

Designing a Variable Typeface for Dyslexia-Friendly Reading

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Abstract: This paper presents the study, design and testing of Dixi, a variable typeface family developed to support readers with dyslexia. The aim of the study was to investigate how typographic characteristics and variable letterform design can improve reading accessibility and adapt to the individual needs of readers with dyslexia. Dyslexia affects reading and writing processes, and can impact broader communication abilities, making the improvement of reading accessibility essential. The study analyses cognitive reading processes, symptoms of dyslexia and existing dyslexia-friendly typographic guidelines. A review of related studies indicates that while certain design features may enhance legibility, findings regarding specialised dyslexia typefaces remain inconsistent due to individual differences among readers. Based on these insights and user-centred considerations, the Dixi typeface family was developed and empirically tested. The results suggest that not all characteristics of existing dyslexia-friendly typefaces necessarily improve reading performance. Instead, highly legible sans-serif characteristics in character shape tend to yield stronger results. The variable nature of Dixi, allowing adjustment between simpler and more complex letterforms, enables individual adaptation to reader needs, representing its primary contribution.

Keywords: dyslexia; reading; type design; variable typeface.

1. Introduction

Today, between 5 and 10% of the global population struggles with dyslexia [1]. This cognitive disability affects individuals differently and its symptoms should not be overlooked. People may experience reduced reading and writing abilities; in some cases, hearing and verbal skills may also be affected. The most common symptoms include confusing letter order and orientation in written or read words, skipping sounds while reading or writing, mixing word order in sentences and losing track while reading. The causes of these symptoms are explained by various theories of dyslexia, with the most frequently discussed being the phonological and orthographic theories [2–5]. Moreover, the double-deficit theory and magnocellular theory are often mentioned. Nevertheless, recent studies show that in most cases symptoms cannot be explained by a single theory, which further highlights the

individuality of these deficits [4–7].

The cognitive ability of reading is one of the main skills of communication [8,9]. It involves letter recognition and the ability to connect letters to sounds, words and sentences. In other words, it is a process linking phonological and orthographic skills, the development of which varies for each individual [2,9]. Reading accuracy is influenced by factors such as prior knowledge, perceptual factors, motivation and socio-cultural influences [3,10,11]. It is also closely connected to text layout and typeface design [12,13].

Due to the individuality of dyslexia and the reading process, developing a single typographical solution is complex. Advances in technology now allow for faster design and easy access to various typefaces, many of which are created for aesthetics, not enhancing legibility [14–16]. Designing a typeface to improve legibility requires a deep understanding

of basic typographic features, character structure and style characteristics. Letter properties such as stroke thickness, x-height, terminal and serif shape, and counter shape can influence the legibility and tonal value of text [14,16]. Study by Beier and Larson [12] shows that even small adjustments to characters can significantly affect text legibility.

There are many guidelines regarding the use and design of dyslexia-friendly typefaces. In 2023, the British Dyslexia Association (BDA) released an updated Dyslexia Style Guide [17], which provides guidance on typeface selection and text styling for readers with dyslexia. They recommend sans-serif typefaces, specifically Verdana, Helvetica, Arial, Comic Sans, and the slab serif typeface Courier. Arial and Comic Sans are primarily recommended, reportedly due to their high legibility characteristics [17].

From the BDA design guidelines, key recommendations include the use of increased x-height, greater spacing between characters, words and lines of text (i.e. leading), as well as increased colour contrast between text and background [17]. Studies have been conducted on the BDA guidelines. One study [18] tested the eye movements and reading speed of readers with dyslexia when reading texts in different typefaces, while another study [13] analysed letter forms and text layout, covering most BDA guidelines in theory. The results of the studies [13,18] largely support the BDA guidelines. A comparative review of dyslexia style guides [19] further confirms the findings of the previously mentioned two studies, though it also notes that some BDA recommendations remain theoretically weak, as the recommended type size is smaller than what most other studies suggest. Furthermore, another study [20] also confirms the BDA recommendations; however, it highlights a significant gap between available study knowledge and its actual implementation in existing typeface libraries and design tools used in practice.

Some designers have also created typefaces specifically for readers with dyslexia. The most well-known are OpenDyslexic and Dyslexie, which feature unusual characteristics such as bold bottoms of characters and greater differentiation between similar characters (d, b, p and q). Opinions and analyses on the usability and likability of these typefaces are mixed,

which may be due to the individuality of dyslexia and reading habits. In one study [21], Arial was found to be more effective for readers with dyslexia than Dyslexie. Similar results were shown by another study [22], which also determined that typographical variables such as character spacing and type size influence readers more than the typeface shape. In contrast, De Leeuw [6] found that OpenDyslexic was preferred and resulted in fewer reading errors for readers with dyslexia compared to Arial and Times New Roman, while additional reading errors occurred in readers without dyslexia.

The aim of this study examines how different typeface characteristics affect reading in individuals with dyslexia. The study also explores whether it is possible to design a typeface that is both aesthetically appropriate and legible for practical use. Additionally, it investigates whether a variable typeface, which can be adjusted to individual preferences, can better accommodate the variability associated with dyslexia. To address these objectives, the following hypotheses were formulated:

H1: A typeface designed with consideration for character recognition difficulties in individuals with dyslexia will improve reading performance.

H2: A variable typeface will allow better adaptation to individual reader needs than a static typeface.

2. Experimental Part

For the design of the Dixi typeface family, we used FontLab computer software (<https://www.fontlab.com>), which enabled us to work with different masters for a specific typeface and supported variability. For testing, we used the Jotform web application (<https://www.jotform.com>). The platform allowed us to section tasks and questions, as well as to support video and GIFs, which were used to demonstrate variability options to users. Finally, test results were analysed in Microsoft Excel (<https://www.microsoft.com>).

2.1. Planning Dixi Typeface Family

We began developing the typeface family by analysing reference typefaces selected based on a previous study. These were Arial, Helvetica, Verdana, Comic Sans, Dyslexie and

OpenDyslexic. Other typefaces for dyslexics analysed in our study included Lexie Readable, Inconsistent Regular and Lexend.

We visually analysed letterform characteristics and determined the objectives we wanted to meet in the design of the Dixi typeface family. The following objectives were established:

- clear sans-serif typeface intended for general digital use,
- optimal typeface legibility,
- clear differentiation between characters,
- enlarged x-height,
- increased space between characters,
- multiple typeface variations and
- variability between typefaces, allowing individual adjustments to user needs.

2.2. Development of Dixi Typeface Family

Based on the analysed typefaces and the established objectives for the newly designed typeface family, we created sketches of individual letter and non-letter characters. The design process then continued in FontLab, computer software intended for typeface design. At this stage, the sketches were digitally converted into vector glyphs. Four versions of the typeface were developed. The first was the basic sans-serif typeface, Dixi Regular. Based on this, Dixi Round was created, emphasising distinctions between similar letterforms and featuring

more circular, softer stroke characteristics. Subsequently, contrasted versions were created for both typefaces (Dixi Regular Contrast and Dixi Round Contrast), featuring increased weight in the lower parts of the strokes.

For each designed typeface variant, a corresponding “master”, or base, was defined. In FontLab, this functions similarly to layers in graphic design software, where each layer can be edited individually. This method of typeface construction later enabled the export of the typeface as a variable typeface.

Before vectorisation, the vertical proportions of the typeface were defined, as shown in Figure 1. The typeface was developed on a 1000 units per em (UPM). The overall type size was set to 910 units. In FontLab, the baseline is at 0, and the x-height was established by setting the x-line to 475 units, increasing the perceived size of the typeface. The cap height was set to 670 units, with the ascender line 30 units above it, creating an ascender zone of 225 units. As a typical typeface spans approximately 1000 units, this would leave about 300 units for the descender zone. To achieve a more balanced proportion, this value was reduced by 90 units, resulting in a descender zone of 210 units. This distribution of typographic lines enabled the development of a typeface with a pronounced yet visually balanced proportion system, featuring an enlarged x-height exceeding 52% of the cap height.

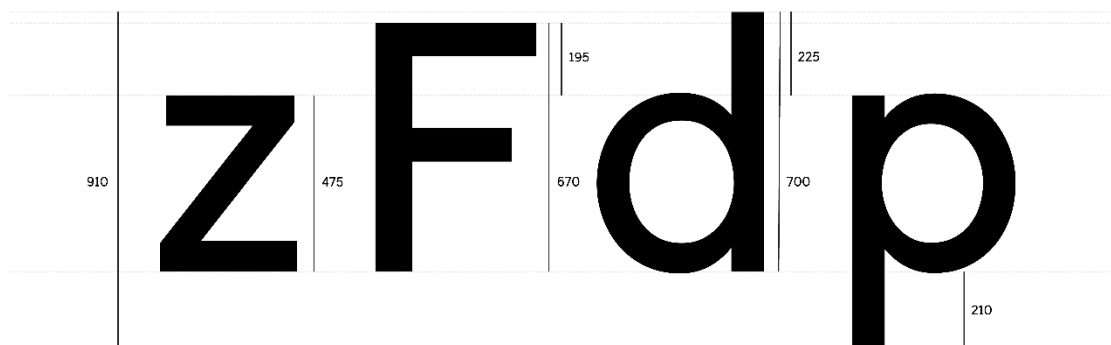


Figure 1. Vertical proportions of typeface.

2.2.1. Designing Base Typeface Dixi Regular

The construction of vectorised glyphs began with the capital letter *O*. Using Bézier curves, the circular form was defined, and the relationship between the stress points and the thinner strokes was established. These characteristics

were then applied to all capital letters. As shown in Figure 2, the thickest stroke (stress point) was defined at 100 units, while the thinnest parts of the letter, located at the top and bottom, were defined at 90 units.

The remaining characters for Dixi Regular were then designed, ensuring consistency in

stroke width relationships. During the design process, attention was also given to the width of the letterforms and their counter shapes, especially in rounded strokes. After completing the capital set, the process continued with lowercase characters, again carefully defining the width of letterforms and their counter shapes, as well as the contrast between thick and thin strokes. Here, the stress points were defined at 88 units, while the thinnest strokes were defined at 82 units.

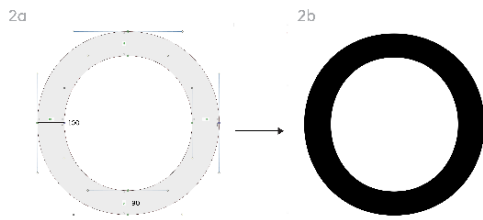


Figure 2. Vector construction of letter *O* in FontLab (2a) and final rendered character (2b).

2.2.2. Designing Typeface Dixi Round

The completed Dixi Regular was duplicated into a new master, from which Dixi Round was developed. Each character shape was carefully adjusted to introduce more handwritten characteristics, resulting in a softer and more rounded appearance (Figure 3).

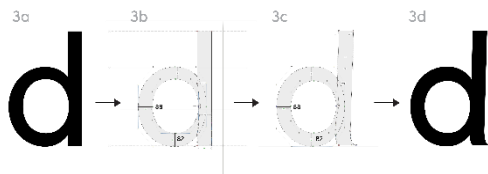


Figure 3. Designing character *d* from Dixi Regular (3a and 3b) to Dixi Round (3c and 3d).

2.2.3. Designing Contrast Instances

For both Dixi Regular and Dixi Round, contrast instances were developed. The aim was to explore how the typeface performs when stroke weight is increased in the lower parts of the letterforms. Previous studies [12,13,18] suggest that these characteristics may help anchor the visual weight of letters towards the baseline, potentially improving legibility by reducing letter inversion and supporting smoother line tracking.

For Dixi Regular, the stroke width of capital letters was increased from 90 units to 115

units. For lowercase letters, the increase was from 82 units (Figure 4b) to 100 units (Figure 4c). The design of this adjustment in the letter *d* is shown in Figure 4.

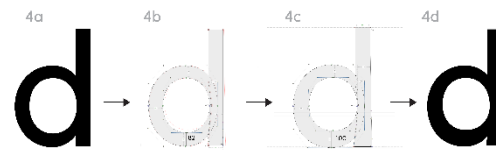


Figure 4. Designing character *d* from Dixi Regular (4a and 4b) to Dixi Regular Contrast (4c and 4d).

As Dixi Round was designed to better suit readers with dyslexia, the increase in stroke width was more pronounced than in the Regular instance. For capital letters, the width was increased from 100 units to 135 units, and for lowercase letters from 88 (Figure 5b) to 115 units (Figure 5c). The design of this increase is shown in Figure 5.

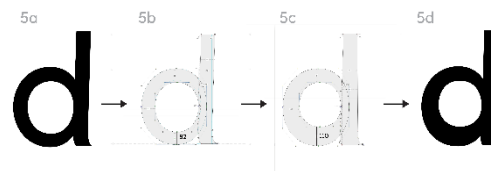


Figure 5. Designing character *d* from Dixi Round (5a and 5b) to Dixi Round Contrast (5c and 5d).

2.2.4. Connecting Instances into Variable Typeface

In FontLab, all four masters were connected using two axes. The first axis, the x-axis (Contrast), links the Dixi Regular and Round instances with their contrasted instances. The second axis, the y-axis (Custom), connects Dixi Regular and Regular Contrast with their corresponding Round instances.

2.3. Planning and Development of Typeface Testing

Testing is the key indicator that shows whether the product – in this case, the typeface – functions as intended. This is particularly important when designing for groups with disabilities or for educational purposes. Users can reveal elements that have been misinterpreted and provide crucial feedback for design improvement.

2.3.1. Testing

The studies involving human participants were reviewed and approved by the Ethics Commission of the Faculty of Arts, University of Ljubljana. Participants provided informed consent to take part in this study. All studies were conducted in accordance with the Declaration of Helsinki. In this study, adults with dyslexia were considered. Participants ranged in age from 18 to 50 years.

To avoid the influence of text content or complexity on legibility during the reading speed assessment, we used the same texts as in previous study [23].

The test was conducted using the web-based application JotForm, allowing participants to complete it independently. As participants were in different environments, variables such as screen size, resolution, lighting conditions and surroundings were not controlled. However, the platform ensured a consistent presentation of the test for all participants, thereby minimising the influence of external factors on the results.

The tests were distributed via email, accompanied by instructions specifying that the test should be completed on a computer screen and that reading time should be measured.

2.3.2. Design of Test Materials

The testing consisted of six texts, each on a different topic and paired with a different typeface. Four of the texts were presented in versions of the Dixi typeface family. One text was set in Arial, as recommended in the BDA guidelines and identified in a previous study [21] as one of the more suitable typefaces for readers with dyslexia. Another text was presented in the Dyslexie typeface, an established dyslexia-oriented typeface, allowing for comparison with Dixi Round Contrast. The typeface style in this test was the independent variable.

To minimise the effects of participant fatigue and mood, two versions of the test with different text orders were distributed. To ensure consistency, all text layouts were predefined based on a previous study [13]. Each text contained approximately 580 characters, set at 14 points (pt) with 20% leading (i.e. line spacing), and each line consisted of 50–60

characters. The texts were in Slovenian; an example is shown in Figure 6.

V starem delu mesta so ozke ulice tlakovane s kamni. Na obeh straneh ulic stojijo visoke ozke hiše, ki se dotikajo ena druge. V mestu je banka, manjša tržnica s sadjem in z zelenjavo, pekarna, trgovina z živili in veliko manjših trgovin, kjer prodajajo različne spominke, ročno izdelana oblačila, zlatino ... Na sredini mesta je trg, kjer je park, občinska stavba, knjižnica, muzej, galerija, gledališče, kinodvorana in glasbena šola. Ob obali stojijo trije hoteli. V poletnem času je v mestu postavljenih veliko stojnic. Turisti kupujejo na stojnicah in se sprehajajo ob morskimi obali.

Figure 6. Example of predefined test text (set in Dixi Regular Contrast).

2.3.3. Measurement of Variables

During the reading tasks, several variables were observed and recorded:

- reading time,
- reading comfort and
- comprehension.

Reading speed is considered a key indicator of reading performance and was analysed together with reading comprehension [8]. In this study, the influence of typeface design on reading speed was examined. Reading speed was measured individually by participants in seconds and minutes, which were later converted into seconds. Using the reading time and the total word count of each text, reading speed (RS) was calculated using the formula: $RS = \text{number of words} \div \text{time [s]} \times 60$. Average reading speeds were then calculated for each text and compared to determine which text was read the fastest.

After reading each text, subjective reading comfort was measured using a five-point Likert scale, ranging from very pleasant to very unpleasant. This was used to evaluate how different character shapes in different typefaces influenced the reading experience.

Reading comprehension was assessed through a multiple-choice question about the text content following each text. By analysing these answers, we could later determine whether the typeface affected understanding. As comprehension is closely related to reading speed, it was also considered in that analysis.

By recording these dependent variables, correlations between them could be analysed to determine whether typeface design improved legibility.

After all six texts, participants answered additional questions. Firstly, they selected their preferred typeface, allowing comparison with their earlier comfort ratings. The following two questions addressed the use of variable typeface features. Short GIF animations demonstrated adjustments between Regular and Contrast, as well as Regular and Round styles. Participants were asked whether they would use such customisation options, with possible responses being *yes*, *no*, or *unsure*.

3. Results and Discussion

3.1. Planning Dixi Typeface Family

Dixi was designed to enhance legibility and help minimise dyslexic symptoms. All Dixi instances contain 118 characters, with each character's spacing carefully adjusted to suit its shape within different instances. All character spacings are slightly enlarged for quicker

differentiation between characters. The typeface family does not include ligatures.

3.1.1. Dixi Regular

Dixi Regular (Figure 7) is the base instance of the Dixi typeface family. It was developed with the characteristics of a sans-serif typeface and high legibility in mind. It is intended for readers with dyslexia as well as everyday use. In the design, counters of letters such as *c* and *č* are enlarged to facilitate faster recognition and differentiation from similar glyphs like lowercase *e* and capital *G*. Monocular forms are used for lowercase *a* and *g*, and visually similar glyphs (*l*, *l*, *1*) are clearly distinguished. The characters *l*, *j*, and *1* include serifs to improve recognition, while the lowercase *t* has a rounded terminal to differentiate it from *l* and *f*. Punctuation marks are rendered bolder for easier identification of sentence boundaries.

Dixi Regular

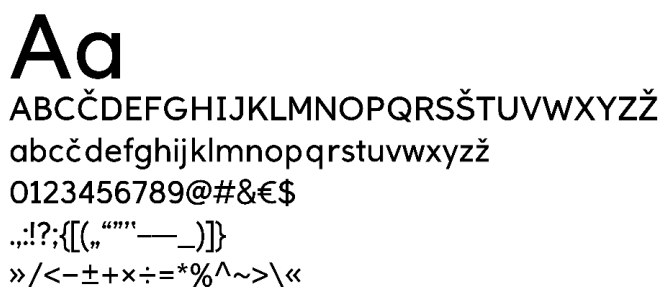


Figure 7. Display of all Dixi Regular characters.

3.1.2. Dixi Round

The Dixi Round instance (Figure 8) features slightly oblique, softer strokes to evoke a handwritten character. Increased differentiation between visually similar characters was introduced; consequently, no character is a perfect mirror. Subtle modifications are intended to improve legibility and character recognition [23]. Many strokes are gently curved to reinforce the handwritten effect: crossbars of *A*, *F*, *H*, *J*, *T*, *2*, *5* and *7*; stroke weight in the lower parts of *D*, *E*, *g*, *h*, *l*, *i*, *L*, *l*, *q* and *1*; and diagonals of *N*, *v*, *w*, *W*, *y*, *Z*, *z*, *Ž* and *ž*. Additionally, some strokes are slightly slanted (*D*, *d*, *F*, *J*, *K*, *l*, *m*, *n*, *p*, *R*, *t*, *U*, *u*, *4* and *6*). Lowercase *a*, *d*, *q* and *l* feature serified terminals, and the lowercase *t* has an enlarged terminal. Diagonals of *v*, *w* and *y*

follow a calligraphic curvature. Visually similar glyphs (*q*, *p*, *d* and *b*) are differentiated by variations in rounded stroke thickness, counter shape and stroke terminals.

Certain letters emphasise openness and differentiation to enhance legibility. The letters *C*, *c*, *Č* and *č* have enlarged open counters; rounded glyphs (*O*, *Q*, *G*, *C* and *o*) vary in width and stroke shape, with the tail of capital *Q* lengthened and curved. Capital *B* and *P* have rounded upper terminals, and capital *G* features an emphasised foot with a rounded transition to the crossbar. The counter of lowercase *e* is distinctly circular, while loops of *g* and *j* are enlarged and more pronounced than in the Regular version.

Punctuation and numerals are carefully adjusted for clarity: dots on *i* and *j* and other

punctuation marks are slightly enlarged and irregular in shape; carets and exclamation marks show stroke-weight variation; numeral 1 is designed without a lower serif; numeral 4 is open; numerals 3, 5, 6 and 8 have enlarged

lower rounded strokes; and numeral 7 includes a crossbar. Special characters (@, #, &, €, \$, %) and the slash were redesigned in harmony with the overall typeface style.

Dixi Round

Aa
ABCČDEFGHIJKLMNOPQRSŠTUVWXYZŽ
abcčdefghijklmnopqrstuvwxyzž
0123456789@#&€\$
.,!?:{[(,“”” —_)}
»/<-±+×÷= *% ^ ~ > \ «

Figure 8. Display of all Dixi Round characters.

3.1.3. Contrast Instances

Dixi Regular Contrast and Dixi Round Contrast retain the core characteristics of their original instances. Dixi Regular Contrast (Figure 9) features slightly enhanced strokes in the lower parts of the letterforms, balanced with increased character spacing. This ensures

that the adjustments neither exaggerate nor disrupt the overall typographic tonal density, maintaining a visually balanced text appearance. In Dixi Round Contrast (Figure 10), the emphasised stroke is more pronounced, yet remains balanced in relation to the overall form and character spacing.

Dixi Regular Contrast

Aa
ABCČDEFGHIJKLMNOPQRSŠTUVWXYZŽ
abcčdefghijklmnopqrstuvwxyzž
0123456789@#&€\$
.,!?:{[(,“”” —_)}
»/<-±+×÷= *% ^ ~ > \ «

Figure 9. Display of all Dixi Regular Contrast characters.

Dixi Round Contrast

Aa
ABCČDEFGHIJKLMNOPQRSŠTUVWXYZŽ
abcčdefghijklmnopqrstuvwxyzž
0123456789@#&€\$
.,!?:{[(,“”” —_)}
»/<-±+×÷= *% ^ ~ > \ «

Figure 10. Display of all Dixi Round Contrast characters.

3.1.4. Variability

Graphic interpolation between all four Dixi instances enabled typeface variability, which was a key objective of this work. The interpolation process is illustrated in Figure 11. Figure 11a shows all instances as orange reference points with their corresponding interpolation values, while the blue point indicates the current interpolation position of the capital letter A. Figure 11b presents the same interpolation state using slider controls, where the values of each axis limit are displayed. Figure 11c shows the outline of the interpolated character A.

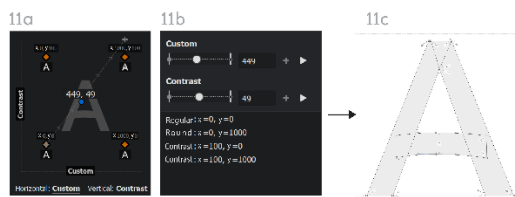


Figure 11. Interpolation of typeface variability in capital letter A – graph of interpolation (11a), slider controls for interpolation (11b) and interpolated capital A (11c).

3.2. Test Results

Thirteen subjects participated in this test: nine were aged 18–30 and four were aged 40–50. The average age was 31.4 years, with a standard deviation of 11.3 years. Sixty-nine percent of participants were female and 31% were male; all confirmed that they have dyslexia.

In the analysis of test results, Text 1 was displayed in Arial, Text 2 in Dixi Regular, Text 3 in Dixi Regular Contrast, Text 4 in Dyslexie, Text 5 in Dixi Round and Text 6 in Dixi Round Contrast.

3.2.1. Reading Speed

The first observed variable was reading speed. Figure 12 shows the average reading speed in relation to typeface form. The results indicate that Text 5, displayed in Dixi Round, was on average the fastest-read text, with an average reading speed of 152 words per minute. In contrast, the slowest reading speed was recorded for Text 4, displayed in Dyslexie. On average, it was read at 132 words per minute, which is by 20 words per minute slower than Text 5 (i.e. Dixi Round).

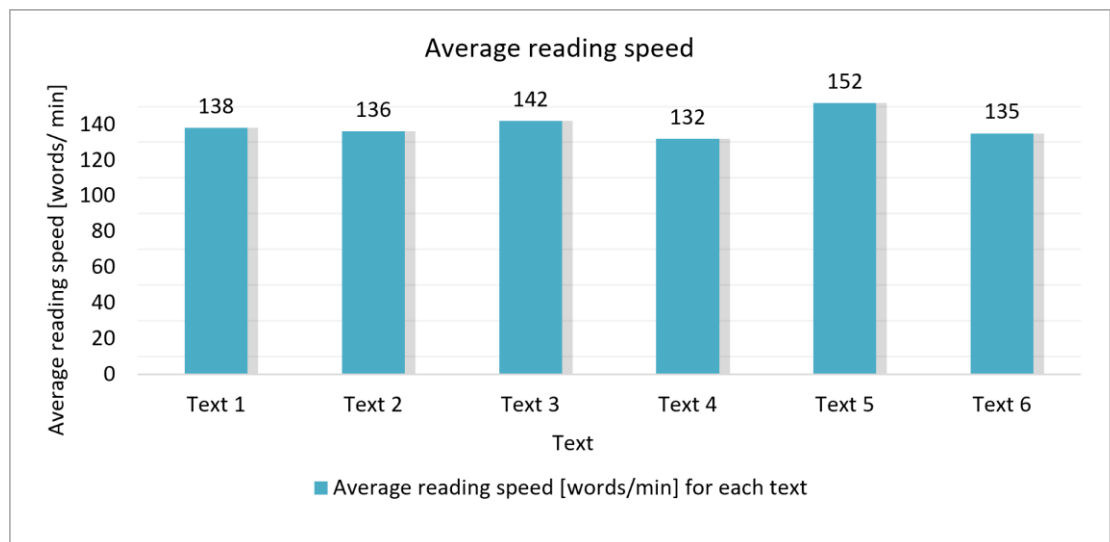


Figure 12. Average reading speed of tested texts.

3.2.2. Reading Comprehension

Reading comprehension was also examined, as its interpretation alongside reading speed provides clearer insight into participants' perception and understanding of a text. Participants were required to select the correct

answer from multiple-choice options related to the text content. The number of correct and incorrect responses was converted into percentages and is presented in Figure 13.

The highest number of incorrect responses occurred in Text 4, displayed in Dyslexie. This text also had the slowest reading speed;

therefore, it can be considered the least effectively read text. Incorrect responses were also observed in Text 1, displayed in Arial, where 23% of answers were incorrect. However, as this text did not show a notably low reading speed, no strong conclusions were drawn.

Although the Dixi typeface instances resulted in varying reading speeds, no decline in reading comprehension was observed. It can therefore be concluded that variations in typeface design influenced reading speed but did not significantly affect comprehension.

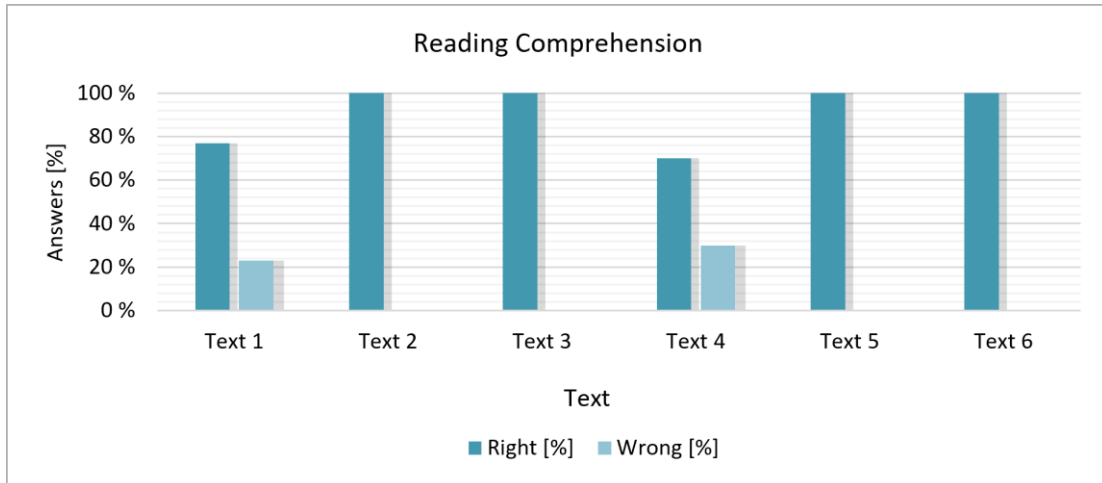


Figure 13. Reading comprehension of tested texts.

3.2.3. Subjective Reading Comfort and Likability of Typefaces

After each text, participants evaluated their subjective reading comfort using a Likert scale. The results were converted into percentages and are presented in Figure 14.

Overall, most typefaces were perceived as pleasant. Text 2, displayed in Dixi Regular, was most frequently rated as pleasant, with 69% of responses in this category. The highest proportion of very pleasant ratings (31%) was

recorded for Texts 2 and 5, displayed in Dixi Regular and Dixi Round.

A small proportion of participants (8%) perceived Texts 1, 2, 4 and 5 as unpleasant. The most neutrally perceived text was Text 1, displayed in Arial, with 54% of responses indicating neither pleasant nor unpleasant.

At the end of the test, participants were also asked to select their preferred typeface. The majority (46%) chose Dixi Regular. The distribution of responses is shown in Figure 15.

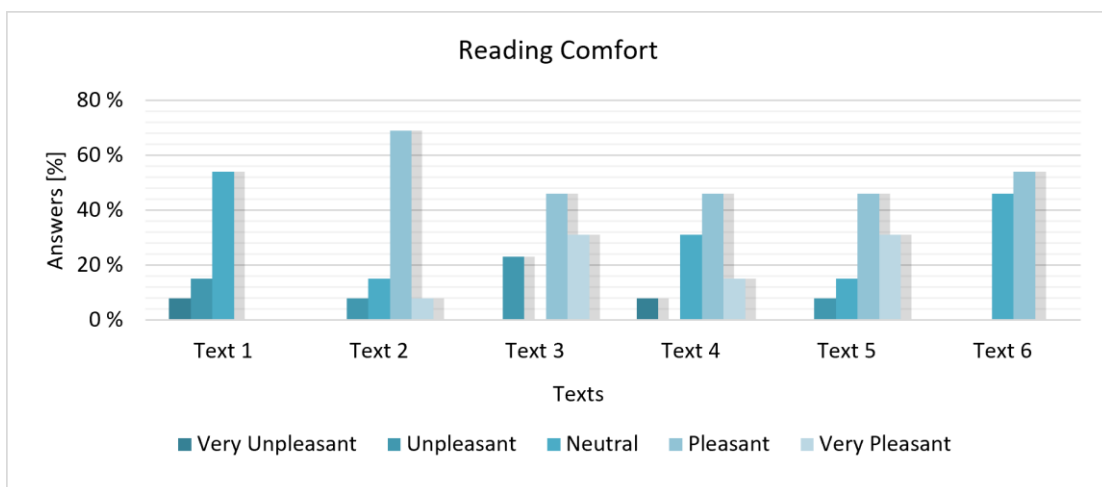


Figure 14. Reading comfort of tested texts.

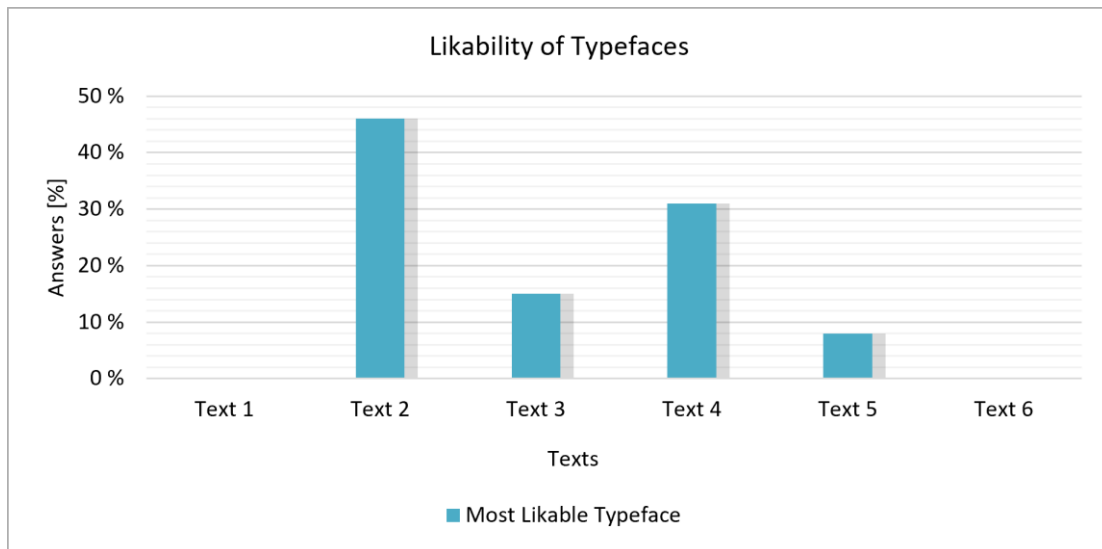


Figure 15. Likability of tested typefaces.

3.2.4. Use of Variability

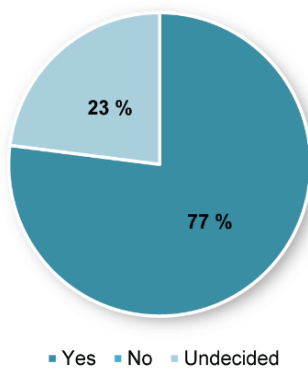
In response to the question about the possibility of independently adjusting the thickness of the lower parts of the letterform strokes, 77% of respondents answered positively (Figure 16a), while 23% remained undecided.

None of the respondents rejected this option.

Regarding the possibility of independently adjusting the letterforms from Regular to Round (Figure 16b), the responses were distributed in the same proportion. The results are presented in Figure 16.

16a

Possibility of independently adjusting the thickness of letterform baseline strokes



16b

Possibility of independently adjusting the letterforms from Regular to Round

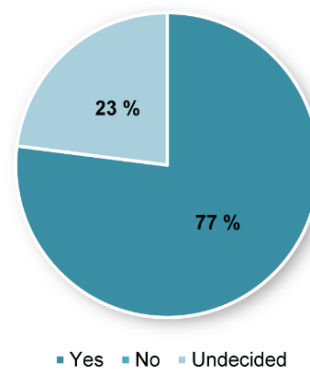


Figure 16. Usage of typeface variability in thickness of strokes (16a) and roundness of letters (16b).

These findings indicate that typeface variability could contribute to adapting typography to the specific preferences of individual readers with dyslexia.

3.2.5. Final Evaluation of Test Results

The results indicate that the text set in Dixi Round achieved the highest overall performance, combining the fastest reading

speed, high comprehension accuracy and the highest levels of perceived reading comfort. Dixi Regular was also positively evaluated by participants. These findings support the applicability of the BDA guidelines, as both typefaces were developed in accordance with these recommendations and were well received by the readers with dyslexia.

In contrast, Dyslexie demonstrated the lowest performance, with reduced reading speed and a higher occurrence of comprehension errors. Lower ratings of reading comfort and preference were also observed for Dyslexie and Dixi Round Contrast, indicating decreased legibility. These findings suggest that enhanced stroke contrast in the lower parts of the letterforms does not contribute to improved reading performance in readers with dyslexia, which is consistent with previous studies [18,21].

It should also be noted that four of the six tested texts were instances of a single typeface family, which reduced the number of distinguishing variables between typefaces, such as differences in x-height. This aligns with previous findings [16]. These results indicate that even minor adjustments in letterform design can significantly influence reading performance.

Furthermore, the findings indicate that typeface variability may serve as a beneficial tool for accommodating individual differences among readers with dyslexia.

4. Conclusion

Individuals with dyslexia across different age groups (i.e. school-aged and adults) experience daily difficulties with reading and comprehension. Existing tools and typographic approaches do not consistently meet the needs of all readers. The highly individual nature of dyslexia, along with differences in phonological and orthographic development, makes it challenging to develop universally effective typographic solutions.

Designing typefaces for this target group therefore requires a thorough understanding of both the condition and fundamental typographic principles. On this basis, the first hypothesis (H1: A typeface designed with consideration for character recognition difficulties in individuals with dyslexia will improve reading performance.) can be confirmed. Before the design process, it was necessary to understand the cognitive aspects of reading, the characteristics and symptoms of dyslexia, and core typographic principles. This knowledge formed the foundation for addressing the challenge of designing the variable typeface family, Dixi.

As an objective evaluation of the design was not feasible within the study, user testing was essential. The results confirmed the effectiveness of the Dixi typeface family. Among the tested variants, Dixi Round achieved the highest legibility, while Dixi Regular was the most preferred. The findings also indicate that most participants would use the variable features of the Dixi typeface. However, further research with a larger sample of participants is required to validate these design principles and findings.

Based on the collected data, the second hypothesis (H2: A variable typeface will allow better adaptation to individual reader needs than a static typeface.) can be supported. However, further testing with a larger sample size is required for more reliable conclusions. A future study will therefore include testing using eye-tracking technology to gain deeper insights into reading behaviour and inform further design improvements.

This study aimed to develop a variable typeface family to improve legibility for individuals with dyslexia, while remaining aesthetically appropriate and adaptable for a wider range of users. The theoretical framework, design and testing process presented in this work contribute to a broader understanding of typeface design for readers with dyslexia and diverse reading needs.

Our study has limitations; therefore, a further study is needed. The testing conducted in this study yielded relatively uniform results, likely due to the limited number of participants and their potential prior familiarity with the texts. Future testing should be conducted on a larger and more representative sample, using more demanding and unfamiliar texts to obtain more precise results and clearer distinctions between typeface variants.

Further studies could also include participants without dyslexia for a comparative analysis. Based on user feedback and additional legibility analyses, particularly through eye-tracking, the typeface will be further refined. Testing should also be conducted in the intended environment, in accordance with ISO standards.

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