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

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Abbreviations

Applied Behaviour Analysis	ABA
Artificial Intelligence	AI
Attention Deficit Hyperactivity Disorder	ADHD
Augmentative and Alternative Communication	AAC
Autism Spectrum Disorder	ASD
Augmented Reality	AR
Child Special Needs Report (Çocuk Özel Gereksinim Raporu)	ÇÖZGER
"Completed, Recall, Open-ended Questions, Wh-Questions, Distancing" Technique	CROWD
Denver Early Start Model	ESDM
Early Childhood Education and Care	ECEC
Educational and Psycho-pedagogical Guidance Teams, by its Spanish initials	EOEP
Educational Information System (System Informacji Oświatowej)	SIO
Electroencephalography	EEG
Electronic National System for Monitoring Disability Certification (Elektroniczny Krajowy System Monitoringu Orzekania o Niepełnosprawności)	EKSMOoN
European Union	EU
Extended Reality	XR
Hearing and Language, by its Spanish initials	AL
Higher Education	HE
Individualized Education Program	IEP

Information and Communication Technologies	ICT
Magnetic Resonance Imaging	MRI
Mixed Reality	MR
National Health Fund (Narodowy Fundusz Zdrowia)	NFZ
Non-governmental Organisation	NGO
Picture Exchange Communication System	PECS
Polish Zloty	PLN
Romanian Autism Society	ARCA
Single-Subject Experimental Design	SSED
Social and Emotional Learning	SEL
Substitution, Augmentation, Modification and Redefinition Model	SAMR
The Council of Higher Education of Türkiye (Yükseköğretim Kurulu)	YÖK
The Early Care EOEPs, by its Spanish initials	EATs
The Special Educational Needs Student, by its Spanish initials	ACNEE
The United Nations Convention on the Rights of Persons with Disabilities	UNCRPD
Theory of Mind	ToM
Therapeutic Pedagogy, by its Spanish initials	PT
Virtual Reality	VR
World Health Organization	WHO

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1. INTRODUCTION

1.1. Background and significance of the topic

Early childhood is defined as a critical period in which development is the fastest and is largely completed (Senemoğlu,2018). Meeting the developmental needs of children affected by developmental disabilities or at risk and supporting their development in all aspects makes this period even more important for children with special needs. Social-emotional development features in the individual's relations with other people that will facilitate social adaptation, self-management skills, understanding the emotions of others and responding to them appropriately (Fox, Hemmeter, Snyder, Binder et al. Clarke, 2011; Ocak and Arda, 2014a). The deficiencies in social-emotional skills in early childhood cause behavioural problems, limited participation in activities and limited communication (Fox; Hemmeter, 2009). Moreover, studies report that problem behaviours reduce children's social acceptance and academic achievement. For this reason, it is necessary to support children's social-emotional development at a young age, as they form the basis for their future lives.

Autism Spectrum Disorder (ASD) is a neuro-developmental condition with 1/100 prevalence in Europe (Autism Europe, 2023). Children with ASD possess unique characteristics, such as limited social interaction and communication abilities, repetitive behaviours, and narrow interests, which can hinder their capacity to communicate, interact, and engage with peers and others in their daily life. These distinctive characteristics, combined with social-emotional skill deficits, can cause reduced social cohesion and acceptance. Therefore, it is essential to support the social-emotional development of children with ASD from an early age, as it directly impacts their ability to functionally participate in social life. Special education teachers have a crucial role to play in this regard, and they must learn and apply effective strategies to promote social-emotional development and prevent problem behaviours among children with ASD (Kalkan, 2019).

As research suggests, it is important to use early intervention programs to support the social-emotional development of preschool children with ASD and prevent problem behaviours. Using digital tools for education of persons with ASD is one of the most effective ways of closing the gaps mentioned above. The development of information technologies allows creating educational processes that are organized, interesting, and tailored to the individual ASD child's abilities and needs. There are a variety of digital tools available including serious video games, humanoid robots, virtual reality, augmented reality, mobile applications for speech and conceptual learning, etc.

Among many methods, social stories, as scientifically proven practices, stand out because they give more contextual clues about the environment and behavioural characteristics. They explain social situations, teach social skills, and help children cope with difficulties in social situations (Reynhout & Carter, 2007; Spencer, Simpson & Lynch, 2008). Social stories can be digitally tailored to fit each learner's pace and interests. Social narrative integrate text with visual images which helps explain daily activities to individuals with ASD as well as prepares them for new experiences. These frameworks are typically taught in traditional formats such as paper artwork but with technology, these experiences can occur over apps, animated videos, and virtual gaming platforms.

However, the digital use of social stories in supporting the social-emotional skills of children with ASD is quite limited although they are substantially effective. For this reason, EARLY-ASD aims to develop digital social stories that are easy to access and train Preservice Teachers to apply them and create an archive to support the social and emotional skills of children with ASD.

1.2. Objectives of the synthesis report

Literature reviews play a crucial role in shaping evidence-based educational practices, particularly for inclusive early childhood education and care (ECEC). All children including those with ASD have the right to receive quality education and equal learning opportunities. Young children's participation is key to developing a culture of human rights, democracy, and rule of law. Therefore, children's active participation and the right to have equal education opportunities must be protected and encouraged from an early age and it is essential to identify existing gaps and best practices in supporting their development. However, its implementation in ECEC remains a challenge.

The EARLY-ASD consortium recognizes the challenges in implementing these rights in ECEC and aims to address them through a synthesis report including the European perspective to early intervention practices for children with ASD, the use of digital social stories in ECEC and the research and practices in the partner countries; Poland, Romania, Spain, and Türkiye. The literature reviews, therefore, focus on gathering insights into recent teacher knowledge and practices regarding digital tools and social stories, identifying challenges in using assistive technologies, and informing the development of a higher education (HE) course curriculum for a framework for developing a course for preservice teachers on effectively using these tools.

Thus, the synthesis report aims to analyse existing research and educational frameworks to ensure that the course curriculum is evidence-based, tailored to the needs of both in-service and preservice teachers, and ultimately enhances the social and emotional development of children with ASD.

1.3. Structure of the report

This synthesis report is structured to provide a comprehensive overview of ASD education in Europe

in general and in Poland, Romania, Spain and Türkiye in detail, with a particular focus on the role of digital tools and social stories in supporting social and emotional development of children with ASD in ECEC. The report is divided into six main sections:

a. **Introduction:** This section outlines the background and significance of the topic, the need for inclusive educational strategies for children with ASD, the objectives of the synthesis report and its structure.
b. **Methodology:** This section describes the approach taken to conduct the literature reviews. It includes information on the partner universities involved, the databases searched, the selection criteria for sources, and the limitations of the review process.
c. **European Perspective on ASD Care and Digital Tools:** This section presents an overview of ASD care systems across Europe, the role of digital tools in ASD education, and the use of social stories as an intervention method.
d. **Country-Based Literature Reviews:** This section provides detailed analyses of ASD education and interventions in Poland, Romania, Spain, and Türkiye. Each country's review follows a consistent structure;
    - the national ASD care system
    - the integration of digital tools in ASD education
    - the implementation of social stories in interventions
e. **Comparative Analysis Across Countries:** This section examines similarities and differences in ASD care systems, policies, access to digital tools, and educational practices across the partner countries based on their literature reviews. It provides insights into common trends and challenges.
f. **Discussion and Conclusion:** The final section synthesizes the findings, highlights the most commonly used digital tools in ASD education, the most studied aspects of social communication and emotional development, and the role of digital social stories in the education of children with ASD in ECEC across partner countries. It also identifies gaps in current practices and offers recommendations for future research and improvements in digital interventions.

2. METHODOLOGY

2.1. Partner organisations involved

The literature reviews that enabled the development of this synthesis report were conducted by the partners of the EARLY-ASD project which are the University of Warsaw (lead institution), the University of Bucharest, the University of Complutense in Madrid, Çanakkale Onsekiz Mart University, the Maria Grzegorzewska University, and Mellis Educational Technologies.

2.2. Literature review strategy

2.2.1. Databases searched

The consortium searched the most relevant national and international (European-level) academic and scientific databases available to each partner institution, based on the following criteria.

- Peer-reviewed publications from 2010 (if available);
- Academic articles, research reports, meta-analyses, books, ministerial reports;
- Policy documents and case studies;
- Scientifically acceptable sources;
- International and region-specific literature relevant to each partner.

2.2.2. Keywords selected

The keywords selected for the literature reviews were provided as follows.

- Digital tools/Technology + ASD
- Digital social stories + ASD
- Social stories + ASD
- Early intervention + social stories + ASD
- Developing social-emotional skills/competences + ASD
- Story-based intervention + ASD
- Social stories + preservice teachers (local terminology) + ASD
- Digital tools/technology+ preservice teachers (local terminology) + ASD

2.2.3. Inclusion and exclusion criteria

Among the documents retrieved from the determined databases, only those containing relevant data on ECEC based on the abovementioned keywords were included in the literature reviews. Other studies that did not meet this criterion were excluded.

2.2.4. Limitations of the review

The scope of the review regarding the European context was limited to European Commission's (EC) reports related to the review's focus and works from Europe written in English. The scope of the country-based reviews was limited to the research in partner universities' regions and countries and in their local language and in English.

3. EUROPEAN PERSPECTIVE ON CURRENT KNOWLEDGE AND PRACTICES OF TEACHERS IN USING DIGITAL TOOLS AND SOCIAL STORIES IN THEIR TEACHING OF CHILDREN WITH ASD

3.1. Introduction

The literature review focuses on understanding current knowledge and practices related to the use of digital tools and social stories by preservice ECEC teachers in teaching children with ASD to improve their social communication skills and support their social and emotional development to help establish a framework for developing a course for preservice ECEC teachers on effectively using these tools.

The first focus of the literature review is on European perspective for teaching children with ASD within the context of the rights of all individuals for education and the inclusive aspects of education. Social and Emotional Development of Children with ASD and Educational Interventions in the European context are the second focal point while the third focus dwells on the use of social stories as an early intervention to the education of children with ASD.

The literature on teaching of children with ASD mostly concentrates on diagnosis of ASD, intervention and early intervention ways, intervention areas, social and communication skill deficits and problem behaviours, parents' awareness and support, and teachers' professional development. This literature review excludes research on diagnosis of ASD, intervention practices related to diagnosis processes, speech development, academic achievement and parents' awareness and involvement.

Early social communication skills are of crucial importance for children with ASD since they are the most critical areas that these children struggle with. Along with that, putting together such practices in a manner that it approaches social inclusion: support the preservice teachers to utilise digital tools while promoting social emotional well-being and inclusion of children with ASD within the classroom in their future teaching. The literature review, in this regard, can help in reconciling the gap that exists between research and practice in the field of education, and also address the overarching challenges of inclusion education.

The scope of the review regarding the European context was limited to European Commission's reports related to the review's focus and works from Europe written in English. Peer-reviewed publications from 2010, academic articles, research reports, meta-analyses, books, ministerial reports, policy documents and case studies, scientifically acceptable sources, and European-level literature were examined in this study.

3.2. Overview of ASD care systems in Europe

Every child has the right to education, and children with ASD are no exception. The Convention on the Rights of Persons with Disabilities and the Universal Declaration on Human Rights play significant roles in developing policies that guarantee the accessibility of education to children with ASD across Europe (Van Kessel, R., et al. 2019). The European Parliament resolution of 4 October 2023 (2023/2728 -RSP) emphasises that there is a need to harmonise the rights of autistic individuals and ensure they have equal opportunities in education in keeping with wider international efforts to ensure an inclusive education for children with ASD. These documents also promote the right to education for all and have been incorporated into the national policies of several European countries (Roleska, M., et al. 2018) aligned with specific needs and contexts of each country.

The growing recognition of the need for inclusive education policies also caters to the unique needs of autistic individuals across Europe. For example, the countries like the United Kingdom, France, and Spain have developed specific strategies to support children with ASD in education and those strategies dwell on inclusive education that allows children with ASD to reach their full potential (Roleska, M., et al. 2018).

The existing legislation on inclusive education and its interpretation by European and international law is centred on full mainstream inclusion. However, this approach has its shortcomings, and there is a push for more neurodiverse and rights-based alternatives. This creates a situation where not only must states bring these children in a more supportive and inclusive mainstream settings, but also provide alternative educational options when necessary (Ducarre, L. 2023).

European countries look for various strategies to implement sustainable policies for supporting teachers working with students with ASD and the literature review by Folostina et al. (2022), shows that there is a lack of adequate preparation in evidence-based educational practices for children with ASD in the European context. Furthermore, a meta-analysis conducted on 23 case studies on teacher evaluation designs for teachers working with children with ASD has revealed some significantly important aspects of teacher's training needs that should be considered in order to enhance the child's social and communication skills (Alexander, J.L.; Ayres, K.M.; Smith, K.A. 2014). The needs teachers articulated in these education gaps strongly indicates the need for an appropriate teacher education on theory, practical methods, and coaching strategies for working with children with ASD.

3.3. Social and Emotional Development of Children with ASD and the Role of digital tools in ASD education across Europe

Children with ASD often exhibit poorer socio-emotional understanding and regulation compared to their typically developing peers, consequently affecting their social competence. Interventions targeting socio-emotional development are crucial for improving social interactions of children with ASD (Reyes, N., Factor, R., & Scarpa, A. 2020; Xanthopoulou, M., Kokalia, G., & Drigas, A. 2019)

Some of those interventions include collaborative approaches involving families, schools, and researchers, utilizing specialized materials that demonstrate positive effects on social and emotional skills development (Lozano Martínez et al., 2017); picture exchange communication system (PECS) (Flippin et al., 2010); psychodynamic interventions Midgley, N., Mortimer, R., Cirasola, A., Batra, P., & Kennedy, E., 2021); peer-mediated interventions that involve typically developing peers to facilitate social interactions of children with ASD (Martinez, J., Waters, C., Conroy, M., & Reichow, B. 2019); and Social and Emotional Learning (SEL) Interventions that incorporate SEL goals into Individualized Education Programs (IEPs) (Dale, B., Rispoli, K., & Ruble, L. 2022).

Technology-involved interventions are one of those interventions that have the potential to support social communication skills of children with ASD. Those interventions using animation videos or video games on mediums such as mobile applications, tablets, computers, social robots (Grynszpan et al., 2014; Mazurek et al., 2015), or artificial intelligence powered applications (Marzano, G., & Zorzi, S. 2022) attract the attention of children with ASD and provide a motivating environment for individuals thanks to the organised and predictable nature of the tasks they offer (Scarcella, et al., 2023).

Information and Communication Technologies (ICT) tools can ensure improvement in various aspects of social skills of children with ASD compared to traditional face to face therapies as Xanthopoulou, M., Kokalia, G., & Drigas, A. (2019) revealed in their study that focused on 14 randomised controlled trials, 12 of which demonstrated the significant influence of ICT in improving social communication skills in children with ASD. In a meta-analysis, Sandgreen, H., Frederiksen, L. H., & Bilenberg, N. (2021), reviewed 16 studies on the effect of technology-involved interventions on children with ASD showed that the overall effect size of the technology-involved interventions was positive, however small, emphasising the need for more practices in this regard. Transformative role of digital technologies, robotics, and artificial intelligence in enhancing the social communication skills of children with ASD also suggests the need for creative, professional training and digital competence development for teachers to effectively support inclusive teaching practices (Marzano, G., & Zorzi, S. 2022).

The technology-involved interventions in Europe mainly include robot-based interventions that use advanced educational humanoid robots to help children with ASD recognize and express basic emotions such as happiness, sadness, fear, and anger (Bartl-Pokorny, K., et al, 2021); virtual reality interventions that demonstrate various improvement levels in social communication skills (Mesa-Gresa, P. & et al, 2018; Bradley and Newbutt, 2018; Dechsling et al., 2021; Parsons et al., 2017); mobile applications and digital games, effective in training metacognitive skills in children with ASD (Mitsea et al., 2022) and digital storytelling through 2D or 3D animation videos that emerge as a promising tool, especially for teaching children with ASD. By using optical triggers, educational animation videos enhance memory and engagement, and offer an affordable and effective method for

interventions (Sakellariou, M., & Sakellariou, M. 2022)

In their study, Syriopoulou-Delli, C. K., & Gkiolnta, E. (2022), reviewed literature and assessed the main components and findings of 13 selected scientific papers on the effectiveness of robots in improving social skills of children with ASD. They found that the social robots had a positive effect on specifically in the areas of attention, speech, and imitative behaviour, as well as the diminishment of certain stereotypical behavioural patterns. Moreover, the analysis from the 13 studies indicated that robots produce immediate impacts on some communication functions of children with ASD. Another study by Scassellati et al. (2018) pointed to significant and noticeable improvements in social communication, social motivation, and social cognition, and demonstrated a decrease in restricted interests and repetitive behaviours.

Mobile applications have recently started to be used in the education of children with ASD and the development of their social skills (Mintz, J., Gyori, M., & Aagaard, M., 2012). The research suggests that these applications are beneficial to support individuals with ASD in the areas they fall behind (Moraiti, I., Fotoglou, A., & Drigas, A. 2023).

3.4. Social Stories as an Early Educational Intervention

Several studies in Europe have shown that social stories can improve social skills in children with ASD with varying effectiveness, including social understanding (Riga, A., Ioannidi, V., & Papayiannis, N. 2021); perspective-taking, initiating and recognizing emotions (Wongkittirungrueang, S., Sanrattana, U., & Warnset, S. 2024); maintaining social interactions (Karal, M. A., & Wolfe, P.S. 2018), social responsiveness (Wright, B., et al, 2024); and social skills (Talas, S., & Kurt, O. 2019). They constitute an effective method to enhance social skills of children with ASD and especially, contribute to increasing social interactions and social learning processes (Fortuny-Guasch, R., Sanahuja-Gavaldà, J. M., & Pérez-Romero, A. 2024).

Social stories can be delivered in various formats such as written, visualised, audio, video, or computer-based programmes. The format can be chosen according to the needs and preferences of children with ASD to enhance engagement and understanding (Karal, M.A., & Wolfe, P.S. 2018).

In Europe, there are few studies that show the effectiveness of social stories in digital format. For example, Smith (2020), suggests that digitally-mediated social story interventions (delivered by teachers) can improve behaviour and understanding, and reduce anxiety in children with ASD in mainstream school settings. Hanrahan et al., (2020), also state that digitally-mediated social stories are found to be effective in producing beneficial changes in behaviour outcomes for children on the autism spectrum.

3.5. Conclusion and Need for Further Research

While digital social stories show promise, there is a need for further research and educational practices to understand how preschool children with ASD benefit from those digital social stories, how well these stories improve socio-emotional skills and how well young children can generalize them to other settings and are maintained over time.

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4. COUNTRY-BASED LITERATURE REVIEWS

4.1. Poland

4.1.1. Overview of ASD care system

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

4.1.1.1. Diagnosis and Early Intervention

The diagnosis of ASD in Poland is primarily conducted in psychological-pedagogical counselling centres, diagnostic centres, 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 behavioural therapies (e.g., Applied Behaviour Analysis - ABA), speech therapy, and sensory integration therapy.

4.1.1.2. 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 centres 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.

4.1.1.3. 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 NFZ,

- Disability certificates (enabling additional caregiving benefits),
- Financial support programs funded by non-governmental organizations.

4.1.1.4. 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 ASD 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 ASD across their lifespan.

The Regulation of the Minister of National Education establishes the framework for special education for children with ASD, 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 ASD 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.

4.1.1.4.1. The Charter of the Rights of Persons with Autism

In the context of care for children with 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 ASD, 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 ASD. The Charter underscores their right to independent, self-sufficient, and active lives while explicitly prohibiting discrimination.

4.1.1.4.1.1. 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 ASD 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 ASD 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 ASD 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 ASD 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 ASD 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.

4.1.1.4.2. 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 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.

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

4.1.1.4.2.2. 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 ASD, 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 ECEC.

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 and sociotherapy centres, special education and care centres, special care centres, and revalidation and educational centres.

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

4.1.1.4.2.3. 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 ASD 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.

4.1.1.4.2.4. 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.

4.1.1.4.2.5. Key Responsibilities of Educational Institutions

Schools and other educational institutions are required to ensure:

- Implementation of recommendations from special education needs certificates, including adaptation of teaching methods and forms to the student's individual needs.
- Appropriate learning conditions, including access to specialized equipment and

teaching aids that facilitate knowledge acquisition.

- Specialized classes, such as therapeutic, speech therapy, psychological, and pedagogical support sessions to assist in student development.
- Rehabilitation, resocialization, and sociotherapy classes, tailored to the students' psychophysical capabilities.
- Integration with the peer environment, fostering social adaptation and development of social competencies.
- Preparation for independent living, through training in essential life skills, vocational development, and decision-making abilities.

4.1.1.4.2.6. 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 ASD 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 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.

4.1.1.4.3. 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 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 centres. In practice, obtaining appropriate assistance requires an individualized approach and cooperation with local social welfare centres and other institutions supporting individuals with disabilities.

4.1.1.4.3.1. Key Provisions of the Act Regarding Children with ASD

- 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.
- Objectives of Social Assistance: Social assistance aims 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.
- 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.
- Specialized Care Services: The Act provides 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.
- Day Support Centres: The Act allows for the creation of day support centres for children and adolescents, offering activities such as sociotherapeutic sessions, therapy, and academic assistance. Participation in such centres can help children with ASD integrate into society and develop essential skills.

4.1.1.4.3.2. 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 centres, 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.

4.1.1.4.4. 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 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.

4.1.1.4.4.1. Key Aspects of the Care Allowance

- Eligibility: Parents or guardians of children with disabilities under the age of 18 can receive the allowance, regardless of their employment status.
- 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.

- 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.

4.1.2. 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.

4.1.2.1.1. 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.

4.1.3. 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 ASD 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.

4.1.3.1. 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 ASD.

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 ASD. 26.6% of specialists participating in the study worked with students with intellectual disabilities and ASD. Remote education was difficult for many students with intellectual disabilities, and especially for those with more severe intellectual disabilities or ASD 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 ASD, 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 ASD. 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 semesters, 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 semesters, which allowed for continuity and documentation of 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 used to analyse the data: digital instructional design and Substitution, Augmentation, Modification and Redefinition (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).

4.1.3.1.1. Mobile Devices Use

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 ASD in Poland (Landowska et al., 2014). A total of 21 centres responded, including seven public benefit organizations (foundations, associations), eight educational institutions (special schools and preschools), two specialized centres, and four psychological counselling centres 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 centres, 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.

4.1.3.1.1.1. Mobile applications

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 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 ASD, 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 (Augmentative and Alternative Communication), ClaroSpeak and NikiTalk. It was noticed that a large group of children with ASD 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 ASD 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 virtual reality (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 ASDs, 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 facilitates 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 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)

4.1.3.1.1.2. 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 behavioural 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 behaviours, and other developmental areas. The findings demonstrated classification accuracies reaching up to 80%, with the highest accuracies observed in assessing stereotypic behaviours and gross motor skills.

4.1.3.1.1.3. 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 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).

4.1.3.1.1.4. Social Stories in ASD education and therapy

None of the Polish articles on social stories use in education and therapy of children with ASD 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 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 ASD (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)

4.1.4. 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 centres 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.

4.1.5. 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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4.2. Romania (UNIBUC)

4.2.1. Overview of ASD Care System

ASD has become an increasingly visible topic in Romania, where efforts to understand and support individuals with ASD are gaining momentum. Although significant progress has been made in recent years, challenges persist in diagnosing, supporting, and integrating people with ASD into education systems and society. By examining the current situation in Romania, it becomes evident that while progress is underway, much remains to be done to address gaps in awareness, infrastructure, and inclusion.

ASD, a complex neurodevelopmental condition, affects how individuals communicate, interact socially, and process sensory information. In Romania, diagnosing ASD has historically been challenging due to a lack of resources, trained professionals, and public awareness. In rural areas especially, access to diagnosis is limited, and early intervention—which is critical for improving outcomes—often comes too late. Even in urban centres, there is a shortage of specialized diagnostic centres and interdisciplinary teams trained to identify ASD. Many families face long wait times or travel significant distances to access the necessary evaluations.

Public awareness of ASD in Romania remains a work in progress. Although campaigns by non-governmental organizations (NGOs) and ASD advocacy groups have brought more visibility to the condition, societal stigma still lingers. Families of children with ASD often encounter judgment or misunderstanding, particularly in small communities where ASD is not well understood. Misconceptions about the condition sometimes result in parents being blamed for their child's behaviours, contributing to a culture of silence and denial that prevents many from seeking professional help.

One of the most critical issues for individuals with ASD in Romania is the state of the education system. While inclusive education is theoretically supported by Romanian law, the reality is that many schools are ill-equipped to accommodate neurodiverse students. Mainstream schools often lack trained teachers and specialists, such as speech therapists, occupational therapists, or behavioural analysts, who are essential for supporting students with ASD. Special education schools exist, but they are few in number and typically located in urban areas, leaving rural families with limited options. As a result, many children with ASD are either placed in inappropriate learning environments or excluded from school altogether.

According to estimates by the World Health Organization (WHO), about 1 in 160 children have an ASD. However, some studies suggest higher rates of up to 1 in 59 children in certain regions, such as the United States. Also, in Romania it is estimated that about 1 in 100 children could have an ASD, similar to general estimates at European level. In recent decades, an increase in the number of cases diagnosed with ASD has been observed, in part due to better awareness and improved diagnostic methods.

At the national level, in Romania, unfortunately there are no clear statistics in this regard, despite

the acute need. The last local research was conducted in 2016 by the specialists of the Help Autism association, which showed a similar and worrying incidence of 1 in 51 children, although the study was limited to a sample of 300 children from nurseries in the capital.

Data collected from the Romanian Institute of Statistics on the "Number of new cases of illness declared by family doctors with the diagnosis of other psychological developmental disorders and without specification (COD ICD 10 - F83-84, F88-F89), in the period 2014-2022" show a 50% increase in the number of new annual diagnoses in recent years: in 2022, 1436 children were diagnosed with ASD, while until 2019 the diagnosis rate was approx. 1000 cases per year.

Data on the number of children with pervasive developmental disorders (autistic disorder, Asperger's disorder, atypical autism/pervasive developmental disorder without further specification), childhood disintegrative disorder, infantile autism (registered with the social assistance service on July 1, 2021) show that 13,992 children (0 to 18 years old) nationwide and 1,095 ASD people who left services in the last 2 years at the age of 18. Also, of the 13,992 children, 6,152 children were in the mainstream education system, 3,446 children in the special education system and 4,394 children were outside any education system (being under educational age or out of school).

Despite these challenges, there are promising developments in autism support within Romania. NGOs and parent-led organizations play a crucial role in bridging gaps left by the public system. Groups such as the Romanian Autism Society (ARCA) and Autism Romania provide services ranging from diagnosis and therapy to advocacy and public awareness campaigns. These organizations often serve as lifelines for families by offering affordable or free therapies such as ABA, speech therapy, and social skills training.

In recent years, government initiatives and legal reforms have shown a growing commitment to supporting individuals with ASD. Romania ratified the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) in 2010, signalling a critical step toward aligning its policies with international standards for the inclusion and protection of people with disabilities, including those with ASD. The convention underscores Romania's obligation to promote human rights, equality, and non-discrimination for all individuals, regardless of their abilities. It specifically highlights the need to foster inclusion in education, employment, and public life, as well as to provide adequate healthcare and support services. While ratification was a positive milestone, the implementation of the UNCRPD in practice has been uneven and continues to face structural challenges, particularly for individuals with ASD. One of the tangible outcomes of Romania's commitment to the UNCRPD is the gradual improvement in public funding for early intervention programs and therapeutic services for children with ASD. Early intervention is widely recognized

as critical in addressing developmental challenges and equipping children with skills that can significantly improve their quality of life. In response, some government-backed programs have begun offering partial subsidies for therapies such as ABA, speech therapy, and occupational therapy. Additionally, specialized centres funded by municipalities and supported through the European Union (EU) programs have been established in a few major cities, providing access to diagnosis and basic therapeutic support for children and families.

Despite these advancements, the financial barriers families face in accessing necessary interventions remain a significant obstacle. The cost of autism therapies in Romania is substantial and often exceeds what public funding or health insurance will cover. Additionally, the uneven geographic distribution of autism services exacerbates inequities. Urban centres such as Bucharest, Cluj, and Timișoara tend to have more access to diagnostic facilities, specialized schools, and therapeutic services. In contrast, rural areas are often underserved, leaving children in these regions at a stark disadvantage. Families in rural or small-town areas often have to travel long distances, further increasing costs and logistical challenges associated with accessing care.

An exciting frontier in autism education and therapy in Romania is the adoption of digital tools. These tools include communication apps, visual schedules, and gamified learning platforms, which can enhance education and therapy for children with ASD. While challenges remain in ensuring access to these tools, especially in underserved areas, their potential to personalize education and bridge gaps in traditional teaching methods is significant. Some inclusive schools in urban centres have piloted the use of such tools, offering hope for broader implementation in the future.

4.2.2. Digital Tools in ASD Education

The review of the "current state of knowledge on the role of digital tools in the education of children with ASD" was carried out through a search in the Google Scholar and Scopus databases since 2010. In the first case, the concepts, in Romanian, "digital resources", "autism spectrum disorder" and "Infantile" were used in common, in any part of the text. In Scopus, the concepts, in English, "autism spectrum disorders" and "information technology", together, were used, located indistinctly, in the title, abstract or keywords, with a search filter in Romania. After a preliminary analysis of the content, and filtering only the articles published after 2010, ten works were selected.

Chistol, Turcu, and Danubianu (2023) developed "Autism Assistant," a Romanian-language therapeutic software platform designed to support home-based interventions for children with ASD. Created collaboratively by Ștefan cel Mare University and Assist Software Company, the platform addresses the time and financial challenges of traditional ABA therapy. Developed using the Double Diamond Model with a Human-Centred Design approach, it integrates insights from 60 Romanian parents, teachers, and therapists to address the specific needs of children with ASD. Comprising a

mobile app built with Unity and a web application using React and Ruby on Rails, it was evaluated as suitable educational software under ISO 9126 standards. The platform empowers parents and caregivers to act as co-therapists, promoting self-reliance and faster skill improvement in children, while filling a critical gap in accessible therapeutic tools for non-English speaking users. Costescu et al. (2024) explored the impact of technology use on the quality of life of autistic children aged 5–10, involving 61 parent-reported assessments. The study found that while most children primarily used technology for relaxation, its use for socialization was positively correlated with higher perceived quality of life. This highlights the potential benefits of technology when used for fostering social interaction, even though such usage was less frequent. The authors emphasized the need for further research on technology-based interventions to enhance social skills and well-being among autistic children, recommending careful consideration of both its benefits and potential risks (Costescu et al., 2024).

In Romania, the adoption of digital tools for children with ASD has begun, but it remains in its infancy. Certain researches such as Costescu (2024) and Toma et al. (2024) explore the role of technology in supporting autistic children, but they differ in scope and focus. Costescu (2024) provides a broad overview of technological tools, including software applications, VR, and robotics, emphasizing their tailored application to individual needs and the need for empirical validation. In contrast, Toma et al. (2024) conduct a systematic literature review specifically on extended reality (XR) mobile applications, such as augmented reality (AR), VR, and mixed reality (MR), analysing their design, testing methods, and preliminary outcomes. While both works highlight the potential benefits of technology in therapeutic and educational interventions, Costescu's (2024) approach is more conceptual and expansive, addressing various tool categories. Meanwhile, Toma et al. (2024) delve deeply into the technical and practical aspects of XR solutions, stressing the need for rigorous testing and ethical considerations. Both underscore the importance of multidisciplinary collaboration and evidence-based development to optimize outcomes for children with ASD. Although many tools available globally are widely regarded as effective, Romania faces an additional challenge in the form of language accessibility. Many apps and software programs are available only in English, limiting their use for educators, therapists, and children who lack proficiency in the language. This presents a clear need for localizing and adapting digital tools to the Romanian context.

While the potential of digital tools is undeniable, their implementation in Romania faces several obstacles. One of the most significant barriers is the lack of resources. Also, many schools lack adequate funding for advanced tools or reliable internet infrastructure, particularly in rural areas where the need for inclusive education support is also greatest. In addition, the effective use of digital tools requires educators to be adequately trained in their application. Yet, many teachers in Romania lack access to professional development programs that focus on how to integrate digital

tools into teaching practices for neurodiverse learners (Folostina, et al., 2022). Similar to the above research is Pasco et al. (2014) article that discusses a training and development project in Romania aimed at enhancing services and promoting social inclusion for children and young people with ASD. The initiative focused on developing the skills of professionals and parents through evidence-based approaches to improve the quality of care and support for autistic individuals. The project emphasized collaboration between local and international experts to address challenges specific to Romania's autism community and enhance opportunities for integration into broader society.

Moreover, research is focus, at national level on the impact of digital platforms, the use of VR and XR. To start with Costescu et al. (2024) focuses on a systematic review that explores the impact of digital platforms on academic performance. It analyses existing studies on how such tools influence learning outcomes, particularly in environments that include children with diverse learning needs. The review identifies key benefits of digital platforms, such as personalized learning and increased engagement, but also underscores the need for adaptive tools and thorough evaluations to maximize educational outcomes across diverse contexts. On the other hand, Chițu et al. (2023) examines the potential of VR in the education of children with disabilities. It highlights VR's ability to create immersive, controlled environments that aid in skill development and learning. The research indicates that VR can improve engagement, understanding, and accessibility for children with disabilities. However, the authors stress the importance of addressing practical barriers, such as cost and accessibility, and further empirical testing to assess its long-term impact. Not least, Tiliute & Pascu (2024) offers a systematic literature review of extended reality (XR)-based mobile applications for the therapy of children with ASD. It reviews the development and evaluation of XR solutions, including VR, AR, and MR tools. While these technologies demonstrate significant promise in enhancing therapeutic interventions, the study underscores the need for comprehensive testing, ethical considerations, and multidisciplinary collaboration to ensure effective application in real-world contexts.

Looking at these three perspectives, these studies share a common focus on using technology to improve the development, education, or therapy of children with disabilities or ASD. Each article examines ways in which technology—such as digital platforms, VR, or extended reality (XR)—can enhance learning outcomes, therapeutic interventions, or social inclusion. They also emphasize the importance of empirical evaluation to assess the effectiveness of these technologies and tailor interventions to the individual needs of the children involved. Additionally, all the papers acknowledge the potential benefits of these technologies in improving engagement and therapy outcomes for children with ASD or disabilities.

However, there are significant differences between the studies. Pasco et al. (2014) focuses primarily on training and development for professionals and parents in Romania, aiming to improve autism

support services and facilitate social inclusion. The study does not centre on specific technologies but rather on the broader context of service quality improvement. Costescu et al. (2024) investigates the use of digital platforms more generally, focusing on enhancing academic performance for children with diverse learning needs through systematic review. Chițu et al. (2023) explores the potential of VR specifically for the education of children with disabilities, considering the unique benefits it offers in terms of engagement and accessibility, while Tiliute and Pascu (2024) concentrate on XR technologies for therapeutic purposes, reviewing existing literature on their effectiveness for children with ASD.

The geographical context also differs, with Pasco et al. (2014) concentrating on Romania's autism community and its specific challenges in integration, whereas the other studies address broader, often international, populations or specific technological tools. In terms of methodology, Pasco et al. (2014) describes a training initiative and its impact, Costescu et al. (2024) and Tiliute and Pascu (2024) conduct systematic reviews, while Chițu et al. (2023) explores VR as an educational tool, possibly using a mixed-method approach to assess its potential.

Each study addresses distinct outcomes, with Pasco et al. (2014) focusing on service quality and social inclusion, Costescu et al. (2024) examining the improvement of academic performance, Chițu et al. (2023) emphasizing engagement and accessibility in education, and Tiliute and Pascu (2024) reviewing XR tools for therapeutic progress in children with ASD. In summary, while these studies share a unified goal of improving services for children with ASD and disabilities, they differ in their technological focus, application, geographical context, and methodological approach.

In conclusion, digital tools offer immense opportunities to enhance the education of children with ASD in Romania by providing personalized, engaging, and sensory-friendly learning experiences. While the potential of these tools is clear, challenges related to resource availability, educator training, language barriers, and cultural stigma must be addressed to maximize their impact. By investing in strategic initiatives and fostering collaboration among educators, families, and policymakers, Romania can unlock the full potential of digital innovation, empowering children with ASD to thrive both academically and socially. The role of digital tools in reshaping the educational landscape for neurodiverse learners is both transformative and necessary, marking a crucial step toward a more inclusive society.

4.2.3. Social stories in ASD Intervention

Regarding the second search strategy on "the current state of the use of social stories as a method of supporting socio-emotional development", a systematic analysis was carried out in the Google Scholar and Scopus databases, These databases contain literature published in Romanian and English-speaking countries In the selected databases, the words "Social Stories", "Autism" or

"Autism Spectrum Disorder" and "Children" or "Early Education" have been inserted together, anywhere in the text. The selection of the filter "publications from 2010-2024" and which referred, at least partially, to the education stage led to a number of 4 selected articles.

Social stories are an effective, widely used method to support the social-emotional development of children, particularly those with ASD. This intervention involves creating simple, narrative-based stories that explain various social situations, appropriate social behaviours, and emotional responses in a clear and relatable manner. The primary aim is to help children with ASD understand social cues, improve interpersonal interactions, and regulate their emotions in challenging scenarios. Bălaş-Baconschi and Bărbulescu (2022) explored the use of social stories as an intervention method to reduce inappropriate behaviours and enhance social skills in children with ASD. Social stories are a common tool in ASD education that helps children understand social situations and appropriate responses through simple, personalized narratives. The authors reviewed various studies and highlighted the effectiveness of this method in improving social behaviours and mitigating behavioural issues, such as aggression and anxiety. The review shows that social stories help children with ASD understand expectations and improve their interaction in social settings. The article presents evidence suggesting that the method contributes significantly to the development of adaptive behaviours and can lead to better emotional regulation and social integration in both school and social environments. The study also discusses potential challenges in applying social stories, including the importance of tailoring stories to the individual needs of each child and the need for consistent use in multiple contexts to reinforce learning. By demonstrating how social stories can be an effective educational tool, the study supports their inclusion in ASD interventions to foster better communication, social understanding, and emotional development in children.

By using social stories, children can learn about expectations in different contexts—whether at school, home, or in the community—and practice appropriate social responses before encountering real-world situations. This proactive approach helps to reduce anxiety and confusion by providing clear guidelines on what behaviours are expected, how others might feel, and how to respond appropriately. The method has been particularly effective in teaching skills like greeting others, sharing, managing conflict, and interpreting emotions. Grigore and Rusu (2014) investigate how therapy dog interaction enhances the effects of the social story method in children with ASD. The study highlights the effectiveness of combining traditional educational methods with animal-assisted therapy. The researchers found that interactions with therapy dogs significantly improved the engagement and social responses of children with ASD. The method used in the study involved both social story interventions and controlled therapy dog interactions, where the children would read or listen to a social story and subsequently interact with the dog. The positive influence of therapy dogs on social behaviours was evident, with children demonstrating better social communication skills, emotional regulation, and increased motivation to participate in therapy. The

interaction with the dog was particularly beneficial in reducing anxiety and promoting a sense of security, which helped the children better respond to the social story's content. By integrating therapy animals into interventions, the study demonstrated a practical approach to addressing core issues in ASD, such as social withdrawal and communication difficulties. The authors suggest that the use of therapy dogs, alongside more traditional behavioural strategies like social stories, could significantly enhance therapeutic outcomes for children with ASD.

Social stories also offer a form of emotional preparation for children with ASD. By helping them recognize and articulate their own feelings, these stories foster greater emotional awareness. They support self-regulation, allowing children to better cope with situations that might otherwise cause frustration or distress. Ramona (2016) explores the role of therapeutic stories in the social-emotional development of pupils, with a focus on children with ASD. The author argues that therapeutic stories serve as a powerful tool for fostering empathy, understanding emotions, and improving interpersonal skills in children with ASD. The study provides an overview of how stories, especially those created with therapeutic intent, can address specific social and emotional challenges faced by children with ASD. Ramona presents case examples illustrating how narratives can teach children with ASD to identify and express emotions, interpret social cues, and learn appropriate behaviours in social interactions. The therapeutic stories are designed to align with the developmental needs of children, engaging them in emotionally relevant scenarios that they can relate to. The article emphasizes the benefits of using stories not only for academic improvement but also for promoting a more inclusive social experience for children with ASD. Furthermore, Ramona highlights how the method allows educators and therapists to address individual emotional challenges by customizing stories for each child's needs, thereby supporting social-emotional growth. The study underscores the importance of integrating such therapeutic tools within educational programs to create a holistic developmental approach for children on the autism spectrum.

Another paper developed by Syriopoulou-Delli and Folostina (2021) present a comprehensive collection of interventions designed to improve adaptive behaviours in children with ASD in their edited volume *Interventions for Improving Adaptive Behaviours in Children with Autism Spectrum Disorders*. The volume includes various contributions that focus on practical, evidence-based interventions aimed at addressing core challenges associated with ASD, such as social communication deficits, repetitive behaviours, and restricted interests. Each chapter in the book highlights specific strategies for improving key adaptive behaviours such as daily living skills, social functioning, and emotional regulation. The interventions presented range from traditional behavioural therapies like ABA to more innovative approaches incorporating technology, including VR and social robotics. The editors underscore the importance of a personalized, multi-disciplinary approach to ASD interventions, acknowledging the need for ongoing assessment and modification of strategies to meet the individual needs of children. The book stresses the value of involving

families in the intervention process, recognizing that consistent practice at home can significantly enhance the outcomes of formal therapies. Syriopoulou-Delli and Folostina conclude that the integration of diverse intervention strategies, coupled with continuous professional development for educators and therapists, is critical for improving the quality of life and functional independence of children with ASD.

Each of these works contributes valuable insights into the challenges and solutions associated with supporting children with ASD, focusing on enhancing their social skills, emotional regulation, and adaptive behaviours through targeted interventions.

4.2.4. Conclusion

All in all, social stories play a pivotal role in the social-emotional development of children, especially those with ASD, by promoting greater understanding of social expectations, emotional recognition, and appropriate behavioural responses. When tailored to the individual needs of each child, they can contribute significantly to improving social skills, enhancing emotional regulation, and fostering a more inclusive environment.

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4.3. Spain

4.3.1. Overview of ASD care system

In Spain, the ECEC stage is divided into two cycles, from 0 to 3 and from 3 to 6 years old. Despite not being compulsory, enrolment in the second cycle is almost universal and constitutes students' first step into formal schooling. Spanish legislation makes inclusion a guiding principle of the organisation of the educational system from this stage onwards. In accordance with this principle, the schooling of children with ASD should preferably be done in ordinary classrooms, with specific educational support. There are different resources, both from the educational field and from the health and social care fields, available to facilitate the diagnosis and educational care of these children.

The general Educational and Psychopedagogical Guidance Teams (EOEP, by their Spanish initials) provide care to students enrolled in ECEC starting from 3 years of age. They provide guidance to schools, students and families. The Early Care EOEPs (EATs) conduct psychopedagogical evaluations of children and, if warranted, make a "determination of special educational needs" associated with ASD. The Special Educational Needs Student (ACNEE, by its Spanish initials) report allows the student to access ordinary support (such as the services of a Therapeutic Pedagogy [PT] specialist or Hearing and Language [AL] specialist). If deemed appropriate, schooling in a preferential centre for children with ASD may also be recommended. In private centres and charter schools, there are usually Guidance Departments that offer assistance to students with ASD who are enrolled there. Lastly, there are also special education centres that offer instruction aimed at students with special educational needs that cannot be met as part of diversity care measures in ordinary schools.

The health system and social care services work alongside the education system. Specialists at Primary Health Care centres make referrals to the Hospital or Mental Health Service, who in turn may make a "clinical diagnosis" of ASD. Additionally, the regional governments (Catalonia, Community of Madrid, Andalusia, etc.) have specific centres to carry out assessments of a situation of dependency – that is, the formal "Recognition of disability" -- for children from 0 to 6 years of age, as well as the "Assessment of the need for early care". These teams assess the child's degree of autonomy and the need for support, while proposing the corresponding interventions from social care services. In some regions, there are what are known as "Specific Teams", which collaborate with the EOEP and the Guidance Departments, especially at the preferential schooling centres. Specific student care teams servicing students with ASD are involved in cases of special difficulty and advise on psychopedagogical evaluations and tailoring educational adaptations. They also offer educational and socio-community guidance for families and educational teams that serve students with ASD. Likewise, Specific Teams also provide guidance to centres on implementing proposals made by Preferential Centres on the schooling of students with ASD.

There are four basic types of schooling for students with ASD. A fifth modality could be added

to these, but it is essentially a variation of the fourth. It does not exist in all regions and, in those where it is used, it is only applied to a small number of students.

1. Ordinary modality without supports or adjustments. This is generally used in cases that do not yet have an autism diagnosis, but do have other diagnoses, such as attention deficit hyperactivity disorder (ADHD) or high capacity. Many students have good or very good oral language skills, as well as good grades, and only have some "trait" or other. They also do not cause conflicts in the classroom and can go more or less unnoticed as being on the autism spectrum until adolescence or adulthood.
2. Ordinary modality with support. Students in this modality receive a certain number of sessions per week from the guidance team, usually less than 9 hours, and sometimes along with other students. On occasion, they are recently diagnosed students in the ECEC stage who have to spend a year in this modality before being assigned a place in a preferential centre. This modality also accepts students with autism who have fewer support needs, students who have not yet received the diagnosis, but who have other comorbidities, such as specific language impairment (SLI) or ADHD, or students who, having previously spent time in ASD preferential centres, have not required significant curricular adaptations.
3. ASD Preferential Centre. This includes everything in the Ordinary Modality plus two professionals on site who are either specialists in ASD or social integration. They usually serve a maximum of 5 children, both in the ASD classroom (a specific physical classroom) or in the ordinary classroom with the other ASD students.
4. Special Education Centre. These centres have curricula that are not comparable to those of ordinary schools. They are aimed at students who require generalised and significant support in all areas of development.
5. Combined Special Education. This final modality combines schooling in a regular centre and in a special education centre, alternating activities between the two.

The specific educational care measures that can be taken with students with ASD in ECEC are:

1. Curricular adaptations. These consist of adapting or modifying different aspects of the learning process to minimise barriers while seeking maximum development of student capabilities. Curricular adaptations are considered "significant" when they extend to the contents or evaluation criteria of previous cycles or courses.
2. Specific support for the teaching and learning process in cases where a significant curricular adaptation has been made, when necessary, as well as to overcome the difficulties students have due to their special condition. This is done via teachers specialised in Therapeutic Pedagogy or in Speech and Language, as set out in the school

enrolment report.

3. Applying specific measures for access to the school setting, including those relating to assessment processes. This may include providing resources that are difficult to implement across a school population or the implementation of specific methodologies for cognitive, sensory and social accessibility.
4. Flexible teaching. The time spent in ECEC may be made more flexible and schooling may be extended for one additional year.

In July 2023, the National Council on Disability approved the First Spanish Strategy Action Plan on Autism Spectrum Disorder 2023-2027 (Ministry of Social Rights and Agenda 2030, 2023). The Plan establishes six lines of action: promoting knowledge and respect for people with ASD; encouraging early detection and diagnosis, and a comprehensive approach to people with ASD; promoting independent living and inclusion in the community; contributing to inclusive and quality education and employment; guarantee access to justice and the strengthening of rights; promoting research, training and innovation. In addition, it includes specific measures related to each line of action, while allocating funds to reach those goals in the five-year period envisaged. Early diagnosis and care are considered key to achieving all of the objectives.

The Plan has detected some gaps in early care, such as the absence of health protocols in most regions. It also notes a lack of systematic implementation of preventive and early detection actions, which would make it possible to identify early signs of neurodevelopmental disorders that may lead to ASD. The need for exhaustive neuro- paediatric follow-up of the population at higher risk of autism due to genetic vulnerability or perinatal complications is also confirmed. Special emphasis is placed on the care of girls, who often receive misdiagnoses prior to the diagnosis of ASD. Likewise, the plan also notes that it is desirable to use diagnostic means that are more sensitive to the clinical manifestations of girls, who tend to have more social and linguistic skills, greater ability to adapt to their environment and fewer stereotyped behaviours and behavioural difficulties. All this highlights the need for national regulations that eliminate regional differences in the provision of care to this population, and for the consolidation of teams that include professionals from the fields of education, health and social services whose intervention will be part of children's natural environments. The plan therefore proposes the establishment of national criteria and evidence-based practices in order to ensure respect for and consideration of the realities of life for people with ASD.

4.3.2. Digital tools in ASD education

This review on "State of the arts on the use of digital tools for education of children with ASD" has been carried out through a search in the Google Scholar and Scopus databases, with 2010 as

the lower limit for publication date. On Google Scholar, the search terms, in Spanish, "recursos digitales (digital resources)", "trastorno del espectro autista (autism spectrum disorder)" and " infantil (early childhood adj)" have been used together. Terms could appear anywhere in the text, and the scope was set to exclude Bachelor's Degree Final Projects and Master's Degree Final Projects. In Scopus, the following concepts have been used together, in English, "autism spectrum disorders" & "information technology". Terms could be located indistinctly in the title, abstract or keywords, and a search filter was set to Spain. The search yielded 298 results, 253 in Google Scholar and 45 in Scopus. In Google Scholar, however, the largest proportion of works corresponds to Spanish- speaking countries in Latin America, or do not fully match the search criteria. In both databases, most of the publications do not specify the educational level, address levels other than ECEC, or are review works that are not based on research and interventions carried out in Spain. After a preliminary analysis of the content, five works have been selected that include ECEC, although most of them do not address it exclusively (see Annex 3).

In general terms, in Spain, as in other countries, there is an upward trend in publication of works and research about the use of digital resources or, in general, Information and Communication Technologies, for the education of children with ASD. This can be seen in the following Scopus chart (Figure 1) on the concepts indicated in the search, showing changes over the last twenty years.

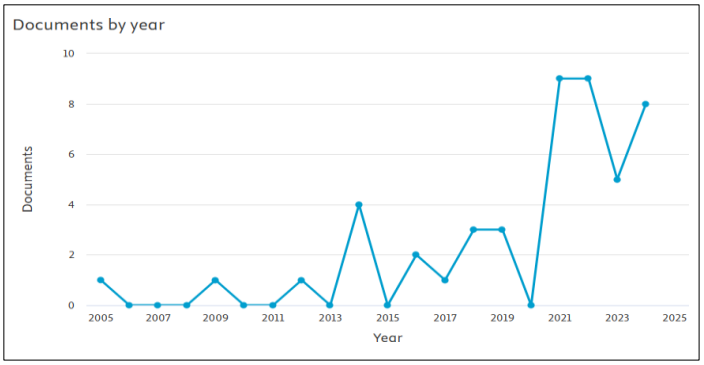

Figure 1. Yearly distribution of research about the use of digital resources published in Spain between 2005 and 2025 (Source: Scopus)

The most common type of work among these results are articles in scientific journals (61.7%), with some contributions in other formats as well. Most of them come from the field of Computer Science (20.7%), followed by Social Sciences, including Education (19.6%) and then Medicine (16.3%), Psychology (8.7%), Engineering (7.6%) and others with minor proportions. By educational level, the largest volume of works focuses on Primary Education (6-12 years). Comparatively, the contributions related to the second cycle of ECEC (3-6 years) are very rare,

and references to this stage frequently appear in comprehensive works that cover Primary Education and sometimes also Secondary Education. The narrower studies that consider the ECEC stage focus mainly on three types of resources: digital applications for mobile devices, robotics and AR.

The usefulness of digital applications in educational care for children with ASD, has been analysed by Gallardo-Montes and his collaborators in several works. One of them (Gallardo-Montes, Rodríguez, Crisol, & Caurcel, 2020) addresses the impact that these applications can have on strengthening theory of mind (ToM), a key skill that allows people to understand the mental states of others and adapt their behaviour accordingly. ToM development is often irregular in children with ASD, thus hindering their ability to engage in social interactions or understand communicative contexts.

The study analysed 101 mobile applications available for free on Google Play, some of which were particularly appropriate for the second cycle of ECEC. These applications were evaluated based on a system of indicators relating to three main dimensions: design/form, content, and pedagogical aspects. The analysis allowed researchers to classify applications into three groups: highly recommendable (11.9% of applications), recommendable (83.2%) and dispensable (5%). Most of the digital applications simultaneously address more than one area related to ToM: communication and language (49.5%); communication, language and emotions (11.88%); language and emotions (5.9%); and communication and emotions (3.96%). Although in smaller numbers, there are also applications focused on a single area, mainly on language development (21.78%) and fostering communication (5.94%). None of the applications work exclusively in the area of emotions.

Although the applications considered in that research offer great potential, the study points out several limitations: a) insufficient attention to the emotional field, which only a fifth of the applications (22 of the 101 evaluated) engage with, despite it being a critical area for children with ASD b) technical limitations: some applications do not incorporate voices or audio recordings, which reduces their usefulness for language learning; c) linguistic restrictions: many applications are not available in multiple languages, which restricts their functionality.

In a subsequent study, Gallardo-Montes, Rodríguez, Caurcel, & Capperucci (2022) used questionnaires to compare the assessment and use that two groups of educators -- one from Spain and the other from Italy -- make of mobile digital applications to care for people with ASD. The research included 286 professionals from ECEC, Primary Education, Secondary Education and Adult Education, who work directly with people with ASD. 159 were from the Granada area in Spain and 127 were from Florence in Italy. Spanish educators reported slightly higher use of apps

compared to their Italian colleagues. 50.3% of participants from Spain said they used them frequently, while in the Italian sample this figure was 44.9%. In both countries, women use apps more frequently than men. In Italy, female teachers primarily use the apps to keep the attention of autistic people for longer, and Spanish female teachers primarily use the apps to work on emotions.

Participants from both countries agree that apps are motivating tools that complement traditional teaching methods. They also highlight their usefulness in reinforcing concepts that were addressed previously and in keeping students' attention for longer. However, differences are detected in specific areas depending on the educational level. In Italy, primary school teachers utilise apps more than early childhood teachers in the areas of reading, self-regulation, numeracy and consolidation of learning, while early childhood teachers find them more useful than their primary school colleagues do for working on socialisation and attention. In Spain, early childhood teachers use apps more than primary school teachers for working on memory, but less in the areas of recreation and attention.

The results highlight the importance of digital applications as complementary tools when educating people with ASD at an early age. However, they also reveal persistent challenges, such as the lack of adequate training in digital technology for educators. The differences that can be observed between professionals in both countries, as evident in the different assessment of applications in the ECEC stage, call for more attention to the training processes and the conditions of use of these resources.

The incorporation of students with ASD into ordinary educational centres (mainstreaming) represents a significant advance for inclusion, but it also poses a challenge due to the lack of teacher training and specific resources. Corrales and Rodríguez (2022) have analysed, through a case study, the use of robotics as an innovative tool to overcome these barriers, taking advantage of the capacity of robots to interact and motivate students. The commercial robot PLEO Rb was used for this purpose. It is a computer-powered pet in the shape of a juvenile dinosaur that responds to the environment, making it a very attractive resource for children.

The research was conducted with a 5-year-old autistic student who was enrolled in a regular Spanish school and had specialised support. The student was diagnosed with ASD when she was 3 years old. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), her need for help in the psychopathological domains of social communication along with restricted and repetitive behaviours would be classified as grade 3 -- that is, need for very significant help. The project was carried out over the course of a school year and had three phases: initiation, teaching-learning and evaluation. The sessions were designed to work on

communication skills and basic concepts (such as notions of shapes and sizes). The intervention was led by the Therapeutic Pedagogy teacher, who received training in the use of the resource and the creation of specific materials. Each session, lasting 45 minutes, once a week, included structured activities around the PLEO Rb robot, which acted as a mediator between the teacher and the student.

The use of the resource produced advances in the field of communication and social interaction. Initially, the student showed rejection towards the robot, limiting her interaction with it to directed activities, but gradually developed curiosity towards the digital pet and initiated more autonomous interactions. At the end of the intervention, she was able to interact independently with the robot and share experiences with the adult. The robot made it easier to transition from a more instrumental communication style to a more functional one, including spontaneous requests and the use of basic expressions such as "hola (hello)" and "adios (goodbye)". A decrease in disruptive behaviours was also observed, especially in moments of uncertainty, thanks to the predictability and consistency of the robot. It also acted as a motivating element, helping to maintain the student's attention and improved performance on academic tasks. The student learned to position the robot following instructions such as "dentro (in)" or "fuera (out)", was able to recognise and manipulate materials associated with the robot's features, and completed activities with minimal support, generalising concepts to other contexts.

The study shows that social robotics can be an effective tool to address the specific needs of students with ASD. However, it also highlights the importance of careful design in interventions, with there being a need for personalised materials along with teachers trained in the use of these technologies.

Pérez-Fuster, Herrera, Kossyvaki, & Ferrer (2022) address improvement in responding to joint attention (RJA) skills in autistic children, with an intervention mediated by AR technology using the "Pictogram Room" tool.

Joint attention involves the ability to share a focus of attention with another person, either through gaze tracking or gestures such as pointing. In typically developed children, these skills begin to emerge between six and twelve months, but in children with ASD they tend to be markedly diminished. This difficulty not only affects social interaction, but also limits critical areas of development, such as language and processes associated with theory of mind (ToM). AR is a useful resource for working on these skills, combining the physical environment with virtual stimuli, offering an immersive platform that can be customised for each user. Unlike VR, AR maintains elements of the real world, which facilitates the generalisation of skills learned in virtual contexts to everyday situations. One prominent tool in this area is "Pictogram Room," a

Kinect-based system that uses games to develop skills such as imitation, body awareness, and specifically, joint attention.

The study included six children with ASD, aged between 3 and 8 years enrolled at a Spanish public school. A multiple baseline single-subject experimental design (SSED) across three groups of two participants was employed. The intervention consisted of a series of sessions spread over 12 weeks and divided into several phases. A) Pre-baseline: The children's initial skills in joint attention were assessed using specific tools. B) Baseline: Joint attention behaviours were observed without intervention. C) Learning Phase: children learned to interact with "Pictogram Room" through basic games. D) Intervention Phase: A specific game, "Gaze Following," was introduced to improve gaze following and pointing. E) Post-intervention: Progress and its generalisation to non- virtual contexts were evaluated.

The design of "Pictogram Room" made it possible to personalise visual and auditory stimuli, while maintaining high levels of interest and participation from the children. After the intervention, all children showed significant gains in gaze tracking and signalling skills. These improvements were sustained and generalised to real situations. The study thus demonstrates that an intervention mediated by AR technology can be highly effective in improving specific skills in children with ASD. “Pictogram Room” not only improves joint attention, but also offers a replicable and accessible model for schools and families, opening new possibilities for inclusive and technologically advanced educational interventions.

Baixauli-Fortea, Gómez-García, Andrés-Sebastiá, & Berenguer-Forner (2020) present another intervention proposal based on AR, in this case in conjunction with dialogic reading, to work with young children with ASD.

Dialogic reading is a shared reading technique that puts adults and children into active interaction during story reading. This method encourages child participation through open-ended questions, sentence completion, and connecting the book content with their own experiences. Previous studies have shown that this technique is effective in developing expressive and receptive language skills, as well as narrative skills. For children with ASD, this intervention can be particularly useful, as it addresses deficit areas such as joint attention, communication and narrative skills, and the use of language in social contexts.

AR is integrated into this proposal as a complement that amplifies the impact of dialogic reading. By overlaying virtual elements on the real world, AR maintains the connection with the physical environment while introducing visual and auditory stimuli that capture the child's attention. In the context of ASD, AR helps reinforce visual and emotional cues in stories, helps keep children's attention on the task, and facilitates understanding of abstract concepts such as emotions and

cause-effect relationships.

The proposal uses three stories designed specifically for children with ASD, starring a character named Ismael. The topics of the stories are a birthday, a field trip, and a day at the beach. Each story follows a simple narrative structure and addresses specific skills related to theory of mind (ToM), such as emotion recognition and understanding of intentions. The illustrations are designed to avoid over-stimulation. The implementation of the dialogic reading technique includes strategies adapted to children with ASD, known as CROWD: a) Completion, pauses for the child to complete sentences; b) Recall, questions about what happened in the story; c) Open-Ended, open-ended questions that encourage description; d) Wh-Questions: specific questions about what, where, how; e) Distancing: connections between the story and the child's personal experiences. These aids are complemented by specific AR tools to emphasise key aspects of the story and capture the child's attention.

The proposal offers a new perspective on how emerging technologies can be integrated into traditional pedagogical methodologies to create richer and more effective learning experiences. The combination of dialogic reading and AR can enhance the child's engagement in the activity, produce advances in vocabulary, literal comprehension and inference, and increase interest in the task. The proposal also represents an innovative approach that not only addresses the educational needs of children with ASD but can also be adapted to include contexts to benefit the entire educational community. The article highlights the need for further studies to evaluate long-term effectiveness and explore its application in diverse contexts.

4.3.3. Social Stories in ASD Intervention

4.3.3.1. Systematic Review

As for the second search strategy on "State of arts on the use of Social Stories for education of children with ASD", a systematic review was carried out on the Google Scholar, Scopus, Dialnet, Latindex, Redined, Redalyc and Scielo databases. These databases contain literature published in Spanish-speaking countries and regions such as Spain, Latin America and the Caribbean. In the selected databases, the words in Spanish "Historias Sociales (Social Stories)", "Autismo (Autism)" or "Trastorno del Espectro Autista (Autism Spectrum Disorder)" and "Infantil (Early Childhood adj.)" or "Educación Infantil (Early Childhood Education)" were used together as search parameters and could be anywhere in the text.

In Scopus, the following concepts were used, in English, "Autism Spectrum Disorder", "Social Stories" and "Childhood" together, and could be located indistinctly in the title, abstract or keywords. As observed in the Scopus chart, publications on social stories have been increasing

for the past two decades, with notable spikes in the years 2014, 2019, and 2024. The search in this database has resulted in 155 publications. However, when selecting the filter "publications from 2010-2024," no results related to Spain were returned.

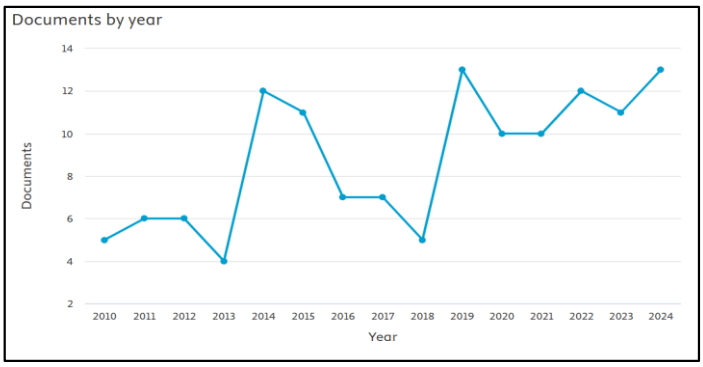

Figure 2. Yearly distribution of research about the use of social stories in ASD intervention published in Spain between 2010 and 2024 (Source: Scopus)

In the Google Scholar database, once the keywords were entered, the 2010-2024 interval was selected, documents written exclusively in Spanish were searched for and only peer- reviewed articles were considered. Once the filters were applied, 30 results were returned. For the rest of the databases, the aforementioned filters were applied, returning the following results: 1 article in Dialnet, 0 results in Latindex and Redined. Regarding the Redalyc database, 5 articles were found. Finally, in the Scielo database, 5 results were obtained, but these were research from countries other than Spain. Therefore, these publications were excluded. Altogether, a total of 46 articles were collected.

Once the documents have been selected, a final filtering procedure was carried out on the publications to include or exclude them definitively. The following key inclusion criteria were established: (1) that the articles' objects of study are wholly or partially children who are in the educational stage of ECEC and (2) that they refer to the strategy of using social stories. Only those papers that have been peer-reviewed were included. A great abundance of Bachelor's Degree Final Projects and Master's Degree Final Projects was observed. These works were excluded because they had not been reviewed by a scientific and editorial committee. Unlike what has been done in the previous section on the use of Information and Communication

Technologies, in view of the small number of works detected, in this case it has been decided to include particularly significant review articles. These criteria have allowed us to select a total of 7 articles (see Annex 4), whose main findings are discussed below in chronological order of publication.

4.3.3.2. Social Stories in the Education of ECEC and Digital Tools' Involvement

The article by Carmen Gregori Signes, Lorena Orellana, and Marisa Samblas Beteta (2013) addresses the thesis of the potential of digital storytelling as an innovative pedagogical tool for educational intervention in children with ASD, namely through the integration of multimedia resources such as images, narrations, pictograms and sounds. The article aims to solidify the place of digital stories as a key resource for the inclusion and comprehensive development of people with ASD, while making it possible for them to participate in diverse social and educational environments. This framework also includes digitalised social stories, thought of as an evolution of traditional social stories. Social stories are proposed not only as a support for structuring routines and anticipating new situations, but also as a means of reducing anxiety and facilitating the understanding of challenging contexts.

The project developed within this framework combines the principles of social stories with the possibilities offered by digital storytelling, creating highly customisable tools that can be adapted to the individual needs of the user through portable digital devices. In particular, a pilot project was developed to familiarise children with ASD with dental procedures, as these contexts are often particularly stressful. The project included incorporating real images, personalised narrations, and sounds to build a multimodal experience that facilitates learning and reduces the stress associated with these visits. According to the study authors, digital stories stand out for their flexibility, allowing therapists and family members to modify the content in response to specific situations, and supporting the continuity of learning between the classroom and home. The authors emphasise that, although the preliminary results of the project are encouraging, it is essential to carry out additional research to validate the effectiveness of these tools and expand their applicability to other educational and therapeutic contexts.

Marta Calleja-Bautista, Pilar Sanz-Cervera, and Raúl Tárraga-Mínguez (2016), analyse the effects of music therapy on children with ASD, highlighting promising findings in children under 6 years of age. Schwartzberg and Silverman (2013) have found positive effects on social and affective development in the singing of social stories. Although repetition is a basic component in the forms of intervention of people with ASD, studies such as those by Kim et al. (2008, 2009) showed that musical improvisation improves joint attention, emotional responses, and social interaction in children aged 3 to 5 years. Likewise, research such as that of Lim (2010) and Lim

& Draper (2011) demonstrated improvements in speech through the use of therapeutic songs, which were more effective than traditional techniques without music. LaGasse's study (2014) documented improvements in joint attention and communication in group activities with 6-year-old children. These interventions, carried out in environments such as home, school and therapeutic centres, included brief 15-minute sessions to programmes lasting several months, highlighting the importance of personalisation in the therapeutic approach.

The research carried out by Inmaculada Baixauli-Fortea, Belén Roselló-Miranda, Carmen Berenguer-Forner, Carla Colomer-Diago and María Dolores Grau-Sevilla (2017) explores various approaches to addressing social communication difficulties in children with ASD. Among the strategies highlighted, social stories are presented as key tools in therapeutic interventions that are pedagogically valuable. Their design takes advantage of strengths such as visual processing and the need for predictability, including clear descriptions, guides for behaviour, and positive reinforcement. The article stresses that these stories are most effective when they are illustrated, read immediately before the situations to be worked on, and are aimed at children with sufficient verbal skills. In addition, it is indicated that these narratives not only address social issues, but can also reinforce positive behaviours, thus promoting a child's self-esteem.

According to the article, although most of the findings focus on children with verbal skills, social stories can also be adapted to early ages, including the ECEC stage, where play and visual resources have a fundamental role. In this context, these tools are particularly useful to prepare children for new routines, changes or group activities, supporting their integration into school and social environments. The article highlights the need for more comprehensive approaches that include the active collaboration of families, teachers and peers, thus optimising the benefits of these interventions for young children.

Marta Ginestar Rodríguez, Gemma Pastor-Cerezuela, Amparo Tijeras-Iborra, and María Inmaculada Fernández-Andrés (2019), analyse the effectiveness of social stories as a psychoeducational tool in people with ASD. This strategy is noted for being of great value for the development of social, communicative and affective skills. The article reviews the current scientific literature, with a focus on the effectiveness of social stories as an intervention strategy. To do so, 29 empirical studies were analysed. They were selected according to specific criteria to cover different ages, contexts and intervention objectives.

The article analyses two studies in particular that were conducted with children under 6 years of age. The results of both studies affirm that social stories are effective in implementing new behaviours and improving basic social skills when used in school environments or at home with

the active participation of family members. Studies such as those by Cihak et al. (2012) and Mandasari et al. (2011) demonstrated positive results in the acquisition and maintenance of desired behaviours in this age group. Cihak et al. (2012) used social stories to increase participation in children aged 4 to 6 years, showing positive results with maintenance of learned skills. Mandasari et al. (2011) found improvements in the behaviour of children with ASD from 3 to 5 years old by implementing social stories in combination with other visual resources. According to these studies, interventions that seek to implement new behaviours (for example, initiating social interactions or following basic rules of being around other people) obtained better results in children in ECEC than in Primary Education.

On the other hand, the effectiveness in reducing problematic behaviours depends on the design and customisation of the stories. Successful interventions were carried out in school settings or with the active participation of family members. In addition, it is concluded that social stories are highly valued by parents and teachers due to their ease of use and integration into daily routines, although in some cases other strategies, such as video modelling, have shown greater effectiveness for specific objectives. The study concludes that social stories are a valuable tool to promote social and communication skills in children under 6 years of age, especially when implemented in collaboration with family members and educators. However, their effectiveness may vary depending on the context, the design of the intervention, and the specific objectives.

The research by Carmen del Pilar Gallardo-Montes, María Jesús Caurcel Cara, Antonio Rodríguez Fuentes, and Davide Capperucci (2019), analyses the educational and therapeutic potential of social stories, highlighting how digital technologies, such as web platforms and mobile applications, have expanded their scope and accessibility for people with ASD. These tools combine text, pictograms, and visual elements, and they are shown to be highly effective resources for teaching social skills, regulating behaviours, and facilitating the understanding of everyday interactions and situations. Consequently, this approach is key to fostering independence and reducing anxiety in daily tasks, such as personal hygiene or complex social interactions.

The authors review several social story apps that stand out for their educational value. These include "Jose Learns" and "Visual Schedules and Social Stories." Both stand out for their intuitive design, neutral colours, and the ability to include automatic narrations, images, and personalised voice recordings, making them more interactive and tailored to individual needs. On the other hand, platforms such as "ARASAAC" provide downloadable resources to create social stories from scratch, facilitating their use at home, at school, and in therapeutic contexts. In this sense, the article underlines the importance of the active participation of family members and psychotherapeutic and educational professionals, to reflect real situations of the user's daily life,

thus fostering a more effective application of the skills acquired.

Lluna María Bru Luna, Manuel Martí-Vilar and Francisco González-Sala (2020), stress the effectiveness of social stories as a tool to promote pro-sociality and empathy in people with ASD. The article is a systematic review of the literature. Among the research reviewed is the study of Crozier & Tincani (2006), who found that the use of social stories in children aged 3 to 5 years reduced inappropriate behaviours and increased appropriate social responses. Social stories are notable for their ability to be personalised, allowing them to be adapted to the specific needs of participants, and were sometimes combined with other techniques, such as video modelling, to improve the generalisation of the skills learned. While the findings on social stories support effective interventions, the authors stress the need to increase the frequency and duration of these interventions, as well as to conduct further research with large samples to optimise their design and maximise their impact.

Finally, the article by Mar Salas Alcayde, Sandra Navarro Sánchez, and Diana Marín Suelves (2022) reviews the scientific literature on intervention cases for the development of social skills in students with ASD. The review was carried out among works that had been published between 2016 and 2021. 19 articles, in English and Spanish, selected from databases such as Scopus, Eric and Dialnet, were analysed. Among the articles, it is worth highlighting the study of Cassia et al. (2020) as a pioneer in verifying the effects of social stories and differential reinforcement in two children in ECEC with ASD, observing not only the improvement in their social and emotional development but also a decrease in inappropriate behaviour.

4.3.4. Conclusion

The Spanish educational system promotes inclusion from ECEC, with a preference for schooling children with ASD in ordinary classrooms with specific support. The health and social care system works closely with the education system to ensure the diagnosis and comprehensive care of children with ASD. Four basic modalities of schooling are established for these children: ordinary without support, ordinary with support, preferential centres for ASD and special education centres. In addition to these is a rarely used mixed modality which alternates education in ordinary centres and in special centres. These options are complemented by educational care measures such as curricular adaptations, specialised support and flexibility in teaching time. In July 2023, the National Council on Disability approved the First Spanish Strategic Action Plan on Autism Spectrum Disorder 2023-2027. It focuses on six lines of action: promoting respect for people with ASD, encouraging early detection and diagnosis, promoting independent living and inclusion of these people, improve education and inclusive employment, guarantee access to justice and strengthening of rights, and promote research and training. The Plan highlights the

need to solidify national criteria that guarantee inclusive and quality education, in accordance with the individual needs of students with ASD and their full integration into society.

The Spanish academic literature has repeatedly considered the relevance of Information and Communication Technologies to care for children with ASD. Although more studies dedicated specifically to the ECEC stage are lacking, the existing evidence underscores the potential of digital or technological resources at these ages. Properly used, these resources can promote attention, communication and social interaction, work on emotions, help to generalise concepts, consolidate learning, promote self-regulation, reinforce memory, and strengthen the processes of memory, ToM and joint attention, among others. The various studies agree, however, that there is a need for more teacher training in the use of these resources and how they can be adapted to pedagogical action for children with ASD, all while taking into account the children's particular characteristics in each case and the context.

In turn, the findings on the effectiveness of social stories in interventions with children with ASD highlight their role as a valuable educational and therapeutic tool, especially in children under six years of age. Social stories construct narratives tailored to the child's cognitive and communicative level and are particularly effective in promoting social skills, regulating behaviours, and preparing children for new situations or routines. In the field of ECEC, significant improvements in social interaction and the reduction of problematic behaviours have been documented when implemented in school or family contexts, when done with the active collaboration of educators and caregivers. Digitised versions of these stories expand their effectiveness by incorporating multimedia elements such as images, narrations, sounds, and music, which increases their personalisation and appeal. The research underscores that the success of social stories depends on proper design that includes visuals, directive phrases, and an approach that encourages children's participation. However, children with ASD face challenges in generalising learning to natural contexts and in the long-term consolidation of acquired skills, which highlights the importance of comprehensive approaches that involve the learner's entire environment. In summary, social stories have proved to be an effective strategy to improve the communication and social skills of children with ASD, particularly in ECEC, although their effectiveness depends on personalisation, collaboration between educational and family agents, and integration into daily routines.

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4.4. Türkiye

4.4.1. Overview of ASD care system

In Türkiye, child and adolescent psychiatrists and child neurologists can diagnose ASD. In the diagnosis process, the children's behaviours are observed by the specialists, developmental tests are applied, and the families are interviewed in detail related to children's developmental stories. The earliest diagnosis is accepted possible in 12th month of a child. During the diagnosis, experts interview family members and ask questions about child's behaviours. Thus, family involvement during early diagnosis is crucial. After diagnosis, the psychiatrists can require medical diagnosis such as Electroencephalography (EEG), Magnetic Resonance Imaging (MRI) or supportive medication to manage accompanying symptoms.

The health institutions provide services for diagnosis:

- State Hospitals' Child and Adolescent Psychiatry Departments
- State Hospitals' Child Neurology Departments
- University Research Hospitals' Child and Adolescent Departments for Mental Health and Disorders
- University Hospitals' Child Neurology Departments

The families should receive a diagnosis report from the authorised hospitals to benefit from education and support services namely Child Special Needs Report (Çocuk Özel Gereksinim Raporu, ÇÖZGER). The key regulations and support mechanisms in Türkiye, mostly focusing on the rights, services, and education include the following.

1. **Decree Law No. 573 on Special Education (1997)**

   This comprehensive law defines educational services, institutions, and programs for individuals with special needs in general. It also refers to diagnosis, IEPs, inclusive education, and parental involvement. Preschool education is made mandatory for young children with disabilities through this law.

2. **Special Education Services Regulation (2000, revised in 2006, 2009, 2010, and 2012)**

   - Clarifies assessment procedures, placement processes, and IEP development.
   - Introduces the principle of "least restrictive environment" in 2006.
   - Defines educational settings like special classes, support education rooms, and home-based services.
   - Emphasizes that services should be based on educational needs rather than type of disability.

3. **Guidance and Psychological Counselling Services Regulation (2001)**

   Establishes procedures for identifying students with special needs and providing

psychological support services.

4. **Turkish Civil Code (2001)**

   Assigns responsibilities to families for the general and vocational education of children with special needs.

5. **Law No. 5378 on People with Disabilities (2005)**

   Covers the rights and services for people with disabilities in health, education, employment, rehabilitation, social security, and care. It promotes accessibility and coordination across sectors.

6. **Amendment to the Ministry of National Education Organization Law (2005)**

   Allows state funding for special education and rehabilitation services. Education expenses of students in rehabilitation centres are covered by the Ministry of National Education.

7. **Free Education Regulation for Rehabilitation Services (2016)**

   Increases government-supported education to **8 hours of individual** and **4 hours of group training** per month, totalling **12 hours** of free education.

8. **Higher Education Institutions Disability Advisory and Coordination Regulation (2006)**

   Aims to provide necessary accommodations and support for students with disabilities including ASD in higher education.

9. **Metropolitan Municipalities Disability Services Regulation (2006)**

   Regulates public awareness, counselling, care, and the responsibilities of disability service units within municipalities.

In Türkiye, education for children with ASD is provided through special education centres and mainstreaming education. The Ministry of National Education implements various models such as in IEPs and special education classes to support the right to education of individuals with ASD. However, research shows that this system is not sufficiently developed, teachers need more training on ASD, and families experience many difficulties in the education process (Ardıç & Olçay, 2020). In particular, it has been reported that there is a strong relationship between the burnout levels of teachers and families and the symptom level of children with ASD. This situation increases both the obstacles faced by children in the educational process and the psychological burden experienced by parents.

Although supportive education, individual therapies and behavioural interventions provided in special education centres contribute to the development of children with ASD, it is emphasized that there are not enough resources and expert support in the education system in Türkiye. Studies have emphasized the need for more support for families in the education process and the importance of providing teachers with more comprehensive training on ASD (Ardıç & Olçay, 2020). In addition, it is also stated that there are physical and academic inadequacies in some schools in mainstreaming education practices and that individualized education cannot be implemented effectively. In conclusion, the education system for children with ASD in Türkiye needs to be more inclusive, expert-supported and sustainable.

Education for children with ASD in Türkiye is shaped on the basis of scientifically based practices and is carried out through individualized education programs (IEPs) tailored to the needs of each child. Within the Ministry of National Education, different models such as mainstreaming education, special education classes, and special education schools are implemented (Tohum Otizm Vakfı, 2014). Evidence-based methods such as ABA, Denver Early Start Model (ESDM), TEACCH Program, and Social Stories are among the evidence-based practices used in the education of children with ASD (Kurt & Yurtçu, 2017). In particular, ESDM has been found to be effective in reducing problem behaviours and gaining social skills in children with ASD and is a widely used method in Türkiye (Aslan, 2018). The Denver Early Start Model supports language and cognitive development by targeting intervention at an early age, while the TEACCH Program improves independent living skills through visual learning and structured teaching techniques (Meral, 2017).

4.4.2. Digital tools in ASD education

In the past 25 years, significant developments have occurred globally and in Türkiye regarding the use of digital technologies in the education of children with ASD. While early 2000s saw limited applications mainly restricted to basic computer-assisted instruction, the rapid growth of mobile technologies, AR, VR, robotics, and artificial intelligence (AI) have increasingly permeated educational practices. In Türkiye, a similar evolution can be observed, though adaptation processes were influenced by systemic infrastructural challenges, teacher training gaps, and policy-level constraints. Nevertheless, between 2000 and 2025, the academic literature demonstrates a progressive and contextually adapted use of diverse digital tools to support cognitive, communicative, social, and behavioural development in children with ASD, excluding interventions based on Social Stories.

This systematic review focuses on peer-reviewed empirical studies conducted in Türkiye between 2000 and 2025, addressing the use of digital tools in ASD education. The studies were identified through academic databases such as DergiPark, Google Scholar, the Council of Higher Education

of Türkiye (Yükseköğretim Kurulu – YÖK) Thesis Centre, and institutional repositories, using Turkish and English search terms including "otizm ve dijital teknoloji," "autism spectrum disorder and digital tools," "augmented reality," "robot-assisted learning," "mobile applications," and "educational games." Undergraduate theses and non-peer-reviewed articles were excluded. Studies involving digitalized Social Stories were excluded to maintain a clear focus on broader technological tools.

In the early 2000s (2000-2010), few studies explored basic computer-assisted instruction. From 2010 to 2015, tablet-based learning, video modelling technologies, and computer games began to emerge in interventions. A significant expansion occurred after 2015, parallel to national digitalization initiatives and global trends. Between 2015 and 2025, the literature reveals increasing diversification, including the introduction of AR/VR environments, AI-driven personalized learning platforms, and robot-mediated social interaction programs.

4.4.2.1. Distribution of Digital Tools Studies in ASD Education

The following histogram (Figure 3) illustrates the number of empirical studies conducted in Türkiye between 2016 and 2025 that employed digital tools (excluding Social Stories) in the education of children with ASI

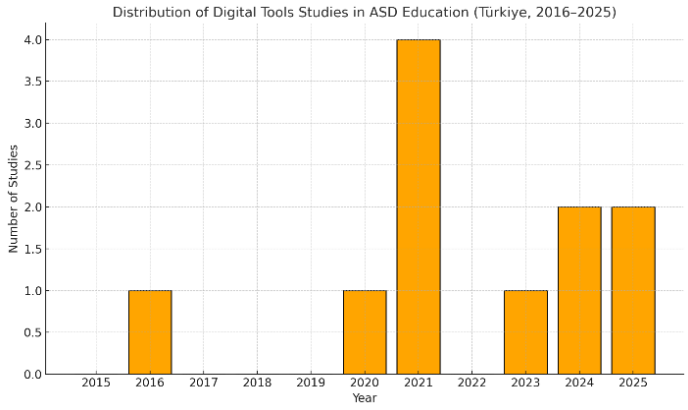

Figure 3. Yearly distribution of research about the use of digital resources published in Spain between 2015 and 2025

Bozkurt (2016) developed an interactive digital learning environment aimed at improving the social interaction skills of children with ASD. Utilizing a design-based research methodology, the study engaged autistic learners in structured digital tasks to facilitate turn-taking, initiation, and response behaviours. The results indicated that the interactive system led to high levels of student engagement

and improved social responsiveness during classroom-based interactions.

Yazıcı & McKenzie (2020) conducted a qualitative case study exploring the strategies employed by educators to develop social skills among children with ASD in Turkish special education settings. While not focused solely on a single tool, the study evaluated the integration of mobile applications and digital platforms into individualized education plans. The findings revealed that teachers frequently used digital content as part of structured interventions, and social stories emerged as one of the most preferred and effective strategies.

Şancı (2021) carried out a literature review to assess how digital tools have contributed to the development of social interaction skills in children with ASD in Türkiye. The study systematically analysed national and international sources, with a focus on web-based digital content. Results emphasized the growing academic consensus on the effectiveness of digital interventions—particularly social stories—in enhancing social behaviour and communication.

Durdu & Demirbilek (2021) reviewed existing literature to evaluate national research trends regarding digital educational interventions for autistic individuals. Their study examined peer-reviewed articles and theses published in Türkiye, highlighting the increasing presence of interactive digital environments in special education. The review found that most research concentrated on the effectiveness of digitally adapted social stories, pointing to a need for more diverse technological approaches.

Köse & Güner-Yıldız (2021) examined the impact of AR tools in special education settings for students with ASD. Through an experimental design involving AR-enhanced instructional materials, the study aimed to promote attention and cognitive retention. Participants showed significant improvements in both focus and recall abilities, suggesting that immersive AR platforms can support embodied learning and information processing in children with ASD.

Elverici (2021) conducted a mixed-methods study investigating the role of AAC mobile applications in supporting expressive communication for nonverbal children with ASD. The study included surveys and case study interviews with speech-language therapists. The findings showed that AAC apps contributed to increased vocabulary use and functional communication, although success varied depending on the individual's cognitive profile and app familiarity.

Keskin (2023) implemented an experimental study on the use of virtual reality (VR) modelling in teaching imitation skills to autistic children. The intervention involved VR scenarios where children observed and replicated modelled behaviours in a controlled digital space. Results demonstrated significant improvements in imitation accuracy and response time, highlighting VR's potential in teaching foundational learning behaviours in early childhood autism education.

Sulu, Aydın & Erden (2024) performed a meta-analysis to evaluate the effectiveness of ABA interventions that incorporated digital tools in Turkish educational contexts. Drawing from multiple single-subject and group design studies, the analysis confirmed that digital ABA programs—such as software-based prompting systems and digital reinforcement schedules—had strong positive effects on behavioural outcomes, including task completion and reduction of problem behaviours.

Güller et al. (2024) piloted the use of a humanoid NAO robot in teaching joint attention skills to children with ASD. The study employed a short-term intervention protocol in a controlled environment, focusing on gaze-following, pointing, and turn-taking behaviours. Preliminary findings suggested that robot-assisted teaching captured children's attention effectively and elicited higher rates of joint attention episodes compared to traditional instructional methods.

Kaymak, Diken & Mahoney (2025) adapted the Responsive Teaching Program into an online group-based format, targeting parent-child interaction among families with children diagnosed with ASD. Using a single-subject design, the study evaluated the effectiveness of the digital program delivered via video conferencing. Results indicated that fathers who participated in the training demonstrated increased responsiveness to their children's cues, and children showed improved social engagement behaviours.

Ozyurt & Ozyurt (2025) investigated the use of "serious games" designed to improve attention and motivation in children with ASD. Through content analysis of various game-based interventions developed or tested in Türkiye, the study found that interactive digital games—particularly those using reward systems and adaptive difficulty—were effective in maintaining engagement and enhancing on-task behaviour.

4.4.2.2. Types of Digital Tools Utilized

1. Tablet Applications: Used extensively for language development, matching tasks, and basic academic skills.
2. Video Modelling: Applied for imitation skills, functional routines, and personal safety instructions.
3. AR: Employed to enhance embodied learning experiences and support visual-spatial processing.
4. VR: Utilized for social interaction simulations and reducing sensory defensiveness.
5. Educational Games (Serious Games): Focused on promoting motivation, attention, and emotional regulation.
6. Robotics: Social robots like NAO have been used for enhancing joint attention and communication.
7. Mobile Communication Tools (AAC apps): Implemented for non-verbal communication

support.

8. AI-Based Systems: Personalized learning systems adjusting instructional difficulty based on real-time responses.

The reviewed studies consistently highlight the positive impact of digital tools on the learning experiences and developmental gains of children with ASD in Türkiye. Tablet applications and mobile platforms dominate the landscape, particularly for cognitive and communicative domains. AR and VR technologies offer promising avenues for embodied and immersive learning, though access remains limited due to high infrastructure costs. Robotics represents an emergent area with preliminary but promising findings regarding its role in social skills training. Video modelling and educational games continue to be effective for targeted skill acquisition, with particular advantages in motivation and engagement. However, common challenges include insufficient teacher training on digital interventions, limited technical infrastructure in schools, and a lack of long-term follow-up studies examining skill maintenance. Furthermore, while AI-driven personalized learning tools have been piloted, their integration into mainstream special education practices remains minimal.

From 2000 to 2025, Türkiye has witnessed a substantial expansion in the use of diverse digital technologies in the education of children with ASD. Beyond the widespread use of tablets and mobile applications, emerging technologies such as AR, VR, and robotics offer novel possibilities for more personalized, engaging, and effective educational experiences. To maximize the potential of digital tools, future efforts must focus on systemic teacher training initiatives, infrastructural investment, interdisciplinary collaboration, and long-term research into the sustainability of technological interventions. The findings affirm that digital technologies, when carefully adapted and thoughtfully implemented, can significantly enhance educational accessibility, engagement, and developmental outcomes for children with ASD in Türkiye.

4.4.3. Social Stories in ASD Intervention

Social Stories, a structured instructional method originally developed by Carol Gray (1991), have become a widely recognized evidence-based strategy for enhancing the social understanding and behavioural skills of individuals with ASD. They are increasingly being adopted in Türkiye as a method that helps children with ASD understand social situations and develop appropriate responses. The Social Stories method helps children learn about situations they may encounter in their daily lives in a structured narrative and thus contributes to improving their social interactions (Şengül-Erdem, 2021).

This systematic review investigates the academic literature on the use of Social Stories in ASD education between 2004 and 2024, drawing on a curated selection of peer-reviewed studies conducted in Türkiye.

The initial search was performed using Google Scholar and national academic platforms such as DergiPark, Avesis, and various university repositories. The search terms included “social stories,” “autism,” and “special education,” both in Turkish and English. Studies were filtered according to criteria emphasizing peer review, relevance to ASD, and inclusion of early childhood or primary education stages. Undergraduate and master's theses were excluded unless they were cited in peer-reviewed sources. This process yielded 13 qualifying studies.

The reviewed studies span a wide range of methodological approaches, including single-subject experimental designs, qualitative case studies, meta-analyses, and systematic reviews. Özdemir (2008), for instance, used a single-subject design to demonstrate that Social Stories effectively reduced problem behaviours in children with ASD. Likewise, studies such as Balçık & Tekinarslan (2012) and Kurt & Kutlu (2019) found that Social Stories were effective in teaching specific behavioural skills, although challenges in skill generalization were noted.

Notably, studies such as Olçay-Gül & Tekin-İftar (2016) and Olçay, Kıyak, & Korkmaz (2022) addressed the evidence-based nature of the intervention. The latter conducted a meta-analysis confirming that Social Stories meet the criteria of validated educational strategies in ASD contexts. Meanwhile, Yazıcı & McKenzie (2020) and Şancı (2021) reinforced the importance of personalization and routine integration, which are vital for both home and classroom implementations.

Despite the positive outcomes observed across most studies, several challenges persist. These include insufficient awareness among teachers and families, the limited incorporation of Social Stories in teacher training curricula, and disparities in technological infrastructure across educational settings.

In summary, the use of Social Stories has shown considerable promise in improving social interaction, emotional regulation, and adaptive behaviour in children with ASD in Türkiye. However, to fully harness their potential, it is necessary to strengthen professional training, expand access to resources, and promote interdisciplinary collaboration among educators, families, and clinical practitioners. As academic momentum continues to grow, future research should focus on long-term outcomes, scalability, and integration into broader inclusive education policies.

Özdemir (2008b), this study investigated the impact of Social Stories on reducing problem behaviours in children with ASD. The participants included children with ASD exhibiting challenging behaviours. Using a single-subject multiple probe design, the study found that Social Stories effectively reduced problematic behaviours and supported the regulation of students' responses in classroom environments.

Balçık & Tekinarslan (2012), the researchers aimed to explore how Social Stories support the teaching of social skills to children with ASD aged between 7 and 11. A single-subject multiple probe design was utilized, and the findings indicated that while Social Stories were effective in increasing target social behaviours, their generalization to different settings remained limited.

Sani Bozkurt & Vuran (2014), this literature review analysed national and international studies on the impact of Social Stories on social skill development in children with ASD. The findings highlighted Social Stories as an effective and widely used strategy, particularly when adapted to individual needs and contexts.

Olçay-Gül & Tekin-İftar (2016), this study examined the effect of Social Stories presented by families on the acquisition of social skills by children with ASD. A single-subject multiple probe design was employed. Results showed that family-delivered Social Stories positively impacted children's skill development, although challenges remained in maintaining these skills over time and across contexts.

Sani-Bozkurt, Vuran, & Akbulut (2017), focusing on the design and classroom implementation of interactive Social Stories, this qualitative study involved children with ASD and educators. Findings revealed that incorporating interactive elements such as visuals and child engagement tools enhanced the learning experience and helped children internalize social rules more effectively.

Kurt & Kutlu (2019), the researchers analysed the use of Social Stories in teaching abduction prevention skills to children aged 6–10 with ASD. A single-subject multiple probe design was used. The study concluded that Social Stories were successful in increasing awareness and appropriate safety behaviour, highlighting their relevance in personal security education.

Yazıcı & McKenzie (2020), through a qualitative case study, this research explored various strategies employed to develop social skills in children with ASD. Social Stories were identified as a commonly used and effective strategy, particularly in individualized education programs, and were supported by both teachers and therapists.

Dablan & Bağlama (2020), this systematic review examined postgraduate theses on the use of Social Stories in ASD education in Türkiye. The analysis emphasized the growing academic interest in this approach and underscored Social Stories' role in enhancing social interaction and behavioural development.

Şancı (2021), conducting a comprehensive review of studies focused on developing social interaction in children with ASD, the author identified Social Stories as one of the most effective tools. The literature supported their use for early intervention and inclusion practices within both

school and home environments.

Durdu & Demirbilek (2021), this literature review aimed to evaluate general trends in research on individuals with ASD in Türkiye. The review noted an increasing number of studies on the effectiveness of Social Stories in recent years, particularly in the context of early education and behavioural adaptation.

Olçay, Kıyak, & Korkmaz (2022), this meta-analysis assessed whether Social Story interventions meet the criteria for being considered evidence-based practices. Including both quantitative and descriptive data from various studies, the findings confirmed that Social Stories qualify as an evidence-based method in special education settings in Türkiye.

Akgün-Giray & Ergenekon (2022), this study evaluated the impact of Social Stories developed by pre-service special education teachers on the social skill acquisition of children aged 8–11 with ASD. Combining single-subject design with qualitative methods, the research found that teacher-designed stories were particularly effective in enhancing social engagement and interaction in the classroom.

Kurtça (2023), this research examined the effectiveness of Social Stories in teaching social skills to adults with intellectual disabilities. A single-subject experimental design was utilized. The study concluded that Social Stories significantly improved the acquisition of targeted behaviours and contributed to the sustainability of learned skills, demonstrating applicability beyond childhood.

The findings from the 13 studies conducted in Türkiye between 2008 and 2023 collectively suggest that Social Stories are an effective and increasingly adopted instructional method for enhancing the social and behavioural skills of individuals with ASD. Most studies employed single-subject multiple probe designs, allowing for in-depth observation of individualized behavioural changes. A consistent theme across the research is the effectiveness of Social Stories in reducing problem behaviours and improving social interaction, particularly when personalized to the needs of the learner. The inclusion of families—especially parents—as implementers of the stories has been shown to significantly enhance the success of interventions, highlighting the importance of home-school collaboration. Moreover, the integration of interactive and digital formats appears to further increase engagement and learning outcomes, as these formats allow for multimedia enrichment and greater adaptability to different learning styles. While Social Stories have proven especially beneficial in teaching social behaviours, they have also been successfully applied in areas such as personal safety and behaviour regulation, including abduction prevention training. In the education models implemented in Türkiye, it is stated that teachers' competencies in scientifically based practices should be increased, and in this context, the importance of investing more in teacher training and family support programs is emphasized. Scientifically based practices are becoming

widespread in the education of children with ASD in Türkiye, but more expert and institutional support is needed to increase the effectiveness of these methods.

Nevertheless, several studies noted limitations regarding the generalization and long-term retention of learned behaviours, suggesting the need for supplementary strategies or reinforcement systems. There is a growing trend of academic interest in Social Stories, as reflected by the increasing number of graduate theses and empirical studies on the subject in recent years. Importantly, teacher candidates have also been involved in developing and delivering Social Stories, indicating a positive shift in pre-service teacher education and awareness. Lastly, although traditionally associated with children, Social Stories have also demonstrated effectiveness among adults with intellectual disabilities, pointing to their versatility across age groups and developmental stages. Overall, Social Stories stand out as a valuable, flexible, and evidence-based tool in the Turkish special education landscape, although further research is needed to optimize implementation strategies and ensure broader generalization of outcomes.

4.4.4. Digital Social Stories in ASD Intervention

This systematic review explores the current academic landscape regarding the use of digital tools in the education of children with ASD in Türkiye, covering the period from 2004 to 2025. The review draws exclusively from 12 peer-reviewed empirical studies identified through targeted searches using Google Scholar, DergiPark, Avesis, and university repositories. Search terms included both English and Turkish keywords such as “autism spectrum disorder” / “otizm spektrum bozukluğu”, “digital tools” / “dijital araçlar”, and “education” / “özel eğitim”. The inclusion criteria excluded undergraduate and master’s theses, retaining only high-quality, peer-reviewed publications that explicitly focuse tal technologies.

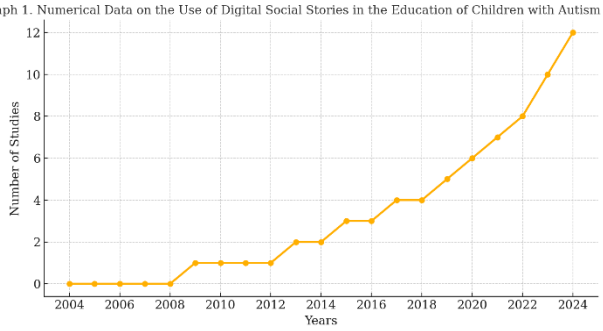

Figure 4. Yearly distribution of research about the use of digital resources published in Spain between 2005 and 2025 (Source: Scopus)

As illustrated in Figure 4, the volume of academic publications in Türkiye focusing on Social Stories

remained low until the mid-2010s. Starting in 2015, however, a gradual and steady increase can be observed. This trend aligns with broader developments in Türkiye's educational technology landscape, as well as with increased awareness of inclusive education practices. The most pronounced growth occurred after 2020, suggesting an expanding academic interest in the practical application of digital tools to support learners with ASD.

Academic production in this field in Türkiye was initially sparse and scattered, with the first relevant publication emerging in 2008. A clear shift occurred after 2015, with a noticeable increase in the number of studies utilizing digital tools within special education contexts. This trend appears to align with broader national efforts toward educational digitalization and growing awareness about the need for innovative instructional strategies tailored to the needs of children with ASD. Between 2015 and 2025, research in this area has gained significant momentum, culminating in a peak in 2025 with three separate empirical studies.

Of the 12 studies examined, 100% are empirical and based on single-subject or multiple probe research designs, indicating strong methodological consistency across the literature. A substantial number of these studies focus on school-aged children between 6 and 12 years old, although a few also include early childhood participants, particularly in interventions involving parental involvement. The most frequently used digital tools across the studies include tablet-based learning environments, mobile applications, digital social stories, AR, and video modelling technologies. A smaller subset of the literature investigates the use of gamified systems and “serious games” to promote attention and engagement, with studies like Ozyurt & Ozyurt (2025) demonstrating effective outcomes in motivation and social participation.

Studies such as those by Dablan & Bağlama (2020) and Durdu & Demirbilek (2021) suggest that while academic interest is growing, a more consistent and structured national strategy is needed to support the use of digital Social Stories in ASD education. Research by Sani-Bozkurt, Vuran & Akbulut (2017) highlighted the use of interactive, digital formats, emphasizing their increased engagement potential. Tablet-supported digital social stories emerge as one of the most prominent tools, particularly in the studies conducted by Özdemir (2008) and Boşnak & Turhan (2020), both of which reported improvements in children’s social interaction skills. Video modeling, often used in conjunction with social stories, has also proven effective. For instance, Turhan & Vuran (2015) and Kutlu & Kurt (2023) found that digital stories enhanced with video modelling led to better social and personal safety skill acquisition. Similarly, studies by Acar, Tekin-İftar, & Yıkmış (2017) highlight the added value of parental involvement, particularly when mothers administer the interventions themselves.

A growing number of studies have emphasized the digitalization of Social Stories and the added

value of visual and auditory support. Researchers such as Akgün-Giray & Ergenekon (2022) noted that multimedia content not only enhances attention and retention but also allows educators to personalize stories based on learners' needs and developmental profiles. These studies also frequently underscore the value of involving caregivers in the implementation of Social Stories, which has been shown to improve consistency and effectiveness.

More recent studies have expanded the technological scope. Köse & Güner-Yıldız (2021) utilized AR-based instructional materials to support embodied learning, reporting gains in cognitive and attention-related domains. Güler & Erdem (2022) explored mobile social story applications for teaching socio-communicative skills, while Jale & Tuba (2025) designed interactive visual card systems to support emotional recognition and expression. Further, Kaymak, Diken & Mahoney (2025) developed an online group-based intervention for fathers and children, marking a notable move toward remote education modalities in special education. Studies like Sulu, Aydın & Erden (2024) have taken a meta-analytical approach to synthesize findings on ABA interventions that incorporate digital components, emphasizing their effectiveness and replicability in Turkish special education settings.

Across the 12 studies, the primary developmental goals targeted through digital interventions are communication and language development (reported in 4 studies), social interaction (6 studies), attention and memory (2 studies), and emotion recognition (1 study). These goals reflect the broader developmental priorities in ASD education and underscore how digital tools can be effectively tailored to address specific cognitive and behavioural needs. Notably, while all interventions report positive or partially positive outcomes, a recurring observation throughout the literature is the variability in teachers' technological readiness and infrastructure support, which may influence implementation fidelity.

In sum, the integration of digital tools into ASD education in Türkiye has progressed considerably between 2005 and 2025. While initial efforts were isolated and exploratory, recent research has been increasingly comprehensive, methodologically sound, and contextually grounded. The reviewed studies provide robust evidence that when appropriately designed and implemented, digital interventions can significantly enhance the educational experiences and developmental outcomes for children with ASD. These findings call for more sustained investment in teacher training, cross-disciplinary collaboration, and policy frameworks that support the inclusive, technology-enhanced education of neurodiverse learners.

Özdemir (2008a) investigated the effectiveness of multimedia-supported social stories in enhancing social interaction among children with ASD. The target population of the study consisted of children with ASD who had limitations in social communication skills. Using a single-subject research

design, the results indicated that multimedia-based social stories were effective in increasing the social interaction levels of children with ASD.

Turhan & Vuran (2015) aimed to compare the effectiveness of social stories and video modelling in teaching social skills to children with ASD. The participants were children diagnosed with ASD who required support in acquiring social behaviours. Implemented through a single-subject comparative analysis, the study found that social stories combined with video modelling were more effective in promoting social skill development.

Acar, Tekin-İftar, & Yıkmış (2017) examined the impact of social stories and video modelling presented by mothers on the acquisition of social skills in children with ASD. The study focused on children aged 7 to 10 with social skill deficits. Utilizing a single-subject multiple probe design, the findings revealed that both approaches—when delivered by mothers—were effective in enhancing children's social abilities.

Boşnak & Turhan (2020) explored the use of tablet-based social stories in teaching social skills to children with ASD. The study targeted children aged 6 to 12 with diagnosed ASD. Conducted using a single-subject design, the research concluded that tablet-supported social stories were effective in fostering social skill acquisition.

Köse & Güner-Yıldız (2021) investigated the use of AR-enhanced learning materials in special education for individuals with ASD. The target group consisted of autistic learners with various educational support needs. Based on an experimental research method, the study demonstrated that AR-based tools positively impacted attention and learning processes in children with ASD.

Güler & Erdem (2022) assessed the effects of mobile social story applications on the development of social and communicative skills in children with ASD. The study involved autistic children who exhibited limitations in social communication. Using a single-subject design, the study found that mobile-supported digital stories had a positive effect on children's social engagement.

Kutlu & Kurt (2023) aimed to compare social stories and video modeling in teaching personal safety skills to children with ASD. The participants were children with ASD requiring support in acquiring daily life and safety skills. Conducted using a single-subject multiple probe design, the study showed that video modeling-supported social stories were more effective than using social stories alone.

Kurt & Erden (2024) investigated the perspectives of pre-service special education teachers in Türkiye regarding the use of assistive technologies. The target group consisted of university students training to become special education teachers. Using a survey research model, the results indicated generally positive attitudes toward technology but highlighted a lack of practical training and

application skills.

Sulu, Aydın, & Erden (2024) conducted a meta-analysis to examine the effectiveness of ABA-based digital interventions for individuals with ASD in Türkiye. Drawing on various empirical studies, the research focused on synthesizing effect sizes of digital ABA implementations. The findings supported the efficacy of digitally-assisted ABA programs in improving behavioural and educational outcomes.

Kaymak, Diken, & Mahoney (2025) evaluated the effectiveness of the Turkish adaptation of the Responsive Teaching Program, delivered as an online group intervention involving fathers and their children with ASD. The participants included children with ASD and their fathers. Using a single-subject design, the study concluded that digital group-based interventions had a positive impact on parent-child interaction and social development.

Ozyurt & Ozyurt (2025) explored the use of "serious games" as educational tools for children with ASD in Türkiye. The participants were children with ASD involved in gamified learning environments. Through content analysis, the study found that digital game-based interventions were effective in increasing motivation, attention, and social participation among children with ASD.

Jale & Tuba (2025) investigated the use of digital illustrated cards in teaching emotional recognition and social skills to children with ASD. The participants included children who showed delays in emotional awareness and expression. Using an experimental research design, the findings demonstrated that interactive digital cards were effective and applicable tools for supporting emotional and social development in autistic learners.

The reviewed body of research spanning from 2008 to 2025 presents a steadily evolving picture of how digital tools are being integrated into the education of children with ASD in Türkiye. Across these 12 empirical studies, several consistent patterns and thematic outcomes emerge that contribute to our understanding of effective practices and current limitations in the field.

First and foremost, the studies demonstrate a strong and growing reliance on single-subject research designs, highlighting a methodological preference within Türkiye for detailed, individualized observations particularly suited to special education contexts. These designs have proven effective in isolating the impact of specific interventions such as video modelling, digital social stories, and mobile applications.

In terms of effectiveness, nearly all of the reviewed studies report positive educational and developmental outcomes following the implementation of digital tools. Social stories—particularly those delivered via multimedia or tablets—consistently appear as one of the most successful

interventions, significantly improving social interaction and personal safety skills among children with ASD. Furthermore, video modelling, often used in conjunction with social stories, has been found to enhance the acquisition and generalization of targeted behaviours, particularly when delivered by parents or caregivers, underscoring the role of family involvement.

More recent studies have extended the scope of digital interventions to include AR and serious games, indicating an expanding interest in immersive and gamified learning environments. These technologies have been shown to support not only engagement and motivation, but also attention regulation and cognitive flexibility—skills often underdeveloped in children with ASD. Likewise, mobile and online platforms have enabled greater accessibility and flexibility, particularly in family-centred interventions such as those involving fathers or caregivers at home.

Despite the overall positive outcomes, the studies also underscore gaps in teacher preparation and technological readiness. Findings from teacher-focused research reveal that while attitudes towards assistive technologies are generally favourable, there is a lack of hands-on training and structured support systems for educators in special education settings. This suggests that the successful integration of digital tools is often contingent upon institutional and professional readiness, not just the availability of the technologies themselves.

The research also reflects a relatively balanced focus across core developmental domains, including social interaction, communication, cognitive skills (attention, memory), and emotional recognition. However, a heavier emphasis is placed on social and communicative development, indicating both the perceived needs within the ASD community and the strengths of current technological solutions.

In conclusion, the studies collectively affirm that digital tools—when thoughtfully selected and contextually adapted—can significantly enhance the educational experiences of children with ASD in Türkiye. These tools are particularly powerful when embedded in individualized, structured interventions and when caregivers or teachers are appropriately trained and involved. Nonetheless, there remains a clear need for broader systemic support, more comprehensive teacher training, and continued research into emerging technologies to fully realize the transformative potential of digital learning environments in special education.

4.4.5. Conclusion

This systematic review provides a comprehensive overview of the evolution and current state of academic research on the use of digital tools and Social Stories in the education of children with ASD in Türkiye between 2005 and 2025. The findings from the reviewed literature indicate a steady progression in the development and implementation of technology-supported pedagogical strategies, particularly following the year 2015, in line with Türkiye's broader efforts toward

educational digitalization and inclusive practices.

A central finding of this review is the consistent effectiveness of Social Stories—especially when delivered through digital platforms—in promoting social interaction, communication, and behavioural regulation in children with ASD. Among the 12 peer-reviewed empirical studies analysed for the digital tools section, Social Stories emerged as the most frequently employed and effective method, followed closely by video modelling, AR, and mobile applications. Tablet-supported digital narratives and serious games were also associated with improvements in motivation, emotional regulation, and social participation.

Further analysis of 13 academic studies focusing specifically on Social Stories (2008–2023) supports the conclusion that this method is not only widely accepted but also increasingly used in diverse intervention contexts across Türkiye. These studies, most of which employed single-subject designs, affirm the value of individualized, context-sensitive instruction and highlight the significant impact of caregiver involvement in reinforcing behavioural gains. Interactive digital formats, often enriched with audio-visual stimuli, were shown to increase student engagement and long-term retention of social behaviours. Notably, the implementation of Social Stories extended beyond childhood populations, with studies showing positive effects among adults with intellectual disabilities as well.

Despite the promising outcomes, the literature also identifies critical limitations in infrastructure, teacher readiness, and policy-level support. Although attitudes toward educational technologies are generally favourable among educators, many lack practical training and consistent institutional backing. In some cases, the limited generalization of learned behaviours to new environments underscores the need for supplementary reinforcement strategies and systematic monitoring.

In light of these findings, several recommendations can be made. Firstly, there is a pressing need to enhance teacher training programs to ensure educators are equipped with the skills required to implement digital interventions effectively. Secondly, family support systems should be strengthened to facilitate continuity between school and home environments. Thirdly, national education policies should be adapted to formally recognize and integrate evidence-based digital tools, including Social Stories, into curricula for children with ASD.

In conclusion, the growing body of empirical research confirms that digital tools and Social Stories, when thoughtfully applied, can significantly enrich the educational experiences of children with ASD in Türkiye. However, to fully realize their transformative potential, these interventions must be embedded within a more inclusive, technologically equipped, and professionally supported educational ecosystem.

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5. Comparative Analysis Across Countries

5.1. Similarities in ASD care systems and interventions, use of digital tools and social stories in ECEC

This report outlines the key common research themes and the similarities in the focus areas of the academic and policy literature concerning the ASD care systems, digital tools and social stories used in Poland, Romania, Spain and Türkiye as synthesized from the reviewed documents.

5.1.1. Diagnosis of ASD

Table 1. provides the similarities of the implementations for the diagnosis of ASD in the reviewed partner countries as follows.

Common Feature	Poland	Romania	Spain	Türkiye
Diagnose by experts	Yes – Diagnosis process requires expertise	Yes – Diagnosis process requires expertise	Yes – Diagnosis process requires expertise	Yes – Diagnosis process requires expertise
Early Diagnosis	Available yet, access is limited	Available, yet access is limited and public awareness is inadequate	Available yet, practice has some gaps	Available yet, public awareness is inadequate
Transition to special education and social support after diagnosis	Yes – Mediation to special education is available	Yes – NGOs serve as bridges	Yes – Cooperation between educational institutions and social services	Yes – A report (ÇÖZGER) required for special education services
Family Involvement	Yes	Yes	Yes	Yes

Table 1. Diagnosis of ASD in the partner countries

The early diagnosis of ASD in Poland, Romania, Spain and Türkiye are available and diagnosed by experts. Child observations and family interviews play a critical role in the diagnosis process. Early diagnosis and intervention are accepted an important goal in each country, however, there are challenges in access in different levels. Reviews commonly highlight some delays in diagnosis, limited screening programs, and the need for structured early intervention frameworks. After the

diagnosis, families are led to educational or social service mechanisms aligned with their own systems.

5.1.2. Educational support for children with ASD

Table 2. provides the similarities in the educational practices in the reviewed partner countries as follows.

Common Feature	Poland	Romania	Spain	Türkiye
Acceptance of Inclusive Education Principle	Yes – All students' education in mainstream inclusive education settings is encouraged.	Yes – Law supports the inclusion. However, there are limitations in practice.	Yes – Inclusion is the fundamental principle of the educational system including ECEC	Yes – Inclusion is provided by the mainstream state schools
Individualised Education Plans	Individual education planning is available through Special Education Needs Report	Individual special needs' recognition is foreseen, however, insufficient in practice.	Individual support is provided after psycho-pedagogical assessment	Individual Education Programme (IEP) is conducted with some practical challenges
Flexibility through Various Educational Institutions	General inclusion and private schools are available.	Special education schools are available, yet limited.	Mainstream schools with individual support, preferential centres and special education centres are available.	Besides mainstream schools, special education centres are available.

Support from Experts/Specialists	Expert support such as therapy, speech therapy, psychological support is available.	Lack of experts and specialists is a challenge but NGOs provide support.	Expert teachers (TP, AL) and guidance units are available	Expert support is available in special education centres yet limited.
Early Intervention	Emphasised	Emphasised	Emphasised	Emphasised
Family Engagement	Encouraged	Encouraged	Encouraged	Encouraged

Table 2. Similarities of the educational practices in the partner countries

All countries examined have the legal infrastructure, protecting and supporting the educational rights of individuals with ASD, including children in ECEC period. Individualisation in educational intervention (IEP) is a fundamental approach also in inclusive education settings. Inclusive education is disseminated to integrate individuals with ASD with the society through mainstream and private special education institutions, family involvement is encouraged, early intervention is prioritised. Those similarities show that the educational systems in those countries depend on the universal special education principles.

5.1.3. Digital Tool Usage in ASD Intervention in Reviewed Literature

Table 3 demonstrates the similarities in the use of digital tools in ASD intervention in the reviewed literature of the partner countries.

Common Feature	**Poland**	**Romania**	**Spain**	**Türkiye**
General Use of Digital Tools in ASD Education	Mentioned	Mentioned	Mentioned	Mentioned
Application-oriented Approaches (Mobile – Tablet, etc.) Robotic	Mentioned	Mentioned	Mentioned	Mentioned

Interventions, e-learning platforms				
Lack of teacher training	Mentioned	Mentioned	Mentioned	Mentioned

Table 3. Similarities in the use of digital tools in ASD intervention in the reviewed literature of the partner countries

In all reviewed countries, digital tools play a supportive role in the education of individuals with ASD. Tablets, applications and specifically created software are widespread. Digital content for individuals with ASD is provided in all reviewed countries through mobile applications and digital platforms, although not that common in Romania. The digital tools are preferred due to their advantages for accessibility and individualizable features. The commonly-mentioned digital tools in the literature reviews are mobile and table applications including interactive quizzes and games, specifically developed software, robotics, AR, VR, and national-level e-learning platforms. A persistent challenge noted in the all the literatures reviewed is the lack of adequate further teacher training in the field of digital technologies for children with ASD.

5.1.4. Social Stories' Usage in ASD Intervention in Reviewed Literature

Table 4. indicates the similarities in the social stories' usage in ASD intervention in the reviewed literature of the partner countries.

Common Feature	Romania	Spain	Türkiye
General Use of Social Stories in ASD Education	Mentioned	Mentioned	Mentioned
Use of Social Stories for Behaviour Management	Mentioned	Mentioned	Mentioned

Table 4. Similarities in the social stories' usage in ASD intervention in the reviewed literature of the partner countries

Except for Poland, the literature in Romania, Spain, and Türkiye includes studies regarding the use of social stories in early ASD intervention. In general, the reviewed studies dwell on the effects of social stories on reducing behavioural issues and enhancing social behaviours. In three literature

reviews, the effect of social stories in reducing anxiety and the importance of personalisation of social stories are handled.

5.2. Key differences in ASD care systems and interventions, use of digital tools and social stories in ECEC

5.2.1. Key Differences in the Diagnosis of ASD

Table 5. provides the key differences of the implementations for the diagnosis of ASD in children in ECEC in the reviewed partner countries as follows.

Category	Poland	Romania	Spain	Türkiye
Accessibility Easiness to Diagnosis	Long waiting time	Accessibility challenges especially in rural areas – Lack of public awareness	Regional differences	Lack of public awareness
The structure of diagnosis centres	Psychological counselling centres and special clinics	Mostly NGO-supported mechanisms	Cooperation of health, social service and educational institutions	State and university research hospitals' indicated departments
The role of NGOs	Supportive	Very active	State-support mechanisms are more at the forefront	Supportive
Lack of services in the diagnosis of girls	Not mentioned	Not mentioned	Emphasised	Not mentioned
Structure of transition to support after	Education-oriented	Access to services through	Inter-agency referral system	Transition to education and social services

diagnosis	NGOs	support through official report

Table 5. Key differences of the implementations for the diagnosis of ASD in children in ECEC in the reviewed partner countries

The key differences among the reviewed countries are seen in access to diagnosis, the structure of the diagnosis centres, the capacity to deliver services to rural areas, the role of NGOs, and the structure of transition to support mechanisms after diagnosis. In Romania, individuals have some challenges to access diagnosis especially in rural areas and also in urban centres. NGOs and parental organisations close the gaps in many aspects. Spain provides a more structured system in terms of institutional cooperation. However, insufficient diagnosis mechanisms for girls are a recognised issue, solutions are sought for. Poland has mostly special counselling and diagnosis centres. However, there are challenges for families, requiring long waiting hours. In Türkiye, state support for diagnosis is provided in an efficient way, however, public awareness should be addressed for early diagnosis.

5.2.2. Key differences in educational support for children with ASD

Table 6 provides the key differences in the educational practices in the reviewed partner countries as follows.

Category	Poland	Romania	Spain	Türkiye
Legal and Institutional Infrastructure	There is a detailed legal regulation and a certified and individualised educational system	Legal framework is available but infrastructure is challenging, causing problems in practice.	Legal infrastructure is strong. Especially, ECEC and referral services are systematic.	Legal infrastructure is available. However, there are physical and professional insufficiencies in educational institutions.
Educational models	There are diversified schools; mainstream, integration,	There is an inequality in access to education. Access to school	5 different educational models are provided comprehensively	3 different educational models are provided including

	special classes.	is difficult in rural areas.	from individual support to combined special education.	inclusive education, special education classes in mainstream schools and special education schools.
Support services and access	There is a state-supported system strengthened with social assistance.	NGOs provide fundamental support and state services are insufficient.	Both public and private institutions are actively working and there are referral centres.	Individual therapies and behavioural interventions are available but there is a lack of expert and resources.
Financial aid	Care assistance and social assistance are available.	Limited support for families through NGOs	Not mentioned, educational support is at the forefront.	Not mentioned but educational support was emphasised.
Differences in rural and urban areas	There is a lack of expert and access problems in rural areas.	Rural areas are disadvantaged and educational support is available mostly in urban areas.	There are differences in rural-urban areas in some regions.	Not mentioned

Table 6. Key differences in the educational practices in the reviewed partner countries

Although all countries have educational systems embracing special education interventions for individuals with ASD, there are structural and implementation-oriented differences. Poland has developed its special education infrastructure through EU harmonisation process and been striving to approach EU standards. However, there are insufficiencies in the number of competent experts and educators. Although Romania has a legal framework, the individuals with ASD are faced with serious challenges in practice such as lack of resource, teacher inefficiency, and social stigma. Spain

has inclusive and advanced practices and its inclusive educational policies are effective. However, there are concerns regarding early diagnosis, especially misdiagnosis of girls, and challenges in early intervention. Türkiye has established IEP implementations, educational infrastructure such as guidance and counselling services and inclusive education systems, however, there are challenges for diagnosis and intervention especially in rural areas, lack of experts, leading to regional differences in intervention quality and expert employment.

5.2.3. Key Differences in Digital Tool Usage in ASD Intervention in Reviewed Literature

Table 7 demonstrates the key differences in the use of digital tools in ASD intervention in the reviewed literature of the partner countries.

Category	Poland	Romania	Spain	Türkiye
Number of reviewed studies	13	8	5	11
Digital tools	Focus is on tablet and mobile application and e-learning platform use	Focus is on XR application (VR, AR and MR)	Focus is on AR and mobile/tablet applications.	The literature covers diverse topics without a specific focus on any digital tool types.
Uniquely mentioned digital tools	Applications: Able AAC, ClaroSpeak, NikiTalk, Scratch, Matzoo, Kahoot, Lulek.tv, AltspaceVR Web-based platforms: Genially,	Mobile and web-based platform: Autism Assistant XR	Social Robot: PLEO Rb AR integrated with Pictogram Room	Humanoid robot: NAO AI-driven platforms

	AutismPro Serious Game: Gyroscope-based game			
Research Topics	Focus is on social communication and routine dependency in children with ASD	Focus is on social communication skills and life quality of children with ASD	The literature covers various topics emphasising attention and communication skills in children with ASD.	Focus is on social interaction and communication skills.
Results	Digital technologies facilitate social communication od children with ASD, increase their motivation to learn, and provide a more structured learning experience. Teachers need to receive training for effective use of digital tools.	Digital technologies have a great potential for the education and therapy of children with ASD. There is a lack of digital tools in Romanian language. There is a need for more empiric studies and teacher training for the effective use of digital tools.	Digital technologies are effective in various skill developments in children with ASD. Female teachers use mobile applications mostly and 83,2% of the reviewed mobile applications are found effective.	Digital technologies have positive effects on children with ASD in terms of cognitive and social communication development. The challenges are the lack of teachers and technical infrastructure.

Table 7. Key differences in the use of digital tools in ASD intervention in the reviewed literature of the partner countries

The Polish literature features with its studies revealing the effectiveness of the existing digital technologies and research examining digital tools for monitoring diagnosis and therapy processes which differentiate from other three literatures reviewed. However, empirical studies specifically exploring the application of digital tools in early interventions for children aged 3–7 with ASD are underrepresented. The absence of domestic empirical research, particularly on the efficacy, cultural adaptation, and long-term outcomes of digital interventions in Polish settings, is highlighted as a challenge.

Specific mentions in the Polish literature

- Remote psychological and pedagogical support using digital resources,
- A study on teachers' use of new technologies in mathematics education,
- Studies on mobile device and application (AUTMON) use in diagnosis and monitoring therapy progress,
- The potential of interactive media like robots and visual programming languages.

The Romanian literature indicates that the adoption of digital tools for children with ASD has begun but remains in its infancy. Research emphasises the role of technology in supporting children with ASD, with some studies providing broad overviews of various tools focusing specifically on Extended Reality (XR) mobile applications (augmented, virtual, and mixed reality). Serios games or gamified systems aren’t explored in the reviewed Romanian literature. Lack of resources, inadequate funding for tools and infrastructure (especially in rural areas), and a lack of adequate training for educators in integrating digital tools are noted challenges in the implementation of these tools, which is reflected in the literature. Another unique and significant challenge mentioned in the literature is language accessibility since many global applications and software are only available in English, limiting the use for non-English speakers, especially children with ASD.

Specific mentions in the Romanian literature:

- Development of specific Romanian-language therapeutic software ("Autism Assistant")
- The use of technology for socialisation; positively correlated with perceived quality of life
- Use of XR holds significant potential in educational and therapeutic processes of children with ASD. However, their effective and safe use requires rigorous technical design, careful testing procedures, and adherence to ethical standards.

The Spanish literature includes empirical studies but notes a lack of studies specifically for the ECEC stage. The studies reviewed focus on the potential of applications for strengthening ToM,

educators' use and assessment of apps, the use of robotics (e.g., PLEO Rb robot) for social skills and AR combined with dialogic reading which is uniquely handled in one study. Digital storytelling, including digitalised social stories, is also examined as an innovative pedagogical tool. Studies point out limitations in the available digital applications, such as insufficient attention to the emotional field and linguistic restrictions.

Specific mentions in the Spanish literature:

- reviews of social story apps (such as "Jose Learns," "Visual Schedules and Social Stories,") and platforms (such as "ARASAAC") as effective resources
- effectiveness of the social robotics (e.g., PLEO Rb robot) to address the specific needs of students with ASD and the importance of careful design in interventions

Türkiye shows a strong reliance on empirical single-subject or multiple probe research designs across studies. The Turkish literature shows that there have been significant developments in the use of digital technologies in ASD education, with a progressive adaptation influenced by national initiatives. The literature reveals increasing diversification after 2015, including AR/VR environments, AI-driven platforms, and robot-mediated social interaction programs. The challenges are indicated as limited access to technologies like AR and VR due to infrastructure costs and variability in teachers' technological readiness. Video modelling and serious games are also included in the literature.

Specific mentions in the Turkish literature:

- Gamified systems and "serious games", used to promote attention and engagement
- Robot-assisted learning (NAO robot)
- Video modelling combined with digital social stories in teaching social and personal safety skills

5.2.4. Key Differences in Social Stories' Usage in ASD Intervention in Reviewed Literature

Table 8 indicates the key differences in the social stories' usage in ASD intervention in the reviewed literature of the partner countries.

Category	Poland	Romania	Spain	Türkiye
Studies about social	-	4	7	25

stories				
Studies including digital tool intervention	-	1	7	12
Research aims	-	Social and emotional development and social communication	Social and emotional development and social communication	Social and emotional development and social communication – Academic success, personal safety

Table 8. Key differences in the social stories' usage in ASD intervention in the reviewed literature of the partner countries

The main difference in the literatures reviewed about the use of social stories is that there are no data, found on social stories and their usage through digital tools in the Polish literature however they are used in the therapy of children as a tool to support social and emotional development of children with ASD in Poland. The Turkish literature examined the use of social stories separately by the existence of the variable "the digital tool usage" and as a result, found 12 out of 25 studies with digital tool intervention. Romania literature included both (one study mentioned digital tool usage) and Spain literature included only digital tool used studies. In terms of the objectives of the research conducted in Romania, Spain and Türkiye, the studies are mostly focused on enhancing social and emotional and social communication skills and reducing problem behaviours. In the Turkish literature, academic improvement is also mentioned in two studies besides social and emotional skills and one study focused on personal safety as a specific research subject. In the Romanian literature, therapy dogs' usage in one study and in the Spanish literature, the use of musical therapy in one study come to forefront as different therapies examined.

6. Discussion and Conclusion

6.1 Most commonly used digital tools for ASD education

The literature reviews examined mention several categories of digital tools used for the education of children with ASD. The concentrated focal points of the reviewed literatures are given as follows.

Table 9 provides the most commonly used digital tools in ASD intervention in the reviewed literature of the partner countries.

Poland	Romania	Spain	Türkiye
Mobile/tablet applications and web-based platforms	XR applications	Mobile/Tablet applications and AR	No focal point

Table 9. Most commonly used digital tools in ASD intervention in the reviewed literature of the partner countries

Identified commonly-mentioned digital tools in the literature reviews across these partner countries are explained as follows:

1. Mobile and tablet applications, including interactive quizzes and games

These are described as widespread and are specifically noted as dominating the field in Türkiye. In Spain, mobile/tablet applications are a focal point in the limited literature on ECEC. Polish literature also discusses the use of mobile devices and applications, by also mentioning low adoption rate for diagnostic and therapy monitoring purposes despite their recognised potential. Romanian research confirms the role of technology in supporting children with ASD, with some studies focusing on mobile applications.

2. Specifically developed software

Examples to specifically developed software mentioned include "Autism Assistant" in Romania, a Romanian-language platform designed for home-based interventions, and "Spektrum Autyzmu Pro" and "AutismPro" therapy support systems in Poland.

3. Robotics

Robotics interventions are mentioned as a common category. Specific examples include the PLEO Rb robot in Spanish literature, and the humanoid NAO robot in Turkish literature. Interactive media like robots (e.g., Scratch) are also discussed in the Polish context for supporting logical thinking and independence.

4. AR, VR and MR

These technologies are covered by an umbrella term “Extended Reality (XR)”. AR and VR technologies offer promising environments for immersive learning in Türkiye, although access is limited by infrastructure costs. Spain's ECEC literature focuses on AR and mobile/tablet applications, including AR technology. In one study, the AR technology integrating the "Pictogram Room" tool for improving joint attention skills is used. Romanian research specifically highlights XR applications (VR, AR, and MR) as a focus and notes the potential of VR in the education of children with disabilities with also a specific focus on potential gamification features in those technologies. In Poland, literature shows that social applications related to VR technology have great educational potential. The AltspaceVR application is mentioned as an example of a VR application.

5. National-level e-learning platforms

Poland mentions e-learning platforms as a focus and includes examples like Matzoo, Kahoot, and Lulek.tv. The "Genially" platform used to create interactive presentations and games is also mentioned in Polish literature.

6. Games

Gamified systems and "serious games" are mentioned in Türkiye for promoting attention and engagement, and are included as part of mobile/tablet apps in the common features. Custom-designed games are mentioned in the Polish literature (gyroscope-based game). And as part of AR and Pictogram Room integration, Spain literature analyses the use of games in ASD intervention.

6.2 Social and emotional development skills in the reviewed literature

Table 10 demonstrates the social and emotional skills mentioned and the most commonly studied social and emotional skills in ASD intervention in the reviewed literature of the partner countries.

Category	Poland	Romania	Spain	Türkiye
Studied social and emotional development skills	Social communication, Social distancing, Emotional intelligence	Social communication, Social interaction, Socialisation, Social cues, Emotional regulation, Emotional awareness/recognition, Empathy, Social	Social communication, Language and emotions, Socialisation, Self-regulation, Attention, Psychopathologica	Social interaction, Social responsiveness, Turn-taking, Initiation, Response behaviours,

		integration, Social functioning, Social responses, Problem behaviours	l domains of social communication, Problem behaviours, Restrictive and Repetitive Behaviours, Joint attention, Narrative skills, Cause-effect relationship, Emotional recognition, Anxiety, Understanding challenging contexts, Emotional responses, Social interaction, Pro-sociality, Empathy	Social communication, Emotional regulation, Adaptive behaviour, Joint attention, Behaviour regulation, Personal safety, Problem behaviours, Emotional recognition
Most-commonly studied social and emotional development skills	Social communication	Social communication, Social interaction, Socialisation, Emotional regulation, Empathy, Problem behaviours, Emotional recognition	Social communication, Social interaction, Socialisation, Empathy, Problem behaviours, Emotional recognition, Joint attention	Social communication, Social interaction, Emotional regulation, Problem behaviours, Emotional recognition, Joint attention

Table 10. Studied social and emotional development skills

The most studied social and emotional development skills in the reviewed literature from Poland, Romania, Spain, and Türkiye are primarily focused on social communication skills (All literatures),

emotional recognition (Romania, Spain and Türkiye), problem behaviours (Romania, Spain and Türkiye) and social interaction (Romania, Spain and Türkiye). Other frequently studied areas include emotional regulation (Romania and Türkiye), empathy (Romania and Spain), socialisation (Romania and Spain), and joint attention (Spain and Türkiye).

6.3 Use of digital social stories across partner countries

The literatures reviewed indicate varying levels of research and implementation regarding the use of digital social stories for supporting young children with ASD across the four partner countries.

The Polish literature review revealed a notable gap in domestic research regarding the use of social stories, including digital social stories for children with ASD in the period of ECEC. The review indicates that social stories are used in ECEC settings, but their use hasn't been reflected into the literature at a satisfactory level yet, since existing Polish-language theoretical works discuss social stories, primarily relying on foreign publications and lack original empirical data within the Polish context.

Social stories are recognised as an effective method in Romania for supporting social-emotional development in children with ASD. While the adoption of digital tools for children with ASD has begun, it is still in its early stages and traditional storytelling is still dominant. Romanian literature includes studies on social stories, and one study was found that mentioned the use of digital tools in relation to social stories. A significant challenge noted is language accessibility, as many global applications and software are only available in English and this situation limits their use for non-English speakers in Romania.

The Spanish academic literature highlights social stories as valuable educational and therapeutic tools, especially for children under six years of age. In the Spanish literature, 7 studies was found focusing on digital social stories and it is observed that the digitalised versions have been expanding their effectiveness by incorporating multimedia elements such as images, narrations, sounds, and music, which has the potential to increase personalisation and appeal. Digital storytelling, including digitalised social stories, is discussed as an innovative pedagogical tool, also by mentioning the language restrictions in existing digital materials. Challenges include generalising learning and long-term skill consolidation, highlighting the need for more comprehensive approaches.

In Türkiye, social stories, particularly in digital formats, have shown considerably promising. The academic literature on digital social stories has seen a gradual and steady increase after 2015, with pronounced growth after 2020. Türkiye has the highest number of studies on social stories among the partner countries (25 studies), and a significant number of these (12 studies) included digital tool intervention. Studies in Türkiye emphasise the digitalisation of social stories and the added

value of visual and auditory support for enhanced attention, retention, and personalisation. Tablet-supported digital social stories are noted as prominent tools that show improvements in social interaction. Video modelling is often combined with digital social stories to enhance skill acquisition, including personal safety skills. Despite the growth, challenges include insufficient awareness among teachers and families, limited incorporation of social stories in teacher training, and disparities in technological infrastructure.

6.4 Identified gaps and the need for digital social stories

The use of digital social stories is a recognised and growing area of research and practice in Spain and Türkiye, with Türkiye showing the highest volume of empirical studies incorporating digital tools. Spain also demonstrates considerable interest in research on digitalised social storytelling and specific apps. Romania is in the early stages of adopting digital tools for ASD, with a study acknowledging digital formats for social stories. In contrast, there is a clear lack of domestic empirical research on digital social stories in Poland. Across countries where digital social stories are used/researched, their benefits for social communication and interaction, behaviour regulation, and emotional development are highlighted. However, challenges regarding teacher training, technical infrastructure, and generalisation of skills persist.

6.5 Suggestions for further research and future directions

A significant fact, particularly evident in the Polish context which indicates a clear absence of original research conducted, and in the Romanian context which has a very limited number of studies, is the urgent need for domestic empirical studies regarding the use of digital social stories for the education and therapy of young children with ASD. The findings in the literature from Spain and Türkiye also supports this reality regarding the need for further research. Future research activities should focus on studies about the efficacy, cultural adaptation, and long-term outcomes of digital interventions, including digital social stories. This is crucial for developing culturally and linguistically relevant tools and methodologies.

Across reviewed literatures of the partner countries, there is a consistent call for further teacher training and professional development regarding the effective use of digital tools and social stories for young children with ASD. Future directions should include developing and implementing comprehensive teacher training programs to bridge the gap between technological potential and current low adoption and limited use, ensuring educators are equipped to integrate these tools effectively by also learning about the free or low-cost technologies.

It is observed in the reviewed literature that further research is needed to address the challenges related to generalising learning and long-term skill consolidation acquired through social story

interventions, including digital media. Future studies should examine the sustainability of technological interventions over time through longitudinal research methods.

It is also observed that there is a need for broader support for educational systems and policy adaptation. This includes addressing challenges like resource availability and funding for digital tools, and investing in technological infrastructure. National education policies should recognise and integrate evidence-based digital tools, including digital social stories, into curricula for children with ASD.

Interdisciplinary and cross-disciplinary collaborations including educators, psychologists, technology developers, families, and clinical practitioners are suggested for the creation and use of innovative digital tools, ensuring effective application in real-world contexts for better involvement of digital technologies in the education and therapy of young children with ASD.

Finally, strengthening family support systems and promoting family involvement in early interventions also ensuring they support the use of digital social stories at home environments is seen as vital for providing the success and generalisation of skills learned.

Annex 1 - Polish Literature Review

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.

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 implementatio n 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	Lacks empirical evaluation; effectiveness and long-term impact are not validated through research

development. data.

Annex 2 - Romanian Literature Review

No	Author, year of publication	Purpose and methodology	Key findings	Relevance to the project's theme
1	Chistol, M., Turcu, C., & Danubianu, M. (2023). Autism Assistant: A Platform for Autism Home-Based Therapeutic Intervention. *IEEE Access*, 11, 94188-94204. https://doi.org/10.1109/ACCESS.2023.3310397.	The paper conducted research focused on a developed educational software for therapeutic interventions for Romanian children diagnosed with Autism Spectrum Disorder (ASD) in a home-based setting. We followed the Double Diamond Model, emphasizing the core principle of Human-Centered Design (HCD) methodology, to design the software with a focus on the special needs of end-users. This involved developing proto-personas, wireframes, and interactive prototypes, exploring the latest technologies, and incorporating feedback from experienced ABA therapists. Based on these inputs, we developed the Autism Assistant platform, which includes a mobile application built with Unity and a web application developed with React and Ruby on Rails.	The platform underwent evaluation using the Quantitative Evaluation Framework (QEF) based on ISO 9126, and it was considered suitable as educational software for special education. The Autism Assistant platform was deemed suitable as educational software for special education	educational software for therapeutic interventions
2	Costescu, C., Tufar, I., Chezan, L.,	Costescu et al. (2024) explored the impact of technology use on the quality of life of autistic children aged 5–10, involving 61	The study found that while most children primarily used technology for relaxation, its	technology use on the quality

	Șogor, M., & Confederat, A. (2024). Assessing technology usage in relation to the quality of life of autistic children. *Digital Health, 10,* 20552076241304885.	parent-reported assessments.	use for socialization was positively correlated with higher perceived quality of life. This highlights the potential benefits of technology when used for fostering social interaction, even though such usage was less frequent. The authors emphasized the need for further research on technology-based interventions to enhance social skills and well-being among autistic children, recommending careful consideration of both its benefits and potential risks.	of life of autistic children
3	Chistol, M., Danubianu, M., & Bărîlă, A. L. (2023). Technology-Mediated Interventions for Autism Spectrum Disorder. *International Journal of Advanced Computer*	Autism Assistant," a Romanian-language therapeutic software platform designed to support home-based interventions for children with Autism Spectrum Disorder (ASD). Created collaboratively by Ștefan cel Mare University and Assist Software Company, the platform addresses the time and financial challenges of traditional Applied Behavior Analysis (ABA) therapy. Developed using the Double Diamond Model with a Human-Centered Design approach, it integrates insights from 60 Romanian parents, teachers, and therapists to address the specific needs of children with ASD. Comprising a mobile app built with	The platform empowers parents and caregivers to act as co-therapists, promoting self-reliance and faster skill improvement in children, while filling a critical gap in accessible therapeutic tools for non-English speaking users.	therapeutic software platform designed to support home-based interventions for children with Autism Spectrum

	Science & Applications, *14*(12).	Unity and a web application using React and Ruby on Rails, it was evaluated as suitable educational software under ISO 9126 standards.		Disorder
4	Toma, M. V., Turcu, C. E., Turcu, C. O., Vlad, S., Tiliute, D. E., & Pascu, P. (2024). Extended Reality–Based Mobile App Solutions for the Therapy of Children With Autism Spectrum Disorders: Systematic Literature Review. *JMIR Serious Games*, *12*, e49906.	A systematic literature review to evaluate the use of extended reality (XR) mobile applications—encompassing virtual, augmented, and mixed reality—in the therapy of children with Autism Spectrum Disorder (ASD). Analyzing 28 studies from 2015 to 2019, they found a predominant focus on augmented reality (AR) solutions developed for Android devices using platforms liks.	a systematic literature review to evaluate the use of extended reality (XR) mobile applications—encompassing virtual, augmented, and mixed reality—in the therapy of children with Autism Spectrum Disorder (ASD). Analyzing 28 studies from 2015 to 2019, they found a predominant focus on augmented reality (AR) solutions developed for Android devices using platforms like Unity 3D and Vuforia. While 68% of these applications were tested with children, the remaining were assessed solely by developers. Evaluation methods primarily involved interviews, yielding generally positive but preliminary outcomes, underscoring the necessity for more comprehensive testing. The review highlights the potential of XR technologies as	

			educational tools for ASD therapy, advocating for multidisciplinary collaboration, thorough empirical evaluations, and attention to technology ethics in future research,	
5	Folostina, R., Dumitru, C., Iacob, C. I., & Syriopoulou-Delli, C. K. (2022). Mapping knowledge and training needs in teachers working with students with autism spectrum disorder: a comparative cross-sectional investigation. *Sustai nability*, *14*(5),	Folostina et al. (2022) conducted a comparative cross-sectional study to investigate the knowledge and training needs of teachers working with students diagnosed with Autism Spectrum Disorder (ASD). The study surveyed teachers from Romania and Greece to assess their understanding of ASD and the effectiveness of their training.	Results revealed significant gaps in knowledge, particularly regarding specialized interventions and strategies for supporting students with ASD in the classroom. Teachers from both countries reported a strong desire for more training in areas such as individualized education programs (IEPs), classroom management, and communication techniques. The study highlighted the need for targeted professional d7evelopment programs to better equip educators with the8 necessary skills and knowledge to effectively teach and 9support students with ASD.	knowledge and training needs of teachers working with students diagnosed with Autism Spectrum Disorder (ASD).

	2986.			
6	Costescu, C. (2024). The Use of Technological Tools for Autistic Children. In *Digital Technologies for Learning and Psychological Interventions* (pp. 151-163). Cham: Springer Nature Switzerland.	A comprehensive overview of technological tools employed in clinical and educational interventions for autistic children. The chapter categorizes these tools into software applications, virtual reality environments, and robotic systems, discussing their applications in enhancing communication, social skills, and learning outcomes.	Costescu emphasizes the importance of tailoring technological interventions to individual needs and highlights the necessity for empirical validation to ensure their effectiveness and appropriateness in therapeutic and educational settings.	technological tools employed in clinical and educational interventions for autistic children
7	Pasco, G., Clark, B., Dragan, I., Kalambayi, F., Slonims, V., Tarpan, A. K., & Wittemeyer, K. (2014). A training	This article discusses a training and development project in Romania aimed at enhancing services and promoting social inclusion for children and young people with autism.	The initiative focused on developing the skills of professionals and parents through evidence-based approaches to improve the quality of care and support for autistic individuals.	developing the skills of professionals and parents through evidence-based

	and development project to improve services and opportunities for social inclusion for children and young people with autism in Romania. *Autism, 1 8*(7), 827-831.			approaches
8	Costescu, C. A., Șogor, M., Pălimariu, S., Katona, J., Tufar, I., & Avram, C. M. (2024, October). Use of digital platforms for enhancing academic performance. Systematic Review.	This systematic review explores the impact of digital platforms on academic performance. It analyzes existing studies on how such tools influence learning outcomes, particularly in environments that include children with diverse learning needs. The review identifies key benefits of digital platforms, such as personalized learning and increased engagement, but also underscores the need for adaptive tools and thorough evaluations to maximize educational outcomes across diverse contexts.	The project emphasized collaboration between local and international experts to address challenges specific to Romania's autism community and enhance opportunities for integration into broader society.	the impact of digital platforms

	In *2024 IEEE 7th International Conference and Workshop Óbuda on Electrical and Power Engineering (CANDO-EPE)* (pp. 39-46). IEEE.			
9	Chițu, I. B., Tecău, A. S., Constantin, C. P., Tescașiu, B., Brătucu, T. O., Brătucu, G., & Purcaru, I. M. (2023). Exploring the opportunity to use virtual reality for the education of children with disabilities. *Childre*	This study examines the potential of virtual reality (VR) in the education of children with disabilities. It highlights VR's ability to create immersive, controlled environments that aid in skill development and learning.	The research indicates that VR can improve engagement, understanding, and accessibility for children with disabilities. However, the authors stress the importance of addressing practical barriers, such as cost and accessibility, and further empirical testing to assess its long-term impact.	virtual reality (VR) in the education of children with disabilities

n, *10*(3), 436.

10	Tiliute, D. E., & Pascu, P. Extended Reality–Based Mobile App Solutions for the Therapy of Children With Autism Spectrum Disorders: Systematic Literature.	This article offers a systematic literature review of extended reality (XR)-based mobile applications for the therapy of children with Autism Spectrum Disorder (ASD).	It reviews the development and evaluation of XR solutions, including virtual, augmented, and mixed reality tools. While these technologies demonstrate significant promise in enhancing therapeutic interventions, the study underscores the need for comprehensive testing, ethical considerations, and multidisciplinary collaboration to ensure effective application in real-world contexts.	extended reality (XR)-based mobile applications for the therapy of children with Autism Spectrum Disorder (ASD).
11	Bălaş-Baconschi, C., & Bărbulescu, A. (2022). Reducing Inappropriate Behaviors and Enhancing Social Skills in Children with ASD Through Social	Bălaş-Baconschi and Bărbulescu (2022) explored the use of social stories as an intervention method to reduce inappropriate behaviors and enhance social skills in children with Autism Spectrum Disorder (ASD). Social stories are a common tool in ASD education that helps children understand social situations and appropriate responses through simple, personalized narratives. The authors reviewed various studies and highlighted the effectiveness of this method in improving social behaviors and mitigating behavioral issues, such as aggression and anxiety. The	The study also discusses potential challenges in applying social stories, including the importance of tailoring stories to the individual needs of each child and the need for consistent use in multiple contexts to reinforce learning. By demonstrating how social stories can be an effective educational tool, the study supports their inclusion in ASD interventions to foster better communication,	use of social stories as an intervention method in workind with students with ASD

	Stories. *Educatia 21*, (23), 93-103.	review shows that social stories help children with ASD understand expectations and improve their interaction in social settings. The article presents evidence suggesting that the method contributes significantly to the development of adaptive behaviors and can lead to better emotional regulation and social integration in both school and social environments.	social understanding, and emotional development in children.	
12	Grigore, A. A., & Rusu, A. S. (2014). Interaction with a therapy dog enhances the effects of social story method in autistic children. *Society & Animals*, *22*(3), 241-261.	The article investigates how therapy dog interaction enhances the effects of the social story method in autistic children. The study highlights the effectiveness of combining traditional educational methods with animal-assisted therapy. The researchers found that interactions with therapy dogs significantly improved the engagement and social responses of children with ASD. The method used in the study involved both social story interventions and controlled therapy dog interactions, where the children would read or listen to a social story and subsequently interact with the dog.	The positive influence of therapy dogs on social behaviors was evident, with children demonstrating better social communication skills, emotional regulation, and increased motivation to participate in therapy. The interaction with the dog was particularly beneficial in reducing anxiety and promoting a sense of security, which helped the children better respond to the social story's content. By integrating therapy animals into interventions, the study demonstrated a practical approach to addressing core issues in ASD, such as social withdrawal and communication difficulties. The authors suggest that the use of therapy dogs, alongside more traditional behavioral	therapy dog interaction enhances the effects of the social story method in autistic children.

			strategies like social stories, could significantly enhance therapeutic outcomes for children with ASD.	
13	Ramona, H. I. (2016). The Contribution of Therapeutic Stories to the Social-Emotional Development of Pupils. *European Proceedings of Social and Behavioural Sciences*.	The article explores the role of therapeutic stories in the social-emotional development of pupils, with a focus on children with Autism Spectrum Disorder. The author argues that therapeutic stories serve as a powerful tool for fostering empathy, understanding emotions, and improving interpersonal skills in children with ASD. The study provides an overview of how stories, especially those created with therapeutic intent, can address specific social and emotional challenges faced by children with ASD. Ramona presents case examples illustrating how narratives can teach children with autism to identify and express emotions, interpret social cues, and learn appropriate behaviors in social interactions. The therapeutic stories are designed to align with the developmental needs of children, engaging them in emotionally relevant scenarios that they can relate to. The article emphasizes the benefits of using stories not only for academic improvement but also for promoting a more inclusive social experience for children with ASD.	It highlights how the method allows educators and therapists to address individual emotional challenges by customizing stories for each child's needs, thereby supporting social-emotional growth. The study underscores the importance of integrating such therapeutic tools within educational programs to create a holistic developmental approach for children on the autism spectrum.	the role of therapeutic stories in the social-emotional development of pupils, with a focus on children with Autism Spectrum Disorder

14	Syriopoulou-Delli, C. K., & Folostina, R. (Eds.). (2021). *Interventions for Improving Adaptive Behaviors in Children with Autism Spectrum Disorders*. IGI Global.	The volume includes various contributions that focus on practical, evidence-based interventions aimed at addressing core challenges associated with ASD, such as social communication deficits, repetitive behaviors, and restricted interests. Each chapter in the book highlights specific strategies for improving key adaptive behaviors such as daily living skills, social functioning, and emotional regulation. The interventions presented range from traditional behavioral therapies like Applied Behavior Analysis (ABA) to more innovative approaches incorporating technology, including virtual reality and social robotics.	The editors underscore the importance of a personalized, multi-disciplinary approach to ASD interventions, acknowledging the need for ongoing assessment and modification of strategies to meet the individual needs of children. The book stresses the value of involving families in the intervention process, recognizing that consistent practice at home can significantly enhance the outcomes of formal therapies. It concludes that the integration of diverse intervention strategies, coupled with continuous professional development for educators and therapists, is critical for improving the quality of life and functional independence of children with ASD

Annex 3 - Spanish Literature Review

Review of the role of digital tools in educating children with ASD.

Author	Year of publication	Study / population	Aim	Methodology	Key findings	Limitation / Weaknesses
Baixauli-Fortea, Inmaculada; Gómez García, Soledad; Andrés-Sebastiá; María de El Puig; & Berenguer-Forner, Carmen	2020	Early Childhood Education Students	To substantiate a proposal for intervention with children with ASD through the combined use of dialogic reading and augmented reality	Descriptive	The combination of dialogic reading and augmented reality can improve the child's involvement in the activity, produce advances in vocabulary, literal comprehension and inference, and increase interest in the task.	Further studies are needed to assess the long-term effectiveness of the proposal and explore its application in various contexts.
Corrales, Laura & Rodríguez, Javier	2022	Early Childhood Education Students	Possibilities of robotics in working with children with ASD	Case study	The use of robotics produces advances in the field of communication and acts as a motivating element, promoting sustained attention and improving performance in academic tasks.	The use of robotics requires qualified teachers and carefully designed interventions.

Gallardo-Montes, Carmen del Pilar; Rodríguez, Antonio; Caurcel, María Jesús; & Capperucci, Davide	2022	Teachers of Early Childhood, Primary, Secondary and Adult Education	Comparison of the ratings and uses of mobile applications for working with populations with ASD in two countries	Quasi-experimental design with questionnaire	Education professionals value the use of mobile applications as complementary tools in the education of people with ASD starting from an early age, although differences are detected according to the educational level, for example	Need for greater focus on teacher training processes in digital skills and the conditions for using these resources.

					between Early Childhood Education and Primary Education, according to the areas of work.	
Gallardo-Montes, Carmen del Pilar; Rodríguez, Antonio; Crisol, Emilio; & Caurcel, María Jesús	2020	Mobile applications for use in Early Childhood, Primary and Secondary Education	Evaluation of commercial mobile applications to strengthen the theory of mind (ToM) in people with ASD	Qualitative design using an indicator system	Mobile applications offer great potential in work with ASD starting at Early Childhood Education. Most of the applications analysed were rated as highly recommendable (11.9%) and recommendable (83.2%) while only 5% were rated as dispensable.	Insufficient attention to the emotional field, which is addressed by only a fifth of the applications; technical limitations: some applications do not incorporate voices or audio recordings, which reduces their usefulness for language learning; Language restrictions: Many apps are not available in multiple languages, restricting their functionality.

Pérez-Fuster, Patricia; Herrera, Gerardo; Kossyvaki, Lila; & Ferrer, Antonio	2022	Early Childhood and Primary Education students	Improvement of responding to joint attention (RJA) skills in autistic children with an intervention mediated by augmented reality (AR) technology	Multiple baseline single subject experimental design	The study shows that an intervention mediated by augmented reality technology can be highly effective in improving specific skills in children with ASD, offering a model replicable and accessible to schools and families.	The success of these interventions is affected by the familiarity of the school environment and the involvement of the teaching staff.

Annex 4 - Review about the use of social stories as a method to support social-emotional development (Spain)

Author	Year	Study / population	Aim	Methodology	Key findings	Limitation / Weaknesses
Gregori Signes, Orellana, Samblas Beteta	2013	Pilot project of personalised digital stories for children with ASD.	Evaluate digital stories as an evolution of traditional social stories.	Design and implementation of digitalised social stories in specific situations.	Reduction in anxiety and improvement in social understanding; high personalisation and ease of adaptation.	Preliminary results; lack of validation and extension to other educational and therapeutic contexts.
Calleja-Bautista, Sanz- Cervera, Tárraga- Mínguez	2016	Review of music therapy applied to children under 6 years of age with ASD.	Analyse the impact of music therapy on social and communication skills in ASD.	Review of scientific literature, including interventions in family, school and therapeutic settings.	Social stories combined with music improve social interaction, joint attention and emotional regulation.	Limited longitudinal evidence; outcomes depend on personalisation of interventions.
Baixauli-Fortea, Roselló- Miranda, Berenguer- Forner, Colomer-Diago, Grau-Seville	2017	Review of strategies for social communicati on in children with ASD.	Analyse interventions such as social stories in social and communication skills.	Narrative review of child-centred strategies in early childhood education.	Social stories increase social understanding and are useful for preparing routines in educational contexts.	Limited generalisability to natural contexts; effectiveness depends on family and teacher collaboration.

Gallardo Montes, Caurcel Cara, Rodríguez Fuentes, Capperucci	2019	Review of digital platforms and apps for social stories in ASD.	Evaluate the impact of technology on the accessibility and effectiveness of social stories.	Analysis of mobile applications and digital platforms for interventions with ASD.	Increasing accessibility, motivation and personalisation in digital social stories.	Need for longitudinal studies and dependence on technological access.
Ginestar Rodríguez, Pastor-Cerezuela, Tijeras-Iborra, Fernández-Andrés	2019	Review of 29 studies on ASD, includes children under 6 years old.	Evaluate the effectiveness of social stories on social and communication skills in ASD.	Systematic review of empirical studies selected under specific criteria.	Improvements in basic social behaviours and reduction of problematic behaviours in children in Early Childhood Education.	Variability in design and objectives; challenges in generalising learning to other contexts.
Bru Luna, Martí-Vilar, González-Sala	2020	Review of interventions in prosociality and empathy in young children with ASD.	Analyse how social stories foster prosociality and empathy in ASD.	Review of literature and empirical studies focused on samples of young children.	Reduction in inappropriate behaviour and improvement in social responses; personalisation key to effectiveness.	Studies limited in sample size and frequency of interventions.
Salas Alcayde, Navarro Sánchez, Marín Suelves	2022	Review of 19 studies on intervention techniques in social skills for students with ASD.	Evaluate the effectiveness of social stories and differential reinforcement on social skills.	Systematic bibliographic review based on literature in Spanish and English.	Social stories and differential reinforcement reduce inappropriate behaviour and improve social skills in early childhood education.	Lack of replicability in some studies and few data on impact in long-term contexts

Annex 5 - Turkish Literature Review

Author(s)/Year	Purpose	Target Group	Method	Findings
Bozkurt (2016)	Interactive Digital Learning Environment	Teaching social interaction	Design-based research	High engagement observed
Ozdemir (2008)	To examine the effect of multimedia social stories on increasing social interaction in children with ASD.	Children with ASD	Single-subject research design	Multimedia-supported social stories positively affected social interaction.
Ozdemir (2008)	To investigate the impact of social stories on reducing problem behaviors in children with ASD.	Children with ASD	Single-subject multiple probe design	Social stories were found to be effective in reducing problem behaviors.
Balçık & Tekinarslan (2012)	To explore the effects of social stories in teaching social skills.	Children with ASD (Ages 7-11)	Single-subject multiple probe design	Social stories were effective in increasing target behaviors, but generalization was limited.
Sani Bozkurt & Vuran (2014)	To analyze the impact of social stories on the social skill development of children with ASD.	Children with ASD	Literature review	Social stories were highlighted as an effective strategy.

Turhan & Vuran (2015)	To compare the effectiveness of social stories and video modeling in teaching social skills to children with ASD.	Children with ASD	Single-subject comparative analysis	Social stories supported with video modeling were found to be more effective.
Olçay-Gül & Tekin-Iftar (2016)	To examine the effect of social stories presented by families on children's social skill acquisition.	Children with ASD	Single-subject multiple probe design	Family-presented social stories were effective, but generalization was limited.
Acar, Tekin-Iftar, & Yikmis (2017)	To investigate the impact of social stories and video modeling presented by mothers on children's social skill acquisition.	Children with ASD (ages 7-10)	Single-subject multiple probe design	Social stories and video modeling were found to be effective in social skill acquisition.
Sani-Bozkurt, Vuran, & Akbulut (2017)	To examine the design and use of interactive social stories.	Children with ASD	Qualitative research	Interactive social stories were effective in the teaching process.
Kurt & Kutlu (2019)	To analyze the effect of social stories in teaching abduction prevention skills to children with ASD.	Children with ASD (ages 6-10)	Single-subject multiple probe design	Social stories were effective in teaching abduction prevention skills.
Yazıcı & McKenzie (2020)	To examine strategies used to develop social skills in children with ASD.	Children with ASD	Qualitative research, case study	Social stories were identified as an effective teaching strategy.

Boşnak & Turhan (2020)	To investigate the impact of social stories presented via tablet computers on social skill acquisition.	Children with ASD (ages 6-12)	Single-subject research design	Tablet-supported social stories were effective in social skill acquisition.
Dablan & Bağlama (2020)	To review postgraduate theses on social stories in the field of ASD in Turkey.	Researchers in the field of ASD	Systematic literature review	Social stories were emphasized as an effective method, particularly in developing social interaction skills.
Şancı (2021)	A review study evaluating social interaction development in children with ASD.	Children with ASD	Literature review	Social stories were identified as an effective method for increasing social interaction.
Durdu & Demirbilek (2021)	To evaluate studies conducted on individuals with autism in Turkey.	Research studies in the field of ASD	Literature review	Studies on the effectiveness of social stories have increased.
Olçay, Kıyak, & Korkmaz (2022)	A meta-analysis study investigating whether social story applications are evidence-based.	Experts working with individuals with ASD	Meta-analysis and descriptive analysis	Social stories were found to be an evidence-based method.
Akgün-Giray & Ergenekon (2022)	To examine the impact of social stories designed and presented by pre-service teachers on the social skill acquisition of	Children diagnosed with ASD (ages 8-	Single-subject research design, qualitative and quantitative data collection	Social stories were particularly effective in enhancing social

	children with ASD.	11)	methods	interaction skills.
Güler & Erdem (2022)	To analyze the effect of mobile social story maps on the cognitive and social skills of children with ASD.	Children with ASD	Single-subject experimental design	Mobile social stories were effective and supported generalization skills.
Kurtça (2023)	To investigate the effectiveness of social stories in teaching social skills to individuals with intellectual disabilities.	Adults with intellectual disabilities	Single-subject experimental design	Social stories were found to be effective and supported sustainable learning.
Kutlu & Kurt (2023)	To compare the effectiveness of social stories and video modeling in teaching personal safety skills to children with ASD.	Children with ASD	Single-subject multiple probe design	Social stories supported with video modeling were found to be more effective.
Köse & Güner-Yıldız (2021)	Augmented reality (AR)	Research studies in the field of ASD	Experimental	Gains in attention and retention
Elverici (2021)	AAC mobile applications	Communication support	Survey & case study	Improved expressive communication
Keskin (2023)	VR modeling	Teaching imitation skills	Experimental	Enhanced imitation performance

Sulu, Aydın & Erden (2024)	Digital ABA interventions	Behavioral outcomes	Meta-analysis	High efficacy confirmed
Güller et al. (2024)	Robot-assisted teaching (NAO robot)	Joint attention training	Pilot study	Positive preliminary results
Kaymak, Diken & Mahoney (2025)	Online group learning	Parent-child interaction	Single-subject	Effective for social engagement
Ozyurt & Ozyur (2025)t	Serious games	Attention and motivation	Content analysis	Increased engagement