The Effects of Font Disfluency on Reading Retention

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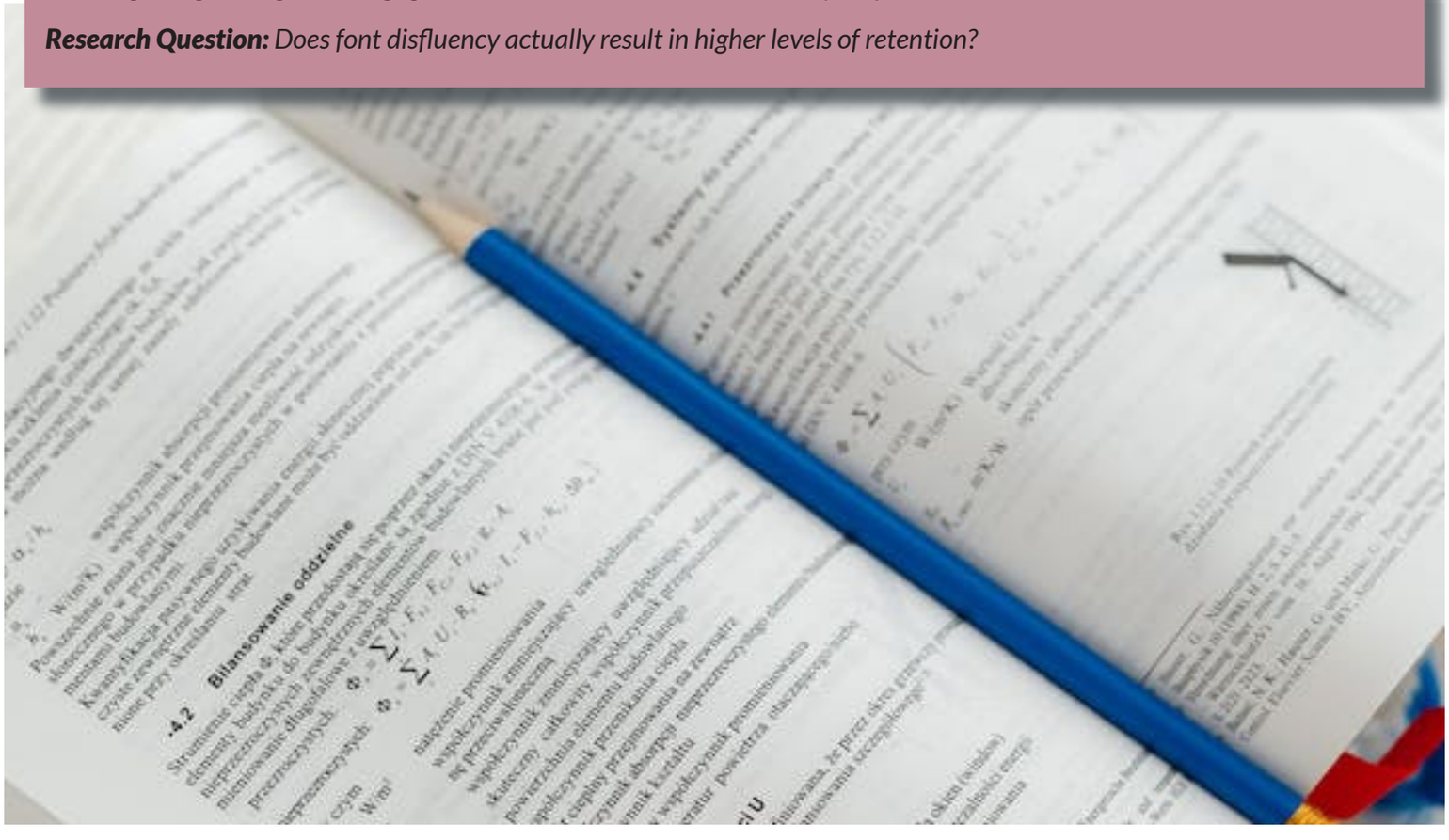
Abstract

Some earlier research into the relationship between reading ease and reading retention suggests that higher reading difficulty promotes higher cognitive engagement, which increases how much readers retain (Bjork, 1994). If the difficulty level is too high, it frustrates readers and decreases engagement, but if the difficulty is just high enough or "desirable," then reading retention will improve (Bjork, 1994). Some researchers believe that this theory can be applied to font choice. Hard-to-read fonts may create a desirable difficulty and increase how much a reader retains. This theory is known as the font disfluency effect. If valid, the font disfluency effect could impact a wide range of fields, including education, marketing, and design. However, while several studies have shown font disfluency to be effective (Bjork, 1994; Oppenheimer et al., 2010; Sungkhasettee et al., 2011), several other studies have shown it to be ineffective (Eitel & Kühl, 2016; Rummer et al., 2016; Taylor et al., 2020). In an attempt to learn more about the effects of font disfluency on reading retention, we conducted a study involving 64 participants. We administered a timed reading test in four different fonts styles to evaluate font disfluency and rank reading difficulty. We then gave participants differing versions of a multiple-choice reading retention test to compare participant scores to font styles and difficulty rankings. Lastly, we administered a post-test interview to assess participant perceptions of font and performance. Our results may indicate that there is a correlation between the legibility of a font style and how much content readers retain; however, the usefulness of font disfluency still remains in question.

Research Premise: *The* ***font disfluency effect*** *theorizes that harder to read fonts provide a level of "desirable difficulty" resulting in higher cognitive engagement. Therefore, disfluent fonts may help students retain more information.*

Research Question: *Does font disfluency actually result in higher levels of retention?*



Introduction

Important Terms and Concepts

Desirable difficulty *- the level at which readers work just hard enough to engage with text at a higher cognitive level, but not so much that they become frustrated*

Font disfluency *- suggests that that hard-to-read fonts can create desirable difficulty*

Reading retention *- how much information readers retain from a text*

Textual communication has increasingly become an integral part of our society. We most commonly see it used for marketing; corporations and interest groups use it to reach, inform, or persuade a target audience to engage with a service or buy a product. For text to fulfill these purposes, the information it communicates must be retained. One important variable in creating more memorable text may be font style. A 2015 study, "The Taste of Typeface," explored some of the ways in which people associate taste with different shapes and fonts (Velasco et al., 2015). The researchers found that people tend to associate fonts with certain ideas, emotions, and experiences. Choice of typeface can also impact cognitive engagement. One 2020 study tested how handwritten text and typed text promote cognitive engagement (Izadi & Patrick, 2020). The study concluded that fonts which mimic handwriting elicit the action of approach and therefore haptic engagement (Izadi & Patrick, 2020). Building on these critical studies and others, our study seeks to understand whether font disfluency has any effect on how much content readers remember.

"The researchers found that people tend to associate fonts with certain ideas, emotions, and experiences."

What is font disfluency?

The font disfluency effect is based on an earlier theory called the disfluency effect. This theory posits that hard-to-read text promotes higher cognitive engagement, therefore increasing content retention at a "desirable difficulty" (Bjork, 1994). The desirable difficulty is the level at which readers work just hard enough to engage with text at a higher cognitive level, but not so difficult that readers become frustrated and lose retention. The font disfluency effect builds on this research by suggesting that that hard-to-read fonts can create desirable difficulty. If this is true, the application of font disfluency theory could have wide-ranging implications for several fields, including education, marketing, and design.

In two related studies on disfluency, researchers found that harder-to-read fonts increased retention rates, leading them to conclude that perceptual disfluency can successfully function as a desirable difficulty (Oppenheimer et al., 2010). Further research on the theory of desirable difficulty has shown the potential benefits of applying font disfluency. A small 2011 study tested font disfluency with 20 undergraduate students from the university of California (Sungkhasettee et al., 2011). Researchers asked each participant to study lists of words. These lists were presented in two different formats: upright and inverted. Researchers found that recall performance was better for inverted words across all lists (Sungkhasettee et al., 2011).

"...harder-to-read fonts increased retention rates, leading them to conclude that perceptual disfluency can successfully function as a desirable difficulty"

Although some studies have shown promising results for the use of font disfluency, there is still doubt surrounding the validity of this theory. Some researchers argue that there is a difference between disfluent difficulty and desirable difficulty. A recent 2020 study on the relationships between fonts and memory noted that, "Of course, not all difficulties are desirable, and desirable difficulties are notoriously fickle" (Taylor et al., 2020). Several other research studies agree that applying desirable difficulties is not generally effective. One 2016 study hypothesized that disfluent text paired with high test expectancy would prompt more mental effort, resulting in increased retention and better test scores (Eitel & Kühl, 2016). However, the researchers found that

disfluency was not effective and could even be a drawback under those experimental conditions (Eitel & Kühl, 2016).

In fact, several researchers have found flaws in studies that support disfluency. One flaw is that many disfluency-supporting studies tested their participants using word lists rather than paragraphs, which does not mimic real-world contexts. Additionally, it has been noted that the test content in certain studies was not only disfluent but also unusual. The test included words, phrases, or concepts which were so unusual that their peculiarity may have made them more memorable. In 2016, a study was conducted in response to this flaw and, using multiple fluent and disfluent word lists, produced opposing results (Rummer et al., 2016). Researchers found that the use of disfluent text in educational settings did not produce learning advantages (Rummer et al., 2016).

> ***"...many disfluency-supporting studies tested their participants using word lists rather than paragraphs, which does not mimic real-world contexts."***

The conflicting results of many of the previously mentioned studies makes the effectiveness of font disfluency unclear. To make matters even more unclear, some businesses and institutions have begun using font disfluency in their marketing campaigns with varying results. For example, the Royal Melbourne Institute of Technology (RMIT) created a font they call Sans Forgetica that, based on an unpublished study they did in 2018, supposedly increases reading retention (RMIT, 2018). The Sans Forgetica font was supposedly created to reach the ideal desirable difficulty in reading. While this study may have some validity, it seems to have been part of a targeted publicity campaign.

This is Sans Forgetica

In our study, we aim to determine if there is a reliable relationship between font legibility and reading retention. To produce valid results, we have drawn methods and best practices from past studies to eliminate as many flaws as possible. Among our primary considerations, we found that font selection and content may have imposed flaws on previous studies. We chose to address these concerns by using a structured font selection process, using paragraphs instead of word lists, controlling for reading level, and focusing on less memorable sentence components. We believe that these considerations have allowed us to address many of the flaws in earlier studies.

Methods

Important Terms and Concepts

Serif font *- font style with small extensions or extra strokes protruding from the ends of letters (these protrusions are called serifs)*

Sans-serif font *- font style without serifs*

Script font *- font style designed to mimic handwriting*

Display font *- font style that is designed to be used at large sizes for display; usually eccentric, eye-catching, and decorative*

In preparation for our study, we set up a structured process for selecting our test fonts. We chose four fonts, one to represent each of the four main typeface styles: serif, sans serif, script, and display. Three of the fonts we used were chosen from the population of fonts on Google Fonts. We chose these fonts as ideal representations because they possessed the highest frequency of the characteristics of their style. Old Standard TT was chosen as our serif font because it had the highest number of

This is Old Standard TT

This is Zen Maru Gothic

This is Cherish

This is Sans Forgetica