



## LEARNING DISORDERS

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### SUMMARY

The respective work addressed the theme of Learning Disorder, focusing on three research pillars: neurological origin, teachers' prior knowledge and early diagnosis. The objective was to demonstrate that the subject is complex and requires a broad discussion. Since it is a heterogeneous theme, early detection can facilitate treatment, which can be costly or time-consuming depending on the support network, and this is linked to the large number of professionals who may be connected. Diagnosis should be recommended in early childhood, since it can reduce social and pedagogical problems. Even if it takes a long time to diagnose, children who demonstrate a disorder or learning difficulty should have their treatment started promptly after the first diagnosis. To guide the study, publications that address the theme of Learning Disorder, its origin (genetic, embryonic, social) and teachers' prior knowledge were used, which demonstrated that the information obtained by the research is within a broad context, but interconnected. To assess the knowledge of teachers, a survey was conducted using Google Forms. The survey was applied in the cities of Nova Friburgo - RJ, Trajano de Moraes - RJ, Centro Novo do Maranhão - MA, Centro do Guilherme - MA, Santa Inês - MA, Zé Doca - MA. Twenty-two teachers participated. It was concluded that the professionals were aware of the law, had worked or were working with students with ASD, and that unfortunately the vast majority did not have the information obtained from their undergraduate studies and were not familiar with the topic addressed. This clearly demonstrates the need for the competent bodies to provide ongoing training covering the topic, since it is a right of the professional and the students in question. Through the survey, it was possible to observe that the professionals had some difficulty in differentiating between learning disorders and learning difficulties, regardless of the category of the educational institution and the level of information acquired.

**Keywords:**Diagnosis, Professor, Neuroanatomy, Learning Disorder

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## ABSTRACT

This study addresses the topic of Learning Disorder, focusing on three main research pillars: neurological origin, teachers' prior knowledge, and early diagnosis. The objective was to demonstrate that this is a complex issue requiring broad discussion. Given its heterogeneous nature, early detection can facilitate treatment, which may be costly or time-consuming depending on the support network, as it involves multiple professionals. Diagnosis should be prioritized in early childhood, as it can help reduce social and educational problems. Even if the diagnosis takes time, children showing signs of a disorder or learning difficulty should begin treatment promptly after the first observation.

To support this study, publications discussing Learning Disorders, their origins (genetic, embryonic, social), and teachers' prior knowledge were analyzed. The findings indicated that the collected information is broad but interconnected. A survey was conducted via Google Forms to assess teachers' knowledge, applied in the cities of Nova Friburgo – RJ, Trajano de Moraes – RJ, Centro Novo do Maranhão – MA, Centro do Guilherme – MA, Santa Inês – MA, and Zé Doca – MA, with participation from 22 teachers.

The study concluded that professionals were aware of the law and had worked or currently work with students with Learning Disorders (TEAp). However, most lacked information on the topic from their undergraduate education. This highlights the need for competent authorities to provide continuous training on this subject, as it is a right of both teachers and students. The research also revealed that professionals struggled to differentiate between learning disorders and learning difficulties, regardless of the institution's category or the level of information acquired.

**Keywords:** Diagnosis, Teacher, Neuroanatomy, Learning Disorder

## INTRODUCTION

Specific learning disorder (pSD) is related to conditions neurological, but which can be aggravated by socio-environmental conditions, in addition to being a highly hereditary condition, this disorder can be divided into three areas, dyslexia - Specific learning disorder with reading impairment -, dyscalculia - Specific learning disorder with mathematics impairment - and dysorthography - Specific learning disorder with writing impairment. We must be aware that ASD is a permanent condition, unlike learning difficulties.

In Brazil, the greatest difficulty in early diagnosis of ASD is related to cost, as it depends on the participation of some trained professionals, which makes it more expensive.

the diagnosis or makes it difficult for those who depend on the public health system, it is important to emphasize that the earlier monitoring is started, the easier it is to remedy ASD.

This work is justified by carrying out a survey of education professionals who are familiar with the current legislation on the subject, as well as identifying which professionals have already had contact with students with ASD and whether they already had prior information on the subject.

The objective of the research is to demonstrate the percentage of teachers trained in the proposed theme, and whether it is possible to propose continued training so that professionals in the education area can improve their teaching methodologies and detect students with ASD early, so that they can refer them to trained professionals.

Works published in magazines, websites, scientific articles, books as well as reports from institutions recognized for the work provided in the area were adopted.

To collect the data, a questionnaire with three objective questions was used, in which each participant had the right to only one answer. This questionnaire did not distinguish between professionals from the public or private network, the focus was to find out their knowledge on the subject.

This research was based on three areas considered important: neuroanatomy, professionals' knowledge on the subject and early diagnosis.

### **SPECIFIC LEARNING DISORDER – ORIGIN, EARLY DIAGNOSIS AND TEACHERS**

Specific learning disorder (pSD) is a heterogeneous condition, most learning disorders are complex or mixed, with deficits in more than one system (Sulkes, 2024).

Sulkes (2024) states that learning disorders can be congenital or acquired, and that no single cause has been defined, but neurological deficits are assumed to be involved, whether or not other neurological manifestations are present (i.e., in addition to the learning disorder). Genetic influences are often involved, and it is also mentioned that other causes of aSD may be related to maternal diseases, drug use during pregnancy, complications during pregnancy and delivery, and neonatal problems.

One area studied is neuroanatomy, with an emphasis on the beginning of the formation of the central nervous system (CNS). Rotta (2016, p.4) says that by reviewing the neurobiology of learning, we will be able to better understand and identify early deviations from normality involved in the act of learning. Riesgo (2016, p.17) mentions that the folding of the cerebral hemispheres becomes much more intense at the end of gestation, around the eighth month. According to Riesgo (2016, p.18), the hemispheres are involved in learning considered more elaborate (some aspects of language, mathematics, reading and writing), which corroborates Grant; Siegel; D'Angiulli, 2020; Carroll et al., 2024; Sanfilippo et al., 2020 (apud Navas and Cibito 2024) who mention the inferior frontal gyrus and the parietotemporal region as regions that are significantly less activated and function inefficiently in readers with dyslexia. Rotta (2016, p 5) says that the anatomical or structural aspects of the CNS involved in learning are important for understanding the act of learning, both in normal and pathological conditions.

ASD may be linked to other disorders such as Attention Deficit Hyperactivity Disorder (ADHD), when this occurs it is called comorbidity, Navas and Cibito (2024) mention that the connection between ADHD and ASD may vary between 20 to 40% of cases (Gaab; Reilly; Tridas, 2023; Holanda; Correa; Mousinho, 2020).

When we talk about the central nervous system, we know that the use of legal or illegal drugs can affect its formation. Campelo et.al (2018) demonstrates that studies evaluated the consequences of drug use by the mother on the cognitive, motor and psychosocial development of children, revealing its association with academic problems and more frequent diagnoses of ADHD. We can complement this with Papalia et.al (2013), who separates human development into age groups and that the prenatal period (from conception to birth) is the period in which cognitive development occurs, which is composed of learning, attention, memory, language, thinking, reasoning and creativity.

Making the connection between drug use and learning disorders Papalia (2013) cites authors who make the correlation between drug use and its consequences on the neurological development of the fetus and possible consequences such as attention deficit, hyperactivity, learning disorders, and memory deficit.

Leaving the neurological area, and delving into early diagnosis, Araújo et al (2013) states that around 15% to 20% of children have difficulty

learning in the first year of schooling, reaching 30% to 50% in the first six years, with a prevalence of males. According to the author, a triad involving the child, family and school staff should be adopted, in addition to considering the existence of organic and psychological pathologies at the origin of the condition. For ASDp, the author states that treatment includes differentiated teaching techniques, psychological and speech therapy monitoring and, in some situations, specific treatments for comorbidities that worsen the child's performance (mood disorders, hearing diseases, obstructive sleep disorders, etc.). Corroborating these indications, Rotta (2016 p.7) says that the multi and interdisciplinary team is only successful when it acts in an integrated manner with the family and the school.

Rotta (2016, p.6) recommends monitoring full-term newborns and preterm infants at risk until the school period, as this makes it possible to provide early care for any learning failures.

Souza (2023) emphasizes that late diagnosis of a learning deficit can cause significant impediments in the student's academic life, and may even trigger emotional and behavioral problems. For treatment, the author emphasizes that these people need appropriate teaching methodologies, as these deficits can impair academic and/or occupational, personal and social functioning. As Araújo et.al (2013), Souza indicates psychopedagogical monitoring, in addition to feedback from the assessment with their family members and, if necessary, applying new teaching techniques, which may include psychological and/or speech therapy monitoring.

To include the child in a learning disorder framework, Brites cites the Diagnostic and Statistical Manual of Mental Disorders 5th edition or DSM-5, which has diagnoses divided into 4 major criteria (A, B, C and D).

Criterion A - the person must have at least one of the 6 symptoms, which are:

1. Reading words imprecisely or slowly and with effort;
2. Difficulty understanding the meaning of what is read;
3. Difficulties in writing orthographically;
4. Difficulties with written expression.
5. Difficulties mastering number sense, number facts, or calculations.
6. Difficulties in reasoning.

For criterion B - The affected academic skills are substantially and quantitatively below what is expected for the individual's chronological age.

Criterion C - Learning difficulties begin during the school years but may not become fully manifest until the demands of the affected academic skills exceed the individual's limited capabilities.

Criterion D - The learning difficulties are significant but cannot be explained by:

1. Intellectual disability;
2. Visual or hearing acuity problems;
3. Other mental or neurological disorders;
4. Psychosocial adversities;
5. Lack of proficiency in the language of academic instruction;
6. Inadequate educational instruction.

According to the author, an interdisciplinary assessment is essential to complete the diagnosis, as it provides a demonstration of the skills that are most deficient in the individual. As it is a costly process (Navas and Cibito (2024) cite Snowling and Hulme (2024), the intervention should not only be provided to those who meet the diagnostic criteria for dyslexia, but also to all those who have reading difficulties, even without a diagnosis.

Oliveira (2020) says that the first step to demystifying the topic is to provide adequate training for teachers, preparing them to serve a heterogeneous class and highlighting to them the difference between disorders, disturbances and learning difficulties. This information is in line with Garcia (2022) who, in his research, found that professionals understood disorders and learning difficulties as synonyms. Oliveira (2020) adds that teacher training has not yet provided conditions for these education professionals to be able to perceive and observe whether the condition is Learning Difficulties or Learning Disorders/Disorders.

In their work, Gonçalves and Crenitte (2014) carried out a study on teachers' knowledge about the difference between School Difficulties, Learning Disorders and Dyslexia. They carried out this research in private and public schools and found that in private schools 100% of the professionals interviewed

believed that there was a difference between the disorders, while 70% of public school teachers reported that there was a difference, which was a statistically significant difference. When comparing teachers with and without prior knowledge on the subject, this difference was not statistically significant.

Evaluating by subject, Gonçalves and Crenitte (2014) demonstrated that the definition of Learning Disorders was assertive for 82% of private school teachers against 30% of public school teachers, with regard to disorder, there was a low level of accuracy between public and private schools with assertions of 15% and 0% respectively, the assertions for the definition of dyslexia between private and public schools were 100% and 75% respectively.

## METHODOLOGY

To carry out this research, a form was generated on Google Form, which was distributed via *WhatsApp* for teachers from the public and private networks in the cities of Nova Friburgo - RJ, Trajano de Moraes - RJ, Centro Novo do Maranhão - MA, Centro do Guilherme - MA, Santa Inês - MA, Zé Doca - MA, 22 teachers participated, without distinction between them, as the focus of the research was to find out how many professionals were aware of the central theme of the research.

The professionals who participated in the research are professionals in Early Childhood Education, Elementary I, Elementary II and High School, and all of them have at least five years of teaching experience in their disciplines.

The type of research adopted was quantitative — It translates information into numbers to be analyzed and classified; statistical techniques are used in the proposed study — (THOMAZ).

Three objective questions were made available, from which professionals could only select one and after submitting them, it was no longer possible to answer or change their answer, making the survey as reliable as possible.

The questions answered by the professionals were:

- Do you have knowledge about Law No. 14,254/21?;
- Do you have, have you had or have you ever had students with ASD?
- Do you have any specific training in ASD?



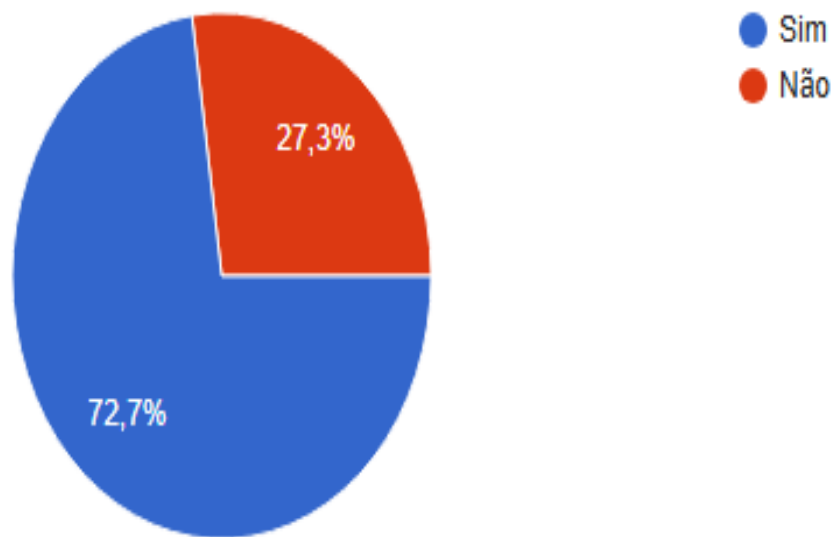
This interview was attended by 22 professionals.

With the responses collected by Google Forms, it gives us a graph with the information necessary to perform the interpretation and reach the necessary conclusions.

## RESULTS AND DISCUSSION

From the data collected by the research, it was possible to verify a good percentage (72.7%) of teachers who have knowledge about Law No. 14,254/21, as shown in graph 1 below, this result corroborates the data from the ABCD institute (2024), this is very important, as teaching professionals are the first professionals who will have contact with students with ASD, thus indicating comprehensive monitoring for students with ASD.

Chart 1: Percentage of professionals who are familiar with Law No. 14,254/21



Source: Authors

To confirm this information, Garcia Paes (2008) states that in 1988, those who most frequently referred students with learning problems were teachers, educational counselors and doctors; in the period from 1989 to 1995, those who referred most were teachers and educational counselors; in the period from 1996 to 2000, those who referred most were teachers, supervisors, educational counselors and pedagogical coordinators; and finally, in the period from 2001 to 2005, this occurrence continues to demonstrate the great importance of trained professionals.



Professionals who are not familiar with the law, which is approximately 27%, need to seek out the education departments and competent bodies in order to learn more about the law and begin ongoing training, which is defended by the law itself (Art. 5), since these professionals are the first ones responsible for indicating the comprehensive monitoring of students.

What does Law No. 14,254/21 say:

Art. 1º The public authorities must develop and maintain a comprehensive monitoring program for students with dyslexia, Attention Deficit Hyperactivity Disorder (ADHD) or other learning disorders.

Sole paragraph. The comprehensive monitoring provided for in the caput of this article includes early identification of the disorder, referral of the student for diagnosis, educational support in the education network, as well as specialized therapeutic support in the health network.

Art. 2. Public and private basic education schools, with the support of the family and existing health services, must guarantee care and protection for students with dyslexia, ADHD or other learning disorders, with a view to their full physical, mental, moral, spiritual and social development, with the help of existing social protection networks in the territory, whether governmental or non-governmental.

Art. 3 Students with dyslexia, ADHD or other learning disorders who present alterations in the development of reading and writing, or instability in attention, which have an impact on learning, must be assured of specific monitoring aimed at their difficulty, as early as possible, by their educators within the scope of the school in which they are enrolled and can count on support and guidance from the area of health, social assistance and other public policies existing in the territory.

Art. 4 Specific needs in the development of the student will be met by professionals from the education network in partnership with professionals from the health network.

Sole paragraph. If the need for therapeutic intervention is verified, this must be carried out in a health service where diagnostic evaluation is possible, with monitoring goals by a multidisciplinary team composed of professionals necessary to perform this approach.

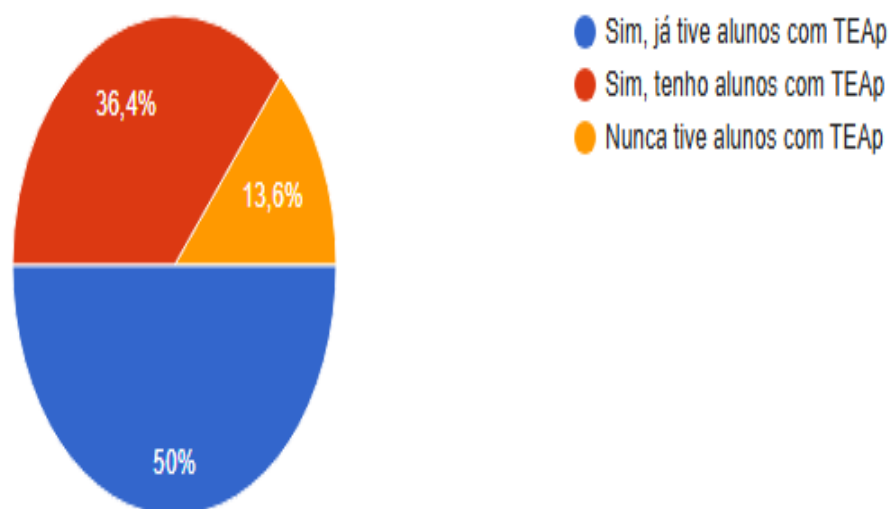
Art. 5 Within the scope of the program established in art. 1 of this Law, education systems must guarantee basic education teachers broad access to information, including possible referrals for multisectoral care, and ongoing training to enable them to identify early signs related to learning disorders or ADHD, as well as to provide educational support to students.

Art. 6 This Law shall come into force on the date of its publication.”

Analyzing Graph 2 below, it was possible to observe that of the interviewees, 50% of the professionals have already had students with some specific learning disorder (ASD), and that approximately 36% have students with ASD. These results are corroborated by the ABCD Institute's research (2024) which indicates that approximately 88% of the professionals who responded to their survey have already had or have a student with ASD.

These data show us that there is a great need for increasingly qualified professionals to teach in educational institutions throughout Brazil. For Santiago (2016), the influence exerted by these professionals goes beyond simple observation or passivity, and even goes beyond the field of pure and simple knowledge transfer and involves human empathy, a need to get closer to the child, in addition to being an inclusive agent that opens society and schools to children with learning disorders.

Graph 2: Percentage of professionals who have, had or never had students with TEAp

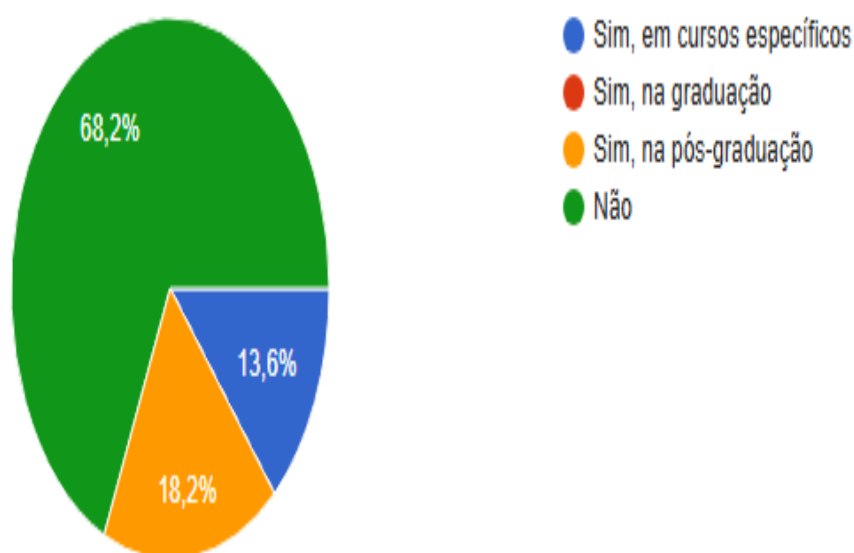


Source: Authors

When surveying teachers who had studied about ASD, graph 3 below shows that approximately 14% of the interviewees received information about the topic in specific courses, approximately 18% in postgraduate studies, which is in line with what was found by Navas and Ciboto (2024, p. 44), but differing from the same authors. In this research, it was found that approximately 68% of the professionals did not have any information about ASD, which is alarming, especially if we consider that none of the 22 interviewees studied the subject in undergraduate studies, which in principle should be the basis of teaching knowledge. This result corroborates what was analyzed by Lopes et.al (2012), in which they found that 60% of teachers, throughout their training, did not receive information about the role of speech therapists in schools, and with Garcia et. al (2022), who obtained reports from professionals claiming that they did not previously receive this information.

Assunção (2018) corroborates this information when he concludes that — the training of licensed teachers does not support a foundation founded in psychology, although teachers often come across psychological issues, so teachers need to use their skills to make classes closer to the student's universe.

Graph 3: Percentage of professionals who have some specific training on ASD.



Source: Authors

It is worth noting that the higher the level of education (undergraduate, postgraduate or specific courses) and the longer the teaching experience, the easier it is for professionals in the field to diagnose people with some type of learning disorder. In their research, Tabakim et.al (2016) demonstrates that, among the professionals involved, 37% had specialization as their highest level of training and, on average, approximately 12 years in activity.

Although we observe a large gap on the subject in research, Gonçalves and Crenitte (2014) report that regardless of the type of school or prior knowledge of the subject, there is a lack of information among teachers, regarding definitions, manifestations and mainly in relation to the causes of School Difficulties and Learning Disorders.

## FINAL CONSIDERATIONS

Learning disorders are heterogeneous and must be monitored by a multidisciplinary team. It is necessary to carry out a parental survey before reaching any conclusion, since several factors can give rise to the “*start*” in this disorder.

Because it is a complex issue, its diagnosis ends up being costly for those involved, or even time-consuming if they depend on the public health system.

Early detection facilitates the academic development of patients, as they will have appropriate psychopedagogical support and a school structure more adapted to their needs, since Law No. 14,254/21 states that students with ASD must have comprehensive support and that schools are responsible for educational support and monitoring.

Professionals who have not previously acquired information about ASD must demand from the competent bodies conditions for them to have continued training to qualify them for early identification and educational assistance (art. 5).

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