

Conducting Correctional Speech Therapy Work with Preschool Children with Autism Spectrum Disorders Using Neuropsychological Technologies

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Abstract

This article examines the theoretical and practical aspects of applying correctional speech therapy using neuropsychological technologies for preschool children with autism spectrum disorders. The study reveals the psychological, neurological, and linguistic characteristics of autism spectrum disorders and, based on scientific evidence, identifies the specific patterns of speech development in this group of children. Particular attention is given to analyzing the impact of the neuropsychological approach on the speech therapy process, especially the implementation of technologies aimed at improving sensory integration, enhancing cognitive functions, stimulating motor activity, and facilitating verbal communication.

The article demonstrates the effectiveness of correctional speech therapy conducted with the use of neuropsychological technologies and scientifically substantiates their positive impact on children's speech activity, social adaptation, cognitive development, and emotional stability. The research findings indicate that a comprehensive neuropsychological and speech therapy approach is essential for restoring and improving speech functions, developing communication skills, and facilitating children's adaptation to the educational process. This study has significant scientific and practical value in the fields of preschool education, special pedagogy, speech therapy, and neuropsychology, and it is aimed at developing methodological recommendations for specialists.

Keywords: Autism spectrum disorder, preschool age, neuropsychological technologies, speech therapy correction, speech development, sensory integration, communicative competence, cognitive processes, neuropsychological diagnostics, comprehensive approach.

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1. Introduction

Recent scientific research has highlighted the steadily increasing global prevalence of developmental disorders

in children, particularly Autism Spectrum Disorders (ASD). This issue is of significant importance not only in the medical field but also in pedagogy and psychology. Autism Spectrum Disorders are characterized by substantial impairments in a child's social interaction, speech development, emotional responses, and cognitive functioning. The timely identification of these anomalies and the implementation of therapeutic interventions—especially during the preschool period—are crucial for the child's subsequent development.

The specific features of speech development in preschool children with ASD are closely associated with functional impairments in their neuropsychological systems. In such children, speech development is often delayed; communicative initiative is limited; and phonemic awareness, articulatory skills, and speech comprehension are insufficiently developed. As a result, traditional speech therapy methods frequently fail to produce adequate outcomes, necessitating the introduction of comprehensive neuropsychological technologies.

The neuropsychological approach is grounded in the functional components of the human brain, their interconnections, and the integral relationship between cognitive processes and brain activity. Within this framework, speech disorders are interpreted not merely as articulation or lexical-semantic deficiencies, but as consequences of systemic abnormalities in brain functioning. From this perspective, neuropsychological technologies offer a structured and methodologically sound approach to corrective speech therapy.

Contemporary scientific literature describes a range of neuropsychological techniques, including sensory integration exercises, neuromotor developmental activities, cognitive training, rhythmic and movement-based therapy, and multimodal communication strategies. These technologies contribute to the activation of brain activity, improvement of neural connections, and the creation of favorable conditions for the natural development of speech processes.

The preschool period represents one of the most critical stages of human development. During this time, the brain demonstrates the highest level of plasticity, making it particularly responsive to corrective interventions. Therefore, initiating speech therapy for children with Autism Spectrum Disorders during the preschool years is of paramount importance.

This study is highly relevant because, despite the

growing number of preschool children diagnosed with ASD in educational settings, a systematic methodology for integrating neuropsychological technologies into corrective and speech therapy support remains insufficiently developed. The present research aims to determine the scientific and theoretical foundations for designing corrective speech therapy using neuropsychological technologies for preschool children with ASD and to evaluate their effectiveness.

2. Methods

The organization of corrective speech therapy using neuropsychological technologies for preschool children with autism spectrum disorders represents a complex scientific field at the intersection of modern pedagogy, psychology, and speech therapy. Recent scientific studies have extensively examined both theoretical foundations and practical approaches to this issue, analyzing the core mechanisms of autism spectrum disorders (ASD), their impact on speech development, their interrelation with neuropsychological processes, and the methodological principles of corrective intervention.

Research in special pedagogy indicates that working with children who have developmental difficulties requires a systematic approach. In the field of special education, developmental disorders are understood not only as deficiencies in certain individual functions but also as specific systemic alterations in overall cognitive activity. This underscores the necessity of comprehensively studying the distinctive features of speech impairments in children with ASD across sensory, motor, cognitive, and affective domains.

Scientific literature identifies restricted social interaction, reduced communicative motivation, and a distinct trajectory of speech development as core characteristics of autism spectrum disorders. In young children, the process of speech development often occurs unevenly; some speech abilities may be relatively developed, while others progress significantly more slowly. The balance of the speech system is disrupted. This suggests that traditional speech therapy methods may not yield sufficient results.

In speech therapy research, accurate diagnosis of speech abnormalities is considered critically important. Diagnosis requires not only identifying observable speech manifestations but also examining their underlying psychophysiological causes. Modern speech therapy methodology interprets speech disorders in

connection with functional changes in brain activity. Consequently, the application of neuropsychological methods in speech rehabilitation is empirically justified.

Neuropsychological research establishes the scientific foundation for understanding the interrelationship between cognitive processes and brain architecture. Theoretical concepts developed in this field emphasize that all mental activities, including speech, occur through the interaction of various functional systems within the brain. Dysfunction within these systems leads to speech development difficulties. The neuropsychological approach therefore serves as an essential methodological basis for addressing speech challenges in children with ASD.

Research demonstrates that neuropsychological technologies—including sensory integration exercises, neuromotor developmental techniques, rhythmic movement therapy, and cognitive training—significantly enhance speech activation. These technologies aim to improve brain functioning, strengthen neural connections, and facilitate the integration of cognitive processes.

The concept of sensory integration emphasizes that the processing of sensory information received from the external environment is crucial for a child's cognitive development. In children with ASD, this process is often insufficiently developed. As a result, speech comprehension, auditory discrimination, articulatory movement, and communicative responses may be underdeveloped. Therefore, combining speech therapy with sensory integration exercises produces improved outcomes.

Research in preschool psychology demonstrates that this stage represents a critical period in human development. During early childhood, extensive neural connections are formed, and cognitive processes develop rapidly. Consequently, initiating corrective interventions at the preschool age significantly increases their effectiveness.

Scientific literature on speech development in children with autism highlights the importance of multimodal communication techniques. These strategies involve developing speech through verbal, visual, kinesthetic, and emotional modalities. This approach takes into account the individual characteristics of children with ASD.

A review of the literature shows that contemporary scientific perspectives strongly support an integrated

approach to speech development in children with autism spectrum disorders. This methodology requires the combination of neuropsychological, speech-therapeutic, pedagogical, and psychological techniques.

Psychomotor development correction is implemented through the following pedagogical methods:

Movement activities and exercises aimed at strengthening balance and coordination. Balance refers to the ability to maintain bodily stability in both static and dynamic positions. In children with ASD, the following balance-related characteristics are frequently observed:

- difficulties in regulating body posture;
- a tendency to fall;
- instability during movement, including running, jumping, and descending stairs;
- insufficient development of the vestibular system;
- difficulties in spatial awareness of one's body position.

These factors reduce a child's confidence in their motor abilities and may lead to avoidance of physical activity.

Coordination refers to the ability to integrate various movement components into a unified process. In children with autism, coordination disorders manifest as:

- imprecise and uneven execution of movements;
- inability to synchronize arm and leg movements simultaneously;
- insufficient development of fine motor skills (writing, sketching, fastening buttons);
- predominance of stereotypical and repetitive behaviors;
- disturbances in movement tempo and cadence.

These deficits create significant challenges in educational activities such as writing, drawing, and practical tasks. Impairments in balance and coordination affect not only physical development but also cognitive and social growth. Research shows that motor activity is closely linked to the development of language and cognitive abilities; insufficient coordination limits a child's autonomy, while balance difficulties reduce self-

confidence. Therefore, special attention must be given to motor development within the educational process.

Effective pedagogical and corrective methods for developing balance and coordination in children with autism include:

- standing on one leg;
- walking across balance paths;
- jumping and stopping exercises;
- exercises using a gym ball;
- vestibular stimulation (e.g., swinging and rotation);
- proprioceptive activities (pushing, pulling, carrying heavy objects);
- tactile stimulation exercises;
- rhythmic movements to music;
- dance integration;
- constructive play;
- finger dexterity exercises;
- working with materials such as plasticine and sand.

The development of balance and coordination should be implemented through an individualized strategy that considers the child's age-related characteristics and developmental level. Systematic and step-by-step organization of sessions, with a gradual increase in complexity, ensures effectiveness.

In children with ASD, impairments in balance and coordination immediately affect both the educational process and social adaptation. To address these deficits, the use of active games, sensory integration activities, rhythmic exercises, and personalized pedagogical strategies is highly effective for both educational and corrective purposes.

Fine motor skill development includes mosaic activities, construction games, manipulation of modeling clay, and finger exercises. Fine motor skills, an essential component of psychomotor development, are often insufficiently developed in children with ASD. These skills involve the precise, coordinated movements of the hands and fingers and are closely related to speech development, cognitive functioning, and daily living

skills. Therefore, the development of fine motor abilities is a crucial component of educational and corrective work.

Children with autism often demonstrate specific fine motor characteristics, including slow and imprecise finger movements, insufficient hand–finger coordination, difficulty grasping and manipulating objects, rapid fatigue during writing, drawing, or cutting tasks, and the predominance of stereotypical movements. These impairments negatively affect academic performance, speech development, and self-care skills.

Research indicates that fine motor skills are closely linked to speech centers in the brain, contribute to the development of cognitive processes such as attention, memory, and reasoning, form the foundation for writing and graphic abilities, and enhance a child's independent functioning. Consequently, the development of fine motor skills becomes a central objective in educational work with children diagnosed with autism.

Pedagogical and corrective methods for developing fine motor skills include:

- finger flexion and extension exercises;
- “finger gymnastics”;
- rhythmic hand movements;
- mosaics and puzzles;
- construction activities (e.g., LEGO and blocks);
- buttoning and threading tasks;
- sensory activities involving plasticine, clay, kinetic sand, grains, beans, and peas.

Graphomotor exercises—including drawing lines and shapes, coloring, and manipulating templates—serve as preparatory activities for writing.

Daily living activities such as fastening and unfastening buttons, tying shoelaces, and using a spoon and fork enhance the child's autonomy. In this process, individualized strategies, short and consistent sessions, visual cues, positive reinforcement, and gradual increases in complexity are essential.

Sensory integration exercises focus on enhancing tactile, vestibular, and proprioceptive sensations. In children with autism spectrum disorders, the ability to perceive, interpret, and respond appropriately to sensory stimuli may be impaired. Sensory integration difficulties directly

affect behavior, motor abilities, speech, and social adaptation.

Sensory integration refers to the central nervous system's ability to process information from tactile, vestibular, proprioceptive, visual, and auditory sensory modalities and to generate appropriate, goal-directed responses. In children with ASD, this mechanism is frequently disrupted, leading to either hypersensitivity or hyposensitivity.

Sensory integration problems manifest in the tactile, vestibular, proprioceptive, visual, and auditory systems. Tactile system disorders are characterized by hypersensitivity to touch, aversion to certain materials, and insufficient awareness of one's own body. Vestibular system dysfunction is distinguished by difficulties in maintaining balance, excessive craving for or fear of spinning and swinging movements, as well as avoidance of movement or, conversely, hyperactivity. Proprioceptive system disorders are characterized by improper distribution of body force, a persistent need to push, hit, or apply pressure, and impaired awareness of personal body boundaries. Visual and auditory system dysfunctions are marked by hypersensitivity to light and sound, difficulty concentrating, and excessive reliance on visual cues.

Sensory integration exercises facilitate psychomotor development, improve balance and coordination, positively influence speech and cognitive development, stabilize behavior, and enhance the child's attitude toward learning activities. This exercise program includes tactile activities (manipulating sand, water, grains, and materials with various textures, as well as body massage), vestibular activities (swinging, spinning, and crossing balance beams), proprioceptive tasks (lifting heavy objects, pushing, and pulling), visual exercises (distinguishing colors and shapes and tracking moving objects), and auditory activities (responding to soft music, identifying sound sources, and performing rhythmic tapping exercises). When designing exercises, it is important to consider the child's sensory needs, conduct short and consistent sessions, ensure safety, and create a positive emotional environment.

As a result, sensory integration exercises strengthen coordination among sensory systems, develop balance and coordination, stabilize behavior, enhance speech and communication activity, and improve the child's adaptation to daily life. Consequently, for children with autism spectrum disorders, sensory integration exercises

serve as an effective educational and therapeutic tool that facilitates psychomotor, linguistic, and social development.

Rhythm and musical movement serve as important teaching tools for developing motor and auditory coordination. Children with autism spectrum disorder (ASD) demonstrate varying degrees of impairment in movement coordination, emotional expression, verbal communication, and social interaction. Musical and rhythmic movements involve the simultaneous engagement of the child's emotional, motor, and affective domains. Therefore, rhythm and musical movement represent beneficial tools for pedagogical and therapeutic interventions for children diagnosed with autism.

Rhythm refers to the specific organization of movements and sounds that directly influences the functioning of the human nervous system, while musical movement facilitates the integration of auditory, motor, and sensory systems. Research indicates that rhythmic input enhances brain activity, supports movement planning and execution, and stabilizes emotional states. Rhythm and music play a significant role in modulating motor activity in children with ASD. Children with autism spectrum disorder demonstrate diverse responses to music: some quickly achieve calmness, others engage in rhythmic movement, music functions as a communicative tool, and rhythmic exercises reduce stereotypical movements. These variables increase the potential for using musical movement in educational and rehabilitation contexts.

Rhythm and musical movement improve motor coordination and balance, facilitate speech and auditory perception, promote emotional and volitional development, enhance social communication and imitation skills, and increase engagement in activities. Therefore, their inclusion in educational and rehabilitation processes is highly important. Rhythmic movements include exercises such as clapping in time, performing rhythmic stepping, and repeating rhythm patterns; music-based movements involve walking according to tempo, distinguishing between slow and fast rhythms, and coordinating body movements with music. Dance components include basic movements, rolling and bending exercises, and group dance elements that develop balance and coordination; musical activities strengthen social interaction through stop-and-go games, musical relay games, and role-playing activities.

Rhythm and musical movement sessions should be short

(10–20 minutes), conducted regularly, individually or in small groups, using visual cues and taking into account the child's sensory needs. As a result, motor coordination improves, emotional stability is achieved, speech activity increases, social communication develops, and stereotypical movements decrease. Rhythm and musical activities serve as effective tools for pedagogical and therapeutic interventions in children with autism spectrum disorders, positively influencing their psychomotor, emotional, and social development. Systematically and individually structured musical sessions significantly improve the child's adaptation to the educational environment.

The structured approach involves organizing sessions in a clear sequence and according to precise instructions, as it is crucial for children with autism to have a predictable, clear, and comprehensible environment. Considering that children with autism experience difficulties in social communication, verbal interaction, and behavioral regulation, the use of structured methodology in their education and upbringing serves as an effective teaching tool.

Structured methodology aims to organize educational, developmental, and rehabilitation processes through a predetermined order, visual supports, consistent routines, and a predictable environment primarily derived from the TEACCH program (E. Schopler) and adapted to the cognitive and visual perception characteristics of children with autism. Children with autism often exhibit sensitivity to change, anxiety in ambiguous contexts, difficulty understanding verbal instructions, challenges in perceiving time and space, and an inability to independently plan activities; the structured approach helps to mitigate these difficulties.

This method divides the educational environment into zones for learning, play, rest, and individual instruction; establishes daily schedules and activity sequences; utilizes pictures, pictograms, color-coded signs, cards, and diagrams; breaks tasks into stages; and clearly defines the beginning and end of each activity. As a result, autonomy develops, behavioral problems decrease, concentration and productivity increase, the learning process becomes simplified, and emotional balance is maintained.

Speech therapy is essential for correcting speech disorders in children with ASD and for alleviating difficulties related to sound pronunciation, vocabulary acquisition, and the development of expressive

communication. Well-structured speech therapy improves the child's verbal activity, promotes clear articulation of sounds, and expands vocabulary. Children with autism often demonstrate delayed or absent speech development, echolalia, reduced articulatory movement, limited vocabulary, insufficient communicative function of speech, and impairments in intonation and prosody, which require an adapted and systematic speech therapy approach.

The primary goal of speech therapy is to improve communicative speech by correcting sound pronunciation and expanding vocabulary. This includes developing the articulatory apparatus, enhancing phonemic perception, teaching accurate sound pronunciation, expanding active and passive vocabulary, and training the use of speech in social contexts. Consistent implementation of articulation exercises, development of phonemic perception, reinforcement of sounds, and the use of thematic vocabulary lead to stable positive outcomes in speech development.

The research methodology was developed in accordance with these theoretical perspectives. The research process followed the principles of a holistic approach, structured methodology, individualization, and progressive pedagogy. Methods were selected based on the psychophysiological characteristics of children with autism spectrum disorders, their levels of speech development, and their potential for social adaptation.

The study employed theoretical analysis, observation, diagnostic assessment, neuropsychological exercises, and speech therapy correction techniques. A theoretical review was conducted, scientific literature on the topic was examined, existing methodological techniques were evaluated, and the research framework was established.

The observation method systematically examined children's speech activity, communication responses, levels of sensory perception, and emotional states. Diagnostic tests were used to assess the level of speech development, phonemic perception, articulatory movements, and cognitive processes. Neuropsychological approaches included sensory integration exercises, neuromotor developmental activities, rhythmic movements, and cognitive training. These strategies were designed to enhance brain functioning, facilitate the integration of cognitive processes, and stimulate speech development.

During the speech therapy correction process, methods

aimed at strengthening articulatory exercises, increasing phonemic awareness, expanding vocabulary, and forming grammatical speech were applied. These strategies were combined with neuropsychological exercises.

A qualitative analysis method was used to analyze the research results. The collected data were systematized and examined to evaluate improvements in children's speech development, levels of communicative activity, and cognitive development dynamics.

The study of literature and methodological foundations indicates that corrective speech therapy using neuropsychological technologies for preschool children with autism spectrum disorders is a scientifically grounded, methodologically sound, and effective strategy. The integration of these approaches contributes to improving the child's language development, strengthening social adaptation, and promoting overall cognitive growth.

3. Discussion

The preschool period represents a crucial stage in a child's cognitive and linguistic development. In particular, interventions implemented during this period for children with Autism Spectrum Disorders (ASD) exert a strong influence on subsequent educational processes and social adaptation. The research findings indicate that the specific characteristics of speech development in children with ASD are not solely related to the language system itself, but are also closely connected with the complex functional systems of the brain.

As a result, the importance of a neuropsychological strategy in addressing speech impairments within this demographic group is grounded in clear scientific evidence. The integration of neuropsychological technologies into speech therapy has a significant impact on activating children's speech activity. This process is essential because it aims to strengthen the connections between sensory, motor, and cognitive systems of brain functioning.

Children with ASD are often characterized by impairments in sensory perception, manifested in delays in receiving and processing information from the external environment. This limits their ability to perceive, understand, and effectively use communication. The development of sensory integration through neuropsychological technologies constitutes an

important component in the advancement of speech processes.

The discussion results demonstrate that the development of verbal communication in children with ASD extends beyond phonetic or lexical-level activity. This process is largely associated with emotional motivation, social demands, cognitive activation, and psychomotor growth. The neuropsychological approach involves a multidimensional impact, particularly by considering these inter-system interactions. By recognizing speech not as an isolated skill but as an integral component of cognitive functioning, this approach significantly enhances the effectiveness of speech therapy.

The study also revealed that the application of neuropsychological technologies positively influences the development of emotional stability in young children. Children diagnosed with ASD frequently exhibit anxiety, social withdrawal, stereotyped behaviors, and emotional instability. Sensorimotor exercises, rhythmic activities, and multimodal communication technologies contribute to the development of a sense of security, which increases children's motivation to engage in communication. Consequently, children's involvement in speech therapy sessions becomes more active and sustained.

Another important feature of neuropsychological technologies is their capacity to provide an individualized approach. Due to the heterogeneous manifestations of ASD in each child, traditional treatment methods do not always yield successful outcomes. Neuropsychological diagnostics enable the identification of a child's strengths and weaknesses, as well as the assessment of functional aspects of brain activity. This makes it possible to personalize corrective interventions and determine the most effective methodological approach for each individual child.

The study results further indicate that a neuropsychological speech therapy strategy requires the involvement not only of specialists but also of parents and educators. To ensure the stability of a child's developmental progress, corrective interventions should continue not only during specialized sessions but also throughout daily activities. Therefore, familiarizing parents with neuropsychological exercises and linguistic games represents an essential element of the corrective process.

Moreover, the discussion findings demonstrate that the implementation of neuropsychological technologies in

preschool educational institutions increases children's overall level of development. These technologies not only help eliminate speech impairments but also promote social adaptation, autonomous activity, learning motivation, and psychological stability in young children.

Overall, the discussion findings confirm that corrective speech therapy based on neuropsychological technologies is a scientifically grounded, methodologically structured, and highly effective approach for preschool children with Autism Spectrum Disorders.

4. Results

The research findings led to the conclusion that neuropsychological technologies significantly improve speech development in preschool children with Autism Spectrum Disorders. Following corrective and speech therapy interventions, a noticeable increase was observed in children's ability to perceive, comprehend, and actively use speech. Sessions structured on the basis of a multimodal approach significantly enhanced the development of vocal communication.

The findings demonstrate that sessions incorporating neuropsychological technologies facilitated the activation of speech activity by improving children's emotional experiences. Sensory integration exercises improved the coordination of auditory, visual, and kinesthetic analyzers, thereby strengthening speech perception and processing. This resulted in vocabulary expansion and the dynamic development of oral communication.

The results also revealed that the development of cognitive processes is directly related to speech activity. Neuropsychological training stimulated attention, memory, thinking, and perception processes, creating favorable conditions for the development of speech skills. The improvement of children's ability to understand relationships between objects and phenomena, to generalize, and to classify contributed to the enhancement of their expressive linguistic abilities.

Furthermore, the findings indicate that neuropsychological technologies contributed to the stabilization of children's emotional states. During the sessions, children's anxiety levels decreased, interest in social interaction increased, and motivation for communication strengthened. This significantly improved the effectiveness of speech therapy sessions.

The results also demonstrate that the neuropsychological speech therapy method plays a crucial role in the development of communicative competence in children. In addition to verbal speech, children gradually acquired the ability to use gestures, facial expressions, and other forms of communication, which significantly enhanced their social adaptability.

The effectiveness of corrective work was found to be directly dependent on its systematic and consistent organization. The regular application of neuropsychological technologies supported the continuation of positive developmental changes in children. Additionally, parental involvement was shown to have a significant positive impact on the outcomes of the corrective process.

In conclusion, the research findings scientifically confirm the significant effectiveness of corrective speech therapy based on neuropsychological technologies in promoting speech development, social adaptation, and cognitive activation in preschool children with Autism Spectrum Disorders.

5. Conclusion

The results of the study indicate that speech development delays in preschool children with Autism Spectrum Disorders (ASD) are multifaceted and associated with insufficient development of functional brain systems. Therefore, it is essential to implement corrective speech therapy not only through direct intervention in the speech apparatus but also by applying a comprehensive cognitive approach.

The application of neuropsychological technologies contributes to improvements in children's speech activity, increases communicative demands, enhances emotional perception, and promotes the development of cognitive processes. Sensory integration exercises, rhythmic movement activities, and multimodal communication techniques have demonstrated a positive impact on speech development.

In conclusion, corrective speech therapy based on neuropsychological technologies for preschool children with Autism Spectrum Disorders plays a crucial role in improving speech development, facilitating social adaptation, and positively influencing overall cognitive growth.

The study further revealed that the neuropsychological–logopedic approach leads to the following outcomes:

- improvement in speech comprehension;
- expansion of active vocabulary;
- formation of communicative interaction skills;
- increased emotional stability;
- enhanced social adaptation.

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