

# THE IMPACT OF ASSISTIVE TECHNOLOGIES IN EDUCATIONAL SETTINGS FOR INDIVIDUALS WITH NEURODEVELOPMENTAL DISORDERS: A NATIONAL PILOT STUDY

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## Abstract

The fostering of efforts to improve the inclusion of individuals with Neurodevelopmental Disorders (ND) has led to the widespread adoption of Assistive Technology (AT) at specialised centres and schools. Research findings indicate that utilizing AT can be beneficial for individuals with various ND, as it promotes the development of their psychological, communication and social abilities. This paper examines the perceptions and preferences of professionals regarding the impact of AT on educational and psychosocial outcomes for students with different disorders. In this study, a Delphi-based survey was carried out among a panel of 23 experts. They come from various occupational domains - speech and language centres, disability organisations, psychological centres and academia. We constructed a questionnaire, consisting of 26 statements and investigating different aspects of AT – education, society, service provision and employment. After two rounds of questionnaire surveying, the top two statements in each category were ranked by the professionals. In this way 10 questions were reserved and completed online. The statistical results of the survey show that there is a lot of consensus among Bulgarian experts on the Delphi statements. As a whole the experts are rather optimistic about the use of AT for individuals with developmental disabilities. Almost all of the stakeholders have intermediate or advanced level of expertise with respect to assistive technology. According to them the biggest challenges for the indicated statements in the survey to become reality are economic and political ones. Considering the results obtained in the study, integrating AT would provide more accessible educational environment for individuals with disorders and would facilitate specialists who work with them. The results of this study could offer valuable insights for the formulation of policies aimed at fostering greater inclusivity for individuals with disorders within educational environments, highlighting the need to expand the sample in future studies.

**Keywords:** *Assistive Technologies, educational settings, Neurodevelopmental Disorders, professional perceptions, Delphi survey.*

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## 1. Introduction

In the educational settings students with neurodevelopmental disorders encounter diverse challenges that limit their academic accomplishments and negatively impacts their behaviour across various classroom activities. It is crucial for these students to have equal access to education and opportunities in society, just like their peers. According to the UNESCO-Weidong Group project on “Leveraging ICT to Achieve Education 2030” “Information and Communication Technologies must be harnessed to strengthen education systems, knowledge dissemination, information access, quality and effective learning, and more effective service provision” (<https://unesdoc.unesco.org/ark:/48223/pf0000265598>). The initiative is in accordance with the worldwide agenda and its objective is to assist Member States in unlocking the maximum potential of ICT to advance the development toward achieving SDG 4. In this regard, Assistive Technology (AT) can serve as a means to enhance communication and boost academic performance of individuals with different disabilities. From a psychological point of view AT can also improve cognitive abilities and address challenging behaviors. AT could enhance the individual’s self-esteem and foster a more robust teacher-student relationship. In addition, AT promotes heightened peer interaction. The use of AT can be advantageous for individuals, supporting their academic, social and employment skills (Meida, n.d.). In a research related to the influence of technology, 67% of participants, specifically special education staff, indicated that AT positively affected the academic outcomes of students (Okolo & Diedrich, 2014).

Studies have affirmed that AT plays a crucial role in overcoming substantial learning challenges associated with learning disabilities (Brussino, 2020). AT, such as Socially-Assistive Robots (SARs), are increasingly used to improve communication skills in children and adolescents (Tsaneva et al., 2023). The findings in a systematic review indicate that the effective utilization of AT successfully enhances the inclusion of students with disabilities. However, obstacles such as inadequate teacher education, insufficient information or accessibility challenges were identified (Fernández-Batanero et al., 2022).

## **2. Methods**

### **2.1. Procedure**

A Delphi-based questionnaire was distributed via emails to Bulgarian professionals belonging to various backgrounds related to neurodevelopmental disorders. Subsequently, the gathered responses underwent analysis. The participants were informed that this study was confidential and voluntary. The survey was conducted in July 2023.

### **2.2. Participants**

The sample consisted of 23 experts who work in different professional fields – universities, disability organisations and neurodevelopmental centres. As a whole the participants are almost equally distributed -11 people work as practitioners (or 48%) and 12 people work in academia (or 52%). The stakeholders encompass a diverse range of age groups. Specifically, there are 3 participants aged 55-63, 4 individuals in the 45-54 age group, 7 respondents aged 25-34 and 9 experts in the 35-44 age group.

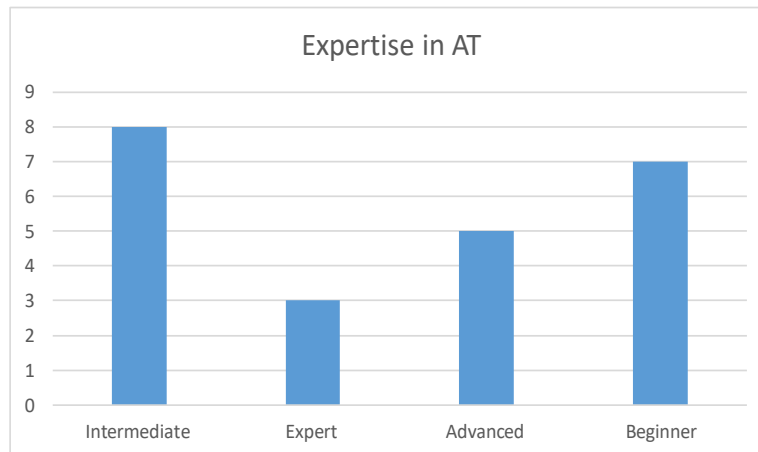
### **2.3. Measures**

The questionnaire used in the current study is a researcher-made questionnaire, based on the Delphi technique. The Delphi technique involves a systematic approach to prediction, utilizing the combined insights of a panel of experts. Over the past few decades, Delphi methods have played a crucial role in formulating best practice recommendations by leveraging collective intelligence in situations where research is constrained, or ethical and logistical challenges exist, or when evidence is conflicting (Nasa, Jain, & Juneja, 2021). The selection of members for the Delphi expert group is primarily based on their professional competence in the research subject. These individuals are acknowledged experts in their respective fields, possessing a greater practical experience in related research topics compared to the general public (Murry & Hammons, 1995). In our case the participants are professionals who work in the field of neurodevelopmental disorders theoretically and practically. The consensus on the ideal number of members for the Delphi group varies. Some scholars suggest that in highly homogeneous Delphi groups, the optimal number of members falls within the range of 15 to 30, while in heterogeneous groups, the recommended range is 5 to 10 members (Delbecq & Gustafson, 1975). In terms of our study, the range of participants is between 15 and 30, so we comply with the requirements for a homogeneous Delphi group.

## **3. Analysis of the results**

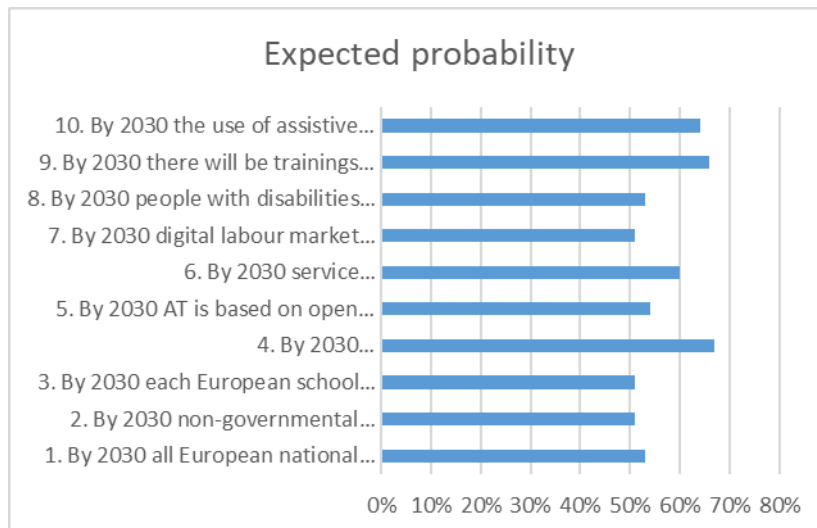
One of the main themes in the current paper is AT and the primary focus is on the impact of AT on the treatment of neurodevelopmental disorders in the near future – by 2030. Even though the respondents work in the field of those disorders, they have a relatively high expertise in AT. 8 people are experts or advanced, 8 participants have intermediate knowledge in AT and 7 people are beginners. The results are shown in the table below.

Table 1. Expertise in Assistive Technology.



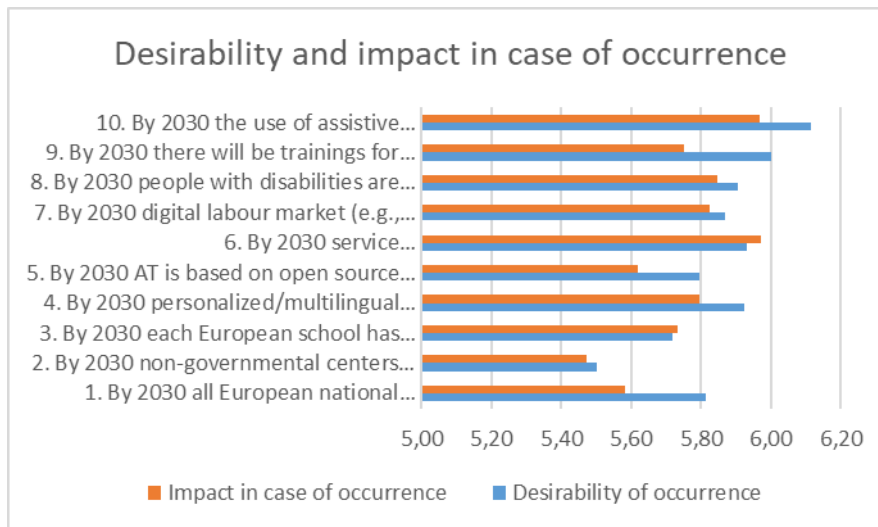
An essential part in a typical Delphi survey is the expected probability of certain scenarios to come true in the near future. In our study these potential occurrences are linked to different aspects of assistive technologies - education, society, service provision and employment, all intertwined with the future period of 2030. An example of the Delphi projections is “By 2030 the use of assistive technologies is included in the professional development of educators in mainstream schools.” The collective probability of over 50% for all Delphi statements indicates a prevailing sense of optimism among respondents regarding the use of these technologies. This optimistic outlook may stem from a positive assessment of current trends and anticipated advancements. The likelihood percentages suggest a general consensus among respondents in favor of the development and accessibility of the assistive technologies. The results observed are displayed in table 2 below.

Table 2. Expected probability of the Delphi scenarios.



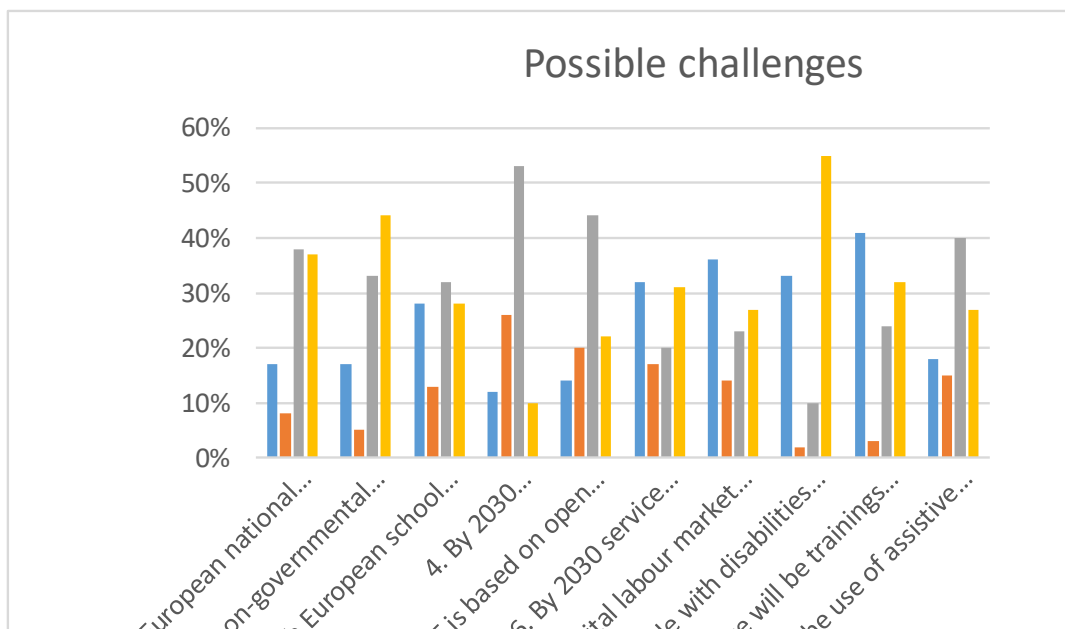
Another theme in the Delphi survey was the assessment of desirability and the potential impact of the identified scenarios. A 7-point Likert scale has been used. The results indicate a notable level of desirability, exceeding 5 and even reaching 6 for statements associated with training for individuals in public services on how to interact with someone with ASD, as well as utilizing assistive technologies for the professional development of educators in mainstream schools. The close alignment between desirability and impact findings suggests a strong correlation, with minimal divergence between the perceived positive desirability and the expected impact in the event of occurrence. The uniformity in these findings strengthens the favorable attitudes, expressed by respondents regarding the potential benefits of these specific aspects within the surveyed scenarios. A visualization is shown in the next chart.

Table 3. Expected probability of the Delphi scenarios.



The other aspect of the survey was focused on possible challenges hindering the realization of the aforementioned scenarios. The proposed challenges were political, economic, technological and social. For almost every statement, respondents identified political or economic challenges as the most significant obstacles. The prevalence of political or economic challenges in respondents' concerns may be attributed to the complex interplay between government policies and socioeconomic conditions. Political instability, policy uncertainties and economic fluctuations could potentially shape individuals' perspectives, leading them to highlight these aspects as primary challenges. The following table illustrates the observed results.

Table 4. Possible challenges related to the Delphi projections.



#### 4. Discussion

The aims of the study were to determine the perspectives of a panel of professionals on how assistive technologies influence the educational environment for individuals with diverse neurodevelopmental disorders. Participants, representing various vocational backgrounds such as educational and psychological centers, disability organizations and academia, provided valuable insights. The statistical analysis of the survey data revealed a substantial level of agreement among Bulgarian experts regarding the Delphi statements. The Delphi technique used in the study serves as a valuable tool

for gauging the expected probability of specific scenarios related to the integration of assistive technologies in various domains. The respondents express optimism regarding the utility and advancement of assistive technologies in the context of neurodevelopmental disorders. The identified potential occurrences, ranging from education and society to service provision and employment, are intricately linked to the envisioned landscape of 2030.

Despite the overall positive outlook among the respondents, regarding the future of assistive technologies, the study acknowledges the importance of addressing some potential challenges. The identification of these challenges underscores the need to overcome multifaceted barriers to ensure the successful integration and realization of the envisioned scenarios surrounding the use of assistive technologies in the future. In conclusion, while the Delphi technique employed in this study proves to be a valuable tool, recognizing the limitations related to the small sample size, we advocate for a future research endeavor with a larger sample to ensure broader applicability and reliability of the study's outcomes. Exploring the evolving intersection of technology and education, society and service provision will provide valuable insights into the ongoing evolution of assistive technologies. This evolving domain offers the potential not just to tackle present challenges but also to cultivate a future that is more inclusive and supportive for individuals with neurodevelopmental disorders in the years to come.

### *Acknowledgment*

These research findings are supported by the National Scientific Research Fund, Project “Application of innovative assistive technologies in the process of social inclusion of people with autism spectrum disorders and/or intellectual disabilities”, Grand № KII-06-KOCT/14.11.2022.

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