Strategies & digital technologies for Autism integration

Ioanna Moraiti[1], Anestis Fotoglou[1], Agathi Stathopoulou[1] & Dionysis Loukeris[1]

[1] National Center for Scientific Research "Demokritos", Greece

Correspondence: Ioanna Moraiti, National Center for Scientific Research "Demokritos", Greece. E-mail: ioannakaterinh@gmail.com

Abstract

The number of people with Autism spectrum disorders is increasing significantly. The purpose of this literature review is to contribute to the integration of autistic people in the educational context with the help of technological means. Educators' views on the education they should provide to students so that autistic people feel accepted by their peers and have equal and inclusive opportunities are listed. People on the Autism spectrum have difficulties in important pillars such as communication, memory, and attention. Strategies are presented for teachers to achieve the inclusion of students and the role of assistive technology, and its benefits are identified for people with Autism with the main benefit being the improvement of communication skills, the improvement of organization activities, memory, and attention.

Keywords: Autism spectrum disorder, web applications, digital technology, mobile applications, inclusion, integration.

Estratégias & tecnologias digitais para a integração do Autismo

Resumo

O número de pessoas com transtornos do espectro do Autismo está aumentando significativamente. O objetivo desta revisão de literatura foi contribuir para a integração de pessoas autistas no contexto educacional com o auxílio de meios tecnológicos. São listadas as opiniões dos educadores sobre a educação que devem oferecer aos alunos para que os autistas se sintam aceitos por seus pares e tenham oportunidades iguais e inclusivas. As pessoas no espectro do Autismo apresentam dificuldades em pilares importantes como comunicação, memória e atenção. São apresentadas estratégias para os professores conseguirem a inclusão dos alunos e o papel da tecnologia assistiva, e são identificados seus benefícios para pessoas com autismo sendo o principal benefício, a melhora das habilidades de comunicação, a melhora das atividades de organização, memória e atenção.

Palavras-chave: transtorno do espectro do Autismo, aplicações *web*, tecnologia digital, aplicações móveis, inclusão.

1. Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication, difficulty speaking, and repetitive and unusual sensory motor behaviors. Social inclusion for people with Autism, in an ideal world, means full inclusion in every aspect of community life. There are many levels of inclusion and many methods to help autistic people. The deficits and difficulties of people with ASD are improved with the help of mobile devices and the use of assistive technology, an important benefit as we live in the age of technology (Hodges; Fealko, 2020).

Teachers, parents, and caregivers can help children take advantage of the positives of technology and feel that technological tools help them to improve communication skills, organize their daily lives through easy-to-use mobile applications, enhance memory and attention of individuals even through games. Mobile devices and the technologies they use are affordable and provide sufficient processing power and memory to support screening activities and improve the lives of people with ASD and their caregivers. In the context of supporting individuals, the social inclusion of individuals in educational contexts is also achieved (Drigas; Ioannidou, 2019).

The following literature review aims to encourage the benefits of digital technologies in the integration of autistic people, with the help of web applications of other technological tools. The ultimate purpose of technological means

is to strengthen the autistic community for the integration of autistic individuals.

2. Materials and Methods

With very few exceptions, the majority of current research's bibliography is made up of publications from worldwide scientific journals. Numerous references to the essay and further information about the theoretical underpinnings of the research can be found in Greek literature. The initial step in the research process was to look for, locate, and collect papers using online databases, particularly Google Scholar, Mendeley, and ResearchGate.

For the search, specific keywords were defined, such as sociability and social communication. Autism, neurodevelopmental disorders, sensory processing disorder, multisensory, models, and syndromes. The second stage involved grouping the articles according to their content in order to create the chapters, and then subdividing the articles within each group to create the sub-chapters. The authoring of the report was the third stage.

3. Bibliographic analysis

3.1 Autism spectrum disorder

Autism is a neurodevelopmental disorder that particularly affects social communication such as sociability, socialization, and play. Autistic people also have difficulties with limited or repetitive behaviors and for many this includes sensory problems according to DSM-5 criteria (American Psychiatric Association, 2013). Autistic disorder involves difficulties in theory of mind i.e., the ability that allows children to understand that other people have various mental states, such as beliefs, desires, or feelings and, based on this understanding, to explain and predict both their own actions to others.

In addition, in verbal and non-verbal pragmatics, the correct use of language and behavior in a social context. The social and environmental context determines how traits such as conventional predictability and difficulty understanding emerge and affect the autistic person and those around them (Prizant, 2015). The term Autism is used to refer to all individuals on the autism spectrum. According to many articles in the world literature, terms such as "disorder" and "deficit" describe autism, but nowadays there are researches that these words have been replaced with positive connotations with others such as "individual differences" (Baron-Cohen, 2015).

Autistic strengths with core pillars of strong memory, focus precision and attention to detail could possibly lead to more positive outcomes for autistic students, Russell et al. (2019). Until 2013 autism was described as a triad of disorders with variable IQ and language development leading to various subgroups such as classical autism, atypical autism, pervasive developmental disorder, and Asperger's syndrome, although after changes in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5, 2013), and the World Health Organization's International Classification of Diseases (ICD-11, 2018) these were collapsed into one diagnosis of Autism spectrum disorder (ASD).

3.2 History about ASD and disabilities

Unesco in 1994 by signing the Salamanca declaration committed to inclusive education with impressive results. There has been a steady increase in the relative number of students in general disability recognized schools. Inclusion involves integrating all children and young people as active, fully participating members of the school community (Lyons; Arthur-Kelly, 2014) including Autism, in mainstream classrooms. Through this process the school increases its capacity to accommodate all students from the local community who wish to attend, and at the same time it reduces the need to expel them (Ainscow, 1995).

In the US, in 1989 there were 31.7% students with disabilities in regular classrooms and 56.8% in 2007 (Snyder; Dillow, 2013). The World Health Organization is working in this direction by co-signing a child-friendly school, which promotes diversity and equality between boys and girls of different nationalities, religions, and social groups. It aims for active involvement and cooperation, avoids the use of corporal punishment, and does not tolerate bullying. In addition, it becomes a supportive environment that provides education that responds to the reality of children's lives. Finally, it helps create connections between school and family life, encourages both creativity and academic skills, and promotes children's self-esteem and confidence (Weare; Gray, 1995).

3.3 Educator's view on autism inclusion

Many times, the theory differs from the practice as most teachers while at the beginning agree on an inclusive approach with equal rights, in the practical part there are disagreements about who will it must be for the autistic

children the appropriate adaptations or for the teachers themselves the appropriate training (Al-Shammari et al., 2019). Due to the complexity of autism and the fact that the symptoms and severity vary as it is estimated that there are probably many causes, this can be considered partially reasonable (Al-Shammari et al., 2019).

According to Ravet (2011) one of the different views is based on supporting a range of educational placements specific to Autism, including separate provisions for some. Parents on the other hand worry about a significant number of cases where this does not work for any of the students. Examining research on the perspective of inclusion for Autism and education makes the issue very important because while policies are in place to support the inclusion of students with disabilities in mainstream education, they are not necessarily translated into practice (Roberts; Simpson, 2016).

According to Baglieri & Shapiro (2012), knowledge of Autism is shown to be a valuable predictor of professionals' ability and willingness to provide learning opportunities without exclusions in autistic students in both general and special education but in general, there is a gap in the literature (Able et al., 2014), regarding knowledge of teachers. For example, in the study by (Segall; Campbell, 2012), with 196 educational professionals surveyed, general teachers and principals responded that they did not know the answer to approximately seven of the 15 items assessing current knowledge about Autism.

Many teachers who come into contact with autistic children through personal or professional experiences do not necessarily determine accurate knowledge on their part or lead to more effective teaching practices for autistic students. This research is confirmed in England by the All-Party Parliamentary Group on Autism (2017), which reports that of the 308 teachers surveyed, less than 50% of teachers felt confident and effective in supporting an autistic child in the classroom there. It turns out, therefore, a large gap in professionals' knowledge about Autism and their self-assessment, resulting in uncertainty about their abilities to provide inclusive provision for autistic students in school (Vincent; Ralston, 2020).

In Greece, according to the research of Giannopoulou et al. (2018), the importance of training was highlighted, as there was an increase from low to medium/high level in terms of teachers' knowledge, without previous training in Autism spectrum disorder (ASD). In the research review of Lappa & Mantzikou (2018), the value of having knowledge about ASD is highlighted, as it seems to influence the view of teachers who aim to formulate a best possible way for the needs of students with autism as well as the needs of teachers themselves. In the study, also by Fleva & Khan (2017), Greek teachers, despite not having a positive view of inclusive education, had a better level of knowledge regarding ASD, compared to Indian teachers interviewed.

3.4 Difficulties of autistic people

3.4.1 Social communication

Depending on the degree of difficulty of each child with autism, their social skills such as communication and language are also affected and may be due to dysfunction of neurons in the brain. In many cases speech often appears delayed. In other cases, the tone of voice is high. There is most often a lack of sociability which results in not good eye contact resulting in great difficulty in starting, maintaining, and ending a conversation. Difficulties in verbal pragmatics lead to particular and unacceptable use of language and non-verbal behaviors that do not fit each situation (Mitsea et al., 2020).

Imitation is an important element of socialization and many children with vocal autism often repeat what they have been told (echolalia) instead of responding. But when an answer is given often it is off topic and inadequate and thus the communication is ineffective. In addition, difficulty in imitative movements is found due to severe dyspraxia. Monologues are a very common phenomenon (Wilmshurst, 2011). In understanding speech, they interpret words with their literal meaning, ignoring the metaphorical one. Sarcasm, irony are elements that many times they cannot interpret. They cannot tolerate loud voices due to sensory processing disorder and avoid the interlocutor who looks them in the eyes (Efstathiou; Polichronopoulou, 2015).

3.4.2 Cognitive flexibility

Cognitive control is a very important element and fundamental principle for any correct behavior to meet the demands of the environment. Studies have shown that autistic people have difficulty switching from one activity to another and show deficits. The executive functions based in the prefrontal lobe such as working memory, inhibition, complex strategy are responsible for behavior and the realization of a goal and in combination with the amygdala and hippocampus help regulate emotions and maintain attention. Studies inform us of deficits in these areas (Sthmison et al., 2013).

Also important is their difficulty in processing stimuli from the environment such as loud sounds and lights,

touches on them and special smells. On the other hand, they may also have a low registration in stimuli. So, because of this sensory overload they find it difficult to organize and focus their attention. Knowing and understanding other people's feelings is called empathy and is a condition that autistic people have difficulty with. More specifically, children with autism are not aware of the other's perspective and have difficulty making an appropriate emotional response to it. They are ignorant and indifferent to the results of their actions which affect other people (Harmasen, 2019).

3.4.3 Memory

Memory is that function that allows us to memorize and encode the sensory experience in order to recall it either intentionally or not. More specifically, through studies it was verified that working memory falls short in a complex solution strategy problem. The hippocampus is the brain structure responsible for this process and in direct connection with the prefrontal lobe for cognitive ability and the amygdala for emotional regulation (Williams, 2005). Episodic memories show deficits in event recall and are disorganized to be recalled. In contrast to the above, it is worth noting that verbal memory is intact in children with autism (Poirier, 2011).

3.4.4 Attention

Attention is the main characteristic lacking in autistic people. Sharing attention with another person favors a person in perceiving the intentions of others, a condition we saw above. Joint attention, an element of sociability, develops in the first months of life. According to research, high-risk infants later diagnosed with autism showed deficits in attention compared to typical children (Mei et al.,2022). There are interventions that can help the attention process such as the TEACH system at school and intensive interaction in therapeutic settings. Early intervention such as the Denver model plays a key role in improving all the above, starting from the first year of age by helping children develop motor and communication skills through play processes and activities that involve parents in daily activities (Waddington et al., 2019).

3.5 Research in typical environment

A descriptive study of intervention research by Stichter et al. (2002) reviewed research articles from 10 journals with children diagnosed with a developmental disorder (including ASD) or an emotional-behavioral disorder. The results showed a significant increase in assessment-based interventions (from about 10% in the 1980s to more than 50% in the 1990s). However, the authors noted a decrease in the use of physical intervention agents, such as teachers, and a decrease in research conducted in primary settings (ie, homes, schools, community). Given the recognized importance of inclusion for social development, this trend could be seen as cause for concern.

A more recent trend analysis was conducted by Crosland & Dunlap (2012) to document the contextual characteristics of intervention research conducted with individuals with ASD between 1995 and 2009 in three leading journals (Journal of Autism and Developmental Disorders, Journal of Applied Behavior Analysis and Forums on Autism and Developmental Disabilities). Data were collected based on participants' age, cognitive and communication levels of functioning, environment, and ecological variables. The results showed that the total number of intervention articles increased and the proportion of articles involving children under 6 increased from 21% to 36% over the 15-year period.

There was a small increase in the proportion of articles that included children with typical cognitive and communicative functioning, but the increase was not comparable to the proposed number of children classified as having higher-functioning Autism. A slight upward trend was observed in the proportion of intervention studies conducted in a typical physical context, although the proportion was still less than 50%, while no trends were observed for the typical activity or social contexts. Less than 40% of studies were reported to be conducted in the child's primary setting (ie, home, school), while the majority of interventions (> 60%) were conducted in clinical/inpatient settings. This can be seen as a disorganization because clinical settings tend to be limited in terms of external validity (Bailey; Williams, 2014).

3.6 Strategies of achieving successful integration

Strategies for achieving successful integration Harrower & Dunlap (2001), about 10 years ago provided a series of effective procedures for supporting children with ASD in general education classrooms. They included a review of research-based strategies designed to help individual students with ASD successfully participate in these inclusive educational environments. The following summaries of individualized strategies are drawn largely from

Harrower and Dunlap's discussion.

Previous procedures. The former processes involve manipulating some aspect of the environment to elicit a desired response or make an undesired behavior less likely to occur (ie, prevent and reduce challenging behavior). These processes are preventive in that they involve changing the environment or routine before problem behavior occurs (Luczynski et al., 2015). Previous procedures that have been used specifically with students with autism in general education classrooms include preparation, timely delivery, and visual programs. Priming consists of allowing a learner to preview information or activities before the learner actually engages in that activity (Koegel et al., 1992).

A student can preview future events such as a fire drill, substitute teacher, field trip, or rainy day to make them more predictable. Preparation can facilitate the inclusion of students with autism by linking one-on-one instruction with larger group classroom activities, a typical feature of general education classrooms (Harrower et al., 2001) Research has shown that preparation is effective in increasing social interaction with typical peers (Zanolli et al., 1996), and in preparing young students for the school field. Video preparation (ie, using videotaped instruction) has also proved effective in reducing challenging behavior during community school trips.

Prompting strategies have been successful in supporting the inclusion of students with autism. Prompts that supplement the general instructional routine are often necessary to elicit a response in academic or behavioral activities for students with Autism. Sainato et al. (1987) combined two prompting strategies to facilitate school transition periods: a peer prompting condition and a teacher prompting condition. Both conditions resulted in an appropriate behavior, while the teacher prompting condition was found to be superior for all transition settings.

In a study conducted by Handlan & Bloom (1993), peers who elicited interactions with students with ASD were able to increase interactions with students with ASD. This prompting or guidance was also generalized outside the context of the study to include the playground, the cafeteria, all educational settings, and the home. Visual programs have been used as a strategy to increase predictability for students with autism. Timelines can be used to visually communicate upcoming events, facilitate transitions between activities, and increase student independence.

Hall et al. (1995) used a picture book program to describe daily activities in the general education classroom for three students with disabilities, including one with autism. Results showed that students followed their activity plans 90% to 100% of the time and required less prompting from classroom aides. MacDuff et al. (1993), and Bryan & Gast (2000) found increases in on- and off-program responding with students with autism through the use of imagery activity programs.

3.7 Delayed contingencies

For students with autism to be functional in general education classes, some degree of independent academic functioning is required. Previous research has shown that while there have been successes in increasing independence under close adult supervision, removing the excess has resulted in re-emergence of challenging behavior and decreases in appropriate behavior. Studies have examined the use of delayed and unpredictable conflicts to facilitate maintenance and generalization of behavior in the absence of direct supervision. Dunlap & Johnson (1985) used a contingency supervision schedule with three children with Autism. Results showed that levels of work behavior and productivity were higher during unsupervised periods after using an unpredictable schedule compared to the predictable supervised schedule.

3.8 Self-management strategies

The components of self-management include studying goals, self-observing and recording the student's own behavior, and giving his own reinforcement. Self-management strategies promote classroom independence by shifting the responsibility of managing behavior from the teacher to the student. Self-management has been shown to promote independent functioning even to the point where a student no longer needs an assistant and shows less dependence on the teacher (Koegel et al., 1999). With less dependence on adults, students have more opportunities to interact with their peers and participate more in classroom activities. Several other studies have found similar results in improving social skills, social interactions, and independent work skills using self-management procedures with students with Autism (Mendo-Lázaro et al., 2018).

3.9 Interventions by peer media

Peer-mediated interventions emphasize the participation of typically developing peers as socially competent facilitators to promote appropriate communicative and social behaviors (Strain et al., 1996). As a way to improve

social reciprocity in more natural social contexts, peer-mediated interventions have been shown to be effective in providing social learning opportunities through peer interaction, peer modeling, and peer reinforcement. Peer tutoring has been used to improve on-task behavior, math performance, and social interactions for children with disabilities in inclusive classrooms (Rodríguez-Medina et al., 2016).

Whole-class peer instruction that involves pairing all children in the classroom has improved reading fluency, text comprehension, and social interactions between students with autism and their peers. More sophisticated uses of peer-mediated strategies include training typical peers to implement basic response training (Nada-Raja et al., 1992), interventional instruction, and monitoring strategies (Morrison et al., 2001) combined self-monitoring with peer-mediated strategies to improve the social interaction of four elementary school students. The combined intervention resulted in increases in requesting, commenting, and sharing behaviors during free play.

3.10 A standardized model of personalized interventions

One of the most common barriers to inclusion is problem behaviors and when students exhibit frustrating behaviors in retaining themselves in general education settings. Prevent–Teach–Enhance (PTR) is a model of personalized PBS designed for use in classroom settings to address the need for a standardized, function-based behavioral intervention model for students with severe behavior problems (Iovannone et al., 2009). The model includes a process for conducting a functional behavior assessment and then using the results to develop intervention plans. It is a collaborative group process facilitated by a counselor experienced in behavioral principles who guides the group through five steps.

Step 1: Grouping establishes membership and an agreement on how the group will operate, including methods for achieving consensus and assigning responsibilities.

Step 2: Goal setting focuses on identifying and setting social, behavioral, and academic goals. The step involves developing a practical tool for daily measurement of target behaviors, the Behavior Scale (BRS).

Step 3: PTR assessment (functional behavior assessment) includes direct and indirect observations covering three categories related to antecedent variables (Prevention), function and replacement variables (Teach), and consequence variables (Reinforcement).

Step 4: Intervention requires the team to select interventions that fit the hypothesis and represent each intervention component (ie, PTR). Step 4 includes a plan for training and coaching adults to implement the strategies as intended. The fidelity of the implementation of the support plan is evaluated during this step.

Step 5: The evaluation uses the BRS data to make decisions about the plan's effectiveness and next steps.

The model manual has been published and provides detailed descriptions of each step as well as tools to be used by teams to collaboratively develop an effective function-based support plan (Dunlap et al., 2010). The PTR was systematically evaluated with more than 200 students with a variety of diagnoses (including students with autism) in five school districts in two states. Results showed that students who received the PTR intervention showed significantly greater improvements in social skills, behaviors, and academic participation than their counterparts who received standard services (Iovannone et al., 2009).

The PTR received high social validity scores and teachers were able to implement the interventions with fidelity. The students included in the study were placed in a variety of settings, including 45% in general education. Strain et al. (2011) specifically evaluated the PTR model with three students diagnosed with autism who spent most of their time in general education classrooms. The students' problem behaviors were severe and included aggression, property destruction, obsessive-compulsive behaviors, violent outbursts, and suicidal threats. Implementation of the PTR model resulted in rapid reductions in problem behaviors and improvements in task engagement for all three children. Teachers implemented the interventions with high fidelity immediately after training and during follow-up, indicating that the interventions were feasible to implement in the general education classroom.

3.11 Organizational/Systems change strategies

A key variable for the success of students with ASD in inclusive settings is the overall school environment. Philosophical practices and policies in a school are instrumental in creating the level of general education receptivity for students with disabilities (including students with ASD), and the processes that determine identification, assessment, and intervention strategies can determine the extent to which successful integration is possible (Soukup; Feinstein, 2007). In short, the school context in which inclusion is considered may be as important as, or more important to achieving success than the integrity of the specific processes implemented.

Over the past 10 to 15 years, there have been significant developments in school restructuring and school system

change that have important implications for inclusion practice. Some of these developments have the potential to affect the inclusion opportunities of students with ASD. Therefore, the focus of this module is on large-scale, organizational initiatives involving systems change and the development of research-based interventions to support inclusive education (Janine; Waclawski, 2002). The two initiatives we will discuss are response to intervention (RtI) and school-based PBS (SW-PBS), which are, in fact, closely related.

Both initiatives have ample evidence of the benefits they can provide to students who have disabilities or are at risk of disability. In addition, both are supported by research and technical assistance funding from the federal government and agencies in many states. However, it is important to recognize at the outset that no initiative is specific to ASD and that there is no direct research linking the initiatives to specific benefits for students with ASD (Kasari et al., 2013).

The initiatives are presented in this section for two reasons: (a) They are becoming very common in schools across the United States (and elsewhere), and b) they contain a clear rationale that links the practices to obvious effects on inclusion and to educational benefits for students with ASD. RtI has been described as an approach to creating and redesigning teaching and learning environments to improve effectiveness and efficiency for all students and teachers (Sugai, 2007). RtI is a problem-solving and decision-making model based on a multiple prevention framework that has been common in public health and has also emerged in education and early intervention (Simeonnson, 1991). RtI emerged as a policy under the Individuals with Disabilities Improvement Act of 2004, and its conceptual and empirical foundations are drawn from applied behavior analysis, curriculum-based measurement, and precision instruction. It is characterized by five defining characteristics: (a) universal screening to identify students at risk, (b) continuous monitoring of progress to identify students who may need additional support, (c) a continuum of evidence-based intervention practices that vary in intensity and are implemented according to individual student needs, d) data-based decision making and problem solving, and (e) fidelity of implementation for each level of the model to ensure practices are implemented accurately and consistently.

The majority of RtI efforts have focused on academic curriculum and educational practices primarily in relation to learning disabilities. Studies evaluating components of RtI have shown improvements in reading fluency with elementary students with reading deficits. SW-PBS is a three-tiered prevention model that includes primary (universal systems strategies for all students), secondary (interventions for specialized groups, classrooms, or students with at-risk behavior), and tertiary (interventions for students with severe behavior problems) levels support. Therefore, all students receive support at universal or primary level. If some students' behavior is unresponsive, then more intensive behavioral supports are provided at the secondary or tertiary level. There are compelling reasons to believe that building a positive school culture at a universal (whole school) level can have a significant impact on students with ASD (Freeman et al., 2006).

Successful SW-PBS incorporates findings from organizational behavior management designed to increase organizations' ability to facilitate and sustain systems change (Sugai; Horner, 2002). These strategies include gaining administrative support from school leaders, building capacity, maintaining, and expanding funding, data-driven decision making, and team decision making (George; Kincaid, 2008). Within the SW-PBS model, secondary interventions were successful in improving inclusion and preventing the need for more intensive interventions for students with ASD. Secondary interventions may include social skills groups or increased reinforcement contingencies to improve problem behavior.

3.12 Benefits of assistive technology in ASD

Some of the benefits of assistive technology for people with autism are improved communication skills. When the assistive technology used is in the form of a web application, it is widely reported that an application can improve organization and time management, reduce conflicts with parents during the morning routine, and improve academic performance of the person. The visual representation of language is observed which helps the child to communicate in a much better way than other forms of communication. Additionally, there is a sense of self-reliance and independence afforded to the individual. Assistive technology improves organization and memory for planning processes and tracking information such as events, weekly schedule, calendar, and to-do list. In conclusion, the development of social and academic skills as well as motor development are some of the benefits associated with the use of assistive technology (Moraiti et al., 2022).

According to numerous studies, information, and communication technologies (ICTs) offer new opportunities to people with developmental disorders in order to develop their autonomy and independence in their daily activities (Meshur, 2016). Specifically, according to the following research participants with cognitive difficulties and autism spectrum disorder used two technological tools to perform their educational activities. The combination of visual and textual information significantly helped students with cognitive disabilities and ASD to focus on the presented contents, avoiding usability and accessibility issues and therefore improving their learning process. At the same

time, the participants had fun interacting with the new technologies, which are found in smartphones and tablets, devices accessible to a wide range of the population. These devices, through their ease of use, touch interaction and portability, have lowered the barriers for people to interact with ICT. Tablets/smartphones allow users through natural gestures to interact and manipulate content directly, allowing them to express themselves in a more natural way, creating better understanding.

Two areas of interest related to assistive technologies for cognitive disabilities are job placement and education. Technologies in general, and mobile technologies in particular, seem to fit perfectly into the shaping and training process. Traditionally, the skills necessary to advance these individuals' job entry are acquired by repeating standard tasks many times. During the sessions with the help of technological tools, the teachers provide verbal instructions as well as manuals with the necessary instructions to the parents (Eady et al., 2013). In some cases, these manuals are enriched with illustrations or diagrams. This approach presents some challenges, such as difficulties relocating when lost or looking for a specific instruction. In addition, during the learning process caregivers must monitor their performance, which requires time and human resources. To solve this problem, it is appropriate to choose a platform for the development of a customized system to support activities to be the smartphone/tablet devices which the user can buy in a wide range of prices according to his ability.

In the field of education, the use of tablets for disabled people has generated a lot of excitement in the education community and their preference for touchscreens has long been documented. This enthusiasm has prompted developers to create hundreds of apps to help people with cognitive disabilities, making it difficult for educators to identify the most useful ones for each individual case. On the other hand, several times teachers do not achieve their educational goals since they are not able to provide appropriate multimedia content, mainly due to the lack of flexibility of the available tools.

3.13 Mobile phone technologies

AssisT-Task app is an app that provides customized task guidance for mobile phones. Users receive assistance wherever they are at any time with the help of QR codes as needed and the context defined by their caregiver as they design the sequence of steps that make up the requested task for the user to perform. All the necessary information to identify the work is then coded into a visual signal (the QR Code) that must be printed and placed near the place where the work is to be carried out. This way users only need to launch the app and point their phones at the tag and get help (Wang et al., 2018).

Guidance is provided through step-by-step instructions supplemented with photographs. To facilitate the process, the system can be set to read instructions aloud to meet needs in multiple ways and channels. Additionally, the app offers an alert mechanism to prevent users from being blocked. If users do not interact with their mobile for a period of time set by caregivers, the system reads the instructions aloud again to warn them that the app will lock. Finally, it records a detailed log so that user performance can be analyzed over time.

Caregivers can create, edit, and customize the sequences for their users as the software allows them to tailor the sequence of tasks to the users' needs and where it is allowed to remove the assistance provided so that the users gain independence as they progress execution of tasks. They can select any step or steps from the sequence they have defined and remove them for a specific user when they have mastered a task. In this way, the help adapts according to the users' progress. The interface and functionality of the application have been designed in collaboration with therapists and educators with the aim of being understandable to users and with the ability to provide a personalized user experience according to the opinion of experts (McNamara et al., 2006). Once the user is selected, a QR capture screen appears, the camera opens, and once a QR code is detected, it is captured and decoded. This loads all available job information and starts the sequence of steps.

Another technological implementation is Dedos which provides teachers with the right tools to design educational and collaborative activities for students. Accordingly, there is also an editing version, Dedos-Editor which is an authoring tool designed to allow teachers to create activities in a flexible way and share it with colleagues. This process can be performed on traditional computers and touch devices. The application is specially designed for users with little technological expertise and the device requirements to perform the activities are minimal.

Each activity can be captured on cards so that they are easy to use for a wide range of students. It offers four types of activities, single and multiple choice, match pairs, connect the dots and math but can be combined to design more complex exercises. Once the learning project is designed, students can solve it using the Player version. The player can be either a digital whiteboard which you are placing in more and more schools or a tablet/smartphone device. Before starting the activities, teachers can shape them according to the educational goals they want to achieve and the needs of the students. Also, the application allows to configure the number of students who will perform the project, how the feedback will be given, if the students will solve the activities in different lessons or

all at the same time, how many students must answer each activity, if the students must answer the activities correctly and if they have to give the same answer. As we understand the functions provided to teachers are many and all that is needed is an electronic device computer/tablet/smartphone.

3.14 Educational experience using the above technology tools

The implementation of the above tools in school classrooms through the inclusion of mobile technologies in vocational training and special education will help students acquire important skills that will improve their autonomy. Indeed, two trials were conducted where mobile technologies were used to assist in the learning processes of vocational and educational skills (Roldán-Álvarez et al.,2016),

The educational experience with the Assist-Task tool involved 10 people aged 16 to 19 with cognitive disabilities and autism. They were students in an educational work program at a special education center. The application ran on a smartphone device and the task developed by the teachers and in which the students participated was the lamination task. As mentioned above these tasks are given to users through verbal instructions or flashcards. Educators designed the procedure using photos of the procedure, and users received only smartphone assistance and indirect supervision from their instructor. In each session the teacher took notes and declared in the application whether the user completed the activity correctly or not.

The study involved 90 sessions and lasted about two months. Each user did the task 9 times. From both the smartphone records and the teacher's notes, it was found that all participants performed the activity correctly during the experiment and the completion rate was 100%. This was a very important factor since the educational process tries to make students proficient in a task and then to accomplish the process in the least possible implementation time. For this reason, the time to complete the task was also measured with an important observation that the time to implement the task in each session was even lower. On the other hand, when it comes to using the smartphone, there was no difficulty of use, and the interaction was fluent. In addition, it was observed that the students received the motivation, and it made them more willing to participate in the activity.

On the other hand, 15 students, 12-20 years old with cognitive difficulties participated in the educational experience with Dedos. Some of them were also diagnosed with Autism Spectrum Disorder (ASD). More than half of the participants had reading difficulties. The study was conducted in three sessions over three weeks, and each participant was asked to perform two educational projects using a smartphone/tablet. Each student completed both projects at least once a week for a total of three weeks. The duration of each session was not predetermined in order to avoid participants' nervousness. The activities performed by the students contained visual and textual information. The texts were easy to read, so they did not affect the student's performance. The data obtained from the sessions were analyzed and the following conclusions were drawn from the studies. Participants using the ICT tools increased their performance as the sessions progressed.

The combination of visual and textual information helped students with cognitive disabilities and ASD to focus on the presented content, avoiding usability and accessibility issues and therefore improving the learning process while having fun interacting with the new technologies. From the results the researchers concluded that the use of technology has a positive influence on students when performing activities. In addition, the use of technology has motivated students and at the same time teachers and students can more easily achieve their goals. The portability and accessibility that smartphones and tablets provide make them interesting tools for use in learning environments for students with special needs (Kaliciak et al., 2013).

Moreover, in recent decades, significant social changes have been observed, which are related to the role of A.I. and technology in people's daily lives. The most important of them concern communication, diffusion, and management information's and in the ability to assimilate and utilize the produced new knowledge. We have to underline that the role of Digital Technologies in education domain as well as in all the aspects of everyday life, are very productive and successful, facilitate and improve the assessment, the intervention, decision making, the educational procedures and all the scientific and productive procedures via Mobiles (Stathopoulou, et al., 2018, 2019, 2020; Kokkalia et al., 2016; Drigas et al., 2015; Vlachou et al., 2017; Papoutsi et al., 2018; Karabatzaki et al., 2018), various ICTs applications (Drigas et al., 2004, 2005, 2006, 2009, 2011, 2013, 2014, 2015, 2016, 2017, 2019; Pappas et al., 2018, 2019; Papanastasiou et al., 2018, 2020; Alexopoulou et al., 2019; Kontostavlou et al., 2019; Charami et al., 2014; Bakola et al., 2019; Kontostavlou et al., 2019; Alexopoulou et al., 2019), via AI Robotics & STEM (Drigas et al., 2004, 2005, 2009, 2014; Vrettaros et al., 2009; Anagnostopoulou et al., 2020; Lytra et al., 2021; Pappas et al., 2016; Mitsea et al., 2020; Chaidi et al., 2021), and games (Chaidi; Drigas 2022; Kokkalia et al., 2017; Drigas; Mitsea 2021).

The New Technologies (NT) and more specifically Digital Technologies provide the tools for access, the analysis and transfer of information and for its management and utilization new knowledge. Information and

Communication Technologies (ICT), unprecedented technological capabilities of man, have a catalytic effect, create the new social reality, and shape the Information Society (Drigas; Kontopoulou, 2016; Theodorou; Drigas, 2017; Drigas; Kostas, 2014; Bakola et al., 2019, 2022; Drigas; Politi-Georgousi, 2019; Karyotaki et al., 2022). Moreover, games and gamification techniques and practices within general and special education improves the educational procedures and environment, making them more friendly and enjoyable (Drigas et al., 2014, 2015; Papanastasiou et al., 2017; Kokkalia et al., 2016, 2017; Doulou et al., 2022; Chaidi et al., 2022).

Concluding, it's necessary to refer that the combination of ICTs with theories and models of metacognition, mindfulness, meditation and emotional intelligence cultivation accelerates and improves more over the educational, productive, and decision- making practices and results (Drigas; Papoutsi, 2020; Drigas; Mitsea, 2020, 2021, 2022; Kokkalia et al., 2019; Pappas; Drigas, 2019; Papoutsi; Drigas, 2016; Karyotaki; Drigas, 2015, 2016; Papoutsi et al., 2019, 2021; Chaidi; Drigas, 2020; Drigas; Karyotaki, 2019; Mitsea et al., 2020, 2021; Angelopoulou; Drigas, 2021; Tourimpampa et al., 2018; Kapsi et al., 2020; Drigas et al., 2021, 2022; Galitskaya; Drigas, 2021). Finally, Driga et al. (2019), Stavridou et al. (2021), and Zavitzanou (2021) suggest that various environmental and dietary factors can act as inhibitors or facilitators of the improvement of the mental abilities and strengths.

4. Conclusions

The conclusion of the present literature review is that there are strategies to achieve the successful integration of autistic individuals in the school environment. An important role for integration to take place is to provide appropriate knowledge and information to teachers and from teachers to students of typical development and their parents with the ultimate goal of independence and inclusion of people with neurodevelopmental disorders. We focused on the role of assistive technology because it is used by the largest share of the population and after a lot of research it is a fact that information and communication technologies offer new opportunities to people with developmental disorders.

Children with autism spectrum disorders have trouble exhibiting socially appropriate behaviors, which is a barrier to their inclusion in regular educational settings. These behaviors can be greatly enhanced by technology through online apps and by enhancing social interactions among students.

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6. Auhors' Contributions

Ioanna Moraiti: experimental design, writing, grammatical and scientific corrections in the manuscript and publication. *Anestis Fotoglou*: experimental design, writing, grammatical and scientific corrections in the manuscript. *Agathi Stathopoulou*: experimental design, writing, grammatical and scientific corrections in the manuscript. *Dionysis Loukeris*: experimental design, writing, grammatical and scientific corrections in the manuscript.

7. Conflicts of Interest

No conflicts of interest.

8. Ethics Approval

Not applicable.

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