ARE ASSISTIVE TECHNOLOGIES USED TO SUPPORT CHILDREN WITH SPECIAL EDUCATIONAL NEEDS IN BULGARIA?

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ИЗПОЛЗВАТ ЛИ СЕ АСИСТИРАЩИ ТЕХНОЛОГИИ В ПОДКРЕПА НА ДЕЦА СЪС СПЕЦИАЛНИ ОБРАЗОВАТЕЛНИ ПОТРЕБНОСТИ В БЪЛГАРИЯ?

Abstract

This study investigates the adoption and use of emerging assistive technologies among 59 Bulgarian professionals working with children with special educational needs (SEN), particularly those with Autism Spectrum Disorders and intellectual disabilities. The mean age of the respondents is 44 years (ranged from 21 to 56). An online questionnaire of 12 closed-ended and 2 open-ended questions was used. It focuses on technological tools such as specialized software for therapy and education, augmentative and alternative communication devices, virtual reality, robots, and other digital solutions. The goal is to generate insights that can inform targeted training initiatives and policy development to facilitate the broader integration of assistive technologies in educational and therapeutic settings.

Descriptive statistics show a predominant belief on traditional or low-tech tools. The highest mean score was recorded for educational hardware and software (M = 2.69), followed by the mobile applications developed for children with special educational needs (M = 2.61) and technologies for augmentative and alternative communication (M = 2.54). The use of robots (M = 1.19) was among the least adopted. Analysis of the open-ended responses further illustrates the difference between available and utilized technologies. Approximately 42% of participants reported not using any assistive technologies, citing lack of access or availability. Among those who did, the most commonly used tools included augmentative and alternative communication applications such as Cboard (18%), Communicator 5, PECS cards, Look to Learn, Bobo Home, interactive floors, and multisensory rooms. Low-tech solutions such as gestures and symbolic pictures remain the prevalent alternatives. When asked about their awareness of colleagues using other assistive technologies, nearly 80% of participants reported no knowledge of such practices. Isolated responses referenced tools like Cboard, Communicator, Look to Learn, and devices like the Nao robot and gaze-controlled systems. This suggests limited peer communication and weak knowledge exchange, which may hinder the broader dissemination and implementation of innovative tools. These findings emphasize the need for targeted professional development, enhanced resource availability, and stronger inter-professional communication to support the wider integration of assistive technologies in SEN educational practices.

Keywords: *Special Educational Needs; Autism Spectrum Disorders; Intellectual Disabilities; Assistive Technology.*

INTRODUCTION

The term "assistive technologies" refers to assistive products and the associated systems and services that enable and promote the inclusion, participation, and engagement of persons with disabilities, older adults, and people living with chronic conditions in family life, the community, and all areas of society, including the political, economic, social, and educational spheres. Assistive products can improve performance in all key functional areas such as cognitive functions, communication, hearing, mobility, self-care, and vision. They may be physical products such as wheelchairs, glasses, hearing aids, etc., or digital products offered as software and hardware solutions that support communication, learning, and more [1].

Developmental disorders are common. The Global Burden of Disease (GBD) study from 2019 shows that worldwide 316.8 million children and adolescents have a health condition leading to developmental disorders [2], highlighting the critical need for effective interventions. Children with developmental disorders represent a heterogeneous group of children with physical, cognitive, sensory, communication, and behavioral impairments that hinder their social functioning and acquisition of new knowledge and skills. Each of these children has individual characteristics and needs. To achieve the maximum potential of each child with a developmental disorder, special educational methods and approaches are applied. Technologies offer opportunities to address the challenges faced by these children, thereby facilitating their social inclusion and integration into mainstream kindergartens and schools and encouraging greater independence [3]. Accessibility to assistive technologies for children with developmental disorders who have special educational needs (SEN) is often the first step toward child development, access to education, participation in sports and civic life, and preparation for future professional practice. As stated in the Global Report on Assistive Technologies of WHO and UNICEF (2023), "Access to assistive technologies is a human right and a prerequisite for equal opportunities and participation" [1].

We live in a time when technologies are developing very rapidly and are an integral part of daily life in an increasing number of countries worldwide. The relationship between technological innovation and socio-economic inequality is examined in a study and data analysis from 59 countries in an article by Xiao et al. (2024) [4]. The authors find that while technological progress brings new opportunities, it often deepens inequalities, especially in developed economies. A major reason is the digital divide – unequal access to technologies and skills, which limits social and economic participation of vulnerable groups, including children with SEN. To overcome this problem, the authors recommend development of accessible infrastructure, support for educational programs in digital skills, and ensuring equal access to innovations and policies for inclusive digitalization, i.e., accessible to everyone. The authors' recommendations for building accessible digital infrastructure and training in digital skills can be directly applied to the educational system to ensure that all students – including those with special needs – have the necessary support. The emphasized need for inclusive digitalization coincides with the goals of inclusive education, i.e., removing barriers and ensuring equal access to technological innovations and using them to reduce inequalities rather than deepen them [4]. The aim of the present study is to investigate whether assistive technologies are used to support children with special educational needs in Bulgaria.

EXPOSITION

Materials and Methods:

To achieve this aim, a questionnaire with 12 closed-ended and 2 open-ended questions was developed in the online tool Google Forms. Each closed-ended question is assessed on a 5-point Likert scale ranging from "Never" to "Constantly." The questionnaire examines whether professionals working with children with SEN apply technological tools in their practice such as specialized software for therapy and education, augmentative and alternative communication (AAC) devices, virtual reality, robots, speech recognition applications, and other digital tools.

This study investigates the adoption and use of new assistive technologies among 59 Bulgarian professionals – resource teachers (39%), speech and language therapists (32%), psychologists (17%), teachers (5%), occupational therapists (4%), and social workers (3%) – who work with children with SEN, especially those with autism spectrum disorders and intellectual disabilities. The mean age of respondents is 44 years (ranging from 21 to 56).

All participants were previously informed about the purpose of the study, approved by the Ethics Committee for Scientific Research (ECSR) of the Institute of Robotics – BAS with protocol No. 8/5.02.2025. By completing the questionnaire, they agreed to participate in the study and to have their responses processed in compliance with the General Data Protection Regulation. The obtained results were processed and analyzed using IBM SPSS v26, applying descriptive statistics.

Results and Discussion

The summarized data from the study is presented in **Fig. 1**. After applying descriptive statistics, it was found that professionals currently working with children with SEN do not frequently use high-tech tools in their practice.

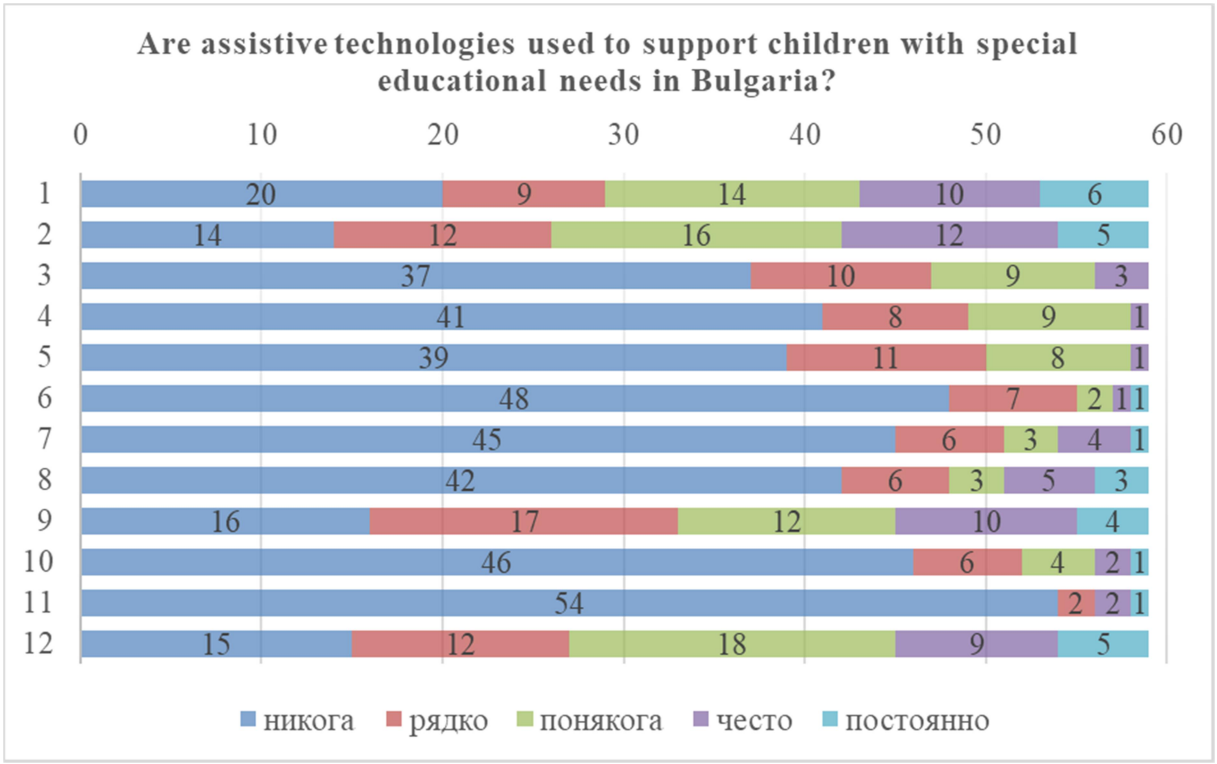

Fig. 1. Results of the survey of specialists working with children with special educational needs.

With respect to the first statement concerning the use of hardware- and software-based assistive technologies for augmentative and alternative communication, a moderate level of adoption is observed. A large proportion of participants have never used such assistive technologies (34%), but there is also a significant share who applies them regularly, i.e., often or constantly (27%). The mean result of responses to the first question is M = 2.54 (see Table 1).

Comparing these results with a survey among professionals working in Regional Centers for Support of Inclusive Education conducted in 2023, an increase in the frequency of use of high-tech AAC systems is observed. In the survey conducted by Hristova and Grinberg (2024), only 4% of professionals used this type of technology often or constantly [5], while in the present study their percentage is significantly higher – 27%. This may be due to the fact that in some universities in Bulgaria there are specialized disciplines in student curricula, and for practicing professionals there are qualification courses in the field of augmentative and alternative communication.

Table № 1. Mean values of summarized results from the study of opinions of specialists working with children with special educational needs

№	Statement	Mean	Std. Deviation
1	I use computer assistive technologies – hardware and software for augmentative and alternative communication.	2.54	1.38
2	I use computer assistive technologies – educational hardware and software.	2.69	1.28
3	I use technologies related to virtual reality.	1.63	0.93
4	I use technologies related to augmented reality.	1.49	0.82
5	I use technologies related to mixed reality.	1.51	0.80
6	I use wearable technologies.	1.30	0.77
7	In my practice I use AI-based virtual assistants.	1.47	0.99
8	In my practice I use speech recognition systems (text-to-speech and speech-to-text).	1.66	1.21
9	In my practice I use personalized learning platforms.	2.47	1.25
10	In my practice I use robotic devices.	1.41	0.89
11	In my practice I use robots.	1.19	0.76
12	In my practice I use mobile applications developed for children with SEN to support and train communication and social skills, behavior management, etc.	2.61	1.26

A more balanced distribution of responses is observed regarding the use of computer assistive technologies in the form of educational hardware and software. The mean result is M = 2.69. A relatively more frequent use is declared compared to the first statement. An undeniable fact is that many educational software and applications are freely available, which increases the possibilities for their use. The application of digital educational technologies supports inclusive learning processes for children with SEN in mainstream kindergartens and schools. They can be useful as they can encourage improvements in academic skills of children with SEN, such as writing skills, learning mathematics, and improving emotional regulation [6]. Two more elements show relatively moderate frequency of use: personalized learning platforms (M = 2.47) and mobile applications developed for children with SEN (M = 2.61).

A systematic review of studies on virtual and augmented reality (VR and AR) related to communication interventions for children and adolescents with neurodevelopmental disorders shows that VR/AR interventions can be effective in some cases. Current findings indicate that these technologies can be used to create safe and authentic communicative learning

experiences for most children and adolescents with autism spectrum disorders, intellectual disabilities, and communication disorders [7]. In Bulgaria, this type of technology is not very popular among professionals working with children with SEN, which is also proven by the results of statements 3–5 of the survey. Respondents predominantly answered "never" for technologies related to virtual reality – 63% (M = 1.63). 70% have never used technologies related to augmented reality (M = 1.49). 66% have never used mixed reality (MR) technologies.

Wearable technologies are devices such as smart glasses, smart watches, smart objects, or smart clothing that offer new learning opportunities. These devices are worn on the body, equipped with sensors, and ergonomically integrated into daily activities. They provide access to information and learning resources while keeping hands free and can effectively improve interactivity, self-directed learning, and engagement during education. These technologies help people with disabilities improve their lives. With access to accessories such as vibrating watches, smart jewelry with navigation functions, or palm bracelets converting speech into text, everyday life and learning becomes easier for students with SEN [8]. According to the study results, this type of technology is unfamiliar to respondents – 81% reported they have never used wearable technologies in their practice.

Artificial intelligence (AI) is increasingly integrated into adaptive learning systems to meet the needs of students with disabilities. Adaptive learning systems using AI represent an innovative step toward inclusion for children with SEN [9]. Only five professionals responded that they often or constantly apply AI-based virtual assistants. 76% answered "never," indicating another technology type unfamiliar to most participants. A similar result is found for speech recognition systems – only six responded positively, while 71% negatively. The mean result for question eight is M = 1.66.

The use of robotic devices (M = 1.41) and robots (M = 1.19) is almost absent in the practice of respondents working with children with SEN. 92% have never used a robot as an assistive technology in their work. Numerous publications indicate the potential of socially assistive robots in supporting the development of children with various impairments, but at the same time therapists face challenges such as high cost and robot programming complexity [10].

Analysis of open-ended responses further illustrates the difference between available and used technologies. Approximately 42% of participants reported not using any assistive technologies, citing lack of access or availability. Among those who did, the most frequently used tools included AAC applications such as Cboard (18%), Communicator 5, PECS cards, Look to Learn, Bobo Home, interactive floors, and multisensory rooms. Low-tech solutions such as gestures and symbolic images remain prevalent alternatives. When asked about awareness of colleagues using other assistive technologies, nearly 80% reported no knowledge of such practices. Isolated responses mentioned Cboard, Communicator, Look to Learn, and devices such as the Nao robot and gaze-controlled systems. This suggests limited peer communication and weak knowledge exchange, which may hinder broader dissemination and implementation of innovative tools. These findings emphasize the need for targeted professional development, improved resource availability, and stronger inter-professional communication to support wider integration of assistive technologies in educational practices for children with SEN.

The reasons for this distribution of responses include accessibility and prices of different technologies. Cheap and easily accessible applications are used more often, while expensive and complex solutions such as robots and mixed reality are almost absent. Mobile applications and platforms are easy to integrate into professionals' daily work. Applying new technologies requires acquiring specific knowledge and skills that not all participating professionals possess. The use of mobile applications and learning platforms shows that

professionals actively seek solutions to facilitate individualized, inclusive learning and support for children with SEN. Unfortunately, the enormous potential of VR/AR/MR, AI, and robotic systems remains unused, which may be considered a missed opportunity for developing more modern practice. It is recommended to create conditions for improving professionals' qualifications in new technologies and to develop more accessible technological solutions in Bulgarian. This can be achieved through project initiatives and institutional support for introducing innovative assistive technologies in educational institutions and professional practice with children with SEN.

CONCLUSION

Technologies such as artificial intelligence and wearable sensor devices (e.g., smart watches) are increasingly accessible and widely used in everyday life, but the study results show a gap between available and widely used technologies and those that remain weakly applied in practice. Most professionals rely on mobile applications for children with SEN and personalized learning platforms, as they are easy to integrate, cheaper, accessible, and directly linked to daily work. Moderate use is observed for educational technologies that have an established place in student support. Technologies such as virtual, augmented, and mixed reality, sensors, AI-based assistants, speech recognition systems, and robotic solutions are rarely used or almost absent. This clearly outlines barriers such as high cost, lack of adapted Bulgarian-language resources, and insufficient professional training. This emphasizes the need for organizing training to increase the qualification of the professionals and facilitate the introduction of new technologies in educational and therapeutic work with children with special educational needs. It is important to work toward policies for integrating innovative assistive technologies into educational and therapeutic practice.

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