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# Learning Disabilities in Children with Autism

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## Abstract

Children with autism spectrum disorders often present signs of cognitive strategies that are not within the expected developmental profile. Therefore, it should be expected that the learning process of children with this disorder should be the focus of several studies regarding schooling and literacy. Unfortunately, that is not the real situation. In this chapter, the authors propose to present an overview of the available literature about learning, reading, and literacy in children with the autism spectrum disorders and report results of studies about the association between executive functions and reading abilities in children with autism spectrum disorders that attend to regular and special schools in Brazil.

**Keywords:** autism, children, language, learning, reading

## 1. Introduction

This chapter aims to gather and integrate studies on the development and neuro-cognitive processes involved in learning by children with autism spectrum disorder (ASD). It is believed that we need to know the neuropsychological foundations of learning for transmitting teaching.

Fonseca [1] describes that, although learning capacity is inherent to several species, the human is the only species that transmits teaching intentionally.

The literature reports that difficulties in learning conditional relationships between stimuli and concepts can lead to restrictions on an individual's life and limit their social interaction.

Communication plays an important role in integration of auditory and visual stimuli. This way, the understanding of the environment arises from the interaction between people, and learning is a result of the relationship created through sensory stimuli.

## 2. Learning by children with ASD: language, social, and cognitive factors

It is known that language occurs mostly by meaningful experiences and situations. Although it depends on cognitive development, physiological integrity, and linguistic abilities, the environmental demands and support have an essential role in the child's learning process. The construction of a socially shared code that leads to the assignment of meaning to the world's various elements and experiences depends

on the interaction with other significant persons. Language and memory are also dependent on meaningful situations and experiences. Abilities acquired through systematic training, despite frequently presenting fast results, are discarded as fast as they are acquired if they are not used or associated with meaningful contexts.

Based on these ideas, it seems reasonable to suppose that children with autism spectrum disorders present some disadvantage in the learning process because they have a social inability that is inherent to the ASD features, with varied degrees of impairment in social interactions. This way, it is accepted that language impairment of children with autism is not necessarily associated with linguistic structures, although they are affected in some children. Language impairments of children with ASD are essentially related to pragmatic abilities, also involving different levels of inabilities, from the lack of contact to subtle difficulties regarding interaction and conversation abilities. This is another reason why it is fundamental to understand the child's context and environment, to assess the impact of each child's inabilities and design intervention plans that address the most efficient and timely intervention.

Several recent studies show that including families in the therapeutic process of children with ASD increases better outcomes and prognosis than traditional one-on-one therapeutic approaches.

Authors like Winnicot [2] consider emotional health as the development's "back bone," allowing cognitive and linguistic development and therefore enabling successful learning processes. Regardless of the causal relation and of the hierarchy among these areas of development, the importance of emotional health to learning is unquestionable. Perceiving and processing sensorial information and positively assimilating and interpreting information in order to build and learn healthily and creatively—that is, so that cognitive processing really occurs—depend on emotional health.

Studies that focus on the importance of engaging parents and caregivers are increasing in number and impact, with results increasingly consistent showing that the quality of life of parents and caregivers as well as their involvement in the intervention processes with children with ASD has a positive influence in the outcomes of these processes.

The symptoms often found that ASD individuals also fit in the attention deficit hyperactivity disorder (ADHD) diagnosis, leading researches to compare learning performance between individuals with ASD and ADHD. Both diagnoses present significant impairments in cognitive performance, and it is important to make considerations from the neurocognitive perspective, raising questions and studies that involve tasks that require skills such as executive function (EF), theory of mind (ToM), language, and even correlations between them, seeking possible relations of causality.

EF is currently defined as a cognitive process necessary to define a goal and accomplish it, including the skills needed for it. Among them, working memory, inhibitory control, and cognitive flexibility are included. Working memory is the ability to rescue information previously stored to accomplish a task. Inhibitory control is the ability to suppress any actions or information that may interrupt or hinder the execution of the task or planning.

EF is closely linked to communicative skills, impacting learning, autonomy, and social life of the individual with ASD. This, in part, makes it difficult to understand the direct impact of EF impairment on children with ASD. Even the studies do not yet reach a consensus on impairments in EF in this population. Some studies indicate deficit and risk indicating the causal relationship between EF and other abilities, while others show that individuals with ASD do not present greater impairment than other groups with typical development (TD), developmental

language disorder (DLD), and ADHD, indicating that this may not be the central impairment of the disorder.

Some researchers, including Kado and collaborators [3], report in their paper that the working memory performance of children with ASD and ADHD is similar, but their performance is below when compared with TD children, even when matched with IQ and school age. However, other researchers like Roleofs and collaborators did not find significant differences in working memory between adolescents and adults with ASD and intellectual disability when compared with individuals without ASD matched with IQ [4]. In an attempt to understand the interdependence of working memory with language, some studies separate the assessment of this cognitive ability between visual or spatial working memory and verbal working memory. A very interesting research that tries to understand the relation of working memory and language ability was Hill's paper in 2015 [5]. The working memory was evaluated and compared in 5- to 8-year-old children with ASD and DLD. In this study, children with ASD were separated into two groups: children with and without language impairment. Children with proper language had better performances than children with language impairment. In addition, children with ASD and impaired language performed similarly to children with DLD in most verbal working memory tasks, but none of these groups differed in visual working memory tasks, suggesting their interdependence. This also happens with inhibition control.

The findings of inhibitory control studies in children with ASD are diverse. Some indicate significant losses, while others find no differences compared to ADHD and DT. A widely used test to verify this ability is Stroop, which requires a refined language skill. Corbett and his collaborators [6] performed several inhibitory control tests, with and without the need for verbal expressive language. In the test, requiring verbal ability, children with ASD and ADHD had worse performances than TD children. In the test where the verbal expressive ability was not required—children should heard or saw a certain number to answer or not—children with ASD performed worse than children with DT and ADHD. However, it is important to note that, even in the test of visual working memory, which supposed to not requiring expressive language, the task required a linguistic ability.

And the same pattern happens in researches that attempt to assess cognitive flexibility [7] using tasks that require some level of language, comprehensive or expressive.

The fact that neuropsychological assessments are intended to assess language and are not sensitive to these skills has been a frequent problem in most proposed assessments. In general, these assessments are made by psychologists who don't have deep knowledge to determine language failures or even to distinguish or define the language structures required for that. Many misjudge language only as an expressive or verbal act, which is conceptually wrong, or disregard the cultural component of language, or even fail to evaluate language ability alone, often considering the cognitive strategies used by the child as language ability or otherwise. And as noted above, this knowledge is essential to clarify a possible causal relationship or to shed light on the possible association between cognitive and language areas, not only in children with ASD.

### **3. Learning to read**

For children with typical development, learning to speak can naturally come out observing and participating in moments and situations of communication with their parents and their community.



In contrast, the act of learning to read and write is a complex task, composed of multiple interdependent processes, including understanding how the visual symbols correspond to spoken language [8].

There is a range of articles that discuss the importance and interdependence of good oral language development for the success of written code acquisition, since writing is considered a representation of language.

The literature of clinical neuropsychology reports that an assessment of cognitive strengths and weaknesses is useful for children with any developmental or learning disorder [9]. Considering the heterogeneity of the clinical settings of children with ASD, assessing and understanding the child's individual strengths and weaknesses help better focus school plans and medical treatment and understand the possible areas of difficulty [9, 10].

Westerveld et al. [11] argue that learning to read is just another challenge for children with ASD. In their study, they found that approximately 30–60% of these children present some difficulty to develop literacy. It is important to highlight that even higher functioning children are also part of the statistics.

Jones et al. [12] described that the cognitive heterogeneity of children with ASD is an element that makes it difficult to characterize the academic difficulties of this population. In addition, they report that cognitive abilities may not be congruent with their writing operations.

In their paper, Fletcher and Miciak [9] argue the fact that some children have deficits in cognitive tests may not necessarily indicate causal direction in a child's learning difficulties. A cognitive deficit does not indicate “why” a child has a learning problem.

Another possible justification found in the literature for this variation in the development of reading and writing in children with ASD is the individual differences in language skills in the areas of phonology, semantics, and syntax [11, 12].

Davidson and Weismer [10] describe that reading disabilities can be classified based on problems that arise in decoding or comprehension abilities. It's important to know the history of reading instruction for children with exceptional educational needs to consider what is known about reading abilities in individuals with ASD [13].

Gabig [14] in her study with children with ASD, who reduced performance in areas such as vocabulary, may have negative influences on skills such as phonological processing. In addition, she found that some abilities related to decoding ability appear to be relatively intact.

Richardson and Heikki [8] discuss that the reasons for the phonological deficit in autism are still not clear but certainly interfere in the quality of mental representations and in the quality of the lexical, creating a poor link between the phonological awareness and reading skills.

Other authors question whether insufficient performance in reading skills are from specific verbal material defects or the consequence of perceptual, temporal, or long-term memory failure problems [15].

Overall, studies indicate that although the ability to recognize written words may be similar to that of typically developing learners, children with ASD tend to have deficits in integrating information. That is, they have difficulty retrieving and integrating meanings necessary for reading comprehension, including the ability to create connections between content read with prior knowledge and the ability to make inferences [16].

The literature describes that most children with autism show average ability to recognize words while reading and to accurately spell words for age and grade level. In contrast, what the literature cannot yet explain is whether phonological

awareness accompanies the good performance of phonetic decoding presented by children with autism [14].

There are several studies that speculate if children with ASD would perform poorer when decoding pseudowords than when reading sight words because of a rote memorization of the visual shape of words. Most of their results indicated that children with autism do not show preference for the visual recognition of sight words over the decoding of pseudowords. It suggests that ASD children are capable of using visual and phonological recognition process to identify written words. Thus, studies lead us to believe that children with autism can benefit from other access channels to achieve good reading and writing performance.

Hyperlexia is frequently one condition presented by children with ASD. It is characterized by a child's precocious ability to read (far above what would be expected at their age). As with all individuals, children with hyperlexia have a wide range of skills and deficits. The high abilities to decode do not exclude the possibility that children may have a cognitive, language learning and/or social disorder.

What experts argue is that content that can be "formally" taught can be more easily learned by children with ASD. Already "intuitive" content such as phonological awareness skills would be less understood by this population.

Corso et al. [17] tested the correlation between reading tasks and different neuropsychological functions. They concluded that the strongest significant correlations occurred during executive functions tasks.

Pellicano [18] pointed out that there are no studies that explicitly investigate the nature of executive functions in autism, arguing that there are only researches with the fractionation of these functions, that is, as if just one of these components can be specifically affected in autism.

It is also often possible to find studies that compare the performance of children with ASD in theory of mind abilities (ToM). Some studies report that children with executive function deficits but with intact theory of mind abilities are hardly found.

Since the use of theory of mind abilities is essential to the mental and behavioral functioning, understanding the nature of these skills cannot be discarded during the assessment of reading and writing skills [19].

One of the reasons why individuals with ASD may have difficulties in representing situations involving theory of mind may be explained by the fact that they have difficulty integrating clues that are relevant to the context and self-representation.

This would be a justification for the text comprehension difficulties so often observed in this population, especially the difficulties related to understanding pragmatic and nonliteral aspects of language.

Deficits in the functioning of EF and literacy may differ between disturbances. Assessing them and identifying their deficits can provide information on which systems may be impaired and, most importantly, what can be done to stimulate them.

#### **4. Important considerations for clinical intervention in SLP**

The intervention approach may consider all areas of oral or written language where the children have deficits. It's important to associate information about the student's facilitating routes, whether auditory, visual, or motor. This way, the therapist should investigate whether the influence of several processing modalities obtain a more comprehensive understanding of the child's potential perceptual abilities.

Bosseler and Massaro [20] describe that technology is also being used in educational settings as an effective method of getting children engaged.

Some authors argue that if we guarantee the use of materials that address the different routes, learning can occur simply due to multiple exposures without necessarily having feedback and formal interference from the therapist. Although Bosseler and Massaro observed that children profited from seeing and hearing, spoken language can better guide language learning than modality alone.

What we should expect is that stimulated content must be learned operatively, processed, stored, and related to a set of experience to apply functionality and use it in a meaningful way.

Currently, there are already some available therapeutic methods that can be developed by parents at home. However, there are not yet numerous clinical articles that allow a more accurate interpretation of the results. Thus, there are limitations in measuring the effectiveness of these approaches in treating autistic children, especially in the long-term.

There are authors who emphasize how important it is to encourage these types of family-based therapeutic approaches as key interveners; however, understand that caregiver training should be done very carefully so that such interventions are not inadequately developed and reinforce difficulties and changes in child development.

## 5. Conclusion

As we have seen, environmental support plays an essential role in the child's learning process. The findings suggest that children with autism spectrum disorders (ASD) have some disadvantage in the learning process due to their inherent social disability to ASD characteristics.

The literature describes that parental support and engagement in intervention processes with children with ASD positively influence the outcomes of these processes. Therefore, the intervention process should encompass all the possibilities and resources of oral and written language stimulation, associated with the information and collaboration presented by the caregivers.

The learning disabilities of children with autism exist, and our ultimate goal for these children is to create a connection between learning and functionality.

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## References

- [1] Fonseca V. Papel das funções cognitivas, conotativas e executivas na aprendizagem: uma abordagem neuropsicológica. *Revista da Associação Brasileira de Psicopedagogia*. 2014;**31**(96):236-253
- [2] Winnicott DW. *Playing and Reality*. London: Tavistock; 1971
- [3] Kado Y, Sanada S, Yanagihara M, et al. Executive function in children with pervasive developmental disorder and attention-deficit/hyperactivity disorder assessed by the Keio version of the Wisconsin card sorting test. *Brain & Development*. 2012;**34**(05):354-359
- [4] Roleofs RL, Visser EM, Berger HJC, Prins JB, Van Schrojenstein Lantman-De Valk HMJ, Teunisse JP. Executive functioning in individuals with intellectual disabilities and autism spectrum disorders. *Journal of Intellectual Disability Research*. 2015;**59**(02):125-137
- [5] Hill AP, Van Santen J, Gorman K, Laghorst BH, Fombonne E. Memory in language-impaired children with and without autism. *Journal of Neurodevelopmental Disorder*. 2015;**7**(01):10
- [6] CorbettBA, ConstantineLJ, HendrenR, LockeD, Ozonoff S. Examining executive functioning in children with autism spectrum disorder, attention deficit hyperactivity disorder and typical development. *Psychiatry Research*. 2009;**166**(2-3):210-222
- [7] Leung RC, Zakanis KK. Brief report: Cognitive flexibility in autism spectrum disorders: A quantitative review. *Journal of Autism & Developmental Disorders*. 2014;**44**(10):2628-2645
- [8] Richardson U, Lyytinen H. The GraphoGame method: The theoretical and methodological background of the technology-enhanced learning environment for learning to read. *Human Technology*. 2014;**10**(1):39-60. DOI: 10.17011/ht/urn.201405281859
- [9] Fletcher JM, Jeremy M. Comprehensive cognitive assessments are not necessary for the identification and treatment of learning disabilities. *Archives of Clinical Neuropsychology*. 2017;**32**(1):2-7. DOI: 10.1093/arclin/acw103
- [10] Davidson MM, Weismer SL. Characterization and prediction of early reading abilities in children on the autism spectrum. *Journal of Autism & Developmental Disorders*. 2014;**44**(4):828-845. DOI: 10.1007/s10803-013-1936-2
- [11] Westerveld MF et al. A systematic review of the literature on emergent literacy skills of preschool children with autism spectrum disorder. *The Journal of Special Education*. 2016;**50**(1):37-48. DOI: 10.1177/0022466915613593
- [12] Jones CRG, Happé F, Golden H, Marsden AJS, Tregay J, Simonoff E, et al. Reading and arithmetic in adolescents with autism spectrum disorders: Peaks and dips in attainment. *Neuropsychology*. 2009;**23**(6):718-728. DOI: 10.1037/a0016360
- [13] Brown HM, Oram-Cardy J, Johnson A. A meta-analysis of the reading comprehension skills of individuals on the autism spectrum. *Journal of Autism and Developmental Disorders*. 2013;**43**(4):932-955. DOI: 10.1007/s10803-012-1638-1
- [14] Gabig CS. Phonological awareness and word recognition in reading by children with autism. *Communication Disorders Quarterly*. 2010. DOI: 10.1177/1525740108328410



[15] Capovilla AGS, Joly MCRA, Ferracini F, Caparrotti NB, Carvalho MR, Raad AJ. Estratégias de leitura e desempenho em escrita no início da alfabetização. *Psicologia Escolar e Educacional*. 2004;**8**(2):189-197. DOI: 10.1590/S1413-85572004000200007

[16] Nunes DRP, Walter EC. Processos de leitura em educandos com autismo: um estudo de revisão. *Revista Brasileira de Educação Especial, Marília*; **22**, 2016(4):619-632

[17] Corso HV, Sperb TM, Jou GI, Salles JF. Metacognição e funções executivas: relações entre os conceitos e implicações para a aprendizagem. *Psicologia: Teoria e Pesquisa*. 2013;**29**(1):21-29. DOI: 10.1590/S0102-37722013000100004

[18] Pellicano E. Links between theory of mind and executive function in young children with autism: Clues to developmental primacy. *Developmental Psychology*. 2007;**43**(4):974-990. DOI: 10.1037/0012 1649.43.4.974

[19] Meyer LKC. A Compreensão de leitura e a Teoria da Mente em crianças com autismo. *Pouso Alegre*. 2018:190f

[20] Massaro DW, Bosseler A. Read my lips: The importance of the face in a computer-animated tutor for vocabulary learning by children with autism. *Autism*. 2006;**10**(5):495-510. DOI: 10.1177/1362361306066599