



# Typography Enhancing Performance in Basic Mathematical Functions



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## Introduction

- The format of text has long been known to impact comprehension, reading speed, and engagement (Dale & Chall, 1949).
- We investigated whether the format adjustments that increase reading speed in short text passages would increase speed in a mathematical reasoning task, following from earlier work by Ashcraft and Krause (2007).
- Both font and spacing influence reading speed and comprehension (Beier et al., 2022; Wallace et al., 2022; Cai et al., 2022; Wallace et al., 2021; Kember & Varley, 1987; Patching & Jordan, 2005; Moret-Tatay & Perea, 2011; Soleimani & Mohammad, 2012).
- We wondered if format tailored to the individual could help mathematical performance. To determine this, we compared an individual's custom font and a spacing and Times New Roman with default spacing (0.0em).

## Methods

- 28 Participants (7M, 21F, 0NB) first used the Virtual Readability Lab (VRL) text reading task to determine their personal fastest reading font and spacing setting (fastest font test available at [readability-test.org](https://readability-test.org)).
- The VRL Personalized Format tests present participants with a set of approximately 150-word 8th grade level reading passages, broken into two approximately 75-word screens.
- Passages were presented in five common fonts (EB Garamond, Times New Roman, Roboto, Montserrat, and Noto Sans) and five common spacings between -.05 and +.30em (+0.10, +0.30em, +0.05em, -0.05em, 0.0em) while recording the time required to read each passage.

## Methods

EB Garamond  
Times New Roman  
Roboto  
Montserrat  
Noto Sans

*Example of each of the texts.*

- Participants completed 80 arithmetic expressions, evaluated as true or false.
- A counterbalanced design presented half of the participants with their speed-optimal custom settings first, and half Times New Roman first.

**Standard Format**  
Times New Roman  
0em Spacing

14 + 56 = 80

True/False?

x80

**Custom Format**  
Speed-Optimal Font  
and Spacing

14 + 56 = 80

True/False?

x80

Break

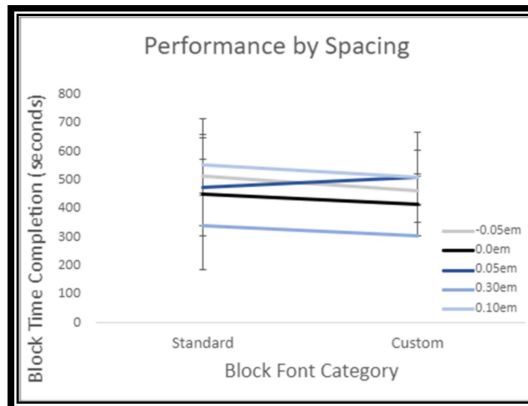
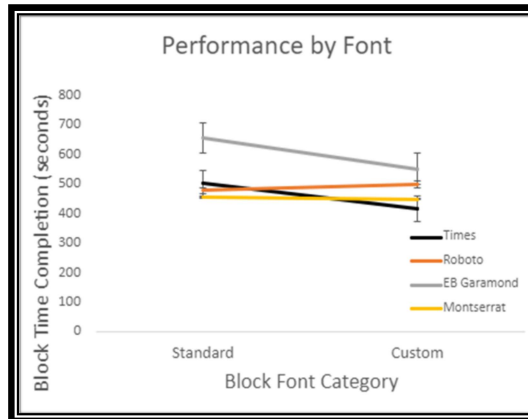
Number of participants with each font or spacing as their fastest.	
Font	Spacing
EB Garamond = 3	+0.10em = 10
Noto Sans = 2	+0.30em = 1
Roboto = 10	+0.05em = 6
Montserrat = 5	-0.05em = 2
Times New Roman = 8 (standard)	0.0em = 9 (standard)

Digital Poster



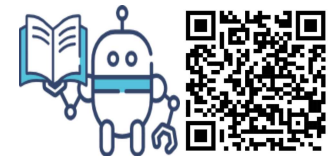
## Results

- Participants achieved a similar level of accuracy (~94%) when completing arithmetic tasks in both their custom and 'standard' typography settings ( $t(27) = 0.40, p = .35$ ).
- Participants were slightly faster to complete the true/false arithmetic statement evaluation presented in their custom settings (M custom = 474.91s, M standard = 519.37s),  $t(27) = -1.82, p = .04^*$ .
- Removing two participants whose tested custom font matched the standard font and spacing settings still yielded a significant effect,  $t(25) = -2.08, p = .024^*$ .



## Discussion

- Personalized custom font and spacing decreased time required for students to identify whether mathematical expressions were true or false.
- Task accuracy was not affected by the increase in task completion speed.
- Even after removing the two participants whose custom font and spacing settings matched the standard comparison format, the observed effect on completion time remained statistically significant ( $p = .024$ ).
- The use of custom typography settings may have the ability to reduce cognitive load for students, enabling them to process and solve basic arithmetic problems more efficiently.
- Further research could use a more sensitive test, evaluating processing time for each expression or smaller blocks of expressions to yield a higher-powered study. A larger study could also evaluate the strength of the effect by font and spacing, rather than the aggregate evaluation used here.
- Limitations include a ceiling effect on task accuracy and the lack of normalization across fonts in this experiment which can cause a confound tilting toward bigger x-height fonts.



Fastest font test available at <https://readability-test.org>

Works Cited

