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ORIGINAL

Pedagogical support for primary school pupils with severe speech difficulties within the framework of development and correction

Apoyo pedagógico a los alumnos de primaria con dificultades graves del habla en el marco del desarrollo y la corrección

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ABSTRACT

Speech impairment is the most common problem that hinders inclusive education, as children with speech problems have a harder time socializing and adapting to school conditions. That is why correctional and developmental support for students with severe speech impairments is important and requires the search for effective tools, such as digital technologies, the positive impact of which has not yet been sufficiently studied. The purpose of our study was to identify effective digitalization tools and algorithms for their application to correct severe speech disorders in primary school students. The study used the methods of analysis, synthesis, systematization, survey, and graphical presentation of results. The survey involved 62 parents, 25 teachers and teacher assistants, and 38 speech therapists. The results of the study revealed the importance of a multidisciplinary approach to speech correction and the use of digital technologies. Among the most popular digital tools were video materials, specific speech development applications, online platforms for assessing results and sharing educational materials. Authors identified the advantages and disadvantages of different types of digital technologies, as well as the difference in views on the effectiveness of their use for speech development among parents, teachers and caregivers. Presented the main recommendations of parents, teachers and speech therapists to improve the effectiveness of remedial therapy for speech disorders through digitalization.

Keywords: Speech Development; Inclusive Education; Primary School Students; Speech Therapists; Digital Tools; Speech Development Applications.

RESUMEN

Las deficiencias del habla son el problema más común que dificulta la educación inclusiva, ya que los niños con problemas del habla tienen más dificultades para socializar y adaptarse a las condiciones escolares. Por eso es importante el apoyo correctivo y de desarrollo para los alumnos con deficiencias graves del habla, lo que requiere la búsqueda de herramientas eficaces, como las tecnologías digitales, cuyo impacto positivo aún no se ha estudiado suficientemente. El objetivo de nuestro estudio fue identificar herramientas de digitalización eficaces y algoritmos para su aplicación en la corrección de trastornos graves del habla en alumnos de primaria.

El estudio utilizó los métodos de análisis, síntesis, sistematización, encuesta y presentación gráfica de resultados. En la encuesta participaron 62 padres, 25 profesores y asistentes de profesores y 38 logopedas. Los resultados del estudio revelaron la importancia de un enfoque multidisciplinar de la corrección del habla y del uso de tecnologías digitales. Entre las herramientas digitales más populares se encontraban los materiales de vídeo, las aplicaciones específicas para el desarrollo del habla y las plataformas en línea para evaluar los resultados y compartir materiales educativos. Los autores identificaron las ventajas y desventajas de los distintos tipos de tecnologías digitales, así como la diferencia de opiniones sobre la eficacia de su uso para el desarrollo del habla entre padres, profesores y cuidadores. Presentaron las principales recomendaciones de padres, profesores y logopedas para mejorar la eficacia de la terapia de recuperación de los trastornos del habla mediante la digitalización.

Palabras clave: Desarrollo del Habla; Educación Inclusiva; Alumnos de Primaria; Logopedas; Herramientas Digitales; Aplicaciones para el Desarrollo del Habla.

INTRODUCTION

Inclusive education plays an important role in creating accessible education for people with disabilities and their socialization in society. However, despite the development of inclusive education programs, equal learning conditions are not easy to achieve in practice.[1] One of the most vulnerable inclusive groups among students is children with severe language disorders, as they have significant problems with communication and socialization. This problem is especially relevant for elementary school students, as speech disorders become a stigmatizing factor among young children. On the other hand, correctional and developmental exercises have great potential for this age group, as the child is able to consciously cooperate with a specialist and perform tasks of varying complexity. Another aspect is the combination of severe speech disorders with problems of psychomotor and cognitive development, which requires an integrated approach in the process of remedial therapy.[2,3] Thus, specialists working with speech disorders face the problem of choosing effective exercises and tools that meet the individual needs of the child. Given the multidisciplinary nature of correctional therapy for severe speech disorders, speech therapists, psychologists, and neuropsychologists are involved in integrating a child into the learning environment, often with different views on the process of speech development. Therefore, in order to achieve coordinated work of specialists, methodological recommendations and algorithms are needed that would become a vector for the process of forming communication skills in children with special needs.

Literature review

The problem of severe speech impairment in children is complex and multidisciplinary, so scientists from different fields pay attention to its study. In particular, scientific works are devoted to pathologies that are accompanied by speech and behavioral disorders, such as autism, which require not only exercises with the articulatory apparatus but also psychological support to overcome the barrier to communication with peers and teachers.[4] Cognitive impairments, which often accompany severe speech disorders and significantly complicate the interaction between children with special needs and their peers, also hinder communication problems.[5,6] Another aspect is a decrease in attention, the ability to focus on the learning process, and difficulties with memorizing material due to insufficient understanding of the semantic, semantic and phonetic composition of verbal material.[7] Such peculiarities of perception and assimilation of the educational program require the involvement of neurologists and neuropsychologists to adapt children with speech disorders to the learning environment.[8]

Severe disorders of a child's speech activity can also be accompanied by dysgraphia, which occurs against the background of impaired higher mental functions, which requires additional diagnosis and a plan for the formation of writing skills.[9,10] Correct diagnosis of allia is the basis for planning correctional and developmental work and includes the exclusion of hearing, articulation, and intellectual disabilities.[11,12] Based on the diagnosis and involvement of specialized specialists, an individual work plan is created for the development of speech activity.[13]

An important aspect of developing communication skills is physical activity, which may include group games and sports exercises.[14] Collective training and work tasks that include the development of a culture of mutual care in the team are also one of the important adaptive approaches in an inclusive space.[15] For the effective development of speech skills and the preservation of an individual approach, it is recommended to create didactic tasks for the development of creative thinking.[16] Sensorimotor exercises also demonstrate a positive impact on speech development by improving auditory and visual perception in preschool and primary school children.[17] Younger age is a favorable period for speech development, so communication in a team or small

groups should occur as early as possible.[18] The methodology for developing an inclusive space also includes an approach that involves identifying the needs of an individual child and focusing on those remedial measures that demonstrate a positive personal result.[19]

In parallel with the development of inclusive education, the education system has undergone a transformation under the influence of comprehensive digitalization. This, in turn, has affected all stages of learning and has been the subject of scientific discourse among educators in recent years.[20] After all, on the one hand, digital technologies open up new opportunities, and on the other hand, they carry pedagogical risks and additional financial burden. In particular, machine learning, which is used to teach, assess, and provide feedback to students, is popularized in education, especially among high school and college students. At the same time, the use of artificial intelligence raises concerns among teachers, as it makes it difficult to verify the knowledge gained.[21] Another negative factor in the accessibility of digital resources among students is the risk of problematic use of the Internet, accompanied by loss of self-control, prolonged screen time, irritability, and poor academic performance.[22] That is why teachers limit the presence of new technologies in the classroom, especially in primary school, using only tools for visualizing educational material, such as interactive whiteboards.[23]

Digitalization for inclusive learning has also opened up new opportunities for people with disabilities by ensuring accessibility of learning materials and continuity of learning.[24] However, the benefits of distance learning for people with disabilities are controversial, as student-teacher contact in this population group shows poorer educational outcomes due to less effective communication at a distance.[25] Moreover, such students need the support of an inclusive teacher to help with various tasks, and online lessons limit their work.[26] In the context of speech disorders, digital technologies use audio and video materials that have demonstrated a positive impact, especially in the group of children with autism spectrum disorder, to better understand interpersonal interaction.[27] However, the author emphasizes the need for careful selection of visual materials in terms of content and form for effective correctional work. Bornman et al.[18] demonstrated the effectiveness of mobile applications for working with children with language competence disorders by increasing speech therapy load, increasing parental involvement in classes, and reducing financial costs. Saeedi et al.[28] studied the role of computer games in correcting speech deficits and identified a positive impact on students' motivation, enjoyment, and concentration, but negative game results reduced children's self-confidence and caused a sense of frustration due to the inability to have a personalized approach in the game.

The literature analysis showed that research on speech disorders is fragmentary and does not provide a holistic view of the methodology for dealing with this problem in the context of information technology. Instead, for the practical use of the material by specialists in inclusive environments, it is necessary to systematize achievements in correctional approaches. Therefore, the purpose of our study was to identify the main effective digital tools for speech correction and to create an algorithm for working with children with severe speech impairments using digital technologies.

METHOD

To achieve the aim of the study, the following tasks were formulated: bibliographic analysis of trends in the development of inclusive education, in particular for children with speech problems; systematization of the main methods and approaches to the correction of speech disorders, including digital tools; creation of an algorithm for remedial therapy for severe speech disorders; analysis of the advantages and disadvantages of digital technologies used as an aid to speech development; survey of participants in remedial therapy (parents, speech therapists, teachers) about their experience of using digital technologies. The methods used in the study were analysis, synthesis, systematization, induction, deduction, logical comparison, and survey. The survey was conducted online among 125 participants of the forum on recommendations for the development of speech in children with speech delays and disorders. An example of the questionnaire is shown in Appendix 1. All participants voluntarily agreed to participate in the survey and publish the results without disclosing their personal data. Among the respondents were 62 (49,6 %) parents, 38 (30,4 %) speech therapists and 25 educators (teachers and teacher assistants). The results of the survey were analyzed by the authors of the study, to avoid bias, the results were evaluated independently by 3 authors, and in case of disagreement, the answers were discussed with the involvement of all authors. The survey results are presented in the form of a graph and a table.

RESULTS

Correctional work with children with speech and language disorders includes a complex multidisciplinary system involving specialists of different profiles and the creation of a plan. Based on the literature analysis, authors systematized information on the features and approaches to speech development and developed a step-by-step algorithm. The stages of correctional and developmental work and their brief description are shown in table 1.

Table 1. Algorithm for correction of speech disorders in children

Stage	Characteristics	Performers
Diagnosis	Detection of the first signs of speech developmental delays, referral to specialized specialists. Exclusion of organic pathologies of the nervous system, hearing impairment, articulation defects, cognitive impairment, behavioral disorders, psychological trauma.	Parents, family doctors, teachers, neurologists, speech therapists, otorhinolaryngologists, psychologists.
Creating a favorable environment	Elimination of negative psychological factors, nutrition, activity and rest regimen, effective inclusive environment.	Parents, teachers of the children's team, psychologist.
Early communication and socialization	Attendance at group classes, communication with peers, teachers and other professionals, creation of inclusive classes.	Parents, kindergarten teachers, early childhood development specialists, teachers, teacher's assistants, videos.
Physical activity	Regular sports activities, swimming, gymnastics, nature walks, sports games based on an individual approach, taking into account physical abilities and enjoyment of the activity.	Parents, coaches, teachers.
Development of fine motor skills, coordination	Exercises with sorting, folding objects of different shapes, sizes, textures, art therapy, modeling with plasticine, clay, assembling constructors, exercises to develop coordination, repetition after the teacher, exercises with eyes closed, asynchronous movement with a focus on those exercises that evoke positive emotions and attract the child's attention.	Parents, teachers, teacher's assistant, neuropsychologist, videos, computer games.
Articulation development	Making sounds, making sound pairs, expanding vocabulary, doing exercises to develop the muscles of the facial and masticatory groups, repeating sounds and words, phrases, tongue twisters, sentences.	Speech therapist, parents, audio and video materials.
Analysis of achievements and correction of the plan for further work	Determination of personal achievements, exclusion of exercises that demotivate and cause negative emotions in a child with special needs, gradual increase in the load and complexity of exercises, emphasis on achievements.	Speech therapist, neuropsychologist, psychologist, teachers, parents, teacher's assistant.

Source: Created by the author based on Ndou and Omidire,[12] Henessy,[6] Miroshnyk and Sidun[13]

As can be seen from the table, each step of the algorithm requires the involvement of parents who accompany the process of developing speaking, writing, and reading skills, so parental training and support is essential. In addition to working with children with special needs, teachers, speech therapists, psychologists, and other professionals should establish interaction with parents, avoid criticism, and instead create trusting and supportive relationships. Contact between teachers and professionals and parents involves training parents to ensure continuity of therapy and feedback on how they perceive different types of activities. In the classroom, the interaction between the teacher and the teacher's assistant is important to take into account the needs and capabilities of students with special needs. Involvement of specialists outside the school can have a negative impact due to the lack of communication with school teachers and psychologists and discrepancies in the educational process. That is why school psychologists and speech therapists are more effective when they communicate within the school with teachers to create a joint speech correction plan. However, not all educational institutions are provided with qualified specialists, as this requires additional costs. To solve these problems, it is advisable to use remote forms of communication between specialists using digital technologies.

Psychological support plays a significant role for both students with speech impairments and parents. Parents need support not only from specialists who work with their child, but also from other parents who have had their children's speech corrected. To this end, parent support forums and communities are being created on social media, where participants share their difficulties and achievements, contacts of professional specialists, etc. Given the additional workload of teachers working with children with speech disorders, psychological assistance to teachers to establish communication with students with special needs is also appropriate. At the same time, the number of students in the classroom should be smaller, and the teacher should be provided with all possible aids, including digital ones. Table 2 presents digital technologies that should be used for the development of speech in primary school students with speech disorders and an analysis of their advantages and disadvantages.

Table 2. Digital tools for the correction of speech disorders

Digital tools	Advantages	Disadvantages
Audio materials	Possibility to choose the format (songs, poems, fairy tales, stories, dialogues), subject matter, voice, combination with video materials.	Time-consuming individual selection of material, refusal to use other methods of communication, need for time constraints.
Video materials	The ability to get a visual representation of words, sounds, behavior in different situations, demonstration of speech therapy exercises and exercises for the development of fine motor skills, and the formation of associations.	Prolonged use of gadgets can cause irritability, refusal to engage in physical activity, communication with peers and parents.
Mobile applications Speech Blubs, Speech Therapy, Speakaro, Articulation Station	Teaching the pronunciation of sounds, words, syllables based on interactive video modeling that engages children in repetition and motivates them to communicate.	Lack of eye contact, decreased interest in communicating with peers, parents and professionals, which requires additional encouragement.
Learning platforms for sharing digital materials, monitoring student achievement and communication teachers and educators (Google classroom, Seesaw)	Communication between specialists, parents, real-time assessment of student achievements, access to the necessary materials, personalized approach to therapy.	Reduction of live communication between parents, teachers, and specialists, misinterpretation of achievements, risk of false conclusions, which leads to negative changes in the correctional therapy plan.
Virtual reality	Creating an environment for better understanding of the context of words, the ability to perform coordination exercises using 3D glasses.	Reduced motivation to work in groups and with a specialist, dizziness and headaches with prolonged use.
Games	High motivation to perform tasks, the ability to combine different tasks, self-control of the results obtained.	Prolonged use causes irritability and dependence on gadgets, in the absence of progress, causes a sense of frustration, and the inability to provide an individual approach.
Logorhythmic combination of music and movements	Helps to correct the tempo-rhythmic component of speech in stuttering.	Requires selection of material by a qualified specialist.
Tests and tasks for evaluating results	Quick independent assessment of results by parents, teachers, speech therapists, neuropsychologists.	Lack of individualized test features, which can give false results.
Platforms for parental education and communication	Creation of conferences, video meetings, seminars, blogs, online communities.	In the absence of professional support, information may appear on these platforms that demotivates parents to continue therapy or encourages them to resort to ineffective methods of correction.

Source: Created by the author based on Zabrocka,[27] Saeedi et al.,[28] Bornman et al.[18]

As can be seen from the table, digital tools are used to achieve various goals, including increasing the effectiveness of articulation exercises, increasing student motivation, improving communication between parents and professionals, the ability to quickly assess the progress of speech development, etc. The general advantage of digital tools is their affordability, ease of use, and involvement of students and parents, but the disadvantages of using information technology should also be taken into account. In particular, the main limitation is the time interval for students to use gadgets, which can lead to psychological disturbances, deterioration of health, lack of desire to exercise, and avoidance of communication. Another factor is the importance of combining different digital tools to prevent addiction to homogeneity of classes. It is also advisable to combine digital technologies with exercises with specialists. An important task is also the hygiene of information related to remedial therapy for speech disorders, which can lead to a regression of achievements if parents refuse effective exercises in favor of unproven methods.

To determine the state of use of digital technologies by the target audience, authors conducted an online survey on the forum on recommendations for remedial therapy for children with speech disorders. The survey involved 125 participants: 25 teachers and teacher assistants, 38 speech therapists, and 62 parents. As can be seen from the activity in the survey, parents were most interested in improving the effectiveness of speech disorders correction. Among teachers and teacher assistants, 80,0 % were representatives of state educational institutions, which may indicate the active implementation of inclusive education, which encourages teachers and teacher assistants to find new methods of communication with students with speech impairments and their parents. Among speech therapists, 73,7 % of respondents worked in specialized private centers, and

24,6 % of respondents combined work in schools and private speech development institutions. This trend may indicate a low level of provision of public schools with speech therapy specialists. Instead, the development of private practice of speech therapists indicates a high demand among parents and a significant financial burden on the family budget associated with the involvement of speech therapists from private institutions in the development of a child's speech. The survey included questions about the experience of using various digital tools to develop children's language skills. The results of the survey are shown in figure 1.

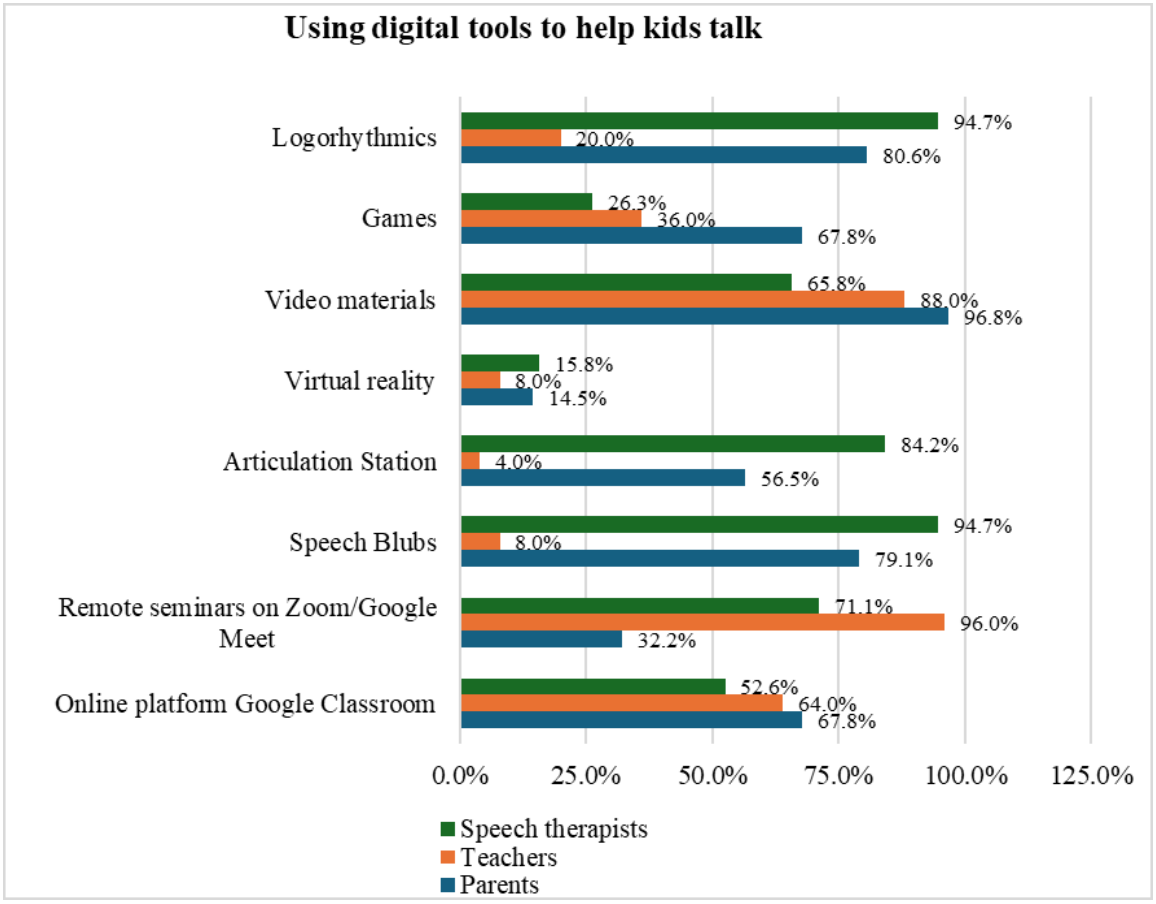

Figure 1. Experience of using digital tools among the respondents, %

As can be seen from the survey results, the popularity of using digital technologies differs among parents, teachers and speech therapists. Specific speech development applications are most popular among speech therapists, namely, more than 90 % of the surveyed speech therapists used the speech rhythm app and the Speech Blubs app, which help children pronounce sounds and engage students in repeating articulation exercises at home. Among parents, speech rhythmics and the Speech Blubs app were also popular and were used in more than 79 % of cases, which demonstrates a high level of compliance with speech therapists' recommendations by parents. The Articulation Station app was somewhat less popular among speech therapists, with 84,2 % of respondents using it. Among the benefits of speech development apps, parents noted a better understanding of the exercises and the ability for their child to complete tasks independently at home.

The most popular tools used by 96,0 % of parents were videos. The high popularity of video materials was also observed among teachers – 88,0 % while among speech therapists this figure was lower and amounted to 65,8 %. Video materials almost completely replaced audio materials, which were occasionally used by 13,2 % of speech therapists. More than 2/3 of the parents surveyed used computer games to fulfill the speech therapist's tasks, while speech therapists used games as a means of speech development in only 26,3 % of cases. Parents explained the use of video games and video materials by encouraging their children to do exercises at home, as they noted their motivating effect. Speech therapists, on the other hand, used video materials and computer games as a tool of desperation when they could not keep a child's attention in any other way. Specialists explained this cautious attitude toward video materials and games as a result of the quick addiction to this form of correction, which reduces the incentive to perform interactive exercises with a specialist and in groups.

There was also a high level of use of Google classroom platforms for monitoring children's progress by all respondents: parents in 67,8 %, teachers in 64,0 %, and speech therapists in 52,6 %. However, parents noted that the platforms created at school and in private speech development centers did not coincide, and teachers and

specialists from different institutions were reluctant to communicate with each other. This problem requires more active involvement of speech development specialists in the educational process in public schools, which requires attention from the authorities and additional funding. Remote seminars organized by specialists in inclusive education were most popular among teachers and teacher assistants (96,0 %) and speech therapists (71,1 %). Instead, among parents, distance seminars were less popular and were used in 32,2 % of cases. Instead, blogs and social media were among the alternative means of communication between parents and specialists and other parents. The least popular among all groups of respondents was the use of virtual reality, which is explained by the high cost and the need to create specific material for the development of movement coordination and speech development.

In order to identify gaps and risks in the use of digital technologies for speech development, teachers, speech therapists, and parents of children with speech disorders were interviewed about recommendations for improving correctional work through innovation. Parents identified the following as the main recommendations:

- creation of a common online platform with the possibility of involving out-of-school specialists to coordinate work and avoid repetition or excessive workload for the child;
- educating parents through video lessons that can be viewed in their free time;
- providing classrooms with auxiliary materials for the introduction of digital technologies.

Speech development specialists emphasized the importance of promoting the use of specific applications such as Speech Blubs and Articulation Station in schools, supporting the diversity of digital tools, individualized selection of materials, and strict time limits for using gadgets. Instead, teachers suggested allocating separate working hours for communication with related specialists and adjusting the curriculum for children with speech disorders, periodic involvement of specialists in the classroom, especially psychologists, and training in working with digital platforms.

DISCUSSION

Our study revealed a high level of interest in the correction of speech disorders among researchers, but the survey results showed that parents were the most interested in improving the effectiveness of speech development. This confirms the results of the study by Gylling-Andersen,[15] who argued that parental education is one of the leading roles in the successful development of speech competence. Moreover, parents expressed a desire to learn in the form of video lessons that would help them do home exercises with their child. Parents also identified insufficient provision of classrooms with digital materials, which indicates a low integration of digitalization into inclusive education.

Instead, speech therapists and parents most often used specialized applications such as Speech Blubs and Articulation Station to help with sound production and increase vocabulary. However, speech therapists did not recommend using video lessons and games regularly because of the negative effects on children's psycho-emotional state. Macur[22] also emphasized the need to limit screen time. Speech therapists also noted the need for diversity and individual selection of digital materials, as well as the popularization of specialized applications for articulation exercises. Although Zabrocka[27] and Saeedi et al.[28] emphasized the positive aspects of computer games and videos, our study found that in the absence of time limits and a variety of types of correctional exercises, their use can have the opposite de-motivating effect.

An important factor in the effective correction of speech disorders is the interaction of parents, teachers and speech specialists, which can be achieved through the use of an online platform to access materials, adjust the therapy algorithm and communicate between all performers to coordinate work. Our study revealed parents' desire for direct communication between school and out-of-school specialists and teachers.

Limitations of the study included the number of respondents and the absence of psychologists among the interviewees, who play an important role in comprehensive activities to develop language competence.

CONCLUSION

The results of the study revealed the importance of a multidisciplinary approach involving teachers, parents, speech therapists, psychologists and their effective communication to coordinate therapy. To improve communication between in-school and out-of-school specialists, it is advisable to use online platforms for individual changes in the therapy algorithm and real-time assessment of achievements. The most popular digital tools among speech therapists were specific speech development applications that develop sound pronunciation and increase vocabulary. Parents and teachers preferred videos and games, but speech therapists used these tools only when it was impossible to keep students' attention with other types of exercises. The unlimited use of videos and games can have a negative impact and reduce motivation for other types of therapy. After analyzing the disadvantages of digital tools, it was determined that their inappropriate use can have a negative impact on the psycho-emotional state, so it is important to use the recommendations of specialists on their use. In view of this fact, the prospect of further research is to involve psychologists in analyzing the impact of

different types of digital technologies on the effectiveness of correctional therapy for speech disorders.

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ANNEXES

APPENDIX A

Survey questionnaire for participants of the forum on recommendations for the development of speech in children with delayed and impaired speech.

1. Your role in remedial therapy:

- Speech and language therapist
- Teacher/teacher's assistant
- Parent
- Psychologist

2. Name the digital tools that you use in the practice of speech development for students with speech problems. (Choose from the list or provide your own answers)

- Special applications for speech development
- Video materials
- Audio materials
- Online platforms for assessment and access to materials
- Distance learning seminars
- Logorhythmics
- Tests for assessment of achievements
- Computer games
- Social networks for communication

3. Briefly describe the advantages of the most effective digital tools for speech correction in your opinion.

4. How do you think the effectiveness of digital tools for developing language competence could be improved?

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