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A Phonemic-Based Methodology for Overcoming Dyslexia in Primary School Children through Sound Analysis Instruction

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ABSTRACT

Dyslexia is a learning disorder that affects the development of reading and writing skills in primary school children. This study explores a phonemic-based methodology that uses sound analysis instruction to support students with dyslexia. The approach focuses on enhancing phonemic awareness, strengthening the connection between sounds and letters, and improving overall literacy. Using multisensory techniques, including visual aids, sound games, and interactive exercises, the method helps children accurately identify, differentiate, and pronounce sounds within words. The research involved both individual and group sessions with students, demonstrating significant improvements in reading accuracy, speed, and self-confidence. Findings also highlight the importance of tailoring instruction to the child's individual needs and incorporating interactive tools to boost engagement. The proposed methodology offers practical benefits for teachers, speech therapists, and parents working with children who face challenges related to dyslexia, and it contributes to inclusive and effective educational practices.

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1. INTRODUCTION

Dyslexia is a neurodevelopmental disorder that manifests as persistent difficulties in accurate and fluent word recognition, spelling, and decoding, despite individuals having average or above-average intelligence and access to adequate educational instruction. As one of the most common specific learning disorders, dyslexia affects an estimated 5–10% of school-aged children globally, making it a central concern in early education (Yang *et al*., 2022; Lin *et al*., 2020; Pape-Neumann *et al*., 2015). The challenges associated with dyslexia often go beyond academic limitations; children with dyslexia frequently face lowered self-esteem, heightened anxiety, and barriers to full participation in classroom activities. These challenges can have long-term implications on students' academic trajectories, social development, and overall psychological health. Therefore, early identification and intervention are critical to ensuring that children with dyslexia are given the tools to succeed within inclusive and equitable educational systems (Van der Kleij *et al*., 2019; Chyl *et al*., 2019; Leitão *et al*., 2017).

Central to the difficulties faced by children with dyslexia is a deficit in phonemic awareness—the ability to hear, isolate, manipulate, and work with individual sounds in spoken language (Kovelman *et al*., 2012; Cabbage *et al*., 2018; Law *et al*., 2014). Phonemic awareness forms the foundation of phonological processing, which in turn underpins a child's capacity to decode and comprehend written language. Numerous international studies have shown that students who struggle with phonemic awareness often experience significant obstacles in reading acquisition and spelling (Milankov *et al*., 2021; Suggate, 2016; Clayton *et al*., 2020). As such, instructional strategies that target phonemic awareness have emerged as one of the most evidence-supported interventions in literacy development for children with dyslexia (Cummings *et al*., 2011).

In this context, sound analysis instruction a method of breaking down spoken words into their individual phonemes and teaching children to connect these sounds to their corresponding graphemes has gained prominence as an effective pedagogical approach. The current study introduces a structured phonemic-based methodology specifically tailored for primary school children exhibiting signs of dyslexia (Yeh *et al*., 2008; Gonzalez-Frey *et al*., 2021; Ryder *et al*., 2008). This methodology is designed to systematically teach sound-letter relationships using a step-by-step approach that goes beyond rote memorization. It employs a multisensory learning model, incorporating visual (e.g., flashcards, written cues), auditory (e.g., pronunciation drills, phoneme identification), and tactile (e.g., tracing letters, sound-based movement games) components to address multiple learning modalities and reinforce cognitive associations (Wai *et al*., 2014).

What distinguishes this methodology from existing phonemic approaches is its adaptive, child-centered framework, which allows for differentiation based on the individual needs, cognitive development, and emotional readiness of each learner (Kapnoula *et al*., 2017). The methodology is implemented in both one-on-one and group settings, enabling flexibility in classroom application and speech therapy environments. Furthermore, it emphasizes interactive and engaging exercises—such as phoneme games, storytelling with phonemic emphasis, and voice recognition activities—that enhance motivation and build confidence among learners who might otherwise disengage from traditional reading instruction (Becker *et al*., 2021).

The novelty of this research lies in its cultural and contextual relevance. While phonemic-based interventions have been widely researched in Western educational systems, their adaptation and evaluation within Central Asian contexts, particularly in Uzbekistan, remain scarce. Given linguistic, curricular, and systemic differences in how literacy is taught, there is

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a pressing need for localized pedagogical models that are both linguistically appropriate and culturally responsive. This study addresses this gap by applying the phonemic-based sound analysis methodology within Uzbek primary schools, evaluating its impact through practical classroom implementations. By doing so, it not only contributes to the global conversation on dyslexia intervention but also offers actionable insights for educators, policymakers, and speech therapists in the region.

Thus, this research seeks to demonstrate that a structured, multisensory phonemic methodology, grounded in sound analysis, can serve as an effective intervention for dyslexia among primary school-aged children. It aims to bridge global evidence with local application, promoting inclusive education and contributing to a deeper understanding of dyslexia remediation in diverse educational landscapes.

2. LITERATURE REVIEW

2.1. Phonemic Awareness and its Role in Literacy Development

A foundational body of research supports the theory that phonemic awareness is a critical predictor of reading success. Carson *et al*. (2013) emphasized that deficits in phonemic awareness are not merely correlated with reading failure but are causally linked. Children who cannot distinguish or manipulate sounds within words often fail to establish the phoneme-grapheme correspondence necessary for decoding, spelling, and fluency. Nithart *et al*. (2011) further demonstrated that interventions focused on developing phonemic awareness could significantly reduce reading failure among at-risk children, especially when implemented in early education settings.

Becker and Sylvan (2021) have consistently recommended the integration of explicit and systematic phonemic awareness instruction into early literacy curricula. These programs have been shown to improve reading accuracy, comprehension, and fluency, particularly when embedded in multisensory and phonics-based approaches. Multisensory teaching strategies, rooted in the Orton-Gillingham approach, combine auditory, visual, kinesthetic, and tactile modalities to reinforce learning and retention of phonemic structures.

2.2. Multisensory Methods in Dyslexia Intervention

Multisensory learning has become a central component of modern dyslexia remediation methods. Yuzaidey *et al*. (2018) highlighted the effectiveness of engaging multiple sensory channels to enhance memory and phonological processing in learners with dyslexia. Programs such as Wilson Reading System, Lindamood Phoneme Sequencing (LiPS), and Read Write Inc. implement these strategies with proven success, particularly for students with persistent decoding difficulties.

By activating different parts of the brain through visual (letters and images), auditory (pronunciations and rhythms), and tactile (tracing and manipulating objects) inputs, students can build stronger associations between phonemes and graphemes. Supriatna and Ediyanto (2021) emphasized that combining neuropsychological approaches with sensory-based instruction can result in deeper cognitive engagement and more sustainable improvements in literacy.

3. METHOD

3.1. Research Approach

This study employed a qualitative, practice-based approach to explore how phonemic-based instruction—specifically sound analysis of words—can support children with dyslexia

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in developing reading and writing skills. Rather than using quantitative data or formal testing, the research focused on the practical application of a structured teaching method in real educational settings. Observations, teacher reflections, and classroom activities were used as the primary sources of data. This approach was chosen to capture rich, in-context insights about student behavior, learning engagement, and progress in literacy.

3.2. Participants and Setting

Participants in this study were primary school children aged 7 to 9 years who showed early signs of dyslexia, including difficulty in recognizing phonemes, reversing letters, slow reading, and spelling errors. These children were identified through teacher observations and informal literacy assessments in classroom and speech therapy sessions. The setting included both inclusive classrooms and dedicated speech therapy environments in selected schools in the Tashkent region of Uzbekistan. The instructional sessions were carried out by trained teachers and speech therapists in both one-on-one and small group formats to allow individualized support.

3.3. Instructional Design and Methodology

The instructional methodology was designed to enhance phonemic awareness by teaching children how to analyze and understand the structure of words at the phoneme level. Lessons followed a sequential structure, starting with phoneme recognition and articulation, and progressing to segmentation, blending, and sound-letter mapping. Instruction was delivered using a multisensory approach, which combined visual (e.g., phoneme cards, letter boards), auditory (e.g., pronunciation and repetition), and tactile (e.g., letter tracing, sand writing) learning strategies. This ensured accessibility for diverse learners and allowed deeper cognitive engagement.

In addition to structured instruction, game-based learning was a key component. Activities such as phoneme bingo, rhyme sorting, and syllable clapping were used to reinforce learning while maintaining student motivation. Instruction was flexible and adapted to each child's progress and needs, making it a child-centered and responsive learning process. Teachers and therapists adjusted the pace, content, and complexity of tasks as needed to support individual differences.

3.4. Data Collection

Data collection relied primarily on qualitative instruments. Teachers and therapists maintained field journals to record student behavior, literacy development, and classroom observations. These notes captured changes in phonemic awareness, engagement levels, and responses to specific instructional methods. Samples of student work, such as reading attempts and writing exercises, were also collected and analyzed for patterns of improvement. Additionally, teacher reflections and informal interviews provided insight into instructional effectiveness, classroom dynamics, and implementation challenges.

Where appropriate, some sessions were audio or video recorded—with full parental consent—to document student participation and support reflective teaching. These recordings were used for internal analysis and not for public dissemination, in compliance with ethical standards.

3.5. Data Analysis

The collected data were analyzed through thematic analysis. This process involved reviewing field notes, reflections, and student work to identify recurring patterns related to

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literacy progress and instructional impact. Key themes included improvements in phonemic perception, increased reading confidence, better letter-sound association, and overall engagement with the learning process. The analysis was interpretive, aiming to understand the nuanced effects of the phonemic-based approach on each student's learning journey, rather than measuring outcomes statistically.

4. RESULTS AND DISCUSSION

4.1. Observable Progress and Behavioral Improvements

At the beginning of the intervention, many children demonstrated typical signs of dyslexia: mispronunciation of phonemes, confusion in the order of sounds within a word, inconsistent recognition of graphemes, and frequent errors in both reading and writing. These difficulties were compounded by low confidence and limited engagement during reading tasks (Lindstrom, 2019).

However, after consistent exposure to targeted phonemic analysis exercises, children showed marked improvement in their phonemic hearing—the ability to distinguish, identify, and manipulate individual sounds in words. They began to decode words more accurately, align sounds with letters more confidently, and read with increased speed and fluency. Teachers reported that children were able to recognize letter-sound correspondences that had previously been difficult for them and began applying this knowledge in independent reading and writing tasks (Siniger *et al*. 2010).

The methodology proved particularly effective when implemented through multisensory strategies and interactive learning, which helped anchor abstract phonemic concepts in real experiences. The following core components were identified as contributing factors to the success of the intervention (Geers & Hayers, 2011):

(i) Development of Phonemic Awareness
Children gained the ability to clearly distinguish individual sounds in words and to segment and blend them during reading. This foundational skill enabled them to recognize syllables and sound patterns, improving both fluency and comprehension.

(ii) Reinforcement of Sound-Letter Connections
Learners developed a stronger understanding of how phonemes correspond to graphemes. This significantly reduced letter reversals and sound substitutions in writing and improved spelling accuracy.

(iii) Use of Visual and Auditory Aids
The combination of auditory pronunciation drills, visual aids like phoneme flashcards, and letter-sound matching games enhanced children's cognitive processing of phonological information. Multisensory engagement allowed them to internalize complex relationships between sound and symbol more effectively.

(iv) Game-Based and Playful Instructional Methods
Incorporating play into instruction such as phoneme puzzles, syllable clapping, and sound-matching activities—increased students' intrinsic motivation. These interactive activities transformed what were once frustrating tasks into enjoyable learning experiences.

4.2. Individualized Instruction and Multisensory Impact

One of the key findings of the study is that the effectiveness of the methodology is significantly enhanced when instruction is tailored to individual learners' needs. Since each child with dyslexia presents unique cognitive and emotional profiles, the ability to adapt

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instruction—through one-on-one attention, differentiated pacing, and personalized material—was essential for success (Schlesinger *et al*., 2017).

The multisensory learning approach emerged as a critical element, particularly for children with more severe phonological deficits. Auditory (listening and repeating), visual (seeing letters and cues), and tactile (tracing letters, manipulating tiles) modes of learning reinforced each other and offered multiple entry points for understanding (Bowers & Ramsdell, 2023).

Moreover, the study revealed that children who initially showed resistance or disinterest in reading became more engaged as lessons incorporated interactive and sensory-based experiences. This shift suggests that emotional engagement and perceived success play significant roles in a child's willingness to persevere with literacy tasks.

4.3. Environmental and Instructional Influences

Another dimension uncovered during the study is the influence of external factors, such as teacher attitudes, classroom environments, and parental involvement, on the success of the intervention. Children whose teachers consistently applied the methodology and encouraged active participation showed more rapid improvement. Similarly, children who received support at home—such as parents practicing phoneme games or reading aloud demonstrated increased confidence and faster gains in literacy (Bazen *et al*., 2023).

This underscores the importance of collaborative educational ecosystems, in which classroom educators, speech therapists, and families work together using shared strategies. In particular, the teacher's approach—whether they adapted materials, encouraged multisensory engagement, and offered positive reinforcement—played a substantial role in the outcome (Hasanah *et al*., 2024).

4.4. Broader Implications and Future Potential

The findings of this research support a growing international consensus that phonemic awareness is a foundational skill for literacy and that explicit, multisensory phonemic instruction is highly effective for children with dyslexia. However, this study extends that understanding by validating these methods within the Uzbek linguistic and educational context, where such structured interventions are still in developmental stages (Suggate, 2016).

This research provides a practical and adaptable instructional model that could be integrated into national literacy programs, particularly in early primary grades. It also suggests that training classroom teachers—not only specialized therapists—in the use of phonemic analysis techniques could broaden the reach and sustainability of dyslexia interventions in Uzbekistan and other multilingual settings (Al Otaiba *et al*., 2012).

During the study, individual and group sessions were conducted with younger school-age children. At the initial stage, children encountered difficulties in distinguishing sounds within a word. Most of them misread letters, mispronounced sounds, or made spelling mistakes. However, after the application of special phonemic analysis exercises, sound games, and multisensory methods, children began to read words more accurately, developed the ability to correctly perceive sounds, and increased reading speed (Giannouli & Pavlidis, 2014).

Also, teaching the structure of sound analysis of a word served to reduce the main symptoms of dyslexia - problems such as misinterpretation of sounds, inability to distinguish them in the word structure, and slow reading. The effectiveness of this methodological approach is explained by the following main factors (Novita, 2016):

(i) Development of phonemic hearing - children learned to clearly distinguish sounds and developed the ability to perceive them by ear.

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(ii) Strengthening the connection between sounds and letters - children learned to connect letters in words with sounds, which facilitated their reading and writing processes.
(iii) Combining visual and auditory methods - various learning materials, including visual cues, voice training, and multisensory approaches, have improved children's perception processes.
(iv) Teaching through play - engaging and interactive activities for children increased their learning motivation and accelerated the learning process.

During the discussion, it was revealed that the methodology for teaching the structure of sound analysis of a word is more effective when it is carried out taking into account the individuality of students. Since the degree of dyslexia and receptivity of each child are different, it is necessary to approach them according to their needs. The research results showed that a multisensory approach (auditory, visual, and tactile learning) improves children's perception of sounds. Also, interactive games and visual materials based on sound analysis helped increase children's interest in learning.

At the same time, it was found that the development of children's phonemic hearing facilitates the process of reading and writing and leads to a decrease in signs of dyslexia. Therefore, to overcome difficulties associated with dyslexia, it is necessary to widely apply special methodological approaches in the educational process. The main conclusions drawn from this study are as follows:

(i) Teaching the structure of sound analysis of a word is one of the effective methods for eliminating dyslexia.
(ii) Developing phonemic hearing helps children distinguish sounds clearly and make fewer mistakes in the process of reading and writing.
(iii) The use of a multisensory approach in solving problems associated with dyslexia increases efficiency.
(iv) Interactive games and visual materials make the learning process more interesting for children and increase their motivation
(v) It is necessary to develop special approaches, taking into account the individuality of each child.

Thus, to eliminate the problem of dyslexia in primary school children, the methodology of teaching the sound structure of a word should be widely used by teachers, speech therapists, and parents. If this approach is combined with innovative technologies in the educational process, the results can be more effective. Therefore, in the future, it is necessary to expand research in this area and explore the possibilities of applying new technological tools, including artificial intelligence and mobile applications. This allows for a deeper study of the problem of dyslexia and the development of effective approaches (Alkhazaleh *et al*., 2022).

The problem of dyslexia in primary school children is one of the most pressing issues in the fields of pedagogy and psychology, and various methodological approaches have been developed to eliminate it. The results of this study showed that teaching the structure of sound analysis of a word is one of the effective methods for correcting dyslexia. For the development of reading and writing skills in children, the formation of phonemic auditory skills is of great importance. During the study, through special exercises, children acquired such important skills as clear separation of sounds, correct placement of sounds in a word, and increasing the speed of reading (Rusyani *et al*., 2022a; Rusyani *et al*., 2021; Rusyani *et al*., 2022b; Soetan *et al*., 2021; Marasabessy, 2023; Adesokan *et al*, 2024). During the discussion, it was found that the methodology for teaching the structure of sound analysis of a word is more effective when it is carried out taking into account the individuality of students. Since

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the degree of dyslexia and receptivity of each child are different, it is necessary to approach them according to their needs. The research results showed that a multisensory approach (auditory, visual, and tactile learning) improves children's perception of sounds. Also, interactive games and visual materials based on sound analysis helped to increase children's interest in reading.Another important aspect identified during the study is that the development of children's phonemic hearing facilitates the process of reading and writing and leads to a decrease in signs of dyslexia. At the same time, the effectiveness of this methodology also depends on the family environment of the children, the teacher's approach, and the quality of educational materials.In general, teaching the sound structure of a word is an effective method for overcoming difficulties associated with dyslexia, and it is recommended to widely use it in the educational process. This method, when applied in accordance with the individual characteristics of the child, greatly contributes to the development of reading and writing skills. In the future, the use of technology in this area should also be considered, including the possibility of improving exercises using mobile applications and artificial intelligence (Delgado *et al*., 2019).

5. CONCLUSION

This study demonstrated the effectiveness of a structured, phonemic-based methodology centered on the sound analysis of words in addressing the reading and writing difficulties faced by primary school children with dyslexia. Through observational analysis and practical classroom application, the study revealed that phonemic instruction, when delivered through a multisensory and child-centered approach, contributes significantly to the development of essential literacy skills.

The intervention led to clear improvements in students' phonemic awareness, decoding ability, and reading fluency. Children who previously struggled to distinguish sounds, connect letters to phonemes, or confidently engage in reading tasks showed measurable progress. The success of the methodology was strongly supported by the use of visual, auditory, and tactile tools, as well as game-based activities that increased motivation and engagement.

Importantly, the study emphasized that individualized instruction tailored to the unique needs of each child—greatly enhances the impact of phonemic-based approaches. The findings also highlighted the critical role of teacher involvement, environmental support, and active parental participation in sustaining student progress.

Beyond confirming the instructional value of phonemic analysis, the study contributes to the broader field of inclusive education in Uzbekistan, offering a locally relevant and scalable model for dyslexia intervention. The results call for the wider implementation of such methodologies in early literacy programs, along with teacher training and systemic support to ensure their effectiveness.

As educational technologies become more accessible, future efforts should explore how tools such as mobile apps and AI-supported platforms can be integrated to enhance learning, increase engagement, and provide personalized support. These innovations, combined with the core principles of phonemic instruction, have the potential to further advance inclusive literacy education and ensure that all children regardless of learning difficulties can achieve reading success.

6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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