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DYSLEXIA AWARENESS AMONG STUDENTS OF MEDICINE

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The article presents the results of a study examining the level of knowledge of students of medicine about dyslexia as dyslexia is a complex disorder that is the object of study and interest of various scientific fields and professions including neurologists, paediatricians, educators, special educators, psychologists. The sampling unit consisted of 129 respondents that were full-time students of Faculty of Medicine of Comenius University in the second year of their university studies. They all reached at least the B1 level of the CEFR scale and were attending a compulsory course "English for Medical Students". Their task was to complete a short questionnaire (11 items) about dyslexia which examined the areas such as the origin of dyslexia, signs of dyslexia and treatment of dyslexia. The study has revealed some surprising outcomes which are further discussed in the article. The article is the outcome of the project VEGA NO.1/0118/20 called Dyslexia as a cognitive-linguistic disorder and its symptoms in developing literacy skills in the mother tongue (Slovak) and a foreign language (English).

***Keywords**: dyslexia, medical students, neurological disorder, reading.*

ОСВЕДОМЛЕННОСТЬ О ДИСЛЕКСИИ СРЕДИ СТУДЕНТОВ МЕДИЦИНСКИХ ВУЗОВ

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В статье представлены результаты исследования уровня знаний студентов медицинских факультетов о дислексии, поскольку дислексия - сложное расстройство, которое является объектом изучения и интереса различных научных областей и профессий, включая неврологов, педиатров, педагогов, специальных педагогов, психологов. Выборку составили 129 респондентов, которые были студентами дневного отделения медицинского факультета Университета Коменского на втором году обучения в университете. Все они достигли как минимум уровня B1 по шкале CEFR и посещали обязательный курс «Английский язык для студентов-медиков». Их задачей было заполнить короткий вопросник (11 пунктов) о дислексии, в котором изучались такие области, как происхождение дислексии, признаки дислексии и лечение дислексии. Исследование показало некоторые удивительные результаты, которые далее обсуждаются в статье. Статья является результатом проекта VEGA NO.1 / 0118/20 под названием Дислексия как когнитивно-лингвистическое расстройство и его симптомы в развитии навыков грамотности на родном (словацком) и иностранном (английском) языках.

***Ключевые слова**: дислексия, студенты-медики, неврологическое расстройство, чтение.*

МЕДИЦИНАЛЫҚ ЖОО СТУДЕНТТЕРІ АРАСЫНДА ДИСЛЕКСИЯ ТУРАЛЫ ХАБАРДАРЛЫҚ

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Мақалада медициналық факультеттер студенттерінің дислексия туралы білім деңгейін зерттеу нәтижелері келтірілген, өйткені дислексия-бұл әртүрлі ғылыми салалар мен кәсіптерді, соның ішінде неврологтардың, педиатрлардың, тәрбиешілердің, арнайы тәрбиешілердің, психологтардың зерттеулері болып табылатын және олардың қызығушылығын тудыратын күрделі ауру. Үлгіні 129 респондент құрады, олар Коменский университетінің медицина факультетінің күндізгі бөлімінің екінші жыл студенттері болды. Олардың барлығы CEFR шкаласы бойынша кем дегенде B1 деңгейіне жетті және "медициналық студенттерге арналған ағылшын тілі" міндетті

курсына қатысты. Олардың міндеті дислексияның шығу тегі, дислексия белгілері және дислексияны емдеу сияқты салаларды зерттеген дислексия туралы қысқаша сауалнаманы (11 бөлім) толтыру болды. Зерттеу мақалада әрі қарай талқыланатын таңғажайып нәтижелерді көрсетті. Мақала Дислексия когнитивті-лингвистикалық бұзылыс ретінде және оның ана (словак) және шет (ағылшын) тілдеріндегі сауаттылық дағдыларын дамытудағы белгілері атты VEGA NO 1 / 0118/20 жобасының нәтижесі болып табылады.

Түйінді сөздер: *дислексия, медициналық студенттер, неврологиялық бұзылулар, оқу.*

1. A brief overview of dyslexia research

Dyslexia as a neurological disorder can be defined and studied from various aspects – neurological, behavioural, cognitive and environmental. International Dyslexia Association [1] presents a very complex definition of dyslexia covering all important aspects that need to be taken into consideration emphasizing that "*Dyslexia is a specific learning disability that is neurobiological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede growth of vocabulary and background knowledge.*" Dyslexia has been the object of the study of various scientific disciplines, including the field of psychology, education, medicine, neurolinguistics and psycholinguistics. The professionals who most often deal with dyslexic children are psychologists, teachers and paediatricians, therefore it is crucial for medical students to be aware of dyslexia so that they are able to identify the symptoms and advise parents to consult a psychologist.

In the past, dyslexia was considered to be mainly a medical problem and was studied by doctors. The first doctor who identified reading and spelling difficulties typical for dyslexia was Adolph Kussmaul who was a German Professor of Medicine. At that time, he viewed dyslexia as word blindness as it was believed that the problems were related to some form of ocular deficit [2. p.770-778]. In 1887, the term dyslexia was used for the first time by Rudolf Berlin who was a German ophthalmologist, however, this term was not widely accepted by researchers until the 1980s [3. p.74; 4. p.336]. In 1891, Dr. Dejerne published his results of his study dealing with reading difficulties of one patient who had suffered from brain trauma. He explained that the patient had problems not only with reading but also with speaking and writing, believing that these difficulties were the result of neurological impairment in his brain that had been caused by the trauma [5. p.400]. The reading difficulties observed in those times were considered to be a medical problem resulting from neurological disorders, however, there was no agreement on how to distinguish different sources and types of the reading difficulties. In 1930s, the term dyslexia started being widely used among educators and dyslexia became one of the objects of study of educational psychology. But as Reeves [4. p.336] emphasizes among the first persons who studied dyslexia from the educational point of view was Sir Francis Galton in 1869 who dealt with the questions of what kind of affect individual differences might have on different learning difficulties.

Dyslexia has been the focus of interest of various scientific disciplines. As it is a neurodevelopmental disorder, it has been the object of research in fields such as neurophysiology, neuropathology, neuropsychology, linguistics and the educational sciences, therefore dyslexia might be considered to be a transdisciplinary topic taking into consideration biological, educational and socio-cultural factors. Moreover, thanks to the development of brain imaging methods, the brain mechanisms involved during reading might be observed and studied. The first doctors who pointed at the fact that dyslexia is of neurological origin were the Scottish ophthalmologist James Hinshelwood and the British physician Pringle Morgan. They noticed that dyslexic children showed similar symptoms which were typical for neurological syndrome of visual word blindness which was firstly referred to by already mentioned Dr. Jules Dejerine, a French neurologist, who observed adults who had undergone damage to the left inferior parieto-occipital region and this resulted in their problems with reading and writing. He suggested that the area in the brain called left angular gyrus might be crucial for processing the images of letters [6. p.197-201]. Hinshelwood [7. p.112] believed that the cause of dyslexia might be the defective development of the same parietal region in the brain which was damaged in adult alexic patients. These speculations were, however, not confirmed until the first pathological examination of a boy who was dyslexic and died from brain haemorrhage which showed that the boy had brain malformations in the cortical gyri of the left inferior parietal region as well as ectopias in the outer cortical layer [8. p.486-502; 9. p.2373-2399]. At the beginning of the 20th century, Dr. Orton, who was an American neurologist, also observed that some children were reversing letters in reading and he started using the term strephosymbolia to refer to this condition. Later, he adopted the term alexia which he used to refer to the children who had problems with reading [10. p.280]. As J. L. Orton explains: *„It was in 1925 that he first called the attention of his medical colleagues in neurology and psychiatry to the fact that many otherwise-normal children have a specific difficulty in learning to read. From that time until his death in 1948, Dr. Orton devoted himself to research and teaching in this field, training other workers and helping many individual children to overcome their language handicaps. In the succeeding years, his ideas have been*

developed in other medical centres and put into practice by many teachers and educators throughout the country." Dr. Orton is mainly known for his lateralization theory of dyslexia. He believed that lateralization of language functions to the left hemisphere was delayed in dyslexic children and because of that learning to read might not develop as it should. On the basis of this theory, a lot of studies in the second half of the 20th century were carried out [11. p.567-589; 12. p.467-473]. As Habib [9. p.2373-2399] explains many of these studies focused on brain asymmetry and cortical asymmetry in dyslexia and three important theories focusing on neurofunctional defects of the dyslexic brain were presented and explored – the phonological processing theory, the visual theory and the temporal processing theory.

Bradley and Bryant [13. p.419-421] noticed that in comparison to mainstream children, dyslexic children are not able to segment words into smaller units before reading age while mainstream children are able to do so. Habib [9] explains that *"one of the most robust discoveries in the domain of cognitive mechanisms leading to dyslexia is the repeated demonstration that the core deficit responsible for impaired learning to read is phonological in nature and has to do with oral language rather than visual perception."* On the other hand, the representatives of the magnosystem theory emphasize that certain errors made by dyslexics are based on visual laws rather than the phonetic ones, for example confusing letters such as b/d and m/n which are visually close letters. Moreover, Valdois et. al. [14. p.31-67] also point at the existence of the visuoattentional dyslexia which occurs when errors made by dyslexics are of purely perceptual impairments. Various research [15. p.111-115; 16. p.215-221] conducted studies which showed that dyslexic children process visual information more slowly. Habib [9. p.2373-2399], however, emphasizes that *"the considerable research effort currently devoted to visual theories of dyslexia may seem disproportionate, since almost all in the field agree that phonological impairment is the crucial phenomenon".* Another hypothesis taking into account the phonological as well as visual deficits is known as the temporal (rate) – processing theory of dyslexia which focused on exploring the dyslexic children's ability to process rapidly changing auditory or visual stimuli. Tallal and Piercy [17. p.182-198] believed that dyslexic children had problems with processing stimuli that includes rapidly changing components.

Nowadays, the neurological research data obtained by neuroimaging studies suggest that reading difficulties of dyslexic people might be explained by the existence of differences in structure and function in the same neural circuits that are engaged by mainstream learners when reading, including the areas of the brain such as left-lateralized temporo-parietal, occipito-temporal, and inferior frontal cortices [18. p.830]. D'Mello and Gabrieli [19. p.798-809] explain that *"individuals with dyslexia show underactivation in the left occipito-temporal cortex or VWFA in response to words or word-like materials and lack the typical functional organization within this region that is associated with increased sensitivity to real words as opposed to false words."* Some neuroimaging studies [20. p.267-276; 21. p.482-494] have identified also differences in the functioning of cerebellum in dyslexic individuals. The cerebellum is connected to temporoparietal and frontal regions which are considered to be significant for phonological processing, verbal working memory, semantics, procedural learning and timing functions. Questions which many experts ask are what are the predictors of dyslexia and how early can dyslexia be identified so that the effective intervention is applied. Neuroimaging studies [22. p.1027-1036; 23. p.937-949] have revealed that the differences in the brain are present in dyslexic children even before they start learning to read. Two approaches are applied when studying the predictors of dyslexia in order to find out which children are supposed be at a higher risk of having dyslexia and thus problems with reading and learning. The first approach focuses on examining neural structure and function in children whose relatives, family members had dyslexia and therefore there is a family history as an indicator of a possible risk of developing dyslexia [24. p.1124-1130]. The second approach focuses on examining the correlates between the children's behaviors and identified "behaviors" associated with later symptoms of dyslexia such as poor phonological awareness [25.p. 308-321]. Various neuroimaging studies even suggest that the brain of children is plastic and can change as a result of remediation and intervention [26. p.295-310; 27. p.411-422]. D'Mello and Gabrieli [19. p.798-809] explain that *"research studies of remediation for individuals with dyslexia typically involve systematic, explicit and intensive instructions in phonological awareness and decoding for a few hours per day over a limited period. These remediation programs can evoke brain plasticity that can be described as normalization (bringing functional and structural patterns closer to what is seen in typical readers) or compensation (altering functional or structural patterns in neural networks that are outside the typical reading networks)."* The data obtained from different neurological studies [28. p.926-933; 26. p.295-310] showed that the brains of children who had undergone target remediation programs indicated increased activation in left-hemisphere temporo-parietal and inferior frontal cortices. These areas typically indicate lower activation in dyslexic individuals. Not only did the activity in these brain regions increase, but the children also improved in reading and skills related to reading such as phonological awareness.

The findings of neurological research can be very beneficial also in education and preparation of remediation programs for dyslexic learners. What, however, should not be forgotten is that there are a lot of factors that need to be taken into consideration such as additional difficulties, the so-called comorbidities, which dyslexic learners might have; bilingualism and also differences between languages regarding the orthographic principles applied in particular languages. Paulesu et al. [18. p.830] explain that the nature of

reading differs between languages depending on the transparency of the language and thus also the organization for reading in the brain differs between the languages. These questions have led to various cross-linguistic studies exploring the differences between reading and learning performance of dyslexic learners in different languages.

The theoretical background and research review pointed at the fact that dyslexia is a complex disorder that is the object of study and interest of various scientific fields and various professions including neurologists, paediatricians, educators, special educators and psychologists. It should, therefore, be a part of knowledge of medical students who are to work with children and come across different problems they may have, including also reading problems that might be connected with various causes from visual problems, or auditory problems to diagnoses such as dyslexia. Therefore we intended to find out how much knowledge about dyslexia medical students in Slovakia have.

2. Purpose of the study

The purpose of the study is to examine the level of knowledge of students of medicine about dyslexia as dyslexia is a complex disorder and is examined from different perspectives as it is explained in the theoretical background. Dyslexia is also one of the topics presented in the textbooks of English for students of medicine [29. p.98-110; 30. p.62-67]. We intended to find out whether the students of medicine are aware of the origin and causes of dyslexia, whether they are able to identify symptoms typical for dyslexia and whether they think that dyslexia might be cured by using medical treatment or special diet. On the basis of these aims, research questions were formulated: Are students of medicine aware of the origin of dyslexia? Are students of medicine able to identify and distinguish typical symptoms of dyslexic children? Do students of medicine consider dyslexia as a disorder which might be cured by using medical treatment or special diet?

3. Methods & sampling unit description

The sampling unit consisted of 129 respondents. No personal information was gathered as it is not relevant for the outcomes of the study. They were full-time students of Faculty of Medicine of Comenius University in their late teens/early twenties in the second year of their university studies. They all reached at least the B1 level of the CEFR scale and attended a compulsory course “English for Medical Students”.

The quantitative research was conducted and a questionnaire was used as a research method. The questionnaire was created in Microsoft Forms which was used as a tool for recording student’s answers. The questionnaire consisted of 11 items from which four were true/false statements and seven of them were multiple choice questions (further specified in the next part). The items were either retrieved from booklet *Dyslexia for Teachers of English as a Foreign Language* [31, p.234-241] (multiple choice questions) or created by the authors of the article (true/false statements). As our respondents were not in-service teachers or future teachers, we selected only those questions and statements which seemed to be the most reliable regarding their future profession – origin, signs and treatment of dyslexia.

4. Results

This section presents the results of the study. The items are in the order and wording they appeared in the questionnaire. The provided options are specified in the text and/or table.

Item no. 1: Dyslexia is about flipping letters and writing them backward.

This was a simple dichotomous statement which examined what respondents think about dyslexia. “True” and “false” were provided as possible answers. Surprisingly, as many as 49 respondents (38 %) chose the option “true”. Only 80 of the respondents (62 %) chose the option “false”. All the respondents provided an answer.

Item no. 2: Which of the statements are true about dyslexia (more correct answers)?

Item no. 2 examined the level of the respondents’ knowledge about dyslexia. There were four statements and the task for the respondents was to tick all the correct answers (it was stated that this item had more correct answers). All the statements and respondents’ answers are recorded in tab. 1.

Tab. 1: Item no. 2

Option		No. of respondents
A	Children born in families with the history of dyslexic difficulties may also have dyslexia.	85
B	Problems caused by dyslexia are limited to difficulties with acquiring literacy.	55
C	Individuals with dyslexia often have problems with sustaining their attention for a long time.	75
D	Individuals with dyslexia often have problems with automatizing new knowledge.	70

This item was quite challenging for the respondents. This was the only item in the questionnaire which had more correct answers than one. Altogether, 285 answers were recorded. The proportion of the recorded answers is visualized in Fig. 1. The highest number of the respondents labelled A (Children born in families with the history of dyslexic difficulties may also have dyslexia) as one of the correct answers. Genetic predisposition of dyslexia seems to be a well-known fact. The rest of the correct answers (C and D) scored a little worse (75 respondents/26 % ticked also C and 70 respondents/25 % ticked also D). However, as many as 55 future doctors (19 %) mistakenly think that problems caused by dyslexia are limited to difficulties with acquiring literacy. This item was very challenging as respondents did not know how many answers were correct and would not be suitable for a bigger research project. However, as we wanted to examine the level of the respondents' knowledge about dyslexia we decided to use also this type of questions – if we provided only one correct option, the respondents' task would be much easier and the result less reliable.

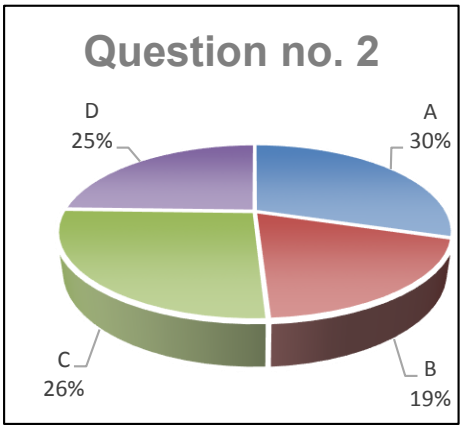

Fig. 1 Graphical representation of respondents' answers for item no. 2.

Item no. 3: Which are potential difficulties experienced by students with dyslexia in taking exams/tests?

This item examined whether the respondents can interconnect their knowledge about dyslexia and their experience from their studies. We asked them which from the offered options can cause potential difficulties experienced by students with dyslexia in taking exams/tests. All the offered options were connected to reading, re-reading and producing a text. All the provided options and respondents' answers are introduced in tab. 2.

Tab. 2: Item no. 3

Option		No. of respondents	%
A	completing all the tasks	6	5
B	answering multiple choice questions	9	7
C	producing extended writing	22	17
D	all of the above	90	71

We recorded 127 answers (2 respondents failed to provide an answer). The positive outcome is that as many as 90 respondents (71 %) answered this tricky item correctly – they labelled D as the correct option. "Producing extended writing" was also labelled as the correct answer many times (22 respondents/17 %), however, this answer is only partially correct for this item.

Item no. 4: Dyslexia can be outgrown.

This was a dichotomous statement which examined whether the respondents know if dyslexia is a lifelong condition. There were only two answers provided – "true" or "false". As many as 51 respondents (40 %) labelled "true" as the correct option; 77 respondents (60 %) chose "false" as the correct option and one respondent provided no answer. However, some students later explained they had not known the meaning of the verb "outgrown" (although the word appears in the textbook of English they study from [29] as one of the words they need to know) and were not sure which option to choose. This could slightly influence the outcomes.

Item no. 5: Which of these statements are true about learners with dyslexia learning a foreign language? The statements started with "They may" and then the students were supposed to decide whether the provided statements about dyslexic learners were true or false (provided answers can be found in tab. 5).

In this item, the respondents were asked about how dyslexia influence learning of a foreign language. They, as fluent users of at least one foreign language (in Slovakia, two foreign languages are compulsorily taught during primary and secondary education), are familiar with obstacles one needs to overcome when learning a foreign language. In this item, we examined if they know signs of dyslexia and realise how they intervene with studying a foreign language. They could choose from four options from which only one was correct (option D). All four options and respondents' answers are listed in tab. 3.

Tab. 3: Item no. 5

	Option	No. of respondents	%
A	find speaking in a foreign language easier than reading and writing	26	20
B	have problems with fast and efficient use of the correct words	7	6
C	have difficulties differentiating between similarly sounding words	14	11
D	all of the above	80	63

According to 80 respondents (63 %), learning a foreign language is influenced by all the stated options. The answers of the rest of the respondents (47 respondents/37 %) were partially correct, however, it is apparent they do not know all the obstacles learners with dyslexia need to overcome when learning a foreign language. Two respondents did not answer the item.

Item no. 6: Which of these is true about signs of dyslexia?

This item also examined the level of knowledge the respondents have about signs of dyslexia. It was intentionally placed after the previous item as the opposite order could influence the answers of the item no. 5. Similarly, the respondents could choose from four options which are listed in tab. 4 and from which only one was correct (option A). The respondents scored as follows:

Tab. 4: Item no. 6

	Option	No. of respondents	%
A	Learners with dyslexia may each display different strengths and weaknesses.	42	33
B	Signs of dyslexia do not change as the learner becomes older.	10	8
C	Spelling difficulties are the main manifestations of dyslexia.	52	42
D	Signs of dyslexia are similar across languages a learner is studying.	21	17

The gathered data shows us that most respondents (52 respondents/ 42 %) think that spelling difficulties are the main manifestations of dyslexia. Surprisingly, as many as 21 respondents (17 %) think that signs of dyslexia are similar across languages a learner is studying although they are aware of the differences among languages. The correct option was identified only by 42 respondents (33 %).

Item no. 7: Dyslexics show more psychopathological symptoms.

This dichotomous item examined what our respondents thought about the connection between dyslexia and psychopathological symptoms. Again, the respondents could choose only “true” or “false” as the correct option. Most of them (87 respondents/68 %) labelled this statement as true. “False” was labelled as the correct option by 41 respondents (32 %). One respondent did not provide an answer.

Item no. 8: Which of these is characteristic of dyslexia?

The eighth item also tested respondents’ general knowledge about dyslexia. Four statements (specified in tab. 5) were provided and their task was to choose the correct option (option B). The following answers were recorded:

Tab. 5: Item no. 8

	Option	No. of respondents	%
A	Dyslexia does not affect learning an additional (foreign/second) language.	18	14
B	If a child finds reading and spelling difficult, he/she does not have to have dyslexia.	76	59
C	Dyslexia can be cured.	31	24
D	Dyslexia disappears in adulthood.	4	3

The recorded results are quite surprising. As many as 31 respondents (24 %) think dyslexia can be cured. And 18 of them (14%) think dyslexia does not affect learning an additional (foreign/second) language. The lack of knowledge about the connection between dyslexia and learning foreign languages was also proved in item no. 6. The positive outcome is that 76 respondents (59 %) know that if a child finds reading and spelling difficult, he/she does not have to have dyslexia. All the respondents provided an answer for this item.

Item no. 9: Specific Learning Difficulties (e. g. dyslexia) affect to a lesser or greater extent:

This item examined whether the respondents know the occurrence of dyslexia. Four answers respondents could choose from were provided. Again, only one answer was correct – option B. All the options and respondents' answers are recorded in tab. 6.

Tab. 6: Item no. 9

Option		No. of respondents	%
A	about 4% of people	28	22
B	about 15% of people	84	65
C	about 25% of people	15	12
D	about 50% of people	1	1

As many as 84 respondents (65 %) identified the correct option, 28 of them (22 %) thought that the occurrence is much smaller and 15 of them (12 %) assumed a little higher occurrence. One of the respondents provided no answer.

Item no. 10: Dyslexic reading difficulties can be reduced by:

Second to last item examined whether future doctors know how dyslexic reading difficulties can be reduced. Again, four options were provided from which only option C (instructional methods) was correct. The four options and respondents' answers are further specified in tab. 7.

Tab. 7: Item no. 10

Option		No. of respondents	%
A	medical treatment	10	8
B	special diet	0	0
C	instructional methods	113	89
D	upgrading the socio-economic status	4	3

It can be concluded that as many as 113 respondents (89 %) knew the correct answer. No respondents chose the option B – special diet. However, 10 respondents (8 %) hoped they could reduce dyslexic reading difficulties by medical treatment. Two respondents were not able to provide an answer.

Item no. 11: More boys than girls are dyslexic.

The last item of the questionnaire explored the common myth – that more boys than girls are dyslexic. These statements about the connection of a sex and dyslexia are quite common and as this item was dichotomous – "true" and "false" answers were provided as the only options to choose from. Most of the respondents (95 respondents/74 %) chose option "true", while 34 of them (26 %) chose the option "false". All respondents provided an answer.

5. Discussion & conclusions

Since the advent of computers and internet in the 1990s, reading has undergone a dramatic transformation. People now read for different reasons, in a different manner, different portions of reading loads and they often read in more languages than before the 1990s. Advanced reading skills thus became increasingly important within two decades and the trend might be growing even more rapidly in the near future [32. p.38]. Many studies dealing with researching reading were published in recent years in Slovakia [e.g. 33. p.207-228; 34. p.161-178; 35. p.117-127] and various research has been carried out dealing with the questions of dyslexia symptoms in different languages [36. p.134-146] , however not many of them dealt with researching of dyslectic readers and the professionals who prepare them for this difficult task. This is the reason why started this project – to find out what level of knowledge the professionals that are directly in contact with dyslexic children posses, what challenges Slovak dyslectic readers have when reading in English and, finally, to educate the professionals and in this way to help the children with dyslexia in Slovakia.

This brief study examined the level of knowledge of young adults during their university studies (future doctors) about dyslexia. We are aware of the limitations of the chosen research method – respondents could have had issues with the items and no one to ask for clarification. Also, the questionnaire has limited usage as it was produced in English language. This could also cause problems to the respondents (although they were fluent in English) as they could have come across some unknown terms and thus might have answered the items incorrectly not because of the lack of knowledge but because of their language proficiency. We do not suppose this occurred in many cases as we compared the language of the questionnaire with the target vocabulary of the textbooks our respondents had studied English from [29. p.306; 30. p.192]. However, a

questionnaire in respondents' mother tongue would eliminate these limitations of the questionnaire and expanded its usage for non-English speaking respondents.

Despite of the limits of the testing instrument, the study provided some interesting outcomes:

- as many as 40 % of future doctors think that dyslexia can be outgrown, 38 % of them agree with the statement that dyslexia is about flipping letters and writing them backward, 68 % are positive that dyslexics show more psychopathological symptoms and according to 74 % of future doctors, more boys than girls are dyslexic;
- surprisingly, 89 % respondents know that instructional methods are crucial for reduction of dyslexic reading difficulties, 65 % of them know the occurrence of dyslexia, and are more or less familiar with the obstacles dyslectic learners need to overcome when studying a foreign language (see items no. 3 and 5), and 59 % of future doctors know that spelling difficulties are not exclusively connected to dyslexia;
- however, future doctors are not very familiar with the symptoms of dyslexia – item no. 2 examined respondents' knowledge of the signs of dyslexia and as many as 19 % of respondents ticked also the incorrect option and mistakenly think that problems caused by dyslexia are limited to difficulties with acquiring literacy (the correct options were ticked by 25 – 30 % of our respondents); item no. 6 caused issues as well – the correct option was not the option selected by the majority of respondents (as many as 42 % of our respondents think that spelling difficulties are the main manifestations of dyslexia; only 33 % of future doctors know correctly that dyslexia, like all conditions, is not homogenous and that people with dyslexia may each display different strengths and weaknesses).

This study examined the level of knowledge of students of medicine about dyslexia as dyslexia is a complex disorder that is the object of study and interest of various scientific fields and various professions including neurologists, paediatricians, educators, special educators and psychologists. We chose students of medicine and examined whether they are aware of the origin of dyslexia, if they are able to identify and distinguish typical symptoms of dyslexic children and what they know about treating dyslexia as a disorder. As the study brought interesting outcomes, we would like to further examine the level of knowledge of professionals that are directly in contact with dyslexic children.

REFERENCES:

1. **International Dyslexia Association. Definition of Dyslexia.** [Online] [7.2.2021] Retrieved from: https://dyslexiaida.org/definition-of-dyslexia/

2. **Kussmaul, A. Diseases of the nervous system and disturbances of speech.** [Text]: H. von Ziemssen (Ed.) Cylopedia of the practice of medicine (pp.770–778). [Text]: New York: William Wood, 1877.

3. **Berlin, R. Eine besondere art der wortblindheit (dyslexia).** [Text]: Berlin: Bergmann, 1887.

4. **Reeves, J. W. Thinking about thinking: Studies in the background of some psychological approaches**. [Text]: London: Routledge, 2016. – 336p.

5. **Dehaene, S. Reading in the brain: The new science of how we read**. [Text]: London: Penguin, 2009. – 400p.

6. **Dejerine J. Sur un cas de cécité verbale avec agraphie, suivi d'autopsie**. [Text]: Mém Soc Biol, 1891;3: 197–201.

7. **Hinshelwood J. Congenital word-blindness**. [Text]: London: Lewis, 1917.

8. **Drake, W. E. Clinical and pathological findings in a child with a developmental learning disability**. [Text]: Journal of Learning Disabilities,1968; 1: 486–502p.

9. **Habbib, M. The neurological basis of developmental dyslexia: An overview and working hypothesis**. [Text]: Brain, Vol.123, 2000. – 2373-2399p.

10. **Orton, S. T. Wordblindness in School Children and Other Papers on Strephosymbolia :(specific Language Disability-dyslexia) 1925-1946 (No. 2)**. [Text]: Maryland: Orton Society, 1966. – 280p.

11. **Obrzut, J. E. Deficient lateralization in learning-disabled children: developmental lag or abnormal cerebral organization?** In: Molfese DL, Segalowitz SJ, editors. Brain lateralization in children: developmental implications. [Text]:New York: Guilford Press; 1988. 567–89p.

12. **Harel, S.; Nachson, I. Dichotic listening to temporal tonal stimuli by good and poor readers.** [Text]: Perceptual and Motor Skills,1997; 84. 467–73p.

13. **Bradley, L.; Bryant, P. E. Categorizing sounds and learning to read – a causal connection**. [Text]: Nature, 1983; 301. 419–21p.

14. **Valdois, S.; Gérard. C.; Vanault, P.; Dugas, M. Peripheral developmental dyslexia: a visual attentional account?** [Text]: Cognitive Neuropsychology, 1995; 12. 31–67p.

15. **Lovegrove, W.J; Heddle, M.; Slaghuis, W. Reading disability: spatial frequency specific deficits in visual information store.** [Text]: Neuropsychologia,1980;18. 111–5p.

16. **Martin, F.; Lovegrove, W. Flicker contrast sensitivity in normal and specifically disabled readers.** [Text]: Perception, 1987, 16. 215-21p.

17. **Tallal, P**. **Auditory temporal perception, phonics, and reading disabilities in children.** [Text]: Brain and Language, 1980, 9(2). 182–198p.

18. **Paulesu, E.; Danelli, L.; Berlingeri, M**. **Reading the dyslexic brain: Multiple dysfunctional routes revealed by a newmeta-analysis of PET and fMRI activation studies.** [Text]: Frontiersin Human Neuroscience, 2014, 8. 830p.

19. **D'Mello, A.; Gabrieli, J. D. E. Structural and Functional Brain Bases of Dyslexia**. [Text]: Language, Speech, and Hearing Services in Schools, 2018, Vol. 49. 798-809p.

20. **Stoodley, C. J.; Stein, J. F**. **Cerebellar function in developmental dyslexia**. [Text]: Cerebellum, 2013, 12(2). 267–276p.

21. **Eckert, M. A.; Leonard, C. M.; Richards, T. L.; Aylward, E. H.; Thomson, J.; Berninger, V. W**. **Anatomical correlates of dyslexia: Frontal and cerebellar findings**. [Text]: Brain, 2003, 126(2). 482–494p.

22. **Langer, N.; Peysakhovich, B.; Zuk, J.; Drottar, M.; Sliva, D. D.; Smith, S. White matter alterations ininfants at risk for developmental dyslexia.** [Text]: Cerebral Cortex, 2017, 27(2), 1027–1036p.

23. **van Viersen, S.; de Bree, E. H.; Verdam, M.; Krikhaar, E.; Maassen,B.; van der Leij, A.; de Jong, P. F. Delayed early vocabulary development in children at family risk of dyslexia**. [Text]: Journal of Speech, Language, and Hearing Research, 2017, 60(4). 937–949p.

24. **Friend, A.; DeFries, J. C.; Olson, R. K.** (2008). **Parental education moderates genetic influences on reading disability**. [Text]: Psychological Science, 2008, 19(11). 1124–1130p.

25. **Torppa, M.; Lyytinen, P.; Erskine, J.; Eklund, K.; Lyytinen, H. Language development, literacy skills, and predictive connections to reading in Finnish children with and without familial risk for dyslexia**. [Text]: Journal of Learning Disabilities, 2010, 43(4),308–321p.

26. **Gaab, N.; Gabrieli, J. D. E.; Deutsch, G. K.; Tallal, P.**; **Temple, E. Neural correlates of rapid auditory processing are disrupted in children with developmental dyslexia and ameliorated with training: An fMRI study**. [Text]: Restorative Neurologyand Neuroscience, 2007, 25(3–4). 295–310p.

27. **Eden, G. F.; Jones, K. M.; Cappell, K.; Gareau, L.; Wood, F. B.; Zeffiro, T. A.; Flowers, D. L.** (2004). **Neural changes following remediation in adult developmental dyslexia**. [Text]: Neuron, 2004, 44(3). 411–422p.

28. **Shaywitz, B. A.; Shaywitz, S. E.; Blachman, B. A.; Pugh, K. R.; Fulbright, R. K.; Skudlarski, P.;Gore, J. C. Development of left occipitotemporal systems for skilled reading in children after a phonologically-based intervention.** [Text]: Biological Psychiatry, 2004, 55(9), 926–933p.

29. **Bábelová, J.; Friedová, L. New English for Medical Students**. [Text]: Bratislava: Comenius University, Faculty of Medicine (4th edition), 2017. - 306p.

30. **Bábelová, J.; Hromadová, K. Video in English for Medical Students**. [Text]: Bratislava: Comenius University, Faculty of Medicine, 2020. - 192p.

31. **Nijakowska, J.; Kormos, J.; Hanušová, S.; Jaroszewicz, B.; Kálmos, B.; Imréné Sarkadi, A.; Smith, A. M.; Szymanska-Czaplak, E.; Vojtková, N.; Alexiou, T.; Košák Babuder, M.; Mattheoudakis, M.; Pižorn, K. Dyslexia for Teachers of English as a Foreign Language.** [Text]: Lodz: University of Lodz, Faculty of Philology, 2013. - 251p.

32. **Javorčíková, J.; Kováč, S.; Šipošová, M. New aspects of literary literacy: the need for defining a "professional reader".** [Text]: Studies in foreign language education, 2020,12(1), pp. 37-56.

33. **Javorčíková, J.; Kováč, S. Aktuálny stav výskumu čitateľskej gramotnosti skúsených používateľov anglického jazyka na Slovensku**. [Text]: Jazykovedné, literárnovedné a didaktické kolokvium, 2020, L-7, pp. 207-228.

34. **Javorčíková, J., Vajdičková, R. Becoming a bookworm: social, cultural and educational hurdles to reading literacy and motivation to read**. [Text]: Radomskie studia filologiczne, 2017, *5*(1), pp. 161-178.

35. **Hankerová, K., Kováč, S. Vývin metód čítania a ich efektívnosť vo výučbe čítania dyslektických žiakov so zameraním na čítanie v anglickom jazyku.** [Text]: Aplikované jazyky v univerzitnom kontexte 7, 2020, pp. 117-127.

36. **Mikulajová, M. 2019. MABEL – multijazyková batéria testov ranej gramotnosti založená na dôkazoch**. [Text]: Psychológia a patopsychológia dieťaťa, 53(2), pp.134-146.

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