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# RESEARCH IN EDUCATION AND REHABILITATION

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## *P R E D G O V O R*

Poštovani čitaoci, autori, saradnici,

Zadovoljstvo nam je predstaviti novo izdanje časopisa *Defektologija* sa izmjenjenim nazivom – Istraživanja u edukaciji i rehabilitaciji. Razvoj defektološke nauke, teorije i prakse, ali suštinska promjena društvenog viđenja invalidnosti, rezultirali su, pored ostalog, izmjenom naziva *defektologija* u naziv *edukacijsko-rehabilitacijska znanost*. Samim tim, javila se potreba da se časopis *Defektologija*, koji je u kontinuitetu izlazio pune 23 godine, terminološki uskladi sa nazivom znanosti čije teorijske i praktične rezultate istražuje, prikazuje i unapređuje. Nadamo se da ćete u časopisu naći korisne i interesantne teme iz područja edukacijsko rehabilitacijske znanosti, ali i iz srodnih disciplina, a naša misija je da stvorimo prostor za dinamičan i progresivan istraživački dijalog.

Zahvaljujemo se svima koji su nas pratili u dosadašnjem znanstvenom putovanju, ali i svima onima koji će nam se pridružiti u budućnosti.

Uredništvo

## *F O R E W O R D*

Dear readers, authors, associates,

It is our pleasure to introduce you a new edition of the jornal Defectology with the changed name - Research in Education and Rehabilitation. The development of defectology as science, theory and practice, but also, a fundamental change in the social vision of disability, resulted in, among other things, the change of the name defectology into the name education and rehabilitation science. Consequently, the need for the jornal "Defectology", which has been continuing for 23 years to come, has been terminologically aligned with the name of science, whose theoretical and practical results are investigates, displays and promots. We hope that you will find useful and interesting reading from the wide field of education and rehabilitation science, but also from related disciplines, and our mission is to create a place for dynamic and progressive research dialogue.

We thank all those who have followed us in the current scientific journey, but also to all those who will join us in the future.

Editorial

Research in Education and Rehabilitation 2021; 4(2): 93-108. DOI 10.51558/2744-1555.2021.4.2.93



# LIMITATIONS AND ADVANTAGES OF COMPUTER TECHNOLOGY IN COMMUNICATION OF PERSONS WITH IMPAIRED VISION

# OGRANIČENJA I PREDNOSTI RAČUNARSKE TEHNOLOGIJE U KOMUNIKACIJI OSOBA OŠTEĆENOG VIDA

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**Review article**

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## ABSTRACT

Modern society requires a constant keeping up with innovative trends in the field of information literacy and knowledge of new computer technologies. In order for each individual to be fully integrated into social life, to progress in education and to socialize successfully, it is necessary to master the basics of computer literacy. People with visual impairments tend to fit into the educational and social environment with the help of computer technology, but they mostly encounter difficulties due to insufficient knowledge of the individual needs of each individual. It is necessary to ensure accessibility, equal conditions of use for all persons and thus enable them to successfully establish and maintain communication.

**Key words**: computer technology, advantages, limitations, communication, People with visual impairments

## SAŽETAK

Savremeno društvo zahtijeva praćenje inovativnih trendova u području informatičke pismenosti i poznavanja novih računarskih tehnologija. Da bi svaki pojedinac bio potpuno integrisan u društveni život, napredovao u obrazovanju i uspješno se socijalizovao potrebno je da ovlada osnovom računarske pismenosti. Osobe sa oštećenjem vida teže se uklapanju u obrazovnu i socijalnu sredinu pomoću rečunarske tehnologije, ali uglavnom nailaze na teškoće zbog nedovoljnog poznavanja indiviualnih potreba svakog pojedinca.

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Potrebno je obezbijediti pristupačnost, jednake uslove korištenja za sve osobe i time im omogućiti da uspješno uspostavljaju i održavaju komunikaciju.

**Ključne riječi:** računarska tehnologija, prednosti, ograničenja, komunikacija, osobe oštećenog vida

## THE IMPORTANCE OF COMPUTER TECHNOLOGY FOR THE VISUALLY IMPAIRED

Although there is literature on computer technology and the information needs of blind and partially sighted people in certain settings, for example in universities, very little is known about the information needs for everyday life (Roth, 1989). Technology is embedded in the technical and consumer culture, but for people with disabilities, it is also embedded in the culture of living with certain ideas about disability. This is reflected in the way technology is created only for people with certain abilities (Johnson and Moxon, 1993). Most computer technologies are constructed in accordance with the market, and they are only superficially adapted to blind people (Virkes, 2004). The implementation of information and communication technology, according to user requirements, allows the user to overcome social and infrastructural barriers, which is the basic goal and purpose of assistive technologies (Hersh and Johnson, 2008; William, 2005). Assistive technology, which is available on the market today, enables visually impaired people to be able to use computer technology more than ever before to communicate, access information, and to create written and multimedia materials (D'Andrea, 2010). Although much work has been devoted to helping the blind to use a variety of computer technologies, further research is needed to make it easier for blind users to pursue highly paid and meaningful careers through the use of technology. Computing is potentially attractive as a career choice option because of its rich sound and tactile content, but there is no standardized educational infrastructure to help visually impaired students on the path to success (Stefiki Gellenbeck, 2010). By providing tools and techniques for use, technology contributes to, but also draws from, a knowledge base within which theory and practice are compact and interdependent. It can be said that the technology is a modified, portable problem-solving procedure (Babalola and Haliso, 2011).
Blind and visually impaired people in the community are underrepresented in computing. Students who want to access computer technology must overcome significant technological and educational barriers in order to succeed (Stefik et al., 2011). With the help of technology, people with limited senses can communicate with others whether they speak sign language or read Braille. Experts have presented solutions in the academic and commercial fields, but it is believed that the technology has advanced enough to provide better options than currently available computer technologies and modern software (Ramirez-Garibay et al., 2014). As technology advances day by day, the interaction of man and innovative machines has become necessary in our daily lives (Harsur and Chitra, 2015).

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Current technology enables efficient distribution and launch of applications on mobile and computer devices, even in cases where computer requirements are more significant and complex.

As a result, computer travel aids, navigation aids, text-to-speech applications, and virtual audio displays that combine sound with haptic channels become integrated into standard devices, enabling a greater degree of interaction and communication.

This trend has opened up a whole range of new perspectives for the rehabilitation and training of people with visual impairments (Csapó et al., 2015). In a world where knowledge and digital inclusion cause a strong IT openness and democratic and social problems, there are situations in companies where the use of technology is necessary for full participation, inclusion and communication. However, some digital divisions in the world of information openness are discriminatory, such as observing the phenomenon of disability. Universal design encourages professionals to shift attention from users to a broader concept, based on reflections on product potentials and their wider application, which would be extremely important for people with disabilities (Gavrilă-Ardelean, 2015).

## ADVANTAGES AND DISADVANTAGES OF COMPUTER TECHNOLOGY AND THEIR IMPACT ON THE COMMUNICATION OF PERSONS WITH IMPAIRED VISION

Computers mean much more to visually impaired students than to students with intact vision, because they provide them with the opportunity to independently read professional literature, independently write seminar papers and other written papers. In relation to learning needs, computers mean much more to them for communication by e-mail, communication with peers, professors and other people. In this way, the computer influences the more successful integration of visually impaired students into the school environment (Butorac, 2002). Research was conducted in order to gain understanding of people with visual impairment and their requirements for information technology. Blind and partially sighted people participated in the research to determine their computer and internet experience. This research clearly identified that people with different types of visual impairment have a high level of computer and Internet expertise, but that they have specific barriers, not a lack of willpower, which prevents them from accessing computing and Internet-related technologies. These barriers include issues related to the perception of disability in society, government policy, corporate policy, everyday computer products, assistive technologies, real-time Internet communication, poverty, and lack of educational opportunities. Solving problems in these areas will significantly reduce the impact of the division on visually impaired people and normal sighted people, enabling people who are blind or visually impaired to participate more effectively in the information age (Hollier, 2007).

An increasing number of people are taking advantage of information technology. In blind and partially sighted people, this trend is even more present.

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There are several reasons for this: computers have advanced and are capable of speech synthesis without additional equipment, they are more affordable to an increasing number of people and make it easier for visually impaired people to integrate into society (Tupek, 2010). It is important to emphasize that despite the progress of information technology, there are many limitations faced by visually impaired people in the desire to freely and independently use innovative computer technologies and thus establish better communication with the environment.

Because web experiences are visual in themselves, the Internet is full of websites, tools, and applications that are virtually unusable by people with visual impairments. For example, it's not uncommon to see websites that use combinations of background and foreground colors, making them virtually unreadable for visually impaired users. Despite all this, people with visual impairments use the web on a daily basis to search, read and write emails, and search for various content on the Internet - in order to communicate with the world (Berners-Lee, 2010). Children with disabilities face extreme disparities and daunting challenges in enjoying academic development, social life, and community participation, socialization, and communication, especially in low-income countries (WHO, 2011).

The advent of computers and speech technology has opened up opportunities for the development of completely new applications that can make the education and life of the blind and visually impaired easier. The world pays a lot of attention to the inclusion of people with disabilities, and as part of that many computer audio games of educational and entertaining character have been developed that help in the process of inclusion in the social environment and establishing communication (Cruz-Cunha et al., 2011). There are a number of accessibility issues that blind people have if they use rich internet applications. These are dynamic principles in which the exchange of information takes place in real time. Due to their higher information density and diversity, providing access to these systems to blind people is difficult because the content is constantly changing (Giraud et al., 2011). Few research studies focus on how the use of assistive technologies affects social interaction among people. Research has shown that certain assistive devices used by people with disabilities are designed so that their functional approach takes precedence over their sense of self-awareness. The research also found that two misperceptions prevailed regarding the perception of the use of assistive technology by visually impaired people: that assistive devices can functionally eliminate disability and that people with disabilities would be helpless without their devices. Such research results provide additional evidence that accessibility should be embedded in conventional communication technologies. When this is not feasible, assistive devices should incorporate the latest technologies and strive to be designed for social acceptability as well as include a new approach to design (Shinohara and Wobbrock, 2011).

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Children with visual impairments experience various forms of distancing, which can exclude them from the health care system, education and social services and thus limit their participation in the family, community and society. This isolation can have a lasting effect on future employment opportunities and participation in civic life.

Support services and technology can enable children with disabilities to take their place in society and contribute to their family and community (UNICEF, 2013). When considering persons with disabilities in the field of information literacy and technology, this should be done by establishing laws and public policies that seek to ensure their rights.

Although the field of computers plays an important role in this context, enabling the development of technologies that promote greater independence and autonomy of persons with disabilities, many tools and technologies used in this field are still unavailable, making it difficult to engage in computer education programs as well as industry (Luque et al., 2014). Among the various technologies used, computer-based solutions are emerging as one of the most promising options, mainly due to their accessibility and ease of use (Jafri et al., 2014). Advances in computing, and increased use of Smartphones, give technology system designers greater flexibility in using computer vision to support visually impaired users. Understanding the needs of these users will certainly provide insight into the development of improved usability of computer devices and overcoming limitations (Terven et al., 2014). Assistive technology helps visually impaired people by giving them greater independence - allowing them daily activities such as internal and external navigation, detecting obstacles, locating doors and lost objects, better communication, etc. Although various assistive technologies are available to blind people, most of them have a complex design that has been developed for a specific purpose. In addition to all of the above, technology designed in this way is expensive for commercial production (Sivani Darsan, 2016). Blind and partially sighted people face many difficulties in communication because they cannot always notice and react in a timely manner when they are not sure whether the person is talking to them or someone else. Computer-based technologies have advanced so much in this domain that they can improve the communication of blind people, make it easy and efficient (Hashmi et al., 2020). Blind people face a number of challenges in performing daily activities, such as reading product labels, identifying banknotes, exploring unfamiliar spaces, identifying the appearance of objects of interest, interacting with digital artefacts, communicating, managing Smartphones, and selecting non-visual items on screen. The advent of assistive technologies based on Smartphones promotes independence and ease of use, resulting in improved quality of life, but presents several challenging opportunities for the visually impaired (Khani Khusro, 2020).

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## COMPUTER TECHNOLOGIES THAT HELP IN OVERCOMING DIFFICULTIES IN THE COMMUNICATION OF VISUALLY IMPAIRED PERSONS

In the past twenty years, many experts have dealt with the use of computer technology and modern aids in order to facilitate the daily life of people with sensory impairments. In order to inform the general public about the selection of adequate aids, software and available platforms, the authors present many solutions for easier and more efficient communication of people with visual impairments.

Voice portal "Contact" was developed for the PC platform with Dialogic CTI (Computer Telephony Integration) card of Springware technology that performs voice signal processing and communication of the PC platform with the telephone line, thus realizing the telephone part of the portal with Internet Information Server (IIS), with PHP and MySQL that hosts web portals on the Internet (Greenspan and Bulger, 2001). There was a tendency to investigate the importance of knowledge of information and communication technology (ICT) in people with disabilities when establishing employment and communication with employers. Such considerations led to the conclusion that information and communication technology must be considered economically, socially and culturally dependent in order to establish the desired employment relationship (Michailakis, 2001).

The study, which looked at the impact of computer-mediated communication on teamwork, examined 40 teams of 4 people working in a face-to-face environment, compared to teams that communicate with computer systems. The results were consistent with the belief that computer-mediated communication teams have difficulty maintaining mutual knowledge, indicating the importance of direct communication and the shortcomings of computer communication technologies (Thompson and Coovert, 2003). Haptic technology has great potential in many applications. Multimodal interactions in the process of creating and exploring graphs are provided using a low-cost haptic device, a Logitech WingMan Force Feedback mouse, and web audio. The Internet-based tool also provides blind people with the convenience of receiving information at home and facilitates communication with the same profile of professionals (Yu et al., 2003). It is stated, that in the haptic and tactile domain, when it comes to communication via messages using mobile devices and various computer technologies, there is a difference that is somewhat analogous to the auditory domain. To adapt the technology to the visually impaired, the goal is to create incoming message icons to be more focused on the intuitive level and long-term goal of recognizing the written message, in the blind and partially sighted, rather than on the level of auditory text perception (Maclean and Enriquez, 2003a). In their next publication, the same authors present that haptic or short icons are programmed with the role of easy and simple communication in a manner similar to the visual display of messages in intact vision persons, indicating easier use in visually impaired people (Maclean and Enriquez, 2003 b). "Tactons" and "tactile icons" are defined as adequate replacements for classic ic, stating that both forms of icon display ons, on computer communication technology, are structured for the visually impaired and that abstract

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messages can be used for effective non-visual communication (Brewster and Brown, 2004). Research in this domain has progressed, leading to the design of a vibro-tactile pen and software for creating tactons and semantic sequences of vibro-tactile patterns on mobile devices (iPAQ Pocket PC). Special games have been proposed to facilitate learning, communication, and easier manipulation of these types of tactons. The techniques are based on gesture recognition and spatio-temporal mapping for the presentation of vibro-tactile signals (Evreinov et al., 2004).

Information and communication technology has become an indispensable tool in the fight against poverty in the world. Statistical analyzes show that there is an empirical link between poverty factors and the adoption of online communication in different countries (Kamssui et al., 2004).

Associations of blind and partially sighted people seek to initiate the development of computer games for blind and partially sighted children to facilitate their inclusion (IGDA, 2009). In such ways, it can directly and indirectly influence the creation of a better social climate and communication with peers in an inclusive environment. AudioDoom, a virtual environment that interacts and successfully communicates with blind children through a 3D Audio system, was conceived, designed and tested in practice (Sánchezi Lumbreras, 2009).

Verbal dialogue is required for effective conversation between two people. Most human communication, however, is made up of nonverbal cues such as gestures and facial expressions. Blind people are thus deprived of opportunities to interact. Considering this problem, a computer vision system with algorithms for facial recognition and speech expression was designed to transmit nonverbal messages to a blind user. The device will improve communication and recognize the identities and facial expressions of communication partners (Astler et al., 2011). The advent of touch-based computing devices has brought new and exciting possibilities. They came at the cost of a significant number of new challenges for people with sensory impairments. They are especially visible in the blind population, because these devices lack tactile signs and are extremely visually demanding. Existing solutions resort to screen reading aids to compensate for the lack of vision, but not all information still reaches the blind user, making it directly difficult for him/her to communicate with the environment (Oliveira et al., 2011). Text-to-speech is a modern application that converts text into spoken word, analyzing and processing text using natural language processing, and then using digital signal processing technology to convert this processed text into synthesized spoken text (Isewon et al., 2012). People who are completely blind are absolutely unable to communicate via computer without assistive technologies. To overcome this barrier, they mainly use screen reader software and Braille. The screen reader system speaks all the information, in human voice, that appears on the screen, even the text typed on the keyboard. Braille makes all information appear on the Braille line so that blind people can read with their tactile senses (Singh, 2012).

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Mobile computer vision is often advocated as a promising technology to support blind people in their daily activities and to interact with the environment (Manduchi, 2012). Based on the 21st detailed interview, it was shown that people with impaired vision and hearing use the Internet mainly to gather information and communicate with friends and family. Meeting new people online has not been a priority need of these people with sensory deficits, although this has been the focus of attention lately (Abeele et al., 2012). The voice assistant makes the Smartphone or tablet very personalized with the help of user settings and his individual language habits.

This technology is still evolving rapidly. Manufacturers are improving mobile assistants to work with multiple national languages. Google is working to recognize children's voices.

Children at different ages have different pronunciation patterns. Intelligent assistants that support visually impaired people when using mobile devices are not solutions limited to mobile technologies; they are also available on personal computers, mainly within web browsers thus directly improving accessibility and interaction (Crossland et al., 2014). Nowadays, computers and the Internet are often used in the preparation, development and practical implementation of English language tests. Many nationally and internationally recognized tests, such as TOEFL, CAE, CPE, APTIS and the like, are already mostly focused on Computer Based Testing (CBT), where the preparation material is in electronic form in the form of an application that allows interaction with the user and greatly facilitates work and saves time (Kovačević, 2014).

Innovative technologies help in the process of learning and striving to communicate in other languages, and this method is especially easy to use for people with visual impairments. For new ways of displaying information during communication, with the use of computer technology, a preview has been created on devices that includes displays with speech or emotional characteristics (such as auditory emoticons and spemoticons), as well as displays used specifically for navigation and warning information (Csapó and Wersenyi, 2014). The function of the intelligent voice assistant is most powerful within the modern technological accessibility for the visually impaired. Google is developing it under the name Google Now, and in iOS it is known as Siri. The personal assistant for the devices used is constructed in natural language for answering questions, giving recommendations and performing actions by transferring requests to special web services (Arati et al., 2015). An analysis of the use and non-use of social media platforms by low-income blind users in rural and suburban India was made. Using an approach of mixed methods, semi-structured interviews, and observations, the benefits that low-income blind people get from Facebook, Twitter, and WhatsApp were examined. Restrictions that hinder their participation in social networks and communication were also examined. The results showed that there are many weaknesses of these social platforms for the communication of blind persons (Vashistha et al., 2015). Research was conducted on motivation, challenges, interaction and experiences with the visual content of blind people on social networking services.

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An analysis obtained from interviews with 60 individuals with visual impairment was presented. All respondents have little or no functional visual ability. Compared with respondents without visual impairment, blind respondents faced profound accessibility challenges, including the prevalence of photos without sufficient textual descriptions and communication difficulties (Voykinska et al., 2016). In addition to applications that are designed for communication only, there are some models that include software for everyday activities. Using these models, it is possible to discuss current topics with people with intact vision, to lead meaningful and interactive communication.

Colour ID helps with visually shaped colour discrimination in various objects. The colour ID works by recognizing the colours around the user and speaking those colours aloud.

A visually impaired user could use this app when choosing clothes, and many other things and talk about it with sighted people. Smart Braille allows Android users to communicate via a version of Braille. Smart Braille has two main units, one that allows users to write text in Braille, and the other that allows the translation of a text. Talking Tags is designed to help blind users create stickers or labels for everyday objects and thus facilitate communication during everyday life activities (Lewis, 2016). The way for the blind and visually impaired to participate in communication in foreign languages is also made possible by innovative computer technologies. A study was conducted on the accessibility of computer technology for blind and partially sighted people in correlation with the method of use and accessibility of specially designed technology, for this type of sensory impairment. Participants rated special applications as useful (95.4%) and available with tools for the visually impaired (91.1%). More than 90% of the middle-aged adult group agree with the claim about the practicality of special applications, which is a significantly higher percentage than the one observed in the younger and older adult group. In addition, visually impaired respondents find that special applications are less accessible to them than those designed for completely blind people (Griffin-Shirley et al., 2017). One of the innovations is a replacement device for the visually impaired, designed using computer vision. Its main goal is to provide users with a 3D view of the environment around them, transmitted by auditory and tactile senses. One of the biggest challenges for this system is to ensure permeation, i.e. to be usable in any indoor or outdoor environment and in any lighting conditions. This type of device will make people safer and give them the opportunity to interact with the environment (Caraiman et al., 2017).

Advances in technology enable people with visual impairments to access many public institutions in order to acquire knowledge and obtain information, communicate with other people and share experiences. Since the middle of the 20th century, libraries have drastically transformed from old book and magazine repositories into powerful centres for knowledge and information. Information and communication technology, which is responsible for this revolution, has drastically changed the organization, management and functioning of modern libraries. Modern libraries are increasingly changing into places where unlimited information can be accessed in many formats, from a large number of sources.

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In addition to providing materials, they also provide the services of librarians, who are experts in finding and organizing information and interpreting the necessary information (Anis, 2017). Blind and partially sighted people can use computers on their own with the help of special programs. Computers have become a medium through which the blind and visually impaired can independently read, write and use all available literature in digital form, thereby enhancing communication skills. It is necessary to put emphasis on the communication of persons who, in addition to visual impairment, also have other sensory impairments.

Researching in that direction, the experts presented a smart tactile-sensory glove based on movements that people with impaired vision and hearing use for communication and learning.

It is based on the concept of Braille and supports face-to-face communication as well as long-distance communication. The device consists of a smart glove worn on both hands, with a contact on the thumb, middle finger and index finger, and it communicates with mobile devices using Bluetooth technology. Six tactile sensors were used, and one pair embedded in a glove on the thumb, middle finger, and forefinger, on both hands, and represents six cells of the Braille code. The user wears a smart glove and enters by touch the desired combination on the fingers that correspond to Braille. This technology serves efficiently and easily to send messages to mobile devices or other gloves. Messages can equally be received with a glove from a mobile device in the form of vibrations on the fingers corresponding to Braille codes (Ozioko et al., 2017). Visually impaired people are neglected due to many modern procedures of communication and interaction. Assistive technologies such as text-to-speech and Braille displays are the most commonly used means of connecting visually impaired people to mobile phones and other smart devices. Both of these solutions face usability problems, so the development of an easy-to-wear solution called “Braille” with haptic technology is being considered, while maintaining affordability. "BrailleBand", i.e. Braille tape, allows passive reading in Braille. The connection between the BrailleBand and the Smartphone (phone) is established using the Bluetooth protocol. It consists of six nodes in three strips that are worn on the hand and serve to map the Braille alphabet, and which are activated to give a sense of touch that corresponds to the characters. Three mobile applications have been developed to train the visually impaired and to integrate existing smart mobile applications such as navigation and short message service (SMS) with the BrailleBand device to facilitate communication of the blind and visually impaired (Savindu et al., 2017). Furthermore, automatic alt-text (AAT) was designed and implemented, a system that applies computer vision technology to recognize faces, objects and themes in photographs as well as to generate photo-alt text. This system is specially designed for users of screen readers on Facebook, they help in communication of visually impaired people in reviewing information on social networks and facilitated communication with the environment (Wu et al., 2017). The most common way to establish communication that is adapted for visually impaired users, in case they use the Internet, is a browser and a screen reader (also known as text-to-

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speech software). Some of the most commonly used screen readers are Microsoft Narrator for Windows users and VoiceOver for Mac users (Ratcliff, 2018).

In an effort to examine whether digital technology can cause addiction and difficulties in use for people with disabilities, Masliković and Krstić (2018) conducted research on this topic. The results of the research showed that there is no risk for people with disabilities to develop addiction to the use of digital technology, but also that people with disabilities have difficulties in using digital technology.

The future development of digital technologies should be in the function of removing barriers in the application by people with disabilities, which would affect the improvement of their position in society (Masliković and Krstić, 2018).

## CONCLUSION

People with visual impairments should have equal opportunities and full accessibility in the use of computer technology in order to acquire information literacy. The educational process, professional guidance, but also everyday life skills and basic human needs, such as communication, can be facilitated by designing technology tailored to the user. As science advances, innovative technologies and simple solutions are patented to make it easier to overcome the obstacles that visually impaired people encounter when using computer technology to establish communication with the environment. People should be trained to use technology and, according to their own needs, actively use it in order to remove barriers to communication. Affordable prices, universal design, adaptation to specific difficulties are among the basic needs that could ensure full access to computer communication technologies, which further leads to greater accessibility to public institutions, the ability to use the latest software on Smartphones and personalized computers. The outcome of research on this topic should be reflected in new software and applications that will be fully adapted to the specifics of sensory deficit in people with visual impairment and represent a compensatory mechanism for establishing effective communication with the environment.

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# DEVELOPMENT OF FUNCTIONAL VISION IN CHILDREN WITH PERINATAL BRAIN DAMAGE

# RAZVOJ FUNKCIONALNOG VIDA I ZNAČAJ RANE INTERVENCIJE KOD DJECE S PERINATALNIM OŠTEĆENJEM MOZGA

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## ABSTRACT

The sense of sight plays a very important role in the life of every individual, since we receive most of the information from the environment with the help of sight. Visually impaired children have difficulty receiving information from the world around them. Lack of visual experience can negatively affect their development. Timely examinations and assessments will indicate the occurrence of various neurological disorders in children, if any are present. A very common cause of neurological disorders is perinatal brain damage. Children with perinatal brain damage often have difficulties in visual functioning and it is therefore very important to assess functional vision in these children. If there are any neurodevelopmental disorders in the child, it is important to start vision rehabilitation as soon as possible, in order to effectively influence the improvement of visual functions.

**Keywords:** functional vision, perinatal brain damage, early vision rehabilitation.

## SAŽETAK

Osjet vida ima veoma važnu ulogu u životu svakog pojedinca, budući da najviše informacija iz okoline primamo uz pomoć vida. Kod djece oštećena vida javljaju se poteškoće pri primanju informacija iz svijeta koji ih okružuje. Nedostatak vizuelnog iskustva može uticati negativno na njihov razvoj. Pravovremena ispitivanja i procjena ukazat će na pojavu različitih neuroloških poremećaja kod djece ukoliko postoje. Jako čest uzrok neuroloških poremećaja jeste perinatalno oštećenje mozga. Djeca sa perinatalnim oštećenjem mozga često imaju poteškoće u vizuelnom funkcionisanju te je stoga jako važno procijeniti funkcionalni vid kod ove djece.

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Ukoliko su prisutna neka neurorazvojna odstupanja kod djeteta, važno je što prije početi sa rehabilitacijom vida, kako bi se efikasno uticalo na poboljšanje vidnih funkcija.

**Ključne riječi:** funkcionalni vid, perinatalna oštećenja mozga, rana rehabilitacija vida.

## INTRODUCTION

Intervention at an early age is of great importance for the development of a child with visual impairment (Radovanović, 2004). The developmental processes of brain maturation take place most rapidly in the first months of the first year of life. This is especially true for processes that allow reorganization after function damage. This process, the so-called brain plasticity is limited to early childhood (Mejaški-Bošnjak, Đuranović, Gojmerac, & Krakar, 2005). Since early visual impairment can affect a child's development, it is necessary to make an assessment of visual functions and functional vision (Colenbrander, 2010). "Assessment of visual functions serves to describe specific visual behaviors, and assessment of functional vision refers to the assessment of a person's residual vision and describes the way a person uses their visual skills during daily activities" (Alimović, Katušić and Jurić, 2013).
The development of vision can be conditioned by perinatal brain damage (Boonstra, Limbutg, Tijmes, Gendern, Schuil and Nispen, 2012). Children with severe perinatal brain damage have greater problems in visual functioning compared to children with mild brain damage (Alimović, 2013). After the impairment is diagnosed and the assessment of visual functions and functional vision is performed, based on the obtained results, a program of visual stimulations is created and implemented in order to raise awareness of the rest of the child's vision for more efficient use (Alimović, Katušić and Jurić, 2013).

## INFLUENCE OF VISION ON CHILD DEVELOPMENT

Visually impaired children are lacking in various areas of development, especially in imitation and movement (Prechtl, Zionini, Einspieler, Bos, & Ferrari, 2001). Visual impairment also has an impact on child development in the context of a limiting impact on the integration and interpretation of data obtained through other senses, on the development of social skills and other cognitive concepts (Sonksen and Dale, 2002). For this reason, visual impairment is one of the main causes of childhood difficulties in children (Fazzi, Signorini, Bova, Ondei, & Bianchi, 2005). Timely detection of visual impairments is important for more efficient implementation of preventive measures for the protection of vision (Alikadić Husović, Alender and Ljaljević, 2006). In visually impaired children, visual perception is reduced, and in blind children, it is absent at all (Šupe, 2009). Depending on the degree of visual impairment, the child receives limited visual impressions from the reality that surrounds it, which is why its observations and performances are incomplete (Teskeredžić and Tulumović, 2013). Konecki (2013) states, that the process of processing an image obtained through the sense of sight involves a series of information processed through the brain. The development of visual function from birth affects learning processes, since young children learn by imitation - due to visual impairment - this process is difficult (Hećimović, Martinec and Runjić, 2014).

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The development of its visual functioning will depend on how the child uses sight when planning and performing activities (Moslavac, Bošnjak-Nađ and Kapitanović, 2019). Dale, Sakkalou, O'Reilly, Springall, De Haan, and Salt (2017) examined the impact of vision on a child's early development. The study included infants aged 8-16 months, with congenital visual impairment, in whom vision and nonverbal cognition were assessed. The results showed that new-borns with congenital visual impairment have the most difficulty with cognitive functions.

## FUNCTIONAL VISION AND ASSESSMENT OF FUNCTIONAL VISION

Vision development is a complex process and arises as a result of what is inherited and the experience gained from the environment (Dorn, 2004). According to Politzer (2008), the visual process can be divided into three categories: visual acuity and visual field; motor abilities of the eye; and visual perception. Visual acuity refers to the clarity of vision, while the visual field is the complete central and peripheral range of vision. The motor abilities of the eye include fixation, tracking, saccades, accommodation, convergence, binocularity, and stereovision. For the interpretation of the environment that surrounds us, the answer is visual perception. Taking into account the above, the complete ability of visual perception consists of visual-motor integration (eye-hand, eye-foot and eye-body coordination); visual-auditory integration (connecting what is seen and what is heard); visual memory (ability to remember and recall what is seen); visual closure (filling in missing parts based on seen parts); spatial relations "(knowledge of where I am - in relation to objects and space around us as well as where objects are in relation to each other), and character-background discrimination (distinguishing objects from background)" (Politzer, 2008). Colenbrander (2010) states that the sense of sight is very important for the overall development of a child, and that for this reason it is necessary to determine as soon as possible how children use their sight in everyday life. Rehabilitators under the term functional vision imply the ability of a person to use their rest of vision in planning and performing tasks, while ophthalmologists under functional vision imply the absence of limitations in visual functions (Colenbrander, 2010). Visual functions, in contrast to functional vision, refer to measurable visual behaviours such as object fixation, eye mobility, and the like. (Alimović, 2013). Prerequisite for timely recognition of deviations in the development of vision is knowledge of the physiological development of vision (Knezović, I., et al., 2015).

In children, functional vision is most often assessed through four areas:

1) solving close-up tasks (observing the child's behaviour in tasks such as searching the desktop, spotting objects at short distances and assessing the position of objects),

2) communication (implies noticing visual characteristics in communication),

3) everyday skills (related to information during daily activities, such as feeding),

4) orientation and movement (involves observing objects and assessing the position of objects in relation to the body in space) (Hyvärinen, 2003).

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The ability to use sight in the above situations is most often assessed on a scale of 3 levels: 1 = usage of the techniques of persons with no visual impairments (in solving tasks it relies primarily on visual information); 2 = usage of techniques of visually impaired people (in solving tasks, visual information that is checked through other senses is used) and 3 = usage of techniques of a blind person (in solving tasks the person relies on the remaining senses, does not use sight at all) "(Hyvärinen, 2003). Alimović and Mejaški-Bošnjak (2011) state that when observing functional vision, it is assessed how a person acts in relation to the use of residual vision. During the assessment of visual functioning, it is necessary to take into account the ability to retain visual attention (Carrasco, 2011). Visual attention implies a focus on certain characteristics of the environment, in order to acquire visual information (Bisley, 2011). If visual information is used to perform certain activities, then such vision is considered functional (Alimović, 2012).

In a study of the importance of assessing and promoting functional vision, visual functions and functional vision were assessed in 30 children, from birth to 3 years of age with perinatal brain damage and visual impairment. After the program of visual stimulations, the variables of functional vision and sensitivity to contrast were significantly improved, while visual acuity improved in only 2.7% of children. Based on the results, it was concluded that the assessment of functional vision is necessary in the early monitoring of a child with perinatal brain damage (Alimović, Jurić and Mejaški-Bošnjak, 2014). Alimović (2013), in his research, compares the differences in the development of visual functions and functional vision in relation to the type and degree of perinatal damage. The study included 101 children aged from early birth days to 3 years who were assessed for functional vision. The results showed that children with perinatal brain damage, who started the visual stimulation program within the first year of life, achieved better results in the progress of visual functioning, than children who started the program within the second year of life. Similar results were obtained by Alimović, Katušić and Jurić (2013), in a study of improving functional vision in 100 children with perinatal brain damage after a visual stimulation program. Based on the results in this study, the greatest improvement was noted in the ability to retain visual attention. The results of visual acuity detection in 50 children with severe perinatal brain damage were compared with the developmental norms of visual acuity detection in children of typical development. Most children had intracranial haemorrhage, periventricular leukomalacia, and hypoxic ischemic changes. The results showed that in most children with severe perinatal brain damage, detection visual acuity developed below the expected limit for the chronological age (Alimović, Penava and Sikirić, 2015).

The study of visual functioning of children with intellectual disabilities concluded that the visual functions of most children are developed below the expected results in relation to their age, and that assessment of functional vision must become mandatory for children with intellectual disabilities, in order to identify visual impairments and that the adjustment of teaching aids and methods must be made (Alimović, 2017). Tončić (2018) claims that visually impaired children, after a vision rehabilitation program, achieve better reading results, general and specific visual functionality.

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## PERINATAL BRAIN DAMAGE-EARLY INTERVENTION AND VISION REHABILITATION

Today, it is considered that 10-15% of children belong to the group of neuro-risk children, while 50% of these children may experience mild or severe neurodevelopmental disorders (Mustafić and Trnovčević, 2006). Mejaški-Bošnjak (2007) points out that the most common cause of neurodevelopmental disorders in children is brain damage during pregnancy, childbirth and the new-born/infant period. Precisely for this reason, perinatal brain damage has a special place among the causes of neurodevelopmental disorders (Jugović et al., 2007). The most common types of perinatal brain damage are: intracranial haemorrhage, vascular disorders, hypoxic-ischemic damage, infection and bilirubinemic encephalopathy (Mejaški-Bošnjak, 2007). One of the causes of brain damage is the release of glutamate, calcium accumulation and lipid peroxidation (Perlman, 2006).

The most common causes of intracranial haemorrhage are mechanical head injuries when passing through the birth canal and hypoxia, which causes venous congestion of the brain and damages the capillary endothelium (Behrman, Kliegman and Jenson, 2000; according to Ljutić, 2013). If these haemorrhages occur in the first week of life, they worsen the neurodevelopmental diagnosis of the new-born (Goldstein, Cotten, Shankaran, Gantz and Poole, 2013), which leads to various cognitive impairments (Schmid, Reister, Mayer, Hopfner, Fuchs and Hummler, 2013). Gram et al. (2013) state that there is still no known therapy that would help the new-born to prevent the occurrence of neurodevelopmental disorders after intracranial haemorrhage. Another type of perinatal brain damage is hypoxic-ischemic encephalopathy (HIE), which is non-progressive, and which occurs as a result of disorders of the brain's blood and oxygen supply (Presečki, Benjak and Barišić, 2009; according to Alimović, 2013).

In the postnatal period, about 15–25% of affected infants die, while 25% develop severe and permanent neurodevelopmental consequences, including visual impairment (Liu and Mccullough, 2013). In his paper, Kuzmanić-Šamija (2015) states that premature infants are a particularly vulnerable group of new-borns for early brain damage, and the frequency of brain damage is higher if the gestational age is lower, i.e. the immaturity of the preterm new-born and if the birth weight is lower. Since there are no well-established treatments when it comes to HIE, it is important to understand the complete pathophysiology to prevent deterioration (Dixon, Reis, Mann Ho, Thang, and Zhang 2015). The neurodevelopmental outcome of a child after brain damage will largely depend on the interactions/relations: the child and the environment, existing brain damage, and compensatory processes of maturation and brain plasticity (Matijević and Marunica Karšaj, 2015). Being able to understand the causes of perinatal brain damage can help identify new strategies for the prevention and treatment of the child in order to reduce the neurological consequences (Hagberg et al., 2015). Alimović, Katušić and Špionjak (2009) found that there are significant differences in children in neurodevelopmental outcome with regard to the type of perinatal brain damage and the time of inclusion in the early intervention program, and that there is a need for habilitation programs in treatment of these children.

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By analysing the incidence and risk factors for the development of intracranial haemorrhage in 150 preterm infants, the results showed that 60% of them had intracranial haemorrhage, with a significant difference in Apgar score, gestational age, birth weight, age and the prophylactic use of the surfactant. Based on the obtained results, it was concluded that the most important factor for the occurrence of intracranial haemorrhage is the use of corticosteroids (Spasojević, Stojanović, Savić and Doronjski, 2010). The characteristics of intracranial haemorrhage in 42 new-borns younger than one month were examined by Hong and Lee (2018) in Korea. Clinical data, mode of childbirth, Apgar score at 1 and 5 minutes, hypoxic injury, neurological symptoms, bleeding site and extent, and developmental outcomes were reported. A total of 30 infants had a combination of infratentorial and supratentorial bleeding. Subdural haemorrhage was the most common type of intracranial haemorrhage, and 44.4% of children had a poor prognosis, while perinatal asphyxia was the most common significant cause. In a study conducted on a sample of 170 high-neurosis children, the results showed that in 75% of children with severe neuromotor abnormalities, brain ultrasound indicated structural changes in perinatal impairment. 38 children had vision impairment, and blindness was recorded in 3 children. 14 children had an abnormal EEG, while West's syndrome and febrile convulsions were observed in 2 children each. Based on the results, it was concluded that neuro-risk children should be recognized and diagnosed early, their development observed, and in case of neurodevelopmental disorders, included in habilitation programs early (Bošnjak-Nađ, Mejaški-Bošnjak, Popović Miočinović, Gverić Ahmetašević and Đaković, 2011). The results of a study evaluating the role of oxidative stress in 90 neonates with perinatal hypoxic-ischemic encephalopathy showed that oxidative stress could be an important factor contributing to hypoxic-ischemic brain damage, especially in preterm infants (Vasiljević, Maglajlić-Dlajlajjni Stankovic, 2012). A large number of new-borns with asphyxia that developed at birth are exposed to the possibility of hypoxic-ischemic encephalopathy. In this case, care by professional staff is very important, in order to influence the improvement of neonatal outcomes (Simiyu, Mchaile, Katsongeri, Philemon and Msuya, 2017).

Harmony et al. (2016), conducted a study aimed at determining the effectiveness of the "neurorehabilitation" method. Infants younger than 2 months with perinatal risk factors for brain damage were included in the study, divided into two groups. One group was treated by the "neurorehabilitation" method (n = 20), while the other was not treated (n = 13) because treatment was voluntarily discontinued after the initial evaluation. At the first examination, all children showed abnormal clinical characteristics as well as an unfavourable picture after magnetic resonance imaging tests. The results showed that the treated group had a higher percentage (90%) of children with the expected outcome than the untreated group. In the second group, only one in five children born before 34 weeks had the expected outcome.

By presenting the types of perinatal damage and the mentioned research, the importance of early intervention and vision rehabilitation can be noticed. Early intervention of an infant with severe visual impairment caused by brain damage may have a different prognosis (Dutton and Jacobson, 2002). Difficulties that occur in children with perinatal brain damage may remain present for the rest of their lives (Jensen, Garnier, Middelanis, & Berger, 2003).

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For this reason, the inclusion of the child in the early intervention program is of great importance for the development of all its abilities, since the child already in the first interactions with the environment acquires experiences that are the basis for further development. Intervention at an early age is defined as timely assistance to the child and its parents (Radovanović, 2004). Blauw-Hospers and Hadders-Algra (2005) state that "early intervention consists of multidisciplinary procedures that promote a child's health, encourage developmental skills, reduce developmental delays, eliminate existing or prevent possible disorders, prevent functional deterioration, and promote family functioning. Only such procedures can stimulate the processes of plasticity of the brain and accelerate the recovery of impaired function (Mejaški-Bošnjak, 2007). Katušić (2011) states that the term plasticity refers to the brain's ability to learn, remember and forget, but also to its ability to reorganize and recover after damage.

Therefore, vision rehabilitation is carried out as part of early intervention and refers to a series of procedures that are applied with the aim of correcting and improving binocular vision, oculomotor and visual perception. Such rehabilitation involves visual stimulation at the earliest age, and later vision exercises. The goals of vision rehabilitation are determined on the basis of the assessment of functional vision, where the basic goal is the rehabilitation of visual functions and more efficient use of vision in everyday activities (Alimović, Katušić and Jurić, 2013). Visual stimulation will help the child become aware of the rest of its vision and focus on using it more efficiently (Alimović, 2012). During exercise, all procedures are individualized and controlled, and are applied depending on the child's reactions to individual stimuli (Ayers, 2002; according to Bošnjak-Nađ, Kapitanović Vidak, Petrović, Tomašković and Nađ, 2019).

Alimović and Mejaški Bošnjak (2011), determined the visual functioning of children with perinatal brain damage, aged 3 years, during which different types of visual stimulation were performed with children. Through a program of visual stimulation, some children are stimulated with light stimuli, some with different materials under ultraviolet light, and some with high-contrast materials. After a one-year program, there was a significant improvement in functional vision, especially in visual attention and visual communication. The results of the research, which aimed to determine the frequency of inclusion of children with neurodevelopmental risk in the early rehabilitation program, given the level of parental education, indicated insufficient information of parents about the importance of early childhood, but also about the possibilities of including neuro-risk children in early rehabilitation programs (Matijević Mikelić, Košiček, Crnković and Radanović, 2011). Researching the impact of rehabilitation on the functional vision of visually impaired children, it was concluded that it is important for these children to apply early rehabilitation to reduce the negative effects associated with visual impairment and to improve their learning abilities (Ganesh, Sethi, Srivastav, Chaudhary and Arora, 2013). In a study of the critical period for visual stimulation in children with perinatal brain damage, 35 children in the first eight months of life were compared with 35 children between the ages of eight and thirty months, all with perinatal brain damage.

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The results showed that children who started a visual stimulation program in the first eight months of life had more improvements in visual functions (Alimović, Katušić and Mejaški-Bošnjak, 2013), which confirms the fact that timely inclusion of highly neurological children in the early intervention program can prevent or at least reduce their neurodevelopmental deviation (Bošnjak-Nađ et al., 2019).

## CONCLUSION

From this overview of the development of functional vision in children with perinatal brain damage, and based on available research, it can be seen that for the neuro-risk group of children and children with low Apgar values it is important to ensure timely diagnosis, to educate their parents, provide early stimulation programs, and provide a stimulating environment that will constantly encourage their development. A review of the available literature showed that there is a lack of research related to the involvement of children in the activities of everyday life as well as to determine the effectiveness of the use of residual vision. Therefore, we can conclude that if the treatment is started on time, then such rehabilitation will have a more effective outcome on the child's development. Future research should include a series of activities that will raise awareness among the population about the importance of early intervention and vision rehabilitation in children with neurodevelopmental disorders.

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# THE RIGHTS OF CHILDREN WITH DISABILITIES TO UPBRINGING AND EDUCATION IN CROATIA – FROM THE CATEGORIZATION TO THE INCLUSION

# PRAVA DJECE S TEŠKOĆAMA U RAZVOJU NA ODGOJ I OBRAZOVANJE U REPUBLICI HRVATSKOJ – OD KATEGORIZACIJE DO UKLJUČIVANJA

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## ABSTRACT

In Croatia, as well as elsewhere in the world, the treatment of individuals with disabilities has historically gone through a number of different phases, from direct discrimination to the final recognition and enactment of various legislative regulations in education systems. The earliest years of life are extremely important for the entire subsequent development of the individual. The environment in which a child lives is a significant factor in the quality and efficiency of its early development and subsequent progression. The increase in the number of children who are identified as children with special educational needs has caught attention of experts in many countries. This increase may be the result of an inadequate educational system, as well as increased and more pronounced differences between children in today's schools. Identification of children with special educational needs brings about the need to create a classification system, which is an issue that has been troubling experts for a long time.

The paper wants to highlight that children with disabilities in Croatia are still perceived from the standpoint of their disability, rather than their ability, and it is the experts who decide about their schooling, their employment and, thus, their entire life. Even though there are some good examples of successful inclusion of children with disabilities in the regular preschool and school system, it still remains to be an issue.

**Keywords:** children, special educational needs, classification system, disability, education system

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## SAŽETAK

U Hrvatskoj, kao i drugdje u svijetu, postupanje prema osobama sa invaliditetom kroz povijest je prošlo kroz niz različitih faza, od direktne diskriminacije do konačnog priznavanja i donošenja različitih zakonskih propisa u obrazovnim sistemima. Najranije godine života izuzetno su važne za cjelokupni kasniji razvoj pojedinca. Okruženje u kojem dijete živi je značajan faktor u kvaliteti i efikasnosti njegovog ranog razvoja i kasnijeg napredovanja. Povećanje broja djece koja se identificiraju kao djeca sa posebnim odgojno-obrazovnim potrebama privuklo je pažnju stručnjaka u mnogim zemljama. Ovo povećanje može biti rezultat neadekvatnog obrazovnog sistema, kao i povećanih i izraženijih razlika među djecom u današnjim školama. Identifikacija djece sa posebnim odgojno-obrazovnim potrebama dovodi do potrebe stvaranja sistema klasifikacije, što je pitanje koje muči stručnjake već duže vrijeme.

Ovim radom se želi naglasiti da se djeca sa teškoćama u razvoju u Hrvatskoj i dalje percipiraju sa stanovišta invaliditeta, a ne sposobnosti, te su stručnjaci ti koji odlučuju o njihovom školovanju, zapošljavanju, a time i cjelokupnom životu. Iako postoje dobri primjeri uspješnog uključivanja djece sa teškoćama u razvoju u redovni predškolski i školski sistem, to i dalje ostaje problem.

**Ključne riječi:** djeca, posebno odgojno-obrazovne potrebe, klasifikacijski sistem, obrazovni sistem.

## INTRODUCTION

### Attitudes towards children and adolescents with disabilities

In Croatia, as well as elsewhere in the world, the treatment of individuals with disabilities has historically gone through a number of different phases, from direct discrimination to the final recognition and enactment of various legislative regulations in education systems. Traditionally, the prevailing form of education of individuals with disabilities was schooling in special education institutions, whereby experts taught children with disabilities separately from other children. This approach reflected the mindset of the entire society as children with disabilities were considered to be “different” or “special.” The aforementioned “special” form of education could also include training for certain vocational jobs, but students hardly ever managed to finish the higher level of education or find a job. The educational segregation continued up until the early 1970s, when the individuals with disabilities living in developed countries gradually achieved treatment equal to that of other citizens.

The Convention on Rights of the Child (State Institute for the Protection of Family, Motherhood and Youth, 2001) is the basic international document that regulates the rights of children. That document points out that the obligation of the state is to develop a system of care and education which promotes the equal development of all children and which is available to all children. Children are born with the fundamental freedoms and rights that belong to all human beings. However, due to the physical and mental immaturity, it imposes the need of emphasizing special children's rights on the protection.

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It is a basic starting point for the Convention on Rights of the Child. Croatia, as a party of the Convention, has become one of those advanced countries that have taken on the obligation to ensure and to protect human rights and fundamental freedoms. Respect, protection and promotion of human rights is a task that arises from the Croatian Constitution, and the safety and welfare of the population, as well as future generations, depend on its realization. Survival, protection, the right to learn and the achievement of full potential of each and every child is the basis of their entire quality of life and the assumption of quality of society and humanity in general. From the standpoint of an individual, the period of early childhood is especially important. A child's progress in school and the entire development of their personality depends on their accomplishments in early childhood. In the period of early childhood, the parents are the main educators of their children. Article 18 of the Convention on the Rights of the Child emphasizes the principle that both parents are responsible for the upbringing and development of the child. This article obliges the signatory countries to appropriate support to parents in fulfilling their parental responsibilities. Regarding the changes in the modern family, it is expected from the society to provide support to parents so that they may perform their parental functions as optimally as possible. For this purpose, the society needs to develop a network of institutions and educational programs meant for children of preschool age.

## EARLY CHILD´S CARE AND PRESCHOOL EDUCATION IN CROATIA

The earliest years of life are extremely important for the entire subsequent development of the individual. In the first years of life, care for the child and encouraging their early development are interrelated and equally important from the standpoint of the overall development. A child cannot enjoy good care if it is not in an environment that encourages their development and provides opportunities for learning. Early care and encouragement of early development in integrity of influence, represent a holistic approach to the child, which includes a wide array of services for children from birth to entering primary school. Historically, the primary goal of the preschool education was preparing children for school; however, the contemporary preschool programs are now oriented on the development of child's abilities and its entire personality. Early childhood is a period of the most intensive physical and mental development – it is the time when the child learns more quickly and easily. In that period of life, the groundwork for further development of an individual is laid down, and the neglect of any part of the development can leave permanent consequences. During those early years, a child needs support in its development and this support should come from their parents and the community. The environment in which a child lives is a significant factor in the quality and efficiency of its early development and subsequent progression. In that period of life, the most important influence is that of parents as the primary educators of the child. It is the family that largely determines the conditions of a child's development. However, we should not forget that the family is a part of the society and they share the fate of the community in which they are. It is getting harder for families to cope with their educational role and they need greater support from the community.

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This does not imply that family should be replaced as a primary educator, but that there should be more ways in which the society can support families so that they may fulfill their roles as primary educators of children in the best possible manner. The early development of the child should be accepted as an integral part of basic education, as it is, in fact, the first and the most crucial step on the way of the overall development of the individual. Every child has the right to achieve their full potential. The community is expected to react whenever this right is compromised, or when the family is unable to provide the conditions for such development. The society is responsible for creating a network of preschool programs which will ensure the realization of the children's rights and thus ensure the high quality of the early development. Croatia is one of the countries in which the early and preschool education is part of the entire educational system and it includes programs of education, health care, nutrition and social welfare.

Early and preschool education in Croatia was accepted as the first level of the educational system and implemented for children from the age of six months to school age. Early and preschool education is determined by the Preschool Education Act (2019) and the National Pedagogical Standard (2008). Early and preschool age is a particularly important stage in a child's development. The general goal of early and preschool education is to provide the child with personal development and the development of social skills required for the establishment of good relations with others (Milanović et al., 2000).

## THE CLASSIFICATION OF CHILDREN WITH DISABILITIES IN THE EDUCATIONAL SYSTEM

The increase in the number of children who are identified as children with special educational needs (hereafter referred to as SEN) has caught attention of experts in many countries. This increase may be the result of an inadequate educational system, as well as increased and more pronounced differences between children in today's schools. The more children exhibit their needs for special education, the higher is the risk that they will be transferred to a special education school, away from opportunities to co-learn and co-develop with their peers. Identification of children with SEN brings about the need to create a classification system, which is an issue that has been troubling experts for a long time.

According to McLaughlin and Florian (2008) the categories can be implemented on various levels of educational system:

1.) microlevel – as interaction between a teacher and a child / parent(s)
2.) mesolevel – the school, professional organizations, organized interactions between experts
3.) macrolevel – systems who organize the interactions.

If the classification system is used solely on the microlevel then its efficiency will be minimal. If the classification system is being applied to a group of experts, the categories are then integrated into their practice, which helps them organize their work and communication.

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If the categories are used to manage the organization of the work of expert groups, then they, the categories, can become a powerful tool which can be used to procure needed funding (McLaughlin and Florian, 2008).

In Croatia, according to Croatian National Education Standard (2005), the term children with SEN is preferred over terms such as children with developmental difficulties or children with disabilities, as the latter two are seen as more narrow, stigmatizing and less appropriate in the context of the education and upbringing. Term "Special Educational Needs" is also relevant for experts-practitioners so they would be able to observe children for a humanistic point of view, focusing more on the child's potential and capabilities, rather than on how its development deviates from that of its peers. On the other hand, the term "children with developmental disabilities" includes only children who have permanent special needs, while temporary (e.g., difficult adaptation to kindergarten) or potential difficulties (e.g., risk factors during birth, living conditions, i.e., the difficulties which can result in future deviations in development or lead to a remission of past deviations) are not taken into account during the process of diagnosis or treatment. However, the term "Special Educational Needs" has proven to be quite useful for prevention in twofold way: firstly, it allows for each child to be observed from a standpoint of their potential and abilities and secondly, it allows for all the factors important for the prevention of serious developmental difficulties to be taken into account (this includes children with permanent, temporary, and potential developmental difficulties).

## The Process of Classification for Children with Developmental Difficulties

The process of classification is conducted by a committee of Social Welfare Center. A first-instance committee for preschool children consists of a doctor of medicine specializing in pediatrics, i.e., a pediatrician, a social worker and a psychologist. A first-instance committee for school-aged children and adolescents consists of doctor of school medicine, a social worker and a psychologist.

A doctor of medicine specializing in a certain field of medicine (e.g. ophthalmology, otorhinolaryngology, physiatry, orthopedics, neurology, psychiatry, dermatology), a psychologist and an educator-rehabilitator of certain specialty are appointed on the list of experts for the first-instance committees (Ministry of social policy and youth, 2014).

The willingness and psychological readiness of parents is a decisive factor in the matter whether their child will undergo the classification procedure or not. It is their responsibility and thus their decision to get in touch with the Social Welfare Centre, the preschool / school educator-rehabilitator only recommends it. Stigmatization and financial matters seem to be the main hindrances. Moreover, discrimination in the community and unwillingness of parents to admit that their child has a difficulty only add to the problem.

## INCLUSIVE PRESCHOOL MODEL

Urie Bronferbrenner's ecological system theory emphasizes the importance of the environment for the child's development and successful psycho-social adaptation.

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During the entire life, but especially in the early childhood, the development of an individual occurs through a reciprocal interaction between an active, developing bio-psycho-social organism and a person, objects and symbols in the individual's immediate environment (Bronferbrenner, 1999).

According to Bronferbrenner (1999), the child is at the center of the system, while the layers of the environment spread around it in concentric circles, and more or less influence his/her development. The field of early childhood education has diverse needs and goals. Community, society, and culture have diverse needs and goals. Each of these components relate to the inclusion of all children within early childhood environments through recognizing the diverse needs of children, families, professionals, and classroom communities, as well as the dynamic influences of society and culture manifested through politics, economics, expectations, and standards for the education of children (Darragh, 2007).

Like other children, children with disabilities have the same rights to cheerful and carefree childhood in the company of their peers, and involvement in appropriate programs of early education. In contemporary educational practice, based on a humanistic-developmental theory, the notion of inclusion of children with disabilities is affirmed in the development of a regular system of early care and education. It assumes a higher level of respect for children with disabilities, as equal participants in the system, regardless of their allocation to specific requirements and the provision of special assistance to any child whenever it needs it. Inclusive preschool programs enable observation, imitation and contact with other children**.** Children also have the opportunity to grow and learn in the most appropriate way, through their common activities and play with other children which gives them the opportunity to develop social and communication skills to become independent, to learn to accept themselves and their disabilities, along with the experience of acceptance of the other, which is necessary to develop self-esteem and confidence. Inclusion also contributes to other children involved in that program. It is well known that the development of children is the most effective in peer groups, where they feel safe and protected. Children with disabilities experience the stigma from birth and they are more prone to exclusion, concealment, abandonment, institutionalization and abuse. Inclusive model affects on prevention of marginalization and segregation of children with disabilities through getting high quality of education and socializing with peers. Inclusion in early and preschool education represents a serious venture which is a basic requirement of awareness of all participants in the educational process, in terms of the importance of inclusion of children with disabilities into regular preschool groups. The positive effects of inclusion are consciousness of the diversity and the possibility that children with disabilities develop with more incentives, to obtain the right on education and inclusion among peers in accordance with their specific development opportunities and to develop a sense of belonging to the group and the wider social community. For other children, the inclusion of children with disabilities in group presents them an opportunity to learn new social skills, build self-esteem by providing help for others, to become more sensitive to the needs of others and to understand the differences.

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Preschool teachers in inclusion programs are focused on the professional development and learning new skills. They are placed in front of challenges to overcome new situations in their practice and to develop their capacities for individual work. For parents of children with disabilities, inclusion represents an opportunity for them to feel better and happier because their child belongs to a group of peers, it is not isolated at home and gets an opportunity to learn the skills necessary to function within the community. Support for parents of children without disabilities is especially important in an inclusive program. Negative attitudes of parents toward children with disabilities are easily transmitted to their children, because preschool period is marked by an intense identification of children with their parents. Successful inclusion of children with disabilities in regular educational institutions depends on many factors, which are also obstacles to the realization of inclusive programs. Psychological factors (stereotypes, prejudices and negative attitudes towards children with disabilities) pose serious obstacles to begin with inclusive education (Booth and Ainscow, 2002).

Preschool providers should recognize and address the particular benefits and risks associated with inclusion as perceived by both parents and providers. Providers should be sensitive to the concerns about inclusion raised by parents of children with and without disabilities, and should work with parents to address these concerns. Rafferty and Griffin, (2005) state in their study that the differential levels of support found for children with specific disabilities, and those with severe disabilities, suggest that practitioners must be provided with training strategies to enhance their knowledge and skills, attitudes, and their ability to work effectively with all children.

Children do not have a political voice of their own, so the adults caring for them are responsible to vouch for their best interests and to ensure that their rights, among which is the right to education, are respected. An excellent pedagogical work aside from teaching and supporting a child, ensuring the encouraging environment, also includes understanding and promoting the human rights of children as a precursor to the betterment of children's lives and the prosperity of society (Širanović, 2012).

Cross et all. (2004) conducted a study in which they conclude that the providers and parents who supported the decision to include the child with significant disabilities in community settings all had optimistic, clearly identifiable attitudes toward inclusion. This research study focused on educational and therapeutic practices that facilitate the successful inclusion of young children with significant disabilities who are served in community childcare or preschool programs.

Inclusion in education consists of:

1. An increase of participation of children in cultural activities, and local community preschool institutions and a decrease in their exclusion from them.
2. A change in culture, policy and practice in preschool institutions, so they can respond to the diversity of children.
3. An active implementation of inclusive values.
4. Equal respect for all children, parents / guardians and preschool personnel.
5. Looking at differences between children, as well as on the resources to support the entertainment and learning, rather than on the problems that must be addressed.

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6. Recognition of the right of the child on quality education and child care in the local community.
7. Reduction of barriers to play, learning and participation for all children.
8. Fostering relationships of mutual support between preschool institutions and communities.
9. Acceptance of inclusion in preschool institutions as well as one form of social inclusion.

For inclusion of any child, we need to keep in mind its entire personality which can be neglected if the inclusion focuses only on one aspect of the child (Booth and Ainscow, 2002). When parents want to involve their child in the preschool institution, institutions and local departments of education are obligated by law to do everything in their power to remove barriers for admission and participation of children with disabilities. Preschool institutions can collaborate with other institutions and communities to improve educational opportunities and social conditions in their local community (Booth and Ainscow, 2002).

Elements of preschool inclusion:

1. Inclusion is about belonging and participation in a diverse society:
- Inclusion is not just a preschooler problem, it extends to the community where children and their families live.
- Inclusion is not just a question of disability; all children and families have right to participate and to be supported in preschools and community.
2. Individuals define inclusion differently:
- Definitions of inclusion are influenced by the different priorities, responsibilities and nature of the ecosystem
- People within the same system (preschool institution) could have very different views of inclusion.
3. Beliefs about the effects of inclusion on its implementation:
- Families' and experts' beliefs on education that affect the planning and implementation of inclusive practice.
- Beliefs about human diversity, such as culture, race, language, class and ability, affect how inclusion is implemented in preschools and community.
4. Programs, but not children, must be ready for the inclusion:
- Personnel of majority of successful inclusive program are the starting point for all children.
- Inclusion may be appropriate for all children so that their work depends on planning, training and support.
5. Cooperation is the cornerstone to effective inclusive programs:
- Cooperation among adults, professionals and parents, within and outside of the system, is essential for inclusive programs
- Interdisciplinary cooperation is one of the greatest challenges of successful implementation of inclusive programs.
6. Specialized Guideline is an important component for inclusion:

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- The individual needs of children with disabilities must be solved in an inclusive program.
- Specialized instruction can be solved through a variety of effective strategies, many of
which can be incorporated in the activities of the group.

7. Appropriate support is required to work in an inclusive environment:
- Support includes training, personnel, materials, planning and continuous consultation.
- Support can be implemented in different ways, and each child in the inclusion may have unique needs.

8. Inclusion can help children with disabilities and without disabilities:
- The parents of children without disabilities whose children participate in inclusive programs, often report beneficial changes in their self-confidence, self-esteem and understanding of diversity.
- The quality of preschool programs form the necessary structural basis for quality inclusive programs, so that all children can benefit from them (Wolery and Odom, 2000).

Early childhood inclusion embodies the values, policies, and practices that support the right of every infant and young child and his or her family, regardless of ability, to participate in a broadrange of activities and contexts as full members of families, communities, and society (Underwood et al., 2012).

According to Skočić-Mihić (2011), the importance of the preschool inclusive context is in the readiness of an educator to implement the current inclusive practices as an expert. In Croatia, the educators' perception of their role in the inclusive practices and their readiness to take on these demanding roles, as well as their estimation of the support strategies they have in their work has not yet been studied, but it is dependent on the organizational policies of the local governing bodies. The results of a study which was conducted in Primorsko – goranska county in Croatia and included 476 educators working in kindergartens show that educators are unsure whether they are ready to work in inclusive groups or not. They exhibited positive attitudes towards preschool inclusion and estimated that they are not very skilled for working with children with disabilities. While teachers of higher grades are more resistant to inclusion, early childhood educators have been found to be philosophically more accepting of inclusion (Killoran et al., 2007).

Killoran et al., 2007 state that that many preschool settings are not inclusive and often do not welcome children with disabilities and their families. The results of this study demonstrate the dire need to focus on preschool settings and the inclusion of young children with disabilities.

Inclusive education enables children with disabilities to stay in their local community, raises the quality of education at a higher level and enables the fight against segregation and discrimination (Milić Babić and Dowling, 2015).

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## THE CONCEPT OF DISABILITY THROUGH HISTORY

The right to education is a fundamental human right and education empowers children and adults to participate equally in the community (Spajić-Vrkaš et al., 2001). The international community proscribes all forms of discrimination in education and advocates for the commitment to gradually guarantee educational opportunity for all.

People with disabilities were gradually given the opportunity to be equally educated and trained as the other citizens, which in turn allowed them to fully develop their potential. The educational segregation in special education institutions was steadily being replaced by the inclusion policies. Disabilities have their own history which spans across different models that reflect how they were perceived at a given point in time. Models who left a strong influence on the term "disability" are: the Mercy Model (religious model), the Medicine Model, the Social Model and the Human Rights Model.

The Mercy Model perceives a person with a disability as a victim who depends on the help of others and should be placed in special institutions (Mihanović, 2010). The Medicine Model sees disabilities as a physical or mental damage which makes a person with disabilities deviate from the average population and thus inhibits their "normal" functioning. The person with a disability is seen as a patient, so the emphasis is put on their medicinal needs (Petek, 2010). The Social Model sees a person with a disability as a fighter for equality who has allies in their fight for a truly inclusive society. As opposed to the Medicine Model, the Social Model shifts the "fault" for the disability from the person to the "unjust and cruel society" (Mihanović, 2010). The Human Rights Model is focused on the development of potential of each person with disability with the aim of empowerment. The emphasis is, therefore, put on the citizen as a keeper of human rights and his activity, rather than the disability (Petek, 2010). Different inappropriate, segregating terms were used in the past, such as "handicap," "social defect," "mental retardation," nowadays, the aim is to label the person as little as possible, contributing factors are technological advancement and awareness raising. The progress made can be seen in the fact that "mental retardation" is far less common and has been replaced by a less stigmatizing term "a person with intellectual difficulties."

### Creating an Inclusive School

In Croatia, the Law on Upbringing and Education in Primary and Secondary School (2020) considers students with special educational needs to be both gifted students and students with disabilities. The aforementioned Law also defines who students with disabilities are. Regulation on Elementary School Upbringing and Education of Students with Developmental Difficulties (2015) comes with an appendix called "Orientation list of types and degrees of developmental difficulties." As the project of Croatian National Educational Standard (2005) strived to redefine certain terms, the way in which the Orientation list of types and degrees of developmental difficulties defines types of difficulties changed. The term "mental retardation" was redefined as "intellectual disability." It can be said that the changes that the

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Social Model included in the education system have greatly contributed to the modernization of approaches in teaching students with intellectual disabilities.

Croatian National Educational Standard (2005) has not only allowed for students to be less burdened with the volume of what they have to learn and know, but it also allowed for the adjustments of content and setting certain standards for educational content, evaluation and assessment of students' achievements, and professional development of teachers and other educators. Moreover, the Social Model also provides us with various ways in which we can help modernize today's education. Models of help and support are the following: occasional help, limited-time help, extensive help and comprehensive support. Occasional help is a help given over a short period of time, usually during certain changes in the living conditions of an individual. Extensive help refers to regular assistance in all situations and it is not limited in time. The last model of help and support is the comprehensive support. Comprehensive support is permanent, provided to a large extent and in all life situations (Not, 2003). Although support should and must be provided by both the wider and closer environment (community, school, family, friends, etc.), the fact is that children spend much of their time in the education system. In that sense, the support children receive in school is of great importance for every child. For example, an assistant provides help and support in various segments and aspects of the child's needs. An assistant is a person who, aside from a teacher, has an important role in the achievement of the full potential of a child. Moreover, there are also individualized educational syllabi which are focused on suiting the educational content to the child's interests, encouraging development of the child's strengths and meeting their individual needs. The concept of individualized education is considered to be one of the crucial concepts in regards to education of students with SEN (Guidelines for Planning and Developing Individualized Curricula for Students with Disabilities, no date). Educational inclusion represents a strategy that aims at the advancement of an inclusive society (Milić Babić et al., 2017 according to Cerić, 2008). Such a vision of society presupposes that all members of society have the right to education and participation in society, in accordance with its needs and abilities. This approach encourages the reduction of segregation, isolation and discrimination (Milić Babić et al., 2017 according to Cerić, 2008). Inclusive education encourages sensitization of students and teachers about the importance of inclusion, with the aim of accepting differences as incentives and not as barriers to learning (Vican and Karamatić-Brčić, 2013). The successful implementation of inclusion in the regular school system presupposes changes in the entire educational practice. The basic principle of inclusive education is to provide all children, regardless of their differences, with education in the regular school system (Thomazet, 2009). Inclusive education has many advantages, but there are many obstacles in terms of negative public attitudes, lack of political will, lack of financial resources and etc (Milić Babić and Dowling, 2015).

## CONCLUSION

The Medicine Model of disabilities is still prevalent in Croatia, not only in regards to the classification of children with disabilities but also in regards to the decisions about their

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education and consequent employment. Children with disabilities are still perceived from the standpoint of their disability, rather than their ability, and it is the experts who decide about their schooling, their employment and, thus, their entire life.

Even though there are some good examples of successful inclusion of children with disabilities in the regular preschool and school system, it still remains to be an issue. The classification system is necessary for the political-administrative purposes so that an adequate funding and fulfillment of other rights can be ensured; however, the classification system should be focused on not only educational needs, but also on the individual needs, abilities and interests of each child with disabilities.

The development of the classification system can always be justified, but thinking globally, emphasis should be put on the development of a system that would impact the early development of children. That system ought to have the same impact on the development of children with permanent special needs and children with temporary and potential special needs.

A multidimensional classification system based on the educational needs of children should be enforced, what is more, it should offer teaching strategies and techniques which are beneficial and efficient for a certain category of children. In order to foster the development of such a system, we should strive to move from the Medicine Model to the Human Rights Model, which emphasizes the citizen as a keeper of human rights and his activity, rather than the disability.

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# SHADOW TEACHERS OPINIONS ABOUT THEIR JOB RESPONSIBILITIES

# MIŠLJENJA LIČNIH PRATILACA O NJIHOVIM ODGOVORNOSTIMA NA POSLU

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## ABSTRACT

Parents of children with disabilities are eligible to apply for additional services to aid their child in the education process. Parents frequently use the service of shadow teachers, but they often end up unsatisfied with the service and change shadow teachers repeatedly. The aim of this research is to a) examine shadow teachers' beliefs about their obligations; b) determine what are their obligations; c) determine what they believe is their level of proficiency in different areas of shadow teaching position and d) determine the discrepancy between what shadow teachers believe their job should be and what job obligations they were expected to do while shadowing a child.

The instrument used was the survey distributed by Manansala & Dizon (2008), it was translated into Serbian language and modified. The sample consisted of 36 students of Faculty for Special education who currently work or have worked in the past as a shadow teacher.

Since the sample consisted of shadow teachers who are also students of special education, it is expected that most of the sample believe that they are very proficient in all job areas. There was a huge discrepancy between what they believe is their job obligation and what their job responsibilities are in all five areas. Future research implications and study limitations were discussed.

**Key words**: shadow teachers, inclusion, school, disability.

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## SAŽETAK

Roditelji dece sa ometenošću se mogu prijaviti za dodatne usluge, koje bi olakšale njihovoj deci edukativni proces. Roditelji često koriste usluge ličnih pratioca, međutim dešava se da nisu zadovoljni uslugama, pa otuda često menjaju lične pratioce. Cilj ovog istraživanja je da a) proceni uverenja ličnih pratilaca o tome šta su njihove obaveze; b) ispita šta su njihove obaveze na poslu; c) proceni njihova uverenja o stepenu stručnosti u različitim oblastima posla i d) proceni stepen diskrepance između onoga što lični pratioci misle da je njihovo zaduženje i očekivanja koja su bila postavljena pred njih od strane roditelja.
Korišćena je modifikovana skala konstruisana od strane Manansale i Dizona (Manansala & Dizon, 2008), koja je prevedena na srpski jezik. Uzorak se sastojao od 36 studenata Fakulteta za specijalnu edukaciju koja su trenutno zaposlena ili su radili na poziciji ličnih pratilaca.
S obzirom da se uzorak sastoji od ličnih pratilaca koji su ujedno i studenti specijalne edukacije, očekivano je da većina uzorka veruje da je veoma stručna u svim oblastima posla. Međutim, primećena je velika diskrepanca između onoga što lični pratioci misle da su njihove obaveze na poslu i očekivanja od roditelja. U zaključnom delu diskutovane su preporuke za implementaciju budućih istraživanja, kao i ograničenja studije.

**Ključne riječi**: lični pratioci, inkluzija, škola, ometenost.

## INTRODUCTION

The change of social paradigm about the socially inclusive model of disability made the civil sector the main entity in providing services to people with disabilities, with the aim of improving their quality of life, removing barriers and creating opportunities of living as a equal part of society (Social services law of Republic of Serbia, 2011, according to Babić, 2018). In the last decade in the Republic of Serbia, the inclusion practice started implementing and it refers to placement of students with special needs in regular classrooms, while adapting the curriculum (Flem & Keller, 2000), or having children with special needs spent majority of their school time in regular classrooms, while still having some classes separately (Dixon, 2005), although it should refer to including all students in age appropriate classes, regardless of their abilities (Begeny & Martens, 2007). Even though inclusion is a regular practice in Serbia in the last decade, research implies that regular school teachers are against it (Bacon & Schultz, 1991) and a half of them believes that they are obligated to do it against their will (Fulk & Hirth, 1994). This is concerning, knowing that people who have the most contact with a child in school are teachers and their shadow teachers.
Placement in the regular school system implies using alternative techniques in regular classroom instruction by simplifying study methods to increase the child's concentration, lessen frustration, improve his/her patience and memory (Lazear, 1991). Also, this placement allows the parents to apply for additional services that would assist the child in overcoming different educational barriers (Vlaović-Vasiljević et al., 2016), such as shadow teachers' services (Dizon, 2001) and this is a support measure that is applicable in the Republic of Serbia since 2012 (Damjanović & Đorđić, 2014).

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Even though every child with diagnosis qualifies for shadow teachers services, according to Social services law of Republic of Serbia (2011), a previous research conducted in this country shows that only 12% of children with special educational needs have this type of service (Krsmanović et al., 2017), which is unfortunately not enough and there should be more services and organizations that can allow the children and their families to obtain the support they need (Vlaović-Vasiljević et al., 2016).

The families that obtained the shadow teacher services, often end up unsatisfied with the service and consequently change shadow teachers very frequently. This is because the job obligations of shadow teachers are not clear and parents often expect more than shadow teachers must do. Therefore, the aim of this research is to examine shadow teachers' beliefs about shadow teachers obligations in general, to determine what their obligations are/were on their shadow teaching job, to determine what they believe their level of proficiency is in different areas of shadow teaching position, as well to determine the discrepancy between what shadow teachers believe their job should be and what job obligations they were expected to do while shadowing a child.

## MATERIAL AND METHODS

### Sample

The sample consisted of 36 students of Faculty for Special education who also currently work or have worked in the past on a shadow teaching position. The sample consisted of four male (11.1%) and 32 female (88.9%) students. The sample variation in terms of gender is expected, since there is a majority of female students who attend Faculty for Special education and rehabilitation (Republic Bureau of Statistics, 2014, according to Arsić et al., 2021).

All students were between 21 and 37 years old and one attends second year of studies (2.8%), one attends fourth year of studies (2.8%), 12 (33.3%) attend super senior year, 20 (55.6%) are Masters level students and two (5.6%) attend Doctorate level studies. Twenty one students (58.3%) have experience in shadow teaching with only one child and 15 (41.7%) have experience with multiple children. On the question regarding age group of child or children they worked with, six students (16.7%) stated they worked with children who comprise the 0-6 age group, 22 (61.1%) worked with children from the 7-10 age group, six (16.7) with 10-14 age group, one (2.8%) with 15-20 age group and also one with 20 and above age group. On the question regarding their average salary on the shadow teaching job, four (11.1%) students stated they had salary that was below 20.000 dinars, 17 (47.2%) had the salary between 20.000 and 30.000 dinars, seven (19.4%) had the salary between 30.000 and 40.000 dinars and eight (22.2%) had salary between 40.000 and 50.000 dinars. Even though we included questions regarding higher than mentioned average salary, none of the respondents stated they received more than 50.000 dinars on their shadow teaching job.

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## Method of conducting research

The survey was distributed to students of Faculty for Special education and rehabilitation through their email addresses collected by their professors and teaching assistants, as well as through their Facebook groups. The description of the survey stated that the survey is exclusively for students who currently work or have worked in the past as shadow teachers. The survey description provided information about the questionnaire, stating that their involvement is anonymous and voluntary. The survey was distributed to them in June 2021 and after a month had passed, the complete set of submissions was exported into a software package SPSS IBM for further data analysis.

## Measuring instruments

The instrument used was a modified version of the survey distributed by Manansala & Dizon (2008), also translated into Serbian language. The original instrument consisted of five parts (curriculum planning, instruction, behavior management, social skills management and team working ability) with each part including seven responsibilities and measuring the respondents beliefs of their proficiency in mentioned obligations on a four-step Likert type scale, with 1 being not proficient, 2 being slightly proficient, 3 being proficient and 4 being very proficient.

We modified the instrument in a way that we had three parts of the instrument. The first part consisted of a list of responsibilities where respondents should select what they believe are the responsibilities of shadow teachers and had all the mentioned responsibilities. The second part of the instrument consisted of the same responsibilities and they selected which one they performed as a shadow teacher on their current or past job. And the third and final part of the instrument was the original instrument, where the respondents stated their beliefs of their proficiency in mentioned areas, by using the mentioned four-step Likert scale. Since respondents could select any of the answers, therefore the total is not 100%.

Besides this instrument, we used self-constructed questionnaire that included questions regarding the respondent characteristics, such as sex, age, year of studies, the highest obtained education level, average salary on their shadow teacher position and if they worked with only one child or more children as a shadow teacher. We also had some questions regarding the characteristics of the children shadow teachers worked with, such as the child's age and diagnosis.

## Data processing methods

We extracted the data into the SPSS IBM statistics software package and we used qualitative analysis methods.

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## RESULTS AND DISCUSSION

### Shadow teacher's beliefs about their job responsibilities

Most of the sample believes that none of the mentioned responsibilities regarding curriculum planning refers to them and their job (44.4%). Over a third of the sample believes that their obligations are simplifying the curricular contents (36.1%), as well as requesting from the regular teachers the lessons and topics in advance at least a week ahead (33.3%). Only 13.9% of the sample believes that their responsibility is differentiating test formats depending on the child's needs (Table 1).

Table 1**.** Shadow teacher's beliefs about their responsibilities regarding curriculum planning

| Curriculum planning | N | % |
|---|---|---|
| Choosing functional, relevant and meaningful skills related to the lessons and based on the assessment report | 11 | 30.6% |
| Requesting from the regular teachers the lessons and topics in advance at least a week ahead | 12 | 33.3% |
| Simplifying the curricular contents | 13 | 36.1% |
| Organizing and task analyzing skills for mastery learning | 11 | 30.6% |
| Programming the lessons depending on the child's needs | 7 | 19.4% |
| Preparing helpful activity sheets in implementing contents | 10 | 27.8% |
| Differentiating test formats depending on the child's needs | 5 | 13.9% |
| Nothing from the above | 16 | 44.4% |

Teaching the child to answer activity sheets independently is the response that the majority of the sample (80.6%) believes to be their job responsibility as a shadow teacher. More than half of the sample believes that their job is to assist the child to take notes or copy board work (66.7%), explain the lessons further when needed (63.9%), work with a child in a non-attention getting manner (61.1%), provide drills during lesson free time (61.1%) and use appropriate instructional materials (52.8%). Only 38.9% of the sample believes that their responsibility is to intersperse light or reward activities into difficult ones during lessons (Table 2).

Table 2 - Shadow teacher's beliefs about their responsibilities regarding instruction

| Instruction | N | % |
|---|---|---|
| Working with the students in a non-attention getting manner | 22 | 61.1% |
| Explaining the lessons further whenever needed | 23 | 63.9% |
| Using appropriate instructional materials | 19 | 52.8% |
| Assisting in teaching the child to take notes or copy board work | 24 | 66.7% |
| Teaching the child to answer activity sheets independently | 29 | 80.6% |
| Interspersing light or reward activities into difficult ones during lessons | 14 | 38.9% |
| Providing drills during lesson free time | 22 | 61.1% |
| Nothing from the above | 2 | 5.6% |

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Assisting in teaching the child to put things in their proper places is the response that the majority of the sample believes to be their responsibility as a shadow teacher (72.2%), while only 36.1% believes they should assist in teaching the child to comprehend and follow school rules (Table 3). For almost all of the following responsibilities regarding behavior management, over half of the sample believes it is their job.

Table 3 - Shadow teacher's beliefs about their responsibilities regarding behavior management

| Behavior management | N | % |
|---|---|---|
| Directing the child's attention to the classroom teacher | 27 | 75% |
| Assisting in teaching the child to comprehend and follow school rules | 13 | 36.1% |
| Assisting in teaching the child to complete a task before moving on to another one | 24 | 66.7% |
| Pulling out the child for more focused skill building | 17 | 47.2% |
| Pulling out the child to cool him or her off in times of tantrums | 22 | 61.1% |
| Physically or verbally prompting the child to perform in circle time, recitations and other group activities | 24 | 66.7% |
| Assisting in teaching the child to put things in their proper places | 26 | 72.2% |
| Nothing from the above | 2 | 5.6% |

Similar to behavior management, when it comes to social skills management, the majority of the sample believes it is their job responsibility to perform social skills acquisition programs with a child, while the most of the sample believes that physically or verbally prompting the child to join in play (86.1%) is their biggest responsibility (Table 4).

Table 4 - Shadow teacher's beliefs about their responsibilities regarding social skills management

| Social skills management | N | % |
|---|---|---|
| Teaching the child social greetings and using simple polite terms | 26 | 72.2% |
| Prompting the child to participate in class recitations | 20 | 55.6% |
| Physically or verbally prompting the child to play appropriately with other children | 27 | 75% |
| Physically or verbally prompting the child to join in play | 31 | 86.1% |
| Assisting the teacher in socializing the child in group activities | 20 | 55.6% |
| Using appropriate reinforcers in shaping positive social skills | 22 | 61.1% |
| Guiding the child in participating actively in programs and school organizations | 23 | 63.9% |
| Nothing from the above | 2 | 5.6% |

From the responsibilities that are related to team working, majority of the sample believes that reporting to the family about the child's school performance and progress is their responsibility (75%), while the least of them believes that it is their job to seek suggestions from teachers regarding the child's behavior (22.2%) (Table 5).

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Table 5 - Shadow teacher's beliefs about their responsibilities regarding team working

| Team working | N | % |
|---|---|---|
| Attending meetings with teachers, parents and other professionals to discuss and plan the child's´ improvement | 14 | 38.9% |
| Providing the regular teacher helpful information about the child | 24 | 66.7% |
| Seeking suggestions from teachers and other professionals regarding the child's behavior | 8 | 22.2% |
| Reporting to the family about the child's school performance and progress | 27 | 75% |
| Coordinating and collaborating with the family and other home members regarding important concerns about the child | 24 | 66.7% |
| Discussing with the regular teacher about curricular modifications | 20 | 55.6% |
| Nothing from the above | 4 | 11.1% |

**Results regarding what were shadow teachers obligations on their job**

On their shadow teaching job, the majority of the sample performed simplification of the curricular contents (80.6%) and just about less than a half of the sample performed differentiation of test formats (47.2%) and requested from the teacher lessons in advance (44.4%) (Table 6).

Table 6 - Shadow teachers job obligations regarding curriculum planning

| Curriculum planning | N | % |
|---|---|---|
| Choosing functional, relevant and meaningful skills related to the lessons and based on the assessment report | 24 | 66.7% |
| Requesting from the regular teachers the lessons and topics in advance at least a week ahead | 16 | 44.4% |
| Simplifying the curricular contents | 29 | 80.6% |
| Organizing and task analyzing skills for mastery learning | 25 | 69.4% |
| Programming the lessons depending on the child's needs | 24 | 66.7% |
| Preparing helpful activity sheets in implementing contents | 21 | 58.3% |
| Differentiating test formats depending on the child's needs | 17 | 47.2% |
| Nothing from the above | 6 | 16.7% |

Out of the instruction part of the job, over half of the sample performed all of the mentioned job duties, with the most performed job obligation being explaining the lessons further (88.9%) and teaching the child to answer activity sheets independently (83.3%) (Table 7).

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Table 7 - Shadow teachers job obligations regarding instruction

| Instruction | N | % |
|---|---|---|
| Working with the students in a non-attention getting manner | 22 | 61.1% |
| Explaining the lessons further whenever needed | 32 | 88.9% |
| Using appropriate instructional materials | 27 | 75% |
| Assisting in teaching the child to take notes or copy board work | 25 | 69.4% |
| Teaching the child to answer activity sheets independently | 30 | 83.3% |
| Interspersing light or reward activities into difficult ones during lessons | 21 | 61.1% |
| Providing drills during lesson free time | 25 | 69.4% |
| Nothing from the above | 2 | 5.6% |

In the behavior management part of the job, also over half of the sample performed almost all of the mentioned duties, except pulling out the child for more focused skill building, which was performed by only 42.2% of the sample (*Table 8*).

Table 8 - Shadow teachers job obligations regarding instruction

| Behavior management | N | % |
|---|---|---|
| Directing the child's attention to the classroom teacher | 24 | 66.7% |
| Assisting in teaching the child to comprehend and follow school rules | 24 | 66.7% |
| Assisting in teaching the child to complete a task before moving on to another one | 31 | 86.1% |
| Pulling out the child for more focused skill building | 17 | 42.2% |
| Pulling out the child to cool him or her off in times of tantrums | 21 | 58.3% |
| Physically or verbally prompting the child to perform in circle time, recitations and other group activities | 29 | 80.6% |
| Assisting in teaching the child to put things in their proper places | 26 | 72.2% |
| Nothing from the above | 2 | 5.6% |

Regarding social skills management, also the majority of the sample performed on their shadow teaching job almost all of the mentioned obligations, with teaching the child social greetings (83.3%) and prompting the child to join in play (83.3%) being the most commonly performed, while prompting the child to participate in class recitations was the obligation that was least performed (66.7%), but still with high frequency (Table 9).

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Table 9 - Shadow teachers job obligations regarding social skills management

| Social skills management | N | % |
|---|---|---|
| Teaching the child social greetings and using simple polite terms | 30 | 83.3% |
| Prompting the child to participate in class recitations | 24 | 66.7% |
| Physically or verbally prompting the child to play appropriately with other children | 27 | 75% |
| Physically or verbally prompting the child to join in play | 30 | 83.3% |
| Assisting the teacher in socializing the child in group activities | 26 | 72.2% |
| Using appropriate reinforcers in shaping positive social skills | 27 | 75% |
| Guiding the child in participating actively in programs and school organizations | 25 | 69.4% |
| Nothing from the above | 1 | 2.8% |

Team working was the area which shadow teachers did on their job the least, with only 22.2% of the sample seeking suggestions from teachers and other professionals regarding the child's behavior, but almost everyone from the sample (91.7%) reported to the family about the child's school performance and progress (*Table 10*).

Table 10 - Shadow teachers job obligations regarding team working

| Team working | N | % |
|---|---|---|
| Attending meetings with teachers, parents and other professionals to discuss and plan the child's´ improvement | 17 | 47.2% |
| Providing the regular teacher helpful information about the child | 28 | 77.8% |
| Seeking suggestions from teachers and other professionals regarding the child's behavior | 8 | 22.2% |
| Reporting to the family about the child's school performance and progress | 33 | 91.7% |
| Conferring with regular teachers, parents and other professionals about the child's progress | 31 | 86.1% |
| Discussing with the regular teacher about curricular modifications | 23 | 63.9% |
| Coordinating and collaborating with the family and other home members regarding important concerns about the child | 20 | 55.6% |
| Nothing from the above | 2 | 5.6% |

***Self-perceived level of proficiency***

Table 11 represents the students perceived level of proficiency in five different areas of the shadow teaching job. Shadow teachers believe they are the most proficient in the area of social skills management (n=3.57), than in the area of behavior instruction (n=3.51), followed by instruction (n=3.48), than team working and the sample believed to be the least proficient in the area of curriculum planning (n=3.34).

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Table 11 - Shadow teachers self-perceived level of proficiency in different areas

| Variable | Composite mean | Rank |
|---|---|---|
| Curriculum planning | 3.34 | 5 |
| Instruction | 3.48 | 3 |
| Behavior instruction | 3.51 | 2 |
| Social skills management | 3.57 | 1 |

**Comparison between beliefs about their responsibilities and obligations on the job**

Table 12 represents the mean percentage of all obligations enlisted in all five areas of shadow teachers job obligations, as well as their beliefs of what their job responsibilities should include. As shown in *Table 12*, in all of the five mentioned areas, the sample believes that they should be doing less of the job obligations than they are actually doing on their jobs. The biggest mean difference refers to curriculum planning tasks, with only 27.3% of obligations being what shadow teachers believe they should be doing and 61.9% of them performing them while working with children.

Table 12 - Comparison between beliefs about their responsibilities and obligations on the job

| Variable | Shadow teachers beliefs about their job responsibilities | RankShadow teachers obligations on their job |
|---|---|---|
| Curriculum planning | 27.3% | 61.9% |
| Instruction | 60.7% | 72.6% |
| Behavior instruction | 60.7% | 67.5% |
| Social skills management | 56.7% | 74.9% |
| Team working | 54.1% | 63.5% |

**DISCUSSION AND CONCLUSIONS**

Since the shadow teachers are the ones sitting next to the child in the classroom and directly attend it and they are partially responsible for the child's success in school, it is important to examine their beliefs of their responsibilities towards the child they are shadowing.

Over two thirds of the sample believe their obligation on the job are prompting the child to join in play (86.1%), teaching the child to answer independently (80.6%), directing the child's attention to the classroom teacher (75%), prompting the child to play with other children (75%) and reporting to the family about child's school performance and progress (75%). We believe it is of crucial value for them to know their job responsibilities in advance and to know more precisely what are the expectations of parents and teachers, in order to provide better services.

The most commonly performed activities by shadow teachers on their shadow teaching jobs consisted of them reporting to the family about the child's school performance and progress (91.7%), explaining the lessons further (88.9%), conferring with regular teachers, parents and other professionals about the child's progress (86.1%), assisting the child to complete a task

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before moving on to another one (86.1%), teaching the child social greetings and giving independent answers (83.3%) and prompting the child to join in play (83.3%).

Since the sample consisted of shadow teachers who are also students of Faculty of Special education and rehabilitation, it is expected that the majority of the sample believes that they are very proficient in all of the mentioned areas of their job, with the composite mean between n=3.34 and n=3.57, out of four. Still it is concerning that they do not perform all mentioned duties in their job, even though they believe they are very proficient in performing them. Following researches should address the relationship between income amount and willingness to perform more duties on their job, because perhaps that is the one of the reasons for lack of delivery.

There was a huge discrepancy between what shadow teachers believe their job obligation is and what their job responsibilities are in all five areas of their job (*Table 12*), therefore it is of crucial value to determine what they believe who should perform those responsibilities, as well as to determine if teachers believe shadow teachers should perform it or they should. We believe that shadow teacher job responsibilities should be clearer, to them and to the parents, therefore there is no conflict between what parents expect of them and what they are willing and not willing to do. Also, it seems it is rather important to determine parents' beliefs regarding shadow teachers' responsibilities during their work with children, in order to learn if their opinions differ from reality and to highlight the nature of those distinctions. Parents are often not content with shadow teachers' efforts, which can be prevented if they are better informed about shadow teachers' actual obligations.

The biggest study limitation is the small sample size and also the fact that participants included in the sample are students of Faculty for special education and rehabilitation. Future research might focus on shadow teachers of different primary professions.

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# METRIC CHARACTERISTICS OF THE TEST OF GROSS MOTOR DEVELOPMENT (TGMD 3)

# METRIJSKE KARAKTERISTIKE TESTA ZA PROCJENU GRUBIH MOTORIČKIH SPOSOBNOSTI (TGMD 3)

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## ABSTRACT

The aim of this study was to determine metric characteristics of the Test of Gross Motor Development (TGMD 3). The study included 146 children from Bosnia and Herzegovina, aged 3-10,4 (6,80 ± 2,23 years; 46,6% male; 53,4% females). Based on the obtained research results it can be concluded that Test of Gross Motor Development (TGMD-3) has satisfactory reliability and internal consistency for children aged 3 to 10 years. Mutual correlations confirm the homogenity of the scale. Based on results of Kolmogorov-Smirnov test, Test of Gross Motor Development is not sensitive for subjects included in this study. The obtained results of the confirmatory factor analysis of this model show a partial agreement of the assumed model with the data ( $h^2$ = 108.17, df = 64, $h^2$ / df = 1.69, TLI = 0.86, CFI = 0.72, NFI = 0.72., RMSEA = 0.07 CI = 0.04-0.09). The data was analyzed with the SPSS 20 software (with the AMOS package). The limitations in the research are the respondents, because due to the epidemiological situation caused by COVID 19, a convenience sample of respondents was selected.

**Key words**: Motor development, TGMD 3, childhood, reliability, confirmatory factor analysis.

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## SAŽETAK

Cilj istraživanja je bio utvrditi metrijske karakteristike testa za procjenu grubih motoričkih sposobnosti (TGMD 3). Istraživanjem je obuhvaćeno 146 djece iz Bosne i Hercegovine, uzrasta od 3-10,4 godina (6,80 ± 2,23 godina; 46,6% dječaci; 53,4% djevojčice). Na osnovu dobijenih rezultata istraživanja može se zaključiti da Test za procjenu grubih motoričkih sposobnosti (TGMD 3) ima zadovoljavajuću pouzdanost i unutrašnju saglasnost. Međusobne korelacije potvrđuju homogenost skale. Na osnovu rezultata Kolmogorov-Smirnovljev testa, Test za procjenu grubih motoričkih sposobnosti nije osjetljiv za ispitanike koji su obuhvaćenim ovim istraživanjem. Rezultati konfirmatorne faktorske analize ovog modela pokazuju djelimiČno slaganje pretpostavljenog modela s podacima ($h^2$ = 108.17, df = 64, $h^2$ / df = 1.69, TLI = 0.86, CFI = 0.72, NFI = 0.72., RMSEA = 0.07 CI = 0.04-0.09). Rezultati istraživanja obrađeni su u statističkom paketu SPSS 20 (sa paketom AMOS).
Ograničenje u istraživanju su ispitanici, jer je zbog epidemiološke situacije izazvane COVID-om 19 odabran prigodan uzorak ispitanika.

**Ključne riječi:** Motorički razvoj, TGMD 3, djetinjstvo, pouzdanost, konfirmatorna faktorska analiza.

## INTRODUCTION

Motor development refers to controlled and efficient movement in space. In the literature, it is simply referred to as motor development or psychomotor development, because during its evaluation, and especially the creation of stimulus programs, it is simply impossible not to emphasize the importance of affective and cognitive development, communication and their interdependence. The motor development of a child is a process that is reflected in the gradual improvement of the levels of functioning in the field of stability, locomotion and manipulation. The success of this motor expression through games - contacts, will determine the child's sense of security in society with others, and motivation to move, which are some of the basic prerequisites for successful improvement of motor skills of children of this age. Fundamental motor skills are an integral part of the increasingly complex patterns of movement that a person uses in the further developmental continuum. However, maturation, in itself, does not ensure successful mastery of complex patterns of movement. The development of fundamental motor skills is developed thanks to a number of internal and external factors (biological, sociological, psychological, motivational, cognitive, etc.) during free active play and structured programs (Branta, Haubenstricker & Seefeldt, 1984). Investing in basic motor skills in early childhood is very important because it provides children with the prerequisites and potential for successful participation in sports and leisure activities in adolescence and adulthood, because once adopted, they remain for life (Hardy, King, Farrell, Macniven & Howlett, 2009; Magistro, Bardaglio, & Rabaglietti, 2015). Furthermore, previous studies suggested a relationship between early gross motor and later school aged cognitive development (i.e. processing speed and working memory) (Piek, Dawson, Smith, & Gasson, 2008; Son & Meisels, 2006; Kim, Duran, Cameron, & Grissmer, 2017) and a relationship between reading and locomotor skills, and mathematics and object-control skills

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in children with learning disorder (Westendorp, Hartman, Houwen, Smith, & Visscher, 2011). The assessment of gross motor developmental status among children can provide valuable information to identify possible motor delays and deficits (Magistro, Piumatti, Carlevaroc, Sherar, Esliger, Bardaglioc, Magnoc, Zecca & Musella, 2020). On the other hand, process-oriented assessment techniques evaluate the presence or absence of movement patterns demonstrated by a child providing qualitative information on children's motor competence that can be used for design and planning interventions (Yun & Shapiro, 2004; Bardid, Vannozzi, Logan, Hardy & Barnett, 2019).The appropriate overtime assessment of proficiency and development of these skills depends on the use of reliable and valid instruments (Netelenbos, 2005; Valentini, 2012). Among process-oriented assessment tools, the Test of Gross Motor Development (TGMD) and its variants Test of Gross Motor Development–Second Edition (TGMD-2) and Test of Gross Motor Development–Third Edition (TGMD-3) are, probably, the most frequently used technique for measuring fundamental motor skills proficiency in educational, clinical, and research settings because of their low cost and feasibility (Klingberg, Schranz, Barnett, Booth, & Ferrar, 2019; Ulrich, 1985; Ulrich, 2000; Urlich, 2016). The TGMD is a normative and criterion-based assessment designed to qualitatively evaluate the gross motor skill performance of children between the ages of 3 to 10 years and 11 months, with and without disabilities (Ulrich, 1985; Ulrich, 2000; Urlich, 2016). The TGMD is composed of two subscales, locomotor and object control/ball skills, which evaluate six to seven fundamental motor skills with between three to five performance criteria, depending on skill (Ulrich, 2000; Urlich, 2016). Child performance is scored with 1 or 0 depending on the presence or absence of such criteria and the final raw scores can be converted into percentile ranks and standard scores. The test results can be used to identify children with gross motor develop mental delay (Brian, Pennell, Taunton, Starrett, Howard-Shaughnessy, Goodway, et al, 2019), to design, plan and evaluate the success of program interventions in FMS development, to assess individual progress, and to serve as an assessment tool in research (Urlich, 2000). In recent years, several studies have been published that examined the inter-rater, intra-rater, and test-retest reliability of the TGMD in different population groups, typically developing children (Wagner, Webster & Urlich, 2017; Magistro, Piumatti, Carlevaroc, Sherar, Esliger, Bardaglioc, Magnoc, Zecca & Musella, 2020) including children with autism spectrum disorder (Allen, Bredero, Van Damme, Ulrich & Simons, 2017), children with attention deficit hyperactivity disorder (Pan, Tsai & Chu, 2009], children with visual impairments (Houwen, Hartman, Jonker & Visscher), children with mental and behavioural disorders [Magistro, Piumatti, Carlevaro, Sherar, Esliger, Bardaglio, et al, 2018], and children with intellectual disabilities (Simons, Daly, Theodorou, Caron Simons & Andoniadou, 2008).

This study aimed to determine metric characteristics of the Test of Gross Motor Development (TGMD 3) on the children aged 3-10.4 years in Bosnia and Herzegovina.

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## MATERIAL AND METHODS

### Sample of participant

The research included a total sample of 146 examinees, of both sexes. The research included examinees aged 3 to 10.4 years. The average chronological age of the subjects was 6.80 ± 2.23 years, and ranged from 3 to 10.4 years. Out of 146 examinees, 11 (7.5%) examinees were 3 years old, 21 (14.4%) examinee were 4 years old, 23 (15.8%) examinees were 5 years old, 24 (16, 4%) examinees were 6 years old, 16 (11%) examinees were 7 years old, 5 (3.4%) examinees were 8 years old, 30 (20.5) examinees were 9 years old and 16 (11%) examinees were 10 years old. The research was conducted in Bosnia and Herzegovina, in the area of cities of Tuzla, Sarajevo, Mostar and Pale.

### Measuring instruments

For the purpose of checking the set aim of the research, there was used the Test of Gross Motor Development (Ulrich, 2016). Gross Motor Development Test (TGMD) is a process-oriented test of gross motor skills of children aged from 3 to 10 years. The Test of Gross Motor Development (TGMD-3), is a valid and reliable tool for assessing 6 locomotor and 7 object-control skills among children aged 3-10 years-old.

### Data processing methods

Research data were processed by the methods of parametric and nonparametric statistics. There were calculated basic statistical parameters of the central tendency measure, dispersion measures, frequencies and percentages, and the results are presented in tables and graphs. Cronbach's alpha value was calculated to verify the set objectives of the research, and measures of symmetry and kurtosis were presented to determine the sensitivity of the test and the normality of the data distribution. To examine the normality of the data distribution there was used the Kolmogorov-Smirnov test. In order to determine the factor structure, i.e. validity, of the Test of Gross Motor Development (TGMD-3) there was applied confirmatory factor analysis. The analysis was performed using the maximum probability algorithm. The data was analyzed with the SPSS 20 software (with the AMOS package).

## RESULTS AND DISCUSSION

Based on the obtained research results, and in terms of reliability check of the measuring instrument, it can be concluded that Test of Gross Motor Development (TGMD-3) has satisfactory reliability and internal consistency for children aged 3 to 10 years, with Cronbach's alpha value of 0.81 The results of Cronbach's alpha value are satisfactory and are in compliance with the results of a study by Weber and Ulrich (2017) entitled "Evaluation of the Psychometric Properties of the Test of Gross Motor Development—Third Edition".
The results of these authors showed that internal consistency was very high in each age group and remained excellent for all racial / ethnic groups and both sexes. Acceptable values of Cronbach's alpha are above 0.7, however, values above 0.8 are preferred (Pallant, 2011).

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Cronbach's alpha values are acceptable in the Locomotion subtest (α=0.71) and in the Ball Skills subtest (α=0.72). Based on the results of the inter-item correlation matrix, the values obtained between the statements are positive, which shows that they measure the same feature. The results in Table 1 show inter-item statistics and reliability within the measuring instrument. The arithmetic means of the instrument range from 72.62 to 75.62; scale variances range from 176.89 to 209.91; Cronbach's alpha coefficient ranges from 0.80 to 0.82. Mutual correlations of variables and the instrument range from 0.35 to 0.37. According to Pallant's instructions (2011), if the degree of correlation of each variable with the total score is less than 0.30, the result shows that the variable measures something other than what the whole measurement scale measures, which is not the case in this study. Therefore, mutual correlations confirm the homogenity of the scale.

Table 1. Inter-item statistics

| Variables | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---|---|---|---|---|
| Run | 73,50 | 205,98 | 0,35 | 0,82 |
| Gallop | 74,53 | 188,24 | 0,49 | 0,81 |
| Hop | 72,62 | 176,89 | 0,58 | 0,80 |
| Skip | 75,60 | 205,55 | 0,39 | 0,81 |
| Horizontal Jump | 73,44 | 196,28 | 0,54 | 0,80 |
| Slide | 73,93 | 191,80 | 0,48 | 0,81 |
| Two-hand strike of a stationary ball | 73,75 | 187,55 | 0,54 | 0,80 |
| One-hand forehand strike of self-bounced ball | 74,97 | 194,56 | 0,41 | 0,81 |
| One-hand stationary dribble | 75,62 | 181,80 | 0,57 | 0,80 |
| Two hand catch | 75,03 | 209,42 | 0,43 | 0,81 |
| Kick a stationary ball | 73,53 | 209,91 | 0,35 | 0,82 |
| Overhand throw | 74,50 | 193,64 | 0,41 | 0,81 |
| Underhand throw | 74,14 | 196,65 | 0,47 | 0,81 |

Table 2 shows the results of descriptive statistics and the Kolmogorov-Smirnov test, which is the base for estimating the sensitivity of the measuring instrument. The obtained results show that the distribution of data is negatively asymmetric, leptokurtic and platykurtic. The results of the Kolmogorov-Smirnov test show that there is a statistically significant difference between the obtained and theoretically normal distribution of results. Based on the results of the KS test, it can be concluded that Test of Gross Motor Development (TGMD-3) is not sensitive for subjects included in this study.

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Table 2. Descriptive statistics and Kolmogorov-Smirnov test (KS)

| Variables | AS | SD | Min | Max | Skew | Kurt | KS | p |
|---|---|---|---|---|---|---|---|---|
| Run | 6,93 | 1,68 | 0,00 | 8,00 | -1,66 | 2,48 | 0,37 | ,000 |
| Gallop | 5,90 | 2,38 | 0,00 | 8,00 | -1,07 | 0,20 | 0,20 | ,000 |
| Hop | 7,81 | 2,70 | 0,00 | 10,00 | -1,23 | 0,73 | 0,22 | ,000 |
| Skip | 4,83 | 1,59 | 0,00 | 6,00 | -1,44 | 1,49 | 0,30 | ,000 |
| Horizontal Jump | 6,99 | 1,76 | 0,00 | 8,00 | -2,09 | 4,19 | 0,35 | ,000 |
| Slide | 6,50 | 2,20 | 0,00 | 8,00 | -1,47 | 1,21 | 0,31 | ,000 |
| Two-hand strike of a stationary ball | 6,68 | 2,24 | 1,00 | 10,00 | -0,26 | -0,69 | 0,17 | ,000 |
| One-hand forehand strike of self-bounced ball | 5,47 | 2,28 | 0,00 | 9,00 | -0,72 | -0,17 | 0,13 | ,000 |
| One-hand stationary dribble | 4,82 | 2,45 | 0,00 | 8,00 | -0,34 | -0,90 | 0,14 | ,000 |
| Two hand catch | 5,40 | 1,20 | 0,00 | 6,00 | -2,53 | 6,92 | 0,40 | ,000 |
| Kick a stationary ball | 6,90 | 1,38 | 4,00 | 8,00 | -0,89 | -0,55 | 0,32 | ,000 |
| Overhand throw | 5,93 | 2,32 | 0,00 | 10,00 | -0,74 | -0,62 | 0,24 | ,000 |
| Underhand throw | 6,29 | 1,92 | 0,00 | 9,00 | -0,96 | 0,29 | 0,23 | ,000 |

In order to determine the factor structure, i.e. validity, of the Test of Gross Motor Development (TGMD-3) there was applied confirmatory factor analysis (Graph. 1).

The analysis was performed using the maximum probability algorithm. Applying Hopkins (2002) criteria, as stated by Ulrich (2016), the sizes of the Factor loadings in Graph 1 range from moderate and large to very large for two variables. The correlation between the subtest "Locomotion" and "Ball Skills" is 0.77 and is very high, according to the Hopkins criteria (2002).The chi-square test, the ratio of the chi-square to the number of degrees of freedom, CFI (Comparative Fit Index, Bentler's 1990), NFI (Bentler and Bonett's normed fit index, 1980), TLI (Tucker-Lewis Index, 1973) and RMSEA (Root Mean Square Error Approximation, Browne and Cudeck's, 1993) were calculated as indicators of agreement of the model with the data.The criterion for an acceptable fit varies among different types of indexes (Ulrich, 2016). Marsh and Hocevar (1985) cited by Ulrich (2016) suggested that relative chi-square values can be as low as 2 or as high as 5 to indicate a reasonable fit.

The TLI, CFI, and NFI values should be at or above .90 to indicate a satisfactory model fit, which values close to 1 indicating a very good fit on any of these indexes (Ulrich, 2016). An RMSEA of less than .11 indicates a reasonable fit, and an RMSEA of .05 or less indicates a close fit of the model in relation to the degrees of freedom (Browne, Cudeck, 1993 cited by Ulrich, 2016). The obtained results of the confirmatory factor analysis of this model show a partial agreement of the assumed model with the data ($h^2$ = 108.17, df = 64, $h^2$ / df = 1.69, TLI = 0.86, CFI = 0.72, NFI = 0.72., RMSEA = 0.07 CI = 0.04-0.09). RMSEA values are less than .11 and indicate a reasonable fit of the model in relation to the degrees of freedom. The ratio of the chi square of the test to the number of degrees of freedom is less than 2 and indicates a reasonable fit as well. The results of the incremental stacking indices are at the limit and are 0.86 (TLI) and 0.89 (CFI), while the NFI value is 0.72 and is significantly below the acceptable limit of 0.90.

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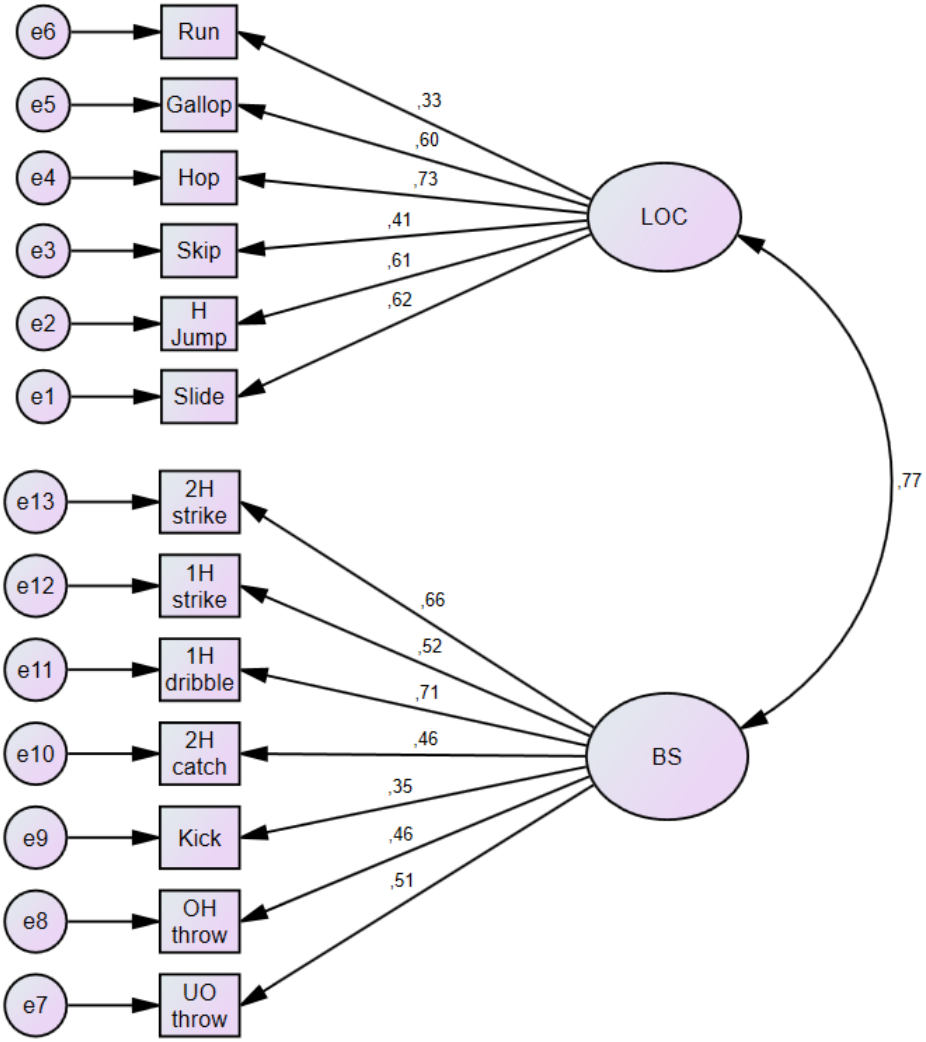


Graph 1. Confirmatory factor analysis

## CONCLUSION

Based on the obtained research results it can be concluded that Test of Gross Motor Development (TGMD-3) has satisfactory reliability and internal consistency for children aged 3 to 10 years. Based on the of the inter-item correlation matrix, the values obtained between the statements are positive, which shows that they measure the same feature and mutual correlations confirm the homogenity of the scale. Based on results it can be concluded that Test of Gross Motor Development (TGMD-3) is not sensitive for subjects included in this study. The obtained results of the confirmatory factor analysis of this model show a partial agreement of the assumed model with the data. The limitations in the research are the respondents, because due to the epidemiological situation caused by COVID 19, a convenience sample of respondents was selected.

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# ACTIVITIES OF DAILY LIFE OF CHILDREN AND YOUTH WITH CEREBRAL PALSY

# AKTIVNOSTI SVAKODNEVNOG ŽIVOTA DJECE I MLADIH SA CEREBRALNOM PARALIZOM

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## ABSTRACT

The main goal of this paper is to determine the level of independence in performing daily activities in children and youth with cerebral palsy who are included in the regular education and rehabilitation program and to see their progress in relation to children and youth with cerebral palsy who are occasionally included or not included in the education and rehabilitation program. The research was conducted in the Center for Children with Multiple Disabilities "Koraci Nade (eng. Steps of Hope)" in Tuzla as well as in practice with the mobile team of the Centre. Total of 40 respondents were included. Respondents were divided into two groups: respondents who were included in the program and respondents who were occasionally or not at all included in the program. The results of the research indicate that the respondents who were included in the regular program of education and rehabilitation achieve better results in performing activities of everyday life in relation to the respondents who are occasionally or not at all included in the program.

**Key words:** cerebral palsy, motor functioning, daily life activities, treatment.

## SAŽETAK

Glavni cilj ovog rada je bio utvrditi nivo samostalnosti u obavljanju svakodnevnih aktivnosti kod djece i mladih s cerebralnom paralizom koja su uključena u redovni program edukacije i rehabilitacije, te sagledati njihov napredak u odnosu na djecu i mlade s cerebralnom paralizom koja su povremeno uključena ili nisu uključena u program edukacije i rehabilitacije. Istraživanje je provedeno u Centru za djecu s višestrukim smetnjama „Koraci nade“ u Tuzl.

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Obuhvaćeno je ukupno 40 ispitanika. Ispitanici su podijeljeni u dvije skupine: ispitanici koji su bili uključeni u program i ispitanici koji su povremeno ili uopće nisu uključeni u program. Rezultati istraživanja pokazuju da ispitanici koji su uključeni u redovni program edukacije i rehabilitacije postižu bolje rezultate u obavljanju aktivnosti svakodnevnog života u odnosu na ispitanike koji su povremeno ili uopće nisu uključeni u program.

**Ključne riječi:** Cerebralna paraliza, motoričko funkcionisanje, aktivnosti svakodnevnog života, tretman.

## INTRODUCTION

A group of non-progressive movement and position disorders caused by a defect or damage to the immature brain in the early stages of development is called cerebral palsy (Punda, 2017). Cerebral palsy, as the most common cause of severe neuro-motor abnormalities in children, is not only a medical, but also a social and psychological problem. Although cerebral palsy is primarily a movement and posture disorder, that is, damage that is limited to the motor system, many children with cerebral palsy suffer from a number of other associated health impairments and problems that make the clinical picture of cerebral palsy even more difficult and complicated for adequate care and treatment. The quality of life of these children, as well as their entire families, is extremely impaired (Kraguljac et al., 2018). The definition and classification of cerebral palsy (CP) is constantly being reconsidered. According to Katušić (2012), previous definitions of cerebral palsy did not take into account non-motor neurodevelopmental difficulties or the progression of musculoskeletal problems. Today, more emphasis is placed on assessing the limitations that people with cerebral palsy have in performing daily activities (Erdeš, 2017). The therapy of a child with cerebral palsy has a functional goal, that is, it is aimed at achieving a given goal. The two main goals of habilitation are to reduce the complications caused by cerebral palsy and to improve the ability to acquire new skills. Additional goals include caregiver education, reduction of physical deformities and improvement of mobility (Kraguljac et al., 2018).

### Activities of everyday life

In children with cerebral palsy, developmental specifics can occur, which significantly affect their training for everyday activities and schooling (Mahmutagić, Prstačić et al. 2006). Cerebral palsy often causes multiple disabilities that affect a person's functioning in all areas of daily life. As the most common motor disorder in childhood (Pakula, Braun, & Yeargin Allsopp, 2009), or one of the most common etiological factors of motor behaviour disorder, cerebral palsy limits the development of abilities with all the consequences that accompany, hinder or disable motor, cognitive, intellectual, emotional and social functioning of these persons and leads to a constant need for intensive and continuous somatopedic support (Milićević, Potić, & Trgovčević, 2011).

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## Motor functioning

Cerebral palsy is clinically manifested by a neuro-motor disorder of control of body position and movement, tone and reflexes from infancy, often with variable symptoms, but there is always a slow development of motor skills (Mejaški Bošnjak, Đaković 2013). Although a fundamental characteristic of children with cerebral palsy is motor deviation and delay, their overall health status should be viewed in the context of medical, developmental, and psychosocial issues. Early recognition and involvement in rehabilitation treatments significantly increases the possibility of the child's general status progressing. It is necessary to include all members of the multidisciplinary health care team in the method of treatment, in order to increase the quality of the final outcomes of treatment, which has been verified to date by the results of recent scientific research (Knežić, 2015). The main difficulties in motor development of children with cerebral palsy are: abnormal muscle tone, the existence of primitive reflexes intertwined with voluntary movements, poorly developed voluntary motor skills, including balance reactions, muscle weakness and poor development of skills and voluntary movements (Katušić, 2012). The measures implemented in the treatment of children with cerebral palsy are aimed at improving their quality of life and daily activities. Parents are actively involved in the overall care of the child (feeding, dressing, hygiene procedures) and are learning to communicate with their children. With growth and development, the child must gain maximum independence in these activities, taking into account its real possibilities. All this is largely feasible with a systematic and multidisciplinary approach that includes physicians of higher specialties (paediatrician, ophthalmologist, audiologist, physiatrist, orthopaedist, speech therapist, and child psychiatrist), a social worker, an occupational therapist, a psychologist etc. A prerequisite for any significant treatment success was and still remains an early diagnosis of a neurodevelopmental disorder (Križ and Prpić, 2005).

The research subjects in this paper are children and youth with cerebral palsy and their level of independence in performing activities of everyday life.
The aims of this research are:

1. To determine the level of independence in performing activities of daily living in children and youth with cerebral palsy who are included in the regular program of education and rehabilitation.
2. To determine the level of independence in performing activities of daily living in children and youth with cerebral palsy who are occasionally included or not at all included in the regular program of education and rehabilitation.

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## MATERIAL AND METHODS

### Sample of respondents

This study included a sample of 40 respondents, children and adolescents with cerebral palsy, aged between 1 and 30. There were 20 male and 20 female respondents in the sample. Considering the set goals of the research, the respondents from the sample were divided into two groups. The first group consisted of children and youth with cerebral palsy who were included in the regular education and rehabilitation program (20) and the second group consisted of children and youth with cerebral palsy who were occasionally or not at all included in the regular education and rehabilitation program (20).

### Measuring instrument

For the purposes of this study, the FIM test was used for evaluation. The FIM test measures functional independence and functional adaptation. The FIM examines 18 functions, and for each of them the grades are set from 1 to 7 so that the total score can range from 18 to 126. (FIM. Instrument. Copyright © 1997 Uniform Data System for Medical Rehabilitation, a division of UB Foundation Activities, Inc. Reprinted with the permission of UDSMR, University at Buffalo, 232 Parker Hall, 3435 Main St., Buffalo, NY 14214).

### Method of conducting research

The research was conducted in a time span from two months in the "Centre for Children with Multiple Disabilities Koraci Nade (eng. Steps of Hope)" in Tuzla, as well as in practice when visiting the respondents by the mobile team of the Centre. In this research, secondary data obtained by reviewing medical records (respondents' files) and primary data obtained using a measuring instrument were used. The research was performed using the test method. All respondents were individually examined, in a pleasant environment in a room that serves for education and rehabilitation of users of the Centre, and during practice work in their homes in the presence and with the consent of parents to participate in the research.

### Data processing methods

The standard Statistical Package for Social Research (SPSS) version 20.0 was used to analyze the results. A t-test for independent samples was used to examine the differences between the two groups of subjects in the stratified sample. The significance of the obtained results was set at the level of $p < 0.05$.

## RESULTS AND DISCUSSION

Using the t-test, we examined the significance of the differences in the arithmetic means of the observed variables between the group of respondents covered by the treatment program and the group of respondents covered occasionally or not at all covered by the treatment program.

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The analysis of the results shown in Table 1, indicate that the respondents included in the treatment program registered better results ($p < 0.05$) on the functional independence test (FIM) in the part related to motor skills, except in the area of independent bathing activities ($p = 0.396$) and climbing stairs ($p = 0.171$).

Table 1. Differences in the achievement on the functional independence test (FIM)

| Areas of activity | Respondents covered by the treatment | | Respondents not covered by the treatment | | t | p |
|---|---|---|---|---|---|---|
| | M | SD | M | SD | | |
| Feeding | 2.05 | 1.84 | 3.35 | 2.87 | 19.58 | .000 |
| Personal hygiene | 1.25 | 1.11 | 2.15 | 1.78 | 11.26 | .002 |
| Bathing | 1.50 | 1.23 | 1.75 | 1.61 | .737 | .396 |
| Putting on upper clothes | 1.10 | 0.44 | 2.50 | 2.43 | 34.50 | .000 |
| Putting on underwear and lower clothes | 1.20 | 0.89 | 2.00 | 1.91 | 9.17 | .004 |
| Toilet | 1.25 | 0.91 | 2.00 | 2.10 | 11.29 | .002 |
| Bladder control | 1.10 | 0.30 | 1.00 | 0.00 | 10.68 | .002 |
| Bowel emptying control | 1.10 | 0.30 | 1.00 | 0.00 | 10.68 | .002 |
| Transfer / bed, chair, wheelchair | 1.00 | 0.00 | 1.05 | 0.22 | 4.45 | .041 |
| Transfer/ toilet | 1.20 | 0.89 | 1.00 | 0.00 | 4.45 | .041 |
| Transfer/ bathtub, shower | 1.05 | 0.22 | 1.00 | 0.00 | 4.46 | .041 |
| Movement / walk, wheelchair | 1.10 | .44 | 1.00 | .00 | 4.47 | .042 |
| Movement / stairs | 2.00 | 1.77 | 1.55 | 1.43 | 1.94 | .171 |
| Communication / understanding | 1.20 | .52 | 1.70 | 1.59 | 6.59 | .014 |
| Communication / expression | 1.55 | 1.27 | 1.60 | 1.56 | .05 | .815 |
| Social interaction | 1.45 | 1.14 | 1.00 | .00 | 16.79 | .000 |
| Understanding of a problem | 1.25 | .91 | 1.15 | .67 | .555 | .461 |
| Memory | 1.05 | .22 | 1.15 | .67 | 1.78 | .190 |

In our study, in general, persons included in the treatment program registered better results in motor activities compared to persons who were occasionally included or not at all included in the treatment program. Training a child to feed itself requires patience, time, energy, knowledge and determination, but it is useful and valuable for a child with cerebral palsy because this way we give it the opportunity to become independent within its capabilities. The therapy of a child with cerebral palsy has a functional goal, i.e. it is aimed at achieving the set goal. The two main goals of habilitation are to reduce the complications caused by cerebral palsy and to improve the ability to acquire new skills. Additional goals include caregiver education, reduction of physical deformities and improvement of mobility (Kraguljac et al., 2018). Positioning is the foundation and beginning of the feeding activity itself. With good positioning, all parts of the body come into the right relationship and become stable. All that affects the improvement of oral motor skills (tonic bite, protruding tongue, lip compression).

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Proper positioning of the child affects the quality of performance of activities. You can also make feeding easier for your baby if you use the various aids available. A light, thickened handle on cutlery, a cuff around the metacarpal bones of the hand to which the cutlery is attached, a curved spoon attached to the cuff - are some of the aids that facilitate coordination of movements and prevent food spillage (Šantek, 2008).

In our study, persons included in the treatment program achieved better results in feeding activities compared to persons who were occasionally included or not at all included in the treatment program. The goal of dealing with a child with cerebral palsy is to achieve maximum independence in movement and activities of everyday life. In addition to the habilitation treatment, which is carried out in specialized institutions, the child learns through routine daily activities (taking/picking up, carrying, changing clothes, bathing, etc.). Therefore, constant communication and exchange of information between parents and all members of the habilitation team is important (Savić and Milić Rašić, 2017). Analysis of the results shown in Graph 1 showed that the group of respondents included in the treatment program achieved better results in lying, standing and walking activities compared to the group of respondents who were occasionally included or not at all included in the treatment program. Due to the high connection between motor development and the development of learning and comprehension skills, a number of aids and techniques are used that enable learning through exercise. Practice shows that in addition to therapy, children must exercise at home. Therefore, in addition to working with the child, the kinesitherapist must be able to educate parents and introduce them to the exercise techniques they can perform at home (Šarčević, 2016). And this research shows that people who are included in the treatment program achieve better results in standing and walking activities compared to people who are occasionally included or not at all included in the treatment program. Children with cerebral palsy should be able to walk independently before they are integrated into school and society. Independent walking plays an important role in the activities of everyday life, improves bone density and cardiopulmonary endurance, reduces obesity, etc. Therefore, independent walking is the most important goal of rehabilitation for many children with cerebral palsy. Therapeutic methods to improve the walking ability of children with cerebral palsy include strength exercises, cardiopulmonary endurance exercises, functional electrical stimulation approaches, task-oriented exercises, neurological developmental approaches, and proprioceptive neuromuscular facilitation (Cho et al., 2016).

The measures implemented in the treatment of children with cerebral palsy are aimed at improving their quality of life and daily activities of those children. Parents are actively involved in the overall care of the child (feeding, dressing, hygiene procedures) and learn to communicate with their children. With growth and development, the child must gain maximum independence in these activities, taking into account its real possibilities. All this is largely feasible with a systematic and multidisciplinary approach that includes physicians of more specialties (paediatrician, ophthalmologist, audiologist, physiatrist, orthopaedist, speech therapist, child psychiatrist), a social worker, an occupational therapist, a psychologist etc. A prerequisite for any significant treatment success was and remains an early diagnosis of a neurodevelopmental disorder (Križ, Prpić, 2005). It is necessary that all neurorisk children are provide with opportunity for greater involvement in the activities of everyday life and

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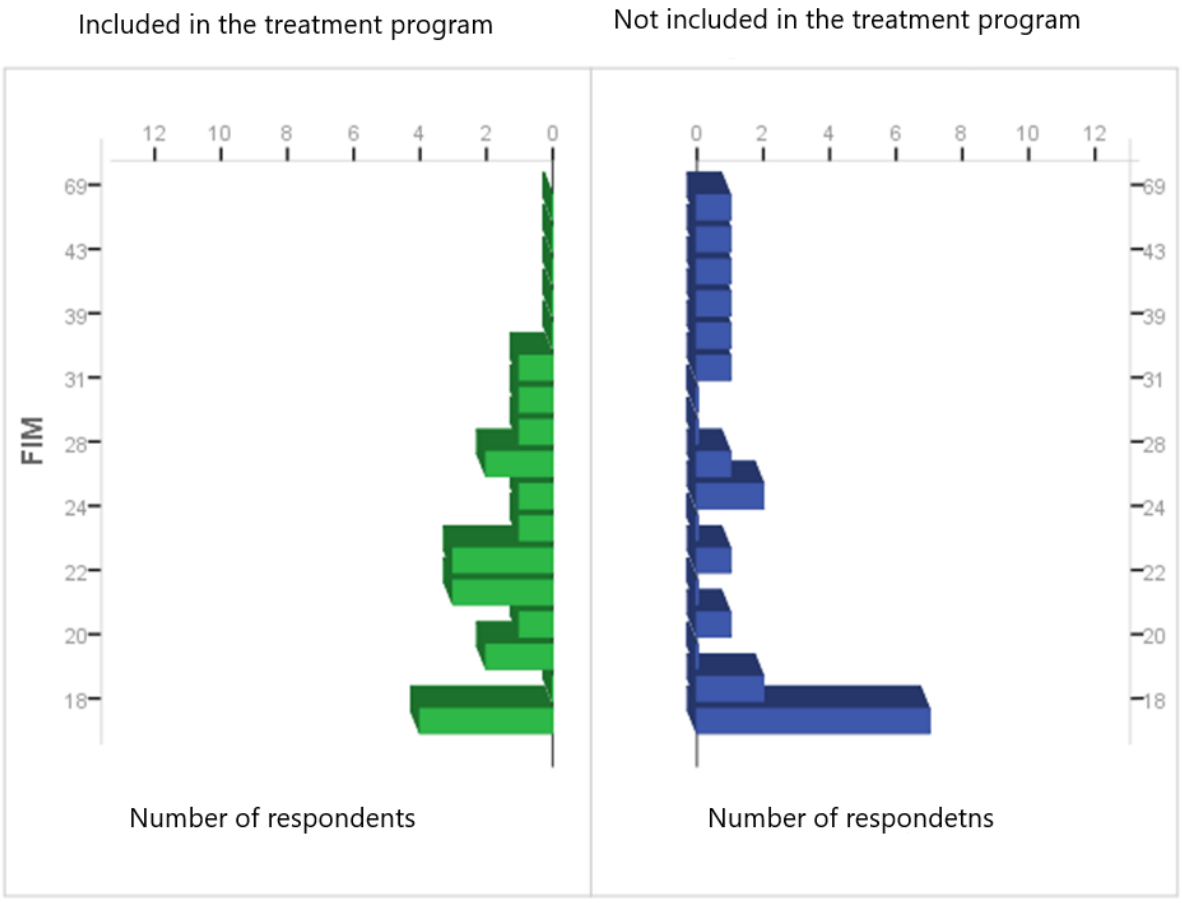
thus also relieve the parents in order for the child to be as independent as possible (Matijević, Marunica Karšaj, 2015).




Graph 1. Distribution of respondents in relation to the FIM

In the research conducted by Joković Turalija et al. (2004), the results obtained in the field of Communication show that 45% of the respondents do not have greater needs for expression, understanding, and speech in social situations. The least progress in functional independence was recorded in the sphere of cognitive functioning, where the respondents included in the treatment program differed significantly ($p < 0.05$) in the area of understanding and social interaction, while in other areas (expression, understanding of problems and memory) the differences were statistically insignificant. Parents most often react to the diagnosis by denying and setting unrealistic expectations related to the child's abilities and capabilities (Igrić, Cvitković, Jakab, 2009). Such an unrealistic attitude of parents leads to a lack of self-confidence in children. Children cannot achieve what is expected of them and then they create a negative image of themselves. Lack of self-confidence leads to feelings of loneliness, which prevents them from developing emotional and social competencies (Mandić, 2015). The quality of life of children with cerebral palsy depends on access to products, information and support. Access to products means the availability of specialized aids that make everyday life easier for children with cerebral palsy and their families, e.g. electric wheelchairs, special computers, cutlery etc. Access to information includes notions where parents can get advice on caring for a child with cerebral palsy, where they can find out all about their rights.

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Likewise, the approach to support involves forming a community support network that includes organizations, families, and children with cerebral palsy to share experiences and advice (Punda, 2017).

## CONCLUSION

It can be concluded that cerebral palsy is a very complex condition that affects a number of developmental areas of the child, the level of its functional abilities and quality of life, which indicates the importance of habilitation treatment.

There is a unique model of functioning for each person, so an individual re / habilitation program should be created in accordance with the diagnosis.

The family of the child or their immediate and wider environment should be given useful advice on the need to include children and youth with cerebral palsy in regular individually tailored education and rehabilitation programs and thus contribute to improving their quality of life.

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# THE POTENTIAL UTILITY OF THE CLOCK DRAWING TEST IN SPECIAL EDUCATION AND REHABILITATION

# MOGUĆNOSTI PRIMJENE TESTA CRTANJA SATA U SPECIJALNOJ EDUKACIJI I REHABILITACIJI

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## ABSTRACT

This article aims to at analyze and point out the importance of the use of the Clock Drawing Test for cognitive screening in special education and rehabilitation with reference to early identification and adequate intervention for children and adults at risk, as well as to prevent the occurrence and intensification of disabilities. Through the simplicity of the test administration and scoring, as well as the great value of qualitative data based on the observation of participants' behavior while performing the given task this test has gained popularity in research and clinical practice. On the other hand, in order to perform the given task, it is necessary to activate complex cognitive functions such as visuospatial / visuoconstructive skills and executive functioning. Given the difficulties in performing, the Clock Drawing Test may be indicative of a potential cognitive inefficiencies in the specified domains and/or executive dysfunctions, such as those related to the temporoparietal and frontal lobe structures. In this regard, the present article aims to present and discuss the utility of the Clock Drawing Test in children of different ages and types of developmental challenges (attention deficit hyperactivity disorder, learning disabilities) as well as in adults with multiple sclerosis, traumatic brain injury and dementia.

**Keywords:** Clock Drawing Test, children, developmental disorder, multiple sclerosis, traumatic brain injury, dementia

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## SAŽETAK

U članku je analiziran Test crtanja sata, sa ciljem da se ukaže na važnost njegove primjene kao dela kognitivnog skrininga u specijalnoj edukaciji i rehabilitaciji, a radi prepoznavanja djece i odraslih u riziku kako bi se sprečio nastanak/pogoršanje invaliditeta i primenile odgovarajuće intervencije. Jednostavnost njegovog zadavanja i skorovanja, kao i dragocenost kvalitativnih podataka koje nam pruža posmatranje ponašanja ispitanika tokom izvođenja datog zadatka, učinili su ovaj test veoma popularnim u istraživačkoj i kliničkoj praksi. Sa druge strane, da bi se navedeni zadatak ispunio neophodno je angažovanje složenih kognitivnih funkcija kao što su vizuoprostorne i vizuokonstruktivne sposobnosti i egzekutivne funkcije. Poteškoće prilikom izvođenja Testa crtanja sata mogu već ukazati na potencijalnu slabost u pomenutim domenima i/ili disfunkciju struktura koje su za njih odgovorne, kao što su temporoparijetalni i frontalni režanj. Biće dati i prodiskutovani primjeri upotrebe Testa crtanja sata kod djece na različitim uzrastima sa različitim izazovima u razvoju (poremećajem pažnje i hiperaktivnošću, smetnjama u učenju), kao i kod odraslih sa multiplom sklerozom, traumatskim povredama mozga i demencijom.

**Ključne reči:** Test crtanja sata, djeca, razvojni poremećaj, multipla skleroza, traumatska povreda mozga,demencija

## THE CLOCK DRAWING TEST: WHY IS IT SO POPULAR AND WHAT DOES IT ASSESS?

The utility of the Clock Drawing Test for cognitive screening has been gaining increasing popularity among researchers and clinicians due to its numerous advantages (Müller et al., 2017; Rogers & Panegyres, 2007). Given that it requires only minimal testing materials, based on paper and pencil, as well as it can be administered in less than 5 minutes relatively free from educational, language and/or cultural bias and typically well accepted by respondents. Although the simplicity of the Clock Drawing Test performance may suggest that it has only limited utility, the way in which it is solved by respondents, problem-solving strategies and potential failures such as errors related to the time-setting instructions may yield valuable diagnostic information (Ghanizadeh et al., 2013; Kibby et al., 2002). Moreover, it has been found that both hemispheres of the brain contribute to the activation of most cortical, subcortical, anterior, posterior skills during the Clock Drawing performance, suggesting in particular the contribution of the frontal, temporal and parietal regions (Aprahamian et al., 2009). Specifically, the posterior parietal cortex and the dorsal premotor area appear to be the main constituents of the frontal-parietal cortical networks associated with performance on the Clock Drawing tasks (Figure 1; Eknoyan et al., 2012). Hence, a performance of this complex task requires a wide range of cognitive domains, including planning, problem-solving, abstract thinking, visuospatial and visuoconstructive skills, motor programming, and executive functioning (Kibby et al., 2002; Müller et al., 2017; Schulman, 2000).

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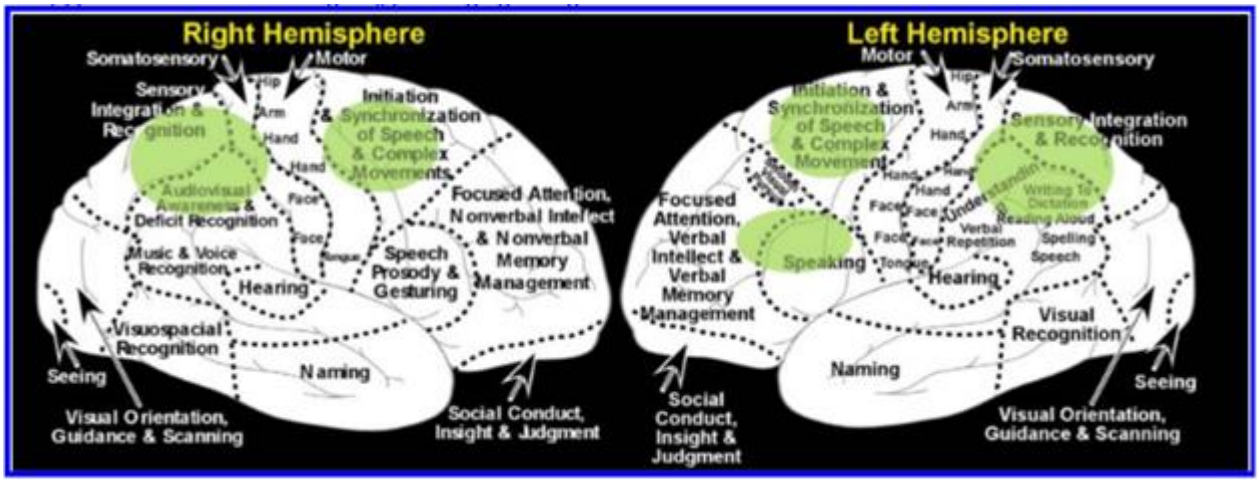


*Figure 1.* Illustrations of the left and right hemispheres in healthy individuals, mapping the major cortical regions activated in the Clock Drawing task; approximate areas are marked in green (Eknoyan et al., 2012)

**Versions of the Clock Drawing Test Instructions**

According to the free-drawn method, the respondent is asked to draw a clock from memory, while according to the method of pre-drawn circle (pre-drawn method) the respondent is asked to place all the numbers on the clock. Sometimes the respondent is required to draw the clock hands indicating 10 min past 11 o'clock. Also, there is the method in which the respondents are only asked to set the hands at a fixed time on a pre-drawn clock, whereas a circular contour and numbers are given. Furthermore, there are versions with and without performance time limit. Scoring varies depending on various test based methods (Agrell & Dehlin, 1998; Schulman et al., 1993; Spenciere et al., 2017). Clock Drawing errors typically include deficits in the spatial arrangement of numbers, omissions, repetitions, number rotation or reversal, incorrect placement of hands to a specific time, and incorrect placement of hour and minute hands (Figure 2; Eknoyan et al., 2012).

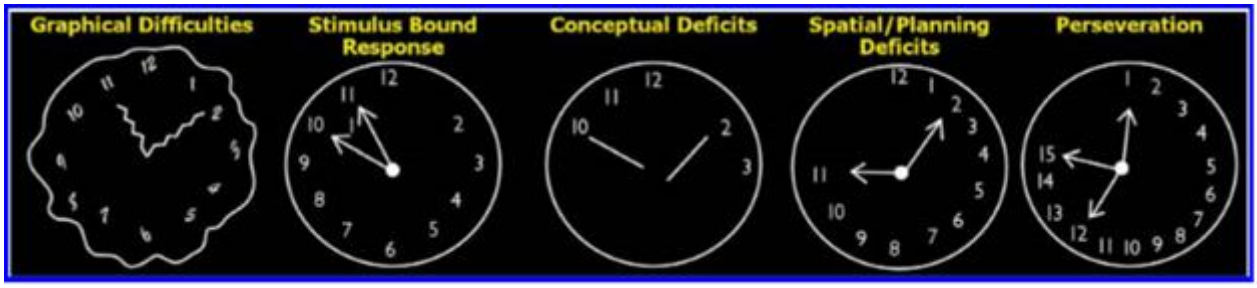


*Figure 2.* Common types of Clock Drawing errors (Eknoyan et al., 2012)

Although there are guidelines about what a well-drawn clock looks like, it is, however, important to note that if a subject's Clock Drawing shows an error, it does not necessarily mean that the subject's cognitive abilities are impaired. Likewise, if a Clock Drawing falls into the range of "normal" performance, this does not necessarily implicate that the subject's

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cognitive abilities are preserved (Figures 3-6; Diagnostic value - time-on-surface is displayed in black color and time-in-air movements are displayed in red color; Müller et al., 2017).

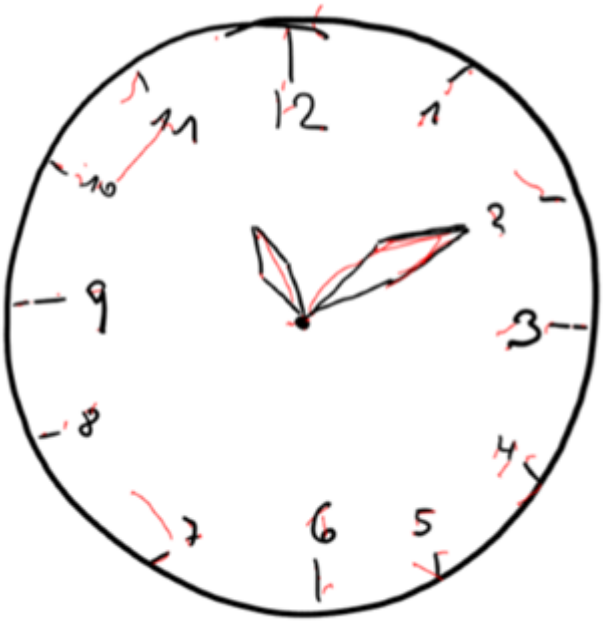

*Figure 3.* Unimpaired Clock Drawing performed by a healthy individual (Müller et al., 2017)

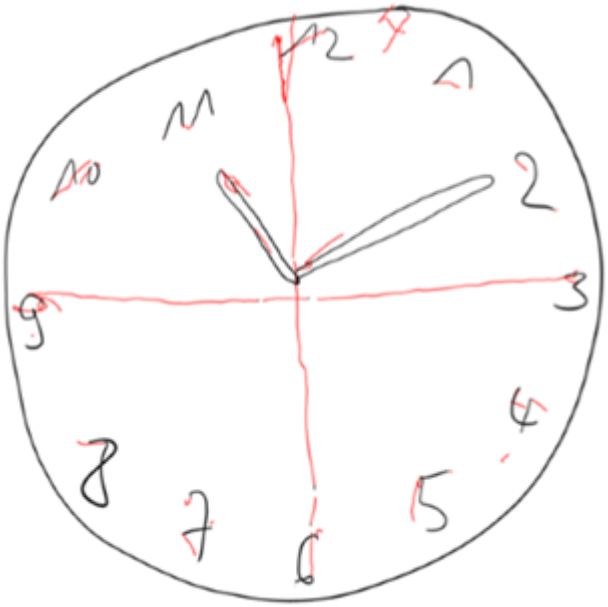

*Figure 4.* Unimpaired Clock Drawing performed by an individual with a mild cognitive impairment (Müller et al., 2017)

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*Figure 5.* Visually distorted Clock Drawing by an individual with a mild cognitive impairment (Müller et al., 2017)

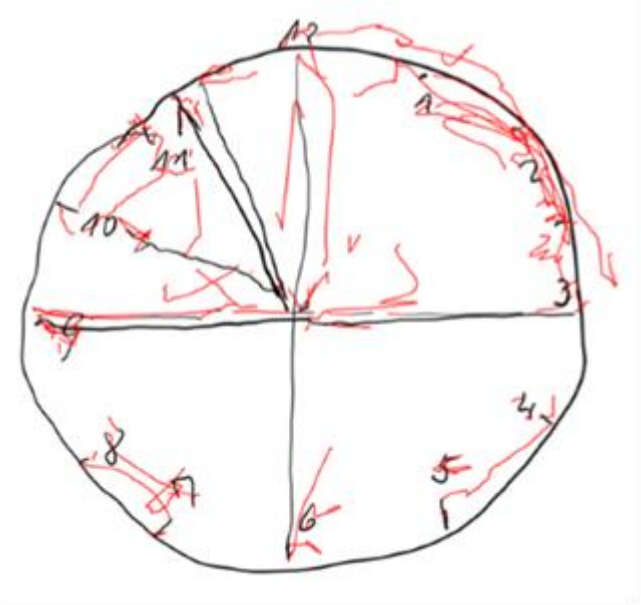

*Figure 6.* Visually distorted Clock Drawing by an individual with early signs of Alzheimer's dementia (Müller et al., 2017)

In the examples of the Clock Drawings given below, participants were allocated 75 seconds to put in the numbers on a given clock contour (pre-drawn clock), and set the hands at 11:10 (Figure 7). It was used the 10-point scoring system. Also, a special transparent foil was used

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for placing over the drawing, with a drawn circle divided into eight equal parts serving as a scheme for evaluating (Figure 8).

One point is given if the numbers are in the proper octant of the circle, one point if the hour hand is set towards the number "11" and one point if the minute hand is set towards the number "2" (Manus & Wu, 1994).

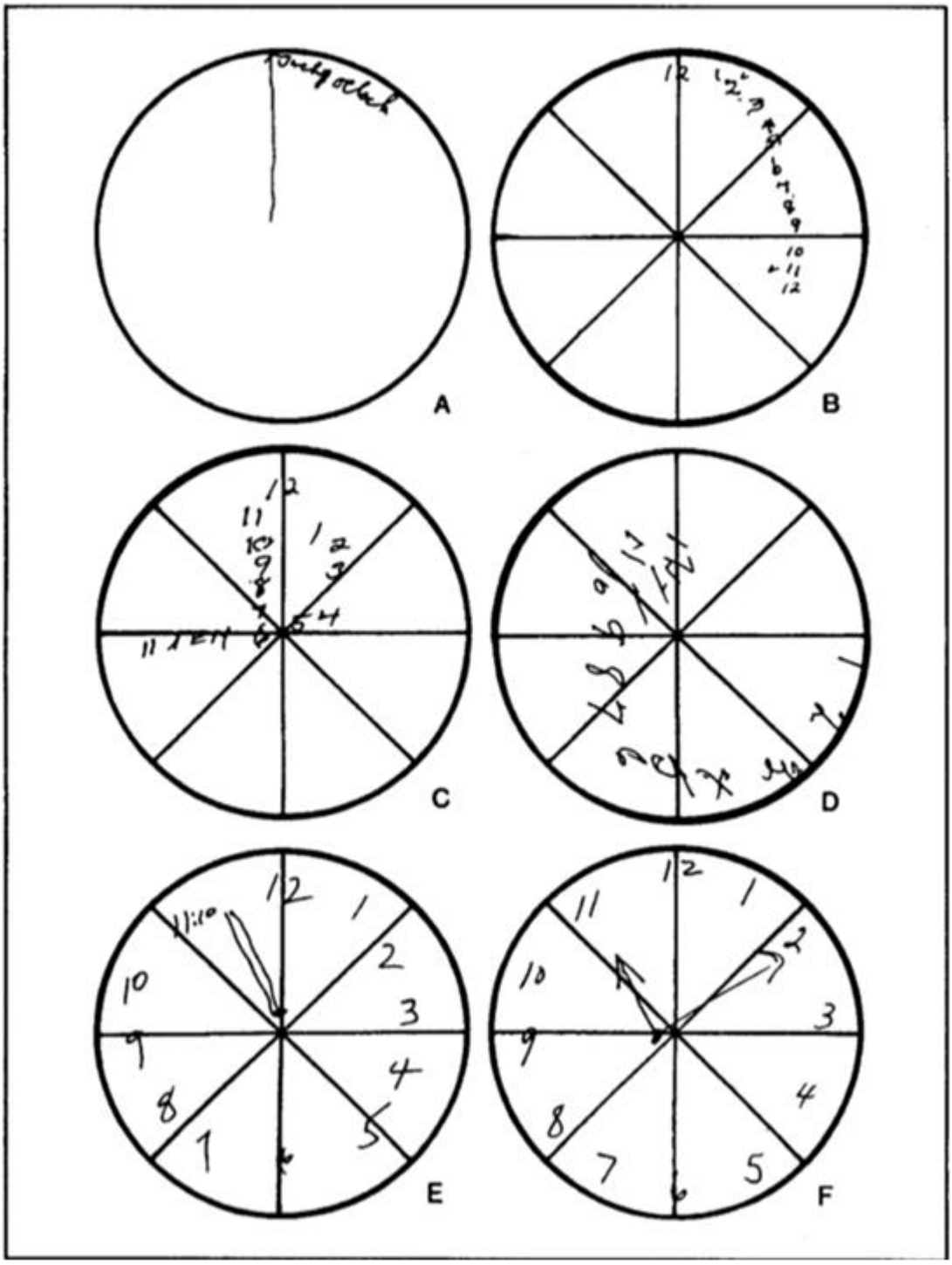

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*Figure 7.* Scoring examples of the Clock Drawing Test: (A) number of points given is 0; (B) one point is given for the correct placement of number 1; (C) two points are given for the correct placement of numbers 1 and 11; (D) four points are given for the correct placement of numbers 7, 8, 10 and 11; (E) eight points are given for the correct placement of numbers 1, 2, 4, 5, 7, 8, 10 and 11, and zero point earned due to the equal length of the clock hands; (F) 8 points are given for the correct placement of numbers 1, 2, 4, 5, 7, 8, 10 and 11, one point each is given for the correct placement of the hour hand at 11, and minute at 2, the maximum number of points earned, i.e. a total of 10 points (Manus & Wu, 1994).

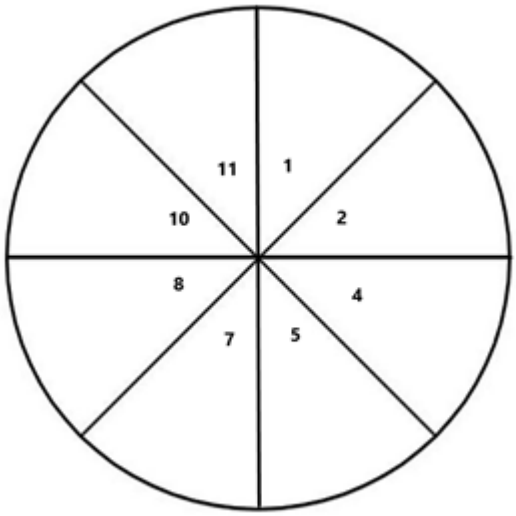


*Figure 8.* Transparent foil used for a simplified scoring of the Clock Drawing Test (Manus & Wu, 1994)

**The Clock Drawing Test in children of different ages**

It is therefore suggested that both clock construction and the concept of time are developmental in nature since most 6-year-olds have a basic conceptualization of a clock, most 8-year-olds have been able to successfully set the time while most 10-year-olds have been able to successfully construct and draw a clock face (Figure 9), although spacing of numbers on the clock face was incorrect (Cohen et al., 2000). However, many children ages 11 and 12 continue having errors in the placement of numbers around the clock, which indicates that the Clock Drawing Test is sensitive to the frontal lobe function, and further reveals the trend of gradually increasing the planning skill development after 12 years of age. Thus, this task should be used in assessing school-age children as an integral part of routine evaluation (Kibby et al., 2002; Yousefian et al., 2015).

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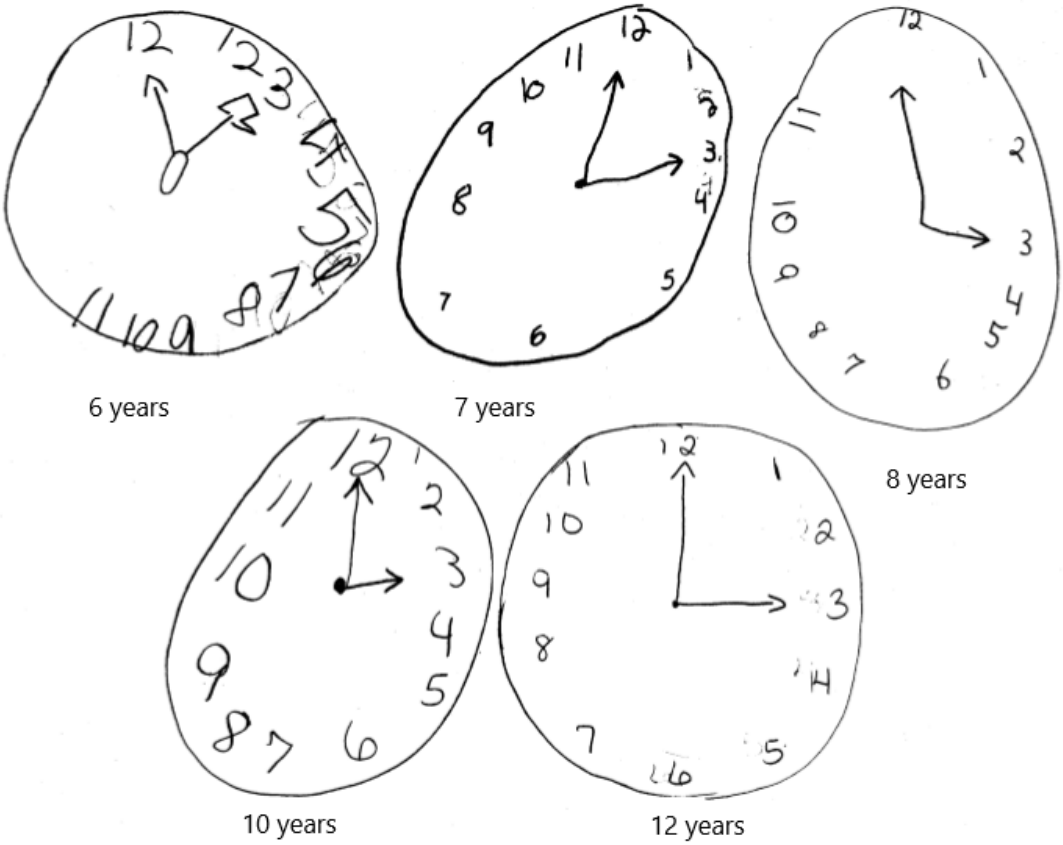


*Figure 9.* Illustration of Clock Drawings performed by children at 6, 7, 8, 10, and 12 years old (Cohen et al., 2000)

**The Clock Drawing Test in children with attention deficit hyperactivity disorder (ADHD)**

Deficits in executive function has been considered as the main problem in children with attention deficit hyperactivity disorder in terms of planning, inhibition, working memory and cognitive control, whereby it is expected that they would present with planning and organizational difficulties during the construction of a clock face. Moreover, executive function deficits interfere with the behavioral self-regulation in everyday life, i.e. these children often have poorer adaptive behavior (Ghanizadeh et al., 2013). Results revealed that with regard to putting numbers and hand setting children with ADHD showed poorer performance on the Clock Drawing Test in comparison to children without ADHD (Figure 10), in spite of their adequate visual-spatial and visual-motor integrative abilities. (Kibby et al., 2002). Most common types of Clock Drawing errors included planning deficits in the placement of numbers around the clock face, whereas if children were subsequently provided with a pre-drawn clock that had the numbers 3, 6, 9, 12, that means, if planning/organizational requirements were reduced, their clock construction improved significantly, validating that errors in their original drawings were due to planning as opposed to visuospatial deficits.

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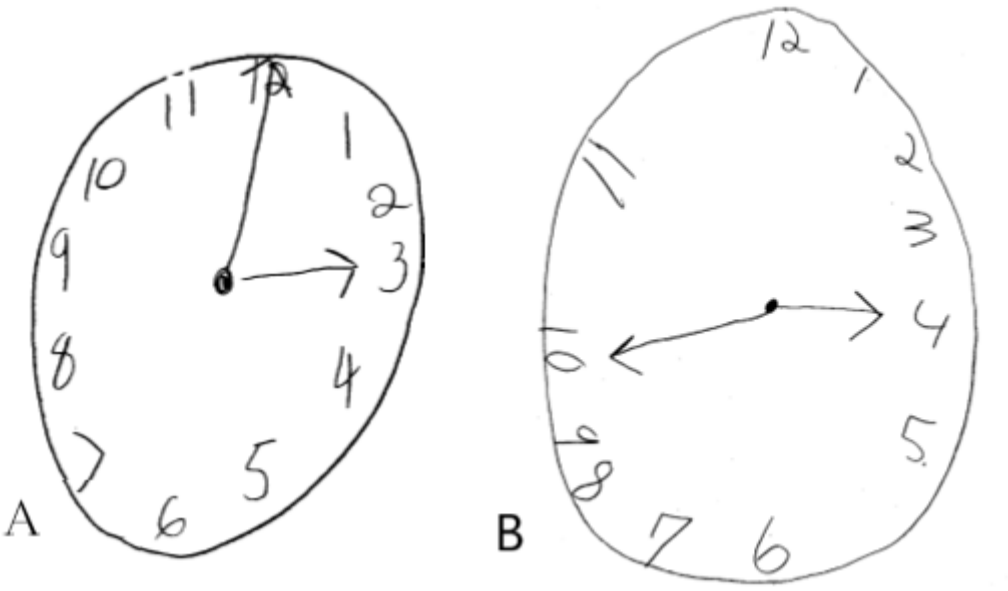


*Figure 10.* (A) An example of the clock face drawing in children with and without attention deficit hyperactivity disorder, the clock with numbers showing 15:00; (B) An example of the clock face drawing in children with attention-deficit/hyperactivity disorder, the clock with numbers showing time 10:20 (Kibby et al., 2002)

**The Clock Drawing Test in children with learning disabilities**

Symptoms of learning disabilities include difficulties with reading, writing and/or math problem-solving skills, attention, poor coordination, and time-related concepts. These symptoms alone are not sufficient to identify an individual with a learning disability. Therefore, professional assessment is required for diagnosis of some of the learning disabilities (Pezeshk et al., 2017).

In comparison to individuals with the normal function, individuals with dyslexia showed increased activation in the right hemisphere posterior and inferior frontal regions to compensate for the dysfunction in their left hemisphere posterior regions (Im et al., 2015; Quercia et al., 2013). In a typically developing population, the brain regions responsible for word analysis and recognition include parietotemporal and occipitotemporal regions (Pezeshk et al., 2017). Developmental dyslexia is a dysfunction of the left hemisphere associated with the impairment of skills, such as verbal working memory and phonological processing, which are largely dependent on this hemisphere. However, deviations can be found in the physiology of the right hemisphere brain regions. There is a research-based evidence that children with dyslexia can neglect the left side of the image when they draw clock faces, suggesting a dysfunction of the right-hemisphere mechanisms in spite of dysfunctions in the left hemisphere associated with dyslexia. Figures 11 and 12 provide insight into the achievement of the Clock Drawing Test performance in children with dyslexia and those with typical development (Eden et al., 2003).

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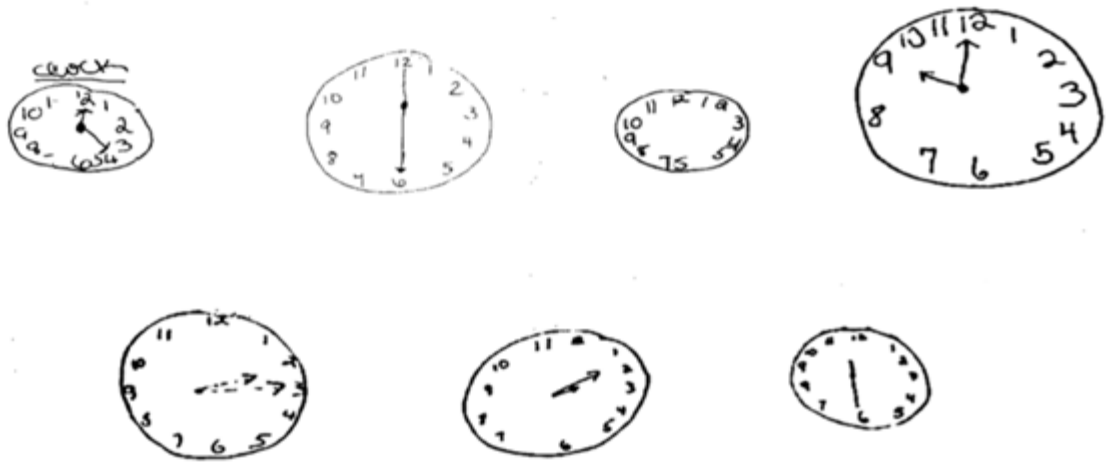

*Figure 11.* Illustrations of the Clock Drawing Test by children without dyslexia and other disorders aged 10 to 11 years (Eden et al., 2003)

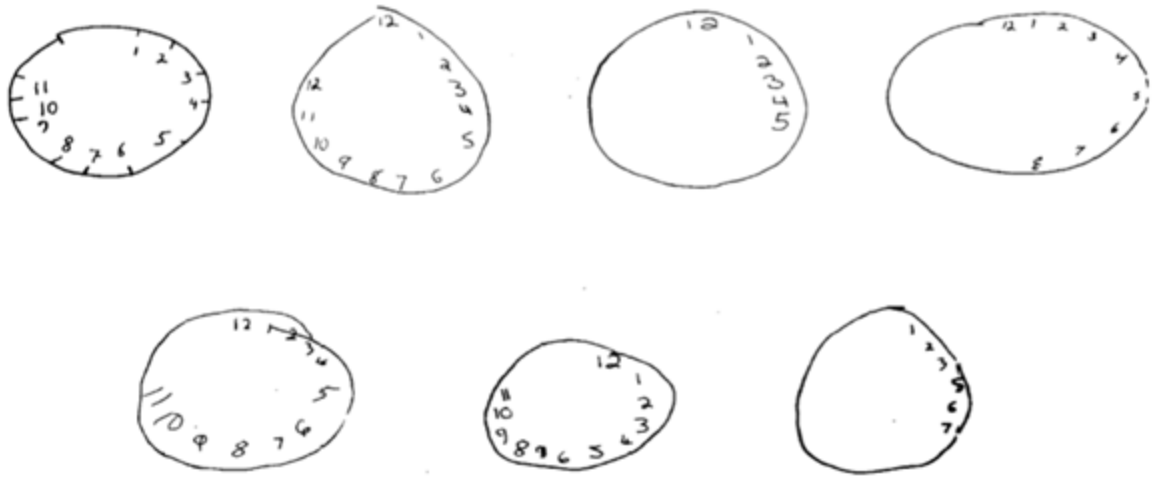

*Figure 12.* Examples of the Clock Drawing Test by children with dyslexia aged 10 to 12 years (Eden et al., 2003)

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Apart from the left side neglect, there were no differences in clock size or number sequencing in children with and without dyslexia. The study found that apart from the left side neglect there were no significant differences between clock size and number sequencing in children with and without dyslexia.

**The Clock Drawing Test in adults with multiple sclerosis (MS)**

In addition to the most common sensory and motor deficits related to multiple sclerosis, it is estimated that cognitive impairment is present in 40-70% of patients (Rogers & Panegyres, 2007). Factors associated with MS-related cognitive impairment include brain lesion localization, duration and form of the disease, neurological deficits, fatigue, drugs affecting the central nervous system, and affective disorders (Amato et al., 2001; Kujala et al., 1997; Thornton et al., 2002). Considering that the disease most often occurs between 20 and 40 years of age, i.e. in the working-age population, with the emphasis on the importance of cognitive screening for early detection in these individuals. In addition, the Clock Drawing Test can be used to evaluate cognitive changes over time which can be used in monitoring treatment progress (Barak et al., 2002).

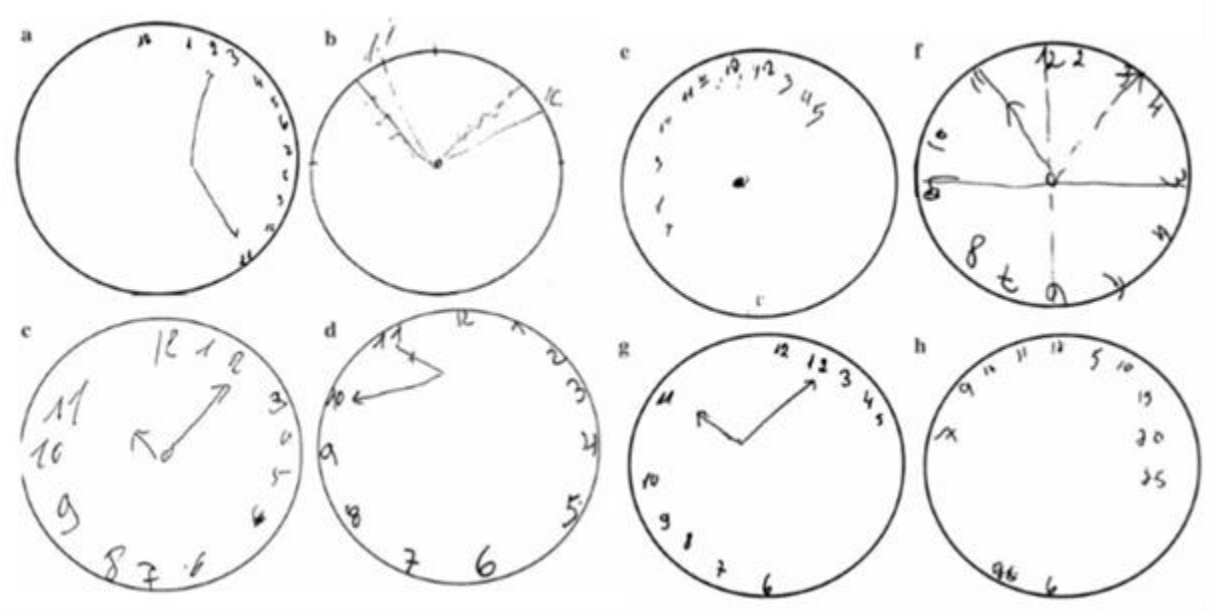

*Figure 13.* Examples of the Clock Drawing Test by individuals with multiple sclerosis: (a) a 46-year-old woman who was diagnosed with MS 14 years ago; (b) a 67-year-old woman diagnosed with MS 13 years ago; (c) a 57-year-old man diagnosed with MS 12 years ago; (d) a 52-year-old woman diagnosed with MS 3 years ago; (e) a 47-year-old woman diagnosed with MS 24 years ago; (f) a 60-year-old man diagnosed with MS 39 years ago; (g) a 46-year-old woman diagnosed with MS 23 years ago; (h) a 40-year-old woman diagnosed with MS 15 years ago (Barak et al., 2002)

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## The Clock Drawing Test in adults with traumatic brain injury

The most common acute cognitive impairments after traumatic brain injury include confusion and disorientation, problems with short-term and long-term memory, attention deficit, problems in communication, organization and planning, and diminished cognitive flexibility (de Guise et al., 2011; Ino et al., 2003). The Clock Drawing Test should help to clinicians gain initial insight into patients' cognitive status and opt for further testing (de Guise et al., 2010). Functional magnetic resonance imaging studies (de Paula et al., 2013) suggest bilateral frontal lobe activation during the Clock Drawing Test, although other regions are also involved. The Clock Drawing Test shows a different error pattern in subjects with right hemisphere lesions (mild left spatial neglect, incorrect placement of hands and reversal of clock numbers) compared to the left frontal lobe lesions (difficulties with understanding the test instructions, incorrect placement of numbers and writing numbers beyond "12"). Difficulties with the Clock Drawing Test performance are more common in patients with right hemisphere lesions than in patients without such lesions. Consequently, numbers are often omitted from the left side of the clock, all the numbers are aligned on the right side and the clock drawing shows only the numbers 12 to 6 (Figure 14; de Guise et al., 2010). Further, they also had a problem with gaps in number spacing and deficit in spatial layout of numbers. Typically, neglect on the lower left quadrant of the clock has been more frequently observed following right parietal lobe lesions.

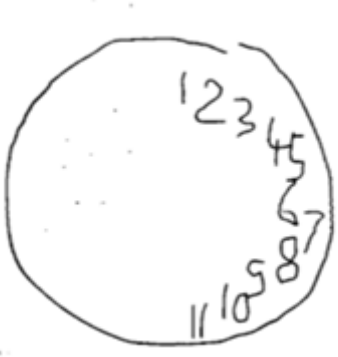


*Figure 14.* An example of the Clock Drawing Test by an adult patient with a right parietal lobe lesion (de Guise et al., 2010)

Patients with traumatic subarachnoid hemorrhage, swelling in the brain or the presence of bilateral brain injury were found to perform significantly poorer on the Clock Drawing Test compared to those without brain injuries. It is about the difficulties in construction of the clock face and the placement of clock hands and numbers in the correct position. Also, older and less educated patients with traumatic brain injuries have shown worse results in the Clock Drawing Test.

## The Clock Drawing Test in people with dementia

Common Clock Drawing Test errors in individuals with dementia include errors in setting clock hands at number "10" and " 11"on the clock face instead towards "11" and "2", setting time (both in letters/numbers) not just in numbers, omission of clock hands, neglect of the left

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or right half of the clock, incorrect placement of the anchor numbers (12, 3, 6, 9), errors in the spatial layout of numbers, numbers written outside the clock face, numbers written counter – clockwise, repeating numbers or duplicating the clock hands. The omission of numbers or hands, errors in number placement and hand proportion, and errors in spatial layout of numbers are more associated with decline in cognitive functions than other errors (Ricci et al., 2016). Sensitivity of the Clock Drawing Test has been shown while comparing groups of patients with Alzheimer's disease, Parkinson's disease and vascular dementia, whereby the group of Alzheimer's disease patients committed more errors related to a loss of semantic knowledge while the impairment of executive functioning seemed to be more pronounced in the other two groups than in the group with Alzheimer's disease (Allone et al., 2018). Further, the errors in placing the clock hands were taken into account for distinguishing patients with mild cognitive impairment, who are more likely to develop dementia (Ehreke et al., 2011). In addition to the patient's condition itself, the educational attainment and literacy status of older people influenced performance on the Clock-Drawing Test significantly (Figure 15; Kim & Chey, 2010).

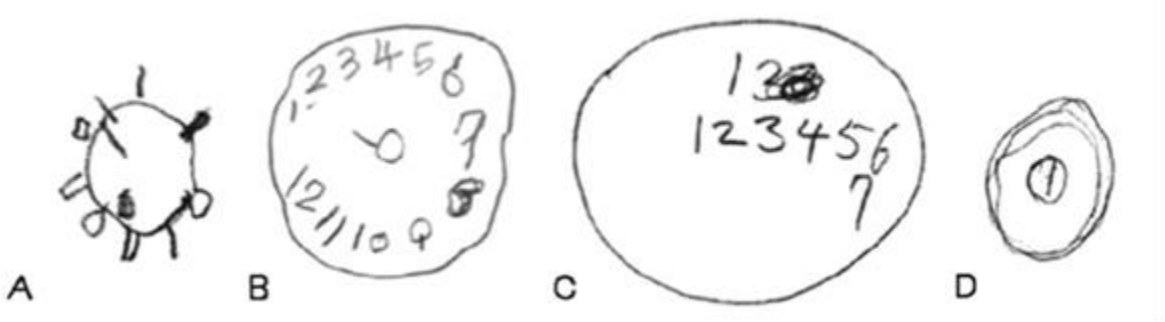


*Figure 15.* Examples of conceptual errors observed most frequently in the illiterate individuals with no education and in the dementia of the Alzheimer's type: (A) 82-year-old woman, uneducated, illiterate; (B) a 69-year-old woman, uneducated, illiterate; (C) 70-year-old woman, Alzheimer's dementia, 6 years of schooling, literate; (D) 57-year-old woman, Alzheimer's type dementia, uneducated, illiterate (Kim & Chey, 2010)

Less educated participants had lower Clock Drawing Test scores. The effects were most dramatic in the illiterate individuals. It has been observed that illiterate and/or less educated older individuals have made mistakes similar to those made by people with Alzheimer's dementia. The conceptual deficits observed in patients with dementia of the Alzheimer's type have been interpreted as stemming from the loss of semantic knowledge evoked by the word "clock' and the graphic representation of a clock. However, this interpretation assumes that everyone has developed semantic and visuospatial representations of the clock and a constructive ability to translate these mental representations into drawing before the development of dementia.

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## CONCLUSION

It is therefore recommended to use the Clock Drawing Test as an integral part of a cognitive screening in both children and adults because it can provide insight into valuable qualitative and quantitative data, which would serve as guidelines for continuing the work with patients in the field of special education and rehabilitation, aiming at recognizing persons at risk and preventing the occurrence and intensification of disability. Given the impact of cognitive domains on the task performance, domains that have a significant impact on test performance are relevant to performance of activities of daily living, and it is essential to assess performance on these cognitive domains.

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# TEACHING SHOELACE TYING TO A CHILD WITH AUTISM SPECTRUM DISORDER

# PODUČAVANJE DETETA SA POREMEĆAJIMA SPEKTRA AUTIZMA VEZIVANJU PERTLI

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## ABSTRACT

Children with autism spectrum disorders (ASD) have difficulties in independent performance of everyday tasks, therefore the aim of this study was to teach a child with ASD to tie shoelaces by using a total task chaining procedure.
The participant was a ten year old boy diagnosed with ASD and the procedure used was total task chaining. The task analysis was divided into 13 steps and the teaching procedure was divided into two phases. Independent performance and generalization probes were also conducted.
Total task chaining procedure was proven to be successful as a independence skills teaching tool, as the child mastered this skill in only 15 sessions with 100% success. These results are particularly significant in light of the demonstration of generalization by the participant, as he will be able to use the skill in present and future.

**Key words**: total task chaining, shoelace tying, autism, independence.

## SAŽETAK

Deca sa poremećajima spektra autizma (PSA) imaju teškoće u samostalnom izvođenju svakodnevnih zadataka, otuda je cilj ove studije slučaja podučavanje deteta dijagnostikovanog sa PSA samostalnom vezivanju pertli korišćenjem *chaining* procedure.
Ispitanik je desetogodišnji dečak i veština vezivanja pertli je podeljena u 13 koraka, a procedura podučavanja je podeljena u dve faze. Sprovedene su i probe samostalnosti u izvođenju zadatka, kao i probe generalizacije.

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Rezultati ukazuju da se *chaining* procedura pokazala uspešnom u podučavanju veština samopomoći kod ispitanika sa PSA, jer je dečak za samo 15 tretmana ovladao podučavanom veštinom sa 100% uspešnosti. Ovakav rezultat je posebno od značaja imajući u vidu generalizaciju naučene veštine, pogotovo jer će ispitanik biti u mogućnosti da datu veštinu koristi u svakodnevnom životu, ali i u budućnosti.

**Ključne riječi**: chaining procedura,vezivanje pertli, autizam, samostalnost.

## INTRODUCTION

Autism spectrum disorders (ASD) is a neurodevelopmental disorder characterized by impairments in social communication and restricted, repetitive patterns of behavior, interests or activities (APA, 2013). Children with ASD have difficulties in independent performance of everyday tasks (Taylor & Seltzer, 2011) and those difficulties are often related to the diagnosis itself, comorbid conditions and their distinct cognitive profile (Hume, Boyd & Hamm, 2014).

There are many known treatment methods used for ASD, but one that has proven to be successful in treatment of ASD is Applied Behavior Analysis (ABA). One of the ABA procedures that is widely used for increasing independence of children with ASD and teaching them necessary skills is response chaining procedure. Response chaining refers to teaching appropriate behavior and skills by breaking down the tasks into small discrete steps and training in a systematic and precise way (Medavarapu, Marella, Sangem & Kairam, 2019). A task is broken down into its component parts by using task analysis and then teaching each component individually (Slocum & Tiger, 2011). There are three ways to teach a skill by using this procedure and they are total task chaining, forward chaining and backward chaining (Cooper, Heron & Heward, 2007). Total task chaining refers to teaching entire skill and giving the learner support only for challenging steps.

Chaining procedure was proven to be a successful tool in teaching children with ASD different skills required for their independence, such as food preparation (Rehfeldt, et al., 2003; Schuster, Gast, Wolery & Guiltinan, 1988; Taber-Doughty et al., 2011), self-feeding (Hagopian, Farrell & Amari, 1996), internet usage (Jerome, Frantino & Sturmey, 2007), shopping skills (Gulnoza & Taber-Doughty, 2013), performing house chores (Shipley-Benamou, Lutzker & Taubman, 2002), leisure skills (Schleien, Wehman & Kiernan, 1981), or verbal skills (Valentino, Conine, Delfs & Furlow, 2015).

The aim of this study was to teach a child with ASD to tie shoelaces by using a total task chaining procedure.

## MATERIAL AND METHODS

### Sample of participant

This case study focused on a boy diagnosed with ASD. Participant was ten years old at the time of the procedure implementation. The participant receives 10 hours of ABA per week by a licenced RBT (Registered Behavior Technician) and nine hours of ABA by his own mother, after she finished parent training in the area of the participants individualised educational plan (IEP). His IEP consisted of Verbal Behavior Intervention (VBI) following Sundberg's

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*Verbal Behavior Milestones and Assessment protocol* (VB-MAPP, Sundberg, 2008), as well as teaching everyday independence skills following the protocol *Essential for Living* (McGreevy, Fry & Cornwall, 2012, 2014).

Sessions were conducted five times a week in a duration of two hours by a RBT in morning hours and mother performed sessions five times a week for a duration of one hour (on the same days as RBT performed session) in the evening and twice a week for a duration of four hours, on the weekends during the day with every session being two hours long.

Prior to this task being taught this skill, boy never tied his own shoelaces. Parents never tried to teach a child this skill and when going out of the house, the parents tied his shoelaces. When the shoelace would become loose, the child asked the parents to tie it, by pointing finger on it, or by verbaly manding.

**Method of conducting research**

We used total task chaining procedure to teach a child how to tie shoelaces. We divided this skill into 13 steps (*Table 1*).

*Table 1 – Step description*

| Step number | Step description |
|---|---|
| 1 | Straighten white shoelace on the left side of the sneaker and black shoelace on the right side of the sneaker |
| 2 | Cross shoelaces |
| 3 | Lift shoelaces up in the part where they cross, |
| 4 | Put white shoelace through the hole |
| 5 | Pull shoelaces tight |
| 6 | Make a loop with white shoelace |
| 7 | Make a loop with black shoelace |
| 8 | Cross the loops so you make a letter X, with black loop being behind the white one |
| 9 | On the crossing point hold the letter X with your left hand |
| 10 | Pull the black loop through the hole |
| 11 | Take the black loop with your right hand |
| 12 | Take the white loop with your left hand |
| 13 | Pull shoelaces tight |

While teaching task analysis to a child, we used most to least prompting procedure, with the most intrusive prompt being full physical, then partial physical and then gestural prompt. Vocal prompts were never used.

Materials needed for teaching included a sneaker (red shoe) with two different pairs of shoelaces (black and white), as well as participant's sneakers that were white with white shoelaces.

Independence was considered when a participant tied his own shoelaces with 100% success in three consecutive sessions with a therapist in contrived conditions and generalization was performed with 3 different people (therapist, mother and father of a child), as well as in three

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different settings (classroom, at home while sitting at couch and at home while being in the hallway) and with three different shoes that the participant owned.
Generalization sessions included child's independent performance with 100% success three times a day while going out of the house in five consecutive days. If a participant did not demonstrate 100% accuracy, the plan was to complete an additional training session in the training setting.

**Measuring instruments**

Participants' abilities to complete the chained task were probed during baseline by using a multiple-opportunity method (Cooper, Heron & Heward, 1987). Baseline data was taken in three consecutive days in three consecutive attempts and at the beginning of each baseline session, a participant was given the verbal instruction 'Tie your shoelaces' and by calculating the number of steps successfully performed. If the participant did not respond after 3 seconds, the performance was marked as unsuccessful.
The teaching procedure was divided into two phases. Phase one consisted of teaching with using a red sneaker with two different colored shoelaces (white being on the right side of a sneaker and black one being on the left), while phase two included teaching mentioned task analysis with a same sneaker, but with same color shoelaces (both black). Criteria for mastering each phase was independent performance of 100% of the task analysis steps in three consecutive days. Each session included ten repetitions of the task, all performed between different IEP goals. Each of those phases was conducted while the child was sitting at a table with the shoe in front of him and the orientation of the sneaker was the same as if the participant was wearing it.

## RESULTS AND DISCUSSION

During baseline, the child was playing with his own shoelaces in a way of lifting them up and down and after a while asking the therapist to tie them in the same ways as described as he does with his parents, by pointing the finger on shoelaces and verbaly asking the therapist to tie them. The child did not perform any of the steps during baseline on all three sessions, so his mean percentage of success was 0%.
Phase one lasted ten sessions, but after only seven sessions, the child was able to complete the task independently (*Graph 1*). The child had most difficulty with steps number eight, nine and ten (see *Table 1*), so most of the prompted steps during the first seven sessions refered to those three.

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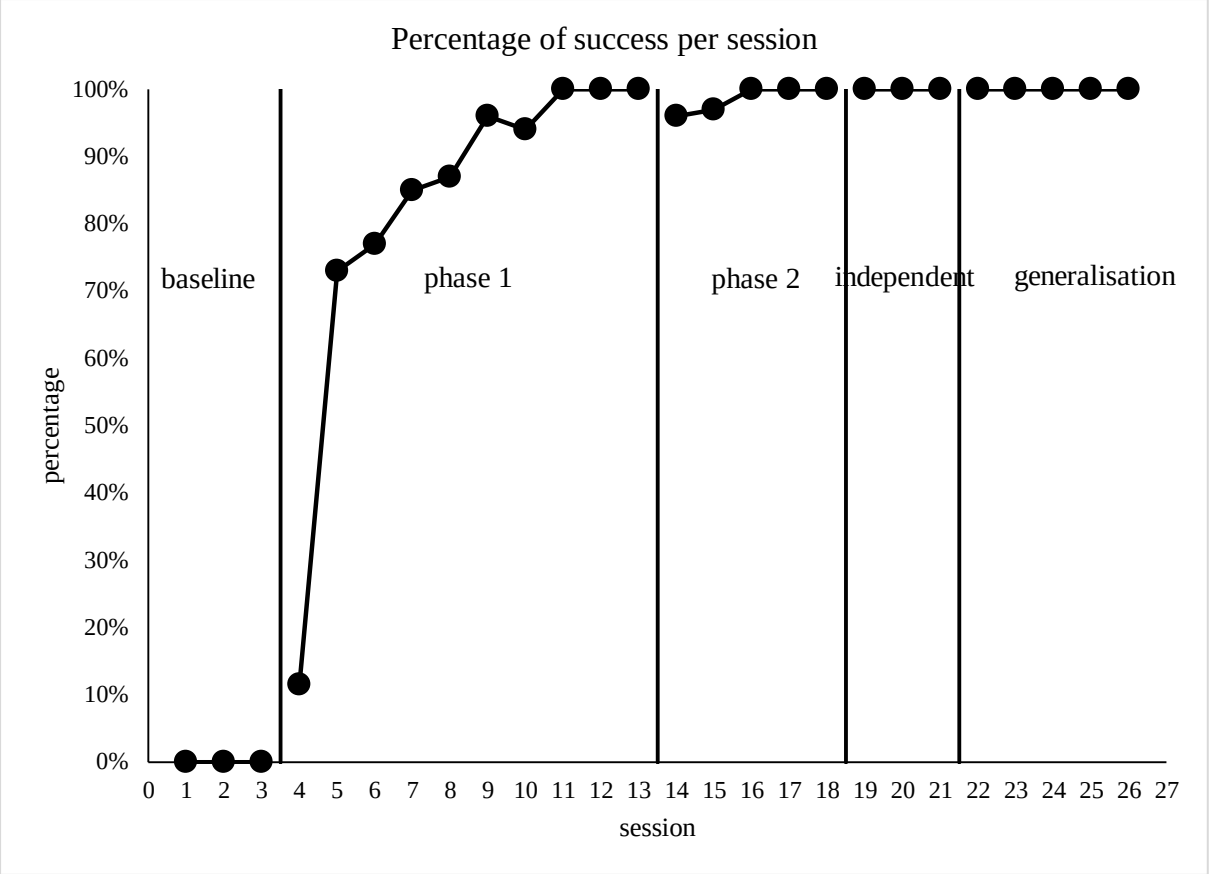


Graph 1 – Percentage of success per session

Phase two lasted only five sessions, with the child mastering it after only two sessions. We believe that the child mastered this phase so quickly, because of so many trials and sessions during phase one, so the skills performance became automatic.

Independent performance of the task occured in three consecutive sessions in contrieved conditions, so we moved on to generalisation probes. The participant had troubles with tying shoelaces on a boot that he owned, because the shoelaces were to short, so we swaped it for another sneaker and he performed successfully. Also, the problem were parents who could not spare enough time for independent performance when the child was going to school in the morning, so one of the generalisation probes included tying shoelaces at home after school, without the child going anywhere afterwards. It is of crucial value that parents should allow children to perform certain tasks independently and not to be too intrusive and parental behaviors in that aspect predict longterm outcomes of children with ASD (Siller, Hutman & Sigman, 2013). Therefore, the parents got suggestions after stating this that the child must tie his shoelaces on his own and to wake him up more early in order to have enough time.

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## CONCLUSION

Total task chaining procedure was proven to be successful as a independence skills teaching tool, as the child mastered this skill in only 15 sessions. These results are particularly significant in light of the demonstration of generalization by the participant, as he will be able to use the skill in present and future. Future research might focus on the efficacy of chaining procedure in teaching different independence skills, as well as with participants with different diagnosis.

Although it was occasionally necessary to prompt parents to conduct the teaching method in their everyday setting and to prompt them to wake up more early in order to have time to allow the participant to tie shoelaces himself prior to going to school, parents stated they found chaining procedure to be effective and implied they would use it more frequently to teach their child some other independence skills, which was listed in his teaching program afterwards. With proper education, the parents can use this method effectively and deliver proper training to their children (Adams et al., 2013; Arora, 2003; Duvall, Ward, Delquari & Greenwood 1997; Ensign, 2000; Kasari et al., 2015; Kidd & Kaczmarek, 2010; Meadan, Ostrosky, Zaghlawan & Yu, 2009; Wetherby et al., 2014), therefore we emphasize the importance of conducting parent trainings in the area of teaching certain procedures used in ABA, because interventions that involve interaction between therapist and a parent can lead to increased competence in parents in performing certain interventions (Arsić, Gajić, Maćešić-Petrović & Bašić, 2021). Also, we emphasize that none of the maintenance probes were needed, since the child continued to tie his own shoelaces daily with success.

The main limitation of this study is lack of interobserver agreement (IOA), which refers to the degree to which two or more independent observers report the same observed values after measuring the same events. This is because the home environment was a dominant setting in teaching a child this skill (fourteen hours in contrast to ten hours in contrived conditions with a therapist) and parents did not make a video recording of each trial. But we emphasize that all therapist sessions were recorded.

In conclusion, chaining procedure appears to be an effective and efficient training procedure for teaching skills that are crucial for independent living, which is one of the main parental concerns if they have a child with any type of diagnosis.

## ACKNOWLEDGEMENTS

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