Use of Information and Communication Technologies in Language and Speech Difficulties

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Abstract

The last decade has seen a significant transformation in inclusive education in the use of information and communication technologies (ICT) for language and speech therapy, diagnosis and intervention of language and speech problems. In most cases, ICT is used as an adjunct to language and speech therapists, and as an intervention tool in areas where language and speech therapists are not available. This article will provide a brief introduction to some of the information and communication technologies used for assessment and intervention purposes due to language and speech difficulties. In parallel with the spread of language and speech problems, the lack of specialists indicates the use of information and communication technologies. The frequency of language and speech problems in the world was 5% in school-age children. This ratio was mainly defined as voice disorder (3%) and stuttering (1%). In a study conducted in Eskisehir, master classes in primary schools in Turkey and 5% of children with problems in the first grade related to speech and language screen. It was found that 1 percent of children with speech problems. A similar study found that 16,000,000 kindergarten, 3.5% of primary and secondary school children had language and speech problems. 59 of Turkey's 25 geographical regions in seven geographical regions and a sample group of private and public institutions in the ranking of barrier services shown in studies; These include stuttering, delayed speech, vocal and vocal disorders, and special learning difficulties with a rate of more than 10%.

I. Introduction

Language and Speech has been the most natural and frequently used agency of human communication throughout history in terms of providing information transfer between individuals (Németh, G., Olaszy, G., Vicsi, K., & Fegyó, T., (2009). Accordingly, the language and speech therapist profession has developed rapidly with interdisciplinary clinical education and practices, especially in the last 30 years, and has recently used existing Information and Communication technologies (ICT) (Hoben, K., & Morris, J.,(2005).

The literature expresses the positive effect of ICT use in children and adults with incomplete speech and language skills. Investigating the use of ICT for the evaluation, support and rehabilitation of communication disorders has shown positive results in disorders caused by neurological disorders, autism, hearing impairment, and acquired speech and language disorders (Danubianu, M., Tobolcea, I., & Pentiuc, S. G.,(2009). Thanks to the use of ICT, therapists use flexible and innovative assistive technology integrated into their clinical competencies, as well as individual therapy programs for participants with language speaking difficulties. Speech and language therapists use ICTs for assessment and evaluation purposes ((Cox, R.,(2007);Danubianu, M., Tobolcea, I., & Pentiuc, S. G.,(2009). In this study, we provide an overview of the most popular practices used to evaluate language and speech disorders and intervention in both children and adults. We divided the assessment and intervention in language and speech therapy into ICTs into two main categories: The first includes assessment tools for adults and children, and the second is to classify language and speech difficulties through ICTs.

II. Use of ICT in Evaluation Procedures

Early diagnosis of language and speech difficulties in children or adults is essential for the language and speech therapist and plays a key role in successfully accomplishing the intervention of the difficulty. Rejection of language and speech difficulties by the participant causes some basic problems: In social and academic life, he / she may experience difficulties in communication skills, lack of self-confidence, negative self-esteem and social withdrawal problems. Since the language and speech therapy process can be challenging and time consuming for both the therapist and the participant, smart diagnosis and therapy systems have been created as a way to increase the efficiency of language and speech therapy (Popovici, D. V., & Buică-Belciu, C.,(2012).

"Telelogos" is an easy-to-use web-based tool aimed at evaluating language and speech tarpists' optimum response. The system offers an alternative ap-

proach to remote / technology-supported language and speech therapists and has a feature that detects children's learning problems as well as language and speech therapy. In addition, it allows to communicate with participants who have language speaking difficulties, to evaluate non-verbal writing language skills, phonological awareness and level. In addition to these features, Telegos is also used as a communicator between two disabled children who have language and speech difficulties (Glykas, M., & Chytas, P., (2005).

He developed a computer-based program for the evaluation and analysis of voice disorders. This tele-diagnostic software package is called "Diagnosis of Sound Disorders (DoVd)". This computer-based program consists of two main applications: Perceptual evaluation of sound and acoustic analysis and integration with endoscopy techniques. The first one, "MedivozCaptura" records the signals in speech production, while the second - "WPCVox" - analyzes the sounds, and objectively measures the quality of the sounds. This computer based software requires a large sound and endoscopic image database to be used (Godino-Llorente, J. I., Sáenz-Lechón, N., Osma-Ruiz, V., Aguilera-Navarro, S., & Gómez-Vilda, P.,(2006).

A study was conducted on aphasia patients to determine if there is a difference in results between standard face-to-face language assessment and real-time tele-rehabilitation through video conferencing. In order to determine the effect of the severity of the language impairment in the evaluation of the language impairment, a total of 32 aphasia patients were examined by two language and speech pathologists under equal conditions. The results revealed that although the severity of aphasia opposed evaluation by telemedicine rehabilitation, it did not affect the accuracy of the evaluation results. Some subtests may be difficult due to some difficulties such as telere rehabilitation sound and image quality deterioration. However, these can be eliminated by using more advanced technological tools (Hill, A. J., Theodoros, D. G., Russell, T. G., Ward, E. C., & Wootton, R.,(2009).

A research was conducted on the comprehensibility of the speeches of the participants with dysarthria speech disorder. In this study, the development of a model that provides reliable phoneme scores calculated from three different types of speech intelligibility models is presented. These are models with phonemic features, phonological features, or a combination of both, that consist of the syntax between speech and typical phonetic transcription. The 10550 sound recording consisting of 10550 consonant and consonant words expressed by one hundred and sixty participants showed that the findings obtained in the study can be used as a clinical tool in terms of reliability and validity (Van Nuffelen, G., Middag, C., De Bodt, M., & Martens, J. P.,(2009).

He developed a screening system to detect decline in cognitive abilities. The system determines the speech characteristics of the participants' conversations

recorded over a phone. These speech characteristics were compared with the recordings made in a controlled environment. The results have shown that remotely recorded speech characteristics, small algorithmic changes, can be reliable enough to be used to monitor early subjects and to interfere with the cognitive decline of aging people (Rapcan, V., D'Arcy, S., Penard, N., Robertson, I. H., & Reilly, R. B.,92009).

An Internet-based program has been developed to identify speech pathology (SPDES) in children between the ages of four and seven. In this system based on developmental methodology, neurology database has been used. The database evaluates the responses of the participant and presents the difficulties in language speaking to the language and speech trap list. The language and speech therapist can create a preliminary draft of the individual training program based on the pathologies in this list. Researchers emphasized that the program can be used for preliminary evaluation and should be considered as an aid to language and speech therapy (Toki, E. I., Pange, J., & Mikropoulos, T. A.,(2012).

III. Use of ICTs in Response Procedures

ICTs have been observed to have a significant effect on intervention in people with language and speech difficulties, neurological disorders - genetic or acquired hearing impairment and autism spectrum disorder. ICTs contribute to the improvement of the cognitive levels of the participant who has difficulty in speaking as well as optimizing the speaking level. The program should be designed in an easy and understandable way for the disability (Paniagua Martín, F., Colomo Palacios, R., & García-Crespo, Á.,(2009); Öster, A. M., House, D., Protopapas, A., & Hatzis, A. (2002).

A. Autism Spectrum Disorder (ASD)

A study was conducted on adding a sensory/ emotional dimension to computer-assisted learning or teaching methods (CAL/ CAI systems) in intervention to autism. In the computer-aided learning program, it is considered as an assistant program that aims to develop various forms of interaction, the process of teaching, the teacher-child education process, and the disability level of the autistic person. The system is composed of an instruction emotional symbol, synthesized speech (in Greek), written on screen, or a combination of all three. For better understanding of the system, sign language and real images are presented together. The icons respond to the child's condition by expressing emotions for every situation, imitating teachers in similar situations. The system also allows the learning process of each child to be recorded for further statistical analysis (.

Luneski, A., Konstantinidis, E. I., Hitoglou-Antoniadou, M., & Bamidis, P. D.,(2008).

The implementation of the ACALPA educational platform for autistic children has been evaluated. The platform uses emotional icons, synthesized speech and multimedia content (videos, images and sounds) aimed at supporting and facilitating teacher-child interaction. The platform used more and less complex modules based on the capacities of the child, each focusing on a specific learning area. Evaluation results showed that the participants contributed positively and significantly to the training process (Konstantinidis, E. I., Hitoglou-Antoniadou, M., Luneski, A., Bamidis, P. D., & Nikolaidou, M. M.,(2009).

The prototype-designed program developed for students between the ages of 6-10 is a facial expression recognition, facial expression with autism spectrum disorder called "Facial Expression Wonderland" (FEW). The training is based on a computer game based on the movie "Alice in Wonderland", which consists of three different educational levels with voice instructions. In order for the participant to move to the next level, children must fulfill all tasks at all levels (Tseng, R. Y., & Do, E. Y. L.,(2010).

The computer-based program reports the benefits of using the TROCAS platform, a customized message board designed to support visual, audio and contextual information through a long-term study. Very simply, this platform allows autistic children to share their ideas with others using the "Like" and "Dislike" buttons, and see other children's views and messages of change. Study results showed that there were important and consistent changes in students' communication patterns (Da Silva, M. L., Simões, C., Gonçalves, D., Guerreiro, T., Silva, H., & Botelho, F.,(2011).

In the 3D dolphinarium, they developed a virtual reality application for autism treatment using 3D virtual pink dolphins. This learning activity system (LAS) allows children to meet their learning and behavioral needs and works as an external stimulus by incorporating various distracting symbols into the system. Therapists teach children how to interact with 3D dolphins, how to use them with simple hand gestures that they want the dolphin to respond to. After a while, with this empowerment, the child with ASD advances and wins other movements, learning to respond to dolphin sounds and even virtual dolphins, so that their communication skills have improved in the process (Chia, N. K. H., Cai, Y., Kee, N. K. N., Thalmann, N., Yang, B., Zheng, J., & Thalmann, D.,(2013).

B. Hearing Impairment

An e-learning tool designed to help children with hearing disabilities learn and practice words more accurately in Thai. This Tool uses language and speech technologies. For example: Overcoming the limits of traditional face-to-face lan-

guage and speech therapy, three-dimensional speech strategy has been developed with computer aided animation (Witsawakiti, N., Suchato, A., & Punyabukkana, P.,(2006).

He developed a software system for hearing impaired children in Iran. The program with multimedia features has a creative and fun combination. The program offers 300 different articulation videos, digital touch schemes for 26 different language positions that facilitate the interaction and synchronization of language and speech activities at home. Language and speech therapy centers have shown that they are integrated with the program developed with the results of the pretests for hearing-impaired children aged 2-6 years (Bastanfard, A., Rezaei, N. A., Mottaghizadeh, M., & Fazel, M.,(2010).

C. Language Disorders

Language disorders affect the language as well as the ability to read and write. Therefore, traditional language therapy and ICTs aim to maximize the participant's language development by improving existing language skills and interfering with language difficulty. Speech and language therapist aims to maximize the communication skills of the participant (Cheng, C., Huo, X., & Ghovanloo, M.,(2009).

Computer based aphasia therapy program based on distance education has been applied to patients with aphasia for six months. In the evaluation made as a result of the research, it was observed that the patients with aphasia showed positive development (Wade, J., Mortley, J., & Enderby, P.,(2003).

A distance-based computer based aphasia therapy program (CVA) developed by Mortley, Wade, and Enderby has been implemented. This therapy program has been applied to participants with verbal aphasia. Therapy is based on 3-6 therapy sessions per week for twenty-seven weeks in the participant's home setting. The computer-based program was created from various therapy methods and feedbacks. The data obtained as a result of participatory interviews with the comparison of the pre-post test language assessment test results before and after the intervention were compared, proving that the program was acceptable and effective (Mortley, J., Wade, J., & Enderby, P.,(2004).

Interactive Reminder Interview (CIRCA) is a computer-based multimedia program that provides oral and non-verbal communication skills in demented participants thanks to the use of interactive multimedia that stimulates long-term memory. After the study on a group of patients with dementia and their caregivers, increased speech autonomy of demented participants was observed. They stated that after the implementation of the CIRCA program, demented participants, with the statements of the caregivers, mobilized memories of their patients

that they had never heard before, and a comfortable interaction environment and more natural speech were formed (Gowans, G., Campbell, J., Alm, N., Dye, R., Astell, A., & Ellis, M.,(2004).

It is a computer-aided word acquisition program using MossTalk Words' Cued Naming exercises. The therapy system is a hierarchical, multi-mode marking protocol under clinician-guided and self-directed instructions. Studies have shown that computer-assisted therapy benefits not only clinical determination therapy, but also one-to-one speech therapy, and this benefit is also effective in individuals with chronic aphasia who have phonetically significant defects (Fink, R., Brecher, A., Sobel, P., & Schwartz, M.,(2005).

It is a multi-media desktop program developed to support aphasic participants. The program is based on the use of video and audio on a PC, the program has the ability to be used by patients to support downloading to the mobile device and communication outside the home (Boyd-Graber, J. L., Nikolova, S. S., Moffatt, K. A., Kin, K. C., Lee, J. Y., Mackey, L. W., ...& Klawe, M. M.,(2006).

Raymer, Kohen and Saffell investigated the effects of the Talk Words Multiple Mode matching exercises module in aphasic participants. Five patients with semantic and phonological anomies were paired with MossTalk Multi-Mode matching exercises (verbal and written word / picture matching) and verbal expression via computer. One month after the training, the picture naming performance proved that computerized lexical training exercises can lead to increases in word comprehension and production (Raymer, A. M., Kohen, F. P., & Saffell, D.,(2006). Work on updating the program is ongoing.

An Online Multimedia Language Assistant (W2ANE) program has been developed for aphasic individuals. The program has two main components: The first consists of OMLA, an online multimedia library and a VIVA adaptive vocabulary. The difference between W2ANE and similar systems is that W2ANE has more multimedia data modalities, including video and non-speech audio. It provides flexible language rehabilitation to users by searching for unknown words, accessing pronunciation and content (Ma, X., Nikolova, S., & Cook, P. R.,(2009).

It is a "Tele Rehabilitation" program that will contribute to tele health by using information technologies. The purpose of the program is to contribute directly to the provision of service through the use of information technologies. By using a virtual desktop, the participant is in real time communication with the therapist and works together using screen materials such as scanned worksheets and documents or computer applications. After six weeks of treatment, all patients who had a stroke showed an improvement in cognitive and communication skills equivalent to similar face-to-face treatment (. Brennan, D., Georgeadis, A., & Baron, C.,(2002).

The effectiveness of MossTalk Words was investigated on two participants

showing anomaly feature. The study proved that the Moss Talk intervention program helped both participants to improve their language skills, maintain some of the therapeutic gains on trained materials, and generalize a sentence production task one month after treatment (- Jokel, R., Cupit, J., Rochon, E., & Leonard, C.,(2009).

Lee, Kaye and Cherney 17 participants with chronic non-fluent aphasia and speech apraxia between the ages of 31-70 have been subjected to a computer-based language speaking training program called Aphasia Scripts TM. The program is nine weeks old and the aim of the program was to investigate the relationship between the duration of treatment and speech writing performance in patients with non-fluent aphasia and the effect of this relationship on the severity of language impairment. As a result, the duration of treatment showed a significant correlation with improvement in both content and rate, especially in participants with severe aphasia (. Lee, J. B., Kaye, R. C., & Cherney, L. R.,(2009).

In patients with semantic dementia who experienced word loss, MossTalk Words used a computer-aided program to regain the words they lost. A computer-based intervention program designed for anomaly was applied to another group of anomalies experiencing semantic dementia. Four months after the intervention, the results of the participants with semantic dementia treated with different methods were compared with the results of MossTalk Words computer-aided program. As a result, it was observed that the results were in favor of MossTalk Words computer-aided program (Jokel, R., Rochon, E., & Anderson, N. D.,(2010).

In adults with aphasia and speech apraxia, the effectiveness of the intervention with tools in the prototype of mixed paper –digital interface (digital paper with mixed interface) and multimodal digital pens was investigated. In particular, they discussed the effectiveness of mixed paper –digital interface (mixed interface digital paper) and multimodal digital pen prototype as an auxiliary tool in language and speech therapy. Livescribe Pulse Smartpen is a new type of digital pen that captures and recognizes paper-based handwriting by voice recording and playback, and also allows custom-made applications to be placed directly on the pen. In addition to being cost-effective, this technology is thought to be useful for supportive therapy as well (Piper, A. M., Weibel, N., & Hollan, J. D.,(2010).

D. Speech Disorders

While speech disorders are defined as voices, sound quality problems, dysfunctional conditions, and phonological disorders, it can also be a combination of the difficulty of speaking out as a result of another dysfunctional condition. In most cases, ICTs can be used as an auxiliary tool in the intervention process for

therapists and people with speech difficulties and their carers (Öster, A. M., House, D., Protopapas, A., & Hatzis, A.,(2002); Calder, D.,(2008).

Dysarthria and Dyspraxia

In a research project supported by an EU fund called "Orto-Logo-Paedia" (OLP), a technology-supported program was developed to improve the quality of life of people with speech disorders. The project has been made available on the Internet by integrating speech training with speech identification technology. The system has three main components: 1. OPTACIA, which provides real-time visual feedback about the level of speaking to the participant 2. Vocabulary appropriate for the participant's level of speech, GRIFOS, an automatic speech recognition system, and 3. TELEMACHOS, to provide web database technology to provide remote lesson and monitoring capability of the system. distance learning (Hawley, M., Enderby, P., Green, P., Brownsell, S., Hatzis, A., Parker, M. & Palmer, R.,(2003).

The research examined the multi-media system based "SpeechKit" to help respond to participants with motor impairments. Therapists have made therapy more effective and easier by using SpeechKit to help voice-based commands that they use in the traditional intervention method. Asymetrix Toolbook has been used to improve the system, and currently a more advanced system is being targeted especially for people with motor speech disorders (Calder, D.,(2008).

The STARDUST (Technology of Supporting Speaking Education Through Distance Education) program, ASR (Automatic Speech identification) was found to positively affect the speech levels of dysarthria patients ((Hawley, M., Enderby, P., Green, P., Brownsell, S., Hatzis, A., Parker, M. & Palmer, R.,(2003).   As part of the STARDUST (Technology for Supporting Speaking Education Through Distance Education) project, it is aimed to increase the speaking levels of participants with dissatisfied speech through the STRAPTK program. STRAPTK works with a console that enables users, software, instructors and participants to work in a high-level graphics environment. The software allows the participant to speak and then receive visual feedback, and also gives the therapist the opportunity to review the participant's performance by reviewing the recorded speech material. As a result of the study with participants who had significant dyssatric speech, three of the participants showed an increase in their level of recognition in most words (Hatzis, A., Green, P., Carmichael, J., Cunningham, S., Palmer, R., Parker, M., & O'Neill, P.,(2003).

Lee Silverman Voice Training (LSVT) in research is a program that improves voice and speech for Parkinson's disease. In addition to improving the level of speech caused by different types of disabilities in LSVT applications, it also im-

proved the patients' voice impairment levels positively. This article presents the research and development of virtual LSVT and also identifies the disadvantages of the project and mainly focuses on the lack of clinical evaluation regarding the participant's performance (Cole, R., Halpern, A., Ramig, L., Van Vuuren, S., Ngampatipatpong, N., & Yan, J.,(2007).

Cheng, Huo, Ghovanloo et al. (Cheng, C., Huo, X., & Ghovanloo, M.,(2009) presented the results of the use of three different algorithms - DIRECT, Powell and Nelder-Mead optimization algorithm - in a new magnetic localization system aimed at monitoring the tongue movement in the 3-D oral cavity. A magnet attached to the tongue sent signals to a 3-D magneto-inductive sensor array outside the mouth, and movements in the oral cavity were monitored. It has been found that the Owell algorithm is a sufficient application that provides real-time monitoring of the language movement.

It is an "E-learning-based Speech Therapy" (EST) tool used in the Netherlands, aimed at providing remote, personalized, but cost-effective Speech Therapy to disadvantaged patients. A central server hosts two types of audio files: target files in MP3 format and recorded speech files uploaded by participants in wav format that can be accessed by a desktop computer or a laptop with an internet connection. Therapists prepare patients with a personalized speech training program from the audio samples of the target speech, stored on the server downloaded by the participant, listen and imitate as accurately as possible. Finally, his statements are compared with examples and uploaded to the server. The disadvantage of this method is that there is no visual feedback that will increase their auditory discrimination skills; this may be affected by subsequent cognitive problems or hearing loss (Beijer, L., & Rietveld, T.,(2011).

Sound Disorders

Mashima (Mashima, P. A.,(2011) investigated the distance education based sound therapy program developed for participants with voice disorders. The effectiveness of the program and customer satisfaction were also examined in the research. Tele-health vocal rehabilitation protocol was developed for this research. In the study, twelve participants with voice disorders received traditional voice therapy, while nineteen participants were interfered with video teleconferencing. As a result, it was observed that the intervention done via telemedicine achieved the same level of success as the traditional voice disorder intervention. However, success in administrative and technical issues was not at the desired level.

Åkerlund, Hulting and Petersson (Åkerlund, L., Hulting, A. L., & Petersson, G.,(2012) presented one of the 16 MedCal e-learning projects on DYSPHONIA

sound disorder, especially for Medical or Speech Therapy students. The program includes sound samples and analysis along with images and video clips of various pathological conditions. It offers students the opportunity to witness exam techniques, therapeutic sessions and surgical interventions.

Articulation and Phonological Disorders

The first web-based program was developed for technology supported language and speech therapy called "Telelogos", which was tested in Greece and the UK in the research. The program suggests that therapists evaluate the child's phonological level and analyze its phonological system, and then what the best intervention will be for each child. There are also tests to detect speech impairment in the content of the program (Glykas, M., & Chytas, P.,(2004).

In the study, three speech therapy tools called "Pre-Lingua", "Vocaliza" and "Cu´entame" were presented to help people develop their communication skills as phonetics, articulation and descriptive and comprehensive language, respectively. Even though it is designed as a program focused on Spain and Latin America, it also has the ability to create an easy interface for speech therapy in any language. In this respect, it has the feature to encourage developments in the functionality and robustness of computing applications (Rodríguez, W., Saz, O., Lleida, E., Vaquero, C., & Escartín, A.,(2008).

The TERAPERS project was developed as an aid to therapists in the intervention process of dislalia in preschool schools in Romania (Danubianu, M., Pentiuc, S. G., Schipor, O. A., Nestor, M., Ungureanu, I., & Schipor, D. M.,(2009). The system includes a wide range of research areas such as artificial intelligence, virtual reality, digital signal processing, and digital electronics and psychology. The main advantage of this system is that the therapist saves time from exercising and can concentrate more on treatment.

Greece has developed an e-learning system to improve the pronunciation levels in preschool children. The software, which can be downloaded from the internet, is an updated version of the game titled "You are talented" that regulates the child's multiple pronunciation and provides feedback to this arrangement. According to the results of the research on this software, it has been revealed that children not only improve their pronunciation levels, but also improve their vocabulary (. Toki, E. I., & Pange, J.,(2010).

Schipor, Pentiuc and Schipor have introduced an improved CBST system called LOGOMON (Logopedics Monitor), which is installed on the PC to improve the speaking levels of preschool children, including the 3D Articulator Model and Homework Manager. The system offers children the advantage of longer fun exercise on the PC. The program also provides for the establishment of a close re-

lationship between predictability, feedback and language speech therapist and the child (Schipor, O. A., Pentiuc, S. G., & Schipor, M. D.,(2012).

In Turkey, (Topbaş, S., Özdemir, S., Tunçer, M., Güven, S., Ünal Ö., Altınsoy, A., Maviş, İ.Lous, K.St ve Topbaş O.(2011) self-help support groups and communities to create work based therapies for stuttering on the internet (e ÖZYARDEP) has been developed as a project. 83 individuals with stuttering participated in the project. In the second study of the project, the effect of individual and group speech therapy on changing stuttering severity and negative attitudes by using the time series model in the second study of the project. It was investigated. Internet-based self-help support program applications were examined qualitatively with group technique. Findings showed that individual e-group speech therapies were effective in changing participants' stuttering severity; revealed that those with moderate and severe stuttering characteristics provided a significant decrease in stuttering severity.

It is supported by the Istanbul Development Agency within the scope of the Information and Communication Technologies Focused Economic Development Financial Support Program for Non-Profit Organizations in 2012 and disadvantaged children who can be used in communication, academic and daily life within the scope of the "Increasing Learning Opportunities of Autistic Children through Technology" project lasting 9 months. A new website has been prepared for them to learn concepts more effectively, easily and fun in every environment with the help of technology (www.tohumotizm.org.tr .,(2013). Within the scope of the project, a total of 300 different concepts have been developed within the scope of 50 sets of education programs that can be used in the daily life for the concept education sets that are aimed to be brought to the children with autism or mental disability, children with 0-8 years of age development, by the trainers of Tohum Autism Foundation Special Education School. . With 50 training programs developed to match 20 objects, distinguish 20 objects and categorize 10 objects, categories, colors, fruits, vegetables, drinks, etc. Of the target group. contribute to learning concepts such as. With the purpose of spreading the concept software and aiming to provide information about the transportation and use of the related software to the teachers and families in Bağcılar, Kadıköy, Şişli, Zeytinburnu and Beylikdüzü districts in Istanbul. Following the development of the software, a total of 525 people, including family and trainer, were reached and 1,050 hours of training were provided for two months. The concept software designed as a game can be found at www.tohumegitim.com; Accessible for free from iOS and Android-based tablets.

IV. RESULT

This study summarizes the best examples of the use of ICT in language and speech therapy in the process of intervention in the language and speech difficulties of therapists, caregivers and other assistants who will facilitate the life of patients. As Bull, Cochran and Snell (1988) suggest, the use of technology in therapy is as effective as traditional therapy, if not even more useful (. Bull, G. L., Cochran, P. S., & Snell, M. E. (1988). During the intervention period, students used technology to increase daily communication goals thereby further substantiating previous observational studies from researchers such as Houle. According to Houle (1989), computer technology offers promise to communicatively-impaired students in regard to the accomplishment of Individualized Education Plan (IEP) goals (Houle, G. R. (1989). The daily speech-language pathology log data provided evidence that many students 'IEP goals were met. As indicated in the logs, percentages of correct responses on articulation exercises for each student increased during the intervention. According to MacArthur and Malouf (1991), "The microcomputer itself is not an instructional method or package; it is a flexible educational tool that can be used in a variety of ways to meet a variety of goals ". MacArthur and Malouf's statement is appropriate when considering the use of a technological intervention, such as Sound Therapy Lite, in speech and language therapy. Moreover, the standardized articulation pretest to posttest gains in regard to previously defined articulation goals supported the use of technology to achieve specified goals. In our country, no studies measuring the attitudes of language and speech therapists towards the use of technology in language and speech difficulties have been encountered. On the other hand, although experienced language speech therapists have been reluctant to use ICTs in their fields, it is seen that these attitudes have changed significantly in the last decade. ICTs are now recognized as a tool to help achieve faster and more efficient results where traditional intervention is insufficient. We tried to present ICTs by classifying them according to their usage in language and speech therapy. Although the ICTs we offer are used efficiently, there is still a need for improvement. In our country, the field of language and speech therapy continues to develop. Considering that there are not enough experts, it is thought that developing and using ICTs will contribute to the field.

REFERANS

1. Németh, G., Olaszy, G., Vicsi, K., & Fegyó, T. (2009) Talking machines?!–. Infocommunications Journal, 8.
2. Hoben, K., & Morris, J. (2005). PATSy: innovations in learning for speech and language therapy. Bulletin of the Royal College of Speech and Language Therapists.
3. Cox, R. (2007). Technology-enhanced research: educational ICT systems as research instruments. Technology, Pedagogy and Education, 16(3), 337-356.
4. Danubianu, M., Tobolcea, I., & Pentiuc, S. G.(2009). Advanced Technology in Speech Disorder Therapy of Romanian Language. arXiv preprint arXiv:0912.3969
5. Popovici, D. V., & Buică-Belciu, C. (2012). Professional challenges in computer-assisted speech therapy. Procedia-Social and Behavioral Sciences, 33, 518-522.
6. Glykas, M., & Chytas, P. (2005). Next generation of methods and tools for team work based care in speech and language therapy. Telematics and Informatics, 22(3), 135-160.
7. Godino-Llorente, J. I., Sáenz-Lechón, N., Osma-Ruiz, V., Aguilera-Navarro, S., & Gómez-Vilda, P.(2006). An integrated tool for the diagnosis of voice disorders. Medical engineering & physics, 28(3), 276-289.
8. Hill, A. J., Theodoros, D. G., Russell, T. G., Ward, E. C., & Wootton, R.(2009). The effects of aphasia severity on the ability to assess language disorders via telerehabilitation. Aphasiology, 23(5), 627-642 .
9. Van Nuffelen, G., Middag, C., De Bodt, M., & Martens, J. P.(2009). Speech technology-based assessment of phoneme intelligibility in dysarthria. International journal of language & communication disorders, 44(5), 716-730 .
10. Rapcan, V., D'Arcy, S., Penard, N., Robertson, I. H., & Reilly, R. B.(2009). The Use of Telephone Speech Recordings for Assessment and Monitoring of Cognitive Function in Elderly People. In Proceedings of 10th Annual conference of the International Speech Communication Association (Interspeech 2009), Brighton (pp. 6-10), September.
11. Toki, E. I., Pange, J., & Mikropoulos, T. A.(2012). An Online Expert System for Diagnostic Assessment Procedures on Young Children's Oral Speech and Language. Procedia Computer Science, 14, 428-437.
12. Paniagua Martín, F., Colomo Palacios, R., & García-Crespo, Á.(2009). MAS: learning support software platform for people with disabilities. In Proceedings of the 1st ACM SIGMM international workshop on Media studies and implementations that help improving access to disabled users (pp. 47-52). ACM, October.
13. Öster, A. M., House, D., Protopapas, A., & Hatzis, A.(2002). Presentation of a new EU project for speech therapy: OLP (Ortho-Logo-Paedia). In Proceedings of the XV Swedish Phonetics Conference (Fonetik 2002) (pp. 29-31), May.
14. Luneski, A., Konstantinidis, E. I., Hitoglou-Antoniadou, M., & Bamidis, P. D.(2008). Affective computer-aided learning for autistic children. In 1st Workshop of Child, Computer and Interaction (WOCCI '08). Chania, Greece, October .

15. Konstantinidis, E. I., Hitoglou-Antoniadou, M., Luneski, A., Bamidis, P. D., & Niko-laidou, M. M. (2009).Using affective avatars and rich multimedia content for education of children with autism. In Proceedings of the 2nd International Conference on PErvasive Technologies Related to Assistive Environments (p. 58). ACM, June.

16. Tseng, R. Y., & Do, E. Y. L.(2010). Facial expression wonderland (FEW): a novel design prototype of information and computer technology (ICT) for children with autism spectrum disorder (ASD). In Proceedings of the 1st ACM International Health Informatics Symposium (pp. 464-468). ACM, November.

17. da Silva, M. L., Simões, C., Gonçalves, D., Guerreiro, T., Silva, H., & Botelho, F.(2011). TROCAS: communication skills development in children with autism spectrum disorders via ICT. In Human-Computer Interaction–INTERACT 2011 (pp. 644-647). Springer Berlin Heidelberg .

18. Chia, N. K. H., Cai, Y., Kee, N. K. N., Thalmann, N., Yang, B., Zheng, J., & Thalmann, D.(2013). Learning Activity System Design for Autistic Children Using Virtual Pink Dolphins. In 3D Immersive and Interactive Learning (pp. 105-121). Springer Singapore.

19. Witsawakiti, N., Suchato, A., & Punyabukkana, P. (2006). Thai Language E-Training for the Hard of Hearing. Special Issue of the International Journal of the Computer, the Internet and Management, Vol. 14 No.SP1, August .

20. Bastanfard, A., Rezaei, N. A., Mottaghizadeh, M., & Fazel, M.(2010). A novel multimedia educational speech therapy system for hearing impaired children. In Advances in Multimedia Information Processing-PCM (pp. 705-715). Springer Berlin Heidelberg.

21. Cheng, C., Huo, X., & Ghovanloo, M.(2009). Towards a magnetic localization system for 3-D tracking of tongue movements in speech-language therapy. In Engineering in Medicine and Biology Society, 2009. EMBC 2009. Annual International Conference of the IEEE (pp. 563-566). IEEE, September.

22. Wade, J., Mortley, J., & Enderby, P.(2003). Talk about IT: Views of people with aphasia and their partners on receiving remotely monitored computer-based word finding therapy. Aphasiology, 17(11), 1031-1056 .

23. Mortley, J., Wade, J., & Enderby, P.(2004). Superhighway to promoting a client-therapist partnership? Using the Internet to deliver word-retrieval computer therapy, monitored remotely with minimal speech and language therapy input. Aphasiology, 18(3), 193-211.

24. Gowans, G., Campbell, J., Alm, N., Dye, R., Astell, A., & Ellis, M.(2004). Designing a multimedia conversation aid for reminiscence therapy in dementia care environments. In CHI'04 Extended Abstracts on Human Factors in Computing Systems (pp. 825-836). ACM, April.

25. Fink, R., Brecher, A., Sobel, P., & Schwartz, M.(2005). Computer-assisted treatment of word retrieval deficits in aphasia. Aphasiology, 19(10-11), 943-954.

26. Boyd-Graber, J. L., Nikolova, S. S., Moffatt, K. A., Kin, K. C., Lee, J. Y., Mackey, L. W., ...& Klawe, M. M.(2006). Participatory design with proxies: developing a desktop-PDA system to support people with aphasia. In Proceedings of the SIGCHI conference on Human Factors in computing systems (pp. 151-160). ACM, April .

27. Raymer, A. M., Kohen, F. P., & Saffell, D.(2006). Computerised training for impairments of word comprehension and retrieval in aphasia. Aphasiology, 20(02-04), 257-268.

28. Ma, X., Nikolova, S., & Cook, P. R.(2009). W2ANE: when words are not enough: online multimedia language assistant for people with aphasia. In Proceedings of the 17th ACM international conference on Multimedia (pp. 749-752). ACM, October .

29. Brennan, D., Georgeadis, A., & Baron, C.(2002). Telerehabilitation tools for the provision of remote speech-language treatment. Topics in Stroke Rehabilitation, 8(4), 71-78, 2002.

30. Jokel, R., Cupit, J., Rochon, E., & Leonard, C. Relearning lost vocabulary in nonfluent progressive aphasia with MossTalk Words®. Aphasiology, 23(2), 175-191.

31. Lee, J. B., Kaye, R. C., & Cherney, L. R.(2009). Conversational script performance in adults with non-fluent aphasia: Treatment intensity and aphasia severity. Aphasiology, 23(7-8), 885-897.

32. Jokel, R., Rochon, E., & Anderson, N. D.(2010). Errorless learning of computer-generated words in a patient with semantic dementia. Neuropsychological rehabilitation, 20(1), 16-41.

33. Piper, A. M., Weibel, N., & Hollan, J. D. (2010).Introducing multimodal paper-digital interfaces for speech-language therapy. In Proceedings of the 12th international ACM SIGACCESS conference on Computers and accessibility (pp. 203-210). ACM, October .

34. Calder, D.(2008). SpeechKit: a multimedia speech tool. In Proceedings of the 10th International Conference on Information Integration and Web-based Applications & Services (pp. 647-650). ACM, November.

35. Hawley, M., Enderby, P., Green, P., Brownsell, S., Hatzis, A., Parker, M. & Palmer, R. (2003).STARDUST; Speech Training And Recognition for Dysarthric Users of Assistive Technology. In 7th European Conference for the Advancement of Assistive Technology (AAATE 2003) (pp. 959-963), August .

36. Hatzis, A., Green, P., Carmichael, J., Cunningham, S., Palmer, R., Parker, M., & O'Neill, P.(2003). An integrated toolkit deploying speech technology for computer based speech training with application to dysarthric speakers. In Proceedings of the 8th European Conference on Speech Communication and Technology (Eurospeech'03) (pp. 2213-2216), September.

37. Cole, R., Halpern, A., Ramig, L., Van Vuuren, S., Ngampatipatpong, N., & Yan, J. (2007). A virtual speech therapist for individuals with Parkinson's Disease. Educational technology-saddle brook then englewood cliffs NJ-, 47(1), 51.

38. Beijer, L., & Rietveld, T. (2011). Potentials of Telehealth Devices for Speech Therapy in Parkinson's Disease.

39. Mashima, P. A.(2011). The Use of Video-Teleconferencing to Deliver Voice Therapy At-A-Distance (Doctoral dissertation, University of Cincinnati).

40. Åkerlund, L., Hulting, A. L., & Petersson, G. (2012). Dysphonia-Illustrating a Nationwide Initiative to Provide Students with High Quality e-Learning Resources. International Journal of Innovation in Science and Mathematics Education (formerly CAL-laborate International), 6(1).

41. Glykas, M., & Chytas, P. (2004).Technology assisted speech and language therapy. International Journal of Medical Informatics, 73(6), 529-541.

42. Rodríguez, W., Saz, O., Lleida, E., Vaquero, C., & Escartín, A.(2008). Comunica-tools for speech and language therapy. In Workshop on Child, Computer and Interaction, Chania, Grecia, October .

43. Danubianu, M., Pentiuc, S. G., Schipor, O. A., Nestor, M., Ungureanu, I., & Schipor, D. M.(2009). TERAPERS-Intelligent Solution for Personalized Therapy of Speech Disorders. International Journal On Advances in Life Sciences, 1(1), 26-35.

44. Toki, E. I., & Pange, J.(2010). E-learning activities for articulation in speech language therapy and learning for preschool children. Procedia-Social and Behavioral Sciences, 2(2), 4274-4278.

45. Schipor, O. A., Pentiuc, S. G., & Schipor, M. D.(2012). Improving computer based speech therapy using a fuzzy expert system. Computing and Informatics, 29(2), 303-318.

46. Topbaş, S., Özdemir, S., Tunçer, M., Güven, S., Ünal Ö., Altınsoy, A., Maviş, İ.Lous, K.St ve Topbaş O.(2011). Proje e-ÖZYARDEP. Maya Akademi, Ankara

47. Teknoloji Yoluyla Otizmli Çocukların Öğrenme Fırsatlarının Artırılması Projes ihttps://www.tohumotizm.org.tr/hakkimizda/projeler/tamamlanan-projeler/teknoloji-yoluyla-otizmli çocuklarin ögrenme firsatlarinin-artirilmasi-projesi-2013.

48. Bull, G. L., Cochran, P. S., & Snell, M. E. (1988). Beyond CAI: Computers, language, and person with mental retardation. Topics in Language Disorders, 8(4), 55-76.

49. Houle, G. R. (1989, June). Teachers of communicatively-impaired students: To use or not to use computer technology? Educational Technology, 29, 43-45.

50. Önemli, M., Ahmedov, H.H. (2016). Üstün yetenekli/ zekalı çocuklarda dilsel sözel zeka. Eğitime Bakış Dergisi, 37, 87-92.