RESEARCH

KIDS READ BETTER WITH OMOTYPE THAN OTHER FONTS FOR DYSLEXIA

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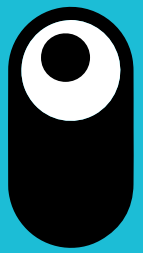

Reading is a complex skill, but also a prerequisite for success in our society. We receive a great deal of information in writing. Just like bike riding, reading is a skill that needs to be mastered. But, the more we get on a bike, the more proficient we become. The same applies to reading. We have to read a lot to acquire the reading skills.

To our surprise, reading assignments show the poor performance of children worldwide. PISA 2018 test results (9) showed that two-thirds of children from the USA are not proficient readers. Two out of three children in the USA failed to meet the reading proficiency standards set by the National Assessment of Educational Progress (7). It seems that many of us have reading difficulties. They are not only the problem of those who suffer from a reading disorder - dyslexia.

To learn how to read, you have to adopt several skills, such as:
- Developing awareness that spoken language can be segmented into smaller units (phonemes),
- Identifying letters,
- Learning the rules of how print units map onto units of sound units,
- Recognizing whole words accurately and automatically,
- Acquiring a vocabulary, and
- Extracting meaning.

Learning to read is a process. The crucial step is learning how to connect the letters to their corresponding sounds. This is precisely what seems to be **the core problem in dyslexia – decoding or mapping letters onto their sounds.** Dyslexia is a language-based learning difficulty. To be more specific – a phonological disorder.

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In English-speaking countries around 15-20% of the population has learning disabilities, and 70% of them are connected with dyslexia (4). In Europe, due to different language systems, approximately 9-12% of the population has dyslexia (3). To overcome these difficulties, children with dyslexia need to be identified early and included in structured literacy programs.

Lately, the technology trends for people with dyslexia include tools that convert text to speech. Undoubtedly, these tools are of great help. Especially during the course of one's education. However, **using text-to-speech technology, dyslexics are not working on their core problem – reading.** There is no magical solution to this problem. Learning to read requires explicit instructions, repetition, and supervision. Besides, reading difficulties in dyslexia do not simply disappear. People with dyslexia will never be great readers, but they can improve with practice.

Fonts present reading interfaces. It is well known that people prefer certain fonts over others. Some find the shapes of letters in certain fonts to be more appealing and easier to read. This is why we came up with the idea of creating a more readable font. Not only for people with dyslexia but for all people who struggle with reading.

Research on the impact of fonts on the readability of texts in people with dyslexia is a relatively new area. So far, the results have shown that the type of font affects text readability in people with dyslexia (10). In addition to that, some dyslexia associations recommend fonts that are more readable for people with dyslexia. Yet, they do not specify from which research they obtained the data (1). So far, several fonts have been designed to target the dyslexic population.

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Two of the most popular ones are Open Dyslexic (Gonzales, 2012) and Dyslexie (Boer, 2008) font.

The philosophy behind both fonts is the underscored bottom of letters which indicates the direction of the letter sign. The authors believe that this font feature helps identify the letter and prevents the mental rotation of the letter. They also consider that the underscore has the function of marking a line of text.

That is because one of the reading characteristics of children with dyslexia is the loss of the row they are currently focused on. **There has been no scientific evidence that mental rotation of letters is a problem that is specific to people with dyslexia** (11). All children make letter reversal errors in the process of learning to read and write.

A small number of studies tested the effectiveness of Open Dyslexic and Dyslexie font. An eye-tracking study from Rello and Baeza-Yates (2013) included Spanish readers with dyslexia (aged 11 – 50) and found that Open Dyslexic font did not significantly improve reading times or shorten eye fixations (10).

Wery and Diliberto (2015) compared Open Dyslexic, Arial and Times New Roman in three reading tasks: letter naming, word reading, and nonsense word reading. Their participants were English-speaking children with dyslexia (aged 9;0 – 12;8). The results showed no improvement in reading rate or accuracy for students with dyslexia or for a group as a whole. Also, none of the participants reported their preference for reading texts in Open Dyslexic font (13).

Kuster et al. (2018) compared Dyslexie, Arial and Times New Roman in two experiments on a group of children with dyslexia and a group without dyslexia. **The results showed that reading performance in both groups – on the word and text level – does not improve when they are reading the Dyslexie font compared to Arial and Times New Roman.**

In addition, children with dyslexia preferred Arial to the Dyslexie font (5). Research conducted by De Leeuw (2010), Pijpker (2013) and Marinus et al. (2016) came to the same conclusion: Dyslexie did not lead to a decrease in reading time or errors compared to other tested fonts. Furthermore, children with dyslexia preferred other fonts to Dyslexie (2, 8, 6).

OMOTYPE FONT FAMILY

Driven by research results that showed that font type affects text readability, we have created a new font family. We initiated this process with **the aim to design a font that would not differ from fonts that are in everyday use.** It had to improve readability, line tracking and prevent similar letters replacement. Aside from that, all the results from past research on readability were taken into account.

OmoType was created to resemble the monospaced fonts. The letter design is divided into 3 modules according to different widths of the letters:

1. Narrow - 300 units
2. Mean thickness - 600 units
3. Wide - 900 units

Therefore, **the option of increasing the spacing between letters doesn't distort the design and the words are not deformed.** This makes it easier to identify them. Special attention was paid to the design of mirror-like letters (d and b) and circular shapes letters (a, e, o, c). The height of the lowercase and uppercase letters were balanced out to avoid the effect of flickering.

The OmoType font family currently has 240 different styles. They are divided into categories according to:

1. Thickness (Light, Regular, Book, Medium, Bold, Black),
2. Character spacing (+1, +2, +3, +4),
3. The height of the extenders and descenders (upper and lower extensions) of the letters (A, B, C, D, E).

A special novelty in font creation is the possibility of adjusting the height of the extenders and descenders. They can be changed in 5 variants. The OmoType font A is the one which is the most similar to standard fonts, while the height of the extender and descender changes in other versions. Our assumption is that the increased height of letters emphasizes the shape of the letter and the word, and this affects readability.

The OmoType font E has the most prominent extenders and descenders. We consider it to be the most suitable for children who are just learning to read (beginner readers). The logic behind this is that, **with the advancement in reading techniques, children will progress from font version E to version A**, which is the most similar to fonts that are in everyday use.

OMOTYPE TYPEFACE SYSTEM

OmoType A	OmoType B	OmoType C	OmoType D	OmoType E
Hdnp	Hdnp	Hdnp	Hdnp	Hdnp
OmoType A Light One	OmoType B Light One	OmoType C Light One	OmoType D Light One	OmoType E Light One
OmoType A Light Two	OmoType B Light Two	OmoType C Light Two	OmoType D Light Two	OmoType E Light Two
OmoType A Light Three	OmoType B Light Three	OmoType C Light Three	OmoType D Light Three	OmoType E Light Three
OmoType A Light Four	OmoType B Light Four	OmoType C Light Four	OmoType D Light Four	OmoType E Light Four
OmoType A Regular One	OmoType B Regular One	OmoType C Regular One	OmoType D Regular One	OmoType E Regular One
OmoType A Regular Two	OmoType B Regular Two	OmoType C Regular Two	OmoType D Regular Two	OmoType E Regular Two
OmoType A Regular Three	OmoType B Regular Three	OmoType C Regular Three	OmoType D Regular Three	OmoType E Regular Three
OmoType A Regular Four	OmoType B Regular Four	OmoType C Regular Four	OmoType D Regular Four	OmoType E Regular Four
OmoType A Book One	OmoType B Book One	OmoType C Book One	OmoType D Book One	OmoType E Book One
OmoType A Book Two	OmoType B Book Two	OmoType C Book Two	OmoType D Book Two	OmoType E Book Two
OmoType A Book Three	OmoType B Book Three	OmoType C Book Three	OmoType D Book Three	OmoType E Book Three
OmoType A Book Four	OmoType B Book Four	OmoType C Book Four	OmoType D Book Four	OmoType E Book Four
OmoType A Medium One	OmoType B Medium One	OmoType C Medium One	OmoType D Medium One	OmoType E Medium One
OmoType A Medium Two	OmoType B Medium Two	OmoType C Medium Two	OmoType D Medium Two	OmoType E Medium Two
OmoType A Medium Three	OmoType B Medium Three	OmoType C Medium Three	OmoType D Medium Three	OmoType E Medium Three
OmoType A Medium Four	OmoType B Medium Four	OmoType C Medium Four	OmoType D Medium Four	OmoType E Medium Four
OmoType A Bold One	OmoType B Bold One	OmoType C Bold One	OmoType D Bold One	OmoType E Bold One
OmoType A Bold Two	OmoType B Bold Two	OmoType C Bold Two	OmoType D Bold Two	OmoType E Bold Two
OmoType A Bold Three	OmoType B Bold Three	OmoType C Bold Three	OmoType D Bold Three	OmoType E Bold Three
OmoType A Bold Four	OmoType B Bold Four	OmoType C Bold Four	OmoType D Bold Four	OmoType E Bold Four
OmoType A Black One	OmoType B Black One	OmoType C Black One	OmoType D Black One	OmoType E Black One
OmoType A Black Two	OmoType B Black Two	OmoType C Black Two	OmoType D Black Two	OmoType E Black Two
OmoType A Black Three	OmoType B Black Three	OmoType C Black Three	OmoType D Black Three	OmoType E Black Three
OmoType A Black Four	OmoType B Black Four	OmoType C Black Four	OmoType D Black Four	OmoType E Black Four

FIRST RESEARCH

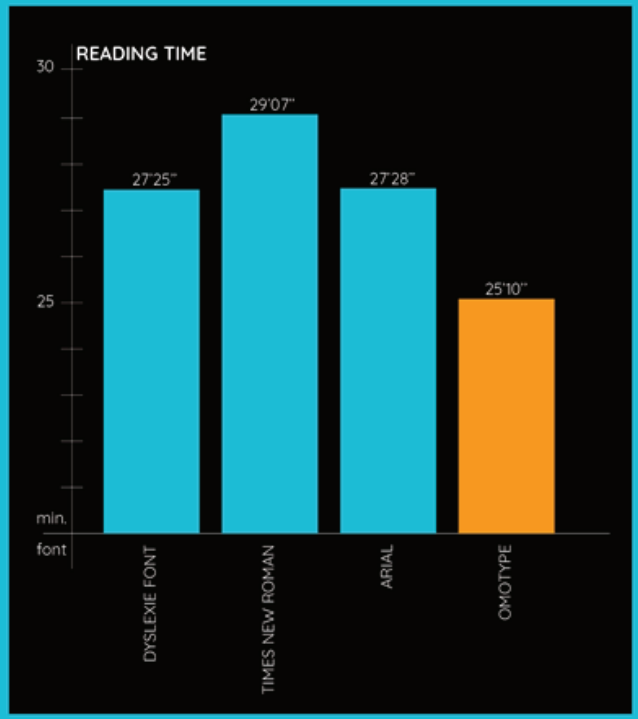
The first research was conducted during the process of designing OmoType. **The aim of this research was to compare OmoType, Arial, Times New Roman, and Dyslexie and to study the effect of fonts on readability.** Arial and Times New Roman fonts are wide-spread in everyday use. Furthermore, the British Dyslexia Association recommends Arial for people with dyslexia. Dyslexie is a font type designed specifically for people with dyslexia. In this research, only one version of the OmoType font was tested – OmoType Standard Regular A.

The research was conducted in collaboration with Dyxy, the Association for Children and Young People with Disabilities in Writing and Learning and the Children's Clinic in Split. **The participants were 15 students with reading disabilities (ages 10 – 14).** In this research, the following reading measures were taken into account: reading time and number of mistakes. The visual preference rating for these four fonts was also collected.

The participants had to read 4 comparable texts with varying font types. All texts were unified by the number of letters. The texts were given in random order to avoid possible fatigue. The texts were all aligned left. The font size for younger participants was 15 points (ages 10 – 11) and for older participants, it was 12 points (ages 12 – 14). The color of the text was black presented on a white background. The research had two steps. First, the participants had received instructions about the experiment. They had read the 4 texts aloud and, after each text, answered the comprehension question. Following the reading, each participant had to provide their preference ratings.

In this research, the following reading measures were taken into account: reading time and number of mistakes. In addition to that, the visual preference rating for four fonts was collected.

Figure 1. Mean of the measure Reading time



RESULTS

The results showed that participants read faster when the text is in OmoType font. Participants made fewer reading errors when the text was in OmoType.

Based on purely visual preferences, OmoType got an average rating of 3.54 from the participants (1 being the lowest grade and 4 being the highest one).

This research showed that there is a difference in reading with regard to the font used and that the OmoType font has an advantage over the other three fonts.

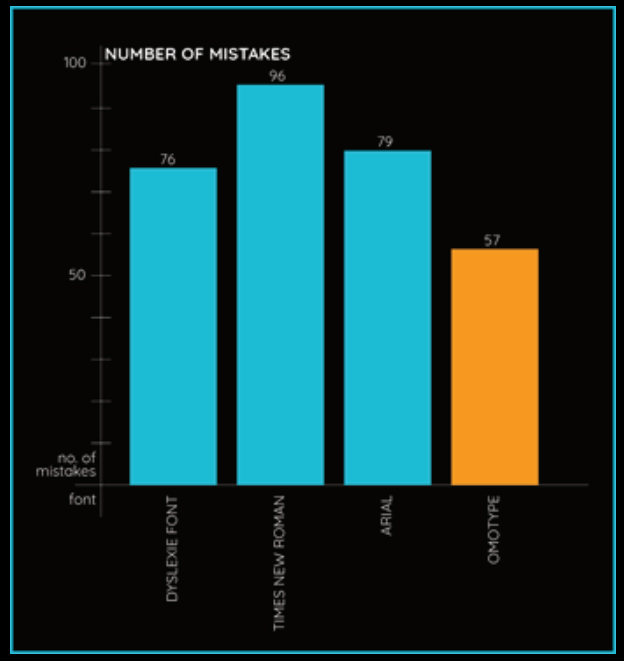


Figure 2. Mean of the measure Number of mistakes

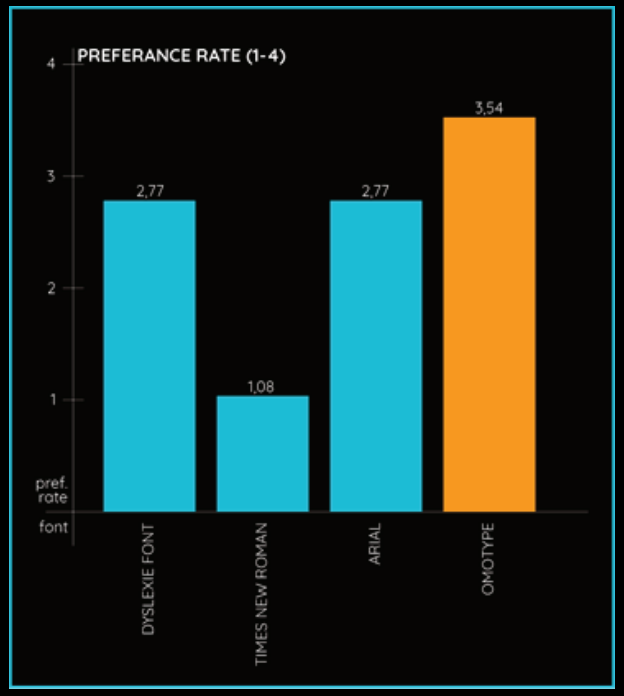


Figure 3. Mean of the measure Preference rate

This research showed that there is a difference in reading with regard to the font used and that the OmoType font has an advantage over the other three fonts.

NOTE: Only one version of OmoType typeface system was tested.

SECOND RESEARCH

The aim of this research was to compare OmoType and Open Dyslexic fonts and to study the effect of fonts on readability. Open Dyslexic is a free font type, designed specifically for people with dyslexia. In this research, only one version of the OmoType font was tested – OmoType Standard Type A.

For this research the most common measures of reading characteristics were taken into account: number of fixations, duration of fixations and reading duration.

Reading comprehension was also monitored. After reading each text, participants were asked a literal question that can be answered by directly checking the text. Questions were multiple-choice with three possible answers (one correct and two wrong answers). They had received 2 texts with different fonts on paper and they had to rate them by preference. They rated the fonts using the Likert scale (1 being the lowest grade and 5 being the highest one).

10 participants with dyslexia (ages 10;5– 11;5) participated in the research. They all had a confirmed diagnosis of dyslexia from an authorized center or a hospital. Each participant had a normal or corrected vision. They were all attending primary school, 4th grade.

The participants had to read 4 comparable texts with varying font types. All texts were unified by the number of words (72 words). Croatian is a language of shallow orthography with a one-to-one grapheme-phoneme relationship. The texts were given in random order to avoid possible fatigue.

For this research the most common measures of reading characteristics were taken into account: number of fixations, duration of fixations and reading duration.

10 participants with dyslexia (ages 10;5 – 11;5) participated in the research.

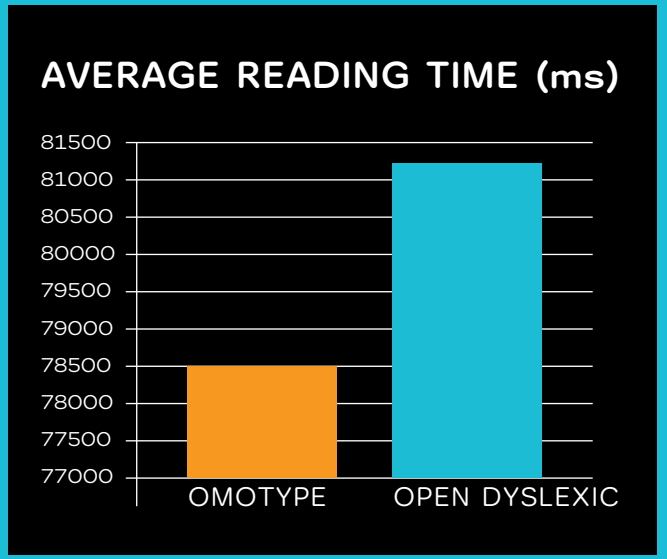
The texts were all aligned justified, with the font size of 28 points. The color of the text was black and presented on a white background. The research was conducted on the SMI Hi-Speed View eye tracker with 500 Hz. It was calibrated individually for each participant and the light focus was always in the same position. **The experiment was conducted at the Laboratory for Psycholinguistic Research, Faculty of Education and Rehabilitation Sciences, University of Zagreb.** It lasted for approximately 30 minutes. It was performed in two steps. First, the participants had received the instructions about the experiment. They had read the 4 texts in silence and, after each text, answered the comprehension question. Following the reading, each participant had to provide preference ratings.

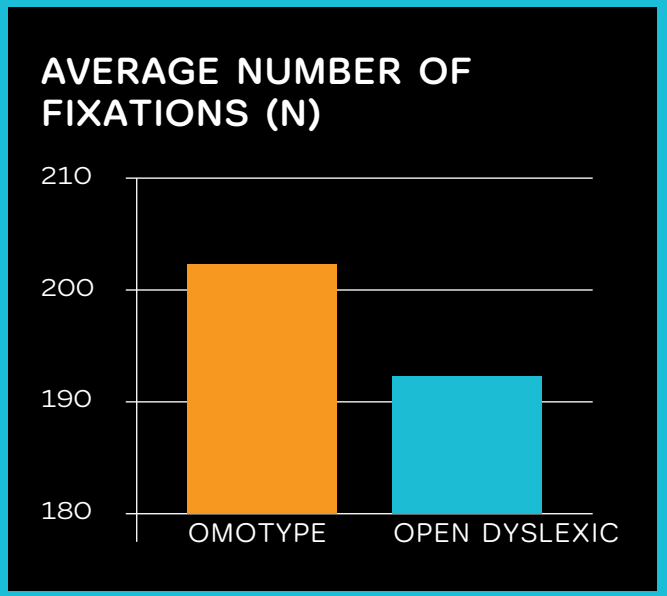
RESULTS

In the following tables the average values of targeted measures are displayed. All texts had the same word count, and all subjects read the texts in both fonts. The arithmetic mean was calculated in the data analysis. Due to the small sample size, no other statistical tests of higher power were performed.

On the measure of Average Reading Time, **children with dyslexia read texts written in the OmoType font faster**, which may be an indicator that the type of font affects reading speed.

On the measure of Average Number of Fixations, the participants achieved a slightly higher number of fixations while reading the text written in the OmoType font. When considering this result, compared to the Average Fixation measure, we see that children with dyslexia





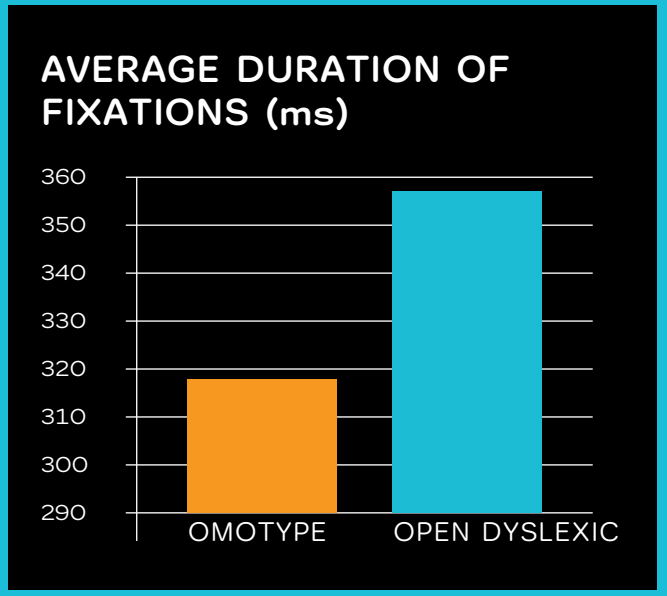
had multiple fixations that lasted shorter, which indicates that the **text written in the OmoType font was more readable than others.**

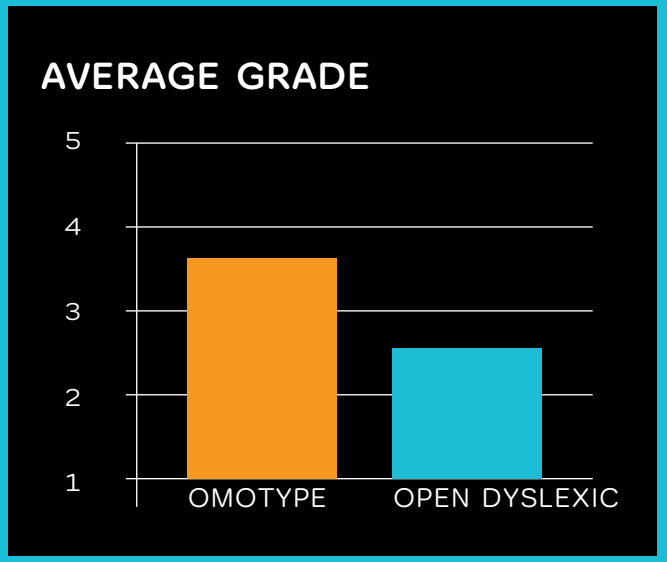
Average Duration of Fixations is assumed to capture the time and the effort needed to decode and process the orthographic input. Our results for OmoType show the tendency for shorter duration of fixations when compared to other fonts. This measure is an indicator of the readability of the font.

The preference ratings displayed in this table show that the participants, by their visual preferences, **prefer the OmoType over Open Dyslexic font.** They felt more comfortable reading the text in that font.

CONCLUSION

The results from these studies suggest that **children with dyslexia read faster and with fewer errors the text written in the OmoType** font than in any of the other two specialized fonts for dyslexia – Dyslexie and Open Dyslexic. Furthermore, according to their visual preferences, they prefer to read texts in OmoType. The result of the eye-tracking research is particularly interesting. Children with dyslexia appeared to have shorter fixations while reading texts in the OmoType font. **These results indicate a higher readability of texts written in this font, which ultimately leads to a better understanding of the text.**





FUTURE STEPS

The next step would be to conduct another research with a larger number of participants. It would allow us to perform more statistical tests with a greater statistical power and possibility of inference. Moreover, it would be interesting to see if there is a difference in readability between the five versions of the font within the OmoType font family. This research was conducted in the Croatian language, which is a language of shallow orthography. It would be interesting to see the impact of fonts on languages of deep orthography, like English, for example.

ABOUT THE AUTHOR

Maja Peretic is a speech and language pathologist. For the last 14 years she has been working with children with dyslexia. She worked in clinical unit of Faculty of Education and Rehabilitation Sciences at University of Zagreb, Croatia for 10 years where she conducted assessment, therapy and counseling for preschool and school-age children, parents and teachers. For 3 years she worked in primary school in Zagreb with children with reading difficulties.

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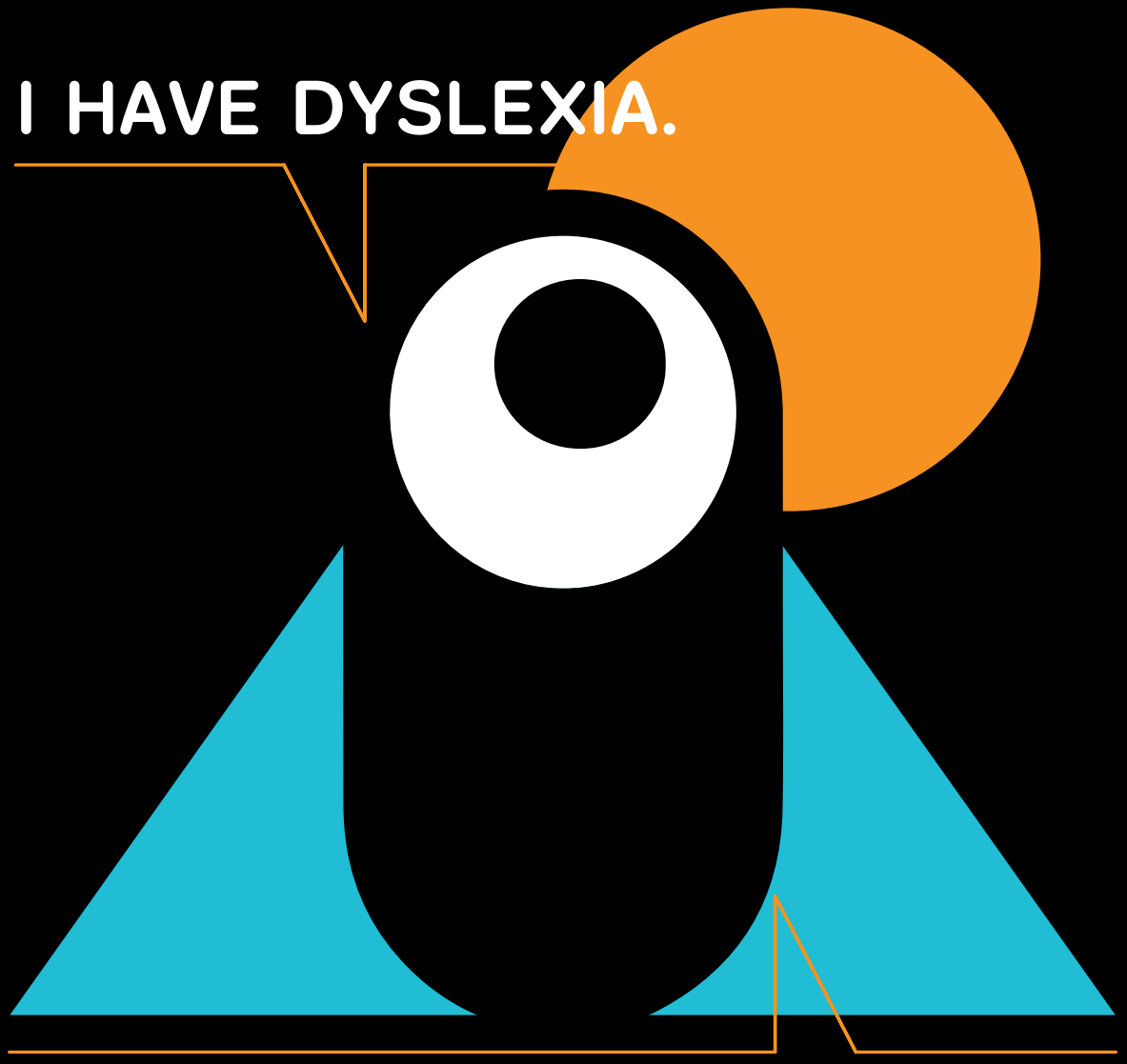
I HAVE DYSLEXIA.



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