Exploring Strategies to Support Elementary Students with Reading Difficulties: A Literature Review

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ABSTRACT:

This systematic literature review examines recent empirical evidence on interventions designed to improve reading outcomes for elementary students with reading difficulties, particularly those with specific learning disabilities (SLDs). The primary objective is to identify which intervention approaches demonstrate the most consistent improvements in decoding, fluency, and comprehension. Findings indicate that early interventions targeting phonological awareness and print knowledge are strongly associated with gains in foundational decoding skills and prevention of persistent reading failure. Multisensory approaches that integrate visual, auditory, and kinesthetic-tactile modalities show consistent improvements in phonological processing and word recognition, especially for students who do not respond to traditional instruction. Technology-based interventions, including computer-assisted instruction and tablet applications, provide adaptive and engaging learning environments, with evidence supporting gains in phonics and fluency, though results for comprehension are more variable. Overall, the review concludes that structured, explicit phonological instruction combined with individualized implementation yields the most effective outcomes.

Keywords: reading difficulties, specific learning disabilities, interventions, elementary students.

INTRODUCTION

Reading ability encompasses more than merely deciphering words; it encompasses comprehension, critical thinking, and an enduring passion for reading. If students lack reading skills, they cannot be expected to be successful readers and thus cannot achieve the required level of comprehension (Kaya, 2015). Therefore, reading is essential for learning and growth, as it enables the acquisition of knowledge and understanding. A well-read society surpasses other nations in educational attainment.

Beyond its individual benefits, reading proficiency is widely recognized as a cornerstone of human capital development, economic competitiveness, and social participation across cultures and nations (Hussien, 2023; Tepetaş & Erol, 2021).

Reading ability is a foundational skill that precedes reading comprehension. It involves recognizing letters, words, and primary language rules (Arcos, 2018). Teaching reading can significantly enhance students' reading skills, as shown in a study conducted by Kaya (2015). Establishing a solid

foundation in reading skills in the early years of education is crucial for a child's mental and emotional development, as it opens a world of opportunities for their future. Effective reading instruction supports academic success and promotes personal and societal growth (Qizi, 2024). However, despite global recognition of its importance, reading achievement levels remain uneven across countries, languages, and educational systems, highlighting persistent disparities in literacy outcomes worldwide. This evidence is substantial and multifaceted. Liu (2024) analyzed PISA 2022 data across diverse countries, finding that disparities in students' reading abilities stem from multiple factors. Gromada et al. (2019) examined 37 EU and OECD countries using PISA 2009 and 2015 data and documented significant inequality in reading outcomes. Zhang and Holden (2025) studied 11 African countries, revealing alarmingly low levels of reading skills, considerable variation, and substantial differences between disadvantaged and advantaged children. Wagner (2017) noted that hundreds of millions of children globally have very low reading scores, even after many have attended school for two or more years. Marôco et al. (2020) confirmed between-country variation in PIRLS 2016 results, indicating persistent disparities across educational systems.

Identifying and addressing reading difficulties early is not just a proactive measure but an urgent necessity that helps prevent long-term academic challenges. Children with reading difficulty often experience academic challenges, such as repeating grades or dropping out (Qizi, 2024). Specific Learning Disabilities (SLDs) are defined as neurodevelopmental disorders characterized by persistent difficulties in reading, writing, and/or mathematics that are not primarily due to intellectual disabilities, sensory impairments, or inadequate instruction (American Psychiatric Association, 2022). SLDs are marked by significant and enduring academic skill deficits that interfere with school performance despite appropriate educational opportunities. More specifically, when addressing reading difficulties among students with specific learning disabilities (SLDs), it is essential to focus on two main aspects: identifying the types of difficulties readers encounter and determining which interventions to emphasize during instruction (Al Otaiba et al., 2023). Most students with SLDs face challenges with reading (Al Otaiba et al., 2023). These individuals often struggle with fundamental reading abilities from a young age (Elhoweris, 2017; Vaughn et al., 2002). Several studies have shown that approximately 85% of students with learning disabilities primarily struggle with reading (e.g., Deniz & Yavuz, 2020; Hussien, 2023; Oluoch-Suleh & Ombara, 2023; Stevens et al., 2021). Students who read below grade level after the early elementary years often require assistance with word-level decoding, reading fluency, and phonemic awareness, all of which are essential for accurate word reading (Oakhill & Cain, 2012; Oluoch-Suleh & Ombara, 2023; Stevens et al., 2021). A key factor contributing to word recognition is phonological deficits, which hinder the ability to identify and manipulate phonemes or individual sounds within words. This deficit impairs students' capacity to decode words accurately and efficiently, leading to significant reading difficulties (Valde, 2024). Such challenges often stem from difficulties associating letters with their sounds, breaking words into syllables, limited attention spans, and insufficient parental support (Valde, 2024). Importantly, these reading-related challenges are documented across alphabetic and non-alphabetic languages and across diverse cultural and socioeconomic contexts, indicating that reading difficulties constitute a global educational concern rather than a localized issue. For example, Maunsell (2020) explicitly frames dyslexia as "a global issue" encompassing "a range of language and literacy cultures" with cross-linguistic and cross-cultural variations in definitions, diagnostic measures, and support procedures. Consequently, it is crucial to explore and implement effective interventions and services to address this pervasive problem (Kilag et al., 2024).

Research indicates that approximately 80–90% of special education services for students with SLDs address reading difficulties (Al Otaiba et al., 2023; Kavale & Forness, 2000; Shapiro et al., 2002). For example, according to a 2019 report from the National Center for Education Statistics, only a third of fourth-grade students in the United States reach proficient reading levels. Among students

with SLDs, just 37% perform at a basic level (NCES, 2019). Similarly, international large-scale assessments have consistently reported substantial proportions of students performing below minimum proficiency levels in reading, underscoring the widespread and cross-cultural nature of the problem (Liu, 2024; Wagner, 2017). Based on that, research emphasized the need to better understand recent evidence on reading interventions, particularly at the elementary stage (Al Otaiba et al., 2023; Petscher et al., 2020; Youman & Mather, 2018). In the Arab region, estimates suggest that more than 15% of Arab students experience reading difficulties (Aldakhil, 2024). Specifically, 11% of primary boys' students struggle at higher rates, and the prevalence of reading difficulties is higher in the Gulf region (24%) compared to the non-Gulf region (13%) (Aldakhil, 2024). It is essential to prioritize and improve reading instruction in Arabic. Research has shown that students with SLDs often develop their reading skills in Arabic at a lower rate than their peers learning other languages (Al Otaiba et al., 2023; Harris & Graham, 2019; Obaid, 2019). These students face significant challenges in reading Arabic, which can negatively impact their academic performance and emotional well-being. Beyond academic consequences, persistent reading failure is associated with reduced self-esteem, behavioral difficulties, limited employment opportunities, and broader social exclusion, amplifying its long-term societal impact (Smart et al., 2017; Zuppardo et al., 2023). To address these challenges, it is essential to tailor reading instruction to meet their diverse needs. This can be achieved through individualized strategies, multisensory approaches, and assistive technologies. Such measures are crucial for closing the reading ability gap and promoting inclusive education (Harris & Graham, 2019; Alawadh, 2016; Shaywitz, 2008).

The current body of literature offers a critical understanding of effective reading interventions for elementary students with reading difficulties. Researchers have analyzed the literature to guide research and practical application. However, despite the growing number of intervention studies, gaps remain in synthesizing recent evidence across cultural and linguistic contexts, particularly in underrepresented regions such as the Arab world. Moreover, limited attention has been given to comparing intervention characteristics, methodological rigor, and outcome measures across studies conducted between 2020 and 2024. This article presents key findings from research conducted from 2020 to 2024, providing additional insights into current knowledge and remaining gaps in understanding reading interventions for children who struggle significantly with learning to read. By systematically examining recent intervention research, this review seeks to clarify what is known, identify persisting research gaps, and highlight the urgent need for culturally responsive, evidence-based practices to address the global prevalence and impact of reading difficulties.

METHODOLOGY

This research involved conducting a systematic literature review and employing thematic analysis as the research method (Creswell, 2009). The literature review focused on recent studies published between 2020 and 2024. These selected articles examine updated interventions for specific learning disabilities (SLDs) and identify knowledge gaps through a thorough review of recent literature on the effectiveness of interventions for reading difficulties and their potential for future research. According to Paré and Kitsiou (2017), a literature review is crucial for summarizing existing knowledge on a subject, recognizing patterns in a particular research area, collecting empirical data to support evidence-based practice, creating new frameworks or theories, and pinpointing areas for further investigation. Therefore, this research approach is suitable for exploring the emerging issue of reading difficulties and potential interventions.

Search Strategy and Data Sources

First, the researchers conducted a systematic search of electronic databases to identify relevant studies addressing reading difficulties and structured interventions for students with SLDs. The databases searched included Connected Papers, Google Scholar, SCOPUS, and the university e-library. The search was conducted between March 2024 and August 2024. Boolean operators (AND, OR) were used to refine the search strategy.

Example search strings included: ("specific learning disability" OR "SLD") AND ("reading difficulties" OR "reading disorder") AND ("intervention" OR "structured literacy") AND ("elementary students" OR "primary school").

The initial search yielded 428 records. After removing duplicates (68 records), 360 articles remained for title and abstract screening. After screening for inclusion and exclusion criteria, 112 full-text articles were assessed for eligibility. Of these, 55 articles were excluded due to not meeting population, intervention, or methodological criteria. Ultimately, 57 studies met all eligibility requirements and were included in the final thematic analysis. See Figure 1

Second, researchers discussed and agreed on explicit inclusion and exclusion criteria before the screening process to ensure consistency and reduce selection bias.

Inclusion Criteria:

1. Articles published between 2020 and 2024.

2. Peer-reviewed empirical research articles and systematic review studies.

3. Studies focusing on reading difficulties among elementary/primary school students diagnosed with SLD.

4. Studies examining structured or evidence-based reading interventions aimed at improving decoding, phonemic awareness, fluency, vocabulary, or reading comprehension.

Exclusion Criteria:

1. Studies focusing on secondary or postsecondary populations.

2. Articles not published in peer-reviewed journals (e.g., newspaper articles, opinion papers).

3. Studies addressing general literacy without specific reference to SLD or diagnosed reading disabilities.

4. Articles not available in full text or not published in English.

Structured reading interventions are instructional approaches that explicitly teach the connection between spoken sounds and written symbols, emphasizing systematic phonics, decoding, encoding, vocabulary development, and word structure (Sayeski & Hurford, 2022).
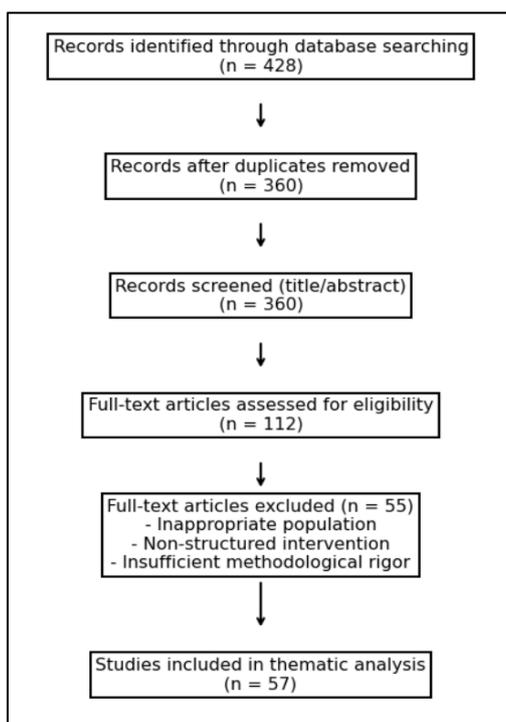

Figure 1. PRISMA Flow Chart of Study Selection Process

Data Analysis and Thematic Synthesis

After the final selection of studies, thematic analysis was conducted to identify recurring patterns, intervention characteristics, targeted reading skills, and reported outcomes. Studies were coded according to intervention type, duration, participant characteristics, research design, and measured outcomes. To ensure objectivity in thematic generation, two researchers independently coded the included studies and collaboratively developed the thematic categories. Inter-coder agreement was established by comparing coding results, and any discrepancies were discussed until consensus was reached. Emerging themes were compared across studies to identify consistencies, differences, and research gaps.

Validity and Reliability Procedures

To enhance the credibility and reliability of the review, several measures were implemented. First, clear inclusion and exclusion criteria were established prior to screening. Second, two researchers independently reviewed titles, abstracts, and full texts to ensure consistency in study selection, and discrepancies were resolved through discussion. Third, studies were selected from reputable indexed databases to ensure academic quality. Additionally, only peer-reviewed publications were included to strengthen the validity of the findings. A transparent documentation of the search and selection process was maintained to enhance replicability.

RESULTS

The research intervention aimed to help two main groups of students struggling with reading. The first group includes students with difficulty understanding language but proficient in code-focused skills, such as those with world-level reading difficulties. The second group consists of students who struggle with both code-focused and meaning-focused abilities (Elliott, 2020; Snowling et al., 2020). If left unaddressed, significant reading difficulties, including low achievement in reading and spelling, can persist and have a negative impact on comprehension (Cervetti et al., 2020). Without targeted interventions, these difficulties may lead to a persistent pattern of inadequate response to intervention (e.g., Miciak & Fletcher, 2020).

Learners with primarily word-level reading difficulties struggle to develop critical abilities related to cracking the code that allows them to decode and spell words and read fluently (Ehri, 2020). This can have significant long-term negative consequences for students' academic and lifelong success (Hussien, 2023). Accordingly, reading disabilities may require more intensive intervention (Al Otaiba et al., 2023).

Based on research, the best intervention strategies for students with reading difficulties can be thematically classified into three main categories: early, multisensory, and technology-based. In the upcoming section, empirical studies and reviews will thoroughly explain each category.

Category #1: Strategies of Early-Intervention

Successful foundational early intervention strategies aim to systematically improve crucial reading abilities such as phonemic awareness, phonics, fluency, and word recognition. Some of the most well-known and effective strategies include the Heggerty Phonological Awareness intervention, which offers explicit, systematic instruction for learners. Each lesson follows a clear, step-by-step script and spans 12 weeks of daily lessons that emphasize syllable and phoneme work. These lessons are conducted orally to help students enhance their auditory skills (Heggerty, 2023). This evidence-based curriculum focuses on developing early reading abilities for pre-kindergarten to first grade. Daily 10–12-minute lessons cover key phonological awareness elements such as rhyming, blending, segmenting, and syllable counting, providing structured instruction to build foundational skills (Heggerty, 2020). The syllabus is divided into skill segments taught directly and revisited in subsequent lessons for reinforcement. The curriculum also includes scaffolding techniques that gradually progress from more straightforward to more advanced skills as students develop, helping struggling readers acquire the phonemic skills necessary for decoding and reading (Heggerty, 2020; Clemens et al., 2021).

Using Heggerty intervention strategies, students can progressively develop their decoding skills. For instance, Melesse and Enyew (2020) found that direct phonemic awareness instruction significantly enhances primary students' reading abilities. Similarly, Gesel et al. (2021) noted that systematic phonemic awareness strategies improve early reading skills. Early interventions in phonemic awareness have been shown to support reading skills throughout elementary school (Bratsch-Hines et al., 2020; Coyne et al., 2021; Melesse & Enyew, 2020; Thangarajathi & Menaha, 2020). Coyne et al. (2021) studied the Heggerty Phonological Awareness strategies with kindergarten and first-grade students. Those in the Heggerty group outperformed peers in phoneme awareness tasks, but no significant differences were found in pseudoword decoding or oral reading fluency. This highlights the importance of Heggerty's strategies for developing essential reading skills among struggling readers, with benefits extending beyond initial instruction. (Bratsch-Hines et al., 2020; Melesse & Enyew, 2020; Siegelman et al., 2022; Thangarajathi & Menaha, 2020). Also, Fox's (2024) study found that fourth graders who received direct phonemic awareness instruction showed more significant word recognition gains than their peers. These results align with existing studies highlighting the importance of explicit early teaching of phonemic awareness in reading instruction (Ciesielski & Creaghead, 2020; Rehfield et al., 2022). Heggerty advocates teaching phonemic awareness in various formats, including whole-group, small-group, one-on-one, and intervention settings (Heggerty, 2023).

It is recommended to use this warm-up strategy before teaching phonics to activate students' auditory processing (VanHekken & Bottari, 2022). Vetsch-Larson (2022) highlighted that the Haggerty Phonemic Awareness strategies were implemented in large groups before small-group instruction. While the strategies effectively included hand gestures for visual learners, not all students had equal opportunities to participate. More proficient students could respond quickly, which put those still mastering phonemes at a disadvantage. The researcher was particularly concerned about students who required small-group instruction due

to challenges with the alphabetic principle and reading fluency, as many first graders entered the strategies with below-average academic performance. Hauck (2021) found that Heggerty strategies effectively support struggling second-grade readers when used alongside their regular curriculum. Students needing intensive help, based on DIBELS scores, participated in 35-minute virtual sessions one to three times a week for eight weeks. Progress monitoring indicated improvements in foundational skills such as short-vowel accuracy, b/d letter reversals, phonetic decoding, and oral reading fluency, suggesting that these interventions can benefit at-risk students (Hauck, 2021).

The Heggerty Phonological Awareness Strategies offer numerous benefits for enhancing early reading abilities. This intervention features well-structured, concise lessons that can be easily incorporated into classroom schedules. Strategies are conducted orally, which helps to strengthen auditory skills. This makes them especially effective for pre-readers and students developing their reading abilities. The consistent, repetitive nature of the strategies is particularly advantageous for students with special needs, fostering confidence and reducing cognitive demand. Research has demonstrated improvements in decoding and fluency. Moreover, Heggerty's intervention is budget-friendly, demands minimal resources, and offers optional professional development to assist teachers in its application. It enhances existing educational strategies as a supplementary resource, making it an invaluable teacher asset (Heggerty, 2024).

Despite its strengths, the intervention lacks multisensory strategies, which may not fully engage learners with diverse needs. Additionally, its structured design requires teachers to be proficient in practical implementation. While the activities can benefit younger learners, they may appear too simplistic or disengaging for older students. Furthermore, the absence of built-in assessment tools makes it challenging to track progress. The program's reliance on oral activities may also restrict the application of skills in real-text reading, and its structure may not adequately meet the individualized needs of all students. Moreover,

adaptations may be necessary to ensure the strategies are culturally and linguistically appropriate for English Language Learners and students from diverse backgrounds (Pennington Publishing, 2021; Wanger, 2017).

Category #2: Multisensory Sensory Interventions

Multisensory instruction is a process that involves the simultaneous use of various senses, including sight, hearing, touch, and movement, to help students connect with and learn concepts. It is recognized as "the most effective strategy for children with reading difficulties" (Institute for Multi-Sensory Education, 2020, October 12). For example, visual strategies involve observing words and graphemes using charts, flashcards, lists, visual cues, and pictures. Auditory strategies involve listening to sounds and directions, rhymes, songs, and mnemonics. Kinesthetic and tactile strategies involve fine motor movements such as finger tapping, manipulating objects with hands, writing graphemes in sand, finger tracing, and whole-body movements like arm tapping and moving to aid in focus and learning. Most early reading strategies focus on the visual and auditory aspects, with some incorporating kinesthetic or tactile activities, such as handwriting practice and spelling words (Oluoch-Suleh & Ombara, 2023; Putri & Hendriani, 2024; Stevens et al., 2021).

Various empirical studies have used different strategies for multisensory learning, demonstrating their effectiveness in helping students with reading difficulties. For example, the Orton-Gillingham (OG) is a primary strategy used to address sensory deficiencies and has proven highly effective (Hussien, 2023; Stevens et al., 2021). It is described as a 'direct, explicit, multisensory, structured, sequential, diagnostic, and prescriptive' strategy (OG Academy, 2020, October 14) and is commonly employed for students with reading disabilities (Pack, 2023). The OG strategies make learning clear and structured by using direct, explicit instruction, modeling, guided practice, and opportunities for feedback (Pack, 2023).

The OG strategies use a multisensory method that enhances learning and integrates auditory, visual, and kinesthetic pathways. Reading abilities are taught sequentially, from simple to complex, with ongoing reviews to ensure retention. Diagnostic tools monitor student responses, identify challenges, and measure progress, while lessons are tailored to address specific learner needs and build on prior achievements (Austin et al., 2023; Hussien, 2023; Stevens et al., 2021). Therefore, the OG strategies are practical because they use a comprehensive, structured, incremental, personalized, phonics-centered, and targeted teaching method (Bin Saddiq, 2021; Valde, 2024). The OG begins by linking sounds to symbols, the fundamental components of written language. It systematically guides students in understanding words, expressions, sentences, and stories by blending sounds using auditory, visual, and tactile learning strategies (Neuss, 2021; Valde, 2024).

Empirically, Valde (2024) conducted a study on the effectiveness of the OG. The study found a noticeable improvement in all students' reading abilities, with each progressing from non-reader to frustrated level. The study underscores the importance of evidence-based strategies, such as the OG, and emphasizes the significance of multisensory techniques in supporting students' development of reading skills. However, it is not just about the language; the context in which OG is applied can also affect its success or failure in implementation. This was noted by Oluoch-Suleh and Ombara (2023), who discussed the context in which teachers often lack training in OG's strategies and are overworked due to inadequate resources and high student-teacher ratios, making it challenging to provide one-on-one attention to students who need help with basic reading skills. Therefore, there is a need for more high-quality and rigorous research targeting larger samples to inform a better understanding of the more tangible effects of the Orton-Gillingham strategies (Hussien, 2023; Oluoch-Suleh & Ombara, 2023; Sayeski & Hurford, 2022; Stevens et al., 2021).

Another multisensory reading strategy is Fernald's VAKT, which combines visual, auditory, kinesthetic, and tactile learning. It uses a child's vocabulary to select reading materials while introducing words in context (Alkhazaleh et al., 2022; Putri & Hendriani, 2024). This strategy effectively enhances initial reading skills by

presenting material in multiple modalities, supporting children in learning more effectively through multiple senses (Putri & Hendriani, 2024; Rosnaeni & Azis, 2022).

This strategy consists of four main steps. First, the teacher writes vocabulary words with crayons, and the child traces the letters with their finger, engaging their sense of touch. Next, the child observes the writing and reads the word aloud while tracing. They aim to write the word accurately without looking at an example. Once their reading skills are confirmed, progress is noted. In the second phase, the child learns the teacher's handwriting by watching them write and speak. Then, the child reads new vocabulary aloud before writing it down. Finally, the child begins reading from a book by recalling previously learned words (Alkhazaleh et al., 2022; Putri & Hendriani, 2024; Widiati & Ardianti, 2021). This strategy offers many benefits, notably its simplicity and the use of basic, cost-effective materials. It encourages personalization based on creativity (Sommadossi, 2022). Furthermore, it can be used by educators or parents from various backgrounds, needing only patience rather than specialized skills, making implementation easy (Alkhazaleh et al., 2022).

Empirically, Frenlad's strategies have effectively developed reading abilities in children with SLDs. For instance, Arriaga Ricardez (2024) found that teachers believed that using multisensory materials improved learning outcomes, motivation, and self-esteem. However, challenges such as distractions from overstimulation by multisensory materials, time constraints, and teachers' lack of knowledge or experience in using these strategies effectively were identified.

Lindamood-Bell's LiPS strategies, created by Patricia Lindamood and Nanci Bell, are well known for their multisensory approach that targets the essential processes involved in reading. The strategies aim to improve phonemic awareness, decoding, and comprehension, making them a practical option for students experiencing reading challenges (Tomarong et al., 2024). Given that phonological awareness is a crucial indicator of children's future reading success, every effort should be made to give young children the

opportunity to cultivate these abilities. The effectiveness of the Lindamood-Bell strategy in enhancing reading abilities should reassure educators, researchers, and policymakers of its capability to tackle SLDs (Jayaseelan & Rajeswaran, 2024).

The Lindamood-Bell strategy emphasizes customized instruction tailored to individual learners' needs. Research highlights its success in adapting to each student's cognitive strengths and weaknesses. By targeting specific areas such as visual processing and phonemic awareness, these strategies effectively address the root causes of reading difficulties, leading to sustained improvements in reading skills. This focus on phonemic awareness and diverse learning styles is valuable for promoting equitable access to reading proficiency and fostering inclusive learning environments (Kilag et al., 2023; Tomarong et al., 2024).

The LiPS intervention strategies teach students to recognize how their mouths move when producing different phonemes. Initially, this training utilizes pictures, and as children improve their oral movements, related letters are gradually introduced (Jayaseelan & Rajeswaran, 2024; Olson et al., 2021). A study of Tamil-speaking children found that an intervention strategy significantly improved phonological sensitivity among those with below-average academic performance. Notably, advances in one area of phonological awareness, such as syllable segmentation, often led to progress on phoneme-level tasks. Younger children significantly improved basic skills, while older children advanced to more complex tasks such as phoneme deletion and substitution (Jayaseelan & Rajeswaran, 2024). Similarly, Boggs et al. (2022) evaluated summer reading strategies focused on phonemic awareness and symbol imagery to improve reading skills in children with sickle cell disease (SCD), who are more prone to academic challenges. The intervention effectively enhanced their phonological processing and symbol imagery, helping to mitigate their reading difficulties. Likewise, Olson et al. (2021) found that the Lindamood Strategies significantly improved phoneme awareness, reading accuracy, and word

recognition. Participants also showed lasting improvements in phonological decoding, indicating a sustained impact on their reading abilities. Based on that, the LiPS intervention is essential for improving students' reading abilities. It emphasizes personalized strategies that cater to individual learning differences, making it practical for struggling readers (Tomarong et al., 2024; Jayaseelan & Rajeswaran, 2024).

The multi-sensory strategies and tailored instruction help address reading difficulties. While research highlights its positive outcomes, more studies are needed to assess its broader applicability and long-term impact on equitable educational opportunities for all students (Kilag et al., 2023; Tomarong et al., 2024). However, the research indicates a requirement for longitudinal studies to assess the long-term impacts of phonological awareness interventions on reading abilities, especially in children facing ongoing reading difficulties, as well as the sustained effectiveness of these interventions on academic performance (Boggs et al., 2022; Jayaseelan & Rajeswaran, 2024; Olson et al., 2021). Additionally, the studies emphasize the importance of examining how multisensory strategies apply to and are effective for children learning other languages with similar complexities, as well as conducting a more comprehensive evaluation of reading abilities such as accuracy, fluency, and comprehension (Boggs et al., 2022; Jayaseelan & Rajeswaran, 2024). Moreover, future research should examine how teacher and caregiver training influences the success of multisensory interventions, as their participation could enhance consistency and support for children beyond therapy sessions (Jayaseelan & Rajeswaran, 2024). In addition, future studies should investigate how multisensory strategies compare with other phonological training techniques, particularly in terms of efficiency and outcomes across different learner profiles (Olson et al., 2021). Moreover, previous research primarily focused on small-scale interventions within a single school setting. Future studies should explore how these multisensory strategies can be scaled and adapted for different educational contexts and larger student populations. There is a gap in understanding how multisensory strategies can be fully integrated into mainstream school curricula rather than being used only in support lessons. Research is needed to explore how multisensory strategies can be incorporated across subjects and grade levels (Alkhazaleh et al., 2022; Arriaga Ricardez, 2024; Jayaseelan & Rajeswaran, 2024; Zamani Behbahani et al., 2021).

Category #3: Technology-Based Interventions

Technology interventions have shown positive outcomes for students with reading difficulties (Alqahtani, 2020). Studies highlight the effectiveness of digital tools, such as computer-based programs and tablet applications, in improving reading skills (Alrawashdeh et al., 2023). These interventions use adaptive learning to customize instruction and provide instant feedback, making learning more engaging (Kilag et al., 2024). Computer-Assisted Instruction (CAI), which has evolved from basic applications to interactive platforms with gaming elements, has particularly benefited students with reading challenges. However, there remains a significant gap in research on the effectiveness of specific CAI tools and their educational frameworks (Eroglu et al., 2020; Gharaibeh & Dukmak, 2022; Winn et al., 2020). For instance, well-known phonological awareness strategies, such as ABC Reading Eggs in Australia, lack studies evaluating their effectiveness. Likewise, although Sounds-Write adopts a linguistic phonics methodology and some digital features, there is a lack of peer-reviewed research validating its effectiveness. Moreover, research on ABRA strategies implemented in Canada shows notable improvements in phonological blending, letter-sound recognition, and phoneme segmentation speed compared with traditional teaching strategies. However, without comprehensive details about the instruction provided to the control group, it remains unclear whether these enhancements result directly from the ABRA strategies or from variations in teaching strategies (Verhoeven et al., 2022; Winn et al., 2020).

Various computerized reading strategies enhance phonics and reading abilities. For example, Lexia Reading Core5 promotes phonological awareness with rhyming and timed silent reading, adapting tasks based on student progress. Trainertext uses visual mnemonics to link images with phonemes for

decoding. Chassymo helps students identify syllables in words, while Oppositions Phonologiques focuses on matching sounds to options on screen. Finally, Tutoring Buddy improves letter-sound knowledge and fluency using an incremental rehearsal strategy. Together, these strategies offer diverse techniques for developing reading ability. Moreover, several computerized strategies aim to enhance reading fluency, comprehension, and phonological awareness through interactive activities. Reading RACES improves fluency by allowing students to listen to passages and read along while tracking speed and comprehension. Read Naturally Software uses text-to-speech to aid both fluency and comprehension. A flashcard tool focuses on phonological awareness by displaying CVC words and adjusting the presentation speed based on responses. Reading Accelerated boosts fluency by gradually deleting sentences, challenging students to keep pace. Kurzweil 3000 supports sight word acquisition through display and pronunciation, with progress measured by the accuracy with which target words are read. These strategies offer engaging ways to support essential reading abilities (Alqahtani, 2020; Verhoeven et al., 2022).

The iPad applications are part of technology-based interventions designed to improve phonological awareness, decoding, and reading fluency through engaging, game-like tasks. For example, WordDriver-1 emphasizes phonological awareness by involving students in grapheme-phoneme correspondence activities, where they read real and made-up words and match letters and words to images across various stages and levels of difficulty. Another app, Sound It Out, seeks to enhance decoding skills by providing phonemic image cues alongside the text to help with correct pronunciation; for instance, a small image of the moon appears beneath the letter "u" in the word "sure" to indicate the proper sound. Similarly, Build A Word—Easy Spelling with Phonics boosts decoding and focus abilities by enabling students to drag and drop letters into boxes to form words, reinforcing letter-sound connections. Lastly, K12 Timed Reading Practice focuses on reading fluency by providing students with unfamiliar texts that match their instructional reading level, allowing

them to read aloud at their own pace. At the same time, the app records their performance and provides feedback on fluency. These applications offer engaging strategies for developing essential reading abilities (Alqahtani, 2020; Gharaibeh & Dukmak, 2022; Verhoeven et al., 2022).

Empirically, Ecalle et al. (2020) investigated the impact of training programs like Chassymo and SyllaboCod on reading abilities among newly arrived migrant children learning French. They focused on these children's challenges, notably their limited reading ability in the host language. Chassymo, designed to aid newcomer migrants, targets word reading fluency through grapho-syllabic processing, strengthening phoneme connections with immediate feedback (Rubin-Wilson, 2022). The study found that both strategies improved reading skills. SyllaboCod notably enhanced phonemic awareness for those with limited French exposure, while Chassymo improved decoding skills for children with some prior reading experience. However, it had little impact on reading comprehension, suggesting a need for additional support in this area. Variations in individual responses indicated that Chassymo may require customization to be effective, and the short duration of the intervention limited the potential for improvements in advanced reading abilities. Integrating Chassymo with other language resources could address its focus on decoding at the expense of vocabulary and syntax development (Ecalle et al., 2020). Within the same domain, Donnelly et al. (2020) developed a tablet-based reading tool grounded in phonics instruction principles to determine whether struggling readers could use this technology to decode difficult words. The tool offered phonemic prompts with icons under each vowel sound, helping readers, especially those with reading difficulties, improve their decoding. The effectiveness of these phonemic cues was evaluated during a two-week intervention. According to the study, Trainertext, a program from the UK, employs visual mnemonics to reinforce the learning of sound-symbol relationships by displaying images above each phoneme in a text. This visual support helps readers connect phonemes to their sounds, enhancing their decoding abilities. Over ten months of consistent

use, Trainertext demonstrated notable improvements in reading, particularly when integrated into school and home practices, highlighting the effectiveness of phonics-based text adaptations in reading development. The study revealed that phonemic cues significantly increased the accuracy of decoding pseudowords in the intervention group, particularly benefiting children with more pronounced phonological difficulties. However, the impact on real-world decoding was not statistically significant. For reading connected text, there were no marked improvements in either accuracy or speed, although younger participants showed some enhancement in reading accuracy. In summary, phonemic cues were effective in aiding isolated word decoding but had a limited effect on reading connected text. Along the same lines, Winn et al. (2020) studied the effectiveness of ReadingDoctor, a multisensory software designed to improve phonics skills among students with reading difficulties. The program combines auditory and visual strategies to enhance phonemic awareness, grapheme-to-phoneme decoding, and visual word recognition. Aimed at primary school children using the software for 20 minutes a day, five days a week, over 12 weeks, the study found significant improvements in phonemic awareness and decoding, particularly in blending, segmentation, and sight-word recognition. Additionally, these gains were sustained for three months after the intervention, demonstrating a lasting impact. Similarly, Li et al. (2020) investigated a computer-assisted reading program called GraphoGame that offered games to enhance reading abilities. The program offered phoneme strategies, such as letter-sound correspondence, in which students selected matching letters from multiple options. The program also involved students in more advanced activities to reach the word level. y, Li et al. (2020) developed measures to assess reading fluency, accuracy, and phonemic awareness. They found that the intervention group outperformed the control group significantly in reading accuracy, fluency, and phonemic awareness. Additionally, Gharaibeh and Dukmak (2022) found that computer-based multisensory strategies significantly improved the reading abilities of fourth-grade students with dyslexia, enhancing

word recognition, spelling, fluency, and comprehension. The strategies' integration of visual, auditory, and kinesthetic-tactile elements strengthened phonological processing and phoneme-grapheme connections. Students using multisensory strategies showed greater gains than the control group, highlighting the effectiveness of these strategies in teaching English as a second language. Among Arabic-speaking children, Layes et al. (2022) found that an intervention combining phonological awareness and print knowledge notably improved reading accuracy and comprehension among fourth graders with reading disabilities. The group that received the intervention demonstrated significant progress in phonological awareness, word recognition, and reading comprehension compared to the control group. These improvements were maintained during a follow-up assessment, indicating that the intervention had a lasting effect on reading abilities.

The gap in CAI research—particularly the lack of rigorous evaluations on pedagogical effectiveness—highlights the critical need for further investigation. A comprehensive analysis and independent validation of CAI's efficacy are essential to optimize the role of computerized reading software, which could provide substantial support for phonological development and potentially improve outcomes for struggling readers (Layes et al., 2022; Winn et al., 2020). Notably, many traditional reading strategies that have proven effective could be enhanced through technology, especially word-level strategies, by identifying and integrating them into digital platforms. Technology also offers opportunities to innovate teaching strategies that are impractical in traditional settings (Alqahtani, 2020). Research suggests that future studies should examine CAI's effects across diverse languages and cultural contexts. Evaluating the long-term impact of the CAI on sustaining reading gains is another crucial area for future research. Additionally, comparing it with alternative interventions will help clarify their relative effectiveness in enhancing reading abilities for students with reading difficulties, ensuring that the most effective strategies are identified and implemented to support diverse learning needs (Gharaibeh & Dukmak, 2022; Layes et al., 2022; Verhoeven et al., 2022).

Assistive Technology (AT) strategies have long supported students with reading difficulties. According to the International Organization for Standardization (2011), assistive products include devices and software designed to aid individuals with disabilities by enhancing engagement and providing support. Recently, reading support tools have become more accessible on tablets and smartphones, improving accessibility compared to traditional computers (Svensson et al., 2021). However, Svensson et al. (2021) noted that research on the effectiveness of assistive technology (AT) for improving reading among students with specific learning disabilities (SLDs) is limited, with a lack of high-quality studies. However, many studies indicate that AT, particularly word processing, multimedia, and hypertext, benefits adolescents and adults with learning disabilities. Text-to-speech (TTS) technologies show mixed results. The authors stress the need to customize AT to individual needs and acknowledge that, although many TTS studies are outdated, advances have improved voice quality and speech recognition reliability. Svensson et al.'s (2021) study evaluated a 6-week intervention using assistive technologies to improve students' reading abilities and gather feedback from students and parents on the technology's usefulness. The goal was to enhance understanding of how assistive tech supports reading development. Teachers received training for an eight-week program that included 24 one-on-one sessions, where students used text-to-speech (TTS) and speech-to-text (STT) applications for reading and writing activities. Homework involved summarizing books, and a word game app, Ruzzle, was used to keep students motivated. The control group continued with standard methods without assistive technology. Results showed improved reading abilities in the intervention group, which were comparable to those of the control group over a year. About 50% of students and parents reported increased motivation for schoolwork after participation (Svensson et al., 2021).

When researching Text-to-Speech (TTS) software, Raffoul and Jaber (2023) emphasized the importance of defining SLDs, as these impair cognitive processes like phonological processing and working memory, ultimately affecting students' performance in the classroom. TTS software assists these students by converting text from various formats—such as books and websites—into audio, enabling them to use effective reading strategies with features like voice selection, adjustable reading speed, and dynamic highlighting. It primarily aids by decoding text, thereby reducing the cognitive load for students with SLDs. An example of TTS assistive technology is the C-Pen. It is designed to aid students with reading difficulties. This lightweight device scans printed text and converts it into spoken words through built-in speakers or headphones. It can read individual words, sentences, or entire paragraphs, enhancing reading fluency and promoting independence among students with specific learning disabilities (SLDs). Users can adjust playback speed and volume to suit different environments (McKenzie & Arslan-Ari, 2024). However, some students encountered technical issues, such as inaccurate word recognition, which caused confusion. Additionally, its reliance on paper-based materials limited its use for digital assignments. Students also required more training to adapt to this new technology effectively. Teachers noted the C-Pen's potential benefits across various subjects (McKenzie & Arslan-Ari, 2024).

The literature examined indicates that technology-based interventions have significant potential to enhance reading abilities, especially for students experiencing reading challenges, utilizing resources such as computer-assisted instruction (CAI), tablet applications, assistive technologies, and text-to-speech (TTS) software. These methods offer tailored, multisensory learning opportunities that improve phonological awareness, decoding, fluency, and comprehension. Nevertheless, significant gaps persist, including a scarcity of thorough evaluations for widely used tools, a lack of research on their effectiveness across different languages and cultural settings, and few longitudinal studies to determine lasting improvements. Additionally, many investigations do not directly compare digital tools with conventional methods, and specific technologies, such as the C-Pen, face challenges integrating with digital materials and need better customization. Future studies should address these shortcomings by conducting detailed

evaluations, investigating diverse learner environments, and developing tools that integrate traditional and modern pedagogical approaches while highlighting the need for structured training to maximize the effectiveness of these interventions.

DISCUSSION

Across the three categories of interventions—early, multisensory, and technology-based—several consistent findings emerge. First, phonological awareness appears as the most consistently improved outcome across all intervention types. Early interventions (e.g., Heggerty-based studies) demonstrated strong gains in phonemic awareness and foundational decoding skills (Melesse & Enyew, 2020; Gesel et al., 2021; Coyne et al., 2021). Similarly, multisensory approaches such as Orton-Gillingham and LiPS have been reported to improve phoneme awareness and decoding accuracy (Valde, 2024; Olson et al., 2021; Jayaseelan & Rajeswaran, 2024). Technology-based programs, including GraphoGame and ReadingDoctor, also showed statistically significant gains in phonemic awareness and blending skills (Li et al., 2020; Winn et al., 2020).

This cross-category consistency suggests that explicit and systematic phonological training remains the central mechanism underlying successful reading interventions, regardless of delivery format (traditional, multisensory, or digital). However, differences emerge when examining broader reading outcomes. Early phonological interventions showed strong effects on foundational skills but yielded mixed results for reading fluency and connected-text comprehension (Coyne et al., 2021). Similarly, some technology-based phonemic cueing tools improved isolated-word decoding but had a limited impact on reading connected text (Donnelly et al., 2020). In contrast, certain multisensory interventions—particularly LiPS—reported more sustained gains in decoding and word recognition, with some transfer effects to comprehension (Olson et al., 2021; Jayaseelan & Rajeswaran, 2024). These differences suggest that while phonological awareness is necessary, it may not be sufficient for long-term improvements in reading comprehension and fluency. Interventions that integrate decoding with broader language components (vocabulary, syntax, and contextual reading practice) appear more likely to produce generalized reading gains.

Another point of comparison concerns implementation conditions. Early interventions such as Heggerty are structured, brief, and cost-effective, making them feasible for whole-class implementation. In contrast, multisensory approaches such as Orton-Gillingham often require specialized teacher training and smaller instructional groups (Oluoch-Suleh & Ombara, 2023). Technology-based interventions offer scalability and adaptive feedback but show variability in research rigor and outcome measurement. Thus, while multisensory and technology-based interventions may provide deeper individualized support, early structured interventions appear more scalable, whereas multisensory approaches may offer more intensive remediation for students with severe SLDs. Technology interventions fall between these models, offering adaptability but requiring stronger empirical validation.

Across all categories, another consistent finding is the need for stronger research designs. Many studies relied on small samples, short intervention durations, or lacked detailed descriptions of control-group instruction. Particularly within technology-based interventions, there is a notable gap in independent validation and long-term follow-up data. Overall, the findings indicate that effective reading intervention for students with SLDs requires explicit phonological instruction, structured and systematic sequencing, opportunities for repeated practice, ongoing progress monitoring, and context-sensitive implementation.

Limitations

Despite its comprehensive synthesis of 57 studies, this review has several limitations that should be acknowledged. To begin with, the review focused exclusively on studies published between 2020 and 2024. While this ensured the inclusion of recent evidence, it may have excluded foundational earlier research that continues to influence current practice. In addition, although multiple databases were searched, the review was restricted to English-language publications, which may limit the

generalizability of the findings to non-English-speaking contexts. A further limitation is that the included studies varied substantially in methodological rigor, sample size, intervention duration, and outcome measures. Such heterogeneity constrains the ability to make direct comparisons of effect sizes across intervention types. Finally, some categories, particularly technology-based interventions, contained studies with short intervention periods and limited longitudinal follow-up, reducing confidence in conclusions about long-term sustainability.

CONCLUSION

This review synthesized findings from 57 recent studies and demonstrates that early, multisensory, and technology-based interventions can significantly improve reading outcomes for students with specific learning disabilities (SLDs). Across intervention types, explicit and systematic phonological instruction consistently emerged as the strongest contributor to gains in decoding and word recognition. Early interventions show particular promise in preventing entrenched reading difficulties, while multisensory approaches provide structured, intensive support for students with persistent challenges. Technology-based interventions offer adaptable and engaging learning environments; however, their effectiveness depends on instructional quality and empirical validation. Overall, effective reading intervention requires structured instruction, individualized adaptation, and sustained implementation rather than reliance on a single approach.

Future research should prioritize longitudinal designs to determine the long-term sustainability of intervention outcomes and conduct comparative studies to clarify which components most effectively transfer to fluency and comprehension. Greater cross-linguistic and cross-cultural investigation is also needed to ensure the applicability of these interventions across diverse educational contexts. In particular, technology-based tools require more rigorous and independent evaluation to strengthen evidence-based adoption.

From a practical perspective, educators should emphasize early screening and explicit phonological instruction as foundational elements of reading support. Ongoing professional development is essential to ensure effective implementation of structured and multisensory approaches in inclusive classrooms. At the policy level, investment in early identification systems, teacher training in structured literacy practices, and careful evaluation of digital interventions are critical steps toward reducing literacy disparities and promoting equitable access to effective reading instruction.

REFERENCES

Al Otaiba, S., McMaster, K., Wanzek, J., & Zaru, M. W. (2023). What we know and need to know about literacy interventions for elementary students with reading difficulties and disabilities, including dyslexia. Reading Research Quarterly, 58(2), 313-332.

Alawadh, A. (2016). Teachers' perceptions of the challenges related to provision of services for learners with specific learning difficulties (dyslexia) in Kuwaiti government primary schools (Doctoral dissertation, University of York).

Aldakhil, A. F. (2024). Prevalence of developmental dyslexia among primary school children in Arab countries: a systematic review and meta-analysis. Research in Developmental Disabilities, 152, 104812.

Alkhazaleh, M., Khasawneh, M. A. S., Alkhazaleh, Z. M., Alelaimat, A. M., & Alotaibi, M. M. (2022). An Approach to Assist Dyslexia in Reading Issue: An Experimental Study. Przestrzeń Społeczna (Social Space), 22(3), 133-151.

Alqahtani, S. S. (2020). Technology-based interventions for children with reading difficulties: a literature review from 2010 to 2020. Educational Technology Research and Development, 68(6), 3495-3525.

American Psychiatric Association. (2022). What is Specific Learning Disorder? Psychiatry.org - What Are Specific Learning Disorders?

Arcos, E. B. P., Leiton, S. G. C., & Parra, E. C. B. (2018). Estrategias interactivas para evaluar la expresión oral en inglés para estudiantes de las instituciones de educación superior-provincia del Carchi. SATHIRI, 13(1), 93-

_____

112.Arriaga Ricardez, F. (2024). Teaching Students with Specific Learning Difficulties Using the Multisensory Approach. [Master Thesis].

Austin, C., Stevens, L., Demchack, A., & Solari, E. (2023). Orton-Gillingham: Which Aspects are Supported by Research and Which Require Additional Research. The Reading League Journal, 4(3), 5-15.

Bin Saddiq, L. (2021). Using an Electronic Educational Program Based on Orton-Gillingham Approach for Developing Expressive Language Skills of Hearing-Impaired Pupils at Integrated Schools in Saudi Arabia. European Online Journal of Natural and Social Sciences, 10(3), pp-309.

Boggs, J., Freeman, M., Okhomina, V. I., Kang, G., Heitzer, A. M., & Wang, W. C. (2022). Reading intervention targeting phonemic awareness and symbol imagery in children with sickle cell disease. Pediatric Blood & Cancer, 69(3), e29561.

Deniz, S., & Yavuz, M. (2020). Investigation of Reading Error Types, Reading Levels and Reading Speeds of Students with Special Learning Difficulties. Cypriot Journal of Educational Sciences, 15(4), 686-698.

Donnelly, P. M., Larson, K., Matskewich, T., & Yeatman, J. D. (2020). Annotating digital text with phonemic cues to support decoding in struggling readers. Plos one, 15(12), e0243435.

Ecalle, J., Vidalenc, J. L., & Magnan, A. (2020). Computer-based training strategies to stimulate learning to read in French for newcomer migrant children: A pilot study. Journal of Educational, Cultural and Psychological Studies (ECPS Journal), (22), 23-47.

Elhoweris, H. (2017). The Impact of Repeated Reading Intervention on Improving Reading Fluency and Comprehension of Emirati Students with Learning Disabilities. International Journal of Psycho-Educational Sciences, 6(2), 36-48..

Gharaibeh, M., & Dukmak, S. (2022). Effect of computer-based multisensory program on English reading skills of students with Dyslexia and reading difficulties. Applied Neuropsychology: Child, 11(3), 504-517.

Graham, S., Harris, K. R., & Beard, K. (2019). Teaching writing to young African American male students using evidence-based practices. Reading & Writing Quarterly, 35(1), 19-29.

Gromada, A., Rees, G., & Chzhen, Y. (2019). Comparing inequality in adolescents' reading achievement across 37 countries and over time: outcomes versus opportunities. Compare: A Journal of Comparative and International Education, 51, 495 - 511.

Hussien, B. A. M. (2023). Using online Orton-Gillingham lessons to teach reading comprehension and word recognition to preschool children at risk for dyslexia. PSYCHOLINGUISTICS, 33(2), 6-28.

Institute for Multi-Sensory Education. (2020). Three components of multi-sensory instruction. https://journal.imse.com/three-components- of-multi-sensory-instruction/

Jayaseelan, M., MJ, A. V., & Rajeswaran, R. (2024). Efficacy of intervention programme to improve phonological sensitivity skills in Tamil speaking children who are below average scholastic performers. Journal of Child Language Acquisition and Development-JCLAD, 900-949.

Kaya, E. (2015). The role of reading skills on reading comprehension ability of Turkish EFL students. Üniversitepark Bülten, 4(1-2), 37.

Kilag, O. K. T., Macapobre, K. A., Balicoco, J. R. M., Alfar, J. D., Peras, C. C., & Tapayan, A. A. S. (2023). Emergent literacy: A reading support program for preschoolers' successful phonological awareness in the home context. Science and Education, 4(2), 896-906.

Kilag, O. K., Quezon, J., Pansacala, J. A., Suba-an, J., Kilag, F., & Esdrelon, K. G. (2024). Advancing Reading Skills: State-of-the-Art Remediation Strategies. International Multidisciplinary Journal of Research for Innovation, Sustainability, and Excellence (IMJRISE), 1(3), 313-322.

Kilag, O. K., Quezon, J., Pansacala, J. A., Suba-an, J., Kilag, F., & Esdrelon, K. G. (2023). Advancing reading skills: State-of-the-art remediation strategies. Excellencia:

Layes, S., Guendouz, M., Lalonde, R., & Rebai, M. (2022). Combined phonological awareness and print knowledge training improves reading accuracy and comprehension in children with reading disabilities. International Journal of Disability, Development and Education, 69(4), 1185-1199.

Liu, D. (2024). Cross-national analysis of differences in student reading performance: Taking PISA 2022 as an example. In Proceedings of the 5th International Conference on Education Innovation and Philosophical Inquiries. https://doi.org/10.54254/2753-7048/54/20241573

Marôco, J. (2020). What makes a good reader? Worldwide insights from PIRLS 2016. Reading and Writing. https://doi.org/10.1007/s11145-020-10068-8

Maunsell, M. (2020). Dyslexia in a Global Context: A Cross-Linguistic, Cross-Cultural Perspective. Latin American Journal of Content & Language Integrated Learning, 13(1), 92-113. https://doi.org/10.5294/laclil.2020.13.1.6

McKenzie, K., & Arslan-Ari, I. (2024). Evaluating the implementation of the reading pen on the reading level, comprehension, and oral reading fluency of students with learning disabilities. Educational Technology & Society, 27(4), 251-266. https://doi.org/10.30191/ETS.202410_27(4).SP03

Neuss, L. K. M. (2021). A Proposed Approach for Teaching Music Students with Dyslexia Using Orton-Gillingham Techniques. The Florida State University.

Oakhill, J. V., & Cain, K. (2012). The precursors of reading ability in young readers: Evidence from a four-year longitudinal study. Scientific studies of reading, 16(2), 91-121.

Obaid, N. A. M. (2019). Investigating the use of "Lughati tablets" to promote arabic reading skills to students with special educational needs and disabilities: A case study at the sharjah city of humanitarian services (UAE) (Order No. 30665011). Available from ProQuest One Academic. (2878259008). Retrieved from https://uaeu.idm.oclc.org/login?url=https://www.proquest.com/dissertations-theses/investigating-use-lughati-tablets-promote-arabic/docview/2878259008/se-2

Olson, R. K., Wise, B., Ring, J., & Johnson, M. (2021). Computer-based remedial training in phoneme awareness and phonological decoding: Effects on the posttraining development of word recognition. In Components of Effective Reading Intervention (pp. 235-253). Routledge.

Oluoch-Suleh, E., & Ombara, J. (2023). Application and Relevance of the Orton Gillingham Structured Literacy Teaching Approach to Pupils with Specific Learning Disabilities in Kenyan Public Primary Schools. Sch Int J Linguist Lit, 6(8), 343-350.

Pack, K. C. (2023). Approaches to Teaching Reading to Children With Dyslexia: A Qualitative Descriptive Study. Grand Canyon University. .

Putri, Y. A. U., & Hendriani, W. (2024). MULTISENSORY METHODS AS TEACHERS'EFFORTS IN DEALING WITH DYSLEXIC CHILDREN IN ELEMENTARY SCHOOL: LITERATURE REVIEW. Psychosophia: Journal of Psychology, Religion, and Humanity, 6(1), 32-44.

Qizi, Q. S. T. L. (2024). ENHANCING THE READING LITERACY OF ELEMENTARY SCHOOL STUDENTS THROUGH MODERN TRENDS. Science and innovation, 3(Special Issue 18), 190-193.

Raffoul, S. & Jaber, L. (2023). Text-to-Speech Software and Reading Comprehension: The Impact for Students with Learning Disabilities. Canadian Journal of Learning and Technology / Revue canadienne de l'apprentissage et de la technologie, 49(2), 1–18. https://doi.org/10.21432/cjlt28296

Rosnaeni, S., & Azis, S. A. (2022). Method Effect VAKT (Visual, Auditory, Kinesthetic, Tactile) On Beginning Reading Ability and Writing Skills of Class I Students.

Rubin-Wilson, L. (2022). Technology use for literacy development in children with reading disabilities (Order No. 30248054). Available from ProQuest One Academic. (2774098267). Retrieved from https://uaeu.idm.oclc.org/login?url=https://www.proquest.com/dissertations-theses/technology-use-literacy-development-children-with/docview/2774098267/se-2

Sayeski, K. L., & Hurford, D. P. (2022). A Framework for Examining Reading-Related Education Research and The Curious Case of Orton-Gillingham. Learning Disabilities: A Multidisciplinary Journal, 27(2).

Shaywitz, S. E., & Shaywitz, B. A. (2008). Paying attention to reading: The neurobiology of reading and dyslexia. Development and Psychopathology, 20(4), 1329–1349.

Smart, D., Youssef, G. J., Sanson, A., Prior, M., Toumbourou, J. W., & Olsson, C. A. (2017). Consequences of childhood reading difficulties and behaviour problems for educational achievement and employment in early adulthood. *British Journal of Educational Psychology*, *87*(2), 288-308. **https://doi.org/10.1111/bjep.12150**

_____

Snowling, M. J. (2013). Early identification and interventions for dyslexia: a contemporary view. Journal of Research in Special Educational Needs, 13, 7–14. doi:10.1111/j.1471-3802.2012.01262.x

Sommadossi, S. (2022). Multisensory approach and total physical response in the EFL support lessons for students with dyslexia: Building sentence structure awareness (Master's degree thesis). Università Ca' Foscari Venezia. http://hdl.handle.net/10579/20853

Stevens, E. A., Austin, C., Moore, C., Scammacca, N., Boucher, A. N., & Vaughn, S. (2021). Current state of the evidence: Examining the effects of Orton-Gillingham reading interventions for students with or at risk for word-level reading disabilities. Exceptional children, 87(4), 397-417.

Svensson, I., Nordström, T., Lindeblad, E., Gustafson, S., Björn, M., Sand, C., ... & Nilsson, S. (2021). Effects of assistive technology for students with reading and writing disabilities. Disability and Rehabilitation: Assistive Technology, 16(2), 196-208.

Tepetaş, C., & Erol, D. (2021). Validity and Reliability Study of the Parent-Child Shared Book Reading Inventory. Psycho-Educational Research Reviews, 10(2), 328–350. https://www.journals.lapub.co.uk/index.php/perr/article/view/1814.

Tomarong, L., Abendan, C. F., Kilag, O. K., Apas, M., Undalok, V., & Alcorcon, J. J. (2024). The Lindamood-Bell Reading Intervention: A Pathway to Enhanced Reading Skills in Pupils. International Multidisciplinary Journal of Research for Innovation, Sustainability, and Excellence (IMJRISE), 1(1), 201-207.

Valde, R. P. (2024). Orton-Gillingham approach: its effects on the reading ability of grade two pupils. International Journal of Novel Research and Development, 9(6), 2456–4184.

Vaughn, S., Roberts, G., Capin, P., Miciak, J., Cho, E., & Fletcher, J. M. (2019). How initial word reading, and language skills affect reading comprehension outcomes for students with reading difficulties. Exceptional children, 85(2), 180-196.Yılmaz, M. (2008). Kelime tekrar tekniginin akıcı okuma becerilerini gelistirmeye etkisi. Turk Egitim Bilimleri Dergisi, 6(2), 323–350.

Verhoeven, L., Voeten, M., & Segers, E. (2022). Computer-assisted word reading intervention effects throughout the primary grades: A meta-analysis. Educational Research Review, 37, 100486.

Wagner, D.A. (2017). Children's Reading in Low-Income Countries. The Reading Teacher, 71, 127-133.DOI:10.1002/TRTR.1621

Widiati, D., & Ardianti, S. D. (2021). Technology of learning media for dyslexia children's. In Proceedings UPY International Conference on Applied Science and Education (Vol. 2). https://proceeding.upincase.upy.ac.id/index.php/Proceedings/article/view/74

Winn, T., Miller, J., & van Steenbrugge, W. (2020). The efficacy of a computer program for increasing phonemic awareness and decoding skills in a primary school setting for children with reading difficulties. Australian Journal of Teacher Education (Online), 45(12), 1-23.

Zamani Behbahani, E., Asgari, P., Heydari, A., & Marashian, F. S. (2021). Comparison of the Effectiveness of Fernald's Multisensory Training and Computer Game Training on Dyslexia in Elementary Students with learning Disabilities. Iranian journal of educational sociology, 4(1), 58-67.

Zhang, H., & Holden, S. T. (2025). Disparity in school children's reading skills in 11 African countries. PLOS ONE. https://doi.org/10.1371/journal.pone.0320688

Zuppardo, L., Serrano, F., Pirrone, C., & Rodriguez-Fuentes, A. (2023). More than words: Anxiety, self-esteem, and behavioral problems in children and adolescents with dyslexia. *Learning Disability Quarterly*, *46*(2), 77-91. https://doi.org/10.1177/07319487211041103