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LITERATURE REVIEW ON THE CURRENT KNOWLEDGE AND PRACTICES OF TEACHERS IN USING DIGITAL TOOLS AND SOCIAL STORIES FOR TEACHING CHILDREN WITH ASD IN POLAND

Edited by

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Introduction

In Poland, there has been a consistent annual increase in the number of individuals diagnosed with autism or Asperger's syndrome.

The Educational Information System (System Informacji Oświatowej, SIO) collects data on students with autism, Asperger's syndrome, and those with multiple disabilities. Additionally, the Electronic National System for Monitoring Disability Certification (Elektroniczny Krajowy System Monitoringu Orzekania o Niepełnosprawności, EKSMOoN) provides information on the number of individuals who have been issued disability certificates or degrees of disability classification (symbol 12-C, indicating pervasive developmental disorders) since 2010.

Available data indicate an exceptionally dynamic increase in the number of patients receiving medical services with either a primary or coexisting diagnosis of autism (ICD-10 codes F84.0 and F84.1) or Asperger's syndrome (F84.5) in Poland between 2012 and 2023. Over this period, the number of such patients increased by more than 600%. Specifically, the number of individuals diagnosed with autism increased fivefold, whereas the number of those diagnosed with Asperger's syndrome increased by a staggering 8.5 times.

According to the National Health Fund (Narodowy Fundusz Zdrowia, NFZ), in 2021, nearly 74,000 individuals under the age of 17 in Poland were diagnosed with autism or Asperger's syndrome. This figure was approximately 62,500 in 2020 and 57,000 in 2019 (data as of March 6, 2024).

Data from the Educational Information System (SIO) of the Ministry of Education and Science (Ministerstwo Edukacji i Nauki) reveal a steady increase in the number of special education certificates issued due to autism and Asperger's syndrome. Analysis of SIO data shows that between the 2016/2017 and 2018/2019 school years, the number of students diagnosed with autism or Asperger's syndrome increased annually by approximately 20%.

In the 2018/2019 school year, there were 6.361 million students in all types of schools and preschools in Poland (SIO data). Among them, 54,400 children diagnosed with autism or Asperger's syndrome were receiving special education support, which corresponds to approximately 1 in 115 students (0.87%).

By the 2021/2022 school year, the number of special education certificates issued for autism spectrum disorders had increased by nearly 31% compared to the previous year. According to the Ministry of Education and Science, as of September 2022, a total of 82,199 children and adolescents in Poland had been issued a special education certificate due to autism spectrum disorders. The highest numbers were recorded in the Mazowieckie (21,710) and Śląskie (11,158) provinces, while the lowest was in Lubuskie (1,241).

These trends highlight the growing recognition of autism spectrum disorders in Poland, reflecting both increased awareness and improvements in diagnostic capabilities. However, they also underscore the rising demand for educational and healthcare services tailored to individuals with autism and related conditions.

1. Overview of ASD Care System

In Poland, the system of care for children with Autism Spectrum Disorders (ASD) involves both public and private institutions, offering support in the areas of diagnosis, therapy, and education.

1.1 Diagnosis and Early Intervention

The diagnosis of ASD in Poland is primarily conducted in psychological-pedagogical counseling centers, diagnostic centers, and private specialist clinics. Early diagnosis is crucial for effective intervention; however, access to specialists is often limited, leading to long waiting times for diagnosis.

- The diagnostic process typically includes child observation, interviews with parents, and psychological tests such as ADOS-2 and ADI-R.
- Early intervention includes behavioral therapies (e.g., Applied Behavior Analysis - ABA), speech therapy, and sensory integration therapy.

1.2 Educational Support System

Children with ASD, as it will be presented in details below, can attend:

- Mainstream kindergartens and schools (with the possibility of support from a special education teacher),
- Integration institutions,
- Specialized educational centers and special schools.

An individualized approach to students with ASD is ensured by a special education needs certificate, which allows for the adaptation of curricula and teaching methods. Although systemic solutions exist, their practical implementation depends on the resources and capabilities of individual institutions.

1.3 Medical and Therapeutic Care

The care of children with ASD includes access to child psychiatrists, neurologists, occupational therapists, and clinical psychologists. Financial support for therapy and rehabilitation can be obtained through:

- Benefits from the National Health Fund (NFZ),
- Disability certificates (enabling additional caregiving benefits),
- Financial support programs funded by non-governmental organizations.

1.4 The ASD Care System – Key Legal Regulations and Support Mechanisms

The ASD care system in Poland is governed by several key legal acts that regulate matters related to diagnosis, education, and social support. Among these documents are:

- The Resolution of the Sejm of the Republic of Poland of July 12, 2013 – The Charter of the Rights of Persons with Autism;
- The Regulation of the Minister of National Education from August 9, 2017, on the conditions for organizing education, upbringing, and care for children and youth with disabilities, socially maladjusted, or at risk of social maladjustment (Journal of Laws 2017, item 1578);
- The Act of March 12, 2004, on Social Assistance (Journal of Laws 2004, No. 64, item 593);
- The Act of July 7, 2023, on Supporting Benefits (Journal of Laws 2023, item 1429).

The introduction of legal regulations presented in these documents aims to ensure comprehensive support for children with ASD and their families, addressing both educational and social aspects.

The Charter of the Rights of Persons with Autism is particularly significant as it outlines the fundamental rights and needs of individuals with autism in Poland, focusing on ensuring access to education, healthcare, and social inclusion. It establishes the right to adequate and personalized support, with an emphasis on promoting the independence and dignity of individuals with autism across their lifespan.

The Regulation of the Minister of National Education establishes the framework for special education for children with autism, ensuring that they receive appropriate care and education tailored to their individual needs. This includes the provision of specialized teaching methods, individualized educational plans, and support in both mainstream and special schools.

The Social Assistance Act provides additional support, offering social benefits and services to individuals with disabilities, including those with ASD. This ensures financial and social security for children with ASD and their families, addressing their broader socio-economic needs.

Finally, the Supporting Benefits Act introduced in 2023, complements these regulations by focusing on the provision of additional benefits, ensuring that families of children with ASD can access financial assistance to help cover the costs of care, therapy, and other necessary services.

These legal frameworks collectively ensure that children with autism and their families have access to a wide range of support systems aimed at improving their quality of life and fostering inclusion in Polish society. Below, we outline key regulations stemming from these legislative foundations.

1.4.1 The Charter of the Rights of Persons with Autism

In the context of care for children with Autism Spectrum Disorders (ASD) in Poland, a particularly important document is the **Resolution of the Sejm of the Republic of Poland of July 12, 2013 – The Charter of the Rights of Persons with Autism**. This document serves as a set of guidelines aimed at ensuring full rights and support for individuals with autism, emphasizing their right to independent and active lives.

The Charter of the Rights of Persons with Autism is a fundamental document within the Polish support system for individuals with ASD. It places obligations on the state and local government authorities to ensure appropriate living conditions, education, and therapy for individuals with autism. The Charter underscores their right to independent, self-sufficient, and active lives while explicitly prohibiting discrimination.

1.4.1.1 Key Principles of the Charter of the Rights of Persons with Autism

The Charter recognizes that individuals with ASD have the right to live as independently as possible and to fully develop their abilities and skills. It also emphasizes that both children and adults with autism must have access to accurate diagnosis, appropriate support methods, and full participation in social life. Specifically, the Charter guarantees the following rights:

1. Early Diagnosis and Support – According to Article 2, individuals with autism should have access to comprehensive diagnostic services (medical, pedagogical, psychological, and speech therapy) from the earliest possible age. Early diagnosis is crucial for developing effective therapeutic and educational programs that address the unique needs of each individual.
2. Tailored Education – The Charter affirms the right of children with autism to accessible, free, and appropriately tailored education that enables them to assume social and professional roles (Article 3). This right extends beyond formal provisions, ensuring adequate conditions in educational institutions and individualized teaching methods suited to the unique needs of each student.
3. Access to Therapy and Emotional Support – The Charter highlights the need to provide suitable therapeutic methods, including emotional, social, and educational support (Article 9). This includes both individual and group therapy as well as access to support services, such as social-emotional development programs and communication training.

4. Equal Access to Public Services – Individuals with autism also have the right to equal access to public services, such as healthcare, transportation, and cultural institutions (Article 13). The Charter promotes initiatives that facilitate the participation of individuals with ASD in social and cultural life, recognizing that such involvement is essential for fostering independence and active engagement in society.

The Charter is not legally binding but serves as a declaration of rights that guides policy-making and legislative efforts in Poland. While it does not impose specific legal obligations, it provides a foundation for advocacy and legal reforms aimed at improving the quality of life for individuals with ASD.

One of the challenges in implementing the Charter's principles is ensuring adequate funding and accessibility of services across different regions in Poland. While major urban areas often offer specialized support, rural regions may lack sufficient resources, leading to disparities in access to early diagnosis, therapy, and inclusive education.

Additionally, the Charter highlights the importance of social inclusion, encouraging policies that facilitate the active participation of individuals with autism in the workforce and broader community. This aligns with European and international efforts to promote the rights and well-being of individuals with disabilities, including frameworks established by the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD).

By recognizing autism as a condition that requires multifaceted support, the Charter of the Rights of Persons with Autism serves as a cornerstone for developing more inclusive policies and programs in Poland.

1.4.2 Regulation of the Minister of National Education of August 9, 2017, on the Conditions for Organizing Education, Upbringing, and Care for Children and Youth with Disabilities, Social Maladjustment, and at Risk of Social Maladjustment

The Regulation of the Minister of National Education of August 9, 2017, on the Conditions for Organizing Education, Upbringing, and Care for Children and Youth with Disabilities, Social Maladjustment, and at Risk of Social Maladjustment (Journal of Laws 2017, item 1578) is a key legal act governing the education of students with disabilities and social maladjustment in Poland. Its provisions emphasize the importance of integration, individualized learning, and adaptation of teaching methods to meet the specific needs of students.

This regulation sets out the principles for organizing education for students requiring special learning conditions and tailored teaching methods, including children and youth with Autism Spectrum Disorder (ASD). Under this regulation, students with ASD are classified as students with disabilities, allowing them to benefit from individualized educational and therapeutic programs and support from a special education teacher. However, implementing these provisions requires appropriate support from the education system, access to specialists, and infrastructure conducive to learning and development.

1.4.2.1 Scope of Regulation

The regulation mandates the adaptation of the educational process to the individual needs of students with a certificate of special education needs, particularly children:

- with disabilities, including autism and Asperger's syndrome,
- with social maladjustment,
- at risk of social maladjustment.

The primary objective of this regulation is to provide students from these groups with appropriate educational conditions, enabling their development and active participation in society.

1.4.2.2 Forms of Educational Organization

The regulation specifies that education for children with a special education needs certificate can take place in various types of institutions adapted to their needs. For students with autism, the following forms of education are available:

Preschools:

- general-access preschools,
- general-access preschools with integration classes,
- integration preschools,
- general-access preschools with special classes,
- special preschools.

Additionally, preschool education can be provided in preschool divisions within primary schools and other forms of early childhood education.

Primary and Secondary Schools:

- general-access schools,
- general-access schools with integration classes,
- integration schools,
- general-access schools with special classes,
- special schools, including those preparing students for work.

Furthermore, education is provided in youth educational centers, youth sociotherapy centers, special education and care centers, special care centers, and revalidation and educational centers.

Such an inclusive educational system allows for selecting the most appropriate form of education tailored to the individual needs of the child.

1.4.2.3 Inclusive Approach to the Education of Students with Disabilities

The regulation promotes the integration of students with disabilities into general education alongside their peers without disabilities. This means that children with autism and other disabilities should have the opportunity to study in general-access preschools and schools, including integration classes.

A key priority is to provide education as close to the student's place of residence as possible, facilitating social inclusion and enabling students to benefit from local educational infrastructure. However, the regulation introduces an exception—it does not provide for the creation of special preschools or special classes for children with mild intellectual disabilities, meaning their education must be organized in general-access or integration institutions.

1.4.2.4 Duration of Education for Students with Special Needs

The regulation extends the duration of education for students with disabilities, allowing them to complete:

- primary school by the age of 20,
- secondary school by the age of 24.

This provision recognizes the specific needs of these students, who may require additional time to complete the curriculum and develop necessary life skills.

1.4.2.5 Key Responsibilities of Educational Institutions

Schools and other educational institutions are required to ensure:

1. Implementation of recommendations from special education needs certificates, including adaptation of teaching methods and forms to the student's individual needs.
2. Appropriate learning conditions, including access to specialized equipment and teaching aids that facilitate knowledge acquisition.
3. Specialized classes, such as therapeutic, speech therapy, psychological, and pedagogical support sessions to assist in student development.
4. Rehabilitation, resocialization, and sociotherapy classes, tailored to the students' psychophysical capabilities.
5. Integration with the peer environment, fostering social adaptation and development of social competencies.
6. Preparation for independent living, through training in essential life skills, vocational development, and decision-making abilities.

1.4.2.6 Challenges and Implementation

While the regulation emphasizes an individualized approach to education, its effective implementation depends on the availability of qualified teaching staff, financial resources, and infrastructure adapted to the needs of students with autism and other disabilities.

One of the challenges is ensuring equal access to specialized services across different regions of Poland. While large urban areas often offer comprehensive support, rural areas may lack adequate educational facilities and specialist staff.

Additionally, the regulation aligns with broader European and international efforts to enhance the rights and well-being of individuals with disabilities, including policies outlined in the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD).

By recognizing and addressing the unique needs of students with disabilities, the regulation serves as a cornerstone for building a more inclusive and supportive education system in Poland.

1.4.3 The Social Assistance Act of March 12, 2004

The Social Assistance Act of March 12, 2004 (Journal of Laws 2004 No. 64, item 593) regulates issues related to providing support to individuals and families in difficult life situations, including persons with disabilities. Although the Act does not contain specific provisions concerning children with Autism Spectrum Disorder (ASD), its general regulations on individuals with disabilities apply to this group. As a result, children with ASD and their families can benefit from various forms of support offered by the social assistance system, such as financial benefits, care services, or day support centers. In practice, obtaining appropriate assistance requires an individualized approach and cooperation with local social welfare centers and other institutions supporting individuals with disabilities.

1.4.3.1 Key Provisions of the Act Regarding Children with ASD

1. Definition of Disability: The Act defines persons with disabilities as those whose physical or mental condition permanently or temporarily hinders, limits, or prevents them from fulfilling social roles, particularly the ability to perform professional work. Children with ASD, depending on the severity of their symptoms, may be classified within this category.
2. Objectives of Social Assistance: The main goal of social assistance is to support individuals and families in overcoming difficult life situations that they cannot resolve using their own rights, resources, and capabilities. In the case of children with ASD, social assistance may include financial and material support as well as services aimed at improving their functioning in society.
3. Forms of Benefits: The Act provides for various types of benefits, including:
    - Financial Benefits: Permanent allowance, periodic allowance, targeted allowance.
    - Non-financial Benefits: Social work, care services, specialized care services, specialist counseling, crisis intervention. Children with ASD and their families may utilize these forms of support depending on their individual needs and life circumstances.
4. Specialized Care Services: The Act provides for the provision of specialized care services for individuals with mental disorders. These services include teaching and

developing skills necessary for independent living. Children with ASD may benefit from these services to improve their daily functioning.

5. Day Support Centers: The Act allows for the creation of day support centers for children and adolescents, offering activities such as sociotherapeutic sessions, therapy, and academic assistance. Participation in such centers can help children with ASD integrate into society and develop essential skills.

1.4.3.2 Implementation and Challenges

The Social Assistance Act of March 12, 2004, serves as a fundamental legal framework for supporting individuals in difficult life situations, including children with ASD. Although the Act does not explicitly mention ASD, its provisions enable access to essential social assistance services. Ensuring the effective application of the Act requires continuous improvements in service accessibility, funding, and inter-institutional cooperation to address the diverse needs of children with ASD and their families.

The effective implementation of the Social Assistance Act requires cooperation between various institutions, including social welfare centers, healthcare services, and educational institutions. The availability of qualified professionals, adequate funding, and well-equipped facilities is crucial to ensuring that children with ASD receive the necessary support. Moreover, local authorities play a vital role in adapting social assistance services to the specific needs of individuals with ASD and their families.

1.4.4 Care Allowance: The Act of July 7, 2023, on Supportive Benefits

The Act of July 7, 2023, on Supportive Benefits (Journal of Laws 2023, item 1429) stipulates that parents or guardians of children with Autism Spectrum Disorder (ASD) are entitled to a care allowance. This financial support is provided to individuals who give up gainful employment to care for a child with a disability.

The care allowance serves as financial assistance for those who resign from their professional careers to take care of a child with a disability, including children with ASD. As of January 1, 2024, new regulations introduced by the Act of July 7, 2023, on Supportive Benefits came into force. Under these new provisions, the care allowance is available to parents or guardians of children with disabilities up to the age of 18, regardless of whether they have ceased employment or any other form of gainful work. This means that individuals can now receive the benefit while continuing their professional activities.

1.4.4.1 Key Aspects of the Care Allowance

1. Eligibility: Parents or guardians of children with disabilities under the age of 18 can receive the allowance, regardless of their employment status.
2. Financial Support:
    - In 2024, the care allowance amounts to 2,988 PLN per month.

- From 2025, the amount will increase to 3,287 PLN per month.

3. Additional Support for Multiple Children:
   - If a family has more than one child with a disability, the care allowance increases by 100% for the second and each additional disabled child under care.

1.4.4.2 Implications of the New Regulations

The new provisions effective from January 1, 2024, simplify access to the care allowance for parents and guardians of children with ASD by removing the requirement to give up paid work. The increased allowance amount provides greater financial relief, and additional increments are granted to families caring for multiple children with disabilities. To access this financial support, parents or guardians must obtain an official disability certificate for the child and submit an application at their local administrative office. The revised regulations aim to provide more flexibility and financial stability to families raising children with disabilities, ensuring better care and support while allowing parents to maintain professional activities if they choose to do so.

1.5 The ASD Care System - challenges

Despite an extensive support system, Poland faces challenges in the following areas:

- Access to specialized care – long waiting times for diagnosis and therapy,
- Disparities in educational support – not all institutions are adequately prepared to work with children with ASD,
- Access to modern therapy methods – limited use of digital tools supporting therapy and education.

2. Literature review on Digital Tools, Technology and Social Stories in ASD Education

This review of the literature in Polish "State of knowledge on the use of digital tools in the education of children with ASD" was conducted by searching the Google Scholar databases, with the lower limit of publication date being 2010. In Google Scholar, the search terms in Polish: 1) “historyjki społeczne w terapii” (social stories in therapy), 341 results found in Google Scholar. 2) “zasoby cyfrowe” or “narzędzia cyfrowe” (digital tools) and “zaburzenia ze spektrum autyzmu” (“digital tools” with the term “autism spectrum disorder”), only 2 results. 3) "zaburzenia ze spektrum autyzmu" (“autism spectrum disorder”) and "małe dzieci" (early childhood), 38 results. 4) "zaburzenia ze spektrum autyzmu"(“autism spectrum disorder”) and "interaktywne narzędzia" (interactive tools), 24 results. 5) "historyjki społeczne" (social stories) i "zaburzenia ze spektrum autyzmu"(“autism spectrum disorder”), 7 results. 6) „interaktywne narzędzia w edukacji szkolnej” (interactive tools in school education), 922 results.

A review of the literature published in Polish language shows that many studies on the diagnosis of autism spectrum disorders are conducted using interactive tools (e.g. Bombińska-Domżał, 2019; Odachowska-Rogalska, 2023) and despite many indications for working with these methods, no studies have been conducted using digital tools. Most publications take the form of a guide, not a report on the research carried out (e.g. Brosch, 2018). Most of the works concern the literature review (Kaczmarek 2015, Pufund 2020) or instructions for working with children (e.g. Bołtuć and Dworzańska, 2022).The articles selected for detailed content analysis were evaluated based on their research objectives, intervention frameworks, and implementation digital tools.

2.1 Digital Tools and Technology in ASD Education

Polish-language literature on the use of digital tools and technology in ASD interventions also heavily depends on reviews of foreign research (e.g., Kister et al., 2023; Kołakowska and Landowska, 2014; Landowska et al., 2014; Rynkiewicz, 2015; Stolarz et al., 2022). This reliance on external sources highlights an underrepresentation of Polish contributions to this field, particularly in terms of empirical studies that explore the application of these tools in early interventions for children aged 3–7 with ASD. Also, a lot of articles focus on the use of digital tools for the therapy of children with intellectual disabilities (for example, Piotrowicz et al., 2015) and do not concern autism spectrum disorders.

The study conducted by Bobik (2022) concerned remote psychological and pedagogical support for students with intellectual disabilities, but it also referred to those with co-occurring autism spectrum disorder. 26.6% of specialists participating in the study worked with students with intellectual disabilities and autism spectrum disorder. Remote education was difficult for many students with intellectual disabilities, and especially for those with more severe intellectual disabilities or autism combined with intellectual disability, due to the departure from routine, which could cause irritation and anxiety. Distance learning has created many barriers for children, and using educational platforms has been not only a technical challenge for many of them, but also a departure from established patterns of operation and a breakdown of daily routine. The introduction of the use of digital resources should be preceded by training specialists in this area (Bobik 2022).

In Mrowiec (2019) research on the use of bibliotherapy in working with children with autism spectrum disorder, various methods were used to shape social and communication skills. The research group was the 3rd grade of primary school, in which three students had a diagnosis of autism spectrum disorder. Relaxation-type reading activities were aimed at evoking positive emotions, introducing a state of relaxation and demonstrating relaxation techniques. Fairy tales and fables were used, which allowed identification with the characters and exploring the world of fantasy. These activities contributed to the perception of the positive aspects of reading as a form of relaxation, increased engagement in library lessons and fulfilled the function of a "surrogate social experience". Readings with a positive tone influenced the increase in self-esteem, recognition and coping with emotions, involvement in active spending of free time and enrichment of speech. Kamishibai theater, or theater of illustrations, was used to strengthen social skills. Telling stories with illustrations activated students and made it easier to enter into a dialogue with the instructor, contributing to establishing communication relationships. This method helped to activate imagination and establish direct contact, and students were more willing to become familiar with the form of "speaking" and public speaking. Sensational reading was an innovative model of reading using movement, pantomime, play, dance and sensory experiences. In summary, bibliotherapy proved to be an effective method of educational, upbringing and therapeutic support for children with ASD, supporting the development of communication and social skills, building self-esteem and integration with peers. The regularity of classes and close contact between the instructor and students are key factors in the effectiveness of this method.

Kopciewicz (2018) presents a study of the implementation of tablets and robots in primary education in Poland, analyzing how two teachers used these technologies. The work examines the evolving teaching and learning practices over two semester, using the theoretical framework of digital didactic design and Rabardel's instrumental genesis theory. The study involved 34 students from two first grades and two early childhood teachers with short teaching experience (3 and 4 years). The same student teams and teachers were observed over two semester, which allowed for continuity and documentation af any changes in technology use. Data collection methods included 30 classroom observations (15 in each classroom), supplemented by field notes and photographs of the lesson. Two main theoretical frameworks were udes to analyze the data: digital instructional design and the SAMR model. The results show differences in the teacher's approaches, where one maintained a transmission model of teaching, while the other attempted a more innovative use of technology, the study emphasized that the mere presence of technology does not guarantee educational changes, and the way it is integrated with the teaching methodology is crucial (Kopciewicz, 2018).

The study conducted by Czajkowska and Mróz (2021) aimed to identify how preschool and grade I–III teachers use new technologies in mathematics education, especially during the COVID-19 pandemic, and to determine differences between groups of teachers in terms of seniority and place of employment. The study involved 110 teachers (73 from preschools, 37 from schools), divided into groups based on seniority (less than 10 years and 10 years or more). The results show that teachers most often used Word (79.1%) and Power Point (70.9%) to prepare classes. Power Point was used more often by preschool teachers. Knowledge of educational websites and portals supporting mathematics was declared by 86.4% of respondents. School teachers were more familiar with Matzoo and Ciufcia.pl, and teachers with longer experience were more familiar with Buliba.pl, while those with shorter experience were more familiar with Kahoot! In direct work with children, 74.5% of teachers used websites and portals. The most popular ones were Matzoo (51%), Scholaris (49%) and Lulek.tv (37%). Preschool teachers used Lulek.tv more often, and early school teachers used Matzoo. Teachers with more experience used Buliba.pl and Ciufcia.pl more often. Teachers encountered technical, methodological, communication and emotional-motivational difficulties. Specific difficulties in online mathematics included, among others, the lack of possibility to explain content and access to teaching aids, as well as parents' preference for "paper mathematics" (Czajkowska and Mróz, 2021).

2.1 Mobile Devices Use

A survey research by Landowska et al (2014) showed to what extent mobile devices and applications are used in diagnosing and monitoring therapy progress for children with Autism Spectrum Disorder (ASD) in Poland (Landowska et al., 2014). A total of 21 centers responded, including seven public benefit organizations (foundations, associations), eight educational institutions (special schools and preschools), two specialized centers, and four psychological counseling centers or other organizations. Only 5% reported that tablets are used for this purpose. However, respondents identified potential areas of table use, mostly therapy and education support. The study highlights a notably low adoption rate of mobile devices, specifically tablets, in ASD diagnostics and therapy monitoring despite the recognized potential for enhancing both educational and therapeutic processes. This gap may stem from limited technological adaptation in many centers, constrained financial resources, and a lack of tailored digital tools for ASD needs. Given the potential benefits of mobile technology—such as individualized therapy support, improved progress tracking, and engaging interactive applications—there is a clear need for increased investment in training, infrastructure, and software development. Future efforts should focus on bridging the gap between technology's potential and its current underutilization, ensuring that specialists are equipped to integrate these tools effectively into their practices.

2.2 Mobile aplications

The AUTMON project (Anzulewicz et al., 2016), developed by an interdisciplinary team at Gdańsk University of Technology, aimed to harness modern technology to monitor the therapeutic progress of children with Autism Spectrum Disorders (ASD). The project's methodology involved the design and development of an intuitive system that automates the measurement of therapeutic progress. This system integrated various educational applications intended to assess multiple dimensions of a child's functioning—including attention, problem-solving, motor skills, and emotional development. The researchers employed repeated measures to track developmental dynamics over time, thereby allowing for a systematic observation of progress and the early identification of areas that required intensified support. The study's conclusions highlighted the potential of such a system to contribute to a more individualized and effective therapeutic process. While the preliminary findings were promising, the project also underscored the need for further research to validate the system's efficacy in diverse clinical settings and to refine its components to better serve the heterogeneous needs of children with ASD.

The research conducted by Ruta-Sominka and Budzińska (2020) employed a mixed-methods approach to evaluate applications provide structured and interactive learning environments. Quantitative assessments were used to measure the effectiveness of manual prompts in guiding children through activity schedules on a tablet, while qualitative feedback from practitioners and users offered insights into the usability and accessibility of the applications. The findings revealed that these applications are not only accessible to children with ASD but also that manual prompts significantly enhance their ability to follow structured activities. The study concluded that such digital tools could play a critical role in improving therapeutic outcomes by fostering autonomy and facilitating consistent engagement in therapy sessions. Future research is recommended to further optimize these applications and to explore their long-term impact on various facets of development in children with ASD.

Beata Rola (2020) wrote that for working with children with autism, there are applications designed for diagnostics and improving daily activities, as well as developing emotional intelligence. Examples of such applications were given, such as Able AAC, ClaroSpeak and NikiTalk. It was noticed that a large group of children with autism shows interest in interacting with computers and tablet devices. For this group of students, applications and mobile devices can create conditions of predictability and the development of a sense of control over the environment, which makes them a less stressful tool than working with sheets of paper. In addition, working with a tablet can be helpful for children with autism who have problems with motor skills of their hands. Interactive media, such as educational robots and programming in visual languages (e.g. Scratch), can support logical thinking, independence and teamwork, which is particularly important for children on the autism spectrum. During the communication process using technology, "episodes of joint engagement" and "scenes of joint attention" are key, which is of particular importance in working with children with learning disabilities, including probably children on the autism spectrum (Rola 2020). This publication does not contain any research, but the practical implications indicate that it is worth using digital tools.

Michalina Ignaciuk (2022) in her research report showed that social applications related to VR technology have great educational potential. This is confirmed by the AltspaceVR application. It allows a group of people who are interested in a given topic, e.g. people with autism spectrum disorders, to meet. Although the participants-avatars may be of different nationalities, English turned out to be their common language.

Krystian Tuczyński i Klaudia Szlęk (2023) analyzed several applications and platforms supporting preschool and early school education. The “Genially” platform is used to create interactive presentations, infographics, quizzes and educational games with the possibility of adding interactivity, multimedia and co-creation. The article analyses numerous ready-made applications and templates for creating your own interactive exercises and tasks based on ready-made templates that can be easily transformed. The applications allow you to assign exercises to students and track their results, and are also used to create graphics containing words, which can be used to consolidate spelling and activate students. The use of these online tools facilitate the teacher’s work and engages students in the process of learning through play (Tuczynski and Szlęk, 2023).

Other studies have shown the potential of mobile devices and gamification in contemporary educational services. The author investigated how information and communication technologies (ICT) and mechanisms known from games can increase students’ motivation and the effectiveness of knowledge acquisition. The study described qualitative methodology. It was based on two main elements: a review of educational websites and applications and a qualitative study. The author reviewed existing educational websites and applications that confirm the effectiveness of using gamification and mobile devices in education. Qualitative research was conducted during a research and scientific internship at a consulting and training company in 2013. The research results indicate that the use of digital tools increases learners' motivation and engagement. Gamification elements can stimulate cooperation between learners. Web 2.0 services, using collective knowledge and interactive communication, can stimulate cognitive activity and prepare for group work (Badzinska 2014)

2.3 Games

One study concerning the use of games was found. A key component of the research was a custom-designed gyroscope-based game, developed as a tool for monitoring therapy outcomes (Kołakowska, Landowska, Karpienko, 2017). The game recorded behavioral patterns during gameplay, capturing interactions with the application and tablet. A study involving 31 children with ASD was conducted over six months, during which participants played the game multiple times. The collected data was used to calculate a variety of metrics related to motor skills, stereotypic behaviors, and other developmental areas. The findings demonstrated classification accuracies reaching up to 80%, with the highest accuracies observed in assessing stereotypic behaviors and gross motor skills.

2.4 Therapy Support Systems

During the search, two therapy support systems were found. The "Spektrum Autyzmu Pro" program is an innovative educational and therapeutic initiative developed to support children with Autism Spectrum Disorder (ASD), their families, and educators. It offers a comprehensive set of tools, including teaching aids, therapeutic materials, and an extensive knowledge base tailored to the specific needs of individuals with ASD. The program emphasizes practical solutions for developing social, communication, and emotional skills, helping to create an inclusive learning environment. Additionally, it provides ongoing training and support for educators and therapists to enhance their effectiveness in working with children on the spectrum (Nowa Era, n.d.).

Another therapy support system available in Poland is AutismPro (Waligórska et al., 2012)—a system with elements of consultative therapy and Internet resources. It offers a structured approach to intervention, focusing on enhancing communication, social skills, and cognitive functions in children with ASD. The system provides a comprehensive framework for therapists and parents to implement effective therapeutic strategies tailored to individual needs. study examined the effects of a home-based intervention program using the AutismPro system, combined with consultative therapy elements. Ten families participated, with nine completing the six-month program. Parents were trained to use the system and implement intervention techniques at home, with modifications made during consultation meetings to suit individual children's needs. The study found that the program had a positive impact on the children's development (Waligórska et al., 2012).

2.5 Social Stories in ASD education and therapy

None of the Polish articles on social stories use in education and therapy of children with autism were found. There is a notable gap in Polish research studies specifically addressing the use of social stories in early education and therapy for children with Autism Spectrum Disorder (ASD). Existing Polish-language literature reviews (e.g., Pufund, 2020) primarily rely on foreign publications, indicating a lack of original research conducted within the Polish context. These reviews often summarize the findings of international studies without presenting new empirical data or localized perspectives. The topic of social stories is also present in Polish reviews of therapy methods in working with children with autism spectrum disorders

(Kopańska et al., 2022). In addition, theoretical works by Polish authors that discuss the topic of social stories (Gajdzik & Bryńska, 2012). However, empirical work is lacking.

There was also an article on examples of social stories about wearing a mask ("How to wear a mask?") and explaining what social distancing is ("What is social distancing?"). These examples illustrated how social stories can explain new rules and situations related to the pandemic in a simple and accessible way. The COVID-19 pandemic and the restrictions introduced were intense stressors, especially difficult to accept for people with ASD due to their strong need for stability and intolerance to change. Sudden changes in routine, restrictions on social contacts, and the need to understand new and often chaotically communicated safety rules posed numerous challenges (Macalka et al. 2020)

2.6 Digital Social Stories in ASD Intervention

The Social Stories™ method, developed by Carol Gray, is also used in the therapy of children with ASD in Poland. It is mainly implemented in therapeutic centers and some educational institutions as a tool to support the development of social and emotional skills. However, no data was found about digital social stories used in Poland.

Conclusions

The absence of domestic research creates challenges for practitioners seeking culturally and linguistically relevant tools and methodologies. For example, the adaptation of digital social stories or other digital interventions often requires contextual adjustments to align with the specific needs of Polish children, their families, and educational systems. This lack of localized evidence may limit the effectiveness and widespread adoption of such interventions in Poland.

Moreover, the reliance on foreign studies could overlook nuances in the educational and therapeutic environments within Poland, such as differences in teacher training, parental involvement, or institutional support. These factors are critical for tailoring interventions like social stories or digital tools to specific cultural and systemic contexts.

Addressing this research gap would not only enhance the practical implementation of social stories and digital tools in Poland but also contribute valuable insights to the global body of knowledge. Empirical studies exploring the efficacy, cultural adaptation, and long-term outcomes of these interventions in Polish settings are urgently needed. Additionally, interdisciplinary collaborations between educators, psychologists, and technology developers could facilitate the creation of innovative, contextually appropriate tools that better meet the needs of Polish children with ASD.

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Annex 1

Authors	Year	Studied Population	Study Aim	Methodology	Key Findings	Limitations/ Weaknesses
Bobik	2022	Specialist, working also with ASD	Evaluate remote psychological and pedagogical support for students with intellectual disabilities (including ASD)	Survey research	Remote education posed significant challenges, especially for those with severe disabilities; specialist training in digital tools is necessary.	Focus not solely on ASD; self-reported data may limit generalizability; context-specific to remote education challenges.
Mrowiec	2019	3rd grade primary school students	Assess the effectiveness of bibliotherapy in enhancing social and communication skills in children with ASD	Qualitative/mixed methods – implementation of reading and dramatized storytelling activities	Bibliotherapy effectively supported relaxation, increased engagement, improved self-esteem, and enhanced communication and social skills.	Very small ASD sample size limits generalizability; findings may be context- and intervention-specific.

Kopciewicz	2018	34 first-grade students from two classes; 2 early childhood teachers	Investigate the implementation of tablets and robots in primary education and their impact on teaching practices	Observational study (30 classroom observations, field notes, photographs) using digital instructional design and the SAMR model	Identified differences in teacher approaches; mere presence of technology did not guarantee educational change – integration with pedagogy is key.	Limited sample size; teachers had relatively short teaching experience; findings are specific to the observed educational context.
Czajkowska & Mróz	2021	110 teachers (73 from preschools, 37 from schools)	Examine how new technologies are used in mathematics education during COVID-19, including differences by teacher seniority	Survey research with group comparisons (by teacher type and experience)	High usage of Word, PowerPoint, and educational websites; noted technical, methodological, and motivational challenges, with differences by experience and setting.	Reliance on self-reported data; specific to mathematics education and the pandemic context; regional factors may affect generalizability.

Landowska Kołakowska, Anzulewicz, Jarmołkowicz, Rewera	2014	21 centers (public benefit organizations, educational institutions, specialized centers, psychological counseling)	Assess the use of mobile devices in diagnosing and monitoring therapy progress for children with ASD	Survey research	Only 5% of centers used tablets despite identifying potential benefits in therapy and education; low adoption may be due to technological and financial constraints.	Limited number of centers; self-reporting bias; survey sample may not capture wider national practices.
Anzulewicz Czajak, Sobota, Landowska, Wróbel	2016	Children with ASD	Develop an intuitive, automated system to measure therapeutic progress in children with ASD through educational applications	System development with repeated measures tracking multiple developmental dimensions (attention, motor skills, etc.)	Demonstrated promising potential for individualized monitoring of therapy progress; enabled early identification of areas needing intensified support.	Preliminary findings; further research is required to validate efficacy in diverse clinical settings and to refine system components.

Ruta-Sominka & Budzińska	2020	Children with ASD engaged with tablet-based learning activities and their practitioners	Evaluate digital applications designed for therapy support, focusing on the effectiveness of manual prompts in structured activities	Mixed methods (quantitative assessments of manual prompts; qualitative feedback from practitioners and users)	Applications were accessible to children with ASD; manual prompts significantly enhanced adherence to activity schedules, suggesting improvements in therapeutic outcomes.	Specific sample details are limited; further optimization and long-term impact studies are needed.
Ignaciuk	2022	Individuals with ASD using social applications related to virtual reality	Explore the educational potential of social VR applications for people with ASD	Research report (approach not detailed; likely qualitative analysis)	Found that VR applications like AltspaceVR can facilitate multi-national interactions with a common language (English), underscoring strong educational potential.	Methodological details and sample size are not clearly specified; findings are based on a specific application and may have limited scope.

Tuczyński & Szlęk	2023	Preschool and early school settings	Analyze applications and platforms that support interactive and engaging learning environments in early education	Descriptive analysis of ready-made applications, templates, and interactive platforms	Online tools like “Genially” help streamline teacher tasks and engage students through interactive exercises, with built-in tracking of learning outcomes.	Focus is on general educational use; direct applicability to ASD interventions is not explicitly addressed; context may be limited to early educational settings.
Badzinska	2014	Learners using ICT and gamification in education (sample details not specified)	Investigate the impact of ICT and gamification on student motivation, engagement, and knowledge acquisition	Qualitative methodology including review of educational websites/applications and internship-based research	Digital tools and gamification were found to increase learner motivation, engagement, and stimulate cooperative and cognitive skills.	Findings are based on qualitative data from a limited sample; generalizability may be affected by the specific context and research design.

Kołakowska, Landowska & Karpienko	2017	31 children with ASD	Evaluate a custom-designed gyroscope-based game as a tool for monitoring therapy outcomes in children with ASD	Longitudinal study over six months with repeated gameplay sessions and behavioral data collection	Achieved classification accuracies up to 80% for assessing stereotypic behaviors and gross motor skills, indicating promising utility as a monitoring tool.	Small sample size; context-specific findings that require additional validation across broader populations and settings.
Waligórska et al.	2012	Families with children with ASD (10 families; 9 completed the program)	Assess the effects of a home-based intervention program using the AutismPro system combined with consultative therapy elements	Intervention study involving home-based application use with periodic consultation meetings	The program positively impacted children's development by providing a structured and adaptable intervention framework for therapists and parents.	Small sample size; short duration (six-month program); heavy reliance on parental implementation may limit consistency and generalizability.

Nowa Era (Spektrum Autyzmu Pro)	n.d.	Children with ASD, their families, and educators	Provide comprehensive educational and therapeutic support through an innovative program offering teaching aids, materials, and training	Program description/initiative (not an empirical study)	Offers a wide range of practical tools and resources aimed at enhancing social, communication, and emotional skills; supports ongoing professional development.	Lacks empirical evaluation; effectiveness and long-term impact are not validated through research data.