

# Evaluating effective interventions for dyslexic children: Insights and future directions from a systematic literature review

**Rahma Hayati<sup>1</sup> , Prana Dwija Iswara<sup>2</sup> , Idat Muqodas<sup>3</sup> , Adit Yuliani<sup>4</sup> **

<sup>1, 2, 4</sup> Department of Elementary Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

<sup>3</sup> Department of Early Childhood Education, Universitas Pendidikan Indonesia, Bandung, Indonesia

<sup>\*)</sup> Corresponding author, e-mail: [rahmaahyati@upi.edu](mailto:rahmaahyati@upi.edu)

Received:	Accepted:	Published:
29 May 2024	30 July 2024	30 October 2024

## Abstract

Dyslexia is a disorder in the left brain's nervous system, which is crucial for identifying strophesymbolia to process meaning that will be used for reading, writing, and communication. Although dyslexia is a disorder that hinders normal learning processes, various interventions can be done to address the disorder. The purpose of this research is to provide a comprehensive understanding to researchers, prospective researchers, parents, and experts about the methods, measures, subjects, and approaches used by previous researchers related to interventions that can be given to dyslexic children. The focus of this research is on significant improvement and intelligent adaptation for future research design. This article adopts a qualitative approach with the Systematic Literature Review (SLR) research method. A literature review serves as the initial foundation to assist further research in the future to find information related to the topic to be studied and to avoid errors and benefit from their experience. The database used in the literature search is Harzing's Publish or Perish with online database sources from Google Scholar and Scopus. The search was done using several keywords in Indonesian and English separately, including 1) "Disleksia and Intervensi," and 2) "Dyslexia and Intervention." The search yielded 140 articles. After selection, coding, extraction, and analysis, only 13 articles met the criteria for analysis using the SLR method. All articles discussing this issue have a positive impact on addressing the disorders experienced by people with dyslexia. Proper management and continuous treatment processes are key to successfully implementing interventions. The findings imply that successful dyslexia interventions require a tailored approach that considers each child's unique needs and response to treatment. Furthermore, this study highlights the need for ongoing support and adaptive strategies to ensure the long-term effectiveness of these interventions, thereby enabling children with dyslexia to achieve improved literacy and communication skills over time.

**Keywords:** Dyslexia, Intervention, Systematic Literature Review (SLR), Individual Needs, Sustained Support

## Abstrak

Disleksia adalah gangguan pada sistem syaraf otak kiri yang berfungsi sebagai bagian penting dalam mengidentifikasi strophesymbolia untuk memproses makna yang nantinya akan digunakan untuk membaca, menulis, dan berkomunikasi. Walaupun disleksia adalah gangguan yang menghambat alur belajar normal, ada berbagai macam intervensi yang bisa dilakukan untuk mengatasi gangguan tersebut. Tujuan dari penelitian ini adalah memberikan pemahaman komprehensif kepada peneliti, calon peneliti, orang tua, dan tenaga ahli tentang metode, ukuran, subjek, dan pendekatan yang digunakan oleh para peneliti terdahulu terkait intervensi yang bisa diberikan kepada penderita disleksia. Fokus pada penelitian ini yaitu peningkatan yang signifikan serta adaptasi yang cerdas untuk desain penelitian selanjutnya. Artikel ini mengadopsi pendekatan kualitatif dengan metode penelitian *Systematic Literature Review* (SLR). *Literature review* menjadi fondasi awal dalam membantu penelitian lanjutan di masa depan untuk menemukan informasi terkait topik yang akan diteliti dan menghindari kesalahan serta mengambil manfaat dari pengalaman mereka. Basis data yang digunakan dalam penelusuran literatur yaitu menggunakan *Harzing's Publish or Perish* dengan sumber *database online* yang berasal dari *Google Scholar* dan *Scopus*. Pencarian dilakukan dengan menggunakan beberapa kata kunci dalam Bahasa Indonesia dan Bahasa Inggris

secara terpisah, antara lain: 1) "Disleksia dan Intervensi", dan 2) "Dyslexia and Intervention". Hasil dari pencarian tersebut diperoleh 140 artikel. Setelah melakukan seleksi, pengkodean, ekstraksi dan analisis hanya 13 artikel yang memenuhi kriteria untuk dianalisis menggunakan metode SLR. Semua artikel yang membahas hal tersebut memberikan pengaruh positif dalam mengatasi gangguan yang dialami oleh penderita disleksia. Penanganan yang tepat dan proses *treatment* yang berkesinambungan merupakan salah satu kunci dalam kesuksesan melakukan intervensi. Hasil penelitian ini mengimplikasikan bahwa intervensi disleksia yang berhasil memerlukan pendekatan yang disesuaikan dengan kebutuhan dan respons unik setiap anak terhadap perawatan. Selain itu, penelitian ini menekankan pentingnya dukungan berkelanjutan dan strategi adaptif untuk memastikan efektivitas jangka panjang dari intervensi ini, sehingga anak-anak dengan disleksia dapat mencapai peningkatan kemampuan literasi dan komunikasi seiring waktu.

**Kata Kunci:** Disleksia, Intervensi, Sistematis Literatur Review (SLR), Kebutuhan Individu, Keberlanjutan Dukungan



This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. ©2024 by author.

## INTRODUCTION

Dyslexia is a neurological learning disorder that impacts the brain's ability to process language and identify strephosymbolia, resulting in reading, writing, and spelling difficulties. Based on the specification of the disorder (Widyorini & Maria, 2019) revealed that dyslexia stems from an anomaly in the nerves of the left brain that regulate language and word order. These anomalies can later impact the processing of meaning from reading, writing, and communication.

Reinforcing the concept above (Brehmer et al., 2022) provides a clear illustration of the neural structure of the left brain to explain the challenges faced by dyslexic children:

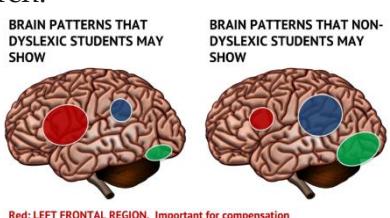


Figure 1. Left Brain Anatomy Between Dyslexic and Normal Children.

Based on the image above, it is understood that in typical cases, the nerves responsible for language, and speech are managed by three specific points in the left brain. However, in dyslexic children, only one nerve point is operational, and has to

handle all three tasks simultaneously. This dual function causes fatigue and suboptimal nerve performance, leading to difficulties interpreting, analyzing, and forming words.

A collaborative study between the International Dyslexia Association (IDA) and (Shaywitz & Shaywitz, 2020) underscores the significance of acknowledging the prevalence of dyslexia among children. The documented ratio of school-age children affected by dyslexia ranges from 5% to 17%, or approximately one in five children is susceptible to dyslexia.

Based on these data, conducting an in-depth study of this subject is imperative, as the prevalence of dyslexia is expected to rise in tandem with increasing birth rates. As posited by (Schulte-Körne, 2010), there is a neurological correlation between dyslexia sufferers based on lineage, suggesting that dyslexia is a disorder that can be passed on genetically from parents to children.

Extensive research on poor reading and spelling skills reveals that a striking 94% of dyslexic children at the primary school level grapple with phonological, visual, and auditory impairments (Le Jan et al., 2011). Specifically (Hulme & Snowling, 2016) stated that the characteristics of dyslexic children are usually difficulty recognizing printed words, pronouncing unfamiliar

words, and reading fluently. As such, dyslexic children often face significant barriers to learning, resulting in lower comprehension and learning speed compared to their peers (Olson et al., 2014).

These challenges can lead to being unfairly labeled as lazy, unmotivated, slow learners, or late bloomers, which may cause dyslexic children to question their intelligence due to slower comprehension and learning speed. In response to this, experts stress that despite being a learning disorder, children with dyslexia possess normal intellectual capacity (Serrano & Defior, 2008). Thus, it may be inferred that despite confronting obstacles in reading and writing, dyslexic children do not manifest a direct correlation between their challenges and their level of intelligence (Ferrer et al., 2010). Recognizing that dyslexic children may struggle with controlling mental functions and motivation, which can impede their learning. It's important to support and encourage dyslexic children, to receive the assistance they need to thrive.

Although dyslexia is not classified as a disease, (Sandman-Hurley, 2016) suggests that the difficulties faced by individuals with dyslexia can be overcome through a personalized educational plan, suitable interventions, skilled educators, and unwavering support from family, friends, and professionals. Interventions are an attempt to improve health and address disorders (Kemendikbud, 2023). Furthermore, attaining optimal outcomes in dyslexia interventions is contingent upon recognizing the individual's resolve to overcome the disorder.

As previously mentioned, interventions are implemented to help dyslexic overcome their challenges, and each child's intervention is different. Various internal and external factors

contribute to this, and it is hoped that with appropriate interventions, the difficulties faced by dyslexics can be effectively addressed. While dyslexia is a lifelong condition, sustained and consistent intervention can help dyslexic children keep up with their peers and have equal access to understanding and comprehending written material. Furthermore, it is anticipated that dyslexic will no longer feel inadequate or doubt their abilities and intelligence.

Despite limited research on dyslexia in Indonesia compared to other fields, it is our hope that this literature review can serve as a valuable resource for future researchers, parents, and experts seeking information on the variety of interventions available for dyslexic children. The digital trail has led to the publication of numerous articles and books on interventions for dyslexic children worldwide. Despite extensive research, there remains a need for more studies on dyslexia interventions in diverse cultural contexts, including Indonesia. The study is focused on significant advancements and astute adaptations for future research designs. However, there is still a lack of comprehensive reviews focusing on this area. This collection of articles will be thoroughly discussed and structured according to the rules of Systematic Literature Review (SLR) analysis. This article will review previous research related to interventions for dyslexic children from 2013 to 2023.

## **METHOD**

This article employs a qualitative approach in conjunction with a Systematic Literature Review (SLR) research method. In his work (Creswell, 2014), delineated a literature review as a comprehensive synthesis of journal articles, books, and other scholarly sources, encapsulating the

historical and present knowledge landscape. They also serve as a foundational resource, guiding follow-up research to avoid mistakes and benefit from previous experiences.

Its primary objective is to furnish researchers, prospective researchers, parents, and experts with a comprehensive comprehension of the methods, measures, subjects, and approaches employed by prior researchers with regard to interventions for dyslexic children. Dyslexia refers to a neurological learning disorder that impacts the brain's ability to process language and identify *strophosymbolia*, resulting in reading, writing, and spelling difficulties. Interventions are an attempt to improve health and address the disorders.

Upon completion of the article collection, a thorough evaluation was conducted to ascertain their viability for integration into the literature review. The articles were subsequently categorized into inclusion and exclusion criteria. Notably, one of the stipulated inclusion criteria for this review comprises peer-reviewed journal articles published between 2013 and 2023, with a specific focus on dyslexia interventions. One of the exclusion criteria includes non-peer-reviewed sources and studies not relevant to the discussion.

The literature search made use of Harzing's Publish or Perish database in conjunction with online sources from Google Scholar and Scopus. The search involved the use of various keywords in both Indonesian and English, including 1) "Disleksia and intervensi", and 2) "Dyslexia and Intervention". The search yielded 140 articles. This selection was done manually, taking into account the relevance of the articles to the topic being discussed. After the selection stage, the next steps involved coding, extraction, and analysis, which were

described in a spreadsheet to gather the necessary information.

Articles were screened based on their titles, abstracts, and full texts. Duplicates were removed using EndNote, and the remaining articles were assessed for relevance to the study's objectives. Data extraction involved collecting information on study design, sample size, intervention type, outcomes measured, and key findings. Each study was critically evaluated based on methodological quality, relevance to dyslexia interventions, and contributions to the field. A thematic analysis was conducted to identify common themes and trends.

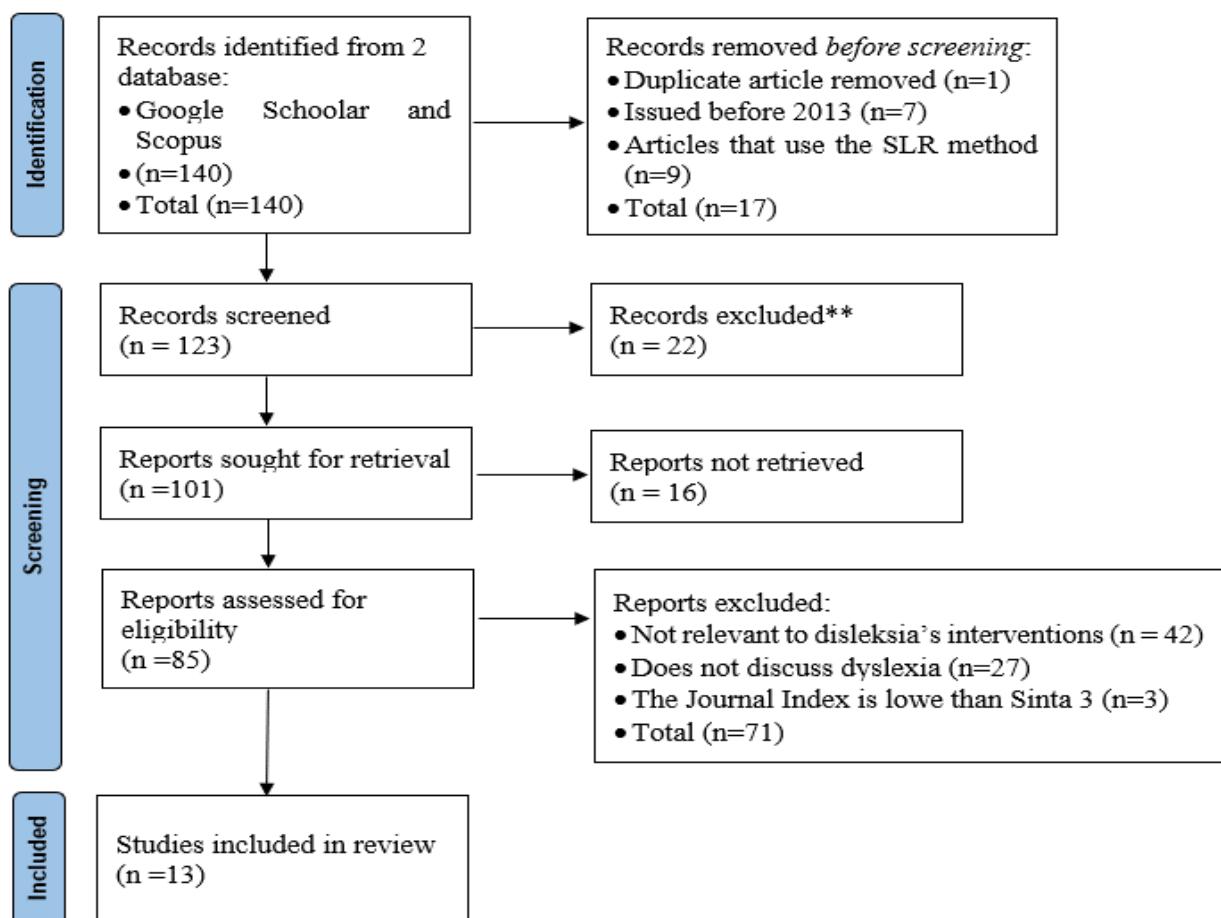
The procedural approach adopted for the literature review aligns with the framework expounded by (Creswell, 2014), thus endowing it with methodological rigor and scholarly integrity. Here are the steps:

1. Identify key terms to use in the search for literature
2. Locate literature about the topic by consulting several materials and databases, including those available at an academic library and on the internet websites.
3. Critically evaluate and select the literature for review
4. Organize the literature you have selected by abstracting or thinking notes on the literature and developing a visual diagram of it
5. Write a literature review that summarizes the literature for inclusion in the research report.

Concrete details regarding article analysis criteria to be integrated into the literature review are outlined in Table 1.

**Table 1. Inclusion and Exclusion Criteria of Articles**

Article Inclusion Criteria	Article Exclusion Criteria
<ol style="list-style-type: none"> <li>Published between 2013 and 2023.</li> <li>A Peer-reviewed journal.</li> <li>Using Indonesian and English.</li> <li>Indexed by Sinta and Scopus.</li> <li>Experimental research</li> <li>Discusses intervention for dyslexia.</li> </ol>	<ol style="list-style-type: none"> <li>A duplicate journal.</li> <li>Was published before 2013.</li> <li>Articles that utilize the SLR method.</li> <li>Contains references that are not articles.</li> <li>Not indexed by Sinta, or Scopus, and is a proceeding article.</li> <li>Not relevant to the intervention.</li> <li>Does not discuss dyslexia.</li> <li>A journal index is lower than Sinta 3.</li> </ol>



**Figure 2. Article Selection Flow Diagram**

## **RESULT**

Thirteen articles have been selected for further analysis using the SLR method. The comprehensive summary of the analysis of interventions for dyslexic children is presented in Table 2:

**Table 2. Analysis of the Reviewed Articles**

Author	Title	Subjects and Location of the Studies	Method	Psychological test used	Type of functions to be improved	Theme type of the intervention	Outcome
(Subramaniam et al., 2023)	The Multisensory Method in Literacy Mastery of Dyslexic Students	Ten dyslexic boys from Dyslexia Association Malaysia, Selangor, Malaysia.	This study utilized the A-B-A design to assess the difference in the subjects' abilities before and after treatment. The study also implemented the Structured Literacy Approach (SLA) to facilitate multisensory learning with the study subjects.	Using a Dys-Literacy Kit called VIKASE and other supporting props. Orton-Gillingham principles used in reading activities.	1. Reading skills. 2. Phonology processing 3. Sensitivity of sense work. 4. Literacy mastery for dyslexic children.	Creativity of intervention implementation to address impairments in dyslexic children.	This research helps to improve the literacy comprehension of dyslexic children and assists in identifying letters and sounds that are initially difficult to understand.
(Baharun et al., 2022)	Technical Assistance Program as A Media to Overcome the Problem of Children's Dyslexia in Madrasah Ibtidaiyah	Five dyslexic children in Grade 1 from MI Mambaul Ulum Kraksaan, Probolinggo, East Java, Indonesia.	This research employs a phenomenological approach. The data collection process involved planning, implementation, and evaluation. Data analysis utilizes the concept of Miles and Huberman.	Technical assistance preparation, implementation, and technical assistance evaluation.	1. Reading skills. 2. Spelling skill. 3. Teacher's understanding of student characteristics. 4. Appropriate technical guidance process.	Overcome the problem of dyslexic children.	Technical assistance successfully addressed reading disorders in dyslexic children at MI Mambaul Ulum Kraksaan.

Author	Title	Subjects and Location of the Studies	Method	Psychological test used	Type of functions to be improved	Theme type of the intervention	Outcome
(Sandra & Soetikno, 2022)	Applying Rapid Automated Naming (RAN) to a Single Case of Dyslexia in a Bilingual Child.	a six-year-old boy attends a private school in Bali, Indonesia.	This research uses a quantitative method with a single case design.	The implementation includes five formal tests as follows: Stanford Binet, CBCL, 3D Test (Early Detection of Dyslexia) which includes Rapid Automated Naming (RAN), Vineland Social Maturity Scale (VSMS), and Graphs (DAM, BAUM, HTP).	1. The speed of naming letters and combining words. 2. Reading speed skill 3. Phonological awareness. 4. Speed of automated naming. 5. Working memory.	Creativity of intervention implementation to address impairments in dyslexic children.	Modified RAN therapy for bilingual children is effective in helping children with dyslexia, especially those who have disorders at the sublexical level.
(Subramaniam & Nasir, 2020)	Multisensory Therapy in Letter Reversal of Dyslexic Pupils.	Students who are members of the Dyslexia Association of Malaysia, located in Ampang, Kuala Lumpur, Malaysia.	This research uses a quantitative method with the model used as multisensory.	Multisensory therapy that involves all the senses also known as VAKT (visual, audio, kinesthetic. And tactile).	The letter reversal problem.	Advantageous of a multisensory model in dyslexic children intervention.	Although the treatment time for each subject is different, the multisensory model can help the letter reversal problems experienced by the subjects.
(Nursara & Rofiah, 2018)	Efektivitas Media Sakura (Susun Huruf, Suku Kata dan Kata) Berbasis Multisensori untuk Meningkatkan Kemampuan Membaca bagi Anak Disleksia Sekolah Dasar.	Second-grade student from SD Inklusi N Sepu, Sleman, Jawa Tengah, Indonesia.	This study is an experimental research type of Single Subject Research (SSR) with an A-B-A design that aims to determine the effectiveness of using SAKURA media.	Using multisensory-based SAKURA media.	Reading skill.	Interventions that can help overcome disorders in dyslexic children.	The application of multisensory-based SAKURA media is effective in improving reading skills for dyslexic children in grade II elementary school.

Author	Title	Subjects and Location of the Studies	Method	Psychological test used	Type of functions to be improved	Theme type of the intervention	Outcome
(Martanti, 2018)	Metode Struktural Analitik Sintetik dalam Pembelajaran Anak Disleksia.	Three dyslexic children in 2nd grade from SDN Watuaji 1 Jepara, Jawa Tengah, Indonesia.	This research is a qualitative experimental research with the type of field research. The intervention process was conducted using the SAS method.	Structural analytic systematic.	Reading skills and co-operation.	The advantages of using linguistic principles in addressing disorders in dyslexic children.	The use of the SAS method can facilitate the learning process of reading for dyslexic children.
(Awada & Plana, 2018)	Multiple Strategies Approach and EFL Reading Comprehension of Learners with Dyslexia: Teachers' Perceptions.	Dyslexic students of 7th, 8th, and 9th grades in Beirut, Lebanon.	This study is qualitative experimental research that uses strategies of graphic organizers, prediction, inference, main idea identification, summarisation, and questioning.	Graphic organizers, visual displays, Mnemonic illustrations, Movie maker journaling and movie use, inference, predictions, and text structure awareness.	Reading skill.	A combination of interventions can be used to address reading disorders in dyslexic children.	The use of combined strategy instruction can assist dyslexic students in overcoming reading disabilities.
(Purnomo et al., 2017)	Pengembangan Game untuk Terapi Membaca bagi Anak Disleksia dan Diskalkulia.	Sixteen children in first grade from a primary school in Surakarta, Jawa Tengah, Indonesia.	This study is a developmental type of experimental research. The intervention used the game application "Two Dis".	Game "Two Dis".	Reading skill dan Numeracy skill	Development of interventions for dyslexic and dyscalculia children utilizing technology.	The design of the game application "Two Dis" gives the feel of playing and learning. This game is easy to play and has its charm.
(Fusco et al., 2015)	Efficacy of a Perceptual and Visual-Motor Skill Intervention Program for Students with Dyslexia.	20 students from third to fifth grade of a public elementary school in Marília, São Paulo, Brazil.	This study used a quantitative experimental method. The intervention was phonological education.	The Test of Visual-Perceptual Skills (TPVPS-3) and the quality of handwriting were analyzed using the Dysgraphia Scale.	Writing skill.	Creativity of intervention implementation to address impairments in dyslexic children.	Perceptual and Visual-Motor Skills are proven to be effective in improving visual perception skills and handwriting quality in dyslexic children.

Author	Title	Subjects and Location of the Studies	Method	Psychological test used	Type of functions to be improved	Theme type of the intervention	Outcome
(Faramarzi et al., 2014)	The effect of phonological educational intervention on the reading performance of students with developmental Dyslexia.	Sixteen dyslexic students in grade III from one of the primary schools in Isfahan, Iran.	This study is a quantitative experimental research with a phonetic learning method to assist the implementation of phonological education intervention.	Rion's Intelligence test and Demographic questionnaire.	Reading skill	Creativity of intervention implementation to address impairments in dyslexic children.	Phonological education intervention with the help of phonetic learning methods effectively affects the reading ability of dyslexic students.
(Subramaniam et al., 2013)	Multi-Senses Explication Activities Module for Dyslexic Children in Malaysia.	Five dyslexic children from Padang Temu National School in Malacca, Malaysia.	This research is an experimental study with information processing theory.	Multisensory exploration with the help of a multi-sensory learning module.	1. Mastery of letter and word concepts. 2. Reading skills.	Creativity of intervention implementation to address impairments in dyslexic children.	The Multi-Senses Explication Activities Module was found to be effective as a bridge to improve brain work.
(Franceschini et al., 2013)	Action Video Games Make Dyslexic Children Read Better.	Twenty dyslexic children.	This study is a developmental type of experimental research. The intervention used action video games.	The allure of playing action video games.	Reading skills, phonological, and concentration.	Development of interventions for dyslexic children utilizing technology.	Attentional abilities and reading speed have improved during action video game training.
(Luo et al., 2013)	Working memory training improves developmental dyslexia in Chinese children.	Thirty dyslexic children aged 8 to 11 years. Wuhan, Hubei Province, China.	This study is a quantitative study with a double-blind, paired designed study design.	Dyslexia checklist for Chinese children, Stroop task, corsi span task, Wechsler Intelligence.	Working memory and Reading skill	Creativity of intervention implementation to address impairments in dyslexic children.	Working memory training improved working memory in children with developmental dyslexia.

A PRISMA flow diagram was used to illustrate the identification and screening process, and studies were included in the review. The entire process of selecting articles meeting the criteria is presented in Figure 2. (Page et al., 2021). Thirteen articles have been selected for further analysis in the systematic literature review. The review identified several effective intervention strategies, including multisensory approaches, assistive technology, and tailored educational programs. The findings suggest that early and individualized interventions are crucial for supporting dyslexic students. Future research should focus on longitudinal studies to assess the long-term effectiveness of these interventions. The researcher has adopted the data analysis technique used by (Yuzaidy et al., 2018), considering specific criteria such as author, title, location of the studies, method, psychological test used, types of functions to be improved, themes type of intervention, and outcome.

Based on the analysis presented in Table 2, it is evident that a broad spectrum of interventions can be administered to dyslexic to help overcome their specific challenges. Embracing creativity and innovation in implementing these interventions has a positive impact on improving the expected outcomes. Additionally, the duration of each treatment is influenced by various internal and external factors, such as the situational context, student motivation, and the severity of dyslexia. Generally, it takes two to six months to observe the successful results of each treatment.

Throughout the intervention process, the support of parents and professionals played a crucial role in enhancing student motivation. As mentioned earlier, moral support is one of the fundamental elements

that must be taken into account. Without moral and material support from the closest individuals, especially parents, the success of the intervention is unlikely. While every intervention has its own set of advantages and disadvantages, it is imperative to acknowledge the dedication and credibility of previous researchers. They are intelligent individuals who bring creativity and innovation to maximize the interventions available for dyslexic children.

## **DISCUSSIONS**

This study has highlighted various intervention strategies for dyslexic children, each with its advantages and limitations. The objective of this study was to identify effective interventions for dyslexia. The elucidation is a crucial resource for potential researchers, parents, and experts to understand appropriate interventions for addressing the specific challenges encountered by dyslexic children. Furthermore, teachers must grasp students' learning characteristics to successfully attain learning objectives. This discussion will first summarize the key findings, then interpret their implications, address study limitations, and conclude with recommendations for practice and future research.

The study findings support the use of multisensory approaches and tailored educational plans as effective strategies. The study's insights into the effectiveness of the VIKASE model and the use of multisensory approaches provide valuable guidance for educators and parents because the VIKASE model used in the study is highly beneficial for facilitating the implementation of multisensory approaches (Gharaibeh & Dukmak, 2022). One limitation of this study is the limited variety of learning media used

during the intervention, which may not fully explore Indra's sensitivity.

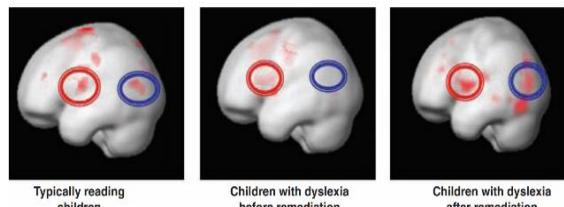
It was imperative to develop revolutionary multisensory approaches to effectively address dyslexia and utilize a combination of methodologies to establish a more structured treatment process. The intervention program involved exercises focusing on visual-motor visual-spatial coordination, shape constancy, sequential memory, figure-ground visual coordination, and visual closure. This research equips educators and parents with invaluable insights to devise impactful strategies for addressing letter reversal issues.

Educators should consider incorporating multisensory approaches and individualized learning plans to better support dyslexic students. The researchers explicitly recommended that future investigations should encompass both male and female students as samples. Future research should explore the long-term effects of different intervention strategies and include diverse populations to enhance generalizability. For instance, the use of the SAKURA media in public schools demonstrated a significant improvement in reading skills among dyslexic students. The intervention involving bilingual children showed that tailored approaches can enhance reading speed and phonological awareness.

The literature examining the aforementioned interventions consistently indicates a positive impact on ameliorating the challenges faced by dyslexic children. Proper handling and continuous treatment are key to successful intervention. Each child requires a tailored intervention. Hence, the treatment of dyslexia necessitates meticulous consideration of various internal and external factors.

Collaboration between parents and professionals is imperative throughout the intervention process.

The image Figure 3 shows the brain of a dyslexic child before and after intervention (Gabrieli, 2009):



**Figure 3. Brain Structure of Dyslexic Children Before and After Intervention.**

Based on the brain structure in the image, it can be inferred that only one nerve point in the left brain of dyslexic patients is active, while the other two nerves are inactive or experiencing dysfunction. However, after the intervention, there was a slight activation of the two previously passive nerve points. Although the movement and response from these points were not as robust as the other nerve points, this demonstrates that the right intervention helps dyslexics overcome their disorders.

## CONCLUSION

Dyslexia is a neurological learning disorder that impacts the brain's ability to process language and identify strephosymbolia, resulting in reading, writing, and spelling difficulties. As such, dyslexic children often face significant barriers to learning, resulting in lower comprehension and learning speed compared to their peers. These challenges can lead to being unfairly labeled as lazy, unmotivated, slow learners, or late bloomers, which may cause them to question their intelligence due to slower comprehension and learning speed. In response to this, experts stress that despite

dyslexia being a learning disorder, they possess normal intellectual capacity.

Based on these data, conducting an in-depth study of this subject is imperative, as the prevalence of dyslexia is expected to rise in tandem with increasing birth rates. As previously mentioned, interventions are implemented to help dyslexic overcome their challenges, and each child's intervention is different. Various internal and external factors contribute to this, and it is hoped that with appropriate interventions, the difficulties faced by dyslexics can be effectively addressed. While dyslexia is a lifelong condition, sustained and consistent intervention can help them to keep up with their peers and have equal access to understanding and comprehending written material.

The study findings support the use of multisensory approaches and tailored educational plans as effective strategies. It was imperative to develop revolutionary multisensory approaches to effectively address dyslexia and utilize a combination of methodologies to establish a more structured treatment process. The intervention program involved exercises focusing on visual-motor visual-spatial coordination, shape constancy, sequential memory, figure-ground visual coordination, and visual closure. In addition, the use of SAKURA media in public schools also demonstrated significant improvements in the reading ability of dyslexic students. The literature examining the aforementioned interventions consistently indicates a positive impact on ameliorating the challenges faced by dyslexic children.

## **FUNDING**

We, the authors of this article, declare that no funding source played a role in

developing this research. The entire process and writing of the article was conducted without financial support from any party, thus ensuring our research's independence, objectivity, and integrity.

## **CREDIT AUTHORSHIP CONTRIBUTION STATEMENT**

**Rahma Hayati:** Conceptualization, Data curation, Funding, Writing – original draft, Writing – review & editing, **Prana Dwija Iswara:** Writing – review & editing, **Idat Muqodas:** Conceptualization, Writing – review & editing, **Adit Yuliani:** Writing – review & editing.

## **DECLARATION OF COMPETING INTEREST**

The Authors Declare No Conflict of Interest in This Paper.

## **ACKNOWLEDGMENTS**

We express our gratitude to Dr. Prana Dwija Iswara, M.Pd., and Dr. Idat Muqodas, M.Pd., Kons. for their guidance and suggestions to improve this research.

## **REFERENCES**

Awada, G., & Plana, M. G.-C. (2018). Multiple Strategies Approach and EFL Reading Comprehension of Learners with Dyslexia: Teachers' Perceptions. *International Journal of Instruction*, 11(3), 463–476.  
<https://doi.org/10.12973/iji.2018.11332a>

Baharun, H., Trisilia, N., Munjat, S. M., & Hussen, B. T. A.-Z. (2022). Technical Assistance Program as A Media to Overcome the Problem of Children's Dyslexia in Madrasah Ibtidaiyah. *Al Ibtida: Jurnal Pendidikan Guru MI*, 9(1), 74–87.  
<https://doi.org/10.24235/al.ibtida.snj.v9i1.9804>

Brehmer, J., Daniels, P., Edwards, C. E., Proebstle, S., Rink, T. L., Rotarius, N., St. Martin, K., & Sayko, S. (2022). *Michigan Dyslexia Handbook: A Guide to Accelerating Learner Outcomes in Literacy* (1.0). Michigan Department of Education. [www.michigan.gov/mde](http://www.michigan.gov/mde)

Creswell, J. W. (2014). *Educational Research: Planning, Conducting, and Evaluating Quantitative and Qualitative Research* (Fifth). Pearson Education.

Faramarzi, S., Ghorbanchian, E., Gharaie, S., Sayyed, S. R. P., & Yarmohamadian, A. (2014). The effect of phonological educational intervention on the reading performance of students with developmental Dyslexia. *Elixir Psychology*, 72(4), 25532–25536.

Ferrer, E., Shaywitz, B. A., Holahan, J. M., Marchione, K., & Shaywitz, S. E. (2010). Uncoupling of Reading and IQ Over Time: Empirical Evidence for a Definition of Dyslexia. *Psychological Science*, 21(1), 93–101. <https://doi.org/10.1177/0956797609354084>

Franceschini, S., Gori, S., Ruffino, M., Viola, S., Molteni, M., & Facoetti, A. (2013). Action Video Games Make Dyslexic Children Read Better. *Current Biology*, 23(6), 462–466. <https://doi.org/10.1016/j.cub.2013.01.044>

Fusco, N., Germano, G. D., & Capellini, S. A. (2015). Efficacy of a perceptual and visual-motor skill intervention program for students with dyslexia. *CoDAS*, 27(2), 128–134. <https://doi.org/10.1590/2317-1782/20152014013>

Gabrieli, J. D. E. (2009). Dyslexia: A New Synergy Between Education and Cognitive Neuroscience. *Science*, 325(5938), 280–283. <https://doi.org/10.1126/science.1171999>

Hulme, C., & Snowling, M. J. (2016). Reading disorders and dyslexia. *Current Opinion in Pediatrics*, 28(6), 731–735. <https://doi.org/10.1097/MOP.0000000000000411>

Kemendikbud. (2023). *KBBI Edisi V* (5th ed.). Badan Pengembangan Bahasa dan Pembukuan, Kementerian Pendidikan dan Kebudayaan. <https://kbbi.kemdikbud.go.id/Berand>

Le Jan, G., Le Bouquin-Jeannès, R., Costet, N., Trolès, N., Scalart, P., Pichancourt, D., Faucon, G., & Gombert, J.-E. (2011). Multivariate predictive model for dyslexia diagnosis. *Annals of Dyslexia*, 61(1), 1–20. <https://doi.org/10.1007/s11881-010-0038-5>

Luo, Y., Wang, J., Wu, H., Zhu, D., & Zhang, Y. (2013). Working-memory training improves developmental dyslexia in Chinese children. *Neural Regeneration Research*, 8(5), 452–460. <https://doi.org/doi:10.3969/j.issn.1673-5374.2013.05.009>

Martanti, F. (2018). Metode Struktural Analitik Sintetik dalam Pembelajaran Anak Disleksia. *Al-Bidayah: Jurnal Pendidikan Dasar Islam*, 10(1), 17–28. <https://doi.org/10.14421/al-bidayah.v10i1.127>

Nursara, S., & Rofiah, N. H. (2018). Efektivitas Media SAKURA (Susun Huruf, Suku Kata, dan Kata) Berbasis Multisensori untuk Meningkatkan Kemampuan Membaca bagi Anak Disleksia di Sekolah Dasar. *Jurnal Fundadikdas (Fundamental Pendidikan Dasar)*, 1(2), 140–150. <https://doi.org/10.12928/fundadikdas.v1i2.1726>

Olson, R. K., Keenan, J. M., Byrne, B., & Samuelsson, S. (2014). Why Do Children Differ in Their Development of Reading and Related Skills? *Scientific*

*Studies of Reading*, 18(1), 38–54. <https://doi.org/10.1080/10888438.2013.800521>

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., ... Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, 10(1), 89–99. <https://doi.org/10.1186/s13643-021-01626-4>

Purnomo, A., Azizah, I. N., Hartono, R., Hartatik, H., & Tri Bawono, S. A. (2017). Pengembangan Game untuk Terapi Membaca bagi Anak Disleksia dan Diskalkulia. *Simetris: Jurnal Teknik Mesin, Elektro dan Ilmu Komputer*, 8(2), 497–506. <https://doi.org/10.24176/simet.v8i2.1351>

Sandman-Hurley, K. (2016). *Dyslexia Advocate! : How to Advocate for a Child With Dyslexia within the Problem Education System* (1st ed.). Jessica Kingsley Publishers. <http://lccn.loc.gov/2015040989>

Sandra, L., & Soetikno, N. (2022). *Applying Rapid Automatized Naming (RAN) To A Single Case Of Dyslexia In A Bilingual Child*. 6(8), 7774–7781.

Schulte-Körne, G. (2010). The Prevention, Diagnosis, and Treatment of Dyslexia. *Deutsches Ärzteblatt International*, 107(41), 718–727. <https://doi.org/10.3238/arztebl.2010.0718>

Serrano, F., & Defior, S. (2008). Dyslexia speed problems in a transparent orthography. *Annals of Dyslexia*, 58(1), 81–95. <https://doi.org/10.1007/s11881-008-0013-6>

Shaywitz, S. E., & Shaywitz, J. (2020). *Overcoming Dyslexia: Second Edition, Completely Revised and Updated*. Sheldon Press.

Subramaniam, V., Kunasegran, K., & Senthil, P. (2023). The Multisensory Method in Literacy Mastery of Dyslexic Students. *Acta Biomed*, 94(1), 1250–1272.

Subramaniam, V., Mallan, V. K., & Mat, N. H. C. (2013). Multi-Senses Explication Activities Module for Dyslexic Children in Malaysia. *Asian Social Science*, 9(7), 241–267. <https://doi.org/10.5539/ass.v9n7p241>

Subramaniam, V., & Nasir, N. S. A. (2020). Multisensory Therapy in Letter Reversal of Dyslexic Pupils. *Universal Journal of Educational Research*, 8(12), 7118–7130. <https://doi.org/10.13189/ujer.2020.081279>

Widyorini, E., & Maria, J. van T. (2019). *Disleksia: Deteksi, Diagnosis, Penanganan di Sekolah dan di Rumah* (2nd ed.). Prenadamedia Group.

Yuzaidey, N. A. M., Din, C. N., Ahmad, M., Ibrahim, N., Razak, R. A., & Harun, D. (2018). Interventions for children with dyslexia: A review on current intervention methods. *Med J. Malaysia*, 73(5), 311–320.