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REVIEW ARTICLE

Autism spectrum disorders and differential diagnosis of speech delays in childhood: a literature review

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Abstract

Objective: This article describes the main conditions in the differential diagnosis of speech delay in childhood, with emphasis on the updated diagnostic criteria to differentiate between neurodevelopmental disorders, such as autism spectrum disorders, and other possible conditions. **Methods:** This non-systematic review of the literature was performed based on updated diagnostic criteria and definitions. **Results:** Speech delays are a common symptom in children with neurodevelopmental disorders, often associated with autism spectrum disorders. However, there is a range of conditions in which speech delay is a symptom that must be considered in differential diagnosis, including other neurodevelopmental disorders, hearing loss, and language disorders. **Conclusion:** Pediatricians play an important role in the assessment, investigation, and management of children with speech delays. Therefore, they should be familiar with the expected neurodevelopmental milestones, the warning signs of developmental disorders including language disorders, and the diagnostic criteria for the most prevalent conditions.

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INTRODUCTION

Speech is an essential tool for communication, which allows interaction with others and the expression of thoughts and feelings. Delays or the non-development of speech is a common denominator in several neurodevelopmental and language disorders, and should therefore be interpreted in the context of the presence or absence of communicative intent, nonverbal communication (answering to a call by name, pointing to show, or asking for something), receptive communication (understanding what is said to and asked of one), and the presence of non-functional language. Language delays may be present in individuals with autism spectrum disorder (ASD), but may also occur in cases of specific language impairment, global developmental delay, attention deficit and hyperactivity disorder (ADHD), apraxia of speech, selective mutism, Rett syndrome, or hearing loss. Therefore, language delays should not be considered in isolation in the evaluation of children with neurodevelopmental disorders; knowledge of the diagnostic criteria of the conditions listed in differential diagnosis is essential for proper patient evaluation and follow-up.

OBJECTIVE

This article reviews the conditions listed in the differential diagnosis of language delays in childhood, focusing on autism spectrum disorders, other neurodevelopmental disorders, and specific language impairment.

METHOD

This literature review included articles published between 2002 and 2022, indexed in Pubmed, Scielo (Scientific Electronic Library Online) and Google Scholar. The following inclusion criteria were used to select indexed articles: articles published between 2002 and 2022; articles written in English, Portuguese or Spanish; articles enrolling pediatric populations; articles found via at least one of the following search keywords: "speech"; "language"; "developmental milestones"; "apraxia of speech in children"; "Rett syndrome"; "multiple disabilities"; "selective mutism"; "autism"; "hearing loss"; "speech delay"; "specific language impairment". The exclusion criteria were: articles not available in full and articles without free access. First, the abstracts of the selected articles were read; the articles that still met the inclusion criteria after the analysis of abstracts were read in full. Data interpretation was based on content analysis, article relevance, and impact on the scientific environment.

The diagnostic criteria for the different disorders and conditions considered were extracted from the latest version of the Diagnostic and Statistical Manual of Mental Disorders.[1]

Speech skills and developmental milestones

In children, neurodevelopment refers to the process of acquiring new and gradually more complex skills in social, emotional, cognitive, communication, and physical functional areas. This process relies on an intact neurobiological apparatus and an environment rich in social and affective stimuli.[2]

In the evaluation of child development, some parameters relate to chronological age and indicate central nervous system function and activity, also known as developmental milestones. These milestones include, for example, communication and social interaction functions, which include speech and language development.[3]

Language is an important marker of child development and a key element in socialization and integration in different functional areas. Children are expected to acquire a range of skills by certain ages as they cover their developmental milestones. In children with typical neurodevelopment, the acquisition of skills begins in the first months of life, and these skills are honed gradually over time.[4]

Before six months of age, children are expected to be able to utter babbling sounds, even if without communicative intent. At around ten months, they are expected to say their first words. From this stage on, especially after the first year of life, vocabulary gradually increases and they begin to form small sentences, which characterize functional language. At the end of the second year of life, children experience a vocabulary explosion, and around three years of age they are expected to be relatively able to maintain conversations with slightly more complex sentences.[1]

In order for speech and verbal language development milestones to be reached within the expected age range, children must live in an environment rich in stimuli and socio-communicative interactions, especially during critical parts of development, when there is greater neuronal plasticity, so that, based on their auditory and cognitive skills, they can recognize sounds, interpret and reproduce them. Appropriate environmental stimuli affect language acquisition and mastery, such as exposure to stimuli from conversations with their parents. In some populations, the mean length of utterance of mothers is highly predictive of infant language development.[5]

An overview of the etiologies of delayed or absent speech

In the first years of life, children develop a series of complex skills that allow the production and organization of sound within grammatically structured patterns. On account of the complexity of this skill, it is natural that achieving full mastery takes about four to five years. However, when the learning process is interrupted or disrupted, outcomes may be impaired.[5] About 15% of 2-year-olds are "late talkers", with approximately half of them achieving normal speech development between the ages of three and five years.[6]

The several distinct etiologies for delayed speech acquisition are subdivided into primary (not attributed to preexisting medical conditions), which includes speech and language developmental disorders, expressive language disorder, and receptive language disorder and secondary (attributed to

other medical conditions), which includes conditions such as ASD, cerebral palsy, childhood apraxia of speech, dysarthria, hearing loss, intellectual disability, selective mutism,[7] developmental verbal dyspraxia, dyslexia, choking or babbling (seen more characteristically in individuals with ADHD and Tourette Syndrome), Down syndrome, Williams syndrome, Prader-Willi syndrome, Angelman syndrome, Wolf-Hirschhorn syndrome, Smith-Magenis syndrome, Turner syndrome, fragile X syndrome, and cri du chat syndrome.[1] Figure 1 shows the main conditions considered in the differential diagnosis of language disorders.

Autism spectrum disorders

Autism spectrum disorders (ASD) include neurodevelopmental disorders that involve a series of social and communication impairments combined with restrictive and repetitive behaviors.[8,9] ASD is diagnosed in childhood from combinations of symptoms that vary from case to case, which primarily affect one's ability to interact socially. The diagnostic criteria for ASD include persistent deficits in communication and social interaction in various contexts, combined with restricted and repetitive behaviors, interests, and activities.[1] These symptoms are accompanied by significant social and academic impairment, occur early in development, and cannot be ascribed to other neurodevelopmental disorders. Since it lacks specific biomarkers, diagnosis is made based on clinical criteria, from the recognition of characteristic behavior patterns. Figure 2 describes the diagnostic criteria for ASD according to DSM-5.

Peritonite Meconial Relacionada à Doença Hepática Materna: Relato de Caso

Pragmatic language, an indispensable element in effective social communication, is one of the main impairments faced by individuals with ASD.[10] According to the DSM-5, deficits in nonverbal communicative behaviors, manifested through difficulty to make eye contact, atypical body language, and difficulty understanding and using gestures, are central factors in diagnosis. Thus, the differential diagnosis for ASD includes other disorders that cause impairments in the development of communication skills, such as Rett syndrome, selective mutism, specific language impairment, social (pragmatic) communication disorder, intellectual disability without ASD, stereotypic movement disorder, ADHD, and schizophrenia.[11] Speech skills are essential in the overall development of children, and impairments in this area compromise sociability and relationships in general. The prevalence of language and speech delays has been estimated at 87% in children aged up to three years with ASD.[8] However, studies show that early diagnosis and appropriate intervention can improve development and lead to better long-term outcomes, since speech development is directly related to social independence.[9]

Specific language impairment

The term specific language impairment has been in use since the 1980s, and describes children with language disorders whose cognitive skills are within normal range and in whom there is no identifiable reason for language impairment. Diagnosis is made by exclusion.[12]

Specific language impairment is characterized by deficits in the acquisition, comprehension, production, and use of written and spoken language, with onset occurring mostly in early childhood, which cause significant limitations in communication skills. The inability to speak loose words (or approximations) at two or three years of age, or to form simple sentences with two words may be an indication of impairment. Individuals with these symptoms may have impairments in their ability to learn, understand, and use language to express the meaning of words and phrases; to tell a story or have a conversation; to understand and use language in social contexts; or resort to humor and ambiguous phrases.[12]

One of the diagnostic criteria stipulates that the language impairment cannot be better explained by ASD, central nervous system disease, intellectual development disorder, selective mutism, or another condition. Although diagnosis is reached by exclusion, some elements may contribute to diagnostic accuracy: loss of acquired language skills is not seen in specific language impairment; patients presenting this symptom are more likely to have ASD or a central nervous system disease, including conditions resulting from epileptic encephalopathy, stroke, or trauma.[12]

This disorder is commonly confused with ASD, since both cause delays in language development. However, unlike individuals with ASD, people with specific language impairment are usually able to initiate and respond to social or emotional input appropriately, and do not show restrictive, repetitive, or stereotypic behaviors.[12]

Childhood apraxia of speech

Apraxia of speech is a neurological disorder that affects the ability to produce speech sounds. Prevalence is 1 to 2 cases per 1,000 live births, and boys are predominantly affected (9:1).[13] Usually, individuals with the condition understand what they want to communicate, but their brains have trouble coordinating the movements of the facial bones and muscles responsible for the articulation of spoken language. The movements of the lips, tongue, and jaw, as well as of the muscles of the vocal folds, lack refinement, which compromises speech. Speech is slow, intermittent, and there is variability in the pronunciation of words. Despite the alterations present in the articulation of words, no actual neuromuscular damage is present; this disorder is thus considered a delay in communication adaptation. Therefore, the diagnosis of children with apraxia of speech varies depending on their ability to produce polysyllabic words. Children able to utter words with

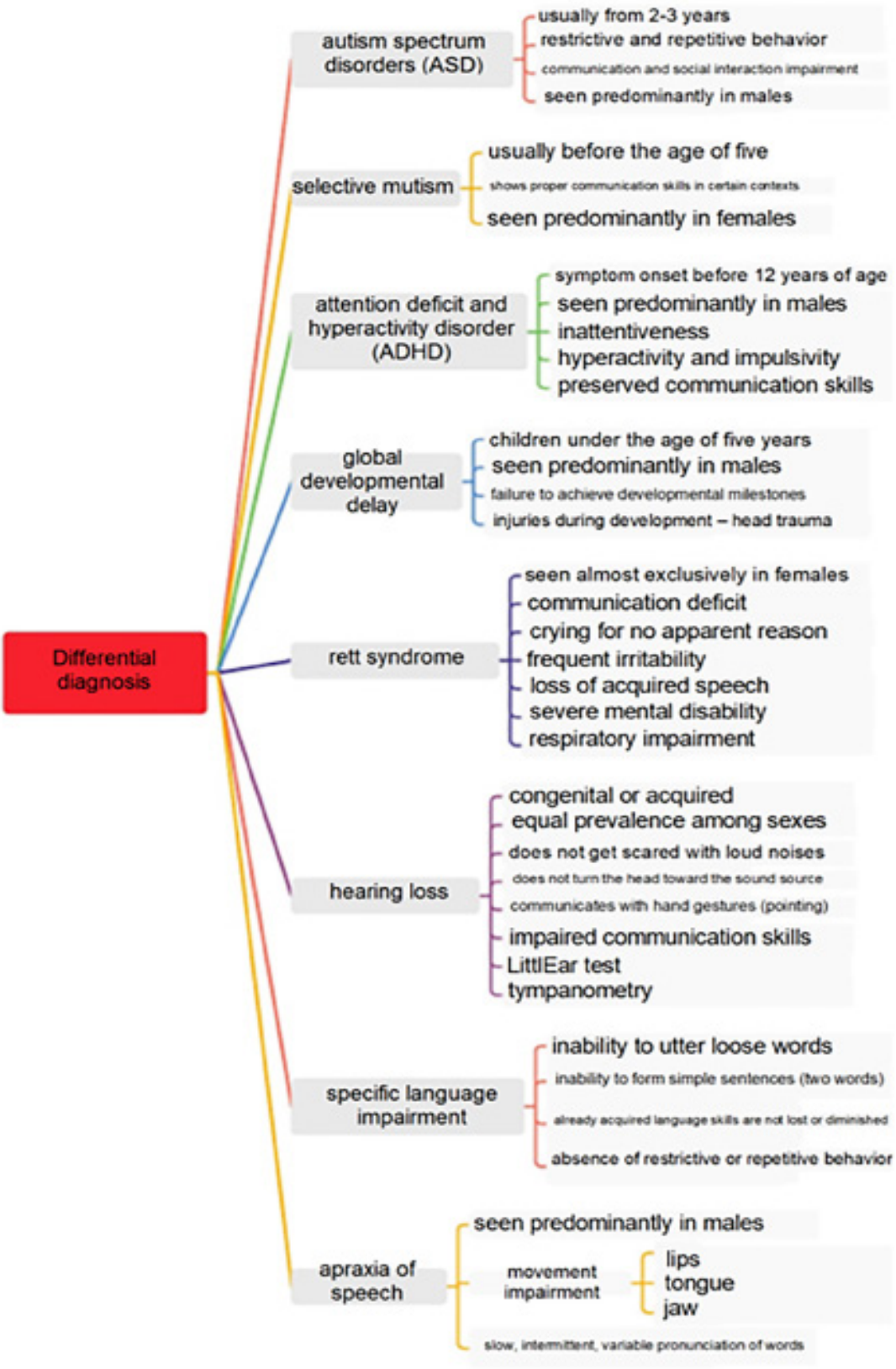


Figure 1. Differential diagnosis of language disorders.

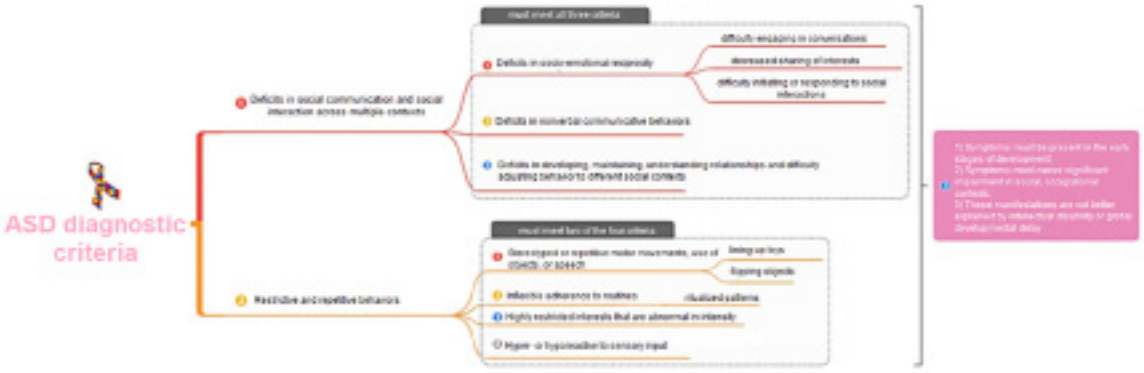


Figure 2. Diagnostic criteria for autism spectrum disorder.

more than two syllables should be considered for disordered prosody, i.e., altered intonation, rhythm, and coordination of speech. Signs of apraxia can be identified in non-verbal children. Difficulty or absence of babbling, difficulty eating, altered behavior, oral motor dysfunction, and introspection are, in early development, signs that may indicate apraxia of speech. Cases of disease in the family and the child's medical history, combined with additional information captured during anamnesis, may help in the differentiation and accuracy of the diagnosis of apraxia of speech. Motor speech therapy is deemed the gold standard treatment for apraxia of speech.[14]

Global developmental delay

According to the DSM-5, children under the age of five who fail to meet the developmental milestones expected for their age in various areas of intellectual function should be diagnosed with global developmental delay. Because of their age, these children cannot participate in systematic intellectual function assessments. Instead, children aged up to six years are tested with tools such as the Denver Developmental Screening Test, which considers the achievement of developmental milestones and signs of cognitive delay.[1] Young children diagnosed with global developmental delay must be reassessed when they are older for purposes of achieving a more accurate diagnosis.

Attention deficit and hyperactivity disorder

Attention deficit and hyperactivity disorder (ADHD) is one of the most common mental disorders in children, with global prevalence estimated at 5%.[15] This disorder is often identified in school age children, when increased attention and inhibiting certain behaviors become more necessary. The main symptoms of ADHD are inattention, hyperactivity, and impulsivity. The disease has been categorized into three types: combined, predominantly hyperactive, and inattentive.[16]

According to DSM-5, diagnosis is based on clinical signs analyzed by a multidisciplinary team. Individuals suspected with ADHD must present a set of persistent symptoms in at least two different contexts for at least six months, before the age of 12 years.[1]

Delayed language acquisition occurs in 6 to 35% of the cases of ADHD, versus 2-6% in children without the condition. In addition, 35 to 50% of the children with ADHD develop language impairment. Speech disorders are less common, and in general appear in combination with language difficulties, with changes in voice volume modulation and fluency alterations.[17]

Studies describe other language disorders associated with ADHD in addition to delayed language acquisition, such as speech disorders, receptive and expressive language disorders – probably seen in most of the cases – as well as social communication disorders.[18]

Selective mutism

Children with this relatively uncommon disorder do not speak in certain circumstances (for example, in a classroom). However, speech and language development are usually preserved in other contexts. Recent data shows that selective mutism may coexist with social anxiety disorder and/or school refusal.[19] It is often diagnosed at about five years of age, concomitantly with the start of school life. According to the DSM-5, children who are consistently unable to speak in specific settings – say, at school – for at least one hour, but can speak at home, for example, might be diagnosed with selective mutism.[1]

Diagnostic confirmation requires that the symptoms interfere with the child's ability to interact socially, after other disorders linked to language impairment have been ruled out. Gold standard treatment involves non-pharmacological approaches with psychotherapy (cognitive-behavioral therapy, play therapy, family therapy). Drug therapy with selective serotonin reuptake inhibitors and antidepressants, such as fluoxetine, is prescribed only when needed.[19]

Rett syndrome

Rett syndrome is characterized by neuromotor deterioration and affects girls almost exclusively. The condition affects 1:10,000 to 1:15,000 girls. Rett syndrome is one of the most frequent causes of severe mental retardation in females. Diagnosis is based on clinical signs combined with supportive findings and exclusion criteria. Diagnostic criteria include partial or complete loss of manual motor skills, appearance of stereotypic hand movements such as hand-wringing, squeezing, clapping, tapping or rubbing, loss of all or part of spoken language, and gait anomalies ranging from gait dyspraxia to total loss of the ability to walk.[20]

Classic cases of Rett syndrome meet all the main criteria and none of the exclusion criteria, and are characterized clinically by a period of regression followed by recovery or stabilization. Approximately 95% of the cases of classic Rett syndrome are caused by mutations in the MeCP2 gene, which is expressed in all tissues, and especially in the brain.[20]

Disease progression has been divided into four stages. The first begins between six and 18 months of age, and is characterized by developmental delay, decreased social interaction, and slower head circumference growth in some cases. The second stage occurs between one and three years of age, and is rapidly destructive, with accelerated psychomotor deterioration; in this stage, children with the condition start crying for no apparent reason, become irritable frequently, and lose acquired speech, which can be confused with autism. Respiratory symptoms also appear in this stage, along with epilepsy and sleep disturbances. The third stage occurs between the ages of three and ten years. Behavior may improve at this point, along with social and communication skills. Girls with Rett syndrome who are able to walk show a characteristic gait, with short steps and hands clasped along the midline, extended legs, and a widened support base. The fourth stage, which begins around ten years of age, involves late motor deterioration, with slow progression of motor deficits, development of scoliosis, and severe mental impairment.[21]

Individuals with Rett syndrome have profoundly impaired or completely absent speech. Some children can speak, but cease to do it as the disease advances. Some acquire a few isolated words. Survival is limited, and individuals with the condition die as a result of infection or of sudden death during sleep. Moreover, respiratory conditions that may develop with the progression of the disease are severe and may occur in combination with scoliosis, which seriously compromises lung expansion and makes breathing dysfunctional.[21]

Hearing loss

The most common causes of hearing loss in neonates are genetic mutations and congenital infection. The main risk factors include low birth weight, hypoxemia or seizures due to dystocia, craniofacial anomalies, sepsis, meningitis, and use of ototoxic drugs.[22] Intrauterine infection by cytomegalovirus accounts for up to 21% of the cases of sensorineural hearing loss at birth, and may also cause late-onset hearing loss.[23]

The diagnosis of hearing loss at birth is made through neonatal screening and the LittlEars Test, which must be performed before the age of three months. The test consists of otoacoustic emissions evoked by soft clicks produced by a device. Abnormal results must be confirmed by repeating the test after one month; if genetic causes are suspected, genetic tests directed by clinical symptoms can be performed.[24]

Acquired hearing loss in infants and children usually result from the accumulation of cerumen, secretory otitis media, or loud noises. Diagnosis in this age range is based on clinical examination and tympanometry, evaluation of the child's speech and development, tympanic membrane movement, response to sounds, and ability to follow auditory commands. Imaging tests such as magnetic resonance imaging and computed tomography may be indicated to identify the etiology of hearing loss and guide the next steps.[25]

Hearing loss may also occur as a comorbid condition with neurodevelopmental disorders. Therefore, hearing must be properly evaluated in children with language delays.[25]

CONCLUSION

Speech delay is a symptom common to several childhood diseases. Healthcare workers involved in the care of children must be familiar with the developmental milestones expected for each age range, as well as the signs indicative of neurodevelopmental disorders. Whenever deviant signs are identified, the children in question must be referred to specialized assessment, since early diagnosis and individualized treatment improve the chances of fulfilling their greatest potential, optimize outcomes, and allow the differentiation between the disorders presented in this article. More research about the childhood communication disorders mentioned in this article is needed to further improve the care provided to pediatric populations, improve diagnostic capabilities, and understand the developmental limitations of each condition.

REFERENCES

1. American Psychiatric Association. Manual diagnóstico e estatístico de transtornos mentais (DSM-5). 5. ed. Porto Alegre: Artmed; 2014.
2. Halpern R. Manual de Pediatria do Desenvolvimento e Comportamento. Sociedade Brasileira de Pediatria.1. ed. Barueri: Manole; 2014.
3. Zubler JM, Wiggins LD, Macias MM, Whitaker TM, Shaw JS, Squires JK, et al. Evidence-Informed Milestones for Developmental Surveillance Tools. Pediatrics. 2022;149(3):e2021052138.
4. Alexandre DS, Alpes MF, Reis ACMB, Mandrá PP. Validation of a booklet on language developmental milestones in childhood. Rev CEFAC. 2020;22(2):e16219.
5. Onnis L, Truzzi A, Ma X. Language development and disorders: Possible genes and environment interactions. Res Dev Disabil. 2018 Nov;82:132-46.

6. O'Hare A, Bremner L. Management of developmental speech and language disorders: Part 1.Arch Dis Child. 2016;101(3):272-7.

7. McLaughlin MR. Speech and language delay in children. Am Fam Physician. 2011;83(10):1183-8.

8. Lord C, Elsabbagh M, Baird G, Veenstra-Vanderweele J. Autism spectrum disorder. The Lancet. 2018;392(issue 10146):508-520.

9. Kodak T, Bergmann S. Autism Spectrum Disorder: Characteristics, Associated Behaviors, and Early Intervention. Pediatric Clinics of North America. 2020;67(3): 525-535.

10. Friedman L, Sterling A. A Review of Language, Executive Function, and Intervention in Autism Spectrum Disorder. Semin Speech Lang. 2019;40(4): 291-304.

11. Saraiva S, Almeida A, Gobira B, Mazete S, Rocha Brito A, Vasconcelos M. Transtorno do espectro autista Resumo Endereço para correspondência. Residência Pediátrica [Internet]. 2018;8(1):72-8. Available from: https://cdn.publisher.gn1.link/residenciapediatrica.com.br/pdf/v8s1a12.pf

12. Reilly S, Tomblin B, Law J, McKean C, Mensah FK, Morgan A, et al. Specific language impairment: a convenient label for whom?. International Journal Language & Communication Disorders. 2014 Jul;49(4):416-51.

13. Rodrigues GS, Maciel RSC, Correia VC, do Rêgo FLC, Coutinho HMTA, Delgado IC, et al. Apraxia de fala da infância e marcadores históricos, desenvolvimentais e comportamentais. Revista Brasileira de Ciências da Saúde. 2019;23(2):53-64.

14. Souza TNU, Payão LMC, Costa RCC. Apraxia da fala na infância em foco: perspectivas teóricas e tendências atuais. Pró-Fono Revista de Atualização Científica. 2009;21(1):75-80.

15. Polanczyk G, de Lima MS, Horta BL, Biederman J, & Rohde LA. The Worldwide Prevalence of ADHD: A Systematic Review and Metaregression Analysis. American Journal of Psychiatry. 2007,164(6):942–948.

16. Machado-Nascimento N, Melo e Kümmer A, Lemos SMA. Alterações Fonoaudiológicas no Transtorno de Déficit de Atenção e Hiperatividade: revisão sistemática de literatura. 2016;28(6):833-42.

17. Barini NS. Características linguísticas de crianças com transtorno do déficit de atenção e hiperatividade. Bauru. Dissertação [Mestrado em Ciências] - Faculdade de Odontologia de Bauru da Universidade de São Paulo; 2014.

18. Rohde LA, Mattos P. Princípios e Práticas em TDAH - transtorno de déficit de atenção/hiperatividade. Porto Alegre: Artes Médicas, 2003.

19. Lucas AVP, Da Costa NML. Mutismo seletivo: Considerações sobre o transtorno de recusa da fala. Research, Society and Development. 2021 Jun;10(7):e27510716316.

20. Neul JL, Kaufmann WE, Glaze DG, Christodoulou J, Clarke AJ, Bahi-Buisson N, et al. Rett syndrome: revised diagnostic criteria and nomenclature. Annals of neurology. 2010;68(6):944-950.

21. Schwartzman JS. Síndrome de Rett. Brazilian Journal of Psychiatry [online]. 2003;25(2):110-13.

22. Udayan KS. Deficiência auditiva em crianças. Sidney Kimmel Medical College at Thomas Jefferson University; [atualizado em 2020 Set; citado em 2022 Jun 10]. Disponível em: https://www.msdmanuals.com/pt/profissional/pediatria/doen%C3%A7as-diversas-da-orelha,-do-nariz-e-da-garganta-em-crian%C3%A7as/defici%C3%AAncia-auditiva-em-crian%C3%A7as

23. Kimberlin DW, Jester PM, Sánchez PJ, Ahmed A, Arav-Boger R, Michaels MG, et al. Valganciclovir for Symptomatic Congenital Cytomegalovirus Disease. The New England Journal of Medicine. 2015; 372:933-943.

24. Pereira BL, Dos Santos EP, Stadler S. TESTE DA ORELHINHA. Anais da Jornada Científica dos Campos Gerais. 2018;16.

25. Gatto CI, Tochetto TM. Deficiência auditiva infantil: implicações e soluções. Rev CEFAC. 2007;9(1):110-15.