,37}, and have fewer speaking episodes than typically developing children²³⁻²⁵, due to social motivation difficulties of individuals with ASD³⁸.

Table 1. Description of study findings

Article	Country	Design	Sample	Tests/protocols applied	Language subsystems	Functional aspects of the language
Arutiunian <i>et al.</i> , 2022 ¹⁴	Russia	Cross-sectional analytical	ASD: 82 children (17 girls) TD: 25 children (11 girls) 7 to 11 years	Russian Child Language Assessment Battery Phoneme detection test from the Russian Test of Phonological Processing Custom-made word repetition test	Pragmatic Morphosyntactic Semantic Phonological	Children with ASD had high variability in language skills (from normal to deficient). Children with ASD had more difficulty understanding speech and answering implicit questions. Children with ASD had lower sentence processing scores than TD children. They repeated short sentences and phrases with high-frequency words better than long sentences and sentences made up of low-frequency words. Children with ASD performed worse in object naming, action naming, noun comprehension, and verb comprehension than TD children. Children with ASD had more difficulty with pseudoword repetitions, phoneme detection, and phonological discrimination than TD children.
Broome <i>et al.</i> , 2021 ²⁸	Australia	Longitudinal descriptive	ASD: 23 children (2 girls) 2 to 6 years	Preschool Language Scale–Fourth Edition (PLS-4) Communication and Symbolic Behavior Scales (CSBS) Polysyllable Preschool Test (POP) First Words First Sentences Test (FWFST) Spontaneous speech samples	Pragmatic Semantic Phonological	Children with ASD had high variability in language skills. However, in general, there was a tendency towards greater receptive than expressive vocabulary and greater production of initial consonants in relation to the middle or final consonants. To better describe the children's language characteristics, they were divided into three subgroups (A, B, and C) according to their functioning: A. Relatively high speech and language skills: children had high receptive and expressive vocabulary, high nonverbal communication, and high speech; they made few articulation errors. B. Greater receptive and nonverbal communication skills in relation to speech and expressive language: children had high receptive vocabulary, high nonverbal communication, low expressive vocabulary, and low speech; they used few words and had low phonemic precision. C. Low language and speech ability: children had low language, nonverbal communication, and speech levels; they used fewer than 10 recognizable words.
Ferrara <i>et al.</i> , 2020 ¹⁵	Italy	Cross-sectional analytical	ASD: 19 children TD: 70 children (34 girls) 8 to 10 years	Children's Communication Checklist 2 (CCC-2)	Pragmatic	Children with ASD had a high level of stereotypical language and difficulty in initiating and using contexts.
Mazzagio, Shield, 2020 ¹⁶	Italy	Cross-sectional analytical	ASD: 23 children (2 girls) TD: 35 children (18 girls) ASD: 3.7 to 10.3 years. TD: 4.8 to 6.4 years	Children's Communication Checklist 2 (CCC-2)	Morphosyntactic Pragmatic	Children with ASD were less likely to produce pronouns in the context of picture identification but more likely to produce overt rather than null pronouns in association with verbs that are marked for first- and second-person subjects. Children with ASD have been able to acquire and use pronominal forms but struggle to understand when and where to use them conventionally, pointing to underlying challenges with pragmatics.
Baixauli-Fortea <i>et al.</i> , 2019 ¹⁷	Spain	Cross-sectional analytical	ASD: 52 children TD: 37 children (18 girls) 7 to 11 years	Children's Communication Checklist 2 (CCC-2)	Pragmatic	Children with ASD had stereotypical language, difficulty in initiation, use of context and nonverbal language, and included irrelevant details in the narrative.
Friedman, Sterling, 2019 ³	USA	Narrative literature review	74 studies	Not applicable	Pragmatic Morphosyntactic Semantic	Children with ASD had: - Difficulties with maintaining the topic, greetings and goodbyes, changing appropriate direction, and using conversation repair strategies. - Difficulties with sentence structuring, regular and irregular past tense, present tense, and regular third-person singular verbs. - Deficit in the production and understanding of personal pronouns, mental state terms, and prepositions.

Article	Country	Design	Sample	Tests/protocols applied	Language subsystems	Functional aspects of the language
Kim <i>et al.</i> , 2018 ¹⁸	South Korea	Cross-sectional analytical	ASD: 15 children (1 girl) TD: 18 children (8 girls) mean age \pm SD ASD: 9.66 \pm 2.19 TD: 10.47 \pm 2.78	Korean Autism Social Language Task (KASLAT)	Pragmatic	Children with ASD had difficulties interpreting sentences according to the context, especially regarding idiomatic expressions.
Brynskov <i>et al.</i> , 2017 ¹⁹	Denmark	Cross-sectional analytical	ASD: 21 children (5 girls) TD: 21 children (6 girls) ASD: 5 to 6 years TD: 4 to 6 years	Clinical Evaluation of Language Fundamentals, Preschool, Second Edition (CELF Preschool – 2), Dansk Impresiv Morfologisk (DIM) test	Morphosyntactic	Children with ASD repeated sentences within the short-term memory period without fully understanding or knowing the grammar and had poor verbal inflection and use of pronouns. There was great variability in the results.
Lane <i>et al.</i> , 2016 ²⁷	USA	Cross-sectional descriptive	ASD: 4 children 4 to 5 years	Behavioral observation – free activity	Pragmatic	Children with ASD were less likely to use meaningful verbalizations to communicate desires and interests.
Lee <i>et al.</i> , 2015 ²⁰	South Korea	Cross-sectional analytical	ASD: 16 children (4 girls) TDAH: 16 children (2 girls) TD: 10 children mean age \pm SD ASD: 9.31 \pm 1.70 ADHD: 8.00 \pm 1.59	Korean Autism Social Language Task (KASLAT)	Pragmatic	Children with ASD faced greater difficulty than TD children in understanding idiomatic expressions. They failed to consider the social context and tended to interpret expressions literally.
Suh <i>et al.</i> , 2014 ²¹	USA	Cross-sectional analytical	ASD (previous treatment and no current symptoms): 15 children. High-functioning ASD: 15 children TD: 15 children 9 to 15 years	Language Data Exchange System (CHILDES)	Morphosyntactic Pragmatic	Children with ASD without apparent symptoms and high-functioning ASD had self-correction disfluency and idiosyncratic language. All three groups had well-developed morphological and syntactic language skills.
Paul <i>et al.</i> , 2010 ²²	USA	Cross-sectional analytical	ASD: 9 children Asperger: 15 children Pervasive developmental disorder-not otherwise specified: 5 children TD: 26 children. 2 to 18 years	Pragmatic Rating Scale (PRS) Coding	Pragmatic	Children with ASD had difficulties in managing topics and information related to difficulties in presuppositional skills and obtaining reciprocity related to attention and sensitivity to the partner's verbal and nonverbal cues. Difficulties in both verbal and nonverbal skills to maintain a balanced conversational exchange.
Amato, Fernandes, 2010 ²³	Brazil	Cross-sectional analytical	ASD: 20 children (3 girls) 2 to 10 years	Pragmatic test – ABFW	Pragmatic	Children with ASD had difficulty interacting with others. Both nonverbal and verbal children with ASD made great use of gestures to communicate. The group of verbal children with ASD use more the verbal environment and less the vocal environment than nonverbal children with ASD, as observed in TD children.
Saad, Godfield, 2009 ²⁶	Brazil	Narrative literature review	27 studies	Not applicable	Pragmatic Semantic	Children with ASD had greater difficulties in understanding idiomatic expressions than TD children and those with ADHD. Also, children with ASD tended not to consider the social context and interpret expressions literally.

Article	Country	Design	Sample	Tests/protocols applied	Language subsystems	Functional aspects of the language
Suh et al., 2014 ²¹	USA	Cross-sectional analytical	ASD (previous treatment and non-apparent current symptoms): 15 children. High-functioning ASD: 15 children TD: 15 children 9 to 15 years	Language Data Exchange System (CHILDES)	Morphosyntactic Pragmatic	Children with ASD without apparent symptoms and high-functioning ASD had self-correction disfluency and idiosyncratic language. All three groups had well-developed morphological and syntactic language skills.
Paul et al., 2010 ²²	USA	Cross-sectional analytical	ASD: 9 children Asperger: 15 children Pervasive developmental disorder-not otherwise specified: 5 children TD: 26 children 2 to 18 years	Pragmatic Rating Scale (PRS) Coding	Pragmatic	Children with ASD had difficulties in managing topics and information, related to difficulties in presuppositional skills, and obtaining reciprocity, related to attention and sensitivity to the partner's verbal and nonverbal cues. Difficulties in both verbal and nonverbal skills to maintain a balanced conversational exchange.
Amato, Fernandes, 2010 ²³	Brazil	Cross-sectional analytical	ASD: 20 children (3 girls) 2 to 10 years	Pragmatic test – ABFW	Pragmatic	Children with ASD had difficulty interacting with others. Both nonverbal and verbal children with ASD made great use of gestures to communicate. The group of verbal children with ASD used more the verbal environment and less the vocal environment than nonverbal children with ASD, as observed in TD children.
Saad, Godfield, 2009 ²⁶	Brazil	Narrative literature review	27 studies	Not applicable	Pragmatic Semantic	Children with ASD had greater difficulties in understanding idiomatic expressions than TD children and those with ADHD. Also, children with ASD tended not to consider the social context and interpret expressions literally.
Lewis et al., 2007 ²⁴	Australia	Cross-sectional analytical	ASD: 20 children (4 girls) TD: 28 children ASD: 9 to 17 years	Test of Language Competence-Expanded Edition (TLC-E) The Test of Nonverbal Intelligence-Second Edition (TONI-2)	Pragmatic	Children with ASD were less skilled at resolving ambiguity, understanding inferential language, and using linguistic flexibility to produce speech within a communicative situation.
Stone et al., 1997 ²⁵	USA	Cross-sectional analytical	ASD: 14 children Language delay: 14 children	Prelinguistic Communication Assessment (PCA)	Pragmatic	Children with ASD were more likely to request objects or actions and less likely to direct the examiner's attention to an object or activity of interest (i.e., comment). They also demonstrated a lower rate and proportionally fewer gestures associated with commenting (i.e., pointing and showing objects), a lower rate, and proportionally fewer acts involving staring. They performed direct manipulation of the examiner's hand, mainly to request.

Captions: SD = standard deviation; ASD = autism spectrum disorder; TD = typically developing; ADHD = attention-deficit/hyperactivity disorder; USA = United States of America.

Source: Developed by the authors, 2023.

The review also found groups of children with ASD who performed well in receptive and expressive language and gesture and speech production, making slight errors in sound articulation²⁸ – which corroborates the literature regarding the great variability of language skills in children with ASD³. Therefore, children with ASD must be classified according to their functioning, identifying heterogeneous groups with similar functioning for therapy, research, and inclusion.

The morphosyntactic subsystem refers to the grammatical and morphological structure of the language – i.e., the order and composition of words and sentences in speech. This information is used to organize speech, promoting adequate expression and understanding³⁶. According to the findings, children with ASD have difficulty in verbal inflection regarding time and number and deficits in producing and understanding personal pronouns, mental state terms, and prepositions⁴. Some of them learn pronouns but have difficulties using them correctly in context^{4,16,19}.

The semantic subsystem refers to the meaning of words and sentences in speech³⁶. It ascribes meaning to a linguistic sign. It is common for children with ASD to have stereotypical, echolalic, and/or idiosyncratic language^{15,17,21,26}. They may have difficulty naming objects and actions and understanding nouns and verbs¹⁴, although some may understand them with no difficulty²⁸.

Regarding the phonological subsystem, related to the production and recognition of speech sounds³⁶, children with ASD may have more difficulty repeating sounds without context (such as pseudowords), detecting phonemes, performing phonological discrimination¹⁴, and producing units in the middle or end of words²⁸. Preliminary studies have shown that children with ASD produce compensatory sounds and strategies similar to those of typically developing children^{38,39}.

The phonological one was the least cited linguistic subsystem in the studies included in this review. The fact that few articles investigate phonology in people with ASD may be due to the greater emphasis given to the pragmatic subsystem³⁹. Hence, this aspect must be further investigated.

Classifying language skills helps identify aspects that need to be addressed and come up with strategies to better include individuals in their social environments. Thus, these aspects should be better explored in clinical and research settings.

An important factor in the findings is the few articles involving adolescents. Studies indicate that, at this

stage, there is greater concern about social interaction with peers and the demands of social inclusion⁴⁰, to the detriment of language skills. Therefore, further investigations are necessary.

This study included two literature reviews^{4,26}. One of them approached studies evaluating executive functions and language development in ASD, observing changes in the pragmatic, semantic, and morphosyntactic subsystems⁴. The second one approached studies that discussed the characteristics of echolalia and communicative intention in ASD – i.e., pragmatic and semantic changes. Although echolalia is quite present in children with ASD, the few studies were cited as a limitation²⁶. Both reviews refer to the need for better characterization of the skills and the great variability of collection instruments. These aspects culminated in diverse and some even controversial results, highlighting the complexity of language changes in ASD.

No studies were found that addressed the language functioning of children and adolescents with ASD according to the International Classification of Functioning, Disability, and Health (ICF). Therefore, it can be inferred that there is a low production of articles on this topic. However, although the classification was not presented, the biopsychosocial model permeated the discussion of the findings in the included studies. Furthermore, there is a wide range of tests and protocols used for clinical evaluation and research, which hindered linear data collection for the review.

CONCLUSION

The study mapped and synthesized the evidence regarding the language functioning of children and adolescents with ASD who had a wide range of changes in language, including the pragmatic, morphosyntactic and semantic subsystems.

It was also found that organizing the language subsystems and the changes that may be present in ASD helps understand its complexity from the perspective of functional classification of language.

This mapping supports language assessment in clinical practice, directing the evaluator to which tests and protocols can be used and which functional aspects should be analyzed, considering possible language changes in ASD. Furthermore, through this synthesis, future research will be able to relate the changes present in each subsystem to the communication functioning in ASD, using classification systems based on the ICF.

Despite much research on language and ASD around the world, few articles have investigated the functioning of language in this population. New observational and experimental research with larger samples is needed, addressing the functioning of the therapeutic intervention process in clinical practice.

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