

# Impact of Developmental Language Disorder on Child Development: Case Report and Differential Diagnosis with Autism Spectrum Disorder

Impacto do Transtorno do Desenvolvimento da Linguagem no Desenvolvimento Infantil: Relato de Caso e diagnóstico diferencial com o Transtorno do Espectro do Autismo

Impacto del Trastorno del Desarrollo del Lenguaje en el Desarrollo Infantil: Informe de Caso y Diagnóstico Diferencial con el Trastorno del Espectro Autista

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## Abstract

**Introduction:** Language processing requires activation of complex neural networks that extend beyond the classic language processing areas in the brain. Impairments in these networks represent a significant risk to the development of speech and language, potentially leading to a diagnosis of Developmental Language Disorder (DLD). **Objective:** To report the case of a child previously diagnosed with Autism Spectrum Disorder (ASD) who, after a speech-language evaluation, was diagnosed with DLD. **Case Report:** Male, 5 years and 7 months old. Reported behaviors include shyness, self-aggression, and hypersensitivity to sound and light. During the initial evaluation, the child appeared withdrawn but demonstrated communicative intent and reciprocity in nonverbal communication turns. Symbolic play was observed. Significant alterations were noted in the receptive and expressive language subsystems. The Denver II Test revealed delays in personal-social areas, fine motor skills, and a marked delay in language. Improvement was observed with speech therapy. **Discussion:** Speech-language pathology focuses on disorders of speech, language, and communication, providing a comprehensive assessment of child development. Language disorders have a profound impact throughout life, affecting social, emotional, and educational development, and increasing the risk of behavioral problems, mental health issues, and employment difficulties in adulthood. **Conclusion:** This study underscores the importance of clinical evaluation with a broad perspective on developmental milestones in children with DLD, emphasizing that this condition may be accompanied by delays in other extralinguistic developmental milestones.

**Keywords:** Child Language; Autism Spectrum Disorder; Specific Language Impairment; Neurodevelopmental Disorders; Cognition

## Resumo

**Introdução:** O processamento de linguagem requer ativação de redes neurais complexas que extrapolam as áreas clássicas de tratamento de linguagem no cérebro. Prejuízos nessas redes representam risco significativo para o desenvolvimento da fala e linguagem, podendo resultar em diagnóstico de Transtorno do Desenvolvimento de Linguagem. **Objetivo:** Relatar o caso de uma criança previamente diagnosticada com Transtorno do Espectro do Autismo que após avaliação foniátrica recebeu diagnóstico de TDL (Transtorno do Desenvolvimento da Linguagem). **Relato de caso:** Masculino, 5 anos e 7 meses. Relato de comportamento tímido, autoagressão e hipersensibilidade a som e luz. Na avaliação inicial, mostrou-se retraído, porém com intenção comunicativa e reciprocidade nos turnos de comunicação não verbal. Apresentou brincadeira simbólica. Observaram-se alterações significativas nos subsistemas de linguagem receptiva e expressiva. O Teste Denver II revelou atrasos nas áreas pessoal-social, motor fino, além de atraso marcante na linguagem. Com terapia fonoaudiológica obteve melhora. **Discussão:** A foniatria dedica-se aos distúrbios de fala, linguagem e comunicação, avaliando o desenvolvimento infantil de forma integral. Distúrbios de linguagem têm um impacto profundo ao longo da vida, prejudicando o desenvolvimento social, emocional e educacional, além de aumentar o risco para problemas comportamentais, de saúde mental e dificuldades de emprego na vida adulta. **Conclusão:** O presente estudo ressalta a importância da avaliação clínica com olhar ampliado aos marcos de desenvolvimento em crianças com TDL, ressaltando que este quadro pode ser acompanhado por atrasos em outros marcos de desenvolvimento extralinguísticos.

**Palavras-chave:** Linguagem infantil; Transtorno do Espectro Autista; Transtorno específico de Linguagem; Transtornos do Neurodesenvolvimento; Cognition

## Resumen

**Introducción:** El procesamiento del lenguaje implica la activación de redes neuronales complejas que trascienden las áreas clásicas del cerebro. El daño a estas redes puede comprometer el desarrollo del habla y el lenguaje, resultando en un diagnóstico de Trastorno del Desarrollo del Lenguaje (DLD). **Objetivo:** Este estudio reporta el caso de un niño de 5 años y 7 meses, diagnosticado previamente con Trastorno del Espectro Autista (TEA), quien fue diagnosticado con DLD tras una evaluación foniátrica. **Informe**



**de Caso:** El niño presentaba comportamientos como timidez, autolesiones y hipersensibilidad a sonidos y luces. Durante la evaluación, mostró retraimiento, pero con intención comunicativa y reciprocidad en la comunicación no verbal, así como capacidad para el juego simbólico. El Test Denver II evidenció retrasos en las áreas personal-social y motricidad fina, además de un marcado retraso en el lenguaje. Con la intervención logopédica, se observaron mejoras significativas en los subsistemas del lenguaje receptivo y expresivo. **Discussion:** La foniatría se centra en los trastornos del habla y la comunicación, valorando integralmente el desarrollo infantil. Los trastornos del lenguaje tienen un impacto profundo a lo largo de la vida, afectando el desarrollo social, emocional y educativo, y aumentando el riesgo de problemas de salud mental y dificultades laborales en la adultez. **Conclusion:** Este estudio subraya la importancia de una evaluación clínica amplia en niños con DLD, destacando que esta condición puede asociarse con retrasos en otros hitos de desarrollo extralingüístico.

**Palabras clave:** Lenguaje infantil; Trastorno del Espectro Autista; Trastorno Específico del Lenguaje; Trastornos del Neurodesarrollo; Cognición

## Introduction

The term “Language Development Disorder” (LDD) was recommended by the international CATALISE consortium, which aimed to standardize terminology to improve communication among professionals and support appropriate diagnosis. This terminology emphasizes that LDD is a specific and persistent language disorder, differentiating it from other linguistic difficulties or disorders with known etiologies. It is estimated that LDD affects about 7% of school-aged children, making it one of the most common developmental disorders. This high prevalence reinforces the importance of early diagnosis and appropriate interventions to minimize the impact on the child’s overall development.

LDD is a neurodevelopmental disorder with a heterogeneous clinical presentation, characterized by persistent difficulties in subsystems of language, such as phonology, morphosyntax, semantics, and pragmatics. These difficulties lead to functional impairment in communication throughout life, impacting both daily life and academic and professional performance. LDD has no known biomedical etiology, although it may co-occur with other conditions such as Attention Deficit Hyperactivity Disorder (ADHD), emotional disturbances, and learning disorders.

Moreover, LDD can impact other domains of child development due to the interconnectedness of neural networks involved in language. It may also be confused with other neurodevelopmental disorders, such as Autism Spectrum Disorder (ASD). The communication difficulties associated with ASD extend beyond speech and language,

affecting social reciprocity and the ability to establish and maintain relationships. These difficulties may include challenges in the appropriate use of verbal and non-verbal language, as well as a lack of reciprocity in communication, impacting the understanding of social rules and the interpretation of different contexts.

Language is a complex neural function, involving the activation of networks in various cortical regions and white matter circuits, including classical areas such as Wernicke’s and Broca’s areas, as well as the arcuate fasciculus, which extends to adjacent areas and other bidirectional circuits. Wernicke (1874) identified language comprehension in the left temporal lobe, while Broca (1861) associated speech production with the left inferior frontal cortex. Throughout the 20th century, advancements in neuroimaging techniques, such as positron emission tomography and functional magnetic resonance imaging, alongside behavioral studies, have expanded the understanding of dynamic and integrated brain networks related to other cognitive and behavioral skills.

Language development is a dynamic, transactional, and contextual process that begins early with auditory skills and speech production. This process continues throughout life, involving physical, psychological, linguistic, and social transformations, and is heavily influenced by the interaction between genetically inherited traits and environmental experiences.

Functional impairment in components of neural networks, including the primary auditory cortex, classical language areas, and adjacent extended areas, can significantly impact the development



of speech and language. The primary auditory cortex in both hemispheres, located in the superior temporal gyrus, processes sounds tonotopically and initiates phonological processing. The left superior and middle temporal regions are involved with linguistic information, while the right regions handle prosodic information.

The extended adjacent areas, beyond the traditional Wernicke's and Broca's areas, are part of a complex network responsible for phonological, syntactic, and semantic processing, being essential for both speech articulation and language comprehension. The dorsolateral prefrontal cortex and other prefrontal regions perform interconnected functions that are fundamental to attention and speech processing. The anterior cingulate cortex contributes to the processing of sounds and emotions in communication, while the insula is involved in motor control, cognition, and the emotional and social processing of language. Cerebellar-thalamic and basal ganglia-thalamic connections are crucial for learned vocal communication and voluntary speech control, and also play a role in more complex cognitive tasks related to language.

Large white matter tracts, such as the arcuate and longitudinal fasciculi, integrate heard speech with produced speech, processing complex language and incorporating emotional and sensory aspects. The inferior fronto-occipital fasciculus, uncinate fasciculus, and fibers from the extreme capsule are essential for auditory comprehension, facilitating the association of sound with lexical meaning. The Frontal Aslant Tract (FAT) connects these areas, facilitating the integration of linguistic and emotional functions and contributing to phonological, syntactic, and semantic processing, as well as being implicated in paralinguistic functions and extralinguistic tasks.

The Human Connectome Project (HCP) has enhanced the understanding of brain networks linked to language, identifying 26 interconnected cortical regions that are prominent in the left hemisphere. This study reinforces the integrated view of language, expanding knowledge beyond the classical Wernicke's and Broca's areas and contributing to more accurate diagnoses and more effective clinical interventions.

### *Objective*

To describe, through a case report, a child diagnosed with Language Development Disorder

(LDD) following a speech therapy evaluation, highlighting how the impact on domains of child development can be confused with other diagnoses of neurodevelopmental disorders, such as Autism Spectrum Disorder (ASD).

### **Method**

This study employs a case report method, allowing for a detailed analysis of a single patient in the diagnostic process of Language Development Disorder (LDD), addressing clinical characteristics, development, and differential diagnosis. This case report is proposed as a pilot study to analyze not only aspects of language but also other milestones of child development, providing a basis for future, more comprehensive research on LDD in children.

Three medical consultations were described, with intervals of 8 and 11 months between the first, second, and third consultations, respectively. The study followed the parameters of speech therapy evaluation, analyzing notes from periodic clinical assessments of speech and language conducted by the speech therapy team and the results of each consultation of the Denver Developmental Screening Test II, a widely used screening tool by pediatricians and other professionals to detect delays in four main areas: personal-social, fine motor-adaptive, gross motor, and language.

The research adhered to the principles established in the Ethics Code for Research with Human Beings. The study included obtaining the assent term from the patient and the Free and Informed Consent Term (FICT) signed by the child's legal guardian, ensuring ethics and respect for voluntary participation.

### *Case Presentation*

Patient BCS, male, 4 years old, referred for speech therapy evaluation due to delayed speech and language development, with an initial suspicion of Autism Spectrum Disorder (ASD).

The pregnancy was uneventful, and delivery was via cesarean section at term (42 weeks). The patient displayed babbling and first words before 1 year, but showed no significant subsequent progress in speech and language development. Parents reported shyness, aggressive behavior, self-harm (head banging), and hypersensitivity to sound and light. In the initial evaluation, the child was withdrawn but demonstrated communicative intent



and reciprocity in speech turns, using non-verbal communication and symbolic play.

The patient had been assessed by a pediatric neurologist 2 years prior and was subsequently referred for speech therapy. He has been followed by the speech therapy team of the same service for 1 year and was later referred for speech therapy evaluation.

In the speech therapy evaluation, consistent with clinical assessments of speech and language conducted by the speech therapy team, significant alterations were identified in receptive and expressive language subsystems. These alterations included phonological errors (substitutions and omissions), syntactic limitations with the formation of simple sentences (subject-verb), lexical-semantic changes, and impairments in pragmatic skills. Difficulties were also observed in understanding commands with more than two actions and performing more complex activities. The patient's performance was immature in conceptual tasks, such as drawing (inability to copy simple shapes like a circle, cross, and "x") and solving puzzles.

The Denver Developmental Screening Test II revealed delays in the personal-social and fine motor areas, as well as a marked delay in language, while gross motor development was adequate for age. Complementary tests and a school report were requested, and speech therapy was continued.

After 8 months of specialized speech therapy, focusing on the observations indicated in the speech therapy evaluation and language assessment, the patient returned with normal results on MRI, audiometry, and electroencephalogram tests. The diagnosis of Language Development Disorder (LDD) was confirmed, while the diagnosis of Autism Spectrum Disorder (ASD) was ruled out based on the criteria of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR), particularly criteria A, related to social communication, and criteria B, related to the child's behaviors.

At follow-up, at 5 years and 7 months of age, a new speech therapy evaluation and a new Denver Test II showed improvement in the personal-social and fine motor areas. Although there was progress in phonological aspects and in receptive and expressive vocabulary, the patient still exhibited significant difficulties in sentence construction and spontaneous narrative coherence. The parents reported improvement in aggressive behaviors and

hypersensitivity, although the child still showed shyness when interacting with new people.

## Discussion

The complexity of language, which involves various brain areas in interconnected networks, can lead to diagnostic confusion, especially in young children. In the presented case, the child diagnosed with Language Development Disorder (LDD) initially exhibited behavioral signs and delays in other developmental milestones that could be mistaken for Autism Spectrum Disorder (ASD). A comprehensive clinical evaluation, such as that performed in speech therapy, which focuses on speech, language, and communication disorders while assessing child development holistically, is essential for identifying specific clinical parameters.

In the context of neurodevelopmental diagnoses, ASD in young non-verbal children with pragmatic alterations can be challenging to diagnose, often being confused with other disorders, such as LDD, as described in the CATALISE studies. The DSM-5 serves as an essential tool for diagnosing ASD, establishing clear criteria. Criterion A refers to social communication, while criterion B pertains to restricted interests and repetitive behaviors. In this case, the initial confusion between ASD and LDD may have been influenced by communication difficulties, delays in some developmental milestones, and notable behaviors of the child, such as shyness, aggression, and hypersensitivity. However, following speech therapy, there was a significant improvement in developmental milestones and behavior, demonstrating the positive impact of the intervention on the child's quality of life and that of their family.

The improvements observed in developmental milestones and behavior after targeted therapy for LDD reinforce the positive impact of early intervention, not only on language but also on the overall development of the child. The Denver Developmental Screening Test II was crucial in detecting delays in personal-social, fine motor, and language areas, aiding in clinical monitoring and the adaptation of therapeutic intervention. However, it is important to highlight that the efficacy of the differential diagnosis was only possible after observing changes with language therapy.

Misidentifying LDD as ASD can lead to inappropriate treatments and stigmatization of the child,

affecting their emotional, social, and educational development. Children with LDD may experience difficulties beyond language, including emotional and behavioral challenges that affect social interactions and quality of life. Therefore, a comprehensive clinical evaluation, such as that provided in speech therapy, is essential to minimize such risks and ensure appropriate interventions.

Despite some limitations, such as the small sample size and lack of more extensive analysis, this study contributes to understanding the neural networks involved in speech and language, highlighting the need for more comprehensive future investigations. The aim of this pilot study is to provide a foundation for future research on LDD and its interactions with child development, facilitating more precise and effective therapeutic approaches.

## Conclusion

This study reinforces the importance of a comprehensive and detailed clinical evaluation in children with LDD, demonstrating how the disorder can cause delays in other developmental milestones and be confused with other neurodevelopmental disorders, such as ASD. Early and targeted intervention for LDD has shown positive impacts not only on communication but also on the overall development and quality of life of the child and their family.

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