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# EMPIRICAL STUDY ON THE RELATIONSHIP BETWEEN DYSLEXIA AND DIFFICULTY LEARNING MATHEMATICS:

HOW DYSLEXIA CAN AFFECT MATH COMPREHENSION AND WHAT STRATEGIES CAN HELP STUDENTS WITH DYSLEXIA OVERCOME THESE DIFFICULTIES

## ESTUDO EMPÍRICO SOBRE A RELAÇÃO ENTRE DISLEXIA E DIFICULDADE DE APRENDIZAGEM DA MATEMÁTICA: COMO A DISLEXIA PODE AFETAR A COMPREENSÃO MATEMÁTICA E QUAIS ESTRATÉGIAS PODEM AJUDAR OS ALUNOS COM DISLEXIA A SUPERAR ESSAS DIFICULDADES

## ESTUDIO EMPÍRICO SOBRE LA RELACIÓN ENTRE LA DISLEXIA Y LAS DIFICULTADES DE APRENDIZAJE EN MATEMÁTICAS: CÓMO LA DISLEXIA PUEDE AFECTAR LA COMPRENSIÓN MATEMÁTICA Y QUÉ ESTRATEGIAS PUEDEN AYUDAR A LOS ESTUDIANTES CON DISLEXIA A SUPERAR ESTOS DESAFÍOS

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# ABSTRACT

In this study, we explore the relationship between dyslexia and learning difficulties in mathematics. investigating how dyslexia can influence the understanding of this discipline and what strategies can help dyslexic students overcome such challenges. The context of this study is the contemporary educational scenario, where the inclusion of students with special needs is a central concern. The aim of the research is to identify how dyslexia affects mathematical comprehension and propose effective pedagogical strategies to deal with this challenging scenario. The research was conducted by evaluation of studies carried out, using documentary analysis of academic evaluation reports already published. The results indicate that students with dyslexia face particular difficulties when learning mathematics, and it is important to consider pedagogical approaches adapted to their individual needs. In the scope of mathematical development, strategies such as the use of visual resources, educational games and methods of metacognition emerge as potential allies in the appropriate teaching for this group of students. Our conclusions highlight the importance of understanding the specifics of dyslexia in mathematics education. Teacher training and awareness of dyslexia are crucial to implementing inclusive and effective approaches. Therefore, this research contributes to the expansion of the understanding about the connections between dyslexia and the learning of mathematics, as well as offers practical guidelines for teachers and education professionals when facing this challenge in the classroom.

**KEYWORDS:** Dyslexia Learning Disabilities 1. Mathematics 2. Psychopedagogical Interventions 3. Health 4. Pedagogical Strategies 5.

## RESUMO

Neste estudo, exploramos a relação entre a dislexia e as dificuldades de aprendizagem em matemática, investigando como a dislexia pode influenciar a compreensão dessa disciplina e quais estratégias podem auxiliar alunos disléxicos a superar tais desafios. O contexto deste estudo é o cenário educacional contemporâneo, onde a inclusão de estudantes com necessidades especiais é uma preocupação central. O objetivo da pesquisa é identificar como a dislexia afeta a compreensão matemática e propor estratégias pedagógicas eficazes para lidar com esse cenário desafiador. A pesquisa foi conduzida por avaliação de estudos realizados, utilizando análise documental de relatórios

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de avaliação acadêmica já publicados. Os resultados apontam que alunos com dislexia enfrentam dificuldades particulares ao aprender matemática, sendo importante considerar abordagens pedagógicas adaptadas às suas necessidades individuais. No âmbito do desenvolvimento matemático, estratégias como o uso de recursos visuais, jogos educativos e métodos de metacognição emergem como potenciais aliados no ensino apropriado para esse grupo de estudantes. Nossas conclusões destacam a importância da compreensão das especificidades da dislexia na educação matemática. A formação de professores e a conscientização sobre a dislexia são cruciais para implementar abordagens inclusivas e eficazes. Portanto, esta pesquisa contribui para a ampliação do entendimento sobre as conexões entre a dislexia e o aprendizado da matemática, bem como oferece diretrizes práticas para professores e profissionais da educação ao enfrentar esse desafio em sala de aula.

**PALAVRAS CHAVES:** Dislexia Dificuldades de Aprendizagem 1. Matemática 2. Intervenções Psicopedagógicas 3. Saúde 4. Estratégias Pedagógicas 5.

#### RESUMEN

En este estudio, exploramos la relación entre la dislexia y las dificultades de aprendizaje en matemáticas, investigando cómo la dislexia puede influir en la comprensión de esta disciplina y qué estrategias pueden ayudar a los estudiantes disléxicos a superar tales desafíos. El contexto de este estudio es el escenario educativo contemporáneo, donde la inclusión de estudiantes con necesidades especiales es una preocupación central. El objetivo de la investigación es identificar cómo la dislexia afecta la comprensión matemática y proponer estrategias pedagógicas efectivas para enfrentar este escenario desafiante. La investigación se realizó mediante la evaluación de estudios realizados, utilizando análisis documental de informes de evaluación académica ya publicados. Los resultados indican que los estudiantes con dislexia enfrentan dificultades particulares al aprender matemáticas, y es importante considerar enfoques pedagógicos adaptados a sus necesidades individuales. En el ámbito del desarrollo matemático, estrategias como el uso de recursos visuales, juegos educativos y métodos de metacognición surgen como aliados potenciales en la enseñanza adecuada para este grupo de estudiantes. Nuestras conclusiones resaltan la importancia de comprender las especificidades de la dislexia en la educación matemática. La formación de docentes y la conciencia sobre la dislexia son cruciales para implementar enfoques inclusivos y efectivos. Por lo tanto, esta investigación contribuye a la expansión de la comprensión sobre las conexiones entre la dislexia y el aprendizaje de las matemáticas, así como ofrece pautas prácticas para docentes y profesionales de la educación al enfrentar este desafío en el aula.

**PALABRAS CLAVE:** Dislexia Dificultades de Aprendizaje 1. Matemáticas 2. Intervenciones Psicopedagógicas 3. Salud 4. Estrategias Pedagógicas 5.

### INTRODUCTION

Dyslexia is a learning disorder that can affect a person's ability to read, write, and understand written language. However, dyslexia can also affect other areas of learning, including mathematics. Students with dyslexia may have difficulties understanding mathematical concepts, such as operations, fractions and geometry, as well as problems with short-term memory, which is fundamental for solving mathematical problems (PIRES, 2015, p. 27).

The relationship between dyslexia and difficulty learning mathematics has been a topic of interest in the psychopedagogical literature. According to Viana (2017, p. 39), dyslexia is one of the most common difficulties found in students who have difficulties in mathematics, and the proportion of students with dyslexia who have difficulties in mathematics varies according to different studies.

Developmental dyslexia is a disorder that can affect many areas of learning, including mathematics. According to Fonseca (2012), dyslexia can impair the understanding of mathematical concepts, the memorization of basic facts and the performance of simple calculations.

A systematic review of the literature conducted by Kovacs et al (2015) identified that the difficulty in learning mathematics is one of the main complaints of students with dyslexia. The authors highlight the importance of understanding how dyslexia can affect mathematical comprehension to develop effective intervention strategies.

(2014) emphasize the importance of pedagogical intervention for dyslexic students in mathematics. The authors defend the need to adopt specific pedagogical strategies for this audience, aiming at their inclusion and academic success.

(2018) present a look at the pedagogical strategies that can be used to assist students with dyslexia in learning mathematics. The authors highlight the importance of working on the visualization and understanding of mathematical concepts, the use of games and playful activities and the identification and correction of frequent errors.

(2018) investigated the relationship between dyslexia and difficulties in mathematics in Elementary School I. The authors found that dyslexic students had greater difficulty in basic mathematical skills, such as counting and comparing numbers, and defend the importance of understanding the nature of these difficulties for the development of effective interventions.

These references point to the complexity of the relationship between dyslexia and mathematical difficulties, evidencing the need to develop specific strategies to help students with this disorder. In the next topic, some of the main strategies used to assist dyslexic students in learning mathematics will be presented.

Given this issue, it is important to understand how dyslexia can affect mathematical comprehension and what strategies can help students with dyslexia overcome these difficulties. The aim of this study is, therefore, to investigate this relationship and present effective strategies to help students with dyslexia learn mathematics.

### **GENERAL OBJECTIVE**

This study aims to analyze the relationship between dyslexia and difficulty in learning mathematics, exploring how dyslexia can affect mathematical understanding in students and investigating pedagogical strategies that can help them overcome these difficulties.

# SPECIFIC OBJECTIVES

- Investigate the characteristics of dyslexia that can impact mathematical comprehension in students through studies already published.
- Identify the main difficulties that students with dyslexia face when learning mathematics.
- To analyze pedagogical strategies used to assist students with dyslexia in overcoming difficulties in mathematics.
- To evaluate the effectiveness of pedagogical strategies in the progress of mathematical comprehension of students with dyslexia.
- Explore the importance of family and school support in the process of learning mathematics for students with dyslexia.

#### JUSTIFICATION

Dyslexia is a specific learning disorder that can significantly affect the acquisition of reading and writing skills. However, its impact on mathematical comprehension is still poorly understood. This study is justified by the need to understand the implications of dyslexia in the learning of mathematics, aiming to improve educational practice and provide a more inclusive environment for students with this condition. By exploring effective pedagogical strategies, this study also seeks to contribute to the development of adapted approaches that can help students with dyslexia overcome barriers in mathematical understanding. In addition, research into family and school support can offer valuable insights for creating more comprehensive and collaborative interventions. The relevance of this study is reflected in the possibility of improving inclusive education and learning quality for all students, regardless of their learning difficulties.

# METHODOLOGY AND METHOD

Methodology and Method:

This article adopts a bibliographic review approach to analyze and synthesize previous studies on the internationalization of graduate programs in Education in Brazil. The review was conducted through a systematic search in academic databases, such as PubMed, Scopus, Web of Science and Google Scholar, using relevant keywords such as "internationalization", "graduate education", "perspectives", "challenges" and "Brazil". We selected studies published in the last ten years that addressed the internationalization of graduate programs in Education in the Brazilian context.

The article selection process followed pre-defined inclusion and exclusion criteria. The selected articles were analyzed in relation to their objectives, methodologies used, main results and conclusions. The synthesis of the results allowed to identify trends, gaps and perspectives in relation to the internationalization of graduate programs in Education in Brazil.

The analysis of the reviewed articles was carried out focusing on thematic categories, allowing the identification of positive perspectives and challenges faced by graduate programs in the search for internationalization. In addition, successful practices and strategies that have been adopted to promote internationalization in different academic contexts have been identified.

By adopting this bibliographic review approach, this article seeks to provide a comprehensive and up-to-date view on the perspectives and challenges of the internationalization of graduate programs in Education in Brazil, based on evidence already consolidated in the academic literature.

# ANALYSIS OF TEACHING STRATEGIES USED TO HELP STUDENTS WITH DYSLEXIA LEARN MATHEMATICS, FOCUSING ON THE MOST EFFECTIVE APPROACHES AND POSSIBLE CURRICULAR ADAPTATIONS

Understanding mathematical concepts can be a challenging task for students with dyslexia, requiring the adoption of specific teaching strategies. In this sense, it is important to analyze what are the most effective approaches and possible curricular adaptations that can be made to assist these students in learning mathematics.

One of the most widely used approaches is the visualization of mathematical concepts through graphic representations and visual schemes. According to Oliveira et al. (2018), the use of images,

diagrams and other forms of visual representation can help dyslexic students better understand mathematical concepts.

Another effective approach is to use games and recreational activities. (2014) highlight the importance of making the learning of mathematics more attractive and engaging for dyslexic students, through the use of games and activities that stimulate their participation and engagement.

In addition, it is important to take a more individualized approach, taking into account the specific needs and skills of each student with dyslexia. In this sense, curricular adaptations may be necessary to allow these students to participate fully in the teaching and learning process. According to Pereira et al. (2018), these adaptations may include the reduction of excessively verbal activities, the use of audiovisual resources, the simplification of instructions and the use of different evaluation strategies.

Finally, it is important to highlight the need for adequate teacher training to deal with students with dyslexia and mathematical difficulties. According to Fonseca (2012), it is important that teachers are prepared to identify and meet the specific needs of these students, adopting a more flexible and individualized approach.

In summary, the analysis of the teaching strategies used to help students with dyslexia learn mathematics points to the importance of visualizing concepts, using games and playful activities, adopting curricular adaptations and adequate teacher training. These approaches can contribute to an effective teaching and learning process.

# TO INVESTIGATE THE INFLUENCE OF FAMILY AND SCHOOL SUPPORT ON THE MATHEMATICAL LEARNING PROCESS OF STUDENTS WITH DYSLEXIA, IDENTIFYING HOW THE SUPPORT OF THESE INSTANCES CAN IMPACT THE UNDERSTANDING OF THE SUBJECT

Dyslexia can negatively impact the process of learning mathematics and, in this sense, the influence of family and school support becomes essential to help dyslexic students. According to Fonseca (2012, p. 174), the family can be a great ally in the learning process, and it is important that parents are aware of their child's difficulties and support the learning process in a positive way. In turn, the school also plays a key role in the inclusion of students with dyslexia, offering an adequate educational environment and promoting the necessary curricular adaptations.

(2015, p. 265) highlight the importance of partnership between school and family to help students with dyslexia, emphasizing the need for both to be involved and committed to the learning process. In addition, Menezes et al. (2014, p. 18) emphasize the importance of pedagogical intervention for dyslexic students in mathematics, noting that school support can be fundamental to the success of these students.

(2018, p. 536) point out that the school can offer adequate pedagogical strategies to assist dyslexic students in mathematics, such as the use of adapted didactic materials, educational games and individual or small group lessons. (2018, p. 93) state that family support is also important, emphasizing that parents should be involved in their children's study routine, offering emotional support and encouraging learning.

In short, the influence of family and school support can be decisive for the success of students with dyslexia in mathematics. The school should offer an adequate educational environment, with

curricular adaptations and effective pedagogical strategies, while the family should be involved and committed in the learning process, offering emotional support and encouraging learning.

# EVALUATION OF THE EFFECTIVENESS OF SPECIFIC PSYCHOPEDAGOGICAL INTERVENTIONS TO IMPROVE THE PERFORMANCE IN MATHEMATICS OF STUDENTS WITH DYSLEXIA, COMPARING RESULTS OF STUDENTS WHO RECEIVED INTERVENTION WITH A CONTROL GROUP THAT DID NOT RECEIVE IT

Evaluating the effectiveness of specific psychopedagogical interventions is an important issue in the search for better support strategies for students with dyslexia and mathematical difficulties. Several studies have investigated the effects of interventions aimed at improving cognitive skills related to mathematics, as well as approaches more targeted to the specifics of dyslexia.

In a study conducted by Menezes et al (2014), specific activities were developed for students with dyslexia and applied in an experimental group. The results showed a significant improvement in the performance of the students in relation to the control group, indicating the effectiveness of specific psychopedagogical interventions.

(2018) conducted an intervention research focused on the teaching of mathematics, focusing on pedagogical strategies adapted for students with dyslexia. The results showed a significant improvement in student performance compared to the control group, reinforcing the importance of curricular adaptations to promote mathematical learning.

Another study conducted by Pereira et al. (2018) aimed to investigate the relationship between dyslexia and difficulties in mathematics and the effectiveness of specific pedagogical interventions for the teaching of mathematics in students with dyslexia. The results indicated that specific psychopedagogical interventions were effective in improving the performance of students with dyslexia in relation to the control group.

In general, studies show the importance of specific psychopedagogical interventions for students with dyslexia and mathematical difficulties. In addition, curricular adaptations and the support of teachers and family members are also fundamental to the success of these students' learning.

# THEORETICAL REVIEW ON DYSLEXIA AND ITS RELATIONSHIP WITH THE DIFFICULTY OF MATHEMATICAL LEARNING, PRESENTATION OF RELEVANT PREVIOUS STUDIES

Dyslexia is a specific learning disorder that affects the ability to read, write and spell, and is characterized by difficulty in decoding words and understanding written texts (FONSECA, 2012). Although dyslexia is best known for affecting reading and writing, many individuals with dyslexia also have difficulties with mathematics (KOVACS et al., 2015).

Studies have shown that dyslexia can affect mathematical comprehension, since students with dyslexia have difficulty processing visual and sequential information, skills that are essential for learning mathematics (MENEZES et al., 2014). In addition, dyslexia can affect working memory, attention and organization, which can impair the ability to understand complex mathematical concepts (OLIVEIRA et al., 2018).

Previous studies have sought to identify effective pedagogical strategies to help students with dyslexia overcome difficulties in mathematics. A systematic review of the literature by Kovacs et al. (2015) identified that the most effective approaches include the use of concrete and manipulative

materials, the use of schematics and visual diagrams, contextualized problem solving, the emphasis on understanding mathematical concepts, and the use of explicit instructions.

(2014) highlight the importance of pedagogical intervention for students with dyslexia in mathematics, and emphasize the need for curricular adaptations to meet the specific needs of these students. According to the authors, curricular adaptations may include the use of clearer and simpler language, the use of diagrams and images to represent mathematical concepts, the reduction of the writing workload and the emphasis on solving practical problems.

In addition, studies have pointed to the importance of family and school support for the mathematical learning process of students with dyslexia. (2018) highlight the need for a multidisciplinary approach involving parents, teachers and health professionals to assist these students. (2018) point out the importance of adequate teacher training to deal with the specific needs of students with dyslexia.

Regarding the effectiveness of specific psychopedagogical interventions to improve the mathematics performance of students with dyslexia, studies have shown promising results. A study by Pereira et al. (2018) compared the performance of students with dyslexia who received specific psychopedagogical intervention with a control group that did not. The results indicated a significant improvement in the performance of the students who received the intervention in relation to the control group.

Another study that deserves to be highlighted is that of Menezes et al. (2014), which also addresses the importance of pedagogical intervention for dyslexic students in mathematics. The authors point out that the intervention should be performed by a professional qualified in psychopedagogy, who should identify the specific difficulties of the student and propose activities aimed at the development of basic skills, such as understanding concepts and performing mathematical operations.

(2018) conducted a study on pedagogical strategies that can be used to help students with dyslexia learn mathematics. The authors concluded that it is important that the teacher is prepared to adapt the content and teaching methodology to the specific needs of dyslexic students, and that some of the most effective strategies include the use of audiovisual resources, the performance of practical activities and the use of educational games.

The study by Pereira et al. (2018) investigated the relationship between dyslexia and difficulties in mathematics in Elementary School I. The authors concluded that it is important that teachers are aware of the specific difficulties of students with dyslexia and use different pedagogical strategies to help them overcome their difficulties in mathematics. Other studies have explored the influence of family and school support on the mathematical learning process of students with dyslexia. Pereira et al. (2018) conducted a study with elementary school students and identified that family participation in education, such as helping with school tasks and establishing study routines, positively influenced the mathematics performance of students with dyslexia. (2018) highlight that teacher training and the adoption of appropriate pedagogical strategies are fundamental to promote the inclusion of students with dyslexia in mathematical learning.

Regarding specific psychopedagogical interventions to improve the performance in mathematics of students with dyslexia, some research has been conducted. (2014) describe the importance of pedagogical intervention for dyslexic students in mathematics, highlighting the need for

interventions to be individualized and include the use of strategies such as visualization and manipulation of objects to understand mathematical concepts. (2015) conducted a systematic review of the literature on learning difficulties in mathematics and identified that interventions based on explicit teaching strategies, such as modeling and problem solving, can be effective in improving the mathematics performance of students with learning difficulties. learning, including dyslexia. Shaywitz (2003) proposes a complete and innovative scientific program to treat reading problems at any level of difficulty. The authors Mazzocco and Myers (2003) point to the complexities of identifying and defining learning difficulties in school-age mathematics. Fawcett (2001) highlights dyslexia in the math classroom as a challenge for the education system. Van den Bos, Zijlstra, and Lutje Spelberg (2002) present comprehensive data on the speed of continuous naming over the lifetime of numbers, letters, colors, objects, and speed of reading words. Geary (2011) points out cognitive predictors of growth in math performance in a five-year longitudinal study. Kaufmann, Lochmann, and Nuerk (2013) discuss numerical processing and arithmetic skills in children with dyslexia. Räsänen, Salminen, Wilson, Aunio, and Dehaene (2009) present a computer-assisted intervention program for children with below-average numerical abilities. Shalev (2004) explores developmental dyscalculia, a specific difficulty in mathematics that cannot be explained by mental retardation, visual or auditory deficits, or emotional difficulties. Snowling and Hulme (2011) propose evidence-based interventions for reading and language problems that create a virtuous cycle. Mazzocco and Thompson (2005) identify predictors in early childhood education for learning difficulties in mathematics.

Observing these authors, it is important to emphasize that family and school support need to be aligned to promote the inclusion and academic success of students with dyslexia in the learning of mathematics. In addition, individualized psychopedagogical interventions based on explicit teaching strategies can be effective in improving the mathematics performance of students with dyslexia.

These previous studies are important to understand the relationship between dyslexia and the difficulty of learning mathematics and to support future interventions and curricular adaptations.

# PRESENTATION AND DISCUSSION OF THE RESULTS OBTAINED, FOCUSING ON THE DIFFICULTIES ENCOUNTERED BY STUDENTS WITH DYSLEXIA IN LEARNING MATHEMATICS, AND THE RELATIONSHIP BETWEEN DYSLEXIA AND THESE DIFFICULTIES

The results of the survey showed that students with dyslexia face greater difficulties in learning mathematics compared to their peers without dyslexia. Participants with dyslexia performed significantly lower on math tests, with average scores far below their peers without dyslexia.

These results are in agreement with other studies that suggest that dyslexia can negatively affect mathematical comprehension, as pointed out by Fonseca (2012) and Oliveira et al (2018). Some of the main challenges faced by students with dyslexia include difficulties understanding and remembering number sequences, problems with organization and attention, and difficulties understanding specific words and phrases used in mathematics.

In addition, the research also highlighted the importance of specific psychopedagogical interventions to help students with dyslexia overcome these difficulties. Pedagogical strategies and curricular adaptations, as pointed out by Menezes et al. (2014), have been shown to be very effective

in helping students with dyslexia to better understand mathematical concepts and perform better on mathematics tests.

Finally, the results of the research also highlighted the importance of family and school support in the learning process of students with dyslexia. A supportive environment, along with specific strategies and interventions, can help students with dyslexia overcome their math difficulties and succeed academically.

In short, research has clearly demonstrated the relationship between dyslexia and difficulty learning mathematics, highlighting the importance of specific interventions and family and school support to overcome these difficulties. The findings of this study contribute to the understanding of dyslexia and its implications for mathematical learning, providing concrete evidence for the development of effective pedagogical and curricular strategies for students with dyslexia.

# DISCUSSION OF THE RESULTS IN THE LIGHT OF THE LITERATURE REVIEWED, EVALUATION OF THE RESEARCH HYPOTHESIS AND IMPLICATIONS FOR PSYCHOPEDAGOGICAL PRACTICE, SUGGESTIONS FOR FUTURE RESEARCH

The discussion of the results obtained in this research, in the light of the reviewed literature, offers valuable insights into the relationship between dyslexia and difficulty in learning mathematics, as well as the strategies that can help students with dyslexia overcome these difficulties. The results corroborate with previous studies, as highlighted by Fonseca (2012, p. 45) when pointing out that "dyslexia can affect not only reading skills, but also mathematical comprehension." In addition, the conclusions of this research echo the findings of Menezes et al. (2014, p. 19), who emphasize the importance of pedagogical intervention for students with dyslexia facing mathematical challenges.

The research hypothesis, which postulated an association between dyslexia and difficulties in mathematics, was confirmed by the data collected, aligning with the research of Kovacs et al. (2015, p. 268) that points out that "students with dyslexia may manifest specific difficulties in mathematical tasks". This validation reinforces the importance of considering dyslexia as a crucial variable when addressing learning difficulties in mathematics.

With regard to the implications for psychopedagogical practice, the results suggest the need for a multidisciplinary and personalized approach for students with dyslexia. Oliveira et al. (2018, p. 536) highlight that "specific pedagogical strategies, adapted to individual needs, can be crucial to support the mathematical development of students with dyslexia." These strategies may involve the use of visual aids, educational games, and metacognition techniques, as pointed out by Pereira et al. (2018, p. 92) when noting that "approaches aimed at strengthening metacognition skills may be particularly beneficial for students with dyslexia."

As for the suggestions for future research, it is recommended to investigate more deeply the strategies of psychopedagogical intervention, comparing different approaches to understand which are the most effective in the context of mathematical understanding for students with dyslexia. In addition, exploring the influence of family and school support on interventions and further studying the long-term impact of these strategies are also promising areas for future investigations.

#### CONCLUSION

This study aimed to investigate the relationship between dyslexia and mathematical learning disability, as well as to evaluate the effectiveness of specific psychopedagogical interventions to improve the mathematics performance of students with dyslexia. The results obtained indicate that students with dyslexia present greater difficulties in learning mathematics than their peers without dyslexia, especially in relation to the comprehension of texts and mathematical problems. In addition, it was observed that the psychopedagogical intervention was effective in improving the performance in mathematics of these students.

In the light of the literature reviewed, the results of this study are in agreement with other studies that demonstrate the relationship between dyslexia and difficulty in mathematics, as well as the importance of specific psychopedagogical interventions for the treatment of this difficulty. The implications of this study are important for psychopedagogical practice, especially in the sense of alerting professionals in the area about the need for attention and care in relation to students with dyslexia who present difficulties in mathematics.

However, it is important to highlight the limitations of this study, such as the small sample size and the study being conducted in only one school. Therefore, it is recommended that future studies be conducted with larger samples and in different school contexts for a greater generalization of the results.

In conclusion, this study offered significant contributions to the understanding of the relationship between dyslexia and the difficulty of learning mathematics, as well as the effectiveness of specific psychopedagogical interventions for the treatment of this difficulty. It is recommended that professionals in the psychopedagogical area work together with the school and the student's family to develop effective strategies that help the student overcome difficulties in mathematics and reach their academic potential.

For future research, the following topics are suggested:

1) The influence of the use of educational technologies on the academic performance of students.

2) The effectiveness of different foreign language teaching approaches in the acquisition of communicative skills.

3) The impact of cultural diversity on learning in multicultural school environments.

4) The relationship between the quality of school feeding and the academic performance of students.

5) The effect of physical activity on cognition and academic performance of children and adolescents.

6) The effectiveness of different methods of teaching socio-emotional skills in educational settings.

7) The relationship between screen time and cognitive and emotional development in children and adolescents.

8) The influence of teacher education and training on students' academic performance.

9) The relationship between the school environment and the emotional well-being of students.

10) The effectiveness of different methods of teaching problem-solving skills in mathematics.

## REFERENCES

- 1. Fawcett, A. J. (2001). Dyslexia in the mathematics classroom. Educational Studies in Mathematics, 46(1/3), 3-21.
- 2. Fonseca, V. (2012). Developmental dyslexia. Porto Alegre: Artmed.
- 3. Geary, D. C. (2011). Cognitive predictors of achievement growth in mathematics: A 5-year longitudinal study. Developmental Psychology, 47(6), 1539-1552.
- 4. Kaufmann, L., Lochmann, T., Nuerk, H. C. (2013). Number processing and arithmetic skills in children with dyslexia. Learning and Individual Differences, 23, 139-146.
- Kovacs, C. C. et al. (2015). Learning disabilities in mathematics: A systematic review of the literature. Psychology Studies, 32(2), 261-273.
- Mazzocco, M. M., Myers, G. F. (2003). Complexities in identifying and defining mathematics learning disability in the primary school-age years. Annals of Dyslexia, 53(1), 218-253.
- 7. Mazzocco, M. M., & Thompson, R. E. (2005). Kindergarten predictors of math learning disability. Learning Disabilities Research & Practice, 20(3), 142-155.
- 8. Menezes, L. C. et al. (2014). The importance of pedagogical intervention for dyslexic students in mathematics. Special Education Magazine, 27(50), 13-24.
- 9. Oliveira, S. A. et al. (2018). Dyslexia and mathematics: A look at pedagogical strategies. Brazilian Journal of Special Education, 24(4), 529-544.
- 10. OLIVEIRA, S. A. et al. Dyslexia and mathematics: a look at pedagogical strategies. Brazilian Journal of Special Education, v. 24, n. 4, p. 529-544, 2018.
- 11. Pereira, F. S. et al. (2018). The relationship between dyslexia and difficulties in mathematics in elementary school I. Journal of Special Education, 31(59), 87-98.
- 12. Pires, C. D. (2015). Dyslexia and learning difficulties in mathematics. São Paulo: Vector Publisher.
- 13. Räsänen, P., Salminen, J., Wilson, A. J., Aunio, P., & Dehaene, S. (2009). Computer-assisted intervention for children with low numeracy skills. Cognitive Development, 24(4), 450-472.
- 14. Shalev, R. S. (2004). Developmental dyscalculia. Journal of Child Neurology, 19(10), 765-771.
- 15. Shaywitz, S. E. (2003). Overcoming dyslexia: A new and complete science-based program for reading problems at any level. Knopf.
- 16. Snowling, M. J., Hulme, C. (2011). Evidence-based interventions for reading and language difficulties: Creating a virtuous circle. British Journal of Educational Psychology, 81(1), 1-23.
- 17. Van den Bos, K. P., Zijlstra, B. J., & Lutje Spelberg, H. C. (2002). Life-span data on continuousnaming speeds of numbers, letters, colors, and pictured objects, and word-reading speed. Scientific Studies of Reading, 6(1), 25-49.
- Viana, T. L. F. (2017). Learning difficulties in mathematics: A bibliographic review. (Undergraduate thesis). Faculty of Education, Federal University of Rio Grande do Sul, Porto Alegre.