

Specifics of Speech Development of Children with Cerebral Palsy

Dolores Zavitrenko¹, Renat Rizhniak², Iryna Snisarenko³, Natalia Pasichnyk⁴,
Tetyana Babenko⁵, Natalia Berezenko⁶

¹PhD in Pedagogics, Candidate of Pedagogical Sciences, Associate Professor, Volodymyr Vynnychenko Central Ukrainian State Pedagogical University, Ukraine, zavitrenkod@gmail.com

²Doctor of Historical Sciences, Professor of the Department of Mathematics, Volodymyr Vynnychenko Central Ukrainian State Pedagogical University, Ukraine, rizhniak@gmail.com

³PhD in Linguistics, Candidate of Philological Sciences, Associate Professor, Donetsk State University of Internal Affairs, Ukraine, irynasnis72@gmail.com

⁴Doctor of Historical Sciences, Professor of the Department of Mathematics, Volodymyr Vynnychenko Central Ukrainian State Pedagogical University, Ukraine, pasichnyk1809@gmail.com

⁵PhD in Pedagogics, Candidate of Pedagogical Sciences, Associate Professor, Volodymyr Vynnychenko Central Ukrainian State Pedagogical University, Ukraine, babenkot80@gmail.com

⁶Post-Graduate Student of the Department of Pedagogy and Educational Management, Volodymyr Vynnychenko Central Ukrainian State Pedagogical University, Ukraine, nberezenko29@gmail.com

Abstract

Cerebral palsy is one of the most serious forms of disorders of the psychophysical development of children, which manifests itself in disturbances of motor functions, which are often combined with speech disorders, other complications of the formation of higher mental functions, and often with a decrease in intelligence. The article will discuss the speech disorder in children with cerebral palsy. Emphasis is placed on some important aspects, which should bear in mind, investigating the problem of specifics of speech development of children with cerebral palsy. In particular at the heart of speech disorders in the cerebral palsy is not only damage to certain structures of the brain, but also the later formation or underdevelopment of those parts of the cerebral cortex, which are of major importance in linguistic and mental activity. This is an ontogenetically young region of the cerebral cortex, which is most rapidly developing after birth (premotor, frontal, temmono-temporal).

It is important to take into account, that children with cerebral palsy have disturbances of phonemic perception. Often,

children do not distinguish between hearing sounds, cannot repeat component rows, allocate sounds in words. At dysarthria, there are violations of pronunciation of vowel and consonant sounds, tempo of speech, modulation of voice, breathing, phonation, as well as asynchronous breathing, alignment and articulation.

As a result, we identified the main features and specifics of the speech development of children with cerebral palsy and described the conditions necessary for the full development of language. Language disturbances in children's cerebral palsy depend on the localization and severity of brain damage. Great importance in the mechanism of speech disorders has a pathology that limits the ability of movement and knowledge of the world.

Keywords: *child cerebral palsy, speech development, speech defects, linguistic disturbances, phonemic perception, dysarthria.*

1. Introduction

One of the most serious illnesses of the central nervous system is infantile cerebral palsy. It manifests itself as different disorders of motor, mental and speech functions. Gravity of these disorders determines a forecast of social adaptation of children with cerebral palsy. Therefore the importance of special educational system developing for children with cerebral palsy is determined not only with humanistic trends of society developing but also the demand of this system. Medical advances in fields of neonatology,

pediatric neurology led to substantial reduction of mortality of newborns and at the same time to the increased frequency of neurologic disorders among children, and infantile cerebral palsy is outstandingly frequent among other disorders [cf.:4, 5, 14, 28, 29]. Peculiarities disorders of speech and the degree of their intensity firstly depend on gravity of lesions of the brain. Causes of speech disorders are due to not only with damages of certain structures in the brain but also with later forming and under-development of the cerebral cortex sections, which are very important for speaking and mental activity. Under-development

of speech is connected to limit of body of knowledge, perception of the world, insufficiency of the social contacts. Sick kids have a little life experience; interact with limited circle of people that are counterparts and adult. Motor pathology is great importance in mechanics of speech disorders in children cerebral palsy because one limits movement and world around cognition. There is detected clinical and pathogenic connection between speech and motor disorders in children with cerebral palsy. The regularity of pathologic tonic reflexes has a negative impact on muscle tone of speech organs. Disorders of speech motor skills delay the development of voice activity and infringe mechanics of pronunciation. Therefore, any study devoted to the problem of specifics of speech development of children with cerebral palsy should take into account all mentioned physical, mental and social factors, which are interconnected.

2. Statement of the Problem

Analysis of existing investigates testifies that modern special education has not methodological, scientific-theoretical practice oriented basics of early complex corrective help to children with cerebral palsy organize. There is apparent contradiction between on the one hands social need for innovative kinds in education, development, social adaptation of children with cerebral palsy and lack of appropriate forms and methods of pedagogical help children in the early years with cerebral palsy, ineffective usage of existing opportunities to address this question on the other hands. Consequently, therefore the problem of devise of modern scientific basis for comprehensive corrective-developmental help children with mentioned disorders and implement one in practice becomes topicality.

It is necessary to take into account that disorders of motor, cognitive, speech and social development of children with cerebral palsy are complicated set of symptoms, these disorders are qualitative heterogeneous and may hamper education and social adaptation of children. A systematic approach to building the functional model of early comprehensive corrective-developmental help children with cerebral palsy provides optimal conditions for successful compensation existing disorders and socialization such children on early

stages. It is necessary to create special organized multifunctional corrective-developing pedagogical environment, providing coordinated system of connections and peculiarities of process of age innovations, active interaction of children with the world around through adult due to mediate semiotic system, change the leading type of activity. It is obvious today that organization of early interdisciplinary support of a child with disorders of speech development fully depends on a concerted effort of the team of specialists and parents. Indispensable condition for that is the sum of medical, psychological and pedagogical measures, which are roll overed and have creative manner. Specifics of speech development in children with cerebral palsy remains not fully studied and systematized. To progress this we will try in our study. *The purpose of the study* is to describe the features of speech development and the classification of speech disorders in children with cerebral palsy.

3. Literature Review

The study of speech development of children with cerebral palsy is devoted to a large number of works of domestic and foreign authors. K. O. Semenova, O. M. Mastiukova, M. I. Smuglina [26] were engaged in the description of the conditions necessary for the proper development of language in children with cerebrospinal fluid. The commonality between linguistic and motor disorders in children with cerebral palsy was studied by M. B. Eidinova, A. M. Pravdina-Vinarskaya [1], N. M. Traugott, N. N. Kaidanova [31], K. O. Semenova [27], A. M. Mastyukova [19]. The study of the formation of speech in children with cerebral palsy was given by M. Ya. Breitman [8], O. P. Arkhipova [1]; L. A. Danilova, K. Stock, G. N. Kazitsyna [10] and others. Different forms of dysarthria and alalia in children with cerebral palsy are distinguished by N. M. Traugott, S. I. Kaidanova [31], L. Pennington, E. Roelant, V. Thompson [22], E. Maas, D. A. Robin [15], V. Thompson [21] and others.

4. Methods and Procedures

To study the specifics and peculiarities of the speech development of children with cerebral palsy, we used the theoretical methods and practical

techniques, corresponding the topic of research, namely: 1) collecting, systematizing, evaluating, comparing and analyzing information (results of discussions with parents, children, teachers and doctors); 2) study and subject analysis of medical and pedagogical approaches to the problem of working with kids with cerebral palsy; 3) pedagogical monitoring in the process of free educational activity of children; 4) the analytical review of the available literature, concerning the topic of our study, devoted specifics of speech development of children with cerebral palsy.

5. Result of Research

In the infant, motor behaviour is largely reflex, and the higher centres of the central nervous system are only beginning to mature [6]. In a complicated structure of violations in children with cerebral palsy, a significant place is occupied by speech disorders, the frequency of which is from 65% to 85% (18, 7). It should pay attention to the diversity of language disorders.

In the work of K. A. Semenova, A. M. Mastiukova, M. I. Smuglin [26], the conditions are described for the full development of the language, which is formed in close union with the motor skills: 1) anatomical preservation and sufficient maturity of brain systems that participate in speechfunction; 2) preservation of kinesthetic, auditory and visual perception; 3) sufficient level of intellectual development that would ensure the need for linguistic communication; 4) regular structure of the peripheral speech apparatus; 5) Sufficient emotional and linguistic environment. Children with cerebral palsy are often deprived of all these conditions.

The features of speech disorders and their degree of severity depend primarily on the localization and severity of brain damage [27]. At the heart of speech disorders in the cerebral palsy is not only damage to certain structures of the brain, but also the later formation or underdevelopment of those parts of the cerebral cortex, which are of major importance in linguistic and mental activity. This is an ontogenetically young region of the cerebral cortex, which is most rapidly developing after birth (premotor, frontal, temmono-temporal). M. Mastyukova [17] emphasizes that the lag in the development of language in the cerebral palsy is

also associated with the restriction of the amount of knowledge and ideas about the surrounding world, the lack of substantive and practical activities and social contacts. Children have little life experience communicating with a narrow circle of peers and adults. Violations of language formation are also caused by insufficiency of kinesthetic, auditory and visual perception, and the delay of intellectual development [17].

Negative influence on speech development leads to mistakes in upbringing committed by parents, who often overemphasize the child, aspire to do much for her, warn all her desires or perform them in response to a gesture or a gaze. In this case, the child does not have a need for linguistic communication. In such cases, the child turns out to be deprived of linguistic communication, which is an important precondition for language development.

Of great importance in the mechanism of speech disorders in the cerebral palsy has the very pathological pathology, which limits the possibility of movement and knowledge of the surrounding world. There is a clinical and pathogenic commonality between linguistic and motor disorders in children with cerebral palsy [31].

Prolonged preservation of pathological tonic reflexes has a negative effect on the muscular tone of the apparatus of articulation. The expressiveness of tonic reflexes increases the tone of the muscles of the tongue, impairs breathing, voiding, arbitrary opening of the mouth, movement of the tongue forward and upward. Such violations of articulation motility delay the formation of voice activity and complicate the development of the sonic-speaking side of the language [3].

In connection with the lack of kinesthetic perception, the child not only complicates the movements, but also poorly senses the position and movement of organs of articulation and limbs. We agree with the opinion of E. M. Mastyukova [18], which points to the relationship between the severity of violations of articulation motility and the violation of the functions of the hands. The most marked violations of articulatory motility are observed in children with significant lesions of the upper extremities [18].

Many researchers note the late development of speech in children with cerebral palsy [1, 8]. Delay in linguistic development begins with the

negotiation period. O. P. Arkhipova [1] analyzed in detail the main stages of development of children with DDP during the first two years of life. She revealed characteristic pathological features during the contractual period and identified four levels of contraceptive development of children who, while at different levels of contraceptive development, differed in character and degree of maturity of mental functions. Particular attention is drawn to the fact that the agreement on the development of children with cerebral palsy is in violation of the pace and content: the eyelashes are slow and characterized by imbalance or even the loss of certain functions [1].

Most children with lingering language development understand someone's speech, speech is formed at a later date. The delay in the formation of the motor language in the CP is due to the pathology of the entire motor functional system [27]. E. V. Romanenko [24] studied the conditions and peculiarities of the formation of the sound side of speech in children of the second year of life with the CP, and also identified some prognostically significant criteria for violations of contraceptive and speech development: late timing of fluttering, the transition to the linguistic level of communication only from 1 year 6 months, the predominance in the linguistic order of one group of sounds (united by the way and place of education) [24].

L. A. Danilova [10] considered the peculiarities of psychomotor and linguistic development of a healthy child and a patient suffering from cerebral palsy, at different age periods, from birth [10]. The study of linguistic development of children with cerebral palsy revealed a violation of various components of speech activity: phonetic-phonemic, lexical and grammatical.

Due to the violation of the functions of the apparatus of articulation in children with cerebral palsy, the phonetic aspect of the language is persistently violated. E. M. Mastjukova [18] emphasizes that «at the initial stage of speech development, there are many sounds, later part of them is spoken distorted or replaced by relatives in articulation, which leads to the indistinctness of the language and the restriction of communication with peers and adults» [18]. It indicates the atypical assimilation of phonemes, which may not coincide

with the sequence of their assimilation in normal ontogenesis. «Already at the early stages of mastering the phonetic system of the language of children with cerebral palsy, defective articulation patterns may appear, which are fixed further in the formation of a pathological speech stereotype» [19]. Children with cerebral palsy have disturbances of phonemic perception. Often, children do not distinguish between hearing sounds, cannot repeat component rows, allocate sounds in words.

In the majority of children with cerebral palsy, there are marked violations of the lexical and grammatical structure of the language, which are caused by the specific disease [12; 16; 13]. The quantitative restriction of the vocabulary and its slow formation in spontaneous development are largely due to the limitation of volume, inaccuracy, and sometimes the mistakenness of knowledge and ideas about the surrounding world. Children have limited lexical opportunities that do not have the necessary linguistic means to characterize various subjects and phenomena of the surrounding world. The peculiarity of the formation of vocabulary finds expression in violation of the assimilation of many language categories. M. V. Ippolitova [12] points out those children have a particularly limited supply of words that denote signs and qualities of objects, as well as various actions with them. Children experience difficulties in using and understanding prepositions, phrases with prepositional constructs, as well as words that denote spatial-temporal relationships [12].

L. B. Khalilov [13] discovered the limitations of lexical notions that manifest themselves in the ignorance of children of the exact meaning of words used in direct and figurative meanings in the difficulty of updating synonyms and antonyms, in violation of the rules of lexical compatibility [13]. M. M. Malofeev [16] showed the peculiarity of the dictionary of children with cerebral palsy, which manifests itself in the form of narrowing the volume of passive and active vocabulary, difficulties in mastering the reader by the function of the word, absence of the ambiguity of the word [16].

Grammatical forms and categories are acquired by children with cerebral palsy extremely slowly and with great difficulty, which is largely due to limitation of linguistic communication, violation of auditory perception, attention, low linguistic activity, and impassability of cognitive activity.

Children have difficulties in constructing sentences, agreeing words in the sentence, using correct posterior endings. Even before school, children do not develop practical skills in the field of word formation.

For children with cerebral palsy, the following types of speech disorders are characteristic:

1) delayed speech development, due to motor insufficiency, intellectual deficiency, severe somatic weakness, unfavorable conditions of the environment (forced isolation from the team, prolonged hospitalization, etc.); 2) dysarthria and antrax; 3) alalia; 4) lingual underdevelopment due to decreased hearing, with mental retardation [26].

Linguistic disturbances in children with cerebral palsy are rarely encountered isolated, with a combination of dysarthria with delayed linguistic development or dysarthria with alalia. The most common linguistic disorder in children with cerebral palsy is dysarthria.

Dysarthria is a violation of the verbal side of speech, which suffers from sound, organization of the sound stream, speech, respiration, voice caused by violation of innervation of speech muscle. According to L. A. Danilova [10], defects of pronunciation are found in 75% of children with cerebral palsy, while in 95% of children these disorders are due to dysarthria of various forms and severity [10].

The peculiarity of violations of the sound-speech side of the speech during dysarthria in children with cerebral palsy is that, with all types of active motions, muscle tone increases in articulation muscles and increased dysarthria.

In children with cerebral palsy, the muscles involved in language formation are usually amazed and speech disorders are observed from simple ambiguity in the pronunciation of some sounds to the absence of articulate speech. The speech in children with dysarthria is smeared, unclear, poorly modulated, with a nasal tint, and in severe cases, completely absent [9, 25].

It should be noted the pathological state of the speech analyzer (violation of tone of muscles and motility of the articulatory apparatus) in children with cerebral palsy. The disorder of speech during dysarthria is due to a violation of the arterial body's motility in connection with paresis, paralysis, hyperkinesia, as well as changes in the tone of the articulation muscles, lips, soft palate, diaphragm,

vocal cords. At dysarthria, there are violations of pronunciation of vowel and consonant sounds, tempo of speech, modulation of voice, breathing, phonation, as well as asynchronous breathing, alignment and articulation.

Even at the end of the XIX century were made attempts not only to distinguish dysarthria with cerebral palsy, but also to describe its different clinical forms. Particular attention was paid to the issues of classification of dysarthria. Subsequently, these classifications were refined and enriched. At the present time, various approaches to the classification of dysarthria are based on the principle of localization of brain damage [23], syndromological approach [32], the degree of comprehensibility of speech for others [30].

According to recent research [21], children with cerebral palsy who have dysarthria and their parents reported that intensive speech therapy focussing on creating a stronger voice and a steady speech rate increased the clarity of children's voice and the intelligibility of their speech.

We consider the most successful classification of dysarthria, proposed by I. I. Panchenko [20]. On the basis of the syndromological approach, she distinguishes the following forms of dysarthria in children with cerebral palsy: 1) spastic-parasitical; 2) spastic-rigid; 3) hyperkinetic; 4) atactic; 5) mixed forms: spastic-hyperkinetic; spastic and atactic; spastic-atactic-hyperkinetic; atactic-hyperkinetic [20].

The author emphasizes that in children with cerebral palsy it is difficult to distinguish the symptoms of speech disorders due to the complexity of lesion of lingual motility, if not correlated with general motor disorders.

In speech motility there are similar defects. The type of dysarthria is determined by the nature of the clinical syndrome. This classification of dysarthria focuses speech therapists on the qualitative side of arrhythmic motility disorder, which allows more purposefully choosing one or another means of therapeutic and logopedic work on the normalization of muscle tone and articulation motor motility.

Linguistic disturbances that arise in cerebral palsy, can cover various pathogenetic links in its formation: cognitive-linguistic processes; motor-language programming; neuromuscular exercise [2].

Clinically, this neurological pathology manifests itself as problems in linguistic communication as a result of paralysis, weakness and discoordination of speech muscle. At the same time, speed, force, amplitude, synchronicity or accuracy of speech movements can be violated. Neurological and topical diagnosis of dysarthria should precede logopedic diagnosis.

6. Conclusion

In the article we have considered the peculiarities of speech development of a child suffering from cerebral palsy in different age periods. The study of linguistic development of children with cerebral palsy revealed a violation of various components of speech activity.

We pointed out the types of speech disorders characteristic of children with cerebral palsy. We have studied dysarthria as the most common speech disorder in children with cerebral palsy.

For the research is required for other speech disorders in children with cerebral palsy, in particular, different forms of alalia.

References

- [1] Arkhipova, E. F. (2006). *Logopedic work with young children: Proc. pos.* Moscow : ACT & Astrel.
- [2] Aronson, A. E. (1990). *Clinical voice disorder*. New York : Time.
- [3] Badalyan, L. O. & Zhurba, L. T., & Timonina, O. V. (1988). *Children's cerebral paralysis*. Kiev : Health.
- [4] Barashnev, Yu. I. (1973). Hypoxic Brain Damage in Premature Infants. *Journal of the Neuropathology and Psychiatry*, 10, 1446–1452.
- [5] Barashnev, Yu. I. (2001). *Perinatal Neurology*. Moscow : Triad-X.
- [6] Bobath, K., & Bobath, B. (1956). The diagnosis of cerebral palsy in infancy. *Dis. Child*, 31, 408.
- [7] Bohme, G. (1966). *Störungen der Sprache, der Stimme und des Gehörs durch frühkindliche Hirnschädigungen. Klinische und experimentell-phonetische Untersuchungen*. VEB Gustav Fischer Verlag.
- [8] Breitman, M. Ya. (1902). *About the clinical picture of children's cerebral paralysis*. Sankt-Petersburg.
- [9] Cardwel, V. E. (1956). *Cerebral palsy : advances in understanding and care*. New York : Association for the Aid of Crippled Children.
- [10] Danilova, L. A. & Stock, K. & Kazitsyna, G. N. (2000). *Features of logopedic work in cerebral palsy: Method, Com. for teachers and parents*. Sankt-Petersburg.
- [11] Eidinova, M. B. & Pravdina-Vinarskaya, E. N. (1959). *Cerebral palsy and ways to overcome them*. Moscow.
- [12] Ippolitova, M. V. (1997). About children with cerebral palsy. *Children with developmental disabilities*, 7, 52–91.
- [13] Khalilova L. B. (1977). Features of phonemic perception and sound analysis in younger schoolchildren with cerebral palsy. *Defectology*, 3, 63–68.
- [14] Lilyin, E. T., Doskin, V. A. (1997). *Child Rehabilitation (Selected Essays)*. Moscow : MBN.
- [15] Maas, E. & Robin, D. A. (2008). Principles of motor learning in treatment of motor speech disorders. *American Journal of Speech-Language Pathology*, 17, 277–298.
- [16] Malofeev, N. N. (2009). *Special education in a changing world. Europe: studies. student manual ped. universities*. Moscow : Education.
- [17] Mastjukova, E. M. & Ippolitova, M. V. (1985). *Disturbance of speech in children with cerebral palsy: Book. for a speech therapist*. Moscow: Education.
- [18] Mastjukova, E. M. (1991). Speech disorders. Mental disorders. *Infantile cerebral paralysis*. Kiev : Health, 99–121.
- [19] Mastjukova, E. M. (1997). *Therapeutic pedagogy (early and preschool age): Tips for teachers and parents on how to prepare for teaching children with special developmental problems*. Moscow: VLADOS.
- [20] Panchenko, I. I. (1974). *Disartric and anarthritic speech disorders in children with cerebral palsy and features of speech therapy work with them* (PhD thesis). Moscow.
- [21] Pennington, L. & Rauch, R. & Smith, J. & Brittain, K. (2019) *Views of children with cerebral palsy and their parents on the effectiveness and acceptability of intensive speech therapy. Disability and Rehabilitation*.
- [22] Pennington, L. & Roelant, E. & Thompson, V. & Robson, S. & Steen, N. & Miller, N. (2013). Intensive dysarthria therapy for younger children with cerebral palsy. *Developmental Medicine & Child Neurology*, 55 (5), 396–484.
- [23] Pravdina O. V. (1948). *Severe dysarthria of childhood in speech therapy practice* (PhD thesis). Moscow.
- [24] Romanenko Ye. V. (1984). *Features of the sound side of the speech of children with cerebral palsies of the second year of life and the methodology of speech therapy work* (PhD thesis). Leningrad : Leningrad University.
- [25] Schonell, F. E. (1956). *Educating spastic children. The education and guidance of the cerebral palsied*. Edinburgh : Oliver and Boyd.
- [26] Semenova, K. A & Mastjukova, E. M. & Smuglin, M. Ya. (1972). *Clinic and rehabilitation therapy of children's cerebral paralysis*. Moscow : Medicine.
- [27] Semenova K. A. (1991). Children's cerebral paralysis (pathogenesis, clinic, treatment). *Medical and social rehabilitation of patients and disabled due to cerebral paralysis: Sat. scientific tr.*, 8 6–21.
- [28] Semenova K. A., Taniukhina È. I. (1998). *Comprehensive rehabilitation of Children with Cerebral Palsy*. Moscow & Sankt-Petersburg.
- [29] Shakhovskaya S. N. (2004). Social Development of Children with Severe Disorders of Speech. *Children with Development Problems*. 3, 37–45.
- [30] Tardieu, G. (1961). *Les feuillets de l'infirmité motrice cérébrale*. Paris : Association nationale des infirmes moteurs-cérébraux.
- [31] Traugott N. N. & Kaidanova, S. I. (1975). *Impairment of hearing in sensory alalia and aphasia*. Leningrad.
- [32] Vinarskaya, E. N. (2005). *Dysarthria*. Moscow : ACT & Astrel; Transit.