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# Determining the Best Online Font for Older Adults

**By Michael Bernard, Corrina Liao, & Melissa Mills**

Studies examining the legibility of fonts on computer screens have almost exclusively investigated young to middle aged adults. However, because of many age-related factors affecting reading, one should be fairly cautious in generalizing these findings to older adults. In light of this, this study sought to examine this population by studying the legibility, reading time, as well as the general font preference for two types of serif and sans serif fonts at 12- and 14-point sizes on computer screens.

This study used a 4 x 2 (font type by size) within-subjects design to investigate differences in legibility, reading speed and perception of font legibility. Preference was measured by means of a Friedman $c^2$. The different font types and sizes are shown in Table 1. The order of each type/size font condition was counter-balanced by means of a Latin square design. A Pentium II based PC computer, with a 60 Hz, 96dpi 15" monitor with a resolution setting of 800 x 600 was used.

## Participants

Twenty-seven participants (12 males and 15 females) volunteered for this study. They ranged in age from 62 to 83, with a mean age of 70 (S.D. = 6 years). All participants were tested to have 20/40 or better unaided or corrected vision. Sixty-seven percent of the participants reported to have regularly read documents on computer screens.

## Font Type/Size Combinations

As shown in Table 1, two general types of fonts were used, the serif fonts Georgia and Times New Roman (Times), and the sans serif fonts Arial and Verdana at both 12- and 14-points. Both Times and Arial were originally developed for print and are the most common fonts of their respective font type used today. Georgia and Verdana, however, were developed specifically to be optimized for the computer screen (Boyarski et al., 1998).

**Table 1. Example of the eight size/type font combinations studied.**

| serif fonts | sans serif fonts |
|---|---|
| Times New Roman | Arial |

| | |
|---|---|
| Georgia | Verdana |
| Times New Roman | Arial |
| Georgia | Verdana |

Font conditions were compared by having participants read eight passages, which were counter-balanced by means of a Latin square design. The text of each passage comprised of a font from one of the eight type/size font conditions.

The passages came from Microsoft's electronic library, Encarta. The passages were written at approximately the same reading level and discussed similar material (all dealt with psychology-related topics). The passages were also adjusted to have approximately the same length (an average of 683 words per passage, S.D. of 16 words) with horizontal margins set at 640 pixels. The amount of words per line varied as a result of the width of the fonts within the different type/size combinations. The color of the font in all passages was black on a white background.

### Procedure

Participants were positioned at a fixed distance of 57 cm from the computer screen. They were then asked to read "as quickly and accurately as possible," passages that contained ten randomly placed substitution words (they were not told the number of substitution words). The substitution words were designed to be clearly seen as inappropriate for the context of the passages when read carefully. These words varied grammatically from the original words—for example the noun "cake" being replaced with the adjective "fake."

To accurately determine font legibility and its associated effect on reading time, an effective reading score was used. The score was derived from obtaining the percentage of accurately detected substituted words in the passages, divided by the time taken to read the passages —which was registered by a stopwatch. After participants read the passages, they ranked the fonts for general preference.

## RESULTS

### Font Legibility

In assessing font legibility by means of reading efficiency, a main effect for size was found [$F(1, 26) = 14.10$, $p < .001$] in which the 14-point font ($\underline{M} = .30$) size had significantly greater reading efficiency than the 12-point font ($\underline{M} = .34$) size. No other main effects or interactions were found.

### Reading Time

In examining the reading time for each font combination irrespective of their accuracy, a marginal type/size font interaction was found [$F(1, 26) = 3.39$, $p < .08$]. As shown in Figure 1, post hoc analysis revealed that the 12-point serif fonts were significantly slower to read than the 14-point serif fonts ($p < .004$) or the 14-point sans serif fonts ($p < .05$). No other interactions were significant.

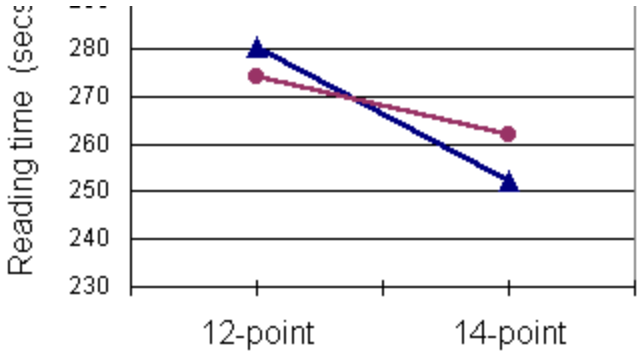


**Figure 1. Time taken to read passages in seconds.**

### Perception of Font Legibility

Assessing the perceived font legibility revealed a significant main effect for size [F(1, 26) = 6.52, p <.016] in which the 14-point font (M = 4.82) size had significantly greater perception of legibility than the 12-point font (M = 4.19) size. No other main effects or interactions were found.

### Font Preference

Analysis of the participants' preference for each font type/size combination revealed a significant difference in ranking [$c^2$ (7, N = 27) = 122.4, p < .001]. Post hoc analysis found that both 14-point sans serif fonts were significantly preferred to all serif and sans serif 12-points fonts. The 14-point serifs fonts, however, were significantly preferred to only the 12-point serif fonts. No significant differences were found between the computer fonts and the print fonts at any font size. Examining participants' 1st and 2nd preference choice further shows the popularity of the 14-point size (see Figure 2).

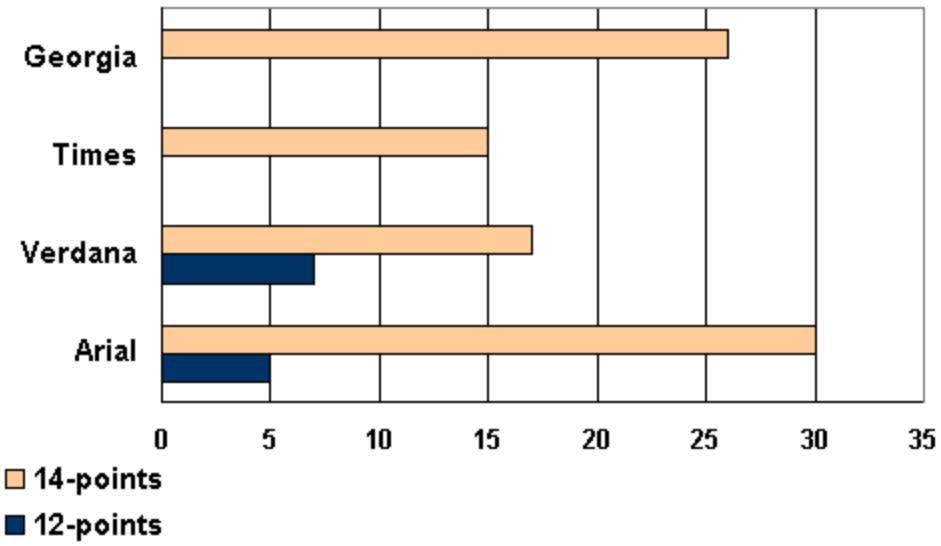


**Figure 2. The percentage of times each font was chosen as the 1st or 2nd preference choice. Both 12-point Georgia and Times were not selected as a 1st or 2nd choice.**

## CONCLUSIONS

Several observations can be made from these findings. First, 14-point fonts were found to be more legible, promote faster reading, and were preferred to the 12-point fonts. Second, at the 14-point size, serif fonts tended to support faster reading. Serif fonts, however, were generally preferred less than the sans serif fonts. Third, there was essentially no difference between the computer fonts and the print fonts. Thus, in light of these results, it is recommended to use 14-point sized fonts for presenting online text to older readers. However, a compromise must be made in deciding which font type to use. If speed of reading is paramount, then serif fonts are recommended. However, if font preference is important, then sans serif fonts are recommended.

**Note:** A presentation based on this work was presented at the CHI '01 Annual Meeting in Seattle, Washington and can be found in the conference proceedings.

### Acknowledgements

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## REFERENCES

Boyarski, D., Neuwirth, C., Forlizzi, J., & Regli, S. H. (1998). A study of fonts designed for screen display. Proceedings of CHI'98, 87-94.

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