

Eötvös Loránd Tudományegyetem
Bölcsészettudományi Kar
Angol-Amerikai Intézet
Angol Alkalmazott Nyelvészeti Tanszék

Teaching English to a dyslexic student: A case study

Szerző:

Szakács Eszter

anglisztika szak, MA, II. évfolyam

Konzulens:

Dr. Albert Ágnes

egyetemi adjunktus

Budapest, 2023

1. Introduction	3
2. Literature review	4
2.1 Dyslexia	4
2.2 Working memory	5
2.3 Working memory test	6
3. Method	7
3.1 Participants	8
3.2 Instruments	8
4. Results and discussion	13
5. Conclusion	22
References	24
Appendix	27
Hungarian summary – Magyar nyelvű összefoglaló	29

1. Introduction

Dyslexia is a lifelong difficulty, which does not only affect children but adults as well. That is why almost all the teachers need to deal with students who display learning difficulties. For students, learning to read and write is crucial in order to have a normal life in most societies. According to the Giofrè et.al., 15% of children are affected by dyslexia worldwide (2019). They not only struggle in learning their mother tongues, but also have hardships learning a foreign language (Crombie, 2000; Kormos et al., 2009). That is why almost all the teachers need to deal with students who display learning difficulties. For this reason, the aim of this study was to provide an insight into the case of an adult English language learner who has dyslexia.

There are several individual difference (ID) factors that can influence successful language learning, and this is true for non-dyslexic and dyslexic learners as well. These can be grouped into cognitive, affective and personality-related differences (Gardner, 1985). The most important cognitive factors are intelligence, aptitude and working memory capacity. Affective factors can include motivation, anxiety and confidence, while personality-related factors involve openness or emotions (Kormos & Sáfár, 2008). Although it is easy to see that all these factors interact when learning a foreign language, most studies choose to focus on one of these aspects only and ignore others while examining the process of language learning. This necessarily leads to a distorted and oversimplified view of language learning. I think that by using the case study approach, a more faithful representation of the language learning process can be portrayed. Therefore, this research aimed to investigate the case of a dyslexic language learner who was attempting to learn English with the help of dyslexia-friendly tasks. While trying to attend to a range of possible ID factors, the main emphasis in the study was put on working memory capacity and whether it influences language learning in this particular participant's case. In the past two decades, working memory has been extensively researched and various models have been proposed. Most of these concentrate on vocabulary learning and verbal working memory in the field of applied linguistics (Service and Kohonen, 1995; Masoura and Gathercole, 2005). The majority of the participants of these studies were children or university students, and there is a gap in researching adult foreign language learner's working memory, especially those who grew up with learning difficulties. The goal of this research is to address this issue by presenting the case of a dyslexic language learner struggling with working memory deficits and showing how through the use of dyslexia-friendly tasks his English language learning might be supported.

2. Literature review

2.1 Dyslexia

The concept of dyslexia is complex, and there have been several definitions proposed so far. It affects an individual's performance in reading, spelling, and writing (Handler & Fierston, 2011). However, defining its characteristics can be a challenge and there are several approaches to explaining its nature (Juhász, Juhász & Magnuczné Godó, 2020).

The most widely accepted definition is by the International Dyslexia Association (IDA), which takes several aspects and influencing factors into consideration and was based on research results:

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 (“Definition of Dyslexia”, n.d.)

Even though this definition is one the most influential ones, it could be improved. Kormos and Smith (2012) rather calls dyslexia a difference in learning than a disability because specific reading disability (SRD) is a name for another learning difficulty. Nijakowska also makes clear distinctions between dyslexia and other reading related problems and suggests that these concepts should not be used interchangeably (2010).

Another widespread definition has been proposed by the British Dyslexia Association (BDA):

Dyslexia is a learning difficulty that primarily affects the skills involved in accurate and fluent word reading and spelling. Characteristic features of dyslexia are difficulties in phonological awareness, verbal memory and verbal processing speed. Dyslexia occurs across the range of intellectual abilities. It is best thought of as a continuum, not a distinct category, and there are no clear cut-off points. Co-occurring

difficulties may be seen in aspects of language, motor co-ordination, mental calculation, concentration and personal organisation, but these are not, by themselves, markers of dyslexia. A good indication of the severity and persistence of dyslexic difficulties can be gained by examining how the individual responds or has responded to well-founded intervention. (Rose, 2009 adopted by BDA)

This definition further points out that dyslexic individuals can also display hearing and visual processing difficulties. Also, every dyslexic individual is different and has different manifestations of this learning difficulty. One individual might have good problem-solving skills, while another has creative skills. This definition calls dyslexia a difficulty, which is a more benevolent name than the one used by the IDA.

As mentioned by the definitions above (“Definition of Dyslexia”, n.d. & Rose, 2009), dyslexic students can have phonological processing difficulties and cognitive/memory problems. In some cases, these problems are not evident at school and can manifest themselves in many forms. There are environmental contributing factors as well: the orthography of the language learnt, whether it is the mother tongue or a foreign language, or the classroom instruction given.

The severeness of these difficulties can also depend on the orthography of the language the student is learning. The Hungarian language has a rather transparent phoneme-to-grapheme relationship (Gyarmathy & Vassné Kovács, 2004). English, on the other hand, is opaque with not so clear relations between the written and the spoken forms of the words. English orthography can affect dyslexic students’ fluency, phonemic awareness, can contribute to spelling mistakes, and cause hardships learning vocabulary (Frost, 2005; Spencer, 2007). Moreover, dyslexic individuals can have problems with working memory and concentration as well (Kormos & Smith, 2012). Combined with the problems rooted in the orthography, it can make learning even more difficult. That is why learning English for Hungarian dyslexic students proves to be particularly demanding.

2.2 Working memory

Since dyslexia is frequently associated with memory problems as it was cited above (Kormos & Smith, 2012), it is crucial to understand its components, mechanisms and functions. Human memory can be divided into two categories: long-term (LTM) and working

memory (WM). Long-term memory is sub-divided into declarative and procedural memory. These refer to the storage of fact, concepts, habits and skills a person learnt during life (Ullman, 2004). Declarative memory stores facts and concepts, while procedural memory is the storage place of motor skills and habits (Kormos & Smith, 2012). Working memory, on the other hand, is an information processing site as well as a gateway for information to be passed further to long-term memory.

There have been several WM models proposed. The most widely accepted framework is by Baddeley and Hitch (1974), according to which it is not only a storage for information but also a place for manipulating and processing information. It has a limited storage capacity and if the information does not pass on to the long-term memory, it will fade away after a few seconds (Baddeley, 1986). It is crucial to mention that the memory does not have a fixed part in the brain, but it forms a part of a network that processes information.

WM is a multi-component system, which consists of the central executive, the phonological loop, and the visuo-spatial sketchpad, according to Baddeley's model. The central executive has a key role. Although its capacity is limited, it is responsible for numerous functions, such as directing information, manipulating attention, or retrieving information from long-term memory (Baddeley, 2001). The visuo-spatial sketchpad processes information connected to seeing, and it is not yet a well-researched area in connection with language learning unlike the phonological loop, which is responsible for retaining and manipulating speech, and is an extensively researched component. It holds information and rehearses it in real-time subvocally until this information vanishes (Kormos & Smith, 2012).

The central executive can be a key component in successful language learning, but only a few studies showcase its contribution to effective learning (Kovács, 2009). For example, Kormos and Sáfár (2008) compared phonological short-term memory and working memory in a foreign language context. They found that the results of the backward digit span test have a strong correlation to achievement in language learning.

2.3 Working memory test

The components of the working memory have been proved to have a strong connection with language learning, especially with how fast students learn and how they develop their reading skills (Racsmány et. al., 2005). The phonological loop is mostly measured by digit span test, number and letter sequencing test, and non-word test. The central

executive is mostly assessed by backward digit span test, Hayling-test, and reading and hearing span tasks. The visuo-spatial sketchpad can be measured by Corsi-test. Although deficits in WM have a major impact on reading, it cannot be said that dyslexia and WM problems are closely associated in every dyslexic individual. According to Mohai and Szabó (2014) weak measurements on the backward digit span test can imply learning difficulties, like dyslexia or dyscalculia. That is why measuring WM is crucial when examining learners with difficulties. However, it is important to keep in mind that the achievement problems of learners can be attributed to other factors as well.

2.4 ENGaGE

More and more training programs are available for dyslexic individuals online, but they are not widespread in Hungary. Kormos and her colleagues initiated an online taskbank for dyslexic English and German language learners, which aims to facilitate the language development of dyslexic individuals (<http://engage.uni-miskolc.hu>). Despite the task bank being primarily designed for children between 4th-8th grades, it was adopted for an adult language course and used as a base for compiling language materials for the sake of this research.

Mixed-ability classes pose a challenge to teachers. This ENGaGE task bank was designed to well fit into these mixed-ability classes, making it easier for the teachers to adapt the speed, methods and content of the language lessons for dyslexic students. Thus, providing equal chances in education and an adequate learning environment. Not to mention, that teachers can learn new ways to address the needs of dyslexic students (Juhász, Juhász, Magnuczné Godó, 2020).

The main goals of ENGaGE are to cater for the needs of dyslexic students who are integrated into mixed-ability classes, to encourage group work and collaborative tasks, to develop empathy towards students who learn differently or slowly, and also to foster autonomy and self-study (Juhász, Juhász, Magnuczné Godó, 2020).

3. Method

This part of the paper outlines the case study, and defines the case first of all. This is a case study of a language learner who was given the pseudonym Ádám, and the objective of the study was to explore the ways this particular language learner was trying to learn English

with my help as his English tutor, utilising dyslexia-friendly tasks from the the ENGaGE task bank, developed particularly for dyslexic learners. Therefore, the following research questions have been formulated:

- 1) What kinds of problems are faced by Ádám, a dyslexic university student while learning English as a foreign language? Does he also need to tackle working memory problems while learning English?
- 2) In what ways can dyslexia-friendly tasks be utilised in Ádám's process of learning English?

The data were collected qualitatively and quantitatively to answer these questions and to gain a more profound understanding of the case. The method was realised in the form of the case study with the dyslexic student, including two interviews, an official opinion of a pedagogical institution, the researcher's notes, teaching methods, and WM tests.

3.1 Participants

One participant took part in the case study, who was given the pseudonym Ádám. He is a Hungarian university student at a Hungarian university. He is studying Sport and Recreation Management and Health Promotion. He is 24 years old now and he was diagnosed with dyslexia at the age of 17. In secondary school, he studied English as part of the curriculum, but he had no assessment in the last two years, only participation was compulsory for him. He went to an art school and had high achievements in sport. He is very creative and has remarkable problem-solving skills. However, learning and getting good grades have always been his biggest struggle.

This study helped to understand the unique situation of a dyslexic adult and how he engaged in the foreign language learning process. The case study lasted for eight months during which the researcher conducted 90-minute classes with the student every week. Sometimes, the lessons lasted for 60 minutes, when he felt a little bit tired. The material of the lessons was based on the ENGaGE task bank.

3.2 Instruments

Researcher's notes

The researcher took notes on the progress and development of the participant during the English classes. These notes include the mistakes Ádám made – both oral and written – and all the scores he achieved on the ENGaGE tasks.

ENGaGE Task Bank

ENGaGE is a thematically organised digital task bank (ENGaGE, 2017). It was created for English and German language teachers to provide them with dyslexia friendly teaching materials and resources that cater for the needs of dyslexic learners. It has more than ten types of tasks, all of which is based on multisensory learning – including games, video recordings, and pictures (“Project”, n.d.). The task bank cannot only be used by teachers as a resource material, but also by children for self studying.

There are altogether four CEFR levels (A1–, A1+, A2– and A2+). Each level has eight modules based on topics, such as family, friends, places, school, clothes, holidays and food (<http://engage.uni-miskolc.hu/index.php/self-studycourse/>). During the English course, level A1– was finished. The modules have 5 lessons and a flashcard revision lesson, which help keep track of the learning process. The first lesson is a warm-up, a lead-in to the topic. Spelling and phonics exercises are included in this lesson, sometimes even memory games. The following lessons include a great variety of exercises, such as matching words and pictures or spelling exercises, pronunciation practices, gap-filling or sentence making (*Figure*

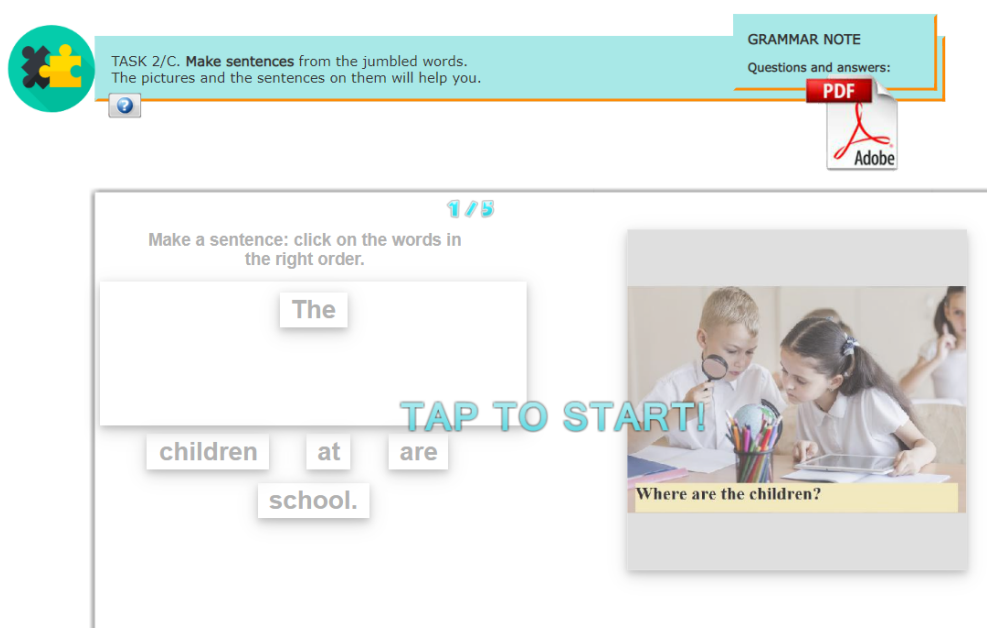
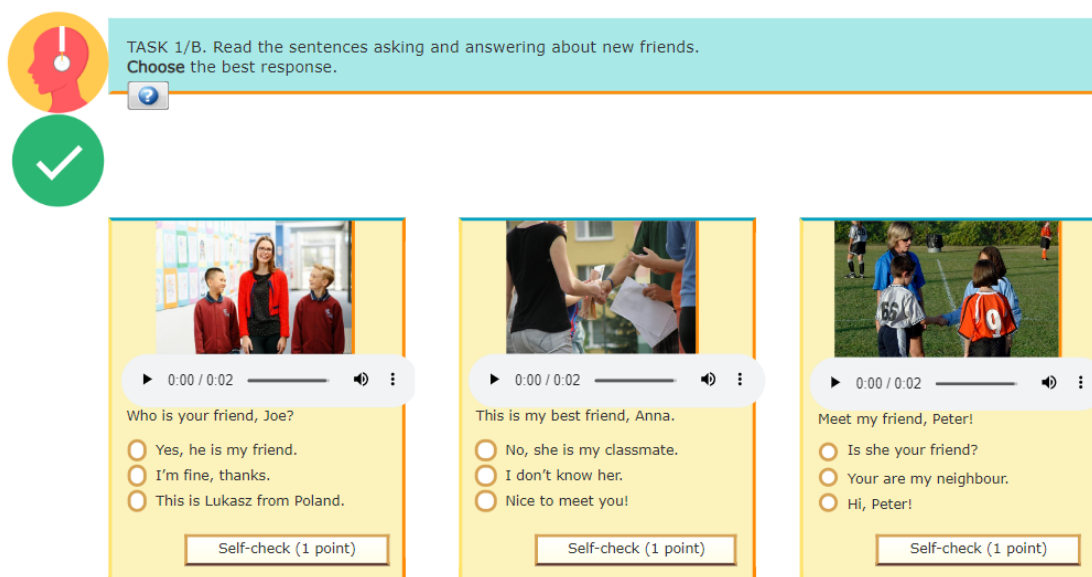


Figure 1. Make sentences exercise.

(http://screenager.hu/html5/page.php?kid1=t_d9926f6b91ad2c_07e90af88114f6&kid2=t_d9926f6b91ad2c)

1). Students can practise the spelling and the pronunciation of the words as well. A lot of videos and audio recordings are included in the tasks (see *Figure 2*).



The screenshot displays a language learning interface. At the top left, there is a red icon of a head with an exclamation mark and a green circular icon with a white checkmark. To the right, a light blue box contains the text: "TASK 1/B. Read the sentences asking and answering about new friends. Choose the best response." Below this, there are three video player thumbnails. Each thumbnail shows a video scene and a set of multiple-choice questions. The first video shows a woman talking to two boys in a hallway. The second video shows a woman talking to a girl in a classroom. The third video shows a woman talking to a boy in a park. Each video player has a progress bar and a "Self-check (1 point)" button.

TASK 1/B. Read the sentences asking and answering about new friends. Choose the best response.

Who is your friend, Joe?

- ☐ Yes, he is my friend.
- ☐ I'm fine, thanks.
- ☐ This is Lukasz from Poland.

Self-check (1 point)

This is my best friend, Anna.

- ☐ No, she is my classmate.
- ☐ I don't know her.
- ☐ Nice to meet you!

Self-check (1 point)

Meet my friend, Peter!

- ☐ Is she your friend?
- ☐ Your are my neighbour.
- ☐ Hi, Peter!

Self-check (1 point)

Figure 2. Exercise with audio recordings

(http://screenager.hu/html5/page.php?kid1=t_d9926f6b91ad2c_1a474117527f60&kid2=t_d9926f6b91ad2c)

These can provide a fun way of learning the basic phonics. The tasks facilitate developing all four skills equally. At the end of lesson 2 or 3 there is a short writing exercise as well. This part proves to be the most challenging for the learners (Juhász, Juhász, Magnuczne Godó, 2020). Overall, the tasks rely more on visual memory and listening than on writing and reading. Lesson 4, the Projects Lesson, is based on creative skills and interaction with other learners. Tasks include making a poster, recording a video, making a presentation or writing a blog. This part was excluded from this research because the projects were not suitable for an adult in a one-to-one course. Lesson 5 and 6 provide further practice and revision. There is a set of flashcards (see *Figure 3*) to help learners recall their knowledge.

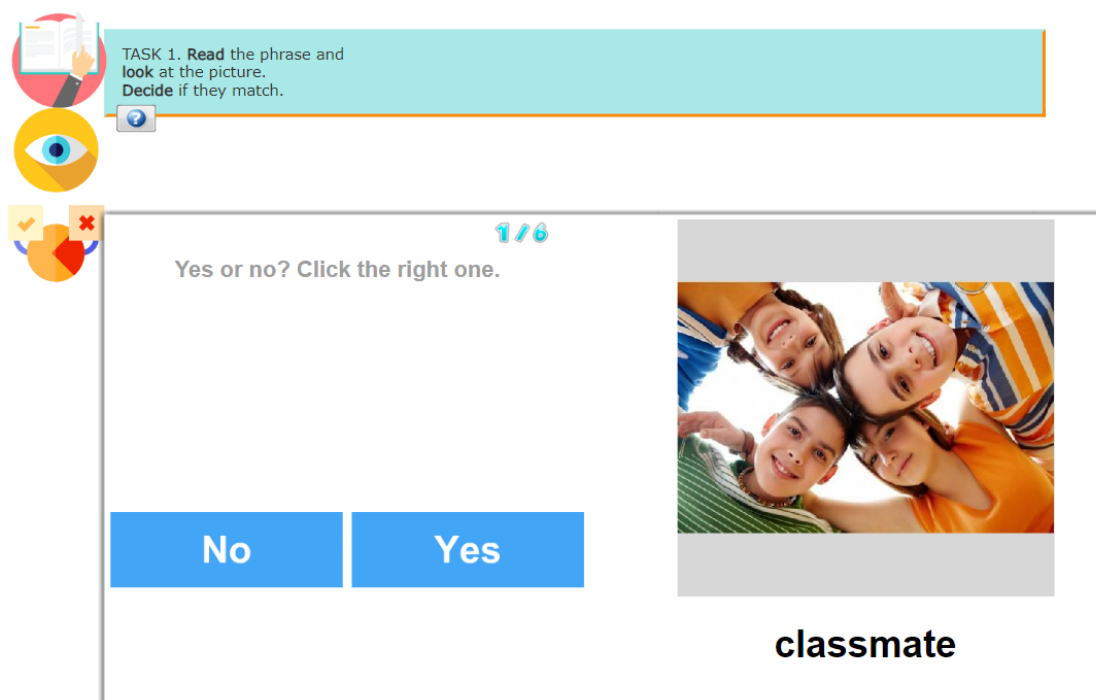


Figure 3. Flashcards

(http://screenager.hu/html5/page.php?kid1=t_d9926f6b91ad2c_de6073a8f6d9d2&kid2=t_d9926f6b91ad2c)

All the tasks are accompanied by clear instructions and function symbols to better understand the type of task (reading, writing, matching, choosing). After each task, the learners can check their own answers and receive points for the tasks. At the end of the lesson, a final summary is included. However, some tasks are not worth points but intended to be done until perfection, for example the flashcards with pronunciation practice. The results of the tasks were collected and summarised.

Official opinion of a pedagogical institution

In order to gain an in-depth understanding of the case of this language learner, official documents were obtained from the participant, including an official opinion of a pedagogical and psychological institution. He was diagnosed at a later age; however, he had been examined by this institution several times before.

Interviews

Two semi-structured interviews were also carried out. It concentrated on the problems Ádám faced in school and faces now at university. The interviews also revealed how Ádám figured out ways to learn more effectively without any professional help. We got to know his

attitude towards learning languages and his views on exemptions and assessments in school. He reported on his family background and how it sometimes hindered or supported his learning.

WM tests

Furthermore, two WM tests were conducted. One at the beginning of the English course and one at the end. Three tests from the “MAMUT – magyar munkamemória-teszt” (Hungarian Working Memory Test) was used for collecting data. Two tests measured different functions of the central executive: backward digit span test and Hayling-test. The third, non-word test, measured the capacity of the phonological loop.

The backward digit span test measures one of the functions of the central executive: the storing and processing of verbal information. The results of this test can tell how effectively this function works. During the test, the participant hears digits and has to remember them and repeat them backwards. The length of the digit sequence increases gradually and it becomes harder to memorise. There are 36 sequences and the longest one consists of 10 digits (Kovács, 2014).

The Hayling test: is another test for measuring the central executive. It tells how effectively the participant can retain and activate information from the long-term memory. This functioning also depends on the ability of inhibiting irrelevant information. Deactivating irrelevant information is crucial for retrieving information from the long-term memory (Fournier, Larigauderie & Goanac'h, 2004; Rosen & Engle, 1998). This test has two parts: the first one measures the time needed for activating the information, and the second part calculates the time required for inhibiting an automatic answer and finding another, random answer. The participant hears an unfinished sentence and has to finish it with a word so that it makes sense. In the next part, the participant hears grammatically similar but semantically different sentences and has to finish them with a word that does not fit or make sense.

The non-word test is a Hungarian adaptation of Speciale, Ellis és Bywater' (2004) test. It measures the efficacy of the phonological loop, that is a short term storage and reproduction of verbal information. In this test, the participant has to repeat a word that is unknown to them, and in order to ensure this, these tests utilise nonsense words that do not exist in the given language, but follow the phonotactic rules of that language. According to Hulme, Maugham, and Brown (1991) nonword test is the best way to test the phonological loop since the successful retention of known words does not only depend on the capacity of the loop but

also on lexical knowledge stored in the long-term memory. For retaining an unknown word, long-term memory is not needed, therefore, the test only measures the function of the WM (Kovács, 2014). The test consists of 32 items, from one-syllable up to eight-syllable items. There are no consonant clusters and most of the items start and end with a consonant, so they follow this format: CVC. As Mohai and Szabó (2014) point out, weak performance on the non-word test can be linked to problems of phonological decoding in reading and spelling and to problems of repeating certain sounds.

4. Results and discussion

The following part is going to elaborate more on the findings from these instruments: official opinion, interview, and researcher's notes on the classes and WM tests.

Official Opinion of a Pedagogical and Psychological Institution

Ádám almost finished secondary education when he got diagnosed with dyslexia. He had not received any special education or training before his diagnosis, nor after it. According to this opinion, now it is too late to implement any special education or training for him in school. They acknowledged that he needs intensive support to develop his partial skills in order to be successful in higher education.

According to the opinion of the pedagogical institution, he makes many orthographic mistakes. His reading is slow, and he usually reads the sentence silently first, then reads it out loud. He also displayed severe reading and comprehension problems. Moreover, he has a high level of anxiety when he has to perform, and he struggles with maintaining his concentration.

The institution also offered some suggestions for improvement. He needs a special teacher to help him improve. He needs to be familiarised with learning methodologies and find what suits him best. From the last year of secondary school, he got exempted from assessment in Hungarian Grammar and Literature and foreign languages. Also, he was advised to take only the oral part of the school leaving exams.

Interview findings

In the interviews with Ádám, the above-mentioned claims were supported. He also said that his difficulties could have been observed from a young age, since he could not concentrate on the activities as much as his peers. He learnt to read and write more slowly than his classmates, but it did not bother his teacher and it was disregarded.

During the course of the two interviews, the following topics were covered: recognising the first signs of being dyslexic, the different forms of manifestation of dyslexia and their impact on his personal life, obtaining exemption from writing tests in primary and secondary schools and higher education, receiving help from teachers, figuring out how he can learn more effectively on his own, learning foreign languages, and the impact of family and life on dyslexia.

Recognising the first signs

The visible differences in comparison to his peers started to be seen around the age of 10 and his situation got worse year by year. He encountered difficulties in Maths, Hungarian, and English. He struggled with reading fluently, learning new words and reading comprehension. According to Ádám, it got worse during his teenage years; he started having problems with spelling as well and he got frustrated when he had to read something out loud. He was a slow reader because he started the sentences over and over again and changed letters in smaller words. He said that “I did not read but rather see the words” especially when learning English, he stopped reading the words letter by letter and started memorising the shapes of the words and recall them from his memory when reading.

Obtaining exemption

He did not receive special attention in primary school, and his dyslexia was not yet diagnosed. He was sent to a speech-language pathologist to correct the sounds he used interchangeably: /r/ and /l/, but no special attention was dedicated to his reading and comprehension problems. In secondary grammar school, he did not let the teachers know about his struggles. However, his form teacher, who was also a teacher of Hungarian language and literature, recognised that he knows more than what he produces on paper. Ádám was in the last but one year in secondary school when he went to get an official recognition of his learning difficulty. He said it was the last chance for him because the school requirements were so high that he could not finish school without an exemption from writing.

By the last year of secondary education, he received the exemption from written assessments and foreign languages. At the school leaving exam, he only attended the Maths written exam. For Hungarian, History and advanced PE, he only attended an oral exam but he had to draw two topics instead of one.

Teachers

Teachers in primary school did not deal with Ádám's learning problems. It was not as common to have a paper of a learning difficulty than nowadays. Teachers in grammar school had more impact on him. His form teacher was the one who asked about his problems and started to help him. Besides her, the Maths teacher offered extracurricular classes to help Ádám. Soon, it became apparent that Ádám could not do the maths exercises, but he memorised the numbers from his book and when he got the same tasks in the test, he was thought to have cheated.

However, there were other teachers who had a damaging impact on him, for example, his English teacher. There were written and oral tests, but he did not know what materials should be learnt for them. He always had cardiospasm before the English classes. Even his mother talked with the English teacher about his difficulties, but he did not take them into consideration.

At university

He handed in his formal papers on dyslexia for a scholarship during the application process, but he forgot to register himself into the system. That is why his teachers at university did not know that he had difficulties reading and writing. Once he made a presentation, a teacher asked whether he has dyslexia and is registered in the system. After the registration, he received exemption from written assessments and got more time to prepare before an exam. Nevertheless, he did not use this opportunity. He did all the assignments and homework just like the others. Since his official papers exempt him from learning foreign languages, he does not need a language certificate to get his diploma.

Impact on life

The mistakes he still quite often makes are the following: changing the letters or syllables, reading a similar word but not the one written down, missing the suffixes, or sometimes adding suffixes. Also, he has similar problems in writing, and sometimes he does not recognise that he missed a letter when he re-reads the text. He added that he also has feelings of anxiety when he has to count or read in front of others. Instead of starting the task, he starts worrying about how to solve the task and puts himself into a stressful situation. His mind builds a barrier to solving the problem and that is why he is slow. In school, he was even ridiculed for processing the tasks slowly or misreading words, which did not help him regain his self-confidence. Another problem he was constantly facing in school was concentration for a longer period of time. His thoughts strayed away during classes when he saw something

more interesting. This is still present in his life but now he has more control over it. Still, he cannot help having stage fright in front of strangers.

He also talked about his feelings connected to dyslexia. He always felt that he was not good enough. Which is a common problem for dyslexic individuals because they see that their peers can do the tasks effortlessly, while they are struggling with it (Humphrey, 2003; Gyarmathy, 2017). As Gyarmathy notes, this feeling “makes it extremely hard for them to develop a positive self-image” (2017, p. 11). He felt an urge to conform to the others and was highly influenced by social pressure.

Own way of learning to live with dyslexia

Despite the lack of professional help, he found his own ways of facing the struggles connected to reading and writing. The methods he used for studying were not introduced to him, but he figured out what worked for him. He can only learn from texts printed on paper because computers provide too much distraction to him. He likes to highlight the important parts and collect the key words and ideas. He added that it is not as easy for him as for the others because understanding the text is a long process in itself. After collecting all the key information, he makes a list. The next step is to memorise the order of the key words. For him, this is the most crucial part of learning. If he misses one key piece of information, he forgets the rest as well at the exam. Moreover, writing with uppercase letters helped him make nicer notes but he does not attach much importance to it.

Family and friends

Ádám's parents divorced when he was seven but according to him, it did not have any impact on his life. He has three brothers, two older ones and one younger. He assumes that he inherited dyslexia from his mother because she sometimes changes letters, or it takes longer for her to understand a text. However, she is a kindergarten head teacher, who attends regular training courses, and she recently earned a second degree. She is a very creative person; she is good at handcrafting and composing long texts. His father was a police officer, then a detective, and now he works at a furniture company as a superintendent. Ádám rarely saw his father as a child, who demanded him to learn harder and read more, but Ádám could never read fluently despite the nagging. His father only recently started to accept his difficulties with learning. On the other hand, his mother has always been supportive. She was one of the first people to realise that Ádám has dyslexia and tried to talk to teachers about helping her son, with little success.

Ádám received help from his mother at home. She still helps him write his assignments or reports when he asks. Nevertheless, Ádám's brothers who went to a highly reputed grammar school and were better students than him, did not support him in learning. This caused tension between them. His brothers made him feel weak and little, and bullied him. Also, in the eyes of his father, Ádám could never be as good as his brothers, which was again a factor contributing to the bad relationship between the brothers. Since they grew up, they get on better with each other. However, he still cannot see himself as good enough to do anything.

Ádám added that he was ridiculed in school for not being able to read and spell properly, which made him stressed and even more anxious. He is still reluctant when it comes to reading aloud. He lacked a supportive environment in school. Also, he did not invite his friends over, and he was not invited anywhere after school. However, an environment in which students can feel confident and supported can facilitate developing skills (Nijakowska, 2010), which unfortunately was not available in Ádám's case.

Learning foreign languages with dyslexia and future goals

In his school years, Ádám learnt English because it was compulsory, but he did not have any motivation to improve his English. He has a different view on English now. He would like to learn it to succeed in his career as a personal trainer. He has high hopes for the future with learning English: he would like to attend competitions abroad, attend online seminars of body training, read research articles on this topic, and would also like to be able to be engaged in casual conversations in English. He does not consider taking a language exam at the moment, but might do it in the future.

Feedback about the English course

He feels that he improved a lot during the private English course he took part in over the past eight months. He understands English better, knows more grammar structures, and knows how to put a grammatically correct sentence together. He started to be more and more confident when it came to speaking; however, he is still hesitant in front of strangers. He liked the shorter lessons more since he could better focus his attention on studying. His attention was distracted more easily when he had a longer lesson.

He had very positive thoughts about ENGaGe. He liked the exercises when he had to repeat the words and the memory games as well. He feels that he is still a beginner learner and

needs to have a stronger basic knowledge, but overall, he has a very positive attitude towards continuing learning English.

8-month long English course and the researcher's notes

The case study involved an English course, where Ádám received one-on-one tutoring, and for the purpose of the language course, the dyslexia-friendly tasks from the EnGage website were used. During this course, I acted as the tutor while performing the role of the researcher in parallel. The language course was delivered from 16 June until 3 December 2022. I wanted to examine the foreign language learning process in the case of a learner with severe dyslexia. The materials were based on the ENGAGE task bank collection.

The first week. I began the study by a language level assessment. This was an oral assessment, during which weak areas were discovered, such as, numbers, spelling, basic grammar structures, tenses, pronunciation and listening comprehension. It was concluded that Ádám had not got a chance to improve his skills during his school years. Overall, he had a willingness to communicate, although he struggled sometimes to express himself. Hence, as the initial diagnosis revealed, there was a necessity to work on all language skills and areas.

The first month. The first module of the A1– level was completed during the first month. Each class started with a warm-up activity. Ádám was asked to talk about what he had been doing recently. He always seemed to be enthusiastic to share his stories. Then, each class was divided into two sub-parts. The first part concentrated on vocabulary improvement and sometimes on little grammar explanations. For this, extra materials were created with many pictures. Ádám had the opportunity to practise the pronunciation, as well as the spelling of the new words. The following topics were covered: the alphabet, greeting and meeting people, countries and nationalities and introducing oneself. The next stage of the lesson was to complete the ENGAGE tasks based on what he had learned. He shared his screen, and I took notes and recorded his scores.

The lessons were based on multisensory instructions. Ádám's various perception channels were activated, which proved to be profitable. He was able to recall the words he learned in the first part of the lessons.

The next seven months. The systematic structure of the lessons was continued for the following seven months. During this time, the following topics were introduced and learnt

about: family, friends, school, at the pet shop, clothes, holiday, and food. Ádám learnt how to formulate affirmative, negative, and interrogative sentences in present simple.

After 8 months, there has been a noticeable improvement in his language skills. The biggest improvement could be observed in his vocabulary. He invested time and effort to learn new words. His writing also improved. At the end of the modules of ENGaGE, he had to produce a small piece of writing. Despite having some mistakes, after reviewing the text, he could correct most of them by himself. Small additional mistakes had to be corrected by me, such as misspelling words ('nad' instead of 'and') and leaving the inflectional suffixes out ('sentence' instead of 'sentences'). As Gyarmathy and Vassné Kovács also point out, learning the English spelling is harder than Hungarian because its orthography is not transparent and problems with reading become apparent very soon (2004).

Overall, Ádám showed enthusiasm towards learning English. Many times, when he wanted to tell a story, he asked about the words he could not say in English and tried to compose the story using those words. Now, he feels that he could be understood abroad and he is motivated to speak and tell stories. Despite the grammar mistakes, he is willing to take part in conversations and speaking tasks.

WM tests results

The WM tests were conducted in July and in December 2022, at the beginning and at the end of the English course. The backward digit span test was the second test Ádám sat for on both occasions. Although the correct answers are the ones repeated without any mistake, partial points are awarded for partially incorrect answers as well. The participants are aware of this and are encouraged not to give up repeating the longer sequences. Every digit is worth a point. The maximum of 200 points can be reached. The points are automatically calculated by the software after manually entering the answers of the participants. Ádám scored 122 on the first test and 117 on the second one. Comparing his scores, it can be seen that he did better in summer before the English course. It should be taken into consideration that the second sitting was held in the afternoon, the backward digit span test was his second test that day, and he started to get tired more easily than on the first sitting, which was in the morning. His average score is 119.5 ($M = 119.5$). Compared to the sample mean presented in the booklet shown in *Table 1*, a significant gap can be observed between Ádám's mean score and the group average score. He performed worse on this test than the average.

Mean	147.65
Standard error	3.195
Standard deviation	22.815
Maximum	200
Minimum	96

Table 1. Descriptive statistics of the total score of backward digit span test (Kovács, 2014)

When taking into consideration the standard deviation, which is 22.815 points and subtracting it from the group mean, the result is 124,835 points, and it is clear that Ádám's mean score does not even reach this threshold. Since in the case of a normal distribution 68% of the participants should score within one standard deviation from the mean, this result indicates how poor Ádám's performance was on this test.

The Hayling-test has two parts; it measures the activation time of information in the long-term memory, and it also measures verbal initiation and strategy generation to find another random answer. The scoring is based on reaction time measurement. The software scores the answers automatically but manual corrections are possible if needed. In the first part of the test the score (A) represents the reaction time for the automatic correct answer. In the second part of the test, the score (B) stands for the time needed for inhibiting the correct answer and retrieving a new one. The software deducts the score B from A and that shows the extra time needed for inhibiting the automatic answer. Ádám's score A was 617 on the first test and 564 on the second. His score B was 1156 on the first and 829 on the second test. The score of the extra time needed is 539 for the first time and 265 for the second time. The lower the score, the faster Ádám could produce the answer. This means that overall he was faster during the second sitting in both parts of the test. In the first sitting, he needed much more extra time for inhibiting the automatic answers but he was familiar with the task for the second time and scored better. The mean of his extra time is 401.5, which is almost half the time of the mean score of population sample presented in the test booklet (see *Table 2*). This means that his score is above average on this working memory component.

Mean (B-A)	846.51
Standard error	106.351

Standard deviation	759.498
Maximum	3291
Minimum	25

Table 2. Descriptive statistics of the total score of Hayling-test (Kovács, 2014)

The non-word test was the third test on the first sitting and the first test on the second sitting. The software cannot recognise speech, so the answers had to be manually added. Every syllable is worth one point and the scores are automatically calculated by the software. The maximum score is 144. Ádám scored 111 on the first test and 109 on the second one. So it can be said that he almost scored the same. The mean of his score is 110 (M=110). Here are two examples of the items he said differently on the sittings:

ITEM 17: né-va-pe-zse-sák

First sitting answer: né-va-pe-ze-sák (4/5 points)

Second sitting answer: né-va-pe-zse-sák (5/5 points)

ITEM 24: bé-fe-vu-szo-csá-fab

First sitting answer: bé-fa (1/6 points)

Second sitting answer: bé-fe-**csu**-szo-csá-fab (5/6 points)

Comparing his scores with the descriptive statistics, his mean score is almost the same as the mean score of the sample population provided in the test booklet, and he is well within the first standard deviation. This indicates that his performance on this particular subtest is average, so no disability is indicated by this score.

Mean	114.58
Standard error	1.276
Standard deviation	12.949
Maximum	144
Minimum	85

Table 3. Descriptive statistics of the total score of non-word test (Kovács, 2014)

We can see that *Ádám*'s dyslexia manifests itself in the backward digit span test the most. However, he produced an average mean score on the non-word test and an outstanding mean score on the Hayling-test.

It is essential to mention that he struggled a lot on the backward digit span test. He complained that his mind is tired. Once he even mentioned that he does not think he will be able to do the longer sequences and almost gave up. However, he really enjoyed the other two tasks. He laughed quite a lot during the Hayling-test, which actually led to longer extra time scores. His high scores on the Hayling-test can contribute to the fact that he might have remembered the sentences.

5. Conclusion

The present study aimed to discuss the case of a dyslexic university student, *Ádám*, with the implementation of ENGaGE teaching materials into foreign language classes, as well as their usage for adult learners. *Ádám*'s WM capacity was also measured to make connections between his learning difficulties and WM functions.

Overall, the task bank could be implemented well into the English classes. *Ádám* can benefit from multisensory instructions since they can learn how to make connections between visual and phonological forms of the words. Also, the employment of modern technology – editing documents together, playing online games and tasks – proved to be beneficial and motivating even for an adult learner.

The most important finding is that *Ádám*'s confidence has been enhanced in the last months. Probably for the first time, he felt that he is capable of learning and was open to trying out new learning methods. These classes were different from his previous English classes, since he was the only student, and the researcher could fully devote her attention to *Ádám*'s needs. The researcher also made sure that *Ádám* receives positive feedback on a regular basis and is being encouraged and motivated. The results speak for themselves: he regained self-confidence in speaking and he is more confident in reading than before.

As demonstrated by *Ádám*'s case, being diagnosed with dyslexia at such an old age resulted in a lack of professional support. His school years were a misery in terms of the effort and time he had to put in learning. Not receiving sufficient assistance in studying can lead to severe reading problems that affect adult life as well. That is why it is necessary to recognise

learning difficulty-related signs early in schools and provide sufficient help for improvement (Gyarmathy, 2017).

As for the WM test results, it can be concluded that measuring the WM capacity can be a crucial part of the diagnosis of dyslexia. Ádám's results revealed that he has problems with one of the functions of the central executive. Namely, he struggles with holding information in the short-term memory and manipulating this information to produce an answer. This finding can be later used to help him succeed in language learning better.

Pedagogical implications

Implementing the task bank in public schools could ensure a dyslexia-friendly education. Students do not only receive support for their foreign language studies but positive feedback and constant feel of success as well.

This paper aimed to raise awareness of the needs of special education programs and materials for teachers. Every teacher should have the resources for individualised treatment in their classes. With the help of similar websites and teacher training, dyslexic students might not need to be exempted from foreign language classes and could be integrated more easily.

Limitations

One limitation of the study is that the classes were online and Ádám could not improve his handwriting, which means that a potentially important aspect of the foreign language learning process was not addressed in this study. Moreover, the qualitative analysis of the interviews did not involve peer debriefing, that is the interviews were only analysed by the researcher. For the sake of avoiding bias, another researcher with similar qualifications should also analyse the transcripts.

References

- Baddeley, A. D. (1986). *Working memory*. OUP.
- Baddeley, A. D. (2001). Is working memory still working? *American Psychologist*, 56, 851–864.
- Baddeley, A. D., & Hitch, G. J. (1974). *Working memory*. In G.H. Bower (Ed.), *The Psychology of learning and motivation*, Vol. 8. London: Academic Press.
- Crombie, M. A. (2000). Dyslexia and learning of a foreign language at school: Where are we going? *Dyslexia* 6, 112–123.
- Definition of Dyslexia*. (n.d.). IDA – International Dyslexia Association. Retrieved September 29, 2020, from <https://dyslexiaida.org/definition-of-dyslexia/>
- ENGaGE. (2017). Digital English and German task bank. <http://engage.uni-miskolc.hu/>
- Fournier, S., Larigauderie, P., & Gaonac'h, D. (2004). Exploring how the central executive works: A search for independent components. *Psychologica Belgica*, 44, 159–188.
- Frost, R. (2005). Orthographic systems and skills word recognition in reading. In M. J. Snowling & C. Hulme (Eds.), *The science of reading. A handbook* (pp. 272–295). Blackwell.
- Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation*. London: Edward Arnold.
- Giofrè, D., Toffalini, E., Provazza, S., Calcagni, A., Altoè, G., & Roberts, D. (2019). Are children with developmental dyslexia all the same? A cluster analysis with more than 300 cases. *Dyslexia*, 25(3), pp. 284–295.
- Gyarmathy, É. Vassné Kovács, E. (2004). *Dyslexia in Hungary. A guide to practice and resources*. In I. Smythe, J. Everatt, & R. Salter, R. (Eds.), *International Book of Dyslexia* (pp. 116–121). Chichester.
- Gyarmathy, É. (2017). *A case study of a Hungarian Adolescent with Dyslexia*. In Peggy L. Anderson, Regine Meier-Hedde: *Dyslexia in adolescence: Global perspectives*. Routledge. pp. 167–179.
- Handler, S., & Fierston, W. (2011). Learning disabilities, dyslexia, and vision. *Pediatrics*
- Hulme, C., Maughan, S., & Brown, G. D. A. (1991). Memory for familiar and unfamiliar words: Evidence for a long-term memory contribution to short-term memory span. *Journal of Memory and Language*, 30, 685–701.
- Humphrey, N. (2003). Facilitating a positive sense of self in pupils with dyslexia: The role of teachers and peers. *Support for Learning*, 18(3) 130–136.

- Juhász, V., Juhász, I. & Magnuczné Godó, Á. (2020). *ENGaGE project: English and German task bank for dyslexic learners and their inclusive classes*. In: Juhász, V., Sulyok, H., Balog, E., Basch, É., Csetényi, K., Erdei, T., Tóthné Aszalai, A. Sárvári, T. & Varga, E. (eds.), *Kommunikáció- és beszédfejlesztés a gyakorlatban* (340–352). Szeged: SZTE JGYPK Magyar és Alkalmazott Nyelvészeti Tanszék.
- Kormos, J., & Sáfár, A. (2008). Phonological short-term memory, working memory and foreign language performance in intensive language learning. *Bilingualism: Language and Cognition*, 11(2), 261–271.
- Kormos, J., Sarkadi, A., & Csizér, K. (2009). The language learning experiences of students with dyslexia: Lessons from an interview study. *Innovation in Language Learning and teaching*, 3(2), 115–130.
- Kormos, J., Smith, A. M. (2012). *Teaching languages to students with specific learning difficulties*. Multilingual Matters.
- Kovács, G. (2009). *The process of spoken second language input in human memory systems: Sublexical factors affecting the short-term retention of L2 speech and the learning of novel word forms*. [Unpublished doctoral dissertation]. Eötvös Loránd Tudományegyetem.
- Masoura, V. M. & Gathercole, S. E. (2005). Phonological shortterm memory skills and new word learning in young Greek children. *Memory*, 13, 422–429.
- Mohai, K. & Szabó, Cs. (2014). A munkamemória vizsgálata. *Gyógypedagógiai Szemle: A magyar gyógypedagógusok egyesületének folyóirata*, 3, 226–232.
- Nijakowska, J. (2010). *Dyslexia in foreign language classroom*. Multilingual Matters.
- Project. (n.d.). ENGaGE. Retrieved 5 December, 2022 from <http://engage.uni-miskolc.hu/index.php/project/>
- Racsmány, M., Lukács, Á., Németh, D. & Pléh, CS. (2005). A verbális munkamemória magyar nyelvű vizsgálóeljárásai. *Magyar Pszichológiai Szemle*, 4, 479–505.
- Rose, J. (2009). *Identifying and Teaching Children and Young People with Dyslexia and Literacy Difficulties*. London: DCSF.
- Rosen, V. M., & Engle, R. W. (1998). Working memory capacity and suppression. *Journal of Memory and Language*, 39, 418–436.
- Service, E. & Kohonen, V. (1995). Is the relation between phonological memory and foreign language learning accounted for by vocabulary acquisition? *Applied Psycholinguistics*, 16, 155–172.

- Speciale, G., Ellis, N. C., & Bywater, T. (2004). Phonological sequence learning and short-term store capacity determine second language vocabulary acquisition. *Applied Psycholinguistics*, 25, 293–321.
- Spencer, K. (2007). Predicting children's word-spelling difficulty for common English words from measures of orthographic transparency phonemic and graphemic length and word frequency. *British Journal of Psychology*, 98, 305–338.
- Ullman, M. T. (2004). Contribution of Memory Circuits to Language: The Declarative/Procedural Model. *Cognition*, 92, 231–270.

Appendix

1. Interjú kérdések

1. Mikor derült ki, hogy diszlexiás vagy?
2. Általános iskolás alsó tagozatosként lemaradtál a többiektől? Ha igen, végeztek felmérést?
3. Milyen formában nyilvánult ki, hogy diszlexiás vagy? Tudsz tipikus példákat hozni?
4. Az olvasás és írás mellett vannak más nehézségek is, amikkel küzdesz?
5. Kérlek mesélj az első felmérésről. Hány éves voltál? Mi lett az eredménye?
6. Kaptál valamiből felmentést? Azután volt, ami megváltozott? Egyenlő esélyeket kaptál az iskolában?
7. Különórákra jártál az iskolában?
8. Az egyetem alatt milyen hatással volt a diszlexia a tanulásra és a vizsgákra való felkészülésre?
9. Nyelvvizsgát kell tenned ahhoz, hogy diplomát kapj?
10. Az egyetem alatt hasonló tanulási módszereket alkalmaztál, mint előtte? Esetleg volt valami új, amit kipróbáltál?
11. Mi alól kaptál felmentést az egyetem alatt?
12. Mi ösztönöz, hogy jól teljesíts és tanulj, akkor is ha nehéz?
13. Mik a jövőbeli elképzeléseid az angollal kapcsolatban? És a saját életeddel kapcsolatban?
14. Az angol kurzus alatt milyen területen szeretnék leginkább fejlődni? (beszédértés, beszédképesség, írásképesség, olvasásképesség)
15. Nyelvvizsgát szeretnél tenni?

2. Interjú kérdések

1. Tudnál visszajelzést mondani az angol kurzusról és az ENGaGE feladatokról?
2. Kérlek mondj valami a családi háttéréről, a szüleiről és a testvéreiről.
3. Milyen volt és milyen most a kapcsolatotok?
4. Milyen volt a család hozzáállása a diszlexiához? Segítettek a nehézségekkel megbirkózni?
5. A tanárokról tudnál mondani még egy pár szót? Tudnál olyanokat említeni, akik támogattak az iskolás évek alatt és olyanokat, akik nem fogadták el a tanulási nehézségeket?

6. A szüleidnek milyen volt a kapcsolata a tanárokkal?
7. A házi feladatot egyedül írtad vagy segítséggel?
8. Mesélnél kicsit a baráti kapcsolatokról az iskolában?
9. Sok barátod volt? Átjártak hozzátok vagy te hozzájuk? Segítettek a tanulásban?
10. Volt az iskolában olyan, aki kicsúfolt vagy bántott?
11. Múltkor említetted a jövőbeli céljaidat, el tudnád mondani, hogy jelenleg mik a céljaid az életben és az angol tanulás terén?

Hungarian summary – Magyar nyelvű összefoglaló

Diszlexia az egyik legelterjedtebb tanulási nehézség, ami nem csak iskolásokat, hanem a felnőttek életét is be tudja folyásolni és hátráltatni. Számukra nem csak az anyanyelvük elsajátítása jelent gondot, hanem az idegen nyelv tanulása is. A nyelvtanulást sok tényező befolyásolhatja, mint a szorongás, érzelmek, motiváció, személyes tulajdonságjegyek vagy memória kapacitás (Kormos és Smith, 2012). A kutatások általában egy tényezőre koncentrálnak, így egy leegyszerűsített képet nyújtanak a nyelvtanulásról. Jelen esettanulmány célja, hogy egy diszlexiás nyelvtanuló angol tanulását végig kísérje és segítse a fejlődését diszlexiabarát feladatokkal. A befolyásoló tényezők közül a főbb hangsúlyt a munkamemória kapta, és hogy vajon a kapacitása befolyással van-e az alany nyelvtanulására.

A diszlexia egy összetett fogalom, amelynek a teljes körű leírása szinte lehetetlen, mert mindenkinél másképp nyilvánul meg. A legelfogadottabb meghatározások szerint neurobiológiai eredetű tanulási nehézség, amely helyesírási és olvasási nehézségekben nyilvánul meg leginkább (“Definition of Dyslexia”, n.d.). Kormos és Smith (2012) kiegészítve az alapvető meghatározást, hozzátette, hogy munkamemória problémákkal is együtt járhat a diszlexia.

A munkamemória már évtizedek óta kutatott területe az alkalmazott nyelvészetnek, viszont a legtöbb kutatást, ami nyelvtanulással kapcsolatos, diákokkal végezték el. A munkamemória modell, amelyet Baddeley és Hitch alkotott meg 1974-ben, máig a legbefolyásosabb keretrendszer a rövidtávú memória kutatásában (1974). A modell három komponensből áll: a központi végrehajtó, a fonológiai hurok és a téri-vizuális vázlatközlő. Jelenleg úgy vélik, hogy a központi végrehajtó kulcsfontosságú szerepet tölt be benne. Habár a kapacitása véges, nagyon sok és különböző funkciót lát el, mint például a figyelem összpontosítását. Ezen kívül, a hosszú távú memóriából képes adatokat aktiválni, előhívni és ellenőrizni (Baddeley, 2001). Összetett funkciójának ellenére, ez a legkevésbé kutatott része a memóriának (Schacter, 1991). A fonológiai hurok a verbális információk rövid távú tárolására képes, ami elengedhetetlen készség nyelvtanulás terén (Mohai és Szabó, 2014).

A munkamemóriát számítógépes tesztekkel lehet mérni. Magyarul is elérhető változata a MAMUT – Magyar munkamemória teszt, amely a munkamemória különböző funkcióinak a kapacitását kéri fel (Kovács, 2014). Jelen esettanulmány a fordított számterjedelem tesztet, a Hayling tesztet és az álszótesztet alkalmazta, hogy felmérje a központi végrehajtó és a fonológiai hurok kapacitását.

A kutatáshoz az adatgyűjtés fél évig tartott, amely időszak alatt két memória teszt lett elvégezve, egy a kutatás elején, és egy a legvégén. Ezen kívül, fél évig heti rendszerességgel tartottam angol órákat a résztvevőnek, amelyeket az ENGaGE (2017) feladattár alapján építettem fel. Két interjú is készült, ami betekintést nyújt a iskolai és családi háttérbe. Sőt, hivatalos pedagógiai szakvélemény átnézésére és elemzésére is sor került.

Az esettanulmány válasz nyújt arra, hogy milyen nehézségekkel küzd meg Ádám az angol tanulása során, és hogy vajon van-e neki munkamemória problémája, ami befolyásolhatja a nyelvtanulást. Ezen kívül, választ kerestem arra is, hogy milyen módon lehet segíteni Ádám tanulását diszlexiabarát feladatokkal.

Ádám egy 24 éves egyetemi hallgató sport és rekreáció szakon. Viszonylag későn, 17 évesen derült ki, hogy diszlexiás, habár előtte voltak rá utaló jelek, amik az egész életét és a tanulmányait befolyásolták. Felmentést csak az utolsó éveiben kapott középiskolában. Érettségiznie szóban kellett, kivéve matematikából, és felmentést kapott az angol érettségi alól.

A szakvélemény alapján, azon kívül, hogy felmentésre szorul, azt is ajánlották neki, hogy forduljon gyógypedagógushoz, akinek a segítségével az egyetemi követelményeket könnyebben tudja teljesíteni. Mivel már az iskolát majdnem befejezte, ott nem kapott már lehetőséget gyógypedagógiai foglalkozásokra. Voltak tanárok akik próbáltak neki órán kívüli foglalkozáson segíteni, hogy megértse az anyagot, de kifejezetten diszlexiásoknak segítő tanára nem volt. Az egyetemi évei alatt a helyzete nem lett könnyebb, minden akadályt nehezebben lép át, mint a hallgatótársai, de küzd és nem adja fel.

Az angol kurzus alatt Ádám alapszinten tanult angolul, mert az iskolai angol oktatás nem volt eredményes és az alapoktól szeretett volna kezdeni. A kurzus végére sokat fejlődött a bátorsága, hogy megszólaljon angolul, de bevallotta, hogy idegenek előtt még mindig félénk és görcsöl. Ezen kívül pozitív változásokat mutatott helyesírásban és kiejtésben is.

A munkamemória teszt eredményei vegyesek voltak. A két teszt, amit a kurzus elején és a végén végzett el, nem mutatott nagy eltérést, viszont a két tesztjének az átlaga a leíró statisztikai átlaghoz képest igen. A legnagyobb eltérést a fordított számterjedelem teszten érte el, az eredménye átlagon aluli volt. Ez azt jelenti, hogy az információk tárolása és feldolgozása, ami a központi végrehajtó egyik feladata, számára nehéz. A másik kettő tesztben, a Hayling és az álszó tesztekben, a leíró statisztikai átlaghoz hasonlóan teljesített.

Ádám példája jól mutatja, hogy mennyire fontos a tanulási nehézségek korai felismerése. Ennek hiányában az iskolai évek küzdéssel telik lehetnek, főleg ha segítség nélkül kell elvégezni az iskolát. Az esettanulmány arra is fényt derített, hogy még felnőttkorban sem késő ezekkel a nehézségekkel foglalkozni, el lehet érni javulási tendenciákat. Ma már szerencsére sok tananyag elérhető diszlexiásoknak az interneten és az e téren képzetlen tanárok is fel tudnak készülni a differenciált oktatásra.

Szakirodalom:

- Baddeley, A. D. (2001). Is working memory still working? *American Psychologist*, 56, 851–864.
- Baddeley, A. D., & Hitch, G. J. (1974). *Working memory*. In G.H. Bower (Ed.), *The Psychology of learning and motivation*, Vol. 8. London: Academic Press.
- Definition of Dyslexia*. (n.d.). IDA – International Dyslexia Association. Retrieved September 29, 2020, from <https://dyslexiaida.org/definition-of-dyslexia/>
- ENGaGE. (2017). Digital English and German task bank. <http://engage.uni-miskolc.hu/>
- Kormos, J., Smith, A. M. (2012). Teaching languages to students with specific learning difficulties. *Multilingual Matters*.
- Kovács, Gábor (2014) Idegennyelv-elsajátítás. In: *Pszicholingvisztika 1-2*. Akadémiai Kiadó, Budapest, 593–674.
- Mohai, K. & Szabó, Cs. (2014). A munkamemória vizsgálata. *Gyógypedagógiai Szemle: A magyar gyógypedagógusok egyesületének folyóirata*, 3, 226–232.
- Schacter, D. C. (1991). Memory. In: M. I. Posner (Ed.), *Foundations of cognitive science* (683–726). Cambridge, MA: MIT Press.