

# Text Design for Dyslexia

**Is there a write way?**

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## What is the difference between typeface and font?

- Typeface - is a **font family** identified by of the same design i.e. letters, numbers and punctuation marks, (e.g.) Arial typeface.
- Font - **is the particular size and style of the typeface** (e.g.) **arial black** is a component of the Arial typeface.

## A snapshot of dyslexia typeface recommendations.



Source: <https://gratisography.com>

## Dyslexia Typeface Recommendations

The British Dyslexia Association

- Arial, Comic, San serif (**to reduce crowding**) and/or Verdana, Tahoma, Century Gothic, Trebuchet, Calibri, Open Sans
- Font Size 12 - 14 points (**text should be expandable**)
- Larger inter-letter spacing (**tracking improves readability**)
- **Inter-word spacing** should be at least 3.5 times the **inter-letter spacing**
- Use a dark coloured text on light background not white (**avoid glare**), (British Dyslexia Association, 2018).

## Dyslexia Typeface Recommendations

### The Irish Dyslexia Association

- Serif font - Arial, Comic Sans, Verdana or Sassoon
- 12pt or 14pt font size
- Use lower case letters. Avoid unnecessary use of capitals (The Irish Dyslexia Association, n.d.).

## Dyslexia Typeface Recommendations

World Wide Web Consortium ( W3C) Web Accessibility Guidelines

- Web Content Accessibility Guidelines (WAG 2.0) **does not explicitly mention text design.**
- Under the success criteria Level AA , AAA (1.1.4) **text resizing** up 200% without losing **functionality** and (1.4.8) **text width and length** affecting **readability** (WAG 2.0, 2008)
- WAG (2.1) **Text spacing** (AA) e.g. 0.16 times font size (WAG 2.1, 2018).

**Cognitive Accessibility User Research W3C Editor's Draft 24 July 2019.**

- Currently the W3C summarise font design from The British Dyslexia Association and The Irish Dyslexia Association guidelines for creating content for people with dyslexia.

Think before you print.



Source: <https://gratisography.com>

- Emerging themes: Text spacing, Text sizing, Typeface

## Dyslexia typeface examples

- OpenDyslexic
- Dyslexie
- Lexie Readable

Dyslexie Typeface (Boer, 2008)

Dyslexie Typeface

a b c d e f  
g h i j k l m  
n o p q r s t  
u v w x y z

typeface: Dyslexie Regular

Figure 2. Representation of Dyslexie Typeface (Boer, 2008).  
Source: <https://laughingsquid.com/dyslexie-an-ingenious-typeface-designed-to-make-reading-easier-for-people-with-dyslexia/>

Christian Boer, graphic designer with dyslexia designed Dyslexie typeface.

- Created letters bottom heavy.
- Strongly uneven, vary heights.
- Longer sticks to catch the eye.

## Dyslexia-friendly typeface empirical research

- **Dyslexie font did not increase reading speed or enable more precise reading**
- Respondents preferred Arial and Times New Roman fonts
- **Dyslexie font is neither advantageous or restrains reading for children with and without dyslexia (Kuster et al., 2018).**

- (n = 102) children with dyslexia and without dyslexia (n = 45) read listed words using contrasting fonts i.e. (Dyslexie, Arial, Times New Roman)
- (n=170) children did not read any faster or more correctly with Dyslexie font than Arial font

## Dyslexia-friendly typeface composition examples

- Characteristics of dyslexia-friendly (i.e.) Dyslexie and Open Dyslexic fonts have **no measurable evidence based to improve readability** (Eden, 2018).
- Effectiveness of Dyslexie is **not the particular designed lettering but it's distinct spacing settings** (Marinus et al., 2016).

- Dyslexia fonts use thicker lines in letters and slant fonts
- Sticks and tails of letters are different lengths

## Dyslexia-friendly typeface empirical research

- In Italy publisher Angolo Manzoni developed a font called EasyReading.™
- Italian and French publishers use EasyReading™ in textbooks
- **Findings indicate students with dyslexia improved their reading accuracy without training using EasyReading™**
- **However, further research is required to clarify if the font, font size, letter, word, or line spacing was responsible** (Bachmann and Mengheri, 2018).

big size, a simple design, and a special serif, to help dyslexic people identify between letters and numbers of similar shapes (d-b, p-q, 6-9). Letter and word spacing, line spacing/ word spacing/ punctuation marks, are wide. The text has no hyphenated words; it is not justified, and the line's interruption follows a natural reading flow.

## Do dyslexia-friendly typeface work?



Source: <https://gratisography.com>

## **Example of non English dyslexia typeface.**

Typeface impacts the reading process of Japanese dyslexics' (Tani et al., 2016).

## Why Japanese typography have not been developed for dyslexic users?

- Characteristics of typeface remain undefined
- Japanese typeface are difficult to create due to large number of complicated characters
- **No universal set of symptoms for dyslexic, therefore harder to design universal typeface**
- Japanese typeface for dyslexic readers has not been developed thus far (Yamada and Zhu, 2017).

# Comparison of standard and dyslexia typefaces

## Characteristics of a typeface

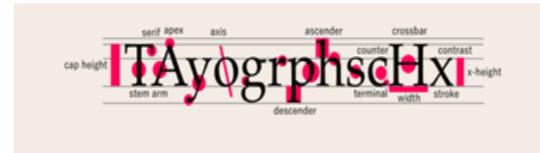


Figure 3. Features of a typeface as a visible components of the typeface (Lupton (2010) as cited by Yamada and Zhu, (2017).

## Dyslexia typefaces

- Dyslexie
- OpenDyslexic
- Lexie Readable

## Comparison

- Arial, Calibri, Century Gothic, Comic Sans, Trebuchet, Verdana

- Findings dyslexic typeface examples, larger letters in same size, bolder strokes, Larger height/width ratio, rounded san serif typefaces, weighted strokes at bottom (Yamada and Zhu, 2017).

## Mapping the characteristic to Japanese typeface



Figure 4. Comparison of Latin and Japanese typefaces Yamada and Zhu, (2017).

- Compared dyslexia typeface and standard typeface
- Extract visual attributes from current Latin typefaces
- Define requirements for Japanese typefaces and dyslexics population
- Mapped the characteristics

## Japanese character sets similarities with dyslexia fonts

- Hiragana, Katakana and Kanji fonts

Hiragana	Katakana	Kanji
い, こ	リ, ハ, ソ, シ	1-A: Kanji characters that share the same radicals and the rest of the strokes are very simple (e.g. '方 and 万', '王 and 玉', '体 and 休', '太 and 大', and '頁 and 頁')
へ, く	ウ, ク, フ, サ	
は, は	ユ, エ	1-B: Kanji characters that share the same radicals and the rest of the strokes are very similar (e.g. '宮 and 宮', '校 and 校', '動 and 動', '體 and 體', and '運 and 運')
る, る	マ, ア	
め, め	テ, テ	B: Kanji characters that have similar outlines (e.g. '支 and 支', '車 and 車', '爾 and 爾', '文 and 文', and '專 and 專')
わ, な	ツ, シ	
ね, れ	ソ, シ	
め, あ	ム, マ	
あ, お	ニ, リ	
る, ら, う	フ, レ	

Figure 5. Japanese character sets with similar shapes to dyslexia fonts (Yamada and Zhu, 2017).

Japanese uses three different character sets. Hiragana and Katakana are similar to our characters, although they tend to encode a syllable rather than a letter per symbol. They both have 46 symbols. Kanji is similar to Chinese and is about 2,500 symbols



**One size does not fit all.**



Source: <https://gratisography.com>

## Empirical research overview on text design

- **Font types greatly impact readability**
- Recommended text- Helvetica, Courier, Arial, Verdana and Computer Modern Unicode
- Arial It - decreases readability
- **Increase readability - sans serif, roman and monospaced font**
- Avoid italics- decreased readability (Rello and Baeza-Yates, 2013).
- **Size matters** -18 points for Web readability, comprehension and speed. **Line spacing had no significant effect** (Rello et al., 2013).

## Empirical research overview on text design

- **E- learning portals** in Slovenia allowed **customization for text size** but **not typeface, background/text colour** (Radovan and Perdih, 2018).
- **Accessibility of websites** findings indicated problems with the use of **italics, poor word and line spacing, small font size, font style and background colour** (Freire et al., 2011).

**What about customization?**



Source: <https://gratisography.com>

## Is customization the answer?

- Created a customized web browser extension for dyslexic users (de Avelar et al., 2015).
- Preference for san serif fonts and options for dyslexia-friendly fonts usage.
- Typeface customization systems for Japanese dyslexics (Yamada and Zhu, 2017).

### WebHelpDyslexia Browser Extension for Dyslexia

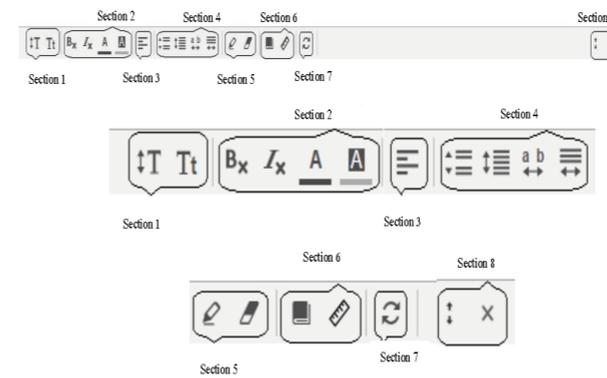


Figure 7. Web browser customisation example for dyslexic users (de Avelar et al., 2015).  
Source: <https://www.semanticscholar.org/paper/WebHelpDyslexia%3A-A-Browser-Extension-to-Adapt-Web-Avelar-Rezende/2f1be25f5674f6a07741ce1d16e4d488339e217a>

- Reading ruler leaves only the part been read and fades out the rest/ helps reader concentrate on part being read
- Highlight text for comprehension

## Is customization the answer?

For example, apple dyslexia friendly features

- Built in text to speech
- Spell words by asking siri
- Speech selection
- Speak screen
- Voiceover
- Predictive Text
- Display options
- Typing feedback (Brauner, 2017).

- Example of Apple fonts

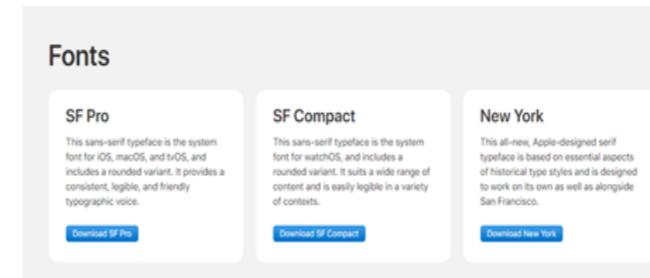


Figure 8. A representation of customization methods from Apple

Source: <https://developer.apple.com/fonts/>

## Is customization the answer?

- Browser extensions/websites/plugins do not have **all** the required features for individual customization needs.

### Example

- Kindle, iBooks, Firefixia, SeeWord, IDEAL eBook Reader and Text4All features and functions for dyslexic users were analysed by ( Rello and Barbosa, 2013).
- **No software system catered to all individual dyslexic requirements (Rello and Barbosa 2013; de Avelar et al., 2015).**

- Features changing font type, size, brightness, colour, letter spacing, word spacing, line spacing, paragraph spacing, column width, synonyms and text to speech

## Text is an interface- what's the future?



Source:<https://gratisography.com>

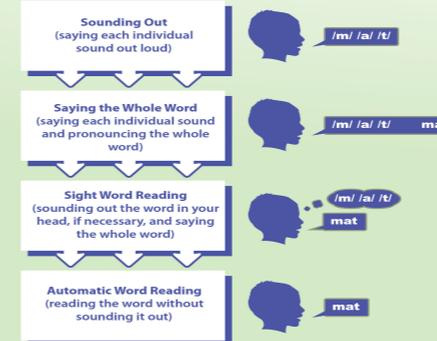
## What I think?

- Should customization methods include phonological decoding?
- Could individualisation of customization methods benefit dyslexic users?

### From Phonological Awareness to Reading Words: The Critical Role of the Alphabetic Principle

Connecting letters with their sounds to read and write is called the "alphabetic principle."  
The alphabetic principle has two parts:  
1) Alphabetic understanding is knowing that words are made up of letters that represent the sounds of speech.  
2) Phonological recoding is knowing how to translate the letters in printed words into the sounds they make.

#### Progression of Regular Word Reading



The research reported here is funded by awards by the National Center on Improving Literacy from the Office of Elementary and Secondary Education, in partnership with the Office of Special Education Programs (Award # 5282100003). The opinions expressed are those of the authors and do not represent views of OERI, OSEP, or the U.S. Department of Education. © National Center on Improving Literacy  
<https://improvingliteracy.org> | [ncil@ed.gov](mailto:ncil@ed.gov) | [facebook.com/improvingliteracy](https://www.facebook.com/improvingliteracy)

Figure 9. English is an example of alphabetic language  
Source: <https://improvingliteracy.org/brief/alphabetic-principle-phonological-awareness-reading-word>

- Reading is linked to Rapid naming, Phonemic awareness and Working memory
- Customize phonological process to develop sound sense when reading
- Take sentence apart word by word to understand syllables and phoneme
- Use AI to develop a phonological awareness decoding method for dyslexics, incorporating auditory to process the text.
- This method differs from text to speech because AI (app/overlay) will phonological decoding (break down) the text as you read.
- **Customized phonological processing to develop sound sense**
- Co-exist with other customized methods.

## Using the IKEA model of customization for text design.

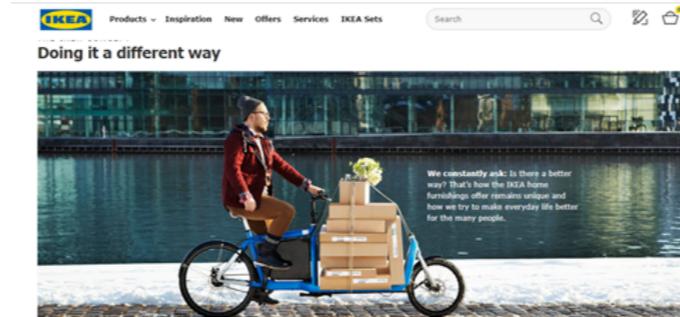


Figure 10. Representation of thinking a different way  
Source: [https://www.ikea.com/ms/en\\_US/this-is-ikea/the-ikea-concept/index.html](https://www.ikea.com/ms/en_US/this-is-ikea/the-ikea-concept/index.html)

Ikea moto: We don't believe in perfect homes. We believe in homes that are a perfect reflection of the people who live inside. Where everything looks the way you want it to, works the way you need it to, and just generally makes you feel good – without costing a fortune.

## Using augmented reality as a reading support

1. Are we moving away from static print into interactive print?
2. Do we have to rethink the way font is designed?
3. Is individualised customization user interface the way forward for dyslexic users?

## Could augmented reality features help text design for dyslexics'?



Source: <https://www.youtube.com/watch?v=7O1w5fbvFyc>

Are we moving away from static print?

## Intelligence Amplification (IA)/Augmented Intelligence for dyslexics'

- Using IA technology to assist human intelligence e.g. amplifying the power of our own minds, not developing independent artificial intelligence technology (AI).
- Augmenting human intellect: a conceptual framework (Engelbart, 1962) report suggests,  
“By “augmenting human intellect" we mean increasing the capability of a man to approach a complex problem situation, to gain comprehension to suit his particular needs, and to derive solutions to problems” (Engelbert 1962).

## What we need to ask according to Engelbart, (1962).

- Ask dyslexics' users for their input (problem solvers)
- Build practical augmented systems on what we currently know or have, don't wait.
- Develop a conceptual framework to take action

“This discipline should aim at **producing a continuous cycle of improvements--increased understanding of the problem, improved means for developing new augmentation systems, and improved augmentation systems that can serve the world's problem solvers** in general and this discipline's workers in particular” (Engelbart, 1962).

## Things to consider

- What would the new augmented system look like?
- What text design approach works best for dyslexics'?
- Do we need to ask dyslexic users what they want e.g. end user insight?
- Do we need longitudinal research and larger sample sizes on text design for dyslexia?
- Do we need to review current research on text design for total gain not individual findings?

**What do you think?**



Source: <https://gratisography.com>

**Thank you.**

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