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Cognitive Stimulation in Children with Severe Speech Impairment

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ABSTRACT

This article discusses speech disorders that may occur in children, particularly those resulting from disruptions in cognitive processes. Such disorders are especially prevalent among children with special needs who experience severe speech impairments. The aim of this article is to provide information on various types of speech disorders, which are often associated with organic damage to the central nervous system, and to offer guidance on appropriate stimulation strategies to support affected children. The research method employed is a literature review. The findings outline stages and exercises that can be implemented to assist children with speech disorders. The article also emphasizes the importance of collaboration between educators and speech therapists in diagnosing and addressing these challenges.

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1. INTRODUCTION

The development of speech abilities in children occurs gradually and continuously evolves over time. As children grow older, their speech development progresses in stages. The most critical phase typically takes place between the ages of one and a half to five years. During this period, children's speech abilities develop at a certain pace, and after the age of five, this development tends to accelerate and become more varied. However, some children experience delays or disruptions in speech development due to specific contributing factors. During this stage, speech disorders of varying degrees may sometimes be observed.

Understanding the causes of speech disorders is essential for parents, preschool educators, and school teachers. This importance stems from the fact that speech is a fundamental form of human communication, developed through historically shaped language systems. Speech consists of a combination of expressive sounds that convey meaning within specific linguistic frameworks. Several types of speech disorders may occur in children, including speech delay (Altuğ-Gücenmez *et al*., 2018; Jullien, 2021; McLaughlin, 2011), dyslexia (Becker *et al*., 2017; Lopez-Zamora *et al*., 2025; Panel *et al*., 2025; Snowling, Hulme, and Nation, 2020), aphasia (Cappa *et al*., 2025; Gilardone *et al*., 2023; MacWhinney, 2025; Sopia *et al*., 2023), and dysarthria (Enderby, 2013; Moya-Galé *et al*., 2021).

The causes of speech disorders in children include external (exogenous) factors, internal (endogenous) factors, and environmental conditions (Ricci *et al*., 2025). To examine the causes of speech disorders, an evolutionary-dynamic approach is employed. This approach encompasses an analysis of the processes leading to the emergence of the disorder, an understanding of the general principles of atypical development, and consideration of speech development patterns at each stage of a child's age.

Several researchers have examined the cognitive development of children with speech pathologies, including McCormack *et al*. (2022), Molini-Avejonas *et al*. (2017), Reilly, Harper, and Goldfeld (2016), Kent (2004), Mysak (1988), and Tsvetkova (1980). Additionally, various efforts have been made by researchers to address dysarthria (McCormack *et al*., 2022).

This article will discuss severe speech disorders in children, specifically dysarthria, and how educational programs are designed to help address these issues.

2. METHODS

A literature review is a systematic research method used to examine, evaluate, and synthesize existing scholarly works on a specific topic. The aim is to identify what is already known, what is not known, and what is being debated regarding the topic (Jesson, Matheson, and Lacey, 2011).

Here are the general steps in conducting a literature review:

i. Formulation of the Research Question: The first step is to define the focus of the review by formulating a clear and specific research question. This question will guide the process of searching and analyzing the literature.
ii. Literature Search: A comprehensive and systematic literature search is required to ensure that all relevant works are identified. "The search strategy should be comprehensive and systematic, using a combination of keywords and controlled vocabulary..." (Petticrew and Roberts, 2006). Relevant sources include electronic databases, scholarly journals, books, conference proceedings, and theses and dissertations.
iii. Literature Selection: After the initial search, the literature found needs to be selected based on pre-defined inclusion and exclusion criteria. "Inclusion and exclusion criteria are used to determine which studies are eligible for inclusion in the review" (Bramer *et al*.,

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2017). Inclusion criteria determine which works will be included in the review, while exclusion criteria determine which works will be excluded.

iv. Evaluation of Literature Quality: The methodological quality of the selected literature must be evaluated to assess the validity and reliability of the findings (Liberati *et al*., 2009).
v. Data Extraction: Relevant data from each selected work is extracted and systematically recorded (Bright *et al*., 2020).
vi. Analysis and Synthesis of Data: The extracted data is analyzed and synthesized to identify key themes, patterns, and gaps in the literature (Booth, Sutton, and Papaioannou, 2016). The synthesis method may vary depending on the type of data and the objectives of the review. The method used in this article generally involves narrative synthesis (summarizing and synthesizing findings descriptively).
vii. Writing the Literature Review Report: The literature review report is written clearly and structured, presenting key findings, conclusions, and implications for further research or clinical practice (Tranfield, Denyer, and Smart, 2003).

3. RESULTS AND DISCUSSION

In children with speech development disorders, violations in the syllabic structure of words can persist for years, especially when they are confronted with new phonological or morphological structures (e.g., motorcyclist, hairstylist). School-aged children often consciously avoid using words that are difficult to pronounce as an attempt to conceal their deficiencies from others.

In the learning process, various supportive methods are utilized, such as demonstrating the form and details of objects through hand movements and describing images. Before selecting corrective methods to address these deficiencies, an assessment by a speech therapist is always conducted. Traditional methods for examining the syllabic structure of words include evaluating overall speech development, intellectual ability, and the child's age.

We present a brief overview of several specific play sessions. Work with images comparing two objects begins with exercises such as completing sentences with appropriate descriptive words (e.g., "The goose's neck is long, but the duck's neck is..."), constructing sentences based on questions like "How do lemon and orange taste?", and identifying contrasting features between two objects (e.g., "The tree is tall, but the bush is short"). Additionally, we apply the method of parallel object description with the child (e.g., cow and goat, dog and cat).

The use of schemas in descriptive storytelling yields positive results. The activity of retelling helps to improve speech structure, expressiveness, pronunciation, and the ability to construct sentences and texts. Storytelling exercises are organized according to a specific plan with the following stages:

i. Organizational section – to help children concentrate and prepare for text perception;
ii. Listening to the text – without assigning a task to retell it;
iii. Analyzing the text in a question-and-answer format – to identify key scenes and speech expressions;
iv. Children read the text again – this time with a task to retell it;
v. Children retell the text – with the support of visual materials;
vi. Exercises to reinforce speech material;
vii. Analysis of the children's storytelling.

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The goals of these activities include strengthening and developing speech communication skills, fostering the ability to construct connected monologue speeches, and encouraging self-control and the ability to monitor the construction of connected speech. Additionally, the aim is to activate mental processes directly related to the development of oral speech. Corrective work to develop storytelling skills is carried out based on several didactic principles and involves collaboration between speech therapists and educators. Special attention is given to teaching children how to plan extensive connected narratives. Each text or visual material is taught in at least two sessions.

3.1 Learning Stages for Children with Dysarthria

For children with dysarthria, it is necessary to implement programs that will assist in improving the clarity and efficiency of their verbal communication. Children also need to be trained to develop the oral motor skills required for speech production, enhance phonological awareness, and improve articulation abilities. Furthermore, in the social life of the child, it is crucial for them to build self-confidence in communication and encourage active participation in social interactions.

There are several stages that can be implemented to assist children with dysarthria, as outlined by Yorkston and Beukelman (1999), which include five stages. This article will present the stages of dealing with dysarthria, as follows:

i. Stage 1: Assessment and Understanding
   Stage 1, as outlined by Mackenzie *et al*. (2012), focuses on assessment and understanding. The goal of this stage is to identify the specific strengths and weaknesses of the child in speech production, understand the type and severity of dysarthria, and gather information about the child's developmental history and communication environment. Activities that can be conducted include: 1) Observation: Observing the child speaking in various contexts (e.g., playing, interacting with family, etc.). 2) Formal Articulation Assessment: Using standardized tests to evaluate speech sound production both individually and in sequences of words. 3) Oral Motor Assessment: Evaluating the strength, coordination, and precision of speech muscles (lips, tongue, jaw, face). 4) Acoustic Analysis (if available): Analyzing the child's speech characteristics (rate, intonation, volume). 5) Interview with Parents/Caregivers: Gathering information about the child's speech development history, communication patterns at home, and any parental concerns. 6) Collaboration with Other Professionals: Discussing with occupational therapists, physical therapists, or psychologists if other developmental issues are present.
ii. Stage 2: Oral and Sensory Motor Exercises
   The goal of Stage 2, as outlined by Bernasconi *et al*. (2025), is to enhance the strength, range of motion, coordination, and control of the muscles involved in speech production, as well as to improve sensory awareness in the oral area. Activities conducted during this stage include: 1) Strength Exercises: These involve practices such as pressing the lips tightly together and holding them, attempting to blow small cotton balls or pieces of paper, sucking liquid through a straw, and chewing food with varying textures. 2) Range of Motion and Coordination Exercises: These include extending and retracting the tongue, moving the tongue upward, downward, left, and right, opening and closing the mouth wide, and performing lip movements such as alternately producing the sounds "O" and "I.". 3) Sensory Exercises: These involve providing tactile stimulation to the face and mouth area with

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different textures (e.g., a soft toothbrush, rough fabric, or ice cubes), sensing vibrations in the mouth area, or exploring various tastes (sweet, sour, salty) to increase oral awareness.

iii. Stage 3: Articulation and Phonology Development

In the stage of articulation development (Mendoza Ramos *et al*., 2021), the goal is to teach the gradual production of sounds that are difficult for the child to pronounce, increase awareness of sounds within words (phonological awareness), and practice the pronunciation of simple words and phrases. Some activities that can be performed include: 1) Single Sound Exercises: This involves starting with the sounds that are easiest for the child to produce, using visual cues (e.g., lip shapes), tactile cues (e.g., feeling vibrations), and auditory cues (e.g., listening to correct sound examples), using visual aids such as pictures or flashcards, and practicing sound production at the beginning, middle, and end of syllables. 2) Syllable Exercises: This involves combining sounds that have already been mastered into simple syllables (e.g., "ba," "ma," "pi"), and practicing syllable repetition. 3) Word Exercises: This involves choosing words that are familiar and relevant to the child's life, using pictures or real objects to help understand the meaning of words, and practicing the pronunciation of words both as a whole and by syllable. 4) Phonological Awareness Development: This involves identifying the initial and final sounds in words, differentiating between similar sounds, grouping words based on their initial or final sounds, and breaking words into syllables. 5) Simple Phrase Exercises: This involves combining the words the child has already mastered into short phrases (e.g., "big ball," "want to drink") or using pictures or situations to visualize the phrases.

iv. Stage 4: Speech Clarity and Functional Communication Enhancement

The goal of this stage is to improve speech clarity in more complex sentences, develop compensatory strategies for speech difficulties, and encourage the use of verbal communication in various social situations. The activities that can be performed include: 1) Sentence Exercises: This involves practicing the pronunciation of sentences with increasingly complex structures and focusing on intonation, pauses, and correct emphasis. 2) Compensatory Strategies: This includes teaching the child to speak more slowly and with more careful articulation, using gestures or body movements to clarify messages, and utilizing communication aids (if needed) such as pictures or communication cards. 3) Conversation Exercises: This involves practicing answering simple questions, participating in short conversations with topics of interest to the child, and practicing asking for help or expressing needs. 4) Generalization: This involves encouraging the child to use the speech skills learned in various environments (home, school, playground) and providing opportunities for interaction with peers and adults outside of the family.

v. Stage 5: Maintenance and Advanced Development

The goal of this stage is to maintain the progress that has been achieved, continue developing communication skills, and enhance the child's independence in communication. The activities that can be performed include: 1) Routine Exercises: Continuing speech practice regularly, although the frequency may be reduced. 2) Monitoring and Evaluation: Monitoring the child's speech development periodically

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and adjusting the program as needed. 3) Ongoing Support: Providing emotional support and motivation to the child. 4) Family Involvement: Encouraging the family to continue creating a positive and supportive communication environment. 5) Use of Technology (if applicable): Utilizing applications or software that can assist with speech practice.

3.2. Picture Series Game "Smart Hedgehog"

The objective of the "Smart Hedgehog" activity is to teach children how to construct a connected narrative based on a series of pictures that describe key moments in the storyline.

The main tasks that educators need to carry out include:

i. Developing skills in analyzing the visual storyline and the ability to create a narrative by comparing the content of individual pictures;
ii. Encouraging the use of complete sentences and the use of 3–6 word sentences in storytelling;
iii. Building skills in word transformation;
iv. Encouraging creative imagination in children;
v. Developing connected speech in a reasoning format.

The media and tools used in presenting the material include four medium-sized colored pictures and a board. The storytelling process can be carried out in two sessions based on the series of pictures.

Regarding non-verbal material exercises, the following aspects should be considered:

i. Games and exercises aimed at developing auditory attention, auditory gnosia, and auditory memory based on non-verbal sounds (e.g., "Where is the bell ringing?", "Find the musical instrument," "How many times is the drum struck?");
ii. Rhythm exercises – from simple to more complex. Children are offered various rhythm repetition methods (clapping, bouncing a ball, using musical instruments such as drums, tambourines, metallophones). Tasks include: "Clap as many times as the number of dots on the cube";
iii. Coordinated movements with rhythmic music – walking, light running, walking (this can be done in either music or logorhythmic sessions if speech therapy is provided in early childhood education institutions);
iv. Dynamic praxis exercises for the hands – performing movements according to a model (left, right, both hands) with oral instructions or counting: fist – edge, fist – edge – palm;
v. Hand coordination exercises – performing simultaneous movements with both hands (e.g., left hand – fist, right hand – edge);
vi. Graphic exercises – "Continue the sequence" (e.g., 0–0–0…).

The types of exercises and teaching methods are selected based on the child's age, intellectual development, and speech development. Speech disorders can hinder a child's development. The proposed methods, such as parallel description, dual object representation, and storytelling, are effective technological approaches to developing speech. These methods have been proven effective and gradually improve the quality of corrective work with children experiencing severe speech disorders. Each speech therapist should choose exercises based on the level of the child's speech deficiency and their

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corrective status. Lessons tailored to the child's condition are the most effective and beneficial.

3.3. Attitudes of Educators and Therapists

Several important aspects that educators and therapists need to consider when conducting therapy and providing support to children include maintaining their mental health and attitude (Connaghan *et al*., 2022), such as:

i. Patience and Consistency: The speech learning process requires time and patience. Provide support and praise for every progress the child makes.
ii. Supportive Environment: Create a positive, safe communication environment that encourages the child to interact.
iii. Engaging Approach: Use games, songs, and activities that are engaging to maintain the child's motivation.
iv. Focus on Functional Communication: Prioritize the child's ability to convey messages and interact effectively, even if their articulation is not yet perfect.

The collaboration process between educators, psychologists, psychiatrists, and speech therapists is essential for providing the most comprehensive and effective support for children with speech and language disorders. This collaborative approach should be continuously developed, nurtured, and implemented, ensuring that all professionals work together seamlessly to address the child's unique needs. Effective communication and mutual understanding between these professionals enable the development of a holistic treatment plan that takes into account the cognitive, emotional, and social aspects of the child's development, alongside their speech and language difficulties.

4. CONCLUSION

Speech disorders in children are generally caused by disruptions in cognitive processes, particularly among children with special needs who experience severe speech impairments. This article provides information on various types of speech disorders, many of which are often associated with organic damage to the central nervous system. It discusses several stages and exercises that can be implemented to support children with speech disorders, including interventions for children diagnosed with dysarthria. Among the recommended stages for assisting children with dysarthria are: conducting a comprehensive assessment and understanding of the condition; performing oral-motor and sensory exercises; developing articulation and phonology; enhancing speech intelligibility and functional communication; and implementing maintenance and ongoing development strategies. Furthermore, the article highlights the importance of collaboration between educators and speech therapists in diagnosing and addressing these disorders.

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