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ADDRESSING SPEECH DISORDERS: A QUICK REVIEW AND DESCRIPTION

DOI: 10.24234/se.v9i2.70

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ABSTRACT

As in the rest of the world, in the Republic of Armenia too, the number of preschool and school-age children with various speech disorders is increasing year by year. Today, it is essential to emphasize the importance of identifying developmental issues commonly observed among students of different age groups in preschool and general education institutions—particularly the statistically frequent speech disorders, including dyslalia, rhinolalia, dysarthria, dyslexia, dysgraphia, stuttering, and aphasia.

Each type of speech disorder has its own manifestations, developmental causes, and clinical indicators. Today, various methodological approaches are applied in clinics to identify these disorders. Interventions aimed at deepening understanding, prevention, and treatment are implemented, incorporating medical, speech therapy, and pedagogical-psychological approaches. Awareness of such information is crucial not only for parents but also for educators and tutors, as it enables the early detection and prevention of speech disorders and their more severe manifestations.

In this context, the close connection between biomedical sciences and pedagogy is especially important. This collaboration helps organize the educational process more effectively and ensures the upbringing and education of a healthy, problem-free generation within society.

Keywords: *Speech disorders, dyslalia, rhinolalia, dysarthria, dyslexia, dysgraphia, stuttering, aphasia, treatment.*

INTRODUCTION OF THE MOST COMMON SPEECH DISORDERS

Speech, as the second signaling system, a higher mental function, a means of communication, and a tool for thinking, is unique to humans. In the brain, the main centers responsible for speech are Broca's area and Wernicke's area (Khudaverdyan, 2020).

Depending on the causes underlying the development of speech disorders (SD), symptoms may appear at different stages in individuals of different sexes (Bobylova, Braudo, Kazakova & Vinyarskaya, 2017; Stepanenko & Sagudinova, 2010). In particular, among children, congenital issues or complications arising during childbirth can be noticeable from an early age.

In adulthood, speech disorders (SD) may manifest as a result of brain tumors, stroke, neurodegenerative diseases, or traumatic brain injuries (Makarov & Emelina, 2017).

In speech therapy, SDs are typically classified into three groups:

1. Oral speech disorders,
2. Written speech disorders, and
3. Disorders of speech tempo and rhythm.

Since oral speech is related to articulation, two types of oral speech disorders are distinguished: disorders of the external and internal formation of speech. Included among the disorders of external speech

formation are dyslalia, rhinolalia, and dysarthria, while internal speech formation disorders include alalia and aphasia.

Two types of written speech disorders are distinguished: dyslexia and dysgraphia.

As for disorders of speech tempo and rhythm, they are divided into non-convulsive and convulsive types. Specifically, non-convulsive disorders include tachylalia and bradylalia, while stuttering is considered a convulsive disorder.

Speech External Formulation Disorders

Dyslalia (partial tension or stuttering of spoken language): This is a speech articulation disorder. Depending on the nature of the disorder, dyslalia is categorized into the following types: functional, mechanical, physiological, monomorphic, and polymorphic. Functional dyslalia is further divided into the following forms:

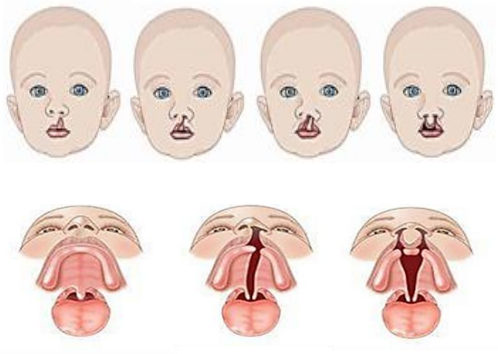
- **Acoustic (phonetic)**: In this case, although the child does not have hearing impairments, the underlying issue is the underdevelopment of phonetic hearing. As a result, the child has difficulty recognizing and differentiating one sound from another.
- **Articulatory (phonetic)**: This occurs when the speech apparatus is impaired, meaning the child cannot pronounce certain sounds correctly. Articulatory phonetic dyslalia is statistically one of the most common speech disorders among students in middle and secondary educational institutions. The causes of the two well-known types of dyslalia mechanical and functional are quite different.

In mechanical dyslalia, there are anomalies in the structures involved in speech production, such as pathological changes in the tongue, particularly a short frenulum, and underdevelopment of the maxillofacial system (Newbury, et al., 2009).

In functional dyslalia, the causes may include somatic or bodily illnesses, as well as complete functional changes in the auditory analyzer.

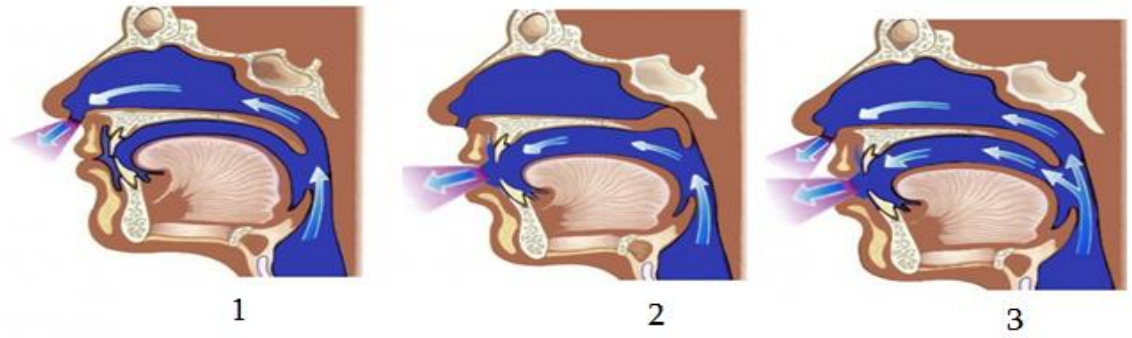
Rhinolalia: This is a disorder of articulation and voice timbre, which is accompanied by morphofunctional deficiencies of the speech apparatus. Clinical signs include changes in voice timbre, articulation, the perception of sounds, grammatical aspects of speech, and speech clarity. Particularly notable are the defects in the maxillofacial system, such as the presence of congenital clefts of the lip and palate, which are manifested as deformations in various parts of the maxillofacial area, either unilaterally or bilaterally (Picture 1).

Picture 1. Congenital clefts of the lip and palate.



Depending on the nature of the impairment in the palatopharyngeal area, different forms of rhinolalia are distinguished: closed, open, and mixed rhinolalia, each of which can be either organic or functional in nature (Picture 2).

Picture 2. Open (1), closed (2), and mixed (3) rhinolalias.



In the case of open rhinolalia, there are clefts of the lip and palate. In closed rhinolalia, although clefts of the lip and palate are absent, there are formations in the nasal cavity that obstruct the airflow into the nasal passage. In mixed rhinolalia, both clefts of the palate and lip are present, along with other formations.

Dysarthria (or speech articulation disorder): Dysarthria is a speech disorder caused by damage to the speech apparatus, resulting from impairments in the central and peripheral nerve innervation processes of the speech organs. The pathogenesis of dysarthria emphasizes the following causes: damage to the nuclei of cranial nerves, the transmission pathways in the brain, the influence of numerous exogenous harmful factors during intrauterine development and postnatal life (Belousova, Utukzova, Gamirova & Prusakov, 2013), disorders of cerebral circulation, brain neoplasms, poisoning, and more. There are various criteria for classifying dysarthria. According to the time of onset, dysarthria can be congenital or acquired (due to the conditions of childbirth). Based on the degree of expression, it can be mild, moderate, or severe. Based on the location of the affected area, there are several types of dysarthria: bulbar dysarthria (caused by damage to neurons in the brainstem, resulting in dull speech, soft voice, and noticeably impaired respiratory

speech), pseudobulbar dysarthria (caused by damage to nerve fibers projecting from the cortex to the cranial nerves, where speech is often interrupted, fragmented, and certain sounds and vowels are difficult to articulate due to relaxation of facial muscles), subcortical or extrapyramidal dysarthria (caused by damage to subcortical brain nuclei and their nerve connections, where speech becomes rough with changes in pitch and rhythm), cortical dysarthria (caused by lesions in the cortex, where all words are articulated but not clearly, with nasal voice, difficulty pronouncing consonants, slow and prolonged speech, and impaired coordination of purposeful movements), cerebellar dysarthria (caused by lesions in the cerebellum, resulting in changes in voice loudness, modulation, and pitch), and Parkinsonian dysarthria (caused by neurodegeneration of dopaminergic centers in the brain, typically seen in Parkinson's disease).

Written speech impairments

Currently, the number of students with reading and writing difficulties is significant in general education institutions. The processes of reading and writing are complex psycho-physiological processes involving various analyzers, such as visual, speech-motor, auditory-speech, and motor functions. Written speech disorders, such as dysgraphia and dyslexia, are the result of uneven development of the hemispheres, bilingualism in the family, hereditary predisposition, and Rh incompatibility (Eicher, et al., 2014).

Dysgraphia is a unique and persistent disorder of writing. Currently, there is a significant number of preschool and school-aged children with reading and writing difficulties in both preschool and general education institutions. This is due to the underdevelopment of the functions of different areas of the cerebral cortex in the brain hemispheres (Yagunova & Gainetdinova, 2018) as well as both overt and hidden left-handedness.

Dyslexia is a unique and persistent disorder of reading, where a child is unable to understand written or printed text. The child cannot accurately recognize letters, combine them into syllables and words, and therefore cannot read quickly and correctly, nor comprehend or retain the text they have read (Gibson & Gruen, 2008).

Speech tempo and rhythm disorders

Speech is not merely a sequence of words, but a structured expression that relies heavily on tempo and rhythm to convey meaning. Emphasis on key words is typically achieved through deliberate articulation, while less critical elements are spoken more fluidly. However, certain speech disorders distort this natural rhythm, either accelerating or decelerating speech to such an extent that comprehension becomes impaired (Shipley & McAfee, 2020).

These tempo and rhythm abnormalities-such as tachylalia, bradylalia, and stuttering are observed in both children and adults. Research suggests that such disorders are often rooted in neurological imbalances,

particularly in the cortical excitation and inhibition processes of the brain hemispheres (Bloodstein & Bernstein Ratner, 2008). For instance, tachylalia (abnormally rapid speech) is linked to dominant excitation, while bradylalia (abnormally slow speech) is associated with inhibition dominance in neural functioning (Kent, 2000).

Despite parents and educators recognizing anomalies in speech patterns, only a qualified speech-language pathologist can accurately diagnose the type and severity of the disorder and identify its underlying causes.

Bradylalia (Slow Speech) is characterized by pathologically slow speech due to heightened inhibitory neural activity. Causes may include hereditary predisposition, emotional fatigue, and even environmental factors, such as parenting style or imitation of slowed speech. Children with bradylalia often display motor skill delays, diminished facial expressiveness, and slow or uncoordinated movements (Paul & Norbury, 2012).

Tachylalia (Rapid Speech) arises from a hyperactive excitation process in the brain. It can stem from dysfunctions in the extrapyramidal motor system, genetic predispositions, or deficits in central speech regulation. Clinically, tachylalia is marked by hyperactivity, rapid motor movements, emotional instability, and a noticeable disparity between cognitive speed and speech output (Conture & Curlee, 2007).

Stuttering (Logoneurosis) is a convulsive disruption in the rhythm and fluency of speech, typically manifesting during the preschool years in children with fragile nervous systems or heightened emotional sensitivity. Symptoms include involuntary sound repetitions, spasms in speech musculature, and significant psychological distress, such as fear of speaking. Triggers often include trauma, familial conflict, neurological illness, or imitative behaviors (Yairi & Ambrose, 2013; Conture & Curlee, 2007).

The disorders of speech rhythm and tempo reflect deeper neurophysiological and psychological mechanisms. While visible to non-specialists, their accurate diagnosis, classification, and intervention require expert assessment and support.

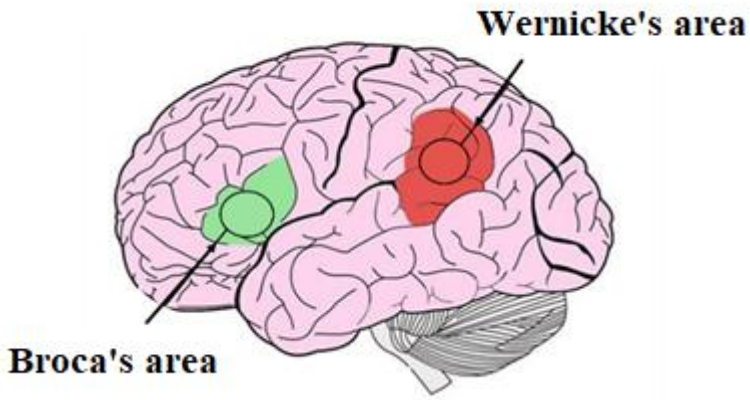
Disorders of internal speech formation

Aphasia is a disorder of already developed speech, in which the patient partially or completely loses the ability to understand others' speech or to express their own thoughts using words and sentences. It is caused by localized damage to the cortical areas of the brain hemispheres responsible for speech. The causes include brain injuries, ischemia, tumors, infectious diseases, lack of innervation of the blood vessels supplying the brain, and impaired cerebral blood circulation (Gainetdinova & Karimova, 2014).

Two main types are distinguished: sensory and motor aphasia. In sensory aphasia, the Wernicke's area located in the posterior part of the left superior temporal gyrus of the cerebral cortex is affected (Picture 3). In this case, the patient hears speech but cannot understand it, neither others' nor their own. It is often

accompanied by difficulties in reading and writing as well.

Picure 3. Localization of the brain centers responsible for speech



Motor aphasia is caused by damage to Broca's area, located in the posterior part of the left inferior frontal gyrus of the cerebral cortex. As a result, although the patient understands spoken language and the speech organs are physically intact, they are unable to speak because the speech-motor center of the cortex does not send the necessary instructions.

In motor aphasia, not only spoken language is impaired, but also reading and writing. Aphasia is often accompanied by alexia (reading disorder) and agraphia (writing disorder).

Alalia is a systemic underdevelopment or absence of speech, most commonly observed in early childhood (Belousova & Merkulova, 2013). The causes include maternal toxic pregnancy, organic damage to the cortical speech centers during fetal development or in the early postnatal period, intrauterine infections, premature or complicated labor, cranio-cerebral trauma in newborns, and unfavorable social conditions in the family.Clinical indicators include delayed speech development, a limited vocabulary, absence of grammatical structure in speech, and lack of phonation and articulation (Kovshikov, 2006). Depending on the location of cortical damage in the brain hemispheres, different manifestations of alalia are distinguished, including sensory or impressive alalia (caused by damage to the auditory speech analyzer; the child does not understand the meaning of speech directed at them, and their own speech is also incomprehensible; they speak excessively and continuously, with impaired pronunciation of syllables and sounds), motor alalia (caused by damage to the speech-motor analyzer; the child understands speech but, due to impaired function of the muscles involved in speech, cannot respond or produce articulated speech), and mixed sensory-motor alalia (caused by damage to both auditory and motor speech analyzers). To prevent and detect alalia early, a comprehensive diagnostic approach is required (Belousova & Merkulova, 2016).

MODERN APPROACHES OF SPEECH DISORDERS TREATMENT

Speech disorders encompass a wide range of conditions that impair an individual's ability to produce sounds that create words. These disorders include stuttering, articulation disorders, apraxia of speech, dysarthria, and voice disorders. Modern treatment approaches are evidence-based, multidisciplinary, and often tailored to the individual's age, diagnosis, and neurological profile.

For the treatment of all types of speech disorders, it is essential to create a friendly and calm environment at home and in the community, and attention should not be drawn to the existing problem of the child or adult. To prevent and eliminate the speech and non-speech symptoms in young children and adults, combined approaches are also used, namely medical, medical-pedagogical, and psychological methodological approaches.

It is necessary to consult specialists with narrow professional expertise, such as speech therapists, psychologists, neurologists, doctors, neuropsychologists, physiotherapists, psychotherapists, and ENT specialists (Zavadenko, 2019). Their correct professional advice, as well as technical or practical approaches, are crucial to detect various speech disorders at an earlier stage and, if necessary, carry out corrective work (Bobylova, Braudo, Kazakova & Vinyarskaya, 2017; Yasin, 2017; Volodina & Shklovsky, 2015). Below is a brief overview of different methodological approaches.

1. Neuroplasticity-Based Therapies

Recent research emphasizes leveraging neuroplasticity-the brain's ability to reorganize itself-to improve speech outcomes. Repetitive, targeted speech tasks can enhance neural pathways involved in motor speech control.

Constraint-Induced Language Therapy (CILT), initially developed for aphasia, is now applied to speech disorders by encouraging use of affected speech functions while limiting compensatory strategies (Pulvermüller & Berthier, 2008).

Intensive speech therapy programs, such as the PROMPT technique, use tactile-kinesthetic cues to guide articulatory movements (Hayden et al., 2010).

2. Cognitive-Behavioral and Mindfulness Approaches

For fluency disorders like stuttering, Cognitive-Behavioral Therapy (CBT) is used to address psychological components such as anxiety, avoidance, and negative self-perception.

Mindfulness-Based Stress Reduction (MBSR) helps clients remain present and reduce anticipatory anxiety during speaking tasks (Boyle, 2011).

These methods are particularly effective for adolescents and adults who have developed secondary behaviors and social fears.

3. Technology-Assisted Interventions

Modern speech-language pathology incorporates digital tools and apps for both assessment and therapy.

- Biofeedback tools (e.g., real-time spectrography or EMG) allow clients to see and correct speech production in real-time.
- Apps and AAC (Augmentative and Alternative Communication) devices support individuals with severe speech impairments or apraxia (Beukelman & Light, 2020).
- Telepractice has grown significantly, especially post-COVID-19, offering access to remote and rural populations (ASHA, 2022).

4. Motor-Based Approaches

For disorders such as Childhood Apraxia of Speech (CAS) and dysarthria, treatments focus on motor learning principles.

- Dynamic Temporal and Tactile Cueing (DTTC) is widely used for CAS, emphasizing repetition, visual and tactile prompts, and fading cues over time (Strand et al., 2006).
- LSVT LOUD is a structured program designed for individuals with Parkinson's disease that improves vocal loudness and clarity (Ramig et al., 2001).

5. Multimodal and Family-Centered Approaches

Modern therapy incorporates the child's environment, family, and educational team into the therapeutic process.

- Family-centered intervention ensures consistent carry-over of strategies in home and community settings.
- Multimodal interventions integrate speech, gestures, visuals, and technology to enhance communication, particularly for nonverbal or minimally verbal individuals.

Besides all these the **breathing exercises** are widely used by speech therapists in order to help strengthen the respiratory muscles, expand the lungs' vital capacity, activate diaphragmatic breathing, and develop the ability for sharp and deep inhalation and prolonged exhalation. Children can regulate prolonged exhalation during speech production and coordinate breathing pauses with the content of speech. **Barotherapy** is used as a special physiotherapy method conducted in special barochambers, where the application of high or low atmospheric pressure activates the body's metabolic processes (which already provides powerful energy resources for the entire functioning of the body), improves blood circulation to the brain, corrects and regulates speech disorders, and overall adjusts the functioning of the nervous system and plasticity, allowing the organism to flexibly adapt to the continuously changing environmental conditions.

ALS therapy is a modern approach used for corrective, developmental, as well as therapeutic, psychological, and medical purposes. Its goal is to activate the brain's neurons through classical music and

neuroplastic exercises.

Bobath therapy is aimed at the physical rehabilitation of individuals with organic damage. It is used for conditions such as cerebral palsy, birth injuries, surgical complications, coordination disorders, and other cases.

Psychotherapy aims to free individuals from various problems, including emotional, anxiety, and social issues. It is conducted using specific and diverse methods. Thanks to psychotherapeutic approaches, children develop appropriate psychological behavior and regain interest in their surroundings.

CONCLUSION

A comprehensive understanding of speech disorders is essential for parents, educators, and caregivers, as it facilitates the early identification, timely intervention, and prevention of speech pathologies and their potential progression. The findings underscore the interdisciplinary interdependence between biomedical sciences and pedagogy, which is pivotal for the effective design and implementation of educational strategies tailored to children with speech disorders.

This integrative approach is particularly critical within preschool and general education settings, where the alignment of medical insights with pedagogical practices contributes not only to the rehabilitation and development of children with communicative impairments but also to the formation of a healthier and more socially integrated generation. Thus, the collaboration between healthcare professionals and educators represents a key determinant in promoting inclusive, equitable, and sustainable educational outcomes.

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The article submitted and sent to review: 12.11.2024
Accepted for publication: 01.08.2025