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## *Asperger Syndrome and Assistive Technologies*

Theopisti Marina Hasioti<sup>1</sup>, Athanasios Drigas<sup>2</sup>, Dionysis Loukeris<sup>3</sup>, Zoe Gavriilidou<sup>4</sup>

<sup>1 2 3</sup>Net Media Lab Mind - Brain R&D IIT - N.C.S.R. "Demokritos" , Athens, Greece,  
<sup>1 3 4</sup>Democritus University of Thrace

theopistichasioti@gmail.com, dr@iit.demokritos.gr, dlookas@gmail.com,  
zgabriil@helit.duth.gr

**Abstract.** In this paper we present a study which revolves around the importance of ICTs (Information and communication technologies) at people with Asperger Syndrome. The goal of the study was to unveil how people with autism such as Asperger Syndrome could use ICTs in order to enhance and facilitate their teaching, learning and everyday lifestyle. ICTs will be potentially a tool towards overcoming difficulties of these individuals.

**Keywords.** ICTs, assistive technologies, autism, Asperger Syndrome, access, educational process, socialization, learning tool

### **1. Introduction**

Nowadays, it is evident that Information and communication technologies (ICTs) have become a crucial aspect of community, living and education. In particular, the development of ICTs provides the opportunity to individuals with autism and specifically Asperger Syndrome to enhance and facilitate their teaching, learning and everyday lifestyle. Asperger's Syndrome is a neurodevelopmental disorder that was only officially recognized by experts in 1994 when it was added to the Diagnostic and Statistical Manual (DSM IV). This syndrome has several similarities with autism. It is characterized by deficiencies and dysfunctions in various areas of development and affects how the individual perceives the world, his ability to understand the thoughts and feelings of others as well as his ability to interact and communicate with other people. Characteristic of the disorder is also the appearance of stereotypical behavior, interests and activities. People with Asperger's usually have average or even higher intelligence. Also, people with Asperger's do not experience significant delays or deviations in language acquisition (grammar, syntax, etc.) as is often the case with autistic people. However, more subtle aspects of social communication (eg the formal giving and receiving of a conversation) are likely to be affected. It is a fact that nothing is more negative, and the "symptoms" of the syndrome can be seen as forces and can be used to help the child be successful in life. Also, often the unique behaviors of a child with Asperger's can be channeled into advantages with the right support, a little creativity, and a change in the way one sees things.

## **2. Asperger and assistive technologies**

At their article Ganz et al, present the results of two case studies of self-monitoring as an intervention for improving pro-social behaviors in two adolescent boys with Asperger. Their research included four questions:

What are the effects of self-monitoring alone (using a vibrating reminder)?

What are the effects of a self-monitoring (vibrating reminder) plus a global rating scale?

What are the effects of a self-monitoring (vibrating reminder) plus a tally self-rating sheet and external reinforcement?

Were the effects maintained following cessation of treatment?

Two middle school students took part in their research, one 12 years old and one 13 years old. The first one was diagnosed with Asperger disorder at the age of 10 years old and he participated in this study because his oral self-stimulatory behavior occurred frequently throughout general education and other parts of the school day. The second one was diagnosed with Asperger disorder at the age of 9 years old. The autism specialist in his school district referred Daniel for participation in this intervention because, although he had normal speech and language skills, Daniel frequently talked at length about preferred topics (i.e., flight and planes) or engaged in monologues about himself, failing to give his communicative partner opportunities to speak and failing to ask them questions about themselves or comment on their statements. For this research self-monitoring materials were individualized. Materials included a MotivAider (available at [habitchange.com](http://habitchange.com) for approximately \$60; now available as an Android app for \$1.99 with limited functionality), which is a timer with a vibrating alarm that can be set to vibrate at chosen intervals to notify participants that they should check to determine whether or not they are engaging in target behaviors. The MotivAider is a small device (about 2 × 3 inches) that can be attached with a clip to one's waistband or put in a pocket. It has two buttons on the face to adjust the settings and a small display with numerals. The researchers programmed the MotivAider to vibrate every 30 seconds as a reminder to the participants; the device can be programmed for a wide range of time spans and with differing intensities of vibration to alert the wearer. Both participants showed some progress at points in the study. Self-monitoring can be a low-cost, or no-cost intervention with general levels of high social acceptability, low training requirements, and no social stigma. Typically developing children and adults commonly use self-monitoring on a variety of behaviors like eating or exercise. The use of such strategies, when determined effective, is compelling for the improvement of quality of life for individuals with disabilities in general, and ASD specifically.

Smith et al. at their article refer to the case study of Anthony. Anthony struggles to get his thoughts on paper in school. Too often, his written assignments fall short in length and depth from his same age peers. Teachers share that his writing is not well organized, structured to the assigned content, or mature in word choice. He also has difficulty meeting timelines for extended assignments, taking notes in class, and gleaning the essential details out of the material that is presented. This article proposes some technology solutions which will help people like Anthony who have been diagnosed with Asperger Syndrome. The first one is Social Skill Development which assist people with autism to develop their social skills through some rules. The second is the Boardmaker which is a communication and learning tool containing over 3000 Picture Communication Symbols (PCS). Another one is iMovie/MovieMaker that enhance the visual experience for the learner and to better illustrate what other people are thinking and feeling within a given social situation, brief movies are increasingly being developed. The Power Point Technology is an excellent way to engage a student's special interest while expanding his/her learning via technology engagement. In Anthony's illustration,

PowerPoint allows him to communicate essential information regarding content, assess learning, and provide alternative output for written product development. Last one is Color-coding. Color can easily distinguish information, allowing the student to group content, assignments, notes, and homework specific to a course. For example, Anthony color codes class notebooks (blue notebook for science), uses colorbased graphic organizers, and has asked for teachers to consider using a specific color paper for homework assignments.

Breivik and Hemmingsson at their article tried to highlight how adolescents with AS experience writing in the school setting when writing by hand and when using a computerized Assistive, Technology Device, ATD, for writing. The chosen ATD was an Alpha Smart Neo, a portable keyboard with a display that clearly shows what is written ([www.alphasmart.com](http://www.alphasmart.com)). It can easily be handled by the student who can connect it to a printer to give the teacher the produced text when needed. In the following quotations the Alpha Smart is referred to as "the device". The study included adolescents with AS who A) were between 11 – 16 years of age, who through earlier occupational therapy assessment had documented limited hand function and handwriting difficulties in school, and B) had used the computerized ATD for at least one year, and were still using it. Previously, when the children were referred to the Habilitation Centre for assessment, parents and teachers reported severe handwriting difficulties. Furthermore, a semi-structured interview guide in four parts was developed that included both open and more structured questions. The first part of the interview guide contained introduction questions, the second part contained questions about the activity of writing in general in the school setting, the third part contained questions about handwriting, and the fourth part contained questions about writing when using the ATD. Four boys and one girl participated, reflecting the fact that more boys than girls are diagnosed with AS (8). Participating adolescents attended regular classes in their neighborhood school. The parents and teachers were all women. In total fifteen persons participated in the study. The result of the ratings of perceived performance and satisfaction of writing A) in handwriting and B) when using the device, matched the qualitative data, on how the performance of writing was experienced. This triangulation indicates the trustworthiness of the result. The participating adolescents described several aspects of handwriting difficulties concerning letter shaping problems combined with pain in the hand and fingers. The participants also mentioned the advantages of being able to keep up with classmates, and being able to make changes in the text easily, being able to change files and use the spelling program.

The purpose of the study of Myles et al. was to determine whether the use of a personal digital assistant (PDA) would facilitate the recording of homework by an adolescent boy with Asperger syndrome (AS). Joseph (a pseudonym) was a 17-year-old boy who was in his junior year at a public high school located in a middle-class community in the midwestern United States. He had a diagnosis of AS made by a medical professional using criteria in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders. Joseph was also asked to complete the Adolescent/Adult Sensory Profile to determine whether he had any sensory issues that would need to be addressed. This assessment revealed that his sensory sensitivity was classified as "much more than most people," his low registration and sensation avoidance was identified as "more than most people," and his sensation seeking was rated as "less than most people." A Hewlett Packard Jornada 560 PDA (Hewlett-Packard, 2002) with Microsoft Pocket PC Software 2002 (Microsoft, 2001)—specifically, the calendar function—was used in implementing the intervention. This investigation showed that the use of an assistive technology device, a PDA, resulted in an increase in independent homework behavior—as measured by

more complete information on homework assignments entered into the PDA—by an adolescent with AS in three school settings.

Lacava et al. tried to explore the use of assistive technology to teach emotion recognition (ER) to eight children with ASC. Participants were between the ages of 8 and 11 years and had a diagnosis of Asperger syndrome (AS). Two (25%) girls and six (75%) boys, ages 8 through 11 ( $M = 10.27$ ,  $SD = 1.24$ ), participated in the study. All participants were European American and had a formal diagnosis of AS. All were diagnosed using criteria from either the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV; American Psychiatric Association, 1994), or the DSM-IV text revision (DSM-IV-TR; American Psychiatric Association, 2000), and a licensed psychiatrist or psychologist rendered a diagnosis independently to each participant. The following four instruments were used. The first three were used during testing, the fourth during the intervention: Cambridge Mindreading Face–Voice Battery for Children. The Cambridge Mindreading Face–Voice Battery for Children assessed the recognition of 15 emotional concepts from facial expression video clips and speech segment audio clips taken from Mind Reading. Child Feature-Based Auditory Task. The Child Feature-Based Auditory Task tested participants' ability to recognize complex emotions using 17 speech segments. Reading the Mind in Films Test–Children's Version. The Reading the Mind in Films Test–Children's Version tested participants' ability to recognize emotions in characters in short social scenes taken from four children's movies. Mind Reading. The Mind Reading software, which served as the independent variable, consists of several components, including emotions library, learning center, and games zone. The emotions library is a catalogue of over 400 different emotions for viewing and interacting. Emotions are presented separately in photographs, short movie clips, and audio clips and are also demonstrated through contextual examples. Results suggest that Mind Reading is a promising new tool for teaching emotion recognition to individuals with AS.

Shrieber et al. in their article they present the purpose of their study which is to examine the use of photographs and assistive technologies for visual information processing as motivating tools for interpersonal communication of adolescents with Asperger Syndrome (AS), aged 16 to 18 years, attending special education school. A qualitative method was chosen for analysis as this method serves the current research objectives. Qualitative research involves collecting information about personal experiences, introspection, childhood stories, interviews, observations, historical interactions, and visual texts which are significant moments and meaningful in peoples' lives. In their research, students with AS expressed their personal stories from their individual perspective. The research population included adolescent students aged 16 to 18 years of average intelligence, diagnosed with Asperger Syndrome and studying in special education schools. The students are from average socioeconomic backgrounds and from supportive families. All five were transferred from their regular schools and began studying in a special education school. This change stemmed from crises, experiences of rejection, and social isolation. Before the transfer, some spent several months at home without attending any educational framework. The chosen research methodology consisted of open ethnographic interviews and observations of the students. Research findings were based on references and verbal responses of participants to photographs and footage of themselves or their classmates. Content analysis was conducted on each response, either made privately or within general class discourse. So analysis of findings examined the impact of using photos and various assistive technologies on the communication of adolescents with AS. These were conducted according to the following categories:

1. Use of photos and assistive technologies as a motive for interpersonal communication and the development of social skills.
2. Photographs and assistive technologies to stimulate intrapersonal communication.
3. Exposing and highlighting the difficulties of interpersonal communication through use of photos and assistive technologies.

Wozniak et al. at their report they examined the role of tablets (namely iPads) in the lives of children and adolescents with Asperger's Syndrome and how assistive technology is an effective technique for teaching emotional recognition skills in children with Asperger's Syndrome. To achieve the first research goal of this report, sources were obtained using two methods. First, a computerized search for empirical research was conducted of the PsycINFO database using combinations of the following keywords: "Asperger's Syndrome" "iPads" and/or "tablets." This search did not result in any relevant sources. Second, a Google search was performed using the same previously identified keywords. This search yielded 13 relevant resources. Eight of these sources were written by various professionals (i.e., speech-language pathologist, retired special education teacher) who either currently work or have worked with children and adolescents with Asperger's Syndrome. Five of the sources are from the perspective of mothers who have a child or adolescent with Asperger's Syndrome. The findings of this literature review suggest that many professionals and mothers support the use of iPads for children and adolescents with Asperger's Syndrome. This report uncovered a lack of empirical research on the use of tablet computers (namely iPads) to support children and adolescents with Asperger's Syndrome.

### **Conclusion**

The incorporation of digital technologies in education domain and in the intervention rehabilitation procedures is very productive and successful, facilitates and improves the educational procedures via Mobiles [12-21], various ICTs applications [22-54], AI & STEM [55-66], and games [67-72]. Additionally the combination of ICTs with theories and models of metacognition, mindfulness, meditation and emotional intelligence cultivation [73-96] as well as with environmental factors and nutrition [8-11], accelerates and improves more over the educational practices and results.

Moreover, it is a fact that Assistive Technologies are very important for people who have been diagnosed with Asperger Syndrome. In addition, the usefulness of ICTs was proven through the use programs and software by people with autism. This research suggested that the ICT programs and software can facilitate the life of these individuals. Finally, the use of computers and assistive technologies strengthens the self-independence and socialization of persons with Asperger Syndrome. It is obvious that researches have shown that governments should organize ICTs at schools and other institutions in order to bridge the gap in accessing ICT among different individuals and social groups. Assistive technology (AT) can play a major role in overcoming the barriers that these persons with developmental disorders. There is no doubt that education policies must promote the use of ICT in schools for autistic students to reinforce the positive attitudes of teachers who already use the ICT for MMR students in their teaching.

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