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Modern technologies and students with dyslexia – opportunities and threats

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The article focuses on the issue of the possibility of using modern technologies in the education and pedagogical therapy of students with developmental dyslexia. The article draws attention to the difficulties experienced by students with developmental dyslexia in contact with modern technologies due to the specificity of their functioning, which consists in the fact that "dyslectic problems do not manifest themselves only within the system of letters, but apply to all the existing systems of signs (symbols) to denote (name, order) the existing reality. This also applies to codes that regulate the use of certain symbols, in other words – dyslexia causes difficulties with the use of symbols and the abstraction and application of rules for the use of these symbols. This may apply both to letters and numbers, as well as music notes, the Morse code, numeric time stamping, etc."

KEY WORDS: new technologies, dyslexia, difficulties

The 21st century can be characterized as the time of media and their presence in the child's life does not raise any doubts nowadays. The analysis of the presence of media in the context of their importance for the child's development has been conducted since the moment of their appearance in the social sphere. The first me-

dium was the radio, which was a focus of attention and a carrier of information, but due to the fact that it did not have images, it has not aroused a great interest of researchers and its impact is not the subject of analyses.

Then television appeared, the importance of which was much greater and which aroused and continues to arouse the interest of those analysing its impact, both in terms of benefits and threats.

Nowadays, ubiquitous digitalization is being observed. The spread of the Internet has contributed to the development of the trend, which consists in the transfer of many areas of life to the "virtual world". The "cyberspace" of the Internet enables its users to engage in many types of activities: exchanging views, accessing scientific information, looking for a job or acquiring knowledge. The phenomenon of moving to "cyberspace" is particularly visible among the younger generation, which cannot imagine living without a computer with Internet access, an iPhone or smartphone with Internet connection and being in constant contact with friends.

It is difficult to determine the age range of people who began the era of new media, otherwise known as the era of "digital natives", but it is assumed that these are people born in the 1980s. The era of "digital natives" is a world in which social media are generally available and widely used. These people are said to be the first population to be born "immersed" in the world of new technologies. Immersion is sometimes defined as "immersion in the content of a medium that causes the loss of sensual contact with the real world"[1].

In 2001, the most frequently quoted work entitled "Digital Natives, Digital Immigrants" appeared,[2] in which the former term referred to young people growing up with new media and the latter referred to people who were forced to adapt to the presence of new

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[1] M. Szpunar, W stronę nowych mediów, Wydawnictwo Adam Marszałek, Toruń 2010, p. 19.

[2] M. Prensky, Digital Natives, Dogital Immigrants, „On the Horizon", 2001, vol. 9, No. 5, pp. 1–6.

media that had emerged and disseminated only at some point in their lives.

In the discourse on new media, the term "technological determinism" appeared, which refers to two areas. Technology, which is defined as: "systematic treatment of science, systematic treatment of grammar and speech, or any set of standardised measures to achieve a preconceived result"[3]. J. Euell also referrers to it as: "all the methods that are attained rationally with absolute effectiveness in every field of human activity"[4]. The second part of the concept is determinism, which is a philosophical concept assuming that phenomena occurring in the world condition each other while remaining in a cause-and-effect relationship. Providing information about the type of impact of technology on behaviour is possible by analysing the cause-effect relationship.

M. McLuhan predicted the emergence of the electronic age, but it is not certain whether he took into account its development in the dimension that is being observed and experienced today, when most people have at least one electronic gadget and communicate in an unlimited way, at a very fast pace. Contemporary technological development is so intense that people are not able to meet these requirements and the need to keep up with changes in the electronic media. Universal access to fast-changing content, the transience of information, the fact that it is quickly outdated, but also the time in which we gain knowledge about events from the most distant parts of the globe make us function in a world that is difficult for many to understand. And for the new, younger generations, although the world is much more understandable, in terms of handling and access to equipment and the rules of use, it is much more difficult to understand everyday life.

Many of the things that used to be difficult or even impossible to reach are now at our fingertips and all we need to do is type one

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[3] B. Siemieniecki, Komunikacja a społeczeństwo, [in:] Pedagogika medialna, Vol. 1, ed. B. Siemieniecki, Wydawnictwo Naukowe PWN, Warsaw 2008, p. 27.

[4] B. Siemieniecki, Komunikacja a społeczeństwo, [in:] Pedagogika medialna, Vol. 1, ed. B. Siemieniecki, Wydawnictwo Naukowe PWN, Warsaw 2008, p. 27.

word in the search engine to get information. Children have access to stimuli and experiences that were previously reserved for extreme situations. For example, in order to feel how it is to lose one's life, one had to find oneself in a very specific situation; today it is enough to switch on a simple game to experience such emotions.

It is impossible to state unequivocally that mass media are bad and contribute to the wrong functioning or development of the child, because they are inextricably linked to the era in which we live today, which means that the child must be prepared to use them and treat them as one of the basic tools in his or her life. This, however, requires maturity, which the child does not have by definition, and which is shaped in the course of its development, and which in turn is determined by the technologies that accompany the child. According to the assumptions of M. McLuhan: "We shape our tools and they shape us" and "the media are the extension of man"[5].

New technologies create new opportunities for working with dyslexic students: they support diagnosis, therapy and correction of disorders. Developmental dyslexia, according to J. Cieszynska's definition, means "difficulties in a linear processing of information: symbolic, temporal, motor, manual and linguistic"[6]. These are students who experience learning difficulties, understood by the European Dyslexia Association (EDA) as "a different way of acquiring reading, writing and spelling skills that is neurobiologically motivated. Cognitive difficulties [...] can also affect planning and counting skills. This can be caused by a combination of difficulties in phonological processing, operating memory, speed of naming, learning organised material in sequences and automation of basic skills"[7]. To cite M. Korendo "additionally, it should be emphasized that dyslexic problems do not manifest themselves only within the system

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[5] E. Griffin, Podstawy komunikacji społecznej, Gdańskie Wydawnictwo Psychologiczne, Gdańsk 2003, pp. 343–353.

[6] J. Cieszyńska, Zaburzenia linearności – podstawowy wymiar trudności w czytaniu i pisaniu, p. 5, http://www.centrummetodykrakowskiej.pl/2,a,do-pobrania.htm [access: 02.07.2018].

[7] Guidebook for parents of children with dyslexia (2013), e-book, p. 15.

of letters, but concern all the existing systems of signs (symbols) used in order to denote (name, order) the existing reality"[8].

Symptoms of developmental dyslexia change with age. In the preschool period, the symptoms appear in the form of delays in the development of visual, auditory-language, motor and lateralisation functions, as well as orientation in the body and space scheme. In the case of older children and adolescents, the problems mainly concern the fluency and understanding of the text, limited vocabulary, difficulties in assimilating the rules of correct writing, reviewing and correcting written texts, problems with planning and organizing their own activities[9].

Organizations associating people with dyslexia offer a variety of devices supporting their functioning. Most often these are: personal computers – laptops, netbooks, palmtops, tablets, hand-held recorders, dictating machines, smartphones, digital cameras, electronic dictionaries and calculators, organizers, scanners and printers of various types[10]. New technologies are an excellent aid, a kind of "cognitive prosthesis", enabling dyslexic students to compensate for their deficits and perform tasks in an alternative way[11].

Problems with reading, such as obligatory school reading can be overcome with audiobooks, smartphone apps, "talking" computers or films. Hypertext or semantic maps can also be used. If the problem is the understanding of content, the Internet may help, where

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[8] M. Korendo, Dysleksja – problem wciąż nieznany, p. 3, http://www.centrum metodykrakowskiej.pl/2,a,do-pobrania.htm [access: 02.07.2018].

[9] M. Bogdanowicz, Specyficzne trudności w czytaniu i pisaniu, [in:] Dysleksja rozwojowa. Perspektywa psychologiczna, ed. G. Krasowicz-Kupis, Wydawnictwo Harmonia, Gdańsk 2006, p. 22.

[10] G. Krasowicz-Kupis, Psychologia dysleksji, Wydawnictwo Naukowe PWN, Warsaw 2008, pp. 210–211.

[11] Cf. R. B. Lewis, Assistive technology and learning disabilities: Today's realities and tomorrow's promises, „Journal of Learning Disabilities" 1998, No. 31, pp. 16–26; M. Crombie, Różnorodność potrzeb edukacyjnych uczniów jako wyzwanie dla nauczyciela kształcenia początkowego [in:] Dysleksja. Teoria i praktyka, ed. G. Reid, J. Wearmouth, Gdańskie Wydawnictwo Psychologiczne, Gdańsk 2008.

one can easily find elaborations which "translate" and explain the most important threads.

The solution to writing problems are text editors (which check grammatical and punctuation correctness), computer dictionaries of synonymous words, editorial aids, software "anticipating" words, or devices "understanding" voice and able to translate it into writing. The user can change the appearance of the text on the screen: font size and type, its colour, brightness and background colour.

Difficulties related to the creation of texts, reluctance to express oneself in writing (writing reports, studies or protocols) can be minimized by using, for example, graphical representations thanks to presentation programs (e.g. PowerPoint, Persuasion). When there is a need to write something down from the blackboard (unfortunately still a common practice in some schools), dyslexic students can take pictures with smartphones. The recipe for counting problems are spread sheets.

Problems with the organisation and planning of activities are supported by electronic timetables and calendars, computer "reminders", scheduling systems or graphic "organisers"[12]. You can arrange a list of things to do according to their importance, mark them in fonts of different colours, and add audio signals.

Programs such as Dropbox and Evernote are also helpful. The first one allows you to edit files shared with other users and automatically update the file on several computers at the same time. The second one allows you to create notes, attach photos, recordings, videos and links to websites. Thanks to this, the student can use the materials in any place with access to a smartphone and the Internet[13].

Disturbances associated with spatial imagination can be compensated for by images e.g. in 3D format, which allow the student not only to see, but often experience reality. For example, they can

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[12] D. Deutsch-Smith, Pedagogika specjalna, Wydawnictwo Akademii Pedagogiki Specjalnej, Warsaw 2009, p. 165.

[13] M. Łockiewicz, K. M. Bogdanowicz, Dysleksja u osób dorosłych, Oficyna Wydawnicza Impuls, Krakow 2013, p. 140.

take virtual walks around the world's largest museums, gaining knowledge about the achievements of mankind. It is also an opportunity to perform experiments, simulations with the use of computer programs, which allow for the understanding, gaining knowledge in a different way, which is particularly important for students with dyslexia, because many of them are not able to master knowledge (even by memory), which they do not understand. For example, it would be difficult to take the children to a nuclear power plant during a chemical class, but by showing them a reactor, not only in the form of a picture, but also during regular operation, would convey the information more strongly than using just text.

Modern technologies are also used in the pedagogical therapy of dyslexic students. Starting from programs introducing children to the world of letters and numbers, through educational games, to utility and information programs. The analysis of educational opportunities offered by the Internet allows us to state that it is a source of knowledge that engages many senses beyond smell and taste. Moreover, it engages the mind and focuses attention during the activity. Searching for specific information requires concentration when typing keywords or copying a link to a website. It can also affect our thinking due to the fact that when we use the Internet we experience alternating focus and distraction of attention, and the latter does not have to be pejorative, as it allows for creative thinking, protects against routine, activates cognitive processes[14].

Computer programs or on-line work on specially designed websites help to improve impaired functions, i.e. language skills, perceptual-motor skills, visual-motor coordination and concentration of attention. Professionally prepared and selected software can fulfil therapeutic and educational functions, meeting individual needs of the student and the therapist's recommendations. The use of a com-

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[14] M. Kozielska, Wpływ Internetu na aktywność mózgu i procesy poznawcze człowieka, [in:] Edukacja a nowe technologie w kulturze, informacji i komunikacji, ed. D. Siemieniecka, Wydawnictwo Naukowe Uniwersytetu im. Mikołaja Kopernika, Toruń 2015, pp. 169-170.

puter makes it possible to repeat and practice a given skill many times, with an appropriate choice of difficulty level. As E. Nowicka and A. Popławska note[15], appropriately selected programmes not only support the acquisition of knowledge – assimilation, repetition of knowledge and acquisition of the ability to apply them in practice, but also require independent thinking and problem solving and stimulate activities based on action, research and discovery. Knowledge is passed on in a very attractive way (rich graphics, special sound effects), which is an additional motivation to perform the tasks.

While the use of new technologies in education, development support or pedagogical therapy for dyslexic students is unquestionable and their advantages are widely appreciated, online pedagogical diagnosis for example is not. From 2005 there have been standards for computer and cyber-based testing, developed and published by the International Testing Commission[16], they do not mention the psychological and pedagogical situation of the study itself. This situation – as described by A. Dzikomska – "does not depend on the way in which the research is conducted, whether it is conducted directly or by telecommunication means, because it is much more important to observe the principles of psychological and pedagogical research"[17].

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[15] Cf. E. Nowicka, Zawartość edukacyjnych programów komputerowych wspierających zajęcia korekcyjno-kompensacyjne [in:] *Dysleksja – problem znany czy nieznany?*, ed. M. Kostka-Szymańska, G. Krasowicz-Kupis, Wydawnictwo Uniwersytetu Marii Curie-Skłodowskiej, Lublin 2007; Popławska A. D., Korzystanie z komputera i Internetu a sytuacja szkolna ucznia [in:] Dziecko i media elektroniczne – nowy wymiar dzieciństwa, ed. J. Izdebska, T. Sosnowski, Trans Humana Wydawnictwo Uniwersyteckie, Białystok 2005.

[16] GUIDELINES OF THE INTERNATIONAL TESTING COMMISSION (ITC), https://www.practest.com.pl/wytyczne-miedzynarodowej-komisji-ds-testow-itc [access: 3.08.2018].

[17] A. Dzikomska, Nowatorska forma diagnozy pedagogicznej dla potrzeb nauczania domowego z wykorzystaniem technologii informatycznej – studium przypadku, (2013), „Наукові записки Національного університету „Острозька академія". Психологія і педагогіка„ 2013, Вип. 24, pp. 140–148.

Many of the programmes for students with dyslexia available on the Polish market, which support the improvement of disturbed functions, at the beginning introduce the so-called competence tests. On the basis of their results, the child's needs and tasks are indicated. This raises many doubts. It should be remembered that the obtained results are generated thanks to an algorithm implemented by the IT specialist and are not the result of evaluation of an experienced diagnostician. Meanwhile, "linking specific categories of errors to a specific disorder of cognitive functions is, in the light of the latest research, unauthorized, as no correlation has been found between deficits of cognitive functions and specific categories of errors"[18]. Besides, as W. Głodowski rightly observes, "one can master computer technology fluently, use the Internet, use the richness of multimedia and information technologies at work, and yet without knowledge of the basic principles of interpersonal communication, the sophisticated technology turns out to be useless. Because someone has to speak, listen, write, watch, formulate their own thoughts and evaluate the thoughts of others. Technology is only an extension of basic human communication skills"[19].

Referring to the findings concerning children's developmental needs, upbringing environments and the tasks they face, it should be noted that new technologies are not able to: participate in satisfying children's needs, build relationships with others, teach the principles of functioning in a group and social roles, etc. Although it should be emphasized that in the social area it is easier to establish contact with other people thanks to the Internet, as language or the ability or possibility to speak is no longer a barrier, which is particularly important for shy people who cannot cope with direct interactions. On the other hand, it can be dangerous as it allows us to abandon the practice of communication skills in direct relations. But

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[18] G. Krasowicz-Kupis G., Dlaczego nie znamy (całej) prawdy o dysleksji – czyli rozważania o metodologii badań, [in:] Diagnoza dysleksji. Najważniejsze problemy, ed. G. Krasowicz-Kupis, Wydawnictwo Harmonia, Gdańsk 2009, p. 65.

[19] W. Głodowski, Komunikowanie interpersonalne, Wydawnictwo Hansa Communication, Warsaw 2006, p. 11.

given that man is a social being and needs the presence of others for proper functioning, this indirect form of contact is much more beneficial than the lack of contact.

Finally, it is worth noting the issues related to the difficulties in using new technologies for people with dyslexia. First of all, the speed of transmission should be mentioned. Nowadays, fast information dominates, assimilated in a very easy way, unfortunately, it also carries a threat in the form of superficial knowledge and may result in the inability to perceive reality in a systematic, linear way, hinder the cause and effectual perception of the changes and processes taking place[20]. For dyslexic students, this may mean a deepening of the already experienced difficulties in this area.

Moreover, the world of new technologies is primarily a world of signs, emoticons and symbols. It often means "reading" between the words, capturing subtle differences and understanding the meanings given to these symbols. Given the difficulties experienced by dyslexic students in remembering signs of similar appearance, it may be difficult for them to transmit and read messages encoded in the form of symbols. It is difficult to associate emoticons with unambiguous equivalents of the names of emotions, events or activities, which can make it difficult for people with dyslexia to receive information. Moreover, the excessive use of the mechanism of using symbols, abbreviated statements and emoticons is in contradiction with attempts to shape their habits of using full, well-structured statements.

Regardless of the views on the benefits and risks of using new technologies, the education of children and young people, as well as adults today, cannot be achieved without their participation. We are an information society, many of the activities we undertake are based on their use. This requires us to know the technologies and devices we use, but also to include them in the education process.

Media in pedagogical therapy have cognitive and educational, emotional and motivational, as well as action and interaction func-

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[20] M. Góralska, Książki, nowe media i ich czasoprzestrzenie, Wydawnictwo SBP Nauka, Dydaktyka, Praktyka, Warsaw 2009, pp. 128–130.

tions [21]. Thanks to new technologies, it is possible to teach children more and in a faster way, which would be very difficult or even impossible without them. Students get to know the world using many senses, which is difficult to grasp and describe formally, but the didactic and therapeutic effects are very visible. The possibility of experiencing the world through many senses at the same time, significantly increases cognitive and developmental capabilities. While using the computer, the student must be active, he/she receives content not only passively, but becomes a part of this process of action.

When using a computer, the child acquires knowledge and skills while playing, which makes learning much more enjoyable and positive than sitting at a desk. The computer is patient, which means that the child can repeat the activities many times without worrying about negative reactions, but at the same time it does not allow the child to go further if the task is not completed. For example, you cannot go to another level of difficulty, or get to know another character if you do not achieve a certain level of proficiency. The tasks awaken imagination, allow to achieve success, students can answer a question by e.g. arranging words, quickly change the answer, and visualization also helps to see the mistake [22]. Although nothing can replace traditional pedagogical therapy, there is no doubt that new technologies provide valuable support in its implementation.

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[21] J. Pielachowski, W. Strykowski, J. Strykowska, Kompetencje nauczyciela szkoły współczesnej, Wydawnictwo eMPi2, Poznań 2007, pp. 60–63.

[22] M. Wojtatowicz, Wykorzystanie tablicy interaktywnej w szkole specjalnej. Część II. Pierwsze kroki przy tablicy, „Szkoła Specjalna" 4/2012, pp. 293–294.

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