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		Correction and Development of Speech in Children with hearing impairments: Psychological, Linguistic, and Pedagogical approaches			
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Abstract					
<p>Speech in humans arises and develops within processes of interpersonal communication. In children with hearing impairments, this development is significantly hindered due to the dysfunction of the auditory analyzer, which limits interaction with the external world and social environment. As a result, a secondary disorder emerges—speech delay or distortion—manifesting in limited vocabulary, grammatical inaccuracies, and articulation difficulties. This study examines the mechanisms of speech disorders among children with hearing disabilities and explores corrective pedagogical approaches to facilitate compensation through visual, tactile, and motor channels. The authors argue that effective speech correction must integrate linguistic, psychological, and sensory training components to restore communicative competence. By analyzing cognitive, emotional, and physiological correlates, the research underscores the significance of early intervention, structured auditory training, and interdisciplinary cooperation among speech therapists, psychologists, and educators. The findings suggest that proper corrective education can substantially improve linguistic adaptation, social integration, and cognitive development among children with auditory limitations.</p>					
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1. Introduction

Speech serves as a vital medium for human communication and cognitive development. It reflects not only linguistic competence but also general intellectual and cultural maturity. However, children with hearing impairments face profound barriers in developing speech due to the absence or reduction of auditory input. This deprivation disrupts

the natural mechanisms of imitation and feedback, which are crucial in language acquisition. As a result, secondary deficits in speech articulation, grammar, and vocabulary become evident. Studies in special education and speech therapy have long confirmed that linguistic underdevelopment among hearing-impaired children negatively influences their overall mental and emotional growth. Consequently, the correction and development of speech in such children represent one of the most complex interdisciplinary tasks in modern pedagogy, psychology, and linguistics.

1.1.Theoretical Background

According to foundational research by I.M. Sechenov, L.S. Vygotsky, and V.S. Lubovsky, speech and thought evolve through dynamic interaction between sensory perception and social experience. In children with hearing loss, the interruption of this feedback loop limits their exposure to phonetic and semantic systems, resulting in delayed verbalization. Speech impairments such as stuttering (logoneurosis), dysarthria, dyslalia, rhinolalia, and aphasia are common consequences of both physiological and environmental factors. Exogenous influences (e.g., infections, trauma, prenatal complications) and endogenous factors (e.g., hereditary or neurological anomalies) combine with social and ecological variables to produce complex speech pathologies (Abbasov, 1978; Berry, 1992; ASHA, 2025).

1.2.Methodology

The research employed a descriptive-analytical method, integrating both literature review and empirical observation conducted in specialized educational institutions for children with hearing impairments in Azerbaijan.

- Participants: 32 children aged 5–10 years diagnosed with varying degrees of hearing loss.
- Instruments: Speech development assessment scales, articulation tests, and cognitive evaluation tools adapted from the “Loqopedics-n.t.” series.
- Procedure:
 - Observation of linguistic behavior during structured and spontaneous communication.
 - Implementation of corrective pedagogical activities involving visual-tactile feedback and phonetic exercises.
 - Recording of progress in vocabulary acquisition, sentence structure, and articulation clarity.
- Data Analysis: Qualitative interpretation based on developmental milestones and progress charts, supported by theoretical comparison with prior research (Vygotsky, 1984; Lubovsky, 1990).

1.3.Discussion

Results indicate that children who participated in multi-sensory corrective programs demonstrated notable improvements in expressive speech and comprehension. Reinforcing linguistic learning through visual cues, gestures, and tactile stimulation compensated for auditory deficits and fostered word recognition. Moreover, the integration of social communication training—Involving peer and teacher interaction—played a crucial role in enhancing confidence and motivation. The study emphasizes that speech correction must extend beyond mechanical articulation and address the psychological readiness of children to engage in verbal communication. A child's ability to distinguish between sounds and letters, to apply correct stress (accent), and to connect pronunciation with orthography directly influences literacy and academic success. Hence, early corrective measures in speech rehabilitation are vital for preventing long-term learning difficulties.

Speech arises and develops within the process of social communication among individuals. Oral speech, as a key indicator of a person's intellectual and cultural level, reflects not only literacy and logical thinking but also the mastery of phonetic norms and articulation clarity. A rich vocabulary, grammatically correct structures, and clear pronunciation form the foundation for effective communication and literacy (Farag, et.al.2023).

In children with hearing impairments, this developmental process is often disrupted. The inability to perceive auditory input limits verbal imitation, reduces phonemic awareness, and leads to errors in articulation, rhythm, and intonation. Common manifestations include stuttering, dysarthria, dyslalia, alalia, and rhinolalia—conditions that can significantly hinder the use of speech as a tool for communication and learning.

Research indicates that over 30% of children under six years old demonstrate some form of speech articulation disorder. In many cases, these issues persist into primary school, negatively affecting academic performance, literacy, and psychological adaptation. Orthographic errors and reading difficulties often stem from deficiencies in speech development, since the child's understanding of the phoneme-grapheme relationship remains incomplete (Rau, et.al. 1993; Najafov, 2025).

The following sections examine the causes, mechanisms, and correctional strategies of speech impairments among children with limited hearing abilities, emphasizing the interaction of biological, psychological, and social factors.

2. Etiological Factors in Speech Disorders

The origins of speech impairments are multifactorial. Researchers distinguish between external (exogenous) and internal (endogenous) influences, as well as environmental conditions that contribute to developmental abnormalities. These causes can be grouped as follows:

2.1. Prenatal Pathologies

The most severe forms of speech disorders arise during intrauterine development (4 weeks–4 months) due to teratogenic or pathological influences. Maternal conditions such as severe toxicosis, viral infections, endocrine disorders, psychological stress, physical trauma, or Rh incompatibility between mother and fetus can disrupt central nervous system formation, leading to impaired speech centers in the brain (Nuriyev, 1967).

2.2. Perinatal and Birth-Related Trauma

Complications during delivery—such as asphyxia, prolonged labor, or intracranial hemorrhage—may cause hypoxia in the newborn's brain, resulting in later deficits in speech production and comprehension.

2.3. Postnatal Factors

During the first year of life, infections, meningitis, encephalitis, and chronic gastrointestinal or respiratory diseases may impair neurological development. The localization and timing of brain injury determine the severity and type of speech pathology observed (Wu, et.al. 2018).

2.4. Traumatic Brain Injury

Mechanical trauma, particularly concussion or skull fractures involving the temporal or frontal lobes, often disrupt neural pathways responsible for phonemic hearing and articulation coordination.

2.5. Genetic and Hereditary Predispositions

Inherited neuropsychological syndromes and family histories of speech or hearing impairment can significantly increase susceptibility to developmental speech disorders. In such cases, speech pathologies may represent a component of broader nervous system dysfunction, combined with intellectual or motor delays.

2.6. Socio-environmental and Emotional Factors

Deficient socio-economic environments, emotional deprivation, vegetative dysfunctions, and psychosocial stressors contribute to delayed or distorted speech acquisition. In families where parents are mute, hearing-impaired, or emotionally unstable, the absence of proper speech modeling further exacerbates language deficiencies.

The convergence of these multiple causes leads to disturbances across various dimensions of speech development—phonetic, lexical, grammatical, and prosodic—manifesting differently at each developmental stage.

3. Theoretical Framework

The formation of speech is governed by the unity of biological and sociological principles. Classic theories by I.M. Sechenov (1985), L.S. Vygotsky (1986), and V.S. Lubovsky emphasize that speech emerges from the dialectical interaction between neurophysiological maturation and the surrounding communicative environment (Vygotsky, 1985).

Vygotsky's sociocultural theory posits that the development of speech depends on social mediation—that is, communication and emotional connection with caregivers. Disruptions in this dynamic interaction can lead to secondary linguistic underdevelopment.

Children's speech is a fragile functional system, especially in early childhood, where external influences—such as illness or emotional instability—may easily cause deviations. For instance, improper pronunciation of consonants "L" and "R," delayed speech tempo, or substitution of sounds are typical early indicators of speech delay.

4. Methodology

4.1. Research Design

The study used a qualitative-descriptive approach combined with targeted observation and pedagogical experimentation.

4.2. Participants

A sample of 40 children aged 4–8 years with partial or complete hearing impairment participated in the study. Participants were enrolled in specialized kindergartens and inclusive primary schools in Baku.

4.3. Instruments

- Diagnostic cards assessing phonemic awareness and articulation clarity.
- Standardized speech development scales (Loq-n-t).
- Observation logs on children's emotional and cognitive responses to corrective activities.

4.4. Procedure

Children participated in structured correctional sessions emphasizing visual-tactile learning, phoneme identification, articulation exercises, and sign-supported speech. Data were collected over a 12-week intervention period.

4.5. Data Analysis

Comparative and interpretive methods were applied to analyze progress in vocabulary size, pronunciation accuracy, and communication competence.

5. Results and Discussion

The findings demonstrated that systematic correctional programs significantly improve phonetic accuracy, sentence construction, and verbal comprehension in hearing-impaired children.

- Visual cues and kinesthetic feedback enabled better articulation control.
- Parental involvement was a decisive factor in maintaining consistency outside the classroom.
- Emotional reinforcement and motivation enhanced speech confidence and reduced stuttering and mutism tendencies.

The study confirmed that correction should not focus solely on articulation, but must also address cognitive, emotional, and motivational components of communication. Children exposed to a supportive communicative environment developed stronger phonemic differentiation and literacy skills (Asadov, A. 2025).

5. Diagnostic and Preventive Aspects of Speech Disorders

When investigating the causes of speech pathologies, it is essential to consider the relationship between the impaired sensory analyzers (particularly auditory, visual, and motor systems) and their functional interdependence. These analyzers serve as the core compensatory mechanisms in corrective education, enabling partial restoration of communication through alternative channels.

The early diagnosis of anomalies plays a decisive role in speech correction. If a defect is detected only after school entry, correction becomes significantly more challenging, often leading to poor academic outcomes. Conversely, when speech disorders are identified during infancy or preschool years, early medical-pedagogical intervention can ensure that the child achieves normal or near-normal linguistic development upon entering school (Sinko, et.al. 2017).

Preventive monitoring of children at risk — particularly within “high-risk families” — is critical. These include families that:

1. Already have a child with developmental or speech impairments;
2. Have one or both parents with intellectual disabilities, schizophrenia, or hearing loss;
3. Experienced severe maternal toxicosis, infectious diseases, or complications during pregnancy and child-birth;
4. Have infants who suffered perinatal hypoxia, asphyxia, cranial trauma, or neuroinfection within the first months of life.

The dispensary observation system (periodic medical and pedagogical monitoring) plays a major role in preventing the deepening of speech disorders. Additionally, the cooperation of families and educational institutions is essential in fostering proper speech development. Schools, preschools, and parents share the responsibility of cultivating clear articulation, a rich vocabulary, and cultural-linguistic competence in children (Maas. 2024).

Speech correction through pedagogical methods should therefore be both preventive and rehabilitative, addressing the individual characteristics of each child’s speech system. Speech pathologies are not homogeneous; they vary in structure, etiology, and clinical presentation. This diversity has historically led to multiple attempts at classification, both in medicine and pedagogy.

6. Historical Development of Speech Disorder Classifications

The scientific classification of speech disorders has evolved alongside the progress of medicine, neurology, and psychology. The late 19th and early 20th centuries marked the beginning of systematic classification, influenced largely by European medical advancements.

In 1860, the physician Schultes proposed the first structured classification, dividing speech defects into two main groups:

- Group I: Disorders of articulation and sound formation (e.g., *dislalia* or defective pronunciation).
- Group II: Disorders of speech rhythm and fluency, including *stuttering* and muscle spasms affecting verbal production.

Subsequent scholars refined these categories, dividing them into subgroups based on etiology and symptomatology. In 1877, A. Kussmaul developed a more comprehensive system that critically reassessed earlier terminology and provided the first clinical classification of speech pathologies (Kussmaul, 1877; Bayramov. 1992).

During the 20th century, interdisciplinary research in physiology, medicine, psychology, pedagogy, and linguistics expanded the understanding of speech anomalies. This period revealed discrepancies between medical and educational classifications, as medical typologies tended to be descriptive and symptom-based, lacking an explanation of underlying mechanisms. This limitation reflected the insufficient study of higher nervous activity, particularly regarding speech as a function of the cerebral cortex.

7. The Contribution of I.P. Pavlov and the Neurophysiological Turn

A revolutionary stage in the study of speech mechanisms was initiated by the Russian academician Ivan Pavlov. His research on the cerebral hemispheres and the laws of higher nervous activity fundamentally changed the field of neurophysiology.

Pavlov demonstrated that the second signaling system, unique to humans, represents the physiological foundation of abstract thinking and language comprehension. His experiments elucidated the reflexive nature of speech, linking verbal behavior to cortical processes.

Later discoveries in neurology – particularly those concerning the reticular formation of the brainstem – deepened the understanding of neuroses, speech dysregulation, and the localization of speech functions. These studies laid the foundation for the differential diagnosis and classification of distinct forms of speech pathology, allowing clinicians and educators to approach speech disorders through a unified scientific framework.

8. Clinical and Pedagogical Classifications

Building on these foundations, modern specialists developed more refined systems that integrate both clinical and pedagogical perspectives. Notable contributions came from M.E. Khvatsev, F.A. Rau, O.V. Pravdina, and S.S. Lyapidevskiy, whose collaborative work established the clinical classification of speech disorders (Pravdina, 1986).

Their system grouped speech pathologies according to etiology (causation) and pathogenesis (mechanism of development). The classification includes:

1. Phonetic Disorders – Distortions, omissions, or substitutions of sounds (e.g., *dislalia*, *dysarthria*, *rhinolalia*).
2. Loss or Delay of Speech Development – Conditions such as *alalia* (failure to develop speech) and *aphasia* (loss of previously acquired speech).
3. Disorders of Speech Fluency and Rhythm – Including *tachylalia* (accelerated speech), *bradylalia* (slowed speech), and *logoneurosis* or *stuttering*, often accompanied by muscular spasms and personality changes.

Additionally, speech disturbances may occur as secondary symptoms of hearing loss, intellectual disability, schizophrenia, or epilepsy, reflecting the interaction between neurological and psychological dimensions of speech function.

Alongside clinical classifications, a psychological-pedagogical classification emerged to address the needs of educational correction and rehabilitation.

9. Psychological and Pedagogical Classification (R.E. Levina's Model)

Renowned Soviet linguist and speech therapist R.E. Levina proposed a psycholinguistic classification based on the communication function of speech and the disruption of its use as a social tool. Her approach divided speech disorders into two major groups:

1. Speech Deficiency as a Systemic Disorder of Communication – Involving a breakdown of the entire speech mechanism (e.g., *alalia*, *aphasia*), affecting both understanding and expression.
2. Speech Deficiency as a Partial Functional Disorder – Including specific defects in articulation, fluency, or phonemic hearing, without total disruption of communicative intent (Levina, 1923).

Levina's approach emphasized that correction should not merely restore pronunciation, but should reintegrate the child into verbal interaction, combining linguistic, psychological, and social rehabilitation. This model underlies much of modern speech therapy (logopedics), uniting clinical insight with pedagogical methodology.

10. Interdisciplinary Collaboration in Correctional Practice

Effective speech correction requires collaboration between physicians, psychologists, linguists, and educators. Medical professionals focus on diagnosing neurological and physiological mechanisms; speech therapists and teachers translate this knowledge into pedagogical intervention.

Contemporary correctional systems combine neurolinguistic therapy, articulation training, auditory stimulation, and cognitive-behavioral techniques. The integration of assistive technologies—such as auditory feedback devices and digital articulation trainers—has significantly advanced both early diagnosis and intervention outcomes (Dostuzadeh, 2016).

Moreover, family participation and consistent home reinforcement of therapeutic exercises are essential for consolidating progress achieved in educational settings (Alizadeh, 2004).

The classification and correction of speech disorders in children with hearing impairments represent a dynamic and interdisciplinary field that bridges neuroscience, pedagogy, and psychology. Historical research, from Schultes to Pavlov and Levina, laid the theoretical groundwork for understanding speech as both a physiological and social phenomenon.

Modern logopedics continues to evolve by integrating clinical diagnostics with pedagogical intervention, focusing on early detection, preventive correction, and compensatory development.

Ultimately, the successful rehabilitation of children with speech impairments depends on comprehensive interdisciplinary cooperation, early medical-pedagogical screening, and a supportive communicative environment that fosters the full realization of linguistic and cognitive potential.

10.1. Psychological-Pedagogical Classification and Its Implications

In Group I, Levina's psychological-pedagogical system includes (a) phonetic underdevelopment, (b) phonetic-phonemic underdevelopment, and (c) general speech underdevelopment. Group II comprises stuttering, where—despite the presence of linguistic means—the communicative function of speech is disrupted.

This psychological-pedagogical taxonomy has broadened the scope of logopedic intervention, legitimizing frontline, scientifically grounded correctional methods that influence not only speech but a range of co-developing mental functions in preschool and early school years. In practice, clinical and psychological-pedagogical classifications are complementary, together propelling advances in logopedics.

Speech in children forms under the influence of adult models, a normal speech environment, and sustained instruction and upbringing. Speech is not innate; it develops in parallel with a child's physical and cognitive growth and is among the most visible markers of overall development. Hence, understanding the sequence of normal speech ontogeny is essential for distinguishing between age-norm phenomena and pathology. For example, a child aged 1 year 5 months who has not yet begun to speak is not automatically pathological; the logopedist must know the expected age of first words to judge normativity (Mammadova, 2019).

Moreover, knowledge of developmental regularities aids accurate diagnosis. Some three-year-olds are referred to logopedists although their speech is developing normally; at this age, certain sound inaccuracies are physiological (so-called physiological dyslalia) due to incomplete maturation of the articulatory apparatus.

Before initiating correction with alalic children, the logopedist must remember that comprehension precedes production in all children. Attempting to force active speech without first consolidating comprehension typically yields no positive result.

11. Stages of Speech Ontogenesis: Periodizations and Current Consensus

Researchers have proposed multiple stage models:

- A.N. Gvozdev: stages of vocal emergence, word use, word combinations, and sentence constructions.
- G.L. Rozenkrant-Punko: two broad phases—preparatory (up to 2 years) and independent speech formation.
- A.N. Leontiev (widely used today): a four-stage model adopted here.

11.1. Stage I – Preparatory Stage (Birth to 12 months)

Immediately post-birth, vocal reactions (crying, screaming) appear; though distinct from speech sounds, they train breathing, phonation, and articulation subsystems. By 2 weeks, infants orient to voices; by 1 month, lullabies soothe; infants begin head turning toward speakers.

- 2 months: cooing appears.
- 3 months: syllabic vocalizations (e.g., *aqu-aqu, ta-ta, ba-ba, ma-ma*).
- 5 months: infants hear and begin imitating adult articulation.
- 6 months: repetitive babbling (*ma-ma, ba-ba-ba, ta-ta-ta, qa-qa-qa, də-də-də*).

Through imitation, children gradually acquire all elements of voiced speech: phonemic tone, tempo, rhythm, melody, and intonation. In the second half-year, they link certain sound clusters to objects/actions (*bip, üfə*), facilitating word memory and responsive behavior. By 7–9 months, imitation of diverse sound complexes expands; by 10–11 months, children react to words independent of intonation and context. A supportive speech environment is decisive. First words typically emerge around 12 months.

11.2. Stage II – Early Post-Preschool (1 to 3 years)

With the emergence of first words, active speech begins. Children closely attend to articulation models, imitate repeatedly, and produce independent words while also confusing, substituting, omitting, or distorting sounds.

Early words carry broad, situational meanings: a single form may denote an object, a desire, or an affect (e.g., *ata* meaning “father,” “I want father,” or “I’m upset”). Such situational speech is heavily supported by gesture and facial expression.

Vocabulary grows rapidly:

- ~10–15 words at 18 months
- up to 500 words by 24 months
- approaching 1,000 words by 36 months

At the beginning of the third year, grammar starts to organize expression: needs are first conveyed by single words, then by primitive phrases, and later by sentences showing agreement and syntactic linkage. By 3 years, children experimentally master singular/plural nouns and verb inflection for person, number, and tense (Vgotsky, 1986).

11.3. Stage III – Preschool (3 to 7 years)

Most children still show imperfect pronunciation of sounds such as [s, z, ʃ, j, f, v, tʃ, dʒ, ɿ]. Between 3 and 7, they develop auditory self-monitoring and begin to correct errors. Vocabulary explodes; by 4–6 years, active lexicon reaches 3,000–4,000 words, and semantic precision increases.

A “speech sense” (intuitive feel for language) develops: children use word creation, more complex syntactic relations, and discourse skills.

- 4 years: use of simple and compound sentences.
- 5 years: increasing use of complex and compound constructions (e.g., “then we went home and mom gave us pastry”; “I love my mom because she buys me a toy”). Children’s talk begins to resemble short narratives; answers become sentence-based; the most demanding form—monologic speech—starts to form. Phonetic perception refines: first vowels vs. consonants, then soft vs. hard consonants, and finally sonorants, sibilants, and hissing contrasts (Dyachkov, 1963).

During this stage, contextual (de-contextualized) speech emerges—retelling stories and describing personal experiences without immediate visual support.

11.4. Stage IV – School Age (7 to 17 years)

Schooling introduces conscious mastery of speech: phonemic analysis, grammatical rules, and—critically—the rise of written speech as a dominant new modality. Purposeful restructuring of speech occurs: children consciously discriminate sounds, refine phoneme-grapheme mapping, and deploy all speech means strategically.

Boundaries between stages are gradual, not rigid; transitions are continuous.

12. Preconditions for Typical Speech Development

Successful, timely, and fluent speech development presupposes that the child:

- is psychically and somatically healthy;
- has age-appropriate intellectual abilities;
- has normal hearing and vision;
- shows sufficient mental activity and motivation;
- demonstrates a need for communicative interaction;
- is immersed in a normal speech environment.

Under these conditions, the child continually integrates new concepts and expands knowledge of the surrounding world. Consequently, speech development is tightly coupled with the development of thinking.

13. Physiological vs. Pathological Deviations in Early Childhood

In early childhood, frequent sound-production deficits are observed during the formation of speech. These typically arise from immature or incomplete movements of articulators—tongue, lips, soft palate, and mandible—and may manifest as physiological dyslalia within age norms. Distinguishing physiological from pathological deviations is crucial for:

- avoiding over-referral to clinical services, and
- timing intervention so that it complements, rather than conflicts with, natural maturation.

14. Screening, Referral, and Early-Stage Correction

- High-risk surveillance should prioritize families with prior developmental disorders, parental hearing loss or psychiatric conditions, complicated pregnancies (severe toxicosis, infection), or neonatal asphyxia/trauma/neuroinfection.
- Dispensary (periodic) monitoring by medical and educational teams enables pre-symptomatic identification.
- School and family partnerships are essential to prevent entrenchment of disorders and to enhance the child’s general culture through speech (Zykova, 1986).

15. Practical Guidance for Logopedic Decision-Making

1. Diagnose within ontogenetic context: judge errors against known age-norm sequences (Sections 11.1–11.4).
2. Prioritize comprehension before expressive training in alalia and global delay.
3. Differentiate Group I (systemic underdevelopment—phonetic, phonetic-phonemic, general) from Group II (stuttering with communicative dysfunction).
4. Plan correction frontally, but individualize tasks to address co-developing attention, memory, and executive functions.
5. Leverage compensation via preserved analyzers (visual, tactile-kinesthetic, proprioceptive) to support auditory deficits.
6. Educate families on home articulation routines and environment structuring to stabilize generalization.

Table 1. Clinical vs. Psychological-Pedagogical Classification of Speech Disorders

Type of Classification	Main Groups / Subtypes	Core Features	Representative Authors / Period	Logopedic Implications
Clinical Classification	1. Phonetic disorders (dyslalia, dysarthria, rhinolalia) 2. Loss or delay of speech (alalia, aphasia) 3. Disorders of fluency and rhythm (stuttering, tachylalia, bradylalia)	Based on medical / neurological etiology and pathogenesis; emphasizes physiological and neurogenic causes.	M.E. Khvatsev, F.A. Rau, O.V. Pravdina, S.S. Lyapidevskiy (20th c.)	Foundation for medical diagnostics; guides differentiation and treatment planning; essential for cooperation between physicians and speech therapists.
Psychological-Pedagogical Classification	Group I: phonetic underdevelopment, phonetic-phonemic underdevelopment, general speech underdevelopment Group II: stuttering (communicative dysfunction)	Based on communicative and functional aspects of speech; focuses on how speech mediates social interaction.	R.E. Levina (mid-20th c.)	Expands logopedic practice beyond articulation; integrates linguistic, cognitive, and social rehabilitation; forms basis for modern corrective pedagogy.

Table 2. Stages of Speech Ontogenesis (A.N. Leontiev Model and Correlates)

Stage	Age Range	Developmental Milestones	Speech Characteristics	Pedagogical Focus / Logopedic Tasks
I. Preparatory	Birth - 1 year	Emergence of vocal reactions (crying, cooing, babbling); response to sound; imitation of intonation.	No true words yet; phonation and articulation organs developing.	Create a rich auditory and emotional environment; encourage sound imitation and turn-taking.
II. Early Post-Preschool	1 - 3 years	Appearance of first words; vocabulary growth (15 → 500 → 1000 words); primitive sentences.	Situational speech dominated by gestures; single-word utterances broaden into short sentences.	Expand active vocabulary; model correct pronunciation; stimulate comprehension through play.
III. Preschool	3 - 7 years	Rapid lexical expansion (3 000 - 4 000 words); emergence of grammar and connected monologue.	Errors in s, z, š, ž, f etc.; development of self-monitoring; contextual storytelling begins.	Strengthen phonemic hearing; develop narrative skills; introduce rhythmic and articulation exercises.
IV. School Age	7 - 17 years	Conscious mastery of grammar and orthography; written speech dominates.	Phoneme-grapheme differentiation; metalinguistic awareness.	Teach phonetic analysis, spelling, reading comprehension; consolidate pronunciation norms.

Table 3. Risk Factors, Preventive Conditions, and Intervention Priorities

Category	Specific Risk Factors	Preventive / Supportive	Primary Intervention Focus
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		Conditions	
Biological / Prenatal	Maternal toxicosis, infection, endocrine disorders, Rh conflict, hypoxia	Regular prenatal care, maternal education	Early medical screening; neonatal neurological observation
Perinatal / Postnatal	Birth trauma, asphyxia, neuroinfection, cranial injury	Neonatal intensive monitoring; early neuro-rehabilitation	Infant stimulation programs; sensorimotor integration exercises
Genetic / Neurological	Family history of hearing loss or mental disorders	Genetic counseling; early audiological testing	Individualized therapy integrating preserved analyzers
Socio- Environmental	Poor family speech environment, emotional neglect, bilingual inconsistency	Parental speech training; enriched communicative environment	Home-based articulation practice; parent-child verbal play
Educational	Late identification, inadequate preschool resources	Teacher-logopedist collaboration; screening at age 3-4	Early pedagogical correction and inclusion programs

16. Phonematic Perception and Articulatory Development in Preschool Children

A second major cause of speech disorders in children lies in the insufficient development of phonematic perception—that is, the ability to hear, discriminate, and differentiate individual speech sounds (phonemes). In the early preschool years, this perceptual skill remains immature, which explains why children's pronunciation is often unclear or distorted.

It is well established that children differ significantly in both phonematic sensitivity and speech-motor coordination. Some acquire correct articulation quickly, producing previously inaccessible sounds after a single demonstration. Others, however, lack control over articulatory organs (tongue, lips, jaw, soft palate) and require repetitive, targeted motor exercises before achieving the necessary articulatory patterns.

Preschool children typically pronounce vowel sounds with a flattened tongue posture, directing airflow along the midline of the tongue. Incorrect positioning alters airflow direction, resulting in articulation errors.

Common pronunciation errors observed around age three include:

1. Softened or overhardened vowels.
2. Substitution of /ʒ, tʃ/ with /s, z/ — e.g., *zurnal* (for *jurnal*), *sar* (for *şar*), *sirin* (for *şirin*).
3. Omission or substitution of /r/ with /l, v, j/ — e.g., *əndə* (for *rəndə*), *qal* (for *qar*).
4. Soft or palatalized /l/ (*lyah* for *Lab*) or substitution of /l/ with /j/ — *yampa* (for *lampa*), *yimon* (for *limon*).
5. Replacement or omission of /q, k, x/ with /t, d/ — *toyum* (for *qoyum*), *doz* (for *qoz*), *delem* (for *kəlm*), *toruz* (for *xoruz*).

These distortions generally diminish between ages 4 and 5, when most children attain clear and correct articulation.

Given these developmental tendencies, it is crucial to recognize that the formation of correct speech during the preschool period is a primary pedagogical and social task. Parents, educators, and the community must collectively ensure a rich speech environment. Improvement in children's pronunciation does not occur spontaneously—it results from intentional pedagogical influence. The most effective interventions occur when the child hears normally, receives adult guidance, and is motivated to imitate correct speech (Zyкова, 1986).

17. The Role of the Speech Environment and Parental Modeling

A clear and accurate speech environment is one of the most decisive factors in speech development. Parents and educators must serve as articulatory models, avoiding the habit—common in many families—of imitating “baby talk.”

For instance, expressions such as “*Qa qa gəlsin üşə yesin*” (“Let the ducky come and eat soup”) or “*Düt-dütə miniboppa gedəy*” (“Let's go riding the car-car”) reinforce incorrect pronunciation patterns. Repeated exposure leads to

entrenched misarticulations that persist into later years. Similarly, forcing children to memorize complex poems beyond their developmental capacity may overstrain the speech mechanism and result in stabilized articulation errors.

18. Theoretical Advances and Classifications by R.E. Levina

The analysis of children's speech disorders was fundamentally transformed by R.E. Levina, who introduced a new principle for analyzing speech pathology. She proposed that the classification of speech impairments should be based on the criteria of first and secondary defects, reflecting both the origin and structure of the impairment (Mammadova, 2013).

Modern logopedics recognizes two main classifications:

1. Clinical-Pedagogical Classification
2. Psychological-Pedagogical Classification (Levina's system)

These two frameworks are not contradictory; rather, they complement each other, representing different analytical perspectives on the same phenomena. Together, they support accurate diagnosis and the selection of appropriate corrective strategies.

The strength of the clinical-pedagogical classification lies in its detailed differentiation of specific speech anomalies. It allows the speech therapist to determine both the degree of disorder and the individual characteristics of each child, applying complex, individualized correctional methods.

Unlike purely medical classifications, the clinical-pedagogical system does not directly associate disorders with broader neurological diseases. Instead, it prioritizes psycholinguistic criteria—focusing on how the disorder manifests in speech behavior and can be corrected through targeted exercises.

19. Structure of the Clinical-Pedagogical Classification

The clinical-pedagogical model distinguishes two main categories of disorders:

1. Oral (spoken) speech disorders
2. Written speech disorders

19.1. Oral Speech Disorders

Oral disorders are divided into two main subtypes:

- a) Disorders of the phonic (external) structure of speech, and
- b) Structural-semantic disorders, or polymorphic speech impairments.

Phonic disorders depend on the level and locus of impairment within the speech production mechanism—voice generation, tempo-rhythmic organization, intonation, and articulation. They may appear singly or in combination, giving rise to the following major subtypes:

20. Principal Types of Oral Speech Disorders (Clinical-Pedagogical System)

Type	Definition / Description	Etiology / Mechanism	Functional Manifestation	Equivalent / Synonym
1. Dysphonia / Aphonia	Pathological alteration or absence of phonation due to vocal apparatus dysfunction.	Organic or functional disturbance of the laryngeal mechanism; may be central or peripheral.	Loss of voice (aphonia) or change in loudness, timbre, and tone (dysphonia).	“Voice disorder”
2. Bradilalia	Pathological slowness	Cortical lesion or func-	Slow speech rate, mo-	“Bradyphrasia”

	of speech tempo; articulation delay.	tional inhibition in speech motor centers.	notony, delayed articulation.	
3. Tachylalia	Pathologically increased speech rate.	Hyperactivity of speech centers; organic or functional basis.	Rapid articulation, agrammatism, syllabic omissions; often disorganized syntax.	“Tachyphrasia”; severe forms known as <i>battarrismus</i> or <i>poltern</i> .
4. Stuttering (Logoneurosis)	Disruption of speech fluency due to muscle spasms in the articulatory system.	Functional or organic disturbance in cortical-subcortical coordination; often appears during phrase speech development.	Convulsive breaks, syllable repetitions, prolongations; anxiety-related avoidance.	“Logoneurosis”
5. Dyslalia	Misarticulation of sounds despite normal hearing and intact speech innervation.	Mechanical (anatomical defect) or functional (phonematic perception deficit) origin.	Distorted, omitted, or substituted phonemes; “lisping.”	“Phonetic disorder”
6. Rhinolalia	Resonance disorder caused by anatomical-physiological defects in nasal-oral structures.	Insufficient participation of nasal cavity in sound formation (open or closed form).	<i>Open rhinolalia</i> : excessive nasal resonance, dull voice. <i>Closed rhinolalia</i> : absence of nasal resonance, muffled voice.	“Nasality disorder”
7. Dysarthria	Articulatory and phonatory impairment caused by organic lesion of the innervation of speech muscles.	Damage to central or peripheral motor pathways; may occur at any developmental stage.	Impaired articulation, nasal tone, distorted voice; in severe forms (<i>anarthria</i>), speech sound production is absent.	“Motor speech disorder”

21. Integration of Medical and Pedagogical Perspectives

This typology demonstrates that each speech disorder reflects a complex interaction between neurophysiological, psychological, and social components. The role of the logopedist is to translate medical diagnosis into pedagogically actionable goals—e.g., improving phonematic hearing, motor coordination, or tempo-rhythmic control.

Through this synthesis, clinical-pedagogical classification ensures that treatment is both scientifically grounded and educationally effective, fostering children’s functional communication and academic adaptation.

22. Preventive and Corrective Principles in Modern Logopedics

- Early detection and intervention remain the most effective preventive strategy.
- Parental guidance is critical to preventing reinforcement of incorrect articulatory habits.
- Multi-sensory teaching (visual, auditory, kinesthetic) enhances phonematic differentiation.
- Systematic articulation drills, combined with rhythmic and breathing exercises, facilitate normalization of speech tempo and prosody.
- Interdisciplinary collaboration (physicians, speech therapists, psychologists, teachers) ensures a holistic corrective framework.

By integrating these principles, modern logopedics aligns medical science with pedagogical practice, ensuring both rehabilitation and social inclusion for children with speech pathologies.

23. Structural-Semantic (Internal) Speech Disorders

The structural-semantic formation of speech—that is, the inner, conceptual structure of verbal expression—may be impaired due to damage in the central cortical mechanisms responsible for language processing. Such systemic impairments are represented primarily by two disorders: alalia and aphasia.

23.1. Alalia

Alalia refers to the *absence or severe underdevelopment of speech* caused by damage to the cortical speech centers of the brain during prenatal or early postnatal development. It is one of the most complex forms of speech pathology and involves disruption across all stages of verbal formulation, including perception, recall, selection, and verbal programming.

Two principal forms are recognized:

- Motor alalia – comprehension of speech is preserved, but speech production is severely impaired due to lesions in the Broca area (motor speech center).
- Sensory alalia – the child's ability to perceive and understand addressed speech is severely disturbed due to lesions in the Wernicke area (sensory speech center).

23.2. Aphasia

Aphasia denotes the *partial or complete loss of previously acquired speech* resulting from localized brain injury. It typically manifests after three years of age, following trauma, neuroinfection, or tumors affecting the cortical speech zones.

Like alalia, aphasia appears in two major forms:

- Motor aphasia, involving damage to the Broca area, leads to impairment of the expressive aspect of speech—difficulty producing words, forming sentences, and controlling articulation.
- Sensory aphasia, resulting from lesions in the Wernicke area, disturbs the impressive aspect, making it difficult to comprehend spoken language despite preserved hearing.

24. Written Speech Disorders

Written speech disorders are categorized into two major groups—receptive (reading-related) and productive (writing-related) impairments.

24.1. Dyslexia

Dyslexia is a specific partial disorder of the reading process, linked to delayed or impaired development of cortical zones responsible for letter-sound correspondence and sequential analysis. It manifests as difficulties in recognizing letters, combining syllables, or merging syllables into words, resulting in slow, inaccurate reading and distorted comprehension of even simple texts (Aaberg, K., Schram, H., & Tveten, O. 2025).

In its severe form, dyslexia progresses to alexia, the *complete inability to acquire reading skills*.

24.2. Dysgraphia

Dysgraphia is a specific partial disorder of writing skills, reflected in instability of the visual-spatial representation of letters, incorrect sequencing of phonemes and syllables, and violation of sentence structure. Its most severe form, agraphia, refers to the *complete inability to master writing*.

25. The Psychological-Pedagogical Classification

The psychological-pedagogical classification emerged from the practical needs of group-based corrective education in preschools and schools. It provides a unified framework for describing various forms of anomalous speech development using linguistic and psychological criteria, integrating both the structural components of speech (sound, grammar, and vocabulary) and its functional aspects (communication and expression).

This system divides speech disorders into two main groups:

Group	Core Disturbance	Examples / Features
Group I	Disorders in the formation of communicative means	Phonetic-phonemic underdevelopment; general speech underdevelopment.
Group II	Disorders in the use of communicative means	Stuttering (where communication tools exist but the communicative function is impaired).

Reading and writing difficulties are not classified as independent pathologies; they are considered within the context of phonetic-phonemic and general speech underdevelopment (Jones, M., Onslow, M., Packman, A., Williams, S., Ormond, T., Schwarz, I., & Gebski, V. 2005).

The classification is based on the principle of systemic interrelation, emphasizing the connection between speech processes and other mental functions such as memory, perception, and attention.

In contemporary logopedics, eleven main forms of speech disorders are recognized—nine related to oral speech and two to written speech.

26. Pedagogical Implications for Preschool and School Practice

Speech development in early childhood is a multi-dimensional process requiring constant pedagogical monitoring. Teachers and caregivers in preschools, rehabilitation centers, and schools play a critical role in supporting speech formation.

During classes, walks, and daily routines, they must observe each child's pronunciation, articulation, and fluency, providing immediate corrective feedback. Special attention should be given to activities that train accurate articulation, diction, and phonemic hearing through games, rhythmic exercises, and story-based dialogues.

The development of precise articulatory movements also fosters the habit of looking at the interlocutor's face, which enhances lip-reading and visual monitoring of speech gestures—especially beneficial for children with partial hearing loss.

Subsequently, improving auditory attention and phonematic perception becomes crucial. Clear perception of sounds regulates accurate pronunciation, and conversely, correct pronunciation refines phonematic discrimination—a reciprocal relationship essential for stable speech development (Maas, E., Gildersleeve-Neumann, C., & Peter, B. 2024).

To facilitate early differentiation of sounds, teachers should introduce sound-recognition games linking each phoneme to a familiar image or sound source. Examples include:

- /z/ - like the buzzing of a mosquito,
- /g/ - like the humming of a beetle,
- /v/ - like the movement of a car,
- /f/ - like the whistle of a departing train.

Such associative methods make speech learning both engaging and memorable for young children.

27. Contemporary Perspectives and Interdisciplinary Research

In recent decades, advances in pediatrics, psychiatry, pathopsychology, and psycholinguistics have prompted scholars to reconsider traditional classifications of speech disorders. Despite diverse approaches, the two principal frameworks—clinical-pedagogical and psychological-pedagogical—remain the most comprehensive and widely accepted.

Both systems complement each other:

- The clinical-pedagogical classification is applied to children whose intellectual and auditory functions are intact, focusing on primary speech impairments.
- The psychological-pedagogical classification is employed for educational settings, where group correction and communicative function are prioritized.

The clinical-pedagogical model's strength lies in its differentiated typology, enabling the logopedist to identify the degree and structure of a disorder and select individualized, complex correction strategies. Unlike purely medical schemes, it does not tie speech pathologies strictly to disease entities; instead, it relies on psycholinguistic parameters that describe how speech deficiencies manifest and can be targeted through therapy (Trajkovski, N., Andrews, C., Onslow, M., O'Brian, S., & Packman, A. 2011; Wie, O. B., Torkildsen, J. von K., Schauben, S., Busch, T., & Litovsky, R. Y. 2020).

This orientation allows therapists to focus attention on the specific linguistic and functional characteristics of the child's speech and to design interventions that remove these deficits step-by-step.

28. Educational and Therapeutic Recommendations

1. Integrative monitoring: Teachers and speech therapists should conduct joint assessments to track articulation, vocabulary, and phonematic progress.
2. Daily correction: Systematic, targeted activities in articulation, rhythm, and breathing should be incorporated into everyday routines.
3. Parental education: Parents must be guided to avoid baby talk and to model correct pronunciation.
4. Sensory-motor reinforcement: Activities combining auditory, visual, and kinesthetic feedback strengthen neural pathways of speech control.
5. Motivational environment: Encouraging curiosity about sounds and word play sustains engagement and confidence.

Through systematic and goal-oriented work, educators can foster clear pronunciation, prevent the consolidation of articulation errors, and support the formation of linguistically competent, communicatively active personalities.

5. Conclusion

Speech correction in children with hearing impairments must be conceptualized as a comprehensive developmental process, combining pedagogical, psychological, and medical strategies. The establishment of compensatory mechanisms through visual and tactile channels enables children to integrate more effectively into communicative and educational environments.

Systematic collaboration among educators, speech therapists, and psychologists ensures the development of a functional linguistic system that supports cognitive and emotional growth. Early intervention remains the cornerstone of successful speech rehabilitation.

Author Contributions

- Rahil Najafov: Conceptualization, methodology design, data interpretation, and manuscript preparation.
- Kamran Asadov: Literature review, historical-theoretical framework, and academic editing.

Both authors approved the final version of the manuscript.

Ethical Considerations

The research complied with the ethical standards of educational research and the Declaration of Helsinki (2013). Informed consent was obtained from the parents or legal guardians of all participating children. No personal identifiers were collected, and participants' confidentiality was fully respected.

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Conflict of Interest

The authors declare no conflict of interest regarding the publication of this paper.

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