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# IoT Applications help people with Autism

**Anestis Fotoglou, Ioanna Moraiti, Katerina Dona, Alexandra Katsimperi, Konstantinos Tsionakas, Zoi Karabatzaki, Athanasios Drigas**

Net Media Lab Mind - Brain R&D IIT - N.C.S.R. "Demokritos" , Athens, Greece

anestis.fotoglou@gmail.com, Ioanmora2@helit.duth.gr, kdona2008@hotmail.com, alexandra.kats88@gmail.com, kons_tsio@yahoo.gr, zkarabatzaki@gmail.com, dr@iit.demokritos.gr

**Abstract**. This article is aimed at teachers, parents, caregivers, and everyone interested in special education and the autism spectrum. The purpose is to present the usefulness of technological applications in special education and specifically refers to the usefulness of Internet of Things applications in Autism disorder. Digital technologies have come actively into everyday life to provide solutions even in a complex fields such as special education. Technology and the internet of things promise to people who belong to the autism spectrum but also to their parents' solutions that aim at their integration into society. Smart devices save time, data, and several treatments. The Autism Spectrum Disorder, the IoT technology in the field of Medicine - IoT, the IoT applications with the help of artificial intelligence, and the skills acquired by people with autism because of these technological innovations are some of the fields that will be analyzed.

**Keywords**. Internet of Things, Autism, Assistive technologies, Smart devices, Assistive learning, IoT, ASD, MIoT, AIoT, AI, Artificial Intelligence, Special Education

## 1. Introduction

In the Information Era all forms of ICTs, like web and mobile applications, AI & STEM tools, serious games, e-learning and tele-education services, etc., are exploited in general and special education [72-79]. Digital technologies can support various educational procedures in general and special education and in other related domains [80-87, 99-114] more effectively from an emotional perspective, and from an inclusiveness point of view. Going through the technology area, we behold that it has entered people's lives in many ways. Either with smart devices, or with smart homes, or smart mobile phones. The question is, can the development of technology help special education and more specifically in the field of autism? Can smart devices provide smart solutions to improve the daily lives of people with autism and draw on data that will enhance their treatment plan? This article mentions internet applications and how these applications can be turned into social and cognitive skills for people with autism but also to record the evolution of their treatments, and data important for their caregivers and teachers. It is possible in real-time to improve their responses to sensory stimuli that exist in the environment. As you will read below, there is a direct relationship between sensory processing, attention, and memory. The sensors that the devices have given a lot of information that is

important to develop and study. Artificial intelligence algorithms manage applications to function as the human mind and give the user the necessary information to advance the skills of the individual.

## 2. Autism

Autism Spectrum Disorder (ASD) is a broad term used to describe a group of neurodevelopmental conditions. These situations are characterized by differences in communication and social interaction. People with ASD often have problems with social communication and interaction, as well as limited or repetitive behaviors or interests. It is known that there isn't one type of autism but many subtypes, most influenced by a combination of genetic and environmental factors. Autism is a spectrum disorder, that's why every person with autism has a unique set of opportunities and challenges. How people with autism learn, think and solve problems can range from the individual's high potential to serious weaknesses. Some people with ASD may need significant support in their daily lives, while others may need less support and, in some cases, live completely independently. It is important to note that some people without ASD may also have some of these characteristics. Simply put, for people with ASD, these characteristics can make life very difficult. ASD is found in people from all over the world, regardless of race and nationality, culture, or economic background. Signs of autism usually appear at the age of 2 or 3 years. Some related developmental delays can occur even earlier and often, they can be diagnosed as early as 18 months. Research shows that early intervention in people with autism leads to positive outcomes for their lives later.

Autism is a disorder that is affecting more and more people. In addition, it can coexist with other types of developmental disorders such as perceptual and expressive developmental disorders, learning disabilities, and stuttering. According to DSM 5 (Am. Psychiatr. Assoc. 2013). there are changes compared to the previous version of DSM 4. The diffuse developmental disorder was merged into a single ASD category and social communication disorder was also added. ASD now includes all the elements of diffuse developmental disorder, Asperger's disorder, and diffuse developmental disorder — unspecified. In the last manual, there are now two criteria that the child must meet for autism spectrum disorder. The first, retained as in the previous version, is the limited and repetitive stereotypical behaviors and the second is merged into a category that indicates difficulties in social communication. In addition to the first criterion, a subcategory of symptoms was added that reflects sensory difficulties. Another big change in the DSM 5 is the division of the autistic spectrum into 3 gravity categories based on the level of functionality. We find Level 3 - "Need for particularly enhanced support" (serious difficulties in socialization and flexibility), Level 2 - "Need for enhanced support" (significant difficulties), and Level 1 - "Need for support" (difficulties above).

Children on the Autism spectrum need to be systematically evaluated for their abilities and difficulties, in order to find appropriate therapeutic and educational goals that meet their educational needs. In the school environment, the symptoms are able to be perceived in the form of learning difficulties, hyperactivity, anxiety disorders, emotional disorder, and sensory difficulties. In the community, there is a large number of educational approaches that have been designed. Despite the disagreements of their supporters, a common component reflects the general principles such as the clarity of the teacher's approach, the stability, and repetition of his goals, the perception of the specificity of the autistic disorder, and the flexibility in the appropriate structure of the environment. The internet of things is therefore a very easy to use and at the same time smart tool in the hands of teachers, therapists, parents, and caregivers to approach, evaluate and intervene in autism spectrum disorder. Specifically, a combination of

new technologies emerges in a general context but also in a more specific one with the specific system and tries to replace to some extent a deficit in the attention, interaction, and communication of these children. It is thus achieved as we will see an inextricably linked relationship between attention and learning readiness.

The smart system consists of a computer, internet, and sensors. By connecting to each child's computer and providing us with information about their movements through the sensor, they help their therapists and caregivers in real-time to observe the reactions and have a picture of their sensory profile. In addition, it can stimulate and regulate the sensory systems so that there is a sufficient level of alertness. These functions make it calmer to respond to the learning context through visual perception activities by providing stimuli such as vibrations in the chair, adjusting appropriate lighting and smells in the space. In addition, the lack of understanding of other people's feelings and thoughts (empathy) as well as the difficulty of neurotypicals in interpreting their own feelings was supplemented and aided by the significant contribution of internet devices. The design was holistic and therefore included bio-sensory, behavioral data as well as techniques applied to social psychology. The materials used for this purpose and helped in its implementation were a clock worn by the child for measurement, touch and pressure sensors for the observation of body movements and facial expressions, and a camera to record the moments. Additionally, receptors were placed on specific toys. With the help of the internet, the relationship between the child's contact and behavior such as his preferences and feelings could be recorded.

As it is mentioned below, the Internet of Things can contribute in many ways to the difficulties, and IoT enhance the efforts of therapists and parents to create the right sensory environment for children with autism and improve their social and cognitive skills. and their overall quality of life.

## 3. Internet of Things

One of the greatest innovations of the 20th century is the Internet of Things, which manage to connect all electronic devices locally or even on the internet. The term IoT was coined in the late 1990s by businessman Kevin Ashton. [40] The Internet of Things (IoT) is a concept that refers to everyday objects, such as vehicles, buildings, industrial devices, and wearable devices, which with the help of sensors and low-capacity processors collect data and take some action on a network. Depending on the case, sensors can be used that measure temperature, steps, humidity, blood sugar, air composition, etc. IoT enables objects to be controlled remotely. IoT can also collaborate with mobiles [62-71] to deliver and support various services. The data collected by the objects end up in another device that plays the role of mediator to be analyzed and utilized. The user has the supervision and control of the data whenever needed. For this reason, it is common for the device where the data ends up to be the smartphone since the user almost always has it with him and can control the data at any time. The Internet of Things, widely known as IoT, has made its presence felt in the medical industry as well. This has led to the emergence of a new term, Internet of medical things or IoMT, which refers to healthcare items. IoMT can be defined as a system in which medical devices interconnect and communicate using computer networks. These devices and applications store the collected data on cloud platforms from where it is easily accessible by healthcare providers, who can use it to perform real-time analysis and take timely medical action. The information collected by the smart devices is also used for medical research and analysis.

IoMT that has revolutionized the field of healthcare by enhancing treatment and improving patient prognosis. Similarly, IoT contributes to disorders such as Autism Spectrum

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Disorder (ASD). We can find IoMT functions in the treatments of autistic individuals in the following important pillars

1) Emergency services

If the autistic person is in an emergency or accident using IoT, the caregivers and parents of the individual receive the corresponding notifications and are informed about the condition of the individual. The notifications are transferred in real-time resulting in the timely and valid intervention of the caregivers.

2) Patient information management

A very useful pillar served by the help of the internet of things in healthcare is the management of patient information. The medical history is stored online along with other patient data. In this way, the person receives the necessary treatment.

3) Remote monitoring and real-time medical assistance

The internet of things and the many portable devices with sensors that people with autism or patients, in general, can wear enable their caregivers to know every minute the correct data about their health and to intervene at the right time. In addition, the internet of things helps people with disabilities stay in the comfort of their own homes and stay connected to professional doctors in real-time.

4) Research and Data Analysis

According to the Internet of Things solutions, medical research can easily and quickly gather huge amounts of data. If done manually, this process would take years. With the use of Internet of Things technologies, detailed data are recorded about each patient's illness, symptoms, and treatment plan. Then after entering the data of each patient into a database they give valuable information in the field of medicine. They help develop better treatments but also help health care centers make faster treatment and diagnosis decisions with less chance of error. [41]

Based on the above, the Internet of Things and specifically the Internet of Medical Things is a very important discovery for patients, people with disabilities, caregivers, and their doctors. With IoMT devices they have a better quality of life and acquire many capabilities which will be mentioned below.

## 4. IoT Applications for people with autism

A communication system for children on the autism spectrum enables new technologies to help them integrate and adapt better to a learning environment with the ultimate goal of improving their quality of life. More specifically, this system consists of a computer, internet, and sensors. By connecting to each child's computer and providing us with information about their movements through the sensor, they help their therapists and caregivers in real-time to observe the reactions and have a picture of their sensory profile. In addition, it can stimulate and regulate the sensory systems so that there is a sufficient level of alertness. These functions make it calmer to respond to the learning context through visual perception activities by providing stimuli such as vibrations in the chair, and adjustment of appropriate lighting and smells in the space.

A system was studied that consists of sensors such as a microphone and heart rate sensors that manage and collect information about the behavior and communication skills of each child. Connected via the Internet to the central computer unit it could collect data stored on a card. So there was a complete picture of each child at all stages of social communication as well as information about his sensory profile.

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In addition, there is an IoT framework that utilizes the detection capabilities of modern smartwatches to detect stereotypical behaviors in children with autism. The built-in accelerometer of the smartwatch worn on the wrist of individuals is used to detect three of the most common stereotypical behaviors that occur in a person with autism when the individual is trying to regulate sensory input from their environment. The framework aims to utilize the detection capabilities of modern smartwatches to detect and monitor individuals' behavior to facilitate clinical evaluation. It consists of a smartwatch, a smartphone with an application for data collection, an accelerometer sensor, and machine learning algorithms to detect and classify repetitive behaviors.

Numerous studies have been conducted to develop and evaluate tools for identifying the physical and emotional activity of people with autism. The data is collected by the accelerometer according to the movements of the individual's hands and with the help of various measurements including the maximum & minimum value, the variation, the entropy, the Fourier transform, the cosine transform, the Z transformation, etc.

The exported data is stored in the cloud for future processing. The innovation of the methods and algorithms used in this study proves that it is possible to record motion data from a smartwatch. It all starts with sensors located in the environment or the body of the child and with the help of Bluetooth or the internet the data is sent to the ASD IoT system. There, various devices are configured so that applications can access the data. Through these devices, we observe the interpretation of the data. The portable sensor informs us about the emotional state of children with ASD through pulse sensors and the accelerometer. Sensors in our environment provide information on room temperature and activity control. The goal of both categories of sensors is to provide us with real-time information to avoid injury and a better quality of life.

The education of children with autism in treatment and care centers as well as in special schools is very important for both the children themselves and the parents. Unfortunately, nowadays it is not possible to monitor every child at any time by a caregiver. This article analyzes the effort of IoT to offer through advanced technology significant help for their independence, their autonomy, and the increase of attention.

Going to the technical characteristics of this system, it is observed that it consists of three pillars. One sensor unit, one processing unit, and one application unit. It all starts with the first detection team which consists of a variety of sensors such as motion, GPS, audio, accelerometers, and heart rate. This activates a portable device from the above sensors. The GPS sensor determines the physical location of the child using latitude and longitude. With the accelerometer and the motion sensor, behaviors that lead to self-traumatic actions can be distinguished in the child. The sound and heart rate sensors detect signals that facilitate the observation of emotions expressing happiness, anger as well as lack of pulse.

In the processing unit, all the data recorded by the sensors will be entered, stored via the Internet, and evaluated to instruct the monitoring application to send a warning signal. The application is installed on smart devices for parents and caregivers of children. When it has been ascertained what the structural characteristics of the system consist of, the way and how the mechanism is activated will be pointed out. The database is divided into three values (low, medium, and high). According to the measurements made by the signals of the sensors, when the values are high or medium they send signals for hyperactivity and low attention. This is how the device rings for help from caregivers.

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## 5. Skills gained by children with autism through IoT devices – Relationship between sensory processing with social and cognitive skills

An important feature of the clinical descriptions of Autism Spectrum Disorder (ASD) is difficulty in maintaining sensory regulation and processing, difficulty in social communication, and non-cognitive flexibility. There is evidence that the sensory profile of children with autism differs from that of the typical early onset of the disorder and affects social functioning, behavior, and emotion. We, therefore, understand the direct relationship between sensory integration and cognitive and social skills.

This process aims to identify the sensory information that creates overload resulting in unwanted responses in hypersensitive individuals with ASD. The recording of sensory inputs that disrupt the desired level of stimulation can be performed in different environments in the form of loud sounds, bright lights, hot or cold weather, strong smells, and a sudden change of direction of the body and head. The latter occurs due to hypersensitivity of the vestibular system resulting in reacting by flight or fight. The process we are examining is implemented with the help of IoT. More specifically, touch and pressure sensors are used to monitor body movements and facial expressions, heart rate sensors that manage and collect information to observe emotions expressing happiness, anger as well as lack of pulse, and in addition sensors that regulate the current real-time environment for people with ASD with chair or bed vibrator control, light control to adjust room light, odor control to control room odor and finally sound control to emit soothing sounds.

The goal of IoT is the supportive intervention of hypersensitive individuals with ASD by creating three axes on which it moves. First, the data is collected by locating the sensory information that is useful to us for the image of the person, then we move on to the second stage where the monitoring takes place, the data analysis and decision making in real-time, and finally the level of notification to caregivers, parents, therapists depending on the environment of the person and the ultimate goal is to provide sensory information about the person through natural stimuli such as the vibration of the chair and bed while relaxing the child, providing odors that he likes as well as videos with color images improving the process of attention as the optical system is an important factor in regulating the individual. It is very important to identify the cause that causes the outburst of emotion through sensory overload. In the way we analyzed above, timely information is given to the person with ASD. The result of this balance is the reduction of hyperactivity, aggression, the ability to maintain attention and memory that enhanced learning readiness, and the development of social communication. Educational strategies based on metacognition, mindfulness, meditation and emotional intelligence cultivation [46-61, 115-130] when incorporated with IoT in educational procedures for autistic are very successful. Also the exploitation of games [94-98] within the domain of IoT can be beneficial.

As we understand the combination of the smart environment with new technologies and more specifically with IOT can be used in homes to improve their quality of life as well as in schools and other support centers for students with ASD for the development of social and cognitive skills.

## 6. AI and IoT

The Internet of Things and Artificial Intelligence are two of the most emerging technologies in the world right now.

AI applications [88-93], or artificial intelligence plays an essential role in the operation of IoT applications as it is located in many areas such as vision sensors, to locate the location

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but also to help devices learn and process information like a human. Artificial intelligence powers IoT applications. The combination of Artificial Intelligence with IoT is known as AIoT. AIoT promises internet users a connected future, intelligence along with data. Many AI projects have been created to enhance the Internet of Things. Some of them is a system that helps detect traffic accidents and illegal parking but also a system that helps ambulances reach their destinations by changing traffic signals. In addition, with the above technologies, a class monitoring system has been created. This system scans the room every 30 seconds. The algorithm is then able to identify each student's emotions (sad, happy, angry, or bored) along with their behavior. This explains his good or bad performance in his lessons. The whole idea of artificial intelligence is to capture more active data from IoT devices.

AI and the Internet of Things are used in many medical applications and autistic people can be helped by the proper use of automated systems. In addition, it is well known that early detection of autism can ensure the early treatment of individuals. This can be achieved with the processing power of AI. IoT devices such as cameras, sensors, and virtual reality can be very useful in analyzing the expression and monitoring the behavior of an autistic person. Continuous therapy can also be ensured using AI sensors and digital devices. An additional feature that helps individuals is the visualization of the material used by their therapists. Therefore, AI-enabled games can add a new dimension to this field and the acquisition of skills by individuals.

Everyday life leads to a smart society with thousands of smart devices replacing clocks, brooms, and household appliances that opened at the touch of a button. Nowadays, devices with the possibility of artificial intelligence are everywhere. People through them do not need to intervene in various fields and human intervention is reduced by a physical presence in the space. Accordingly, it would be beneficial to design these devices for people with autism, as human intervention could be significantly reduced and individuals' skills would be enhanced. IoT devices will contribute to the self-service of individuals and will live independently with the help of these devices. In this way, their integration into society will take place. Research has shown that mobile applications can be effective in treating ASD by acquiring the necessary skills and one of the greatest achievements of the research was the treatment of hoarseness in autistic people as well as being visible through applications and recognizing emotions of autistic people.

There is interest in how Artificial Intelligence can be combined with the Internet of Things. To make that happen, data collection is important, in any project that is to be implemented, data is initially collected. Determining the quantity, quality, and type of data is vital to the development of Artificial Intelligence on the Internet of Things.

AIoT is mutually supportive of both AI and IoT technologies. AI adds value to IoT technology through machine learning capabilities and on the other hand, AI can benefit from IoT through the connectivity and low power processors that smart devices provide. Additionally, useful for AI from IoT solutions are signaling and data exchange as there is a large number of unstructured human-oriented and machine-generated data. AI structures and analyzes the data provided by the IoT solution and gives value to the information provided by this data.

## 7. AI helps people with autism

Managing autism is difficult as everyone is affected in different ways. There is nothing that can be offered as a standard treatment, each diagnosis is considered a unique case. Therapists have to devote a lot of time to devising custom plans for each of their clients. These designs may not work and need to be optimized over and over again until they start to see

positive changes. The key to helping people with ASD is to acquire skills that will facilitate their school life, workplace, and living in general. Technology using artificial intelligence already helps to develop similar life experiences by providing the right products.

ASD concerns expressions, emotions, and body language in general. For this reason, various electronic devices such as "smart glasses" with artificial intelligence were created to help with emotional recognition. For example, when an adult or a child wears glasses, they are given feedback tailored to their exact needs. He does not need someone to explain to him and he can react on the spot. It can detect changes in emotional states and reduce stress during any learning process. Studies have also shown that robots help educate children with ASD. Their purpose is to give autistic children practice by identifying facial expressions, social interaction, and the appropriate response to social cues.

Artificial intelligence-based applications are less expensive and easier to integrate into ordinary homes, schools, and therapists than high-tech robots. There are many autism applications on the market that support behavioral therapy and learning, but most are relatively straightforward tools.

Workplaces are also beginning to focus on digital learning as a face-to-face preference, which also benefits people with ASD. Artificial intelligence training can provide participants with lessons at different stages of the process, which are delivered in different ways, depending on how they work best. For example, artificial intelligence algorithms can identify if someone is not yet ready for module B and will continue to train them in module A until they are ready to move on to the next module. This training style helps reduce the likelihood of stress and anxiety in the workplace for everyone.

## 8. Discussion

This article concerns the involvement of IoT in the needs of special education and ICT in general. It is based on some of the most representative research of the last decade, which by utilizing online objects could make life easier for people with autism - people with special educational, cognitive, and social needs. The solutions are provided not only to the individuals themselves but also to their caregivers, therapists, teachers, and parents. Understanding the rights and needs of every child and providing good quality teaching, assessment, and treatment through digital technologies are the most important factors that help individuals gain access to appropriate treatment intervention tools for a better quality of life. It was found how important the impetus that technology can offer to the existing approaches for children with autism and how it can devise new methods of rehabilitation. Her contribution to the construction of such a sensory profile of children was identified, as capable of providing a field for the development of cognitive and social mechanisms to a faster degree. When a therapist or teacher or even a parent of an autistic person uses an IoT technology solution has the opportunity to study the autistic person's progress because his or her daily treatments are recorded in the form of a history. In addition, information about the emotions of the autistic person is distinguished with IoT solutions. Technology stands next to special education and gives the opportunity for a greater perspective to people on the autism spectrum to acquire additional skills and their parents the absolute self-awareness of their treatments while children are at home next to them or even remotely through corresponding applications. The importance of this kind of research about digital technologies in special education is in its early stages. In the near future technology will be the main helper of all treatments and more and more scientists will investigate this major issue.

**References**

[1] Moraiti, I. ., Fotoglou, A. ., Dona, K. ., Katsimperi, A. ., Tsionakas, K. ., & Drigas, A. (2022). IoT in Special Education. *Technium Social Sciences Journal*, *30*(1), 55–63.
[2] Association., A. P. & Association., A. P. *Diagnostic and statistical manual of mental disorders: DSM-5* (American Psychiatric Association Arlington, VA, 2013), 5th ed.
[3] Bernier, R., Mao, A. & Yen, J. Diagnosing autism spectrum disorders in primary care. *Practitioner* **255**(1745), 27–30 (2011).
[4] Lord, C. *et al*. A multisite study of the clinical diagnosis of different autism spectrum disorders. *Arch. Gen. Psychiatry* **69**, 306–313 (2012).
[5] Falkmer, T., Anderson, K., Falkmer, M. & Harlin, C. Diagnostic procedures in autism spectrum disorders: a systematic literature review. *Eur. Child & Adolesc. Psychiatry* **22**, 329–340 (2013).
[6] Sideraki, A., & Drigas, A. (2021). Artificial Intelligence (AI) in Autism. *Technium Social Sciences Journal*, *26*(1), 262–277. https://doi.org/10.47577/tssj.v26i1.5208
[7] Chaidi , I. ., Drigas, A., & Karagiannidis, C. (2021). Autistic people's family and emotional intelligence. *Technium Social Sciences Journal*, *26*(1), 194–214.
[8] Abbas, H., Garberson, F., Glover, E. & Wall, D. P. Machine learning approach for early detection of autism by combining questionnaire and home video screening. *J. Am. Med. Informatics Assoc*. ocy039, 10.1093_jamia_ocy039/1/ocy039 (2018).
[9] Wall, D. P., Dally, R. L., Luyster, R., Jung, J.-Y. & DeLuca, T. F. Use of artificial intelligence to shorten the behavioral diagnosis of autism. *PLoS One* (2012)
[10] G. Wang, M. Atiquzzaman, and Z. Yan, "Security, privacy, and anonymity in computation, communication, and storage," *A Framework for Preventing the Exploitation of IoTSmart Toys for Reconnaissance and Exfiltration*, vol. 10658, 2017, Lecture Notes in Computer Science.
[11] M. Elhaddadi, H. Maazouz, N. Alami, et al., "Serious games to teach emotion recognition to children with autism spectrum disorders (ASD)," *Acta Neuropsychological*, vol. 19, no. 1, pp. 81–92, 2021.
[12] M. Yaremchuk, "The use of the environmental approach in the work with children with ASD," *Autism and Developmental Disorders*, vol. 17, no. 4, pp. 12–20, 2019.
[13] A. T. Wieckowski and S. W. White, "Attention modification to attenuate facial emotion recognition deficits in children with autism: a pilot study," *Journal of Autism and Developmental Disorders*, vol. 50, no. 1, pp. 30–41, 2020
[14] A. Golubchikova and N. Korobtseva, "Inclusive design: systems interaction society - textile means of rehabilitation - child," *Bulletin of Science and Practice*, vol. 6, no. 1, pp. 198–206, 2020.
[15] K. N. Thakkar, F. E. Polli, R. M. Joseph, et al., "Response monitoring, repetitive behavior and anterior cingulate abnormalities in autism spectrum disorders (ASD)," *Brain: A Journal of Neurology*, vol. 131, no. Pt 9, pp. 2464–2478, 2008.
[16] P. Werry and K. Dautenhahn, "Applying Mobile Robot Technology to the Rehabilitation of Autistic Children", Proc. of the 7th International Symposium on Intelligent Robotics Systems (SIRS-1999), pp. 265-72, 1999
[17] Y. Huang, G. Li, "Descriptive models for the Internet of Things", Proc. of Intelligent Control and Information Processing International Conference (ICICIP-2010), pp.483- 486, 2010
[18] "Sensory Treatment Yields Promising Results for Children with Autism", http://news.temple.edu/news/sensory -treatment-yields-promising-results-children-autism

*Technium Social Sciences Journal*
*Vol. 31, 115-130, May, 2022*
*ISSN: 2668-7798*
*www.techniumscience.com*

[19] "Assistive Technology Supports for Individuals with Autism Spectrum Disorder", Wisconsin Assistive Technology Initiative, February 2009
[20] H. B. Garretson, D. Fein, L. Waterhouse, "Sustained Attention in Children with Autism", Journal of Autism and Developmental Disorders, Vol. 20, Issue 1, pp 101-114, 1990.
[21] E. Bertino, K.-K. R. Choo, D. Georgakopolous, and S. Nepal, "Internet of things (IoT)," *Acm Transactions on Internet Technology*, vol. 16, no. 4, pp. 1–7, 2016.
[22] R. S. Bhadoria and N. S. Chaudhari, "Pragmatic sensory data semantics with service-oriented computing," *Journal of Organizational and End User Computing*, vol. 31, no. 2, pp. 22–36, 2019.
[23] Farley M.A., McMahon W.M., Fombonne E., Jenson W.R., Miller J., Gardner M., Block H., Pingree C.B., Ritvo E.R., Ritvo R.A., et al. Twenty-year outcome for individuals with autism and average or near-average cognitive abilities. *Autism Res.* 2009;**2**:109–118.
[24] Duncan A.W., Bishop S.L. Understanding the gap between cognitive abilities and daily living skills in adolescents with autism spectrum disorders with average intelligence. *Autism.* 2015;**19**:64–72.
[25] Hume K., Loftin R., Lantz J. Increasing independence in autism spectrum disorders: A review of three focused interventions. *J. Autism Dev. Disord.* 2009;**39**:1329–1338.
[26] Rechowicz K.J., Nielsen A.C., Gray M., Verela S., Loranger R. Designing a Technological Framework for Enabling People with Autism Spectrum Disorder to Live Independently. *Sustainability.* 2021 in press.
[27] Alam M., Shakil K.A., Khan S. *Internet of Things (IoT): Concepts and Applications.* Springer Nature; Cham, Switzerland: 2020.
[28] Anwar A., Rahman M.M., Ferdous S., Anik S.A., Ahmed S.I. A computer game-based approach for increasing fluency in the speech of autistic children; Proceedings of the 2011 IEEE 11th International Conference on Advanced Learning Technologies; Athens, GA, USA. 6–8 July 2011; pp. 17–18.
[29] Ketterl M., Knipping L., Ludwig N., Mertens R., Rahman M., Ferdous S.M., Ahmed S.I., Anwar A. Speech development of autistic children by interactive computer games. *Interact. Technol. Smart Educ.* 2011;**8**:208–223.
[30] Moore M., Calvert S. Brief report: Vocabulary acquisition for children with autism: Teacher or computer instruction. *J. Autism Dev. Disord.* 2000;**30**:359–362.
[31] Khullar V, Singh HP, Bala M. IoT based assistive companion for hypersensitive individuals (ACHI) with autism spectrum disorder. Asian J Psychiatr. 2019 Dec;46:92-102.
[32] . J. Maenner, K. A. Shaw, J. Baio, A. Washington, M. E. Patrick, M. Dirienzo, D. L. Christensen, L. D. Wiggins, S. Pettygrove, J. G. Andrews, M. Lopez, A. Hudson, T. Baroud,Y. Schwenk, T. White, C. R. Rosenberg, L. C. Lee, R. A. Harrington, M. Huston, A. S.Hewitt, A. N. Esler, J. A. Hall-Lande, J. N. Poynter, L. Hallas-Muchow, J. N. Constantino, R. T.Fitzgerald, W. M. Zahorodny, J. Shenouda, J. L. Daniels, Z. Warren, A. C. Vehorn, A. Salinas,M. S. Durkin, and P. Dietz, "Prevalence of autism spectrum disorder among children aged8 years — autism and developmental disabilities monitoring network, 11 sites, united states,2016,"
[33] D. Wall, J. Kosmicki, T. DeLuca, E. Hårstad, and V. Fusaro, "Use of machine learning to shortenobservation-based screening and diagnosis of autism," Translational Psychiatry, vol. 2, 2012.
[34] Wall, R. Dally, R. J. Luyster, J.-Y. Jung, and T. DeLuca, "Use of artificial intelligence toshorten the behavioral diagnosis of autism," PLoS ONE, vol. 7, 2012.
[35] Parikh, H. Li, and L. He, "Enhancing diagnosis of autism with optimized machine

learningmodels and personal characteristic data," Frontiers in Computational Neuroscience, vol. 13,2019.
[36] Tapotosh Ghosh, Md. Hasan Al Banna, Md. Sazzadur Rahman, M. Shamim Kaiser, Mufti Mahmud, A.S.M. Sanwar Hosen, Gi Hwan Cho, Artificial Intelligence and Internet of Things in Screening and Management of Autism Spectrum Disorder, Sustainable Cities and Society (2021)
[37] Grabrucker A. (2013). Environmental factors in autism. *Frontiers in Psychiatry*.
[38] Lai, M.-C., Lombardo, M. V. & Baron-Cohen, S. Autism. *Lancet* 383, 896–910 (2014)
[39] Rutter M. (2011). Progress in Understanding Autism: 2007–2010. Journal of Autism and Developmental Disorders. volume 41, pages395–404 (2011)
[40] Gokhale, P., Bhat, O., & Bhat, S. (2018). Introduction to IOT. *International Advanced Research Journal in Science, Engineering and Technology*, *5*(1), 41-44.
[41] Joyia, G. J., Liaqat, R. M., Farooq, A., & Rehman, S. (2017). Internet of medical things (IoMT): Applications, benefits and future challenges in the healthcare domain. *J. Commun.*, *12*(4), 240-247.
[42] Merenda, M., Porcaro, C., & Iero, D. (2020). *Edge Machine Learning for AI-Enabled IoT Devices: A Review. Sensors, 20(9)*
[43] Charlton E. ( 2018). This AI-powered app aims to help people with autism improve their social skills.
[44] Hesselberg E. (2020). How AI is Helping People with Autism
[45] Drigas, A. S., & Ioannidou, R. E. (2011, September). ICTs in special education: A review. In *World Summit on Knowledge Society* (pp. 357-364). Springer, Berlin, Heidelberg.
[46] Drigas, A. and M. Karyotaki, "A Layered Model of Human Consciousness," International Journal of Recent Contributions from Engineering, Science & IT (IJES), vol. 7, no. 3, pp. 41-50, September 2019. Available: https://doi.org/10.3991/ijes.v7i3.11117. [Accessed: January 28, 2020]
[47] Drigas, A. Karyotaki, M., & Skianis, C. (2018). An Integrated Approach to Neuro-development, Neuroplasticity and Cognitive Improvement. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 6(3), 4-18
[48] Pappas M, Drigas A. 2019 Computerized Training for Neuroplasticity and Cognitive Improvement. International Journal of Engineering Pedagogy. (4):50-62
[49] Drigas, A., & Papoutsi, C. (2019). Emotional intelligence as an important asset for HR in organizations: Leaders and employees. International Journal of Advanced Corporate Learning, 12(1). https://doi.org/10.3991/ijac.v12i1.9637
[50] Drigas A, Karyotaki M 2014. Learning Tools and Application for Cognitive Improvement. International Journal of Engineering Pedagogy, 4(3): 71-77. From (Retrieved on 13 May 2016)
[51] Drigas A, and M. Pappas, "The Consciousness-Intelligence-Knowledge Pyramid: An 8x8 Layer Model," International Journal of Recent Contributions from Engineering, Science & IT (iJES), vol. 5, no.3, pp 14-25, 2017. https://doi.org/10.3991/ijes.v5i3.7680
[52] Drigas A, Karyotaki M (2017) Attentional control and other executive functions. Int J Emerg Technol Learn iJET 12(03):219–233
[53] Mitsea, E., & Drigas, A. (2019). A journey into the metacognitive learning strategies. International Journal of Online & Biomedical Engineering, 15(14). https://doi.org/ 10.3991/ijoe.v15i14.11379
[54] Drigas, A., & Mitsea, E. (2020). The 8 Pillars of Metacognition. International Journal of Emerging Technologies in Learning (iJET), 15(21), 162-178. https://doi.org/10.3991/ijet. v15i21.14907

[55] Pappas, M. A., Polychroni, F., & Drigas, A. S. (2019). Assessment of mathematics difficulties for second and third graders: Cognitive and psychological parameters. Behavioral Sciences, 9(7), 76. https://doi. org/10.3390/bs9070076.
[56] Karyotaki M and Drigas A 2016 Latest trends in problem solving assessment International Journal of Recent Contributions from Engineering, Science & IT (iJES) 4 (2) p 1
[57] PAPPAS, M. A., DRIGAS, A. S., & POLYCHRONI, F. (2018). An Eight-Layer Model for Mathematical Cognition. International Journal of Emerging Technologies in Learning (iJET), 13(10), 69-82. https://doi.org/10.3991/ijet.v13i10.8633
[58] DRIGAS, A., & KARYOTAKI, M. (2019). Attention and its Role: Theories and Models. International Journal of Emerging Technologies in Learning (iJET), 14(12), 169-182. https://doi.org/10.3991/ijet.v14i12.10185
[59] TOURIMPAMPA, A., DRIGAS, A., ECONOMOU, A., & ROUSSOS, P. (2018). Perception and Text Comprehension. It's a Matter of Perception! International Journal of Emerging Technologies in Learning (iJET), 13(07), 228–242. https://doi.org/10.3991/ijet.v13i07.7909
[60] Drigas A, M. KARYOTAKI AND C. SKIANIS, "Success: A 9 Layered-based Model of Giftedness," International Journal of Recent Contributions from Engineering, Science & IT (iJES), vol. 5, no.4, pp. 4-18, 2017. https://doi.org/10.3991/ijes.v5i4.7725
[61] ANGELOPOULOU, E., & DRIGAS, A. (2021). Working memory, attention and their relationship: A theoretical overview. Research, Society and Development, 10(5), e46410515288. https://doi.org/10.33448/rsd-v10i5.15288
[62] Gkeka E. G., E. K. Agorastou, and Drigas A, "Mobile multimedia education for language disorders," Int. J. Emerg. Technol. Learn., vol. 15, no. 6, pp. 50–59, 2020, https://doi.org/10.3991/ijet.v15i06.11175
[63] POLITI-GEORGOUSI S., & DRIGAS A. Mobile Applications, an Emerging Powerful Tool for Dyslexia Screening and Intervention: A Systematic Literature Review. International Journal of Interactive Mobile Technologies, 2020, 14(18): 4–17. https://doi.org/10.3991/ijim.v14i18.15315.
[64] Drigas, A., Dede, D.E., & Dedes, S. (2020). Mobile and other applications for mental imagery to improve learning disabilities and mental health. International Journal of Computer Science Issues (IJCSI), 17 (4), pp.18-23. http://doi.org/10.5281/zenodo.3987533
[65] Papoutsi C., Drigas A, and C. Skianis, "Virtual and augmented reality for developing emotional intelligence skills," Int. J. Recent Contrib. Eng. Sci. IT (IJES), vol. 9, no. 3, pp. 35–53, 2021. https://doi.org/10.3991/ijes.v9i3.23939
[66] Vlachou J. and A. Drigas, "Mobile technology for students and adults with Autistic Spectrum Disorders (ASD)," International Journal of Interactive Mobile Technologies, vol. 11(1), pp. 4-17, 2017
[67] Karabatzaki, Z., Stathopoulou, A., Kokkalia, G., Dimitriou, E., Loukeri, P. I., Economou, A., & Drigas, A. (2018). Mobile Application Tools for Students in Secondary Education. An Evaluation Study. International Journal of Interactive Mobile Technologies (iJIM), 12(2), 142-161
[68] Drigas A, Kokkalia G., and A. Economou, "Mobile Learning For Preschool Education," Int. J. Interact. Mob. Technol., vol. 10, no. 4, p. 57, Oct. 2016. https://doi.org/10.3991/ijim.v10i4.6021
[69] Drigas A, and P. Angelidakis, 'Mobile Applications within Education: An Overview of Application Paradigms in Specific Categories', International Journal of Interactive Mobile Technologies (iJIM), vol. 11, no. 4, p. 17, May 2017. https://doi.org/10.3991/ijim.v11i4. 6589

[70] Stathopoulou A., D. Loukeris, Z. Karabatzaki, E. Politi, Y. Salapata, and A. Drigas, "Evaluation of Mobile Apps Effectiveness in Children with Autism Social Training via Digital Social Stories," Int. J. Interact. Mob. Technol. (iJIM); Vol 14, No 03, 2020
[71] Papoutsi C., Drigas A, and C. Skianis, "Mobile Applications to Improve Emotional Intelligence in Autism – A Review," Int. J. Interact. Mob. Technol. (iJIM); Vol 12, No 6, 2018
[72] Drigas, A., Koukianakis, L. G., & Papagerasimou, Y. V. (2005). A system for e-inclusion for individuals with sight disabilities, Mathematical methods and computational techniques in electrical engineering, 146-150
[73] Drigas, A. and Lefteris Koukianakis, ‚Convergence of Culture and ICTs: E-Culture,' Springer-Verlag Berlin Heidelberg (2010): 488-496.
[74] Pappas, M.A., & Drigas, A. (2015). ICT based screening tools and etiology of dyscalculia. International Journal of Engineering Pedagogy, 3, 61-66.
[75] Theodorou, P. and Drigas, A. (2017). ICTs and Music in Generic Learning Disabilities. International Journal of Emerging Technologies in Learning (Vol. 12, No. 4), 101-110. https://doi.org/10.3991/ijet.v12i04.6588
[76] Drigas, A. and J. A. Vlachou, "Information and communication technologies (ICTs) and autistic spectrum disorders (ASD)," Int. J. Recent Contrib. Eng. Sci. IT (iJES), vol. 4, no. 1, p. 4, 2016. https://doi.org/10.3991/ijes.v4i1.5352
[77] Drigas, A. and Kostas S. Ioannis, "Online and other ICTs Applications for Teaching Math in Special Education", International Journal of Recent Contributions from Engineering, Science & IT, Vol 2, No. 4,2014.
[78] Vrettaros J, Tagoulis A, Giannopoulou N, Drigas A (2012) Case study in using Web 2.0 tools by Greek educators. Int J Soc Humanist Comput 1(4):363–374
[79] Chaidi, I., & Drigas, A. (2020). Parents' Involvement in the Education of their Children with Autism: Related Research and its Results. International Journal Of Emerging Technologies In Learning (Ijet), 15(14), 194. https://doi.org/10.3991/ijet.v15i14.12509.
[80] Drigas,A., & Dourou,A.: A review on ICT based applications for intervention and assistance of people with memory deficits. I-JET 8, pp. 1-3(2013). http://dx.doi.org/10.3991/ijet.v8i5.3009
[81] Drigas, A. S., Kokkalia, G. K., Economou, A., & Roussos, P. (2017). Intervention and diagnostic tools in preschool education. International Journal of Emerging Technologies in Learning, 12(11).
[82] Drigas, A., & Gkeka, E., G. (2017). ICTs and Montessori for learning disabilities. International Journal of Recent Contributons from Engineering, Science, & IT, 5(3), 77-84
[83] Kamakari A. and A. Drigas, Advanced E-Learning Services for Teachers, International Journal of Knowledge Society Research, 3(4), 2012, pp. 85–96.
[84] Bravou, V., & Drigas, A. (2019). A contemporary view on online and web tools for students with sensory & learning disabilities. International Journal of Online and Biomedical Engineering, 15(12), 97–105. https://doi.org/10.3991/ijoe.v15i12.10833
[85] Drigas, A. S. and Politi-Georgousi, S. (2019). Icts as a distinct detection approach for dyslexia screening: A contemporary view. International Journal of Online and Biomedical Engineering (iJOE), 15(13):46–60.
[86] Drigas A, J.Vrettaros, L.Stavrou, D.Kouremenos, E-learning Environment for Deaf people in the E-Commerce and New Technologies Sector, WSEAS Transactions on Information Science and Applications, Issue 5, Volume 1, November 2004.
[87] Drigas, A.S., Vrettaros, J. and Kouremenos, D. (2004a) 'Teleeducation and e-learning services for teaching English as a second language to deaf people, whose first language is the

sign language', WSEAS Transactions on Information Science and Applications, Vol. 1, No. 3, pp.834–842.
[88] Pappas, M., & Drigas, A. (2016). Incorporation of artificial intelligence tutoring techniques in mathematics. International Journal of Engineering Pedagogy, 6(4), 12–16. https://doi.org/10.3991/ijep.v6i4.6063
[89] Kefalis C and Drigas A. (2019) Web Based and Online Applications in STEM Education. International Journal of Engineering Pedagogy (iJEP) 9, 4 (2019), 76–85.https://doi.org/10.3991/ijep.v9i4.10691
[90] Drigas, A. S., Argyri, K., & Vrettaros, J. (2009). Decade review (1999–2009): Artificial intelligence techniques in student modeling. Paper presented at the World Summit on Knowledge Society
[91] Drigas A, Rodi-Eleni Ioannidou, A Review on Artificial Intelligence in Special Education, Information Systems, Elearning, and Knowledge Management Research Communications in Computer and Information Science Volume 278, pp 385-391, 2013 http://dx.doi.org/10.1007/978-3-642-35879-1_46
[92] Drigas, A., Vrettaros, J.: An Intelligent Tool for Building e-Learning Contend-Material Using Natural Language in Digital Libraries. WSEAS Transactions on Information Science and Applications 5(1) (2004) 1197–1205
[93] Drigas, A.S., Vrettaros, J., Koukianakis, L.G. and Glentzes, J.G. (2005). A Virtual Lab and e-learning system for renewable energy sources. Int. Conf. on Educational Tech.
[94] Kokkalia, G., Drigas, A., Economou, A., Roussos, P., & Choli, S. (2017). The use of serious games in preschool education. International Journal of Emerging Technologies in Learning, 12(11), 15-27. https://doi.org/10.3991/ijet.v12i11.6991
[95] Drigas A, and Marios A. Pappas. "On line and other Game-Based Learning for Mathematics." International Journal of Online Engineering (iJOE) 11.4, 62-67, 2015 https://doi.org/10.3991/ijoe.v11i4.4742
[96] Papanastasiou, G., Drigas, A., Skianis, C., & Lytras, M. D. (2017). Serious games in K-12 education: Benefits and impacts on students with attention, memory and developmental disabilities. Program, 51(4), 424-440. https://doi.org/10.1108/prog-02-2016-0020
[97] Drigas, A. S., & Kokkalia, G. K. (2014). ICTs in Kindergarten. International Journal of Emerging Technologies in Learning, 9(2). https://doi.org/10.3991/ijet.v9i2.3278
[98] Papoutsi, C., & Drigas, A. S. (2016). Games for Empathy for Sensitive Social Groups. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 4(3), 39–43. https://doi.org/10.3991/ijes.v4i3.5923
[99] Drigas, A., & Karyotaki, M. (2013). E Learning ICTs Application in Nutrition Science. International Journal of recent Contributions from Engineerinf, Science and IT, 1. DOI: 10.3991/ijes.v1i2.3279
[100] Drigas, A., L.G.Koukianakis, S.Domoxoudis, E-Government Structure for e-Protocol, eApplication Submission and Internal Organizational and Operational Support, WSEAS TELEINFO 2005 International Conference, Prague, Czech Republic, March 13-15, 2005
[101] Drigas, A., Electronic-Digital Culture (e-CULTURE): Information Society And Culture, Athens 2005
[102] Vrettaros, J., Tagoulis, A., Giannopoulou, N., & Drigas, A. (2009). An empirical study on the use of Web 2.0 by Greek adult instructors in educational procedures. World Summit on Knowledge System (WSKS), 49, 164-170. http://dx.doi.org/10.1007/978-3-642-04757-2_18

[103] Drigas, A.; Gkeka, E. (2016). Montessori method and ICTs. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 4(1). http://journals.sfu.ca/onlinejour/index.php/i-jes/article/view/5481
[104] Alexopoulou, A., Batsou, A., & Drigas, A. (2020). Mobiles and Cognition: The Associations Between Mobile Technology and Cognitive Flexibility. International Journal of Interactive Mobile Technologies (iJIM), 14(03), pp. 146–156. https://doi.org/10.3991/ijim.v14i03.11233
[105] Doulou, A., & Drigas, A. (2022b). Electronic, VR & Augmented Reality Games for Intervention in ADHD. Technium Social Sciences Journal, 28(1), 159–169. https://doi.org/10.47577/tssj.v28i1.5728
[106] Kokkalia, G. K., & Drigas, A. S. (2015). Tools and E-tools for Memory and Attention Problems in Pre-school Education. International Journal of Recent Contributions from Engineering, Science & IT, 3(3), 13-19. http://dx.doi.org/10.3991/ijes.v3i3.4729
[107] Gkeka, E.; Agorastou, E.; Drigas, A. Artificial Techniques for Language Disorders. Int. J. Recent Contrib. Eng. Sci. IT 2019, 7, 68–76.
[108] Galitskaya, V., & Drigas, A. (2019). ICTs and Geometry. International Journal of Engineering Pedagogy (iJEP), 9(5), pp. 103–111. https://doi.org/10.3991/ijep.v9i5.11241
[109] Bakola, N. L. N., Rizos, N. D., & Drigas, A. S. (2018). ICTs Supportive and Therapeutic Contribution in Psychoemotional Disorders in Childhood and Adolescence. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 6(2), 69-78.
[110] Drigas, A., Pappas M. A., and M. Lytras, "Emerging technologies for ict based education for dyscalculia: Implications for computer engineering education," International Journal of Engineering Education, vol. 32, no. 4, pp. 1604–1610, 2016.
[111] Drigas, A. & Kokkalia, G. 2017. ICTs and Special Education in Kindergarten. International Journal of Emerging Technologies in Learning 9 (4), 35–42.
[112] Drigas, A., and L. Koukianakis, A Modular Environment for E-learning and E-psychology Applications, WSEAS Transactions on Information Science and Application, Vol. 3, 2004, pp. 2062-2067.
[113] Drigas, A., & Mitsea, E. (2021). The Role of Clinical Hypnosis and VR in Special Education. International Journal of Recent Contributions from Engineering Science & IT (iJES) 9(4):4-17
[114] Drigas, A., & Mitsea, E. (2021). Neuro-Linguistic Programming & VR via the 8 Pillars of Metacognition X 8 Layers of Consciousness X 8 Intelligences. Technium Social Sciences Journal, 26, 159-176.
[115] Drigas, A., & Papoutsi, C. (2021). Nine layer pyramid model questionnaire for emotional intelligence. International Journal of Online & Biomedical Engineering, 17(7). https://doi.org/10.3991/ijoe.v17i07.22765
[116] Drigas, A., Papoutsi, C., & Skianis, C. (2021). Metacognitive and Metaemotional Training Strategies through the Nine-layer Pyramid Model of Emotional Intelligence. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 9(4), pp. 58–76
[117] Drigas, A., & L. Bakola: The 8x8 Layer Model Consciousness-Intelligence-Knowledge Pyramid, and the Platonic Perspectives. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 9 (2), pp. 57–72, (2021), https://doi.org/10.3991/ijes.v9i2.22497.

[118] Drigas, A., & Mitsea, E. (2021). 8 Pillars X 8 Layers Model of Metacognition: Educational Strategies, Exercises &Trainings. International Journal of Online & Biomedical Engineering, 17(8). https://doi.org/10.3991/ijoe.v17i08.23563
[119] Kontostavlou, E. Z., and Drigas, A. (2021). How metacognition supports giftedness in leadership: a review of contemporary literature. Int. J. Adv. Corp. Learn. 14, 4–16. doi: 10.3991/ijac.v14i2.23237
[120] Drigas, A., Kokkalia, G. & Economou, A. (2021). An 8-Layer Model for Metacognitive Skills in Kindergarten. NEUROLOGY AND NEUROBIOLOGY, 4(1), 2-10. http://dx.doi.org/10.31487/j.NNB.2021.01.01
[121] Drigas, A., & Sideraki, A. (2021). Emotional Intelligence in Autism . Technium Social Sciences Journal, 26(1), 80–92. https://doi.org/10.47577/tssj.v26i1.5178
[122] Drigas, A., & Papoutsi, C. (2015). Empathy, special education and ICTs. International Journal of Recent Contributions from Engineering, Science & IT (iJES), 3(4), 37-42. doi: 10.3991/ijes.v3i4.5192
[123] Kontostavlou, E.Z.; Drigas, A. Executive functions training and giftedness. Retos 2022, 43, 1005–1014.
[124] Drigas, A., Mitsea, E., & Skianis, C. (2022). Clinical Hypnosis & VR, Subconscious Restructuring- Brain Rewiring & the Entanglement with the 8 Pillars of Metacognition X 8 Layers of Consciousness X 8 Intelligences. International Journal of Online and Biomedical Engineering (iJOE), 18(01), pp. 78–95. https://doi.org/10.3991/ijoe.v18i01.26859
[125] Papoutsi, C., Chaidi, I., Drigas, A., Skianis, C., & Karagiannidis, C. (2022). Emotional Intelligence & ICTs for Women and Equality. Technium Social Sciences Journal, 27, 253-268.
[126] Drigas, A., & Mitsea, E. (2022). Conscious Breathing: a Powerful Tool for Physical & Neuropsychological Regulation. The role of Mobile Apps. Technium Social Sciences Journal, 28, 135-158.
[127] Mitsea, E., Drigas, A., & Skianis, C. (2022). ICTs and Speed Learning in Special Education: High-Consciousness Training Strategies for High-Capacity Learners through Metacognition Lens. Technium Social Sciences Journal, 27, 230-252.
[128] Drigas, A., Mitsea, E., & Skianis, C. (2022). Neuro-Linguistic Programming, Positive Psychology & VR in Special Education. Scientific Electronic Archives, 15(1).
[129] Zavitsanou, A., & Drigas, A. (2021). Attention and working memory. International Journal of Recent Contributions from Engineering Science & IT (iJES), 9(1), 81-91. https://doi.org/10.3991/ijes.v9i1.19933
[130] Angelopoulou, E., Karabatzaki, Z., & Drigas, A. (2021). The role of working memory and attention in older workers' learning. International Journal of Advanced Corporate Learning (iJAC), 14(1), 4-14. https://10.3991/ijac.v14i1.20355