Global Journal of Engineering and Technology Advances
eISSN: 2582-5003
Cross Ref DOI: 10.30574/gjeta
Journal homepage: https://gjeta.com/

(REVIEW ARTICLE)

Check for updates

# The role of digital games for sensitive social groups to foster empathy

Chara Papoutsi *

*Department of Information and Communication Systems Engineering (ICSD), University of Aegean, Greece.*

Global Journal of Engineering and Technology Advances, 2023, 16(02), 057–064

Publication history: Received on 03 June 2023; revised on 29 July 2023; accepted on 01 August 2023

Article DOI: https://doi.org/10.30574/gjeta.2023.16.2.0133

## Abstract

Almost everyone uses information and communication technology in some capacity every day across a wide range of industries. All individuals, including those with varied disabilities and health issues, should have access to ICTs. The studies summarized in this article are part of a growing body of research that shows how playing games can foster empathy in the fields of special education and healthcare.

**Keywords:** Digital Technologies; Games; Empathy; Emotion Recognition; Special Education; Health

## 1. Introduction

Information and communication technologies (ICT) are a clear part of modern culture, and their influence has grown over recent years as a result of how quickly technology is developing and how it affects society as a whole. Today's technologies play a significant role, particularly in the fields of healthcare and special education, and have been shown to be beneficial because they help to create an environment that is dynamic, appealing, and motivating for students with special educational needs and health issues.

Technology and video games have already demonstrated their viability and efficacy in assisting rehabilitation, fostering cross-cultural understanding, deepening comprehension of racial, religious, and historically based conflicts, and providing a variety of viewpoints on topics like international relations and foreign policy. Changes in knowledge, attitudes, cognitive abilities, physical capabilities, health, or mental welfare of the user are other impacts that are intended to be attained through games. In addition, games have a big impact on how socially adept people become. Empathy is a vital social ability.

Empathy, according to McDonagh (2006), is the "intuitive ability to identify with other people's thoughts and feelings - their motivations, emotional and mental models, values, priorities, preferences, and inner conflicts." [1]. The idea of empathy was first introduced in art history in 1873 by Vischer, who coined the term "Einfühlung" (German for "feeling into") to describe a process in which a woman puts her entire personality onto an item and, in a way, fuses with it. Theodor Lipps (1851–1914), a psychologist, used term to describe aesthetic experiences when he said, "Einfühlung [...] is the fact that the contrast between myself and the object disappears." then used the phrase to refer to people's understanding of other people's mental states [3] and experience with them [2].

The term empathy [is] used in at least two different ways, to mean a largely cognitive response, knowing how another feels, or to mean an emotive communion with the other, according to Gallo (1989):...an empathetic response is one which comprises both a cognitive and an affective dimension. As stated by Carl Rogers in 1975 and quoted by Gallo in 1989, "the state of empathy or being empathic is to perceive the internal frame of reference of another with accuracy and with the emotional components and means that pertain thereto as if one were the person." [4]. A common understanding of the key characteristics of people with an autism spectrum disorder is difficulty with social

* Corresponding author: Chara Papoutsi

Copyright © 2023 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution Liscense 4.0.

engagement, reciprocal communication, and emotion identification. Additionally, individuals who experience severe health issues frequently struggle emotionally or encounter others who lack compassion for those around them. Digital game interaction provides opportunities for social interaction, which improves emotional well-being and raises the chance of developing socioemotional abilities like empathy.

The current article focuses on games that have empathy detection and development as a major or secondary goal, and it provides a summary of the most pertinent studies in that regard. The games have been expanded in the areas for special education and health care that are listed below.

## 2. Empathy fostering games

### 2.1. Games for Special Education

The game platform ASC Inclusion was unveiled by Schuller et al. (2014) with the goal of serving children with ASD aged 5 to 10 years old. The ongoing ASC-Inclusion initiative aims to assist children with ASC by allowing them to practice expressing and identifying their emotions through playing games in a virtual environment. The platform features training through games, text discussion with peers, analysis of users' motions, facial, and voice expressions utilizing a conventional microphone and webcam or a depth sensor, as well as animation, video, and audio recordings. [5]

To enhance social cognition and empathy in people with ASD, Serret (2012) created the serious game "Jestimule". ICT was also employed to make it easier for young toddlers or kids with developmental impairments to use the game. (e.g., hap- tic joystick for feed-back). One of the main goals of the game was to teach people with ASD how to understand emotional situations, emotional gestures, and facial expressions. At the hospital, the game was tested on a group of 40 people ranging in age from 6 to 18. In several tasks, participants' ability to recognize facial expressions of emotion, emotional gestures, and emotional circumstances improved, according to the results. Future training should take into account these findings, which have strong educational and therapeutic implications for ASD [6]. With the use of real-time automatic facial expression analysis and virtual character synthesis, the "LIFEisGAME" pro-totype-Ipad version of the game was introduced by Alves et al. (2013). This game encourages facial recognition while assisting people with ASD in understanding emotions and cultivating empathy. It includes five games modes. The "LIFEisGAME" prototype was tested on 11 ASD kids ranging in age from 5 to 15 years old, and the gaming session lasted for 15 minutes. The results were encouraging and showed that the game is helpful in fostering emotional understanding, improving the quality of life for kids with autism [7, 8].

Beumont and Sofronoff (2008) created "The Junior Detective Training Program," an intervention program for children with Asperger syndrome that featured a computer game, small group sessions, parent training sessions, and teacher handouts. The player of the computer game is a private eye with expertise in interpreting people's mental and emotional states. The participants learn to perceive complex emotions by practicing their recognition of facial expressions, body postures, and speech prosody as they go through several stages of play. To teach emotion perception and social problem solving, both real people and computer-animated figures were used. Depending on how a user carried out a particular activity, support and mission outcomes were unique and varied. 49 children with Asperger syndrome between the ages of 7.5 and 11 were used in the study. Overall, the results of this study point to the possibility that the Junior Detective Training Program could be a useful tool for teaching social skills and emotion awareness to kids with Asperger syndrome. The generalization of targeted abilities to actual social circumstances was not measured in this study, despite the fact that intervention components were created particularly to improve skill generalization [9].

Both typically developing kids and high-functioning autistic kids were given "cMotion," a game in development that uses virtual characters to encourage empathy, emotion recognition, and logical problem solving. Finkelstein et al. (2009) offered "cMotion" to both groups of kids. An interactive interface that focuses on computer programming, a full game that merges the previous two phases into one activity, and a playable introduction that emphasizes social skills and emotion recognition make up "cMotion" [10]. In a game called "Autism," Gibbons (2015) demonstrated how sensory hypersensitivity disorder, which affects children with autism, feels like. A team of three persons worked on it for 12 hours during the Hacking Health Vancouver 2013 hackathon. In a bustling playground, the player assumes the role of an autistic youngster and is free to independently explore and develop empathy for this environment. The user discovers right away that sustained exposure to sensory stimulation can result in sensory overload, which manifests as visual noise and blur as well as aural distortion [11].

A game called "Social Clues" was created by the University of Southern California in 2014 with the intention of teaching autistic youngsters about appropriate behavior and how to alter their behavior through exercises based on actual situations and places. When playing the position of a communicate or participant, players gain knowledge about the

significance of facial expressions, the usefulness of eye contact, and the relevance of empathy [12]. A wheelchair-controlled persuasion game called "Birthday Party" was created by Gerling et al. (2014). Players must fulfill a number of wheelchair-related challenges. The object of the game is for players to maneuver an avatar in a wheelchair to get to a friend's birthday party on time. The player must stop at several spots along the road to gather supplies for the party, but time is of the essence because they are running behind schedule. The game fosters empathy and a supportive mindset toward those who have difficulties [13].

A program called "Barriers: The Awareness Challenge" was created by Pivik et al. in 2002 to imitate a wheelchair-bound child's experiences in an elementary school setting that is familiar to most kids. The program offers chances for the child without a disability to actually encounter various circumstances, points of view, perceptions, and interactions through the eyes of a child with a handicap. The project's specific goals were to encourage more accepting attitudes and behaviors toward children with disabilities and to raise children's knowledge of the accessibility and attitude barriers that negatively affect people with disabilities [14]. The instructional program "Aprende con Zapo" was created by Ballesta et al. suggestions for instructional methods to teach emotional and social skills. The curriculum tries to teach children with autism spectrum disorders to recognize fundamental and complex emotions on others' faces on five different levels, as well as to predict actions based on beliefs (true or untrue) on those same five different levels. The main character of the program, the clown Zapo, interacts with the students as they complete the various exercises, helping them to better understand social and emotional abilities, particularly the crucial ability of empathy [15].

Tanaka et al. (2008) created the "Let's Face It! Skills Battery (LFI! Battery)," a computer-based assessment that consists of a number of engaging video games arranged according to a theoretical hierarchy of face processing domains. This reinforces the child's capacity to pay attention to faces, identify facial identity and emotional expressions, and interpret facial cues in a social context. Participants with ASD and controls (TDC) who were matched for age and IQ underwent testing with the LFI! Battery. The results demonstrate that people with ASD were equally as capable of correctly labeling the fundamental facial emotions as typically developing participants, with the exception of the angry face. This collection of games intends to strengthen the child's capacity for face attention, expression recognition, and social context interpretation. Participants with ASD had a tendency to see the mouth feature holistically and the eyes as separate pieces, and they were less able to generalize facial emotions across multiple identities. The findings also demonstrate that autistic children's facial recognition abilities can be significantly improved by relatively brief intervention programs [16, 17].

An interactive multimedia application called "Mind Reading" was developed by Golan et al. (2006) to educate adults with Asperger syndrome and high-functioning autism about emotions and mental states. Based on a taxonomy system with 412 emotions and mental states grouped into 24 emotion groups and six developmental stages from four years old to adulthood, it can be used to understand human behavior. Basic and complicated emotions are systematically introduced and taught via written text, audio, and video in Mind Reading. Users had access to a library of emotions to study, lessons and tests in the learning area, and games on emotions in the gaming zone. Results revealed that after using the software for 10–20 hours over the course of 10–15 weeks, individuals greatly increased their capacity to identify complicated emotions and mental states from both faces and voices, when compared to their performance before the intervention and compared with a control group [18].

In order to teach people with ASD to perceive and anticipate emotions in others, Silver and Oakes (2001) looked into the usage of a multimedia software application called the Emotion Trainer. The Emotion Trainer was a teaching tool for emotions that featured animated emotional reactions and five sections with images of real people. The degree of success or difficulty that individual encountered as they advanced through the program determined the frequency of feedback, prodding, and reinforcement that was provided. It entails activities centered on facial expression detection, emotion prediction, and context-based interpretation. Based on age, gender, and academic level, 22 ASD sufferers, ranging in age from 10 to 18, were paired. While the second member of the pair was placed in the no-intervention control condition, one member of the pair was randomly allocated to the intervention condition, which consisted of 10 computerized sessions spread over 2-3 weeks. From pre- to post-intervention, both groups shown a considerable improvement in their capacity to decipher facial expressions for mood or mental condition [19].

By putting the user in the position of a caretaker to a virtual avatar, Hughes (2014) created the game WUBeeS to help young children with ASD (Autism Spectrum Disorder) develop empathy and perspective-taking skills. It is believed that after playing this game repeatedly in a series of trials, kids with ASD would demonstrate an improvement in their capacity to distinguish between different emotions, give suitable answers to fundamental requirements (such as food, water, and shelter), and distinguish between different types of social cues. (e.g. feeding the avatar when it is hungry), and be able to communicate more clearly about emotions. The time spent playing incentive games, the amount of time

spent responding to changes in the avatar's emotional or physical expression, and other as-yet-unidentified game-play behaviours were all included in the game data [20].

The Social Motivation Adaptive Reality Treatment Games (SMART-Games), a unique game-based SST (Social Skills Training) intervention for ASD, were described by Gotsis et al. (2010). The player can change an avatar's moods, wants, and behavior by manipulating it. The game places a strong emphasis on social qualities like empathy [21].

### 2.2. Health-promoting games

"A Day in the Life of an Inpatient" is a simulation game that Cosgray et al. (1990) presented to change how staff members felt about people who were mentally ill. The purpose of the game was to provide personnel a firsthand look at the circumstances that psychiatric patients in a hospital can occasionally encounter. The objective was that staff members would develop a greater sense of empathy for patients as a result of their experience playing the part of a patient, and that this empathy would lead to good improvements. The goal of the game was to familiarize players with certain staff methods and institutional norms and policies that can have a negative impact on patients. 900 hospital employees participated in the study, and the results showed that the game increased staff sensitivity and benefited staff who had little patient contact [22].

"Into Dementia" by Ijsfontein is an educational game that was presented by McCallum et al. (2013). Players can feel the restrictions and challenges that a dementia sufferer encounters on a daily basis in the game's physical, interactive environment, which uses virtual reality to depict the world of a person with dementia. The game is played on a simulation platform inside a specially modified vehicle. The game's objective is to foster empathy for those who suffer from dementia and to promote awareness of the difficulties these individuals encounter. [23], [24].

"Packy and Marlon" is an interactive video game for health that was created by Brown et al. in 1997. The game is intended for young people with diabetes. The game's protagonists are two elephants that are at a diabetes summer camp. They need to get rid of a pack of roving rats that are denying the campers access to diabetic supplies and wholesome meals. Players must successfully control their insulin levels and food intake in order to maintain their characters' glucose levels within a reasonable range in order to win. Participants in the treatment group in a randomized experiment that tested this game played it for six months (Brown et al., 1997). By the end of the trial, patients who had access to the game displayed improved daily diabetes self-management practices, stronger felt selfefficacy for diabetes self-management, and increased communication with parents about diabetes. If "Packy and Marlon" is played by other players as well, the game can also foster empathy for the sufferers of this chronic condition as well as the sickness itself [25].

A video game called "Bronkie the Bronchiasaurus" was created specifically for young children with asthma, according to Lieberman (2001). The world is dusty and the game is set in prehistoric periods. A fan that typically disperses the dust has broken. By staying away from asthma triggers like dust and smoke while on their journey, players can assist the two in-game characters Bronkie and Trakie in managing their condition. The game includes a few text-based questions and answers along the route that must be answered correctly in order to move further. Studies on the game revealed that when compared to a control, patients' self-concepts, social support, knowledge, self-care practices, and selfefficacy regarding their asthma improved after playing the game. Additionally, the game has an impact on empathy, a crucial social skill [26].

A game for health called "Cytarious" was presented by Gerling et al. (2011). It intends to demonstrate cancer treatment and to disseminate knowledge about the disease through its background story and game mechanics. The backdrop narrative takes place in space and revolves around the planets Cytarius, Haima, Enképhalon, and Blaston. The people of Enképhalon and Haima coexist peacefully, but Blaston's citizens were kicked out of the intergalactic society because of their self-centered actions. They quickly reproduce themselves in an effort to infiltrate the community and take over the neighboring planets in retaliation. The people of Cytarius, genetically modified Cytowarriors led by the player, attempt to defend the two tranquil planets from the invaders. Beyond providing knowledge about the disease, the game engages patients and healthy kids in play and can help parents, medical professionals, and kids develop empathy [27].

A video game called "Re- Mission" was developed by Tate et al. (2009) in which the player enters the game as a nanobot that battles the illness from within the bodies of young patients. Through the use of gameplay elements like opponent and weapon design, the game intends to spread fundamental knowledge about typical cancer symptoms and treatment methods. In order to improve communication and contact with the young patients, "Re-Mission" aims to boost patients' sentiments of self-efficacy and self-esteem as well as generate feelings and empathy [28, [29].

The single-player video game "Elude" was developed by Rusch et al. (2011) with the goal of educating friends and family members of persons with depression about what their loved ones are going through. Elude was developed by Singapore-MIT GAMBIT Game Lab to assist the patient's family members in understanding what depression is like. By fostering empathy for those who experience despair on a daily basis, "Elude's" metaphorical model for depression aims to raise awareness of the reality of depression. In order to depict a neutral mood, the game is set in a forest. The objective is to scale trees until you reach the tops, where you will find "happiness". The player will encounter several "passions" items along the journey, and they must get past the barriers in order to reach the treetops and soar into the air [30], [31].

"Beyond Eyes" is a gorgeous game created by Sherida Halatoe (Tiger & Squid) about Rae, a blind girl who uses her remaining senses to visualize the world around her. After an accident cost Rae her sight, she was scarred by the event. She rarely leaves her house since she is afraid of loud noises and crowded places. All of that, however, is altered when Nani, her cat, tragically goes missing. Now, the player must direct Rae on her arduous quest to find Nani, protect her from any dangers she may come across, teach her to conquer her fears so she can leave her golden prison and find beauty and perhaps even new friends. The player gains a greater understanding of people with visual impairments' behavior and actions as a result of playing this game [32].

Finally, it's critical to emphasize the beneficial and influential role that digital technologies play in the field of emotional education. Mobile devices (33-35), a range of ICT apps (36-46), AI & STEM ROBOTICS (47-50), and games (51) are examples of the technologies that facilitate and improve educational processes including evaluation, intervention, and learning. Additionally, the use of ICTs in combination with theories and models of metacognition, mindfulness, meditation, and the development of emotional intelligence [52-63], speeds up and improves educational practices and results, especially in emotional and empathy education.

## 3. Conclusion

More specifically, it is undeniable that we live in a technologically advanced era, and that influence of technology permeates every part of our life on both a practical and more fundamental level, impacting our very existence. The participants' quality of life improved as a result of their exposure to ICT. Empathy is a crucial social ability that should be developed by individuals to varying degrees. It enables social interaction and raises our awareness of a variety of important concerns.

The publications reviewed above covered using cutting-edge computer games to assess, intervene with, and cultivate empathy in those with special educational needs and individuals who have other health issues. In the first instance, students with impairments lack empathy and emotion detection, but by engaging in digital games, these socioemotional skills could be evoked in a fun way. Additionally, empathy is a tough quality for those who are struggling with their health. But these games also benefit those who are in good health because they help them develop empathy for others who are suffering from major health issues.

While some of the study is encouraging, additional research is required to ascertain whether and how games might aid in the development of empathy, the function of identity in fostering empathy, and whether empathy and identification are linked to a greater interest in global learning. Games may only be one of many possible pathways for doing this, thus more should be properly constructed to encourage the development of empathy. It has been found repeatedly in the scientific literature that empathy makes people's attitudes and behaviors toward other people and groups better, whereas a lack of empathy makes people's views and behaviors more negative. In conclusion, the review emphasizes that ICT tools do play a vital role in insuring and increasing empathy to achieve more in special education, in health, in human-computer connection, etc., given the vast expansion of digital tools.

## Compliance with ethical standards

### *Acknowledgments*

The Authors would like to thank University of Aegean, Department of Information and Communication Systems Engineering (ICSD) Team for their support and especially prof. C. Skianis and the SPECIALIZATION IN ICTs AND SPECIAL EDUCATION: PSYCHOPEDAGOGY OF INCLUSION Postgraduate studies Team, for their support.

## References


[1] McDonagh, D. (2006). Empathic research approaches to support the designer: a supra- qualitative research for designing model. Design Issues.

[2] Lipps, T. (1903). Einfühlung, innere Nachahmung und Organenempfindungen.

[3] Nilsson, P. (2003). Empathy and emotions: On the notion of empathy as emotional sharing.

[4] Gallo, D. (1989). Educating for empathy, reason and imagination. The Journal of creative behavior, 23(2), 98-115. http://dx.doi.org/10.1002/j.2162-6057.1989.tb00680.x

[5] Schuller, B., Marchi, E., Baron-Cohen, S., O'Reilly, H., Pigat, D., Robinson, P., & Daves, I. (2014). The state of play of ASC Inclusion: an integrated Internet-based environment for social inclusion of children with autism spectrum conditions. arXiv preprint arXiv:1403.5912.

[6] Boucenna, S., Narzisi, A., Tilmont, E., Muratori, F., Pioggia, G., Cohen, D., & Chetouani, M. (2014). Interactive technologies for autistic children: a review. Cognitive Computation, 6(4), 722-740. http://dx.doi.org/10.1007/s12559-014-9276-x

[7] Alves, S., Marques, A., Queirós, C., & Orvalho, V. (2013). LIFEisGAME Prototype: A Serious Game about Emotions for Children with Autism Spectrum Disorders. PsychNology Journal, 11(3), 191-211.

[8] Miranda, J. C., Sousa, A. A., Fernandes, T., & Orvalho, V. C. (2011). Interactive technology: teaching people with autism to recognize facial emotions. INTECH Open Access Publisher.

[9] Beaumont, R., & Sofronoff, K. (2008). A multi component social skills intervention for children with Asperger syndrome: The Junior Detective Training Program. Journal of Child Psychology and Psychiatry, 49(7), 743-753. http://dx.doi.org/10.1111/j.1469- 7610.2008.01920.x

[10] Finkelstein, S. L., Nickel, A., Harrison, L., Suma, E., & Barnes, T. (2009, March). cMotion: A new game design to teach emotion recognition and programming logic to children using virtual humans. In Virtual Reality Conference, 2009. VR 2009. IEEE (pp. 249-250). IEEE.

[11] Gibbons, S. (2015). Disability, Neurological Diversity, and Inclusive Play: An Examination of the Social and Political Aspects of the Relationship between Disability and Games. Loading. 9(14).

[12] Social Clues. (2014). A curriculum based on 'evidence-based practices.' Social Clues. Retrieved from http://www.socialcluesgame.com/#!science/c7jq

[13] Gerling, K. M., Mandryk, R. L., Birk, M. V., Miller, M., & Orji, R. (2014, April). The effects of embodied persuasive games on player attitudes toward people using wheelchairs. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 3413-3422). ACM. http://dx.doi.org/10.1145/2556288. 2556962

[14] Pivik, J., McComas, J., MaCfarlane, I., & Laflamme, M. (2002). Using virtual reality to teach disability awareness. Journal of Educational Computing Research, 26(2), 203-218.

[15] http://dx.doi.org/10.2190/WACX-1VR9-HCMJ-RTKB

[16] Lozano, J., Ballesta, J., & Alcaraz, S. (2011). Software for Teaching Emotions to Students with Autism Spectrum Disorder. Comunicar, 36, 139-148. http://dx.doi.org/10.3916/C36-2011-03-05

[17] Tanaka, J. W., Wolf, J. M., Klaiman, C., Koenig, K., Cockburn, J., Herlihy, L., & Kaiser, M. D. (2012). The perception and identification of facial emotions in individuals with autism spectrum disorders using the Let's Face It! Emotion Skills Battery. Journal of Child Psychology and Psychiatry, 53(12), 1259-1267. http://dx.doi.org/10.1111/j.1469-7610.2012.02571.x

[18] Wolf, J. M., Tanaka, J. W., Klaiman, C., Cockburn, J., Herlihy, L., Brown, C., & Schultz, R. T. (2008). Specific impairment of face-processing abilities in children with autism spectrum disorder using the Let's Face It! skills battery. Autism Research, 1(6), 329-340. http://dx.doi.org/10.1002/aur.56

[19] Golan, O., & Baron-Cohen, S. (2006). Systemizing empathy: Teaching adults with Asperger syndrome or high-functioning autism to recognize complex emotions using interactive multimedia. Development and psychopathology, 18(02), 591-617. http://dx.doi.org/10.1017/S0954579406060305

[20] Silver, M., & Oakes, P. (2001). Evaluation of a new computer intervention to teach people with autism or Asperger syndrome to recognize and predict emotions in others. Autism, 5(3), 299-316. http://dx.doi.org/10.1177/1362361301005003007

[21] Hughes, D. E. (2014). The Design and Evaluation of a Video Game to Help Train Perspective-taking and Empathy in Children with Autism Spectrum Disorder (Doctoral dissertation, University of Central Florida Orlando, Florida).

[22] Gotsis, M., Piggot, J., Hughes, D., & Stone, W. (2010, June). SMART-games: a video game intervention for children with Autism Spectrum Disorders. In Proceedings of the 9th International Conference on Interaction Design and Children (pp. 194-197).

[23] ACM. http://dx.doi.org/10.1145/1810543.1810569

[24] Cosgray, R. E., Davidhizar, R. E., Grostefon, J. D., Powell, M., & Wringer, P. H. (1990). A day in the life of an inpatient: an experiential game to promote empathy for individuals in a psychiatric hospital. Archives of psychiatric nursing, 4(6), 354-359. http://dx.doi.org/10.1016/0883-9417(90)90025-G

[25] McCallum, S., & Boletsis, C. (2013). Dementia Games: a literature review of dementia-related Serious Games. In Serious Games Development and Applications (pp. 15-27). Springer Berlin Heibelberg. http://dx.doi.org/10.1007/978-3-642-40790-1_2

[26] Into Dementia: intodmentia.com, http://intodmentia.com/, (Last visited: April 5th, 2013)

[27] Brown, S. J., Lieberman, D. A., Gemeny, B. A., Fan, Y. C., Wil- son, D. M., & Pasta, D. J. (1997). Educational video game for juvenile diabetes: results of a controlled trial. Informatics for Health and Social Care, 22(1), 77-89.

[28] Lieberman, D. A. (2001). Management of chronic pediatric dis- eases with interactive health games: Theory and research findings. The Journal of ambulatory care management, 24(1), 26-38. http://dx.doi.org/10.1097/00004479-200101000-00004

[29] Gerling, K., Fuchslocher, A., Schmidt, R., Krämer, N., & Masuch, M. (2011). Designing and evaluating casual health games for children and teenagers with cancer. In Entertainment Computing– ICEC 2011 (pp. 198-209). Springer Berlin Heidelberg. http://dx.doi.org/10.1007/978-3-642-24500-8_21

[30] Tate, R., Haritatos, J., & Cole, S. (2009). HopeLab's approach to Re-Mission.

[31] Kato, P. M., Cole, S. W., Bradlyn, A. S., & Pollock, B. H. (2008). A video game improves behavioral outcomes in adolescents and young adults with cancer: a randomized trial. Pediatrics, 122(2), e305-e317. http://dx.doi.org/10.1542/peds.2007-3134

[32] Rusch, D. C. e-beratungs journal. net. Singapore MIT GAMBITGame Lab: Elude. http://gambit.mit.edu/loadgame/elude.php Last access 2012/03/29. http://www.tiger-squid.com/home/4558559479

[33] Stathopoulou A, Karabatzaki Z, Tsiros D, Katsantoni S, Drigas A, 2019 Mobile apps the educational solution for autistic students in secondary education Journal of Interactive Mobile Technologies (IJIM) 13 (2), 89-101https://doi.org/10.3991/ijim.v13i02.9896

[34] Drigas A, DE Dede, S Dedes 2020 Mobile and other applications for mental imagery to improve learning disabilities and mental health International Journal of Computer Science Issues (IJCSI) 17 (4), 18-23 DOI:10.5281/zenodo.3987533

[35] Drigas, A. S., Koukianakis, L, Papagerasimou, Y. (2006) “An elearning environment for nontraditional students with sight disabilities.”, Frontiers in Education Conference, 36th Annual. IEEE, p. 23-27. https://doi.org/10.1109/FIE.2006.322633

[36] Drigas A, Petrova A 2014 ICTs in speech and language therapy International Journal of Engineering Pedagogy (iJEP) 4 (1), 49-54 https://doi.org/10.3991/ijep.v4i1.3280

[37] Bravou V, Drigas A, 2019 A contemporary view on online and web tools for students with sensory & learning disabilities iJOE 15(12) 97 https://doi.org/10.3991/ijoe.v15i12.10833

[38] Xanthopoulou M, Kokalia G, Drigas A, 2019, Applications for Children with Autism in Preschool and Primary Education. Int. J. Recent Contributions Eng. Sci. IT (IJES) 7 (2), 4-16 https://doi.org/10.3991/ijes.v7i2.10335

[39] Stathopoulou A, Spinou D, Driga AM, 2023, Burnout Prevalence in Special Education Teachers, and the Positive Role of ICTs, iJOE 19 (08), 19-37

[40] Stathopoulou A, Spinou D, Driga AM, 2023, Working with Students with Special Educational Needs and Predictors of Burnout. The Role of ICTs. iJOE 19 (7), 39-51

[41] Loukeri PI, Stathopoulou A, Driga AM, 2023 Special Education Teachers’ Gifted Guidance and the role of Digital Technologies, TECH HUB 6 (1), 16-27

[42] Stathopoulou A, Temekinidou M, Driga AM, Dimitriou 2022 Linguistic performance of Students with Autism Spectrum Disorders, and the role of Digital Technologies Eximia 5 (1), 688-701

[43] Vouglanis T, Driga AM 2023 Factors affecting the education of gifted children and the role of digital technologies. TechHub Journal 6, 28-39

[44] Vouglanis T, Driga AM 2023 The use of ICT for the early detection of dyslexia in education, TechHub Journal 5, 54-67

[45] Drakatos N, Tsompou E, Karabatzaki Z, Driga AM 2023 Virtual reality environments as a tool for teaching Engineering. Educational and Psychological issues, TechHub Journal 4, 59-76

[46] Drakatos N, Tsompou E, Karabatzaki Z, Driga AM 2023 The contribution of online gaming in Engineering education, Eximia 8, 14-30

[47] Chaidi E, Kefalis C, Papagerasimou Y, Drigas, 2021, Educational robotics in Primary Education. A case in Greece, Research, Society and Development 10 (9), e17110916371-e17110916371 https://doi.org/10.33448/rsd-v10i9.16371

[48] Lytra N, Drigas A 2021 STEAM education-metacognition–Specific Learning Disabilities Scientific Electronic Archives 14 (10) https://doi.org/10.36560/141020211442

[49] Ntaountaki P, et all 2019 Robotics in Autism Intervention. Int. J. Recent Contributions Eng. Sci. IT 7 (4), 4-17, https://doi.org/10.3991/ijes.v7i4.11448

[50] Demertzi E, Voukelatos N, Papagerasimou Y, Drigas A, 2018 Online learning facilities to support coding and robotics courses for youth International Journal of Engineering Pedagogy (iJEP) 8 (3), 69-80, https://doi.org/10.3991/ijep.v8i3.8044

[51] Chaidi I, Drigas A 2022 Digital games & special education Technium Social Sciences Journal 34, 214-236 https://doi.org/10.47577/tssj.v34i1.7054

[52] Drigas A, Mitsea E, Skianis C 2021 The Role of Clinical Hypnosis & VR in Special Education International Journal of Recent Contributions from Engineering Science & IT (IJES) 9(4), 4-18. https://doi.org/10.3991/ijes.v9i4.26147

[53] V Galitskaya, A Drigas 2021 The importance of working memory in children with Dyscalculia and Ageometria Scientific Electronic Archives 14 (10) https://doi. org/10.36560/141020211449

[54] 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), 194-203. https://doi.org/10.3991/ijet.v15i14.12509

[55] Drigas A, Mitsea E, Skianis C. 2022 Virtual Reality and Metacognition Training Techniques for Learning Disabilities SUSTAINABILITY 14(16), 10170, https://doi.org/10.3390/su141610170

[56] Drigas A,. Sideraki A. 2021 Emotional Intelligence in Autism Technium Soc. Sci. J. 26, 80, https://doi.org/10.47577/tssj.v26i1.5178

[57] Bamicha V, Drigas A, 2022 The Evolutionary Course of Theory of Mind - Factors that facilitate or inhibit its operation & the role of ICTs Technium Social Sciences Journal 30, 138-158, DOI:10.47577/tssj.v30i1.6220

[58] Karyotaki M, Bakola L, Drigas A, Skianis C, 2022 Women's Leadership via Digital Technology and Entrepreneurship in business and society Technium Social Sciences Journal. 28(1), 246–252. https://doi.org/10.47577/tssj.v28i1.5907

[59] 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

[60] Drigas A, Papoutsi C, Skianis, 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 58-76, https://doi.org/10.3991/ijes.v9i4.26189

[61] 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 Soc. Sci. J. 27, 230, https://doi.org/10.47577/tssj.v27i1.5599

[62] Drigas A, Karyotaki M, Skianis C, 2017 Success: A 9 layered-based model of giftedness International Journal of Recent Contributions from Engineering, Science & IT 5(4) 4-18, https://doi.org/10.3991/ijes.v5i4.7725

[63] Drigas A, Mitsea E, Skianis C, 2022 Intermittent Oxygen Fasting and Digital Technologies: from Antistress and Hormones Regulation to Wellbeing, Bliss and Higher Mental States BioChemMed 3 (2), 55-73