The importance of using innovative game technologies in developing the written speech of children with dysarthria

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Abstract: *The article examines the concept of dysarthria, its causes and classification, as well as the mechanisms underlying written language disorders in children with dysarthria. The content, procedure and corrective value of innovative game technologies used to develop written speech - an interactive graphomotor game, a syllable game on an interactive whiteboard and the game "Make a Story from Letters" - are analysed. Recommendations are given on selecting and applying game technologies in speech therapy work.*

Keywords: *dysarthria, written speech, dysgraphia, game technologies, innovative game, graphomotor skills, speech therapy*

INTRODUCTION

Today, the early identification of children with developmental disabilities and the timely provision of corrective support are among the most pressing tasks of the education system. Among the speech disorders found in children, dysarthria occupies a special place. It affects not only the pronunciation side of oral speech but also, once the child starts school, the acquisition of reading and writing skills.

Speech therapy work with children with dysarthria is long-term and requires a great deal of repetition. Performing the same exercises over a long period dampens the child's interest and leads to rapid fatigue. For this reason, it is important to use modern game technologies in speech therapy sessions that increase the child's motivation and engage the visual, auditory and motor analysers simultaneously.

The aim of the study is to analyse the causes of written speech disorders in children with dysarthria and to substantiate the content and significance of using innovative game technologies to develop their written speech.

Dysarthria is a disorder of the pronunciation side of speech caused by an organic impairment of the innervation of the speech apparatus [1; 2]. The term derives from the Greek *dys* - "impairment" and *arthroo* - "I articulate clearly". In dysarthria, limited mobility of the speech organs (the soft palate, tongue and lips) makes the articulation of speech sounds difficult. Voice and breathing are also impaired, and the rate, rhythm and expressiveness of speech change [1; 8]. The most severe degree of dysarthria, in which the articulation of speech sounds is entirely impossible, is called *anarthria* (from the Greek negative prefix *an*).

Dysarthria results from damage to various parts of the central and peripheral nervous system: the cerebral cortex, the subcortical nuclei, the cerebellum, the brainstem (the pons and medulla oblongata), the nuclei of the cranial nerves and the conduction pathways connecting them [7; 14]. Dysarthria is often observed together with cerebral palsy.

Early attempts to classify dysarthria are found in the works of foreign neurologists such as W. Gowers, E. Froeschels and W. Peacher, who grouped speech disorders mainly according to which part of the nervous system was damaged [7]. In modern speech therapy,

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dysarthria is classified on two grounds. By the site of the lesion, bulbar, pseudobulbar, subcortical (extrapyramidal), cerebellar and cortical dysarthria are distinguished; pseudobulbar dysarthria is the most common form in children. By the degree of speech intelligibility to others, anarthria, pronounced dysarthria and mild ("erased") dysarthria are distinguished [1; 7; 11].

Dysarthria is caused by prenatal factors (foetal hypoxia, maternal infectious diseases, toxicosis of pregnancy, rhesus incompatibility), natal factors (asphyxia, birth injuries) and early postnatal factors (neuroinfections, brain injuries) [2; 3]. Today, advances in medical diagnostics make it possible to detect neurological disorders in the very first months of life. This creates conditions for starting corrective and pedagogical work early and for significantly alleviating the consequences of the disorder.

In Uzbekistan, issues of speech therapy work with children with dysarthria have been covered in the works of L.R.Mo'minova, M.Yu.Ayupova, S.J.Achilova and others [1; 2; 3; 4; 5]. Among Russian scholars, E.F.Arkhipova developed methods for identifying and overcoming mild dysarthria and methods of speech therapy massage [11; 12; 13]. The American scholar J.R.Duffy systematically described the differential diagnosis and management of motor speech disorders [14]. The theoretical and methodological foundations of using games in speech therapy are presented in the textbook "Logopedik o'yin" (Speech Therapy Games) by Z.M.Ahmedova, M.Yu.Ayupova and M.P.Xamidova [6].

The main cause of written speech disorders in children with dysarthria is deficiencies in oral speech. If a child mispronounces a sound, he or she reproduces it in the same way in writing, which results in articulatory-acoustic dysgraphia. Insufficiently developed phonemic perception leads to an inability to distinguish acoustically similar sounds (voiced and voiceless, fricative and sonorant) and to substituting them in writing [5; 11]. In addition, children with dysarthria have underdeveloped fine motor skills of the hand. This manifests itself in graphomotor difficulties: distorted letter shapes, slow writing and rapid fatigue [4].

Therefore, work to prevent written speech disorders in children with dysarthria should be systematic and comprehensive. It includes massage of the articulatory apparatus and articulation exercises, work on breathing and voice, correction of sound pronunciation, and the development of phonemic perception and fine motor skills of the hand [3; 12; 13]. Speech therapy is combined with the treatment prescribed by a neurologist (therapeutic physical exercise, physiotherapy, medication). The main focus is on the child's level of speech development, the lexical and grammatical side of speech, its communicative function and the state of written speech.

Game technologies are particularly effective in working with children with dysarthria. Modern game technologies increase the child's motivation and create an engaging learning environment. By engaging the visual, auditory and motor analysers together, they consolidate the skills the child has acquired [6]. Three innovative games aimed at developing written speech are analysed below.

1. "Draw the Letter" - an interactive graphomotor game.

Application: using a finger or a stylus, the child traces the outline of a letter on a tablet or touch screen. An audio reward or an animation is provided for each correctly completed task.

Corrective value:

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- increases interest in writing;
- develops fine motor and graphomotor skills of the hand;
- helps the child firmly memorise the shapes of letters.

2. “Make a Word from Syllables” - a game on an interactive whiteboard.

Application: the syllables of a word are displayed on the interactive whiteboard in random order. The child arranges them in the correct sequence to form a word. Work begins with two-syllable words and is gradually made more complex. Words are selected taking into account the child’s age and individual characteristics.

Corrective value:

- develops syllable analysis and synthesis skills;
- develops eye-hand coordination;
- activates thinking processes;
- prevents errors involving the omission of syllables in writing.

3. “Make a Story from Letters”.

Application: letters of different colours are displayed on a large screen. The child makes words from them and writes them down, then composes a story aloud based on the words he or she has written. At first the speech therapist demonstrates the game several times as a model, then plays it together with the child, and once the skill has been formed the child works independently. The story is written out on the screen step by step. At the end, the story can be brought to life as an animation using artificial intelligence tools.

Corrective value:

- teaches the child to distinguish letters and colours;
- consolidates sound-letter and syllable analysis;
- teaches the child to connect words grammatically;
- develops coherent speech and vocabulary;
- increases interest in writing.

The games analysed are applied step by step: from sounds and letters to syllables, from syllables to words and from words to coherent text. In this way, they serve to develop all aspects of oral and written speech. The type of game is selected according to the child’s age, the form and severity of the disorder, and his or her individual characteristics. A correctly chosen game technology helps to correct and compensate for the disorder. To achieve this, the speech therapist should first examine the child comprehensively, establish a trusting relationship with him or her, and only then select an appropriate method.

Dysarthria is an organic disorder of the pronunciation side of speech, and its consequences are not limited to oral speech. Incorrect pronunciation, insufficient phonemic perception and weak fine motor skills of the hand lead to written speech disorders in children with dysarthria. It is therefore advisable to begin developing written speech as early as preschool age, in parallel with the correction of oral speech.

Innovative game technologies - interactive graphomotor games, syllable games on an interactive whiteboard and games for making stories from letters - increase the child’s interest in speech therapy sessions, engage several analysers at once and help to form the graphomotor, phonemic, lexical and grammatical foundations of written speech.

For game technologies to be effective, they must be matched to the child’s age, type of disorder and ability to take in information, and must be applied systematically and

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according to a plan. Corrective work produces the expected results only when it is carried out in close cooperation between the speech therapist, neurologist, paediatrician, psychologist and parents.

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