

A Comparative Study of Dyslexia Style Guides in Improving Readability for People With Dyslexia

Fonita Theresia Yoliando¹

¹ Universitas Multimedia Nusantara

*Corresponding author. Email: fonita.yoliando@umn.ac.id

ABSTRACT

Dyslexia is a cross-cultural complex learning disability that mainly affects the visual structure region of the human brain. The main characteristic is quite distinctive such as seeing words as if they seem doubled, overlapped, irregular, moved, danced, faded, swirled, and even bounced or jumped out of the page which is termed as visual-perceptual distortion. Since 1887, some researchers have tried to discover the most beneficial methods to accommodate people with dyslexia in spelling and reading. In response to this, British Dyslexia Association published Dyslexia Style Guides in 2018, which aimed to ensure that written material considers the difficulties experienced by individuals with dyslexia who estimated around 10% in the world. This was also echoed in Indonesia as the fourth South-east Asian countries based on disability prevalence, where approximately 1 out of 5 people sustained linguistic or learning difficulties. This research was addressed to analyse the BDA Dyslexia Style Guides and perceive its effectiveness through a comparative study with other past research.

Keywords: visual dyslexia, dyslexia style guides, readability, comparative study.

1. READING EXPERIENCE

Dyslexia is a multi-faceted syndrome that could be interpreted from multi-perspectives. It is caused by information processing problems in the brain or the senses by difficulties in accurate word recognition, spelling, and decoding abilities despite having a normal vision and high cognitive ability. Based on the interview with Sumarsono from Dyslexia Center Indonesia in 2019, people with dyslexia can be diagnosed and treated starting from 5-7 years old through the five steps: (1) Screening, (2) Assessment, (3) Consultation, (4) Intervention, and (5) Monitoring. They can succeed in normal life through special treatment and education but this condition can't be cured for a lifetime [1].

There are three major types of dyslexia: *dysnemkinetic* (motor ability problem in writing and printing), *dysphonetic* (auditory problem in reading/decoding and spelling/encoding), and *dyseidetic* (visual problem in reading/decoding and spelling/encoding). Besides, all of these difficulties, could be overlapped or affected each other and often became indistinguishable. The symptoms, including reading, writing, spelling, memory, and motor difficulties were not conclusive considering external and internal factors that occurred or

changed through the years. According to [2], the individual must exhibit a collection of the following behaviours, continually, over time, in various situations to be addressed potentially dyslexic.

Estimated around 50% of people with dyslexia also experienced visual perceptual distortion which becomes their main hindrance in reading [1]. There are observable characteristics that comparatively unique for each individual, such as seeing words as if they seem doubled (halo), overlapped (blurry), irregular (rivers), moved/danced (shaky), faded (wash-out), sucked in (swirl), and bounced/ jumped out of the page (seesaw). In addition, these symptoms worsen when looking at contrast pictures, small-sized text on plain paper, narrow font-spacing, extreme lighting conditions (both excessive or low illuminations), and other certain conditions. It is believed that the symptoms could be alleviated by creating a more friendly environment/ reading materials for people with dyslexia.

2. DYSLEXIA STYLE GUIDE

In 2018, the most well-known and recognized style guide titled Dyslexia Style Guide 2018: Creating Dyslexia Friendly Content had been published by British

Dyslexia Association (UK) [3]. This guideline adopted the best practice to make all written communication, both printed and screen media, easier on the eye especially for people with dyslexia. Plenty of designers, publishers, and associations use this guideline as their reference. Below are the summary of the BDA Dyslexia Style Guide 2018:

recognized as easier to read. In alignment with the recommendation of BDA Dyslexia Style Guide, the result of this research stated that a high contrasted text and background colours were not recommended as people with dyslexia are susceptible to brightness that diminished readability [5].

Based on the experiment with 89 participants by Rello

Table 1. Dyslexia Style Guide 2018 by British Dyslexia Association

Colour	Font	Layout
Text colour Use dark (not black) text on a light (not white) background. Avoid using contrast colours.	Font size Ideal size is 12-14 point, some may need a larger font.	Heading Use a font size that is at least 20% larger than normal text. Further emphasis use Bold.
Background colour Use single colour background. Avoid patterns, pictures, or distracting surrounds.	Font type Sans serif, such as Arial, Comic Sans, Verdana, Tahoma, Century Gothic, Trebuchet, Calibri, Open Sans as it appears less crowded and easier to read.	Alignment Use align left, without justification. Avoid center or align right as it can be confusing.
Materials Use matte paper rather than glossy and should be thick enough	Font case Use lowercase only, avoid title case, upper case, and small caps as it is harder to be distinguished.	Columns Avoid multiple columns as used in newspapers. 60-70 characters/ line.
Special colour Avoid green and red/ pink, as it is difficult for those who have colour blindness.	Font emphasis Use Bold only, avoid Underline and Italic as it can make the text appear to run together.	Numbering Consider using bullet points and numbering.
Best colour Using cream or soft pastel colour.	Character spacing Ideally around 35% of the average letter width, if excessive it can reduce readability.	Abbreviation Abbreviation is not recommended.
Worst colour Not explained	Word spacing Should be at least 3.5 times the inter letter spacing.	Hyphenation Not explained
Effects Not explained	Line spacing Should be proportional to word spacing, 1.5 (150%) is preferable.	Indentation Not explained

3. COMPARATIVE STUDY

1.1. Colour

The impact of colour selections in people with dyslexia' reading performance have been discussed intensely and often recommended. Meares (1980) and Irlen (1983) agreed using certain tinted spectacles (coloured overlays technique) could alleviate the visual distortion which is experienced by people with dyslexia [4]. As each dyslexia individual has their own comfortable colour, there are also general colours that are

and Bigham warm background colours such as peach, cream, and orange significantly increased the reading speed performance over cool background colours such as blue, green, and grey [6]. In addition, Rello and Baeza-Yates also stated that yellow-black are the worst possible combination colours for dyslexia, followed with white-blue and white-black [7]. It proved that high contrasted colours are not beneficial for people with dyslexia. In contrary, the best combination is cream-black as pastel colours were easier to be perceived by people with dyslexia.

Table 2. Comparative Study – Colours for Dyslexia

	British Dyslexia Association	Comparative Study
Text colour	Use dark (not black) text on a light (not white) background. Avoid using contrast colours.	Use less contrasted colours, such as cream-black. Avoid yellow-black, white-blue, and combination of grey.
Background colour	Use single colour background. Avoid patterns, pictures, or distracting surrounds.	Use warm background colours, such as peach, cream, and orange. Avoid cool background such as blue, green, and grey.
Materials	Use matte paper rather than glossy and paper should be thick enough.	Use matte paper rather than glossy as it inflicts flare and reflection.
Special colour	Avoid green and red/ pink, as it is difficult for those who have colour blindness.	Each individual has their own most comfortable colours as long as it is not overly contrasted.
Best colour	Using cream or soft pastel colour.	Using cream or soft pastel colour.
Worst colour	Not explained.	Yellow-black, white-blue, grey.
Effects	Not explained.	Avoid using drop shadow or gradient.

According to the Rello, brightness differences less than 125 and colour differences less than 500 are considered not beneficial for people with dyslexia [8]. However, using grey for font or background colour should be avoided as most participants said it didn't help them. This contradicted the statement which argued that dyslexia should use low contrasted colours. A further research is needed to clarify this.

1.2. Font

Based on the BDA Dyslexia Style Guide 2018 [3], the recommended font size of dyslexic is 12-14 point. This seemed not in accordance with other past researches. The first finding was from Rello, Kanvinde, and Baeza-Yates [5] who did an experiment with 22 dyslexic readers by giving a text that sized vary from 14, 18, 22, and 26 pt. Unexpectedly, 14 of the participants (63,64%) chose the biggest option (26 pt) while others preferred the second biggest size (22 pt). They also showed shorter fixations period in these font sizes compare to others.

This then explored further through the next study by Rello, Pielot, and Marcos with 104 participants [9]. It was agreed that font size had a significant role in readability and comprehension. Both aspects seemed to be enhanced with increasing font sizes until 18-22 pt which is far beyond the BDA recommendation. According to this, 12-14 pt could be considered as the recommended minimum size but not the most ideal font size for people with dyslexia which can vary from 12-26 pt. Further research must be done as it remains unclear from which point on increasing font size is no longer beneficial.

On the other side, most researchers and associations agreed that using sans serif font could improve people with dyslexia' reading speed and accuracy. Most recommended font types were Arial and Comic Sans

which also supported by Evett and Brown [10]. The only recommendations for serif fonts were Times New Roman by International Dyslexia Centre and Courier by Ability Net as it is monospaced. There were also several font types who were designed specifically for people with dyslexia, such as Open Dyslexic, Dyslexie, and Lexie Readable.

Through a specific test by Rello and Baeza-Yates [11], 12 font types (sans serif, serif, monospace, special font) were examined and analysed. According to the result, it was evident that Arial and Courier (objective measures) also Verdana and Helvetica (preferences) resulted in a better manner.

In contrast, serif and monospace font types showed remarkable longer fixations durations and preference rating, but not in reading time. Regrettably, fonts that were specially designed for dyslexia did not lead to better readability. On the contrary, it pointed slightly longer reading time and less preferred by participants compared to sans serif, which Dee Leeuw mentioned [12]. This result supported by Marinus et.al [13], Kuster et.al [14], and Eden [15] by explaining that the font was neither advantageous or restrained reading for people with dyslexia or without dyslexia as there was no measurable evidence-based to improve readability.

Regarding font case and emphasis, the BDA recommendations aligned with the past research and interview results with Dyslexia Center Indonesia Association and Persatuan Dyslexia Malaysia. The combination between lowercase and uppercase could lead to people with dyslexia' confusion as they exhibited difficulties in distinguishing lower and uppercase. In order to give an emphasis, italic and underline should be avoided since it significantly decreased readability.

Table 3. Comparative Study – Font for Dyslexia

	British Dyslexia Association	Comparative Study
Font size	Ideal size is 12-14 point, some may need a larger font.	Minimum size is 12 pt. Size may vary between 12-26 pt. Maximum size (?)
Font type	Sans serif, such as Arial, Comic Sans, Verdana, Tahoma, Century Gothic, Trebuchet, Calibri, Open Sans as it appears less crowded and easier to read.	Sans serif and monospaced. Most suggested font types are Arial, Courier, Verdana, Helvetica. Special dyslexia fonts are not considerably effective.
Font case	Use lowercase only, avoid title case, upper case, and small caps as it is harder to be distinguished.	Use lowercase only, avoid title case, upper case, and small caps as it is harder to be distinguished.
Font emphasis	Use Bold only, avoid Underline and Italic as it can make the text appear to run together.	Using roman font only. If emphasis is needed then use larger size font. Bold can be used if necessary. Avoid Underline and Italic in any case.
Character spacing	Ideally around 35% of the average letter width, if excessive can reduce readability.	Using normal width (0%) is the most ideal. Larger width can be used if necessary (should be proportional).
Word spacing	Should be at least 3.5 times the spacing.	Proportional to the font size and spacing.
Line spacing	Should be proportional to word spacing, 1.5 (150%) is preferable.	Not highly affect the reading performance. 1.4-1.5 is preferable.

Based on an examination by Rello, Pielot, and Marcos, participants with dyslexia had longest reading time, fixation duration, and number of fixations in reading italic fonts as the words seemed crowding and unclear. The most recommended font emphasis was using larger size, if necessary used Bold [9].

Unlike the significant effects of font size, type, and case options, the effects of line spacing were less pronounced. The previous study [9] led to an assumption that the line spacing was not the primary factor on readability. In other words, 1.4-1.5 spacing was considered ideal but it should be proportional with the other factors as the comprehension of the texts may be impaired when line spacing is too small or large compare to the size.

On the contrary, based on a test with 74 people with dyslexia by Zorzi, et.al, character spacing and word spacing improved reading accuracy (number of errors 4.95 vs 13.5) and speed (number of syllables per second 2.07 vs 1,72) [16]. This finding suggested that spacing manipulation provided an effective way to improve people with dyslexia' reading performance. Other study by Rello, Kanvinde, and Baeza-Yates, also resulted to 75% of the participants chose either the standard spacing among characters (0%) or more separated characters (7%) as they preferred to have a clear spacing but not too far [5]. This seemed quite distinctive to the BDA Dyslexia Style Guide which recommended 35% for character spacing.

1.3. Layout

In terms of heading and alignment adjustment, there was no conclusive evidence which proved that align left is more effective than others. The study by Rello et.al only mentioned that justification in alignment could create inconsistent word spacing and confusion [17].

Based on the BDA Dyslexia Style Guide 2018 [3], it was recommended to use single column only. In response to this, Schiavo and Buson added that column width and line length should also be considered [18]. According to that, the ideal column was 44-66 characters/ line which quite distinctive with the BDA recommendation that was 60-70 characters/ line. Column width also should not be too narrow or wide, depending on its font size and spacing. The line length affected the eye movements and focuses, leading to faster reading time, fixation durations, and level of comprehension.

As person with dyslexia has difficulties reading continuous prose and complex sentences, numbering and bullet points were also agreed to be an effective way to improve their reading performance and comprehension. In alignment with the BDA Dyslexia Style guide 2018 [3], abbreviation should be refrained as possible and considered to provide the expanded form when first used. Based on the Dyslexia Association of Ireland (n.d.) [19], hyphenation and indentation were not recommended to separate words and paragraphs as they brought misconceptions to dyslexic readers.

Table 4. Comparative Study – Layout for Dyslexia

	British Dyslexia Association	Comparative Study
Heading	Use a font size that is at least 20% larger than normal text. Further emphasis use Bold.	Use larger font size than normal text. No specific percentage mentioned.
Alignment	Use align left, without justification. Avoid center or align right as it can be confusing.	Use align left, without justification as it leads to inconsistent word spacing.
Columns	Avoid multiple columns as used in newspapers. 60-70 characters/ line.	Avoid multiple columns as used in newspapers. 44-66 characters/ line.
Numbering	Consider using bullet points and numbering.	Consider using bullet points and numbering.
Abbreviation	Abbreviation is not recommended.	Abbreviation is not recommended.
Hyphenation	Not explained.	Hyphenation is not recommended.
Indentation	Not explained.	Indentation is not recommended.

4. CONCLUSION

Based on the result of this comparative study, there were several noticeable differences among BDA Dyslexia Style Guide 2018 and past research in terms of colour, font, and layout as can be seen in the tables above. However, it was fully agreed that colours, font, and layout played a major role in improving reading performance, speed, fixation periods, understanding and comprehension of people with dyslexia. The deviation emerged then should be evaluated through a further research. Both results could then enrich each other and became a firmer basis of the next phase of this research, aiming to create Dyslexia Style Guide for Indonesian. Even so the result should not be considered as a strict guideline which should be followed blindly as dyslexia is a multi-faceted syndrome. Individual characteristics should be taken into consideration throughout the process.

REFERENCES

- [1] Hermijanto, Olivia B. (2016). *Disleksia: Bukan Bodoh, Bukan Malas, Tapi Berbakat*. Jakarta: Gramedia Pustaka Utama.
- [2] Shannon, Albert J. (2006). Dyslexia: Causes, Symptoms, Definition. *Journal of Reading, Writing, and Learning Disabilities International*, July 2006, 2(3), pp. 217-223.
- [3] British Dyslexia Association. (2018). *Dyslexia Style Guide*. (2018). Retrieved from www.bdadyslexia.org.uk (Accessed 22 August 2020).
- [4] Stein, John & Kapoula Z. (2012). *Visual Aspects of Dyslexia*. London: Oxford University Press.
- [5] Rello, L., Kanvinde, G., & Baeza-Yates, R. (2011). Layout Guidelines for Web Text and a Web Service to Improve Accessibility for Dyslexics. In ACM (2012). *W4A2012, April 16-17, 2011*. 978-1-4503-1019-2
- [5] Rello, L., & Bigham, J.P. (2017). Good Background Colors for Readers: A Study of People with and without Dyslexia. In ACM (2017). *ASSETS'17, October 29-November 1, 2017*. <https://doi.org/10.1145/3132525.3132546>
- [6] Rello, L. & Baeza-Yates, R. (2015). How to Present More Readable Text for People with Dyslexia. *Universal Access in The Information Society*. 10.1007/s10209-015-0438-8.
- [7] Rello, L. (2012). Optimal Colors to Improve Readability for People with Dyslexia. *Text Customization for Readability Online Symposium*. Barcelona: W3C.
- [8] Rello, L., Pielot, M., & Marcos, M. (2016). Make It Big! The Effect of Font Size and Line Spacing on Online Readability. In PNAS (2012). *Journals of PNAS July 10, 2016, 109 (28), pp. 11455-11459*. <http://dx.doi.org/10.1145/2858036.2858204>
- [9] Evett, L. & Brown, D. (2005). Text formats and web design for visually impaired and dyslexic readers-clear text for all. *Interacting with Computers 2005*, 17(4), pp. 453-472.
- [10] Eden, G. (2018). Dyslexia-friendly Font: Does It Work? Retrieved from <https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/>
- [11] Rello, L., & Baeza-Yates, R. (2016). The Effect of Font Type on Screen Readability by People with Dyslexia. In ACM (2016). *ACM Transactions on Accessible Computing*, 8(4), 15, pp. 1-33. <http://dx.doi.org/10.1145/2897736>
- [12] De Leeuw, R. (2010). Special Font for Dyslexia? Master's thesis. University of Twente.
- [13] Marinus, E. *et al.* (2016). A Special Font for People with Dyslexia: Does it Work and, if so, why?. *Dyslexia*, 22(3), pp. 233–244. doi: 10.1002/dys.1527.
- [14] Kuster, S. M. *et al.* (2018). Dyslexie font does not benefit reading in children with or without dyslexia.

- Annals of Dyslexia*. Springer US, 68(1), pp. 25–42.
doi: 10.1007/s11881-017-0154-6.
- [15] Eden, G. (2018). Dyslexia-friendly Font: Does It Work? Retrieved from <https://www.understood.org/en/learning-attention-issues/child-learning-disabilities/dyslexia/dyslexia-friendly-font> (Accessed 20 August 2020).
- [16] Zorzi, M. *et.al.* (2012). Extra-large letter spacing improves reading in dyslexia. In ACM (2016). *Journals of CHI 2016, May 07-12, 2016*, pp. 3637-3648.
<http://pnas.org/cgi/doi/10.1073/pnas.1205566109>
- [17] Rello, L. *et.al.* (2013). Frequent Words Improve Readability and Short Words Improve Understandability for People with Dyslexia. In IFIP (2013). *INTERACT 2013, IV, pp 203-219*.
- [18] Schiavo, G. & Buson, V. (2014). Interactive e-Books to Support Reading Skills in Dyslexia. In ACM (2014). *IDC'14, June 17-20, 2014*. 1-58113-000-0/00/0010
- [19] Dyslexia Association of Ireland. (n.d.). *Dyslexia Friendly Style Guide*. Retrieved from www.dyslexia.ie (Accessed 29 July 2020).