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Original articles

Learning disorders: The knowledge of basic education teachers

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ABSTRACT

Purpose: to assess knowledge about learning disorders among basic education teachers and intern teachers in Brazilian public and private schools.

Methods: two questionnaires administered to teachers from several Brazilian schools, selected by random sampling. The first questionnaire collected sociodemographic data, and the second assessed knowledge about learning disorders. The chi-square test investigated factors regarding knowledge about learning disorders, with a 5% significance level.

Results: 51 of the 158 registered teachers responded to the questionnaire and completed the research stages. They were mostly females (90.2%) with a mean length of service of 13.6 years. The questionnaire on learning disorders obtained 1,020 responses, of which 757 (74%) were adequate, and 263 (26%) were incorrect. Greater knowledge of learning disorders was statistically significantly related to previous lectures/courses on the topic ($p = 0.02$).

Conclusion: teacher training significantly increases knowledge about learning disorders, suggesting the need for more professional development programs focused on this topic. Understanding teachers' knowledge on learning disorders is crucial to developing effective educational interventions and supporting students with such difficulties.

Keywords: Neurodevelopmental Disorders; Learning Disabilities; School Teachers; Knowledge Bases

A study conducted at the Medical School of the Universidade Federal de Minas Gerais, Belo Horizonte, MG, Brazil.

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INTRODUCTION

Neurodevelopmental disorders are described as behavioral and cognitive changes that manifest during one's development and include significant difficulties in acquiring and performing specific intellectual, motor, linguistic, and social functions[1]. They involve learning problems, motor disorders, and executive control limitations[2]. Individuals commonly have more than one of these disorders, simultaneously[3].

This study addresses the neurodevelopmental disorders named specific learning disorder (SLD), a comprehensive group of conditions that can impact how a person processes, retains, and uses information. It can manifest in cases of impaired reading (F81.0), impaired written expression (F81.1), and/or impaired mathematics (F81.2)[2].

Other conditions, besides SLD, can cause academic harm or intensify the impact at school – e.g., attention-deficit/hyperactivity disorder (ADHD), developmental coordination disorder (DCD), autism spectrum disorder (ASD), and so forth.

DCD involves motor skill deficits that can negatively interfere with daily and school activities, such as difficulties using scissors, rulers, handwriting, and teamwork[2]. ADHD is characterized by a persistent pattern of inattention and/or hyperactivity-impulsivity present in various environments, interfering with the person's functioning or development[2]. Studies show that executive function components are significantly related to ADHD and reading disorders[4]. In addition, ADHD is one of the main treatable causes of poor school performance[5].

These disorders require greater attention from educators to meet students' educational needs and involve them in all school activities with their peers.

Neurodevelopmental disorders can have genetic and hereditary origins and manifest from 12 months of age[3], successively affecting the individual's personal, academic, social, and professional spheres, especially when not identified and treated timely.

A recent study with caregivers of children treated by the public health network in Sydney[6] indicates various factors may delay diagnosis, such as the child's sex, the severity of their signs and symptoms, the age of the parents or caregivers, the level of education, and broader issues related to the family's socioeconomic level. Thus, the risk of late discovery increases in low and middle-income countries, with greater economic vulnerability and social fragility[7] and low indicators of social, economic, and scientific development. Brazil falls into this category.

This context underscores the practical and theoretical relevance of this study. Gaps in teacher training hinder work aimed at identifying students' risk factors and/or impairments. This prevents or delays the development of effective strategies to manage learning disorders at school.

SLD persists throughout the person's life, and its course and impact depend on several factors, including the support and intervention systems available[2]. Therefore, delaying SLD diagnosis or failing to identify risk factors for its occurrence can cause greater reading, writing, and/or mathematics impairment.

The factors that pose a greater risk for SLD involve changes in oral language (vocabulary, grammar, story recall, and speech), phonological awareness, visual processing, difficulty in identifying letters, and poor performance in rapid automatic naming tasks[8].

SLD signs include delays in writing, reading, or logical-mathematical thinking, changes in behavior, such as attempts to abstain from performing tasks, lack of interest in activities, disruption of the teacher or class[9], inaccuracy in reading words, low speed or fluency in reading, difficulty in reading comprehension, spelling inaccuracy, and difficulty in written expression[2].

Considering that these skills can be observed at school even before they begin learning to read and write and that SLD causes harm throughout the student's life, the teacher plays an important role in diagnosing this disorder, in its early identification, referral, and intervention[10,11]. Teachers have prolonged contact with students, which allows them to analyze children's development as they perform physical, linguistic, intellectual, and social tasks[10].

Diagnosing and identifying risk factors helps schools and teachers modify their teaching approach and make necessary adjustments to meet students' needs better, reducing the risk of academic failure. In addition, they can refer their students for the necessary treatments.

Such measures are essential for making good use of individual skills and better managing these students in the classroom, aiming at quality teaching and improving the relationship between the school, the student, and the teacher, regardless of their limitations, but considering their full potential[12].

Brazilian laws and policies aim to include all students in the regular education system. They were initially meant for students with disabilities, global developmental disorders, and/or high abilities[13-15].

In 2021[16], students with dyslexia, ADHD, and other learning disorders were guaranteed specific support for their difficulties as early as possible within the school where they are enrolled. They must also have support and guidance from the health and social assistance and other existing public policies.

Therefore, there is a need for specific training addressing SLD issues – which the curriculum of teacher training courses may not be able to sufficiently cover[17] – to meet the needs of this large number of students.

Various studies have shown that activities related to language components improve reading skills[18]. The same is true for the Response to Intervention (RTI), an approach whose multilevel instructional activities aim to prevent, identify, and intervene in learning difficulties[11,19]. In this program, teachers play a fundamental role because they can identify signs of risk, early, and implement pedagogical strategies that favor their students' cognitive-linguistic development at a time of greater brain plasticity[19]. Hence, this study aimed to assess the knowledge about learning disorders among basic education teachers and intern teachers in Brazilian public and private schools.

METHODS

This study was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais, MG, Brazil, under CAAE: 35589420.5.0000.5149 and evaluation report number: 4.453.272. This is a cross-sectional, analytical, observational study with undergraduate teachers-in-training working as intern teachers and basic education teachers from public and private schools in several Brazilian cities.

Sample

This study included teachers from public and private institutions, residing in capitals and inland cities of Brazil, with or without prior knowledge of learning disorders, and undergraduate teachers-in-training, nearing the end of their training, working as teachers through mandatory internships. Exclusion criteria ruled out higher education professors, teachers residing outside Brazil, and those who did not complete one or more stages of the study.

The study comprised five stages described below.

Stage 1: the first stage of the study was the review of the literature on learning disorders and their perception by teachers on the VHL/LILACS and Google Scholar search platforms, using free descriptors – teachers, knowledge, and learning disorders – to filter articles published in the last 5 years.

Stage 2: After the review, the researchers updated a pre-existing questionnaire on learning disorders – linked to the "Learning Disorders" booklet, produced by the Literacy for All outreach program of the Universidade Federal de Minas Gerais to measure the knowledge of teachers and the general population about these disorders[20]. This instrument was validated as the booklet was being produced, proving to be precise and accurate thanks to the consistency of the responses in different applications. For instance, a study[21] incorporated the questionnaire into the m-health tool, "Learning Disorder Quiz", obtaining a recommendation to shorten it and public satisfaction for being practical to access. Thus, its review incorporated updated information relevant to learning disorders based on the cited study, ensuring that the questions reflected contemporary trends and challenges in this area.

Stage 3: Following the questionnaire, the booklet was also revised in line with the updates, producing a second version, according to suggestions from a previous study[21]. Then, a PowerPoint class was prepared to give lectures to teachers, according to the scientifically based information in the booklet. Promotional material for the lecture was also prepared and distributed in the "Literacy for All" outreach program.

Stage 4: After organizing the questionnaire, booklet, and lectures, the study prepared material to obtain sociodemographic data from the target population, using two different forms. The first was distributed through social networks mainly to invite teachers to participate in the research and register for the online lecture on learning disorders. The second form (Chart 1) was emailed to the teachers who had registered for them to confirm their registration, sign an informed consent form for the research, and collect sociodemographic information.

Stage 5: Data collection on learning disorders. The revised and updated questionnaire used to collect data on teachers' knowledge (Chart 2) was made available to the teachers participating in the lecture through a link that directed them to Google Forms, where they provided their personal data (name and email) to the researchers.

Chart 1. Sociodemographic questionnaire via Microsoft Teams

Question	Answer options
Full name	Personal answer
E-mail	Personal answer
Sex	Open personal answer
Race	I'm not interested in declaring White Black Multiracial Indigenous Brazilian East Asian
Age	Open personal answer
Education level	Incomplete middle school Graduate middle school Incomplete high school Graduate high school Incomplete higher education Bachelor's degree Postgraduate Master's degree Doctoral degree
If you checked incomplete higher education, please indicate the program you are currently studying.	Open personal answer
Bachelor's degree	Open personal answer
College/university you attended	Open personal answer
Time in the profession	Open personal answer
At how many schools do you teach?	Open personal answer
What shifts do you teach?	Morning Afternoon Evening
What education levels do you teach?	Preschool Elementary/middle school High school Higher education Postgraduation
What subjects do you teach?	Open personal answer
Have you ever attended educational lectures on literacy or learning and its disorders?	Yes/no
Do you currently have students with complaints related to learning, reading, or writing difficulties?	Yes/no

Chart 2. Questionnaire about learning disorders made available via Google Forms

Question	Answer options	Correct answer
1 - What is the difference between school difficulties (1st) and learning disorders (2nd)?	a) The 1st is due to poor adaptation to the teaching method, and the 2nd is due to sociocultural factors. b) The 1st has a neurobiological origin, and the 2nd has a genetic origin. c) The 1st is related to factors external to the individual, and the 2nd to neurobiological factors. d) The 1st is detrimental to reading, and the 2nd affects writing.	c)
2 - Do children with learning disorders have cognitive deficits?	a) No. These children are more intelligent than the others. b) Yes. Children with learning disorders are not intelligent. c) No. These children's intelligence is within the expected range for their chronological age. d) Yes. These children's cognitive capacity is within the expected range, but they are unable to use it.	c)
3 - Select the alternative that is NOT a characteristic sign and symptom of learning disorders.	a) Difficulties with written expression b) Reading words imprecisely and with effort c) Difficulties with logical-mathematical reasoning d) Difficulties understanding the meaning of what is said	d)
4 - What can cause learning disorders?	a) Genetic and neurobiological factors b) Inadequate teaching or inappropriate literacy method c) Brain injury d) Lack of encouragement to read and low motivation	a)
5 - Who is the professional responsible for diagnosing learning disorders?	a) Neurologist or psychiatrist b) Psychologist c) Speech-language-hearing pathologist d) Multidisciplinary team	d)
6 - Which factor is NOT a criterion to be met before reaching a diagnosis?	a) Observing that the symptoms persist for 6 months, even with specialized treatment b) Ensuring that the symptoms harm the student, interfering with academic performance or daily activities c) Ensuring that there is no other cause or pathological condition that better explains the problem d) Waiting for the student to grow and mature because the symptoms may disappear	d)
7 - What to do when diagnosed?	a) Look for a specialized school for this type of student b) Seek specialized therapeutic support according to the symptoms (speech-language-hearing therapy, psychology, occupational therapy, psychopedagogy, medical monitoring), besides educational adjustments c) Seek private lessons while waiting for the student to mature d) Do all the activities and tasks differently for these students	b)
8 - What are the expected effects of treatment for learning disorders?	a) Cure the disorder b) Improve motivation; the child should develop without assistance c) Eliminate the short-term academic impact d) Increase motivation, self-esteem, and the necessary foundations to process learning	d)
9 - The term dyscalculia refers to	a) A specific mathematical calculation disorder b) A difficulty in getting good grades in mathematics c) An intellectual disability that prevents the child from learning mathematics d) Lack of stimulus in learning mathematics	a)

Question	Answer options	Correct answer
10 - Children who have difficulty performing daily tasks that require motor skills (e.g., getting dressed, writing, playing ball or riding a bike) may have a specific condition called developmental coordination disorder (DCD). Regarding DCD, it is correct to state that	a) The child does not have good intellectual capacity, so motor performance is below chronological age. b) DCD signs include difficulties in school tasks involving organization, attention, and agility, such as writing. c) Motor skills do not need to be evaluated in children with learning disorders because they are rarely affected. d) These children's writing is illegible and scratched, but they write quickly.	b)
11 - Myths and truths about dyslexia. Mark T (true) or F (false) for the following statements	Dyslexia can be diagnosed at 5 years old. Treatment for dyslexia is mainly done with medication. The phonic method of teaching reading is recommended for people with dyslexia. Students with an intellectual disability or uncorrected sensory deficiencies may also have dyslexia. People with dyslexia can choose the career of their calling. There are no limits or contraindications.	11.1. F 11.2. F 11.3. T 11.4. F 11.5. T
12 - Check D for dyslexia and T for ADHD regarding their differences	Spelling error types are more consistent and related to specific difficulties. The most common error in reading is trying to guess the word they are reading. Phonological processing, difficulties in one of the reading access routes, and difficulties in spelling, auditory, and/or visual processing are the bases compromised in this condition. Changes in executive functions are the cause of symptoms in this condition. Task performance fluctuates – sometimes they get the task right, sometimes they fail.	12.1. D 12.2. T 12.3. D 12.4. T 12.5. T

Captions: DCD: developmental coordination disorder; ADHD: attention-deficit/hyperactivity disorder.

After completing the questionnaire, a lecture on learning disorders was held for teachers via the Microsoft Teams videoconferencing platform.

These data were collected remotely through Microsoft Teams and Google Forms on September 20, 21, and 25, 2023. Participants were informed about the study objectives and guaranteed their right to withdraw at any time, also ensuring that the information they provided would remain confidential, complying with the General Personal Data Protection Law (no. 13,709/2018) and the strict legal obligations to protect the privacy and rights of individuals when processing their personal data.

Data analysis

The data collected in the questionnaire were analyzed using the Statistical Package for the Social Sciences (SPSS), version 22.0.

A knowledge score was created to qualify participants' knowledge about learning disorders, summing each participant's correct answers in questions 1 to 12. The minimum score was 0 and the maximum score was 20 points.

The categorical variables were submitted to a descriptive analysis and the numerical variables, to measures of central tendency and dispersion.

The knowledge score was divided into two categories ("Less knowledge" and "Greater knowledge") for the bivariate analysis, according to the median of the participants' responses, corresponding respectively to scores less than and greater than or equal to 15.

The study investigated factors related to knowledge of learning disorders. Thus, the chi-square test compared the teachers' knowledge with the explanatory variables (sociodemographic and training data), with a 5% significance level ($p \leq 0.05$).

RESULTS

Altogether, 158 people registered, of which 51 responded to the questionnaire and completed all stages of the research.

They were 46 females (90.2%) and five males (9.8%), with a mean age of 40.5 years (± 10.86), a minimum of 20, and a maximum of 66 years.

Regarding education, eight were undergraduate students (15.7%) and the other 43 participants were classified as education professionals (84.3%), with the following education levels: bachelor's degree: nine (17.6%); postgraduate degree: 28 (54.9%); and master's degree: six (11.8%).

The average length of service was 13.6 years (± 10.77), with a maximum of 36 years and a minimum of 0 years (corresponding to the intern teachers) (n = 8).

Participants' responses to the questionnaire about learning disorders are shown in Figures 1, 2, and 3.

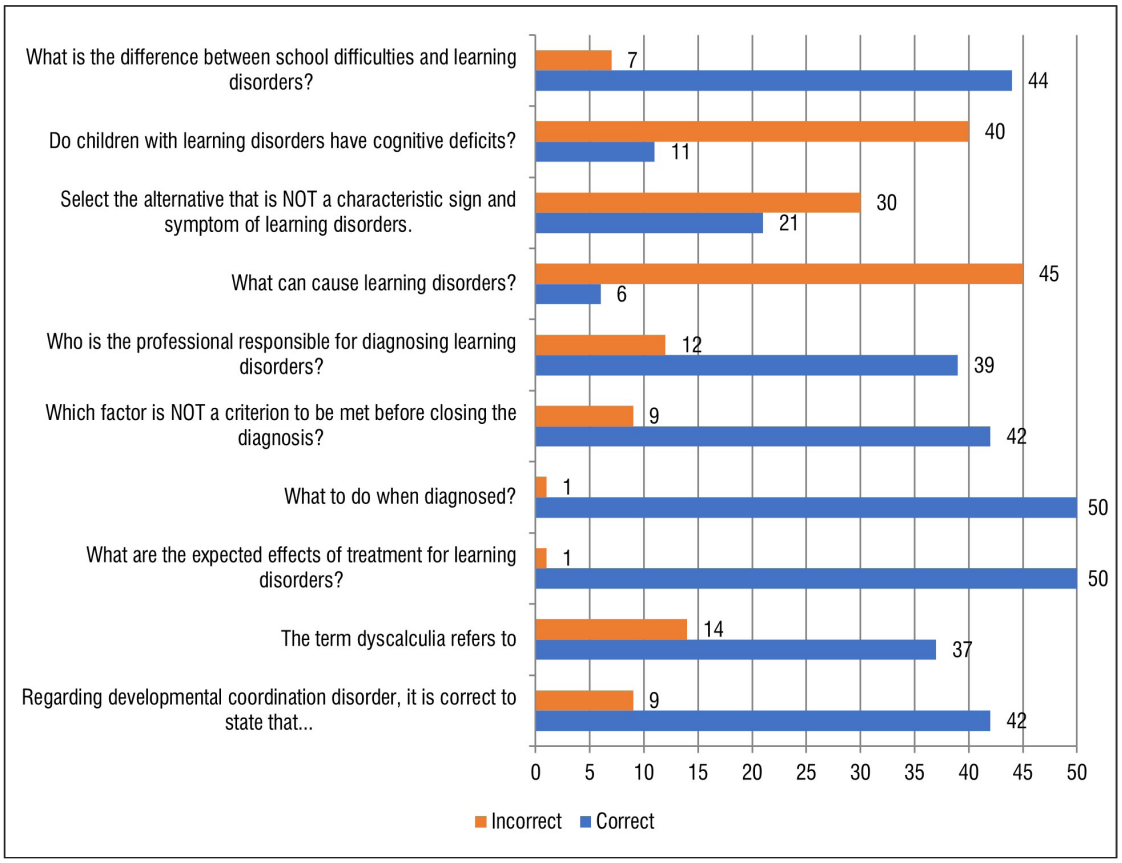

Figure 1. Descriptive results of educators' responses to questions 1 to 10 of the questionnaire on learning disorders

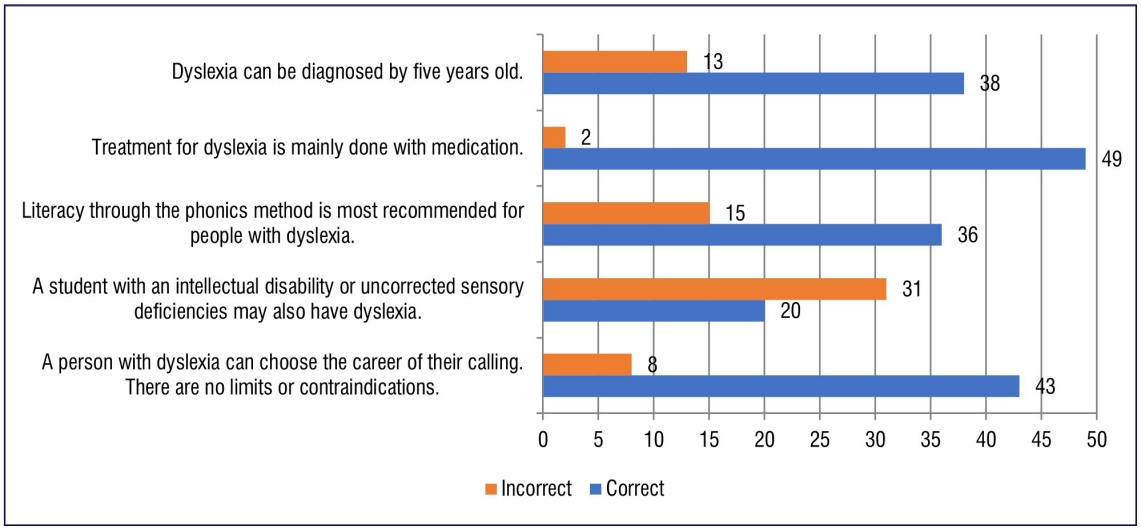

Figure 2. Descriptive results of question 11 regarding myths and truths about dyslexia

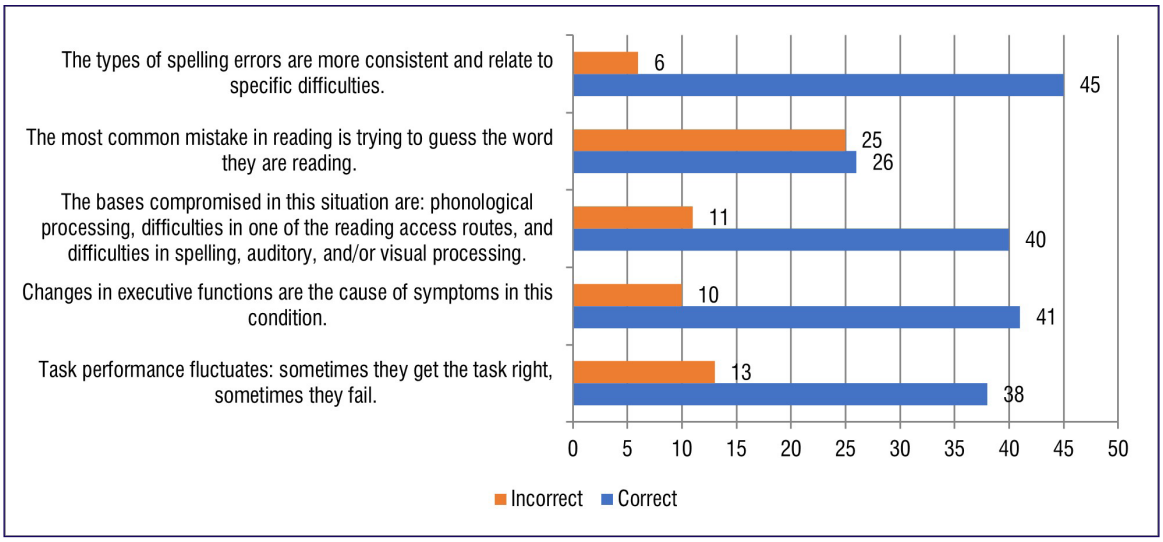

Figure 3. Descriptive results of question 12 on the differences between dyslexia and attention-deficit/hyperactivity disorder

As seen in Figure 1, participants had the most difficulty with questions 2 and 3, with 78.4% and 58.8% of errors, respectively. In question 2 (about cognitive changes), 100% of the wrong answers corresponded to the alternative "Yes. These children have cognitive capacity within the expected range, but they cannot use it." In question 3 (about exceptions in the signs and symptoms of learning disorders) 54% of the errors corresponded to the alternative "Reading words imprecisely and with effort", 23% to "difficulty with written expressions", and the remaining 23% believed that "difficulty in logical-mathematical reasoning" is not a sign or symptom. All other questions obtained mostly correct results.

The binary choice questions, shown in Figures 2 and 3, were respectively related to teachers' knowledge about dyslexia and its differentiation from ADHD. The only true (T) or false (F) statement in question 11 with a prevalence of incorrect answers was, "A student with intellectual disability or uncorrected sensory deficiencies may also have dyslexia" – 60.8% of teachers had no prior knowledge of this exclusion factor in the diagnosis of dyslexia. In question 12, only one alternative ("the most common error in reading is trying to guess the word read") had half of the incorrect answers, as 49% of the teachers believed this to be a prevalent characteristic of dyslexia. Of the total 1,020

responses obtained in the questionnaire, 757 (74%) were adequate and 263 (26%) were incorrect.

Table 1 describes the educators' sociodemographic factors in the second level of knowledge about learning disorders. Greater knowledge of learning disorders was statistically significantly related to previous lectures/courses on the subject (p = 0.02).

Table 1. Factors associated with greater knowledge of learning disorders

Sociodemographic data		Knowledge of learning disorders				Chi-square test	p-value
		Lesser (n = 31)		Greater (n = 20)			
		n	%	n	%		
Sex	Females	27	87.1%	19	95%	0.85	0.35
	Males	4	12.9%	1	5.0%		
Training	Students	6	19.4%	12	10%	0.80	0.37
	Professionals	25	80%	18	90%		
Time in the profession	< 12 years	15	48.4%	7	35.0%	0.88	0.34
	≥ 12 years	16	51.6%	13	65.0%		
Teaches preschool	Yes	8	25.8%	8	40%	1.13	0.28
	No	23	74.2%	12	60%		
Teaches elementary or middle school	Yes	24	77.4%	14	70%	0.35	0.55
	No	7	22.6%	6	30%		
Teaches high school	Yes	9	29%	6	30%	0.005	0.94
	No	22	71%	14	70%		
Previous lectures and courses	Yes	12	38.7%	14	70%	4.76	**0.02***
	No	19	61.3%	6	30%		
Students with complaints	Yes	25	80%	17	85%	0.15	0.69
	No	6	19.4%	3	15%		

Captions: * p < 0.05: statistically significant difference; n: sample size; %: percentage.

DISCUSSION

This study aimed to assess the knowledge about learning disorders and associated factors among basic education teachers and intern teachers in Brazilian public and private schools. It also compared the sociodemographic data, analyzing the influence of the teachers' and interns' sex, age, length of service, prior knowledge, and individual voluntary search for information.

They provided mostly correct responses, indicating that this population had general basic knowledge about these disorders.

However, the study also found a significant percentage of incorrect answers and alternatives with a predominance of mistakes, demonstrating that teachers still lack knowledge about SLD, despite the courses and lectures.

Question 2 assessed teachers' knowledge of the relationship between cognitive deficits and learning disorders. Notably, more than 70% of participants responded that, although these children have cognitive abilities as expected, they are unable to use them adequately. This statement, however, is incorrect – which is worrying because of the teachers' difficulty in recognizing causal factors of learning disorders. As DSM-5-TR[2] points out, cognitive abilities (specifically intelligence) are not related to these disorders and are even a factor in excluding SLD.

The other questions with a predominance of incorrect answers followed the same pattern as question 2. It was found that teachers were uncertain in question 3 (related to the characteristic signs and symptoms of learning disorders), sometimes mixing their signs and symptoms with other issues. One example is central auditory processing disorder (ICD H93.2), characterized, among other factors, by the person's difficulty in understanding the meaning of speech, also attributed to receptive language problems, but absent in learning disorders. Question 11 highlighted the teachers' lack of knowledge about the exclusion factors in diagnosing

dyslexia. The misperception that children with cognitive and/or sensory deficits have dyslexia stands out, disregarding the possibility that this condition may manifest regardless of the correction of these associated factors. In question 12, it was evident that teachers had difficulty in differentiating the signs and symptoms of dyslexia and ADHD, especially concerning reading and how it is affected differently in each of these disorders.

This research did not address the extent to which the topic was approached in their basic training, and it is unknown what the participants' level of knowledge was before going to college. Hence, this may be a bias in identifying the main relevant factor for such a level of knowledge from the study data.

Teachers' knowledge may also have been acquired from popular information about learning disorders, making this a relevant factor for discussion. A study[22] with undergraduate speech-language-hearing students at a public university who had not yet taken courses on the identification and intervention of neurodevelopmental disorders (80% of whom had never participated in events on the subject) obtained approximately 70% of correct answers.

All the teachers' difficulties in the questionnaire were related to these conditions' etiology and signs and symptoms. Hence, if teachers do not understand these parameters, the school approach will not be focused on the key points that students need and may be accompanied by socially rooted prejudice and stereotypes – e.g., the belief that students are biologically unable and unwilling to learn[23], adding lasting academic, social, and emotional risks to these children's future lives[24].

The comparison of results between this and previous studies in the literature shows that some aspects have similarities and differences.

In a study conducted in Bangalore, Southern India, only 5% of primary school teachers had adequate knowledge about learning difficulties[25]. Another study conducted in Saudi Arabia[26] found the need to invest in training for teachers to identify students with learning difficulties and provide better teaching strategies.

In Brazil, a study conducted in schools in the South of Minas Gerais[27] verified that the concepts of disorder and learning difficulties are used indiscriminately and that most teachers refer students with suspected or diagnosed SLD. Only one of the teachers reported adapting materials to serve these students better.

In another study conducted in São Paulo[28], teachers had mostly unfounded knowledge about learning disorders and doubts about how to deal with these problems. However, speech-language-hearing guidance in a training lecture increased their knowledge of learning disorders, showing that even basic knowledge enables teachers to identify a difficulty, propose differentiated activities, and intervene effectively.

The same was observed in a study[29] with elementary and middle school teachers, concluding that they have limited knowledge on the subject and that their length of service does not impact their ability to identify and deal with disorders in the classroom. These results may indicate that, despite their length of service and having students with learning disabilities, they have not sought relevant knowledge on the topic during their professional careers[29].

Likewise, the present research found that the level of knowledge about learning disorders was not significantly associated with professional training, length of time in the profession, education level they teach, or having students with learning complaints.

On the other hand, courses, lectures, and updated scientific training to understand learning disorders significantly impacted teachers' good performance, highlighting the importance of providing adequate support to teachers, through continuing education. Thus, it is suggested that constant professional development increases teachers' capacity and knowledge to teach in line with the abilities and difficulties of students with these conditions.

Teachers must be encouraged to seek constant improvement because, besides mastering broad knowledge and skills to provide quality education to their students, their classrooms may have children at different developmental stages[30].

There are currently various ways to obtain information and knowledge. In addition to in-person and distance learning courses, interactive social media platforms such as Instagram, Twitter, and Facebook allow for comprehensive dissemination and better communication with society, enabling health and education professionals to present scientific information in dynamic, appropriate language, understandable by the general population[31]. Moreover, platforms such as YouTube and Spotify are being used to transmit scientific knowledge quickly and accessibly. This inclusive resource allows access to visually impaired people and different age groups, education levels, and social status[32]. They have been widely used for leisure and teaching, especially after the COVID-19 pandemic[33]. However, caution is advised because the

user's autonomous and individual search may pose a bias. Health misinformation on social media can generate direct and indirect negative consequences for population health[34]. The search for scientifically based information must be guaranteed to the population.

Another way to disseminate knowledge to the population is through campaigns, courses, lectures, and so on, focused on the topics of greatest interest to the target population – in this research, learning disorders and their impacts in the classroom. Unfortunately, governmental agencies seldom offer campaigns and continuous education on these topics, indicating the lack of attention to these issues, despite the vast number of research and studies on SLD[25,26].

Law 14,254, of November 30, 2021[35], was a major achievement, as it assigns to the government the duty to develop and maintain monitoring programs for students with dyslexia, ADHD, and other learning disorders. This law provides that monitoring must include early identification, referral for appropriate diagnosis, educational support, and specialized clinical care. In Article 5, the law also determines that education systems must guarantee basic education teachers broad access to information and continuing education. In other words, there are laws in force that guarantee, among other forms of support, continuing education for teachers, and it is the role of the state and education systems to ensure this right.

Besides offering courses, it is important to encourage the participation of teachers who may have difficulty doing so[26], as observed in this research. Participants were offered an online instructional lecture at the end of the questionnaire application. Many were interested in participating, but attendance was limited to approximately one-third of those registered. Occupational physical and mental exhaustion may be a factor in absence[36]. Teachers increasingly face significant psychosocial demands concerning their and their students' academic, professional, and social performance, increased workload, little leisure time, and physical and/or psychological violence at work. Thus, they may not be able to dedicate more time and attention to continuing education, requiring other strategies for schools and the government to adjust the supply and demand regarding the needs of students and teachers.

This study provided an understanding of how the factors analyzed influence the teachers' knowledge of learning disorders, especially professional development. It demonstrated that ongoing teacher training improves the ability to recognize and manage students' different conditions in an academic setting. Specialized complementary assistance and academic strategies may provide students with more opportunities to develop their skills and understand their obstacles, increasing effective school engagement, and minimizing the risk of academic failure[37].

Nonetheless, this research has limitations, considering the sample size and possible influence of other factors not analyzed in this study. On the other hand, its potentials include online data collection strategies that offer greater convenience and ease to research participants, generating large samples and a broad geographic reach, and collecting participants' data impartially[38,39]. Despite these benefits, there is a high percentage of non-response by the population[39]. Although this strategy provides a wide reach and simple and quick access to the target audience of the study[40], it depends on their interest and willingness to respond to the survey in full, which may not occur in spite of the wide dissemination and ease of participation.

Therefore, the results of this research contribute to the current understanding of teachers' knowledge of learning disorders and the importance of continuing education to implement an inclusive pedagogical approach. Thus, there is a need for initiatives from the government and/or private educational institutions to provide scientific-based lectures, courses, and workshops in accessible language to train teachers. Such continuing education strategies enable teachers to safely identify possible signs of neurodevelopmental changes in students and organize pedagogical work and teaching methods to increase the efficiency and effectiveness of their classes, enabling learning for all students.

Strategic continuing education does not overburden educators; rather, it helps them manage each student's learning difficulties so that they do not become an additional obstacle to pedagogical practice. Thus, teachers support public health without straying from the social function of the school, sharing historically accumulated knowledge and mediating the students' cognitive and social development.

CONCLUSION

This study achieved its purpose of investigating knowledge about learning disabilities among basic education teachers and intern teachers. Data analysis revealed that participation in lectures and courses on the topic was the main factor influencing greater

knowledge – i.e., continuing education was the main driver of the increase in knowledge. Understanding teachers' knowledge about learning disabilities is crucial to developing effective educational interventions and supporting students with learning disabilities.

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JNS: Formal analysis; Investigation; Methodology; Supervision; Validation; Writing - Review & editing.

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Data sharing statement:

The data from this research is not available for sharing.