

Development of a “universal design” font with blur tolerance (2): A comparison of the legibility of Gothic and “universal design” typefaces

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Nakano et al. (2010) proposed a method of assessing universal design (UD) fonts based on scientific evidences, and they found that “the new UD font” was more readable than Ming and Gothic typefaces and a conventional UD font. They examined the effects of a font when “reading text,” but in everyday life readers must often obtain information from a relatively short piece of text. In such instances, what is needed is not only an index of how easy the text is to read, i.e. readability, but also that of how visible the text is and how easy letters or characters are to distinguish, i.e. legibility. Thus, the current study performed experiments to compare fonts in order to determine the legibility of a newly devised UD font.

Exp1 Gothic vs New UD

The legibility of the new UD font and Gothic font were compared using a low visual acuity simulator (Nakano et al., 2006).

Participants

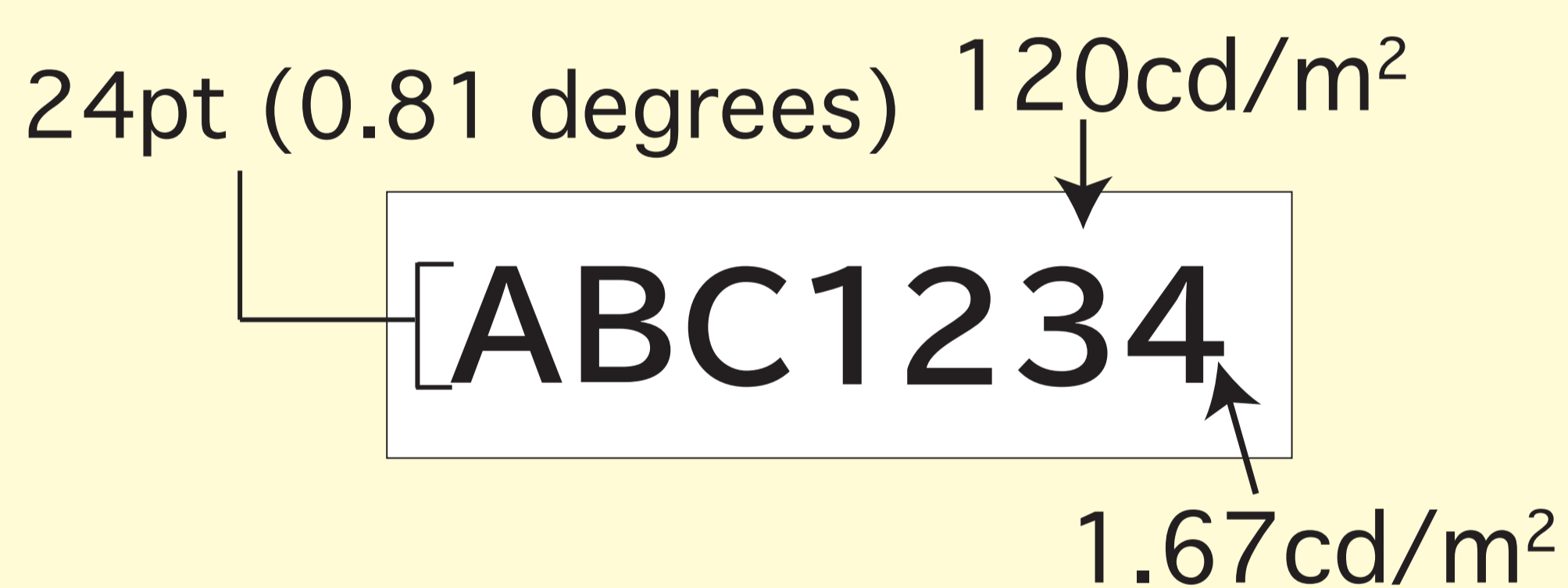
- 15 people with normal vision ages 20 to 40 (average: 27.5, SD: 4.9)
- Visual acuity was 1.0 or better.

Equipments

- Letters and numbers were presented on a CRT monitor (FlecScan T966, Eizo) with a resolution of 2048x1536 pixels.
- To simulate blurred vision, a spatial filter was used that continuously attenuate high spacial frequency components similar to those used by Legge et al. (1985) and Nakano et al. (2006).
- The viewing distance was 60cm.

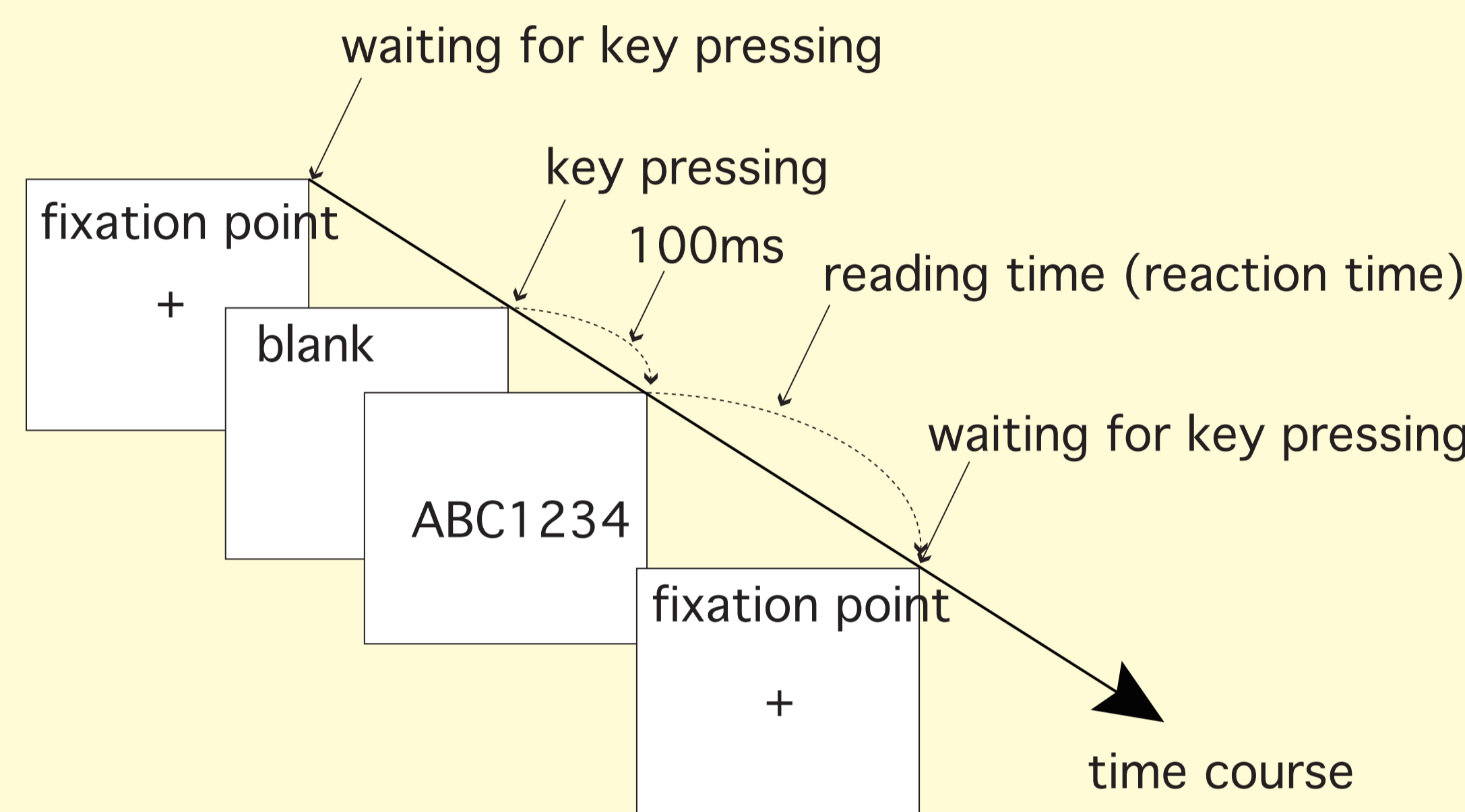
Patterns

- 7-character-long strings of letters and numbers started with randomly selected 3 letters that were followed 4 numbers.



Procedures

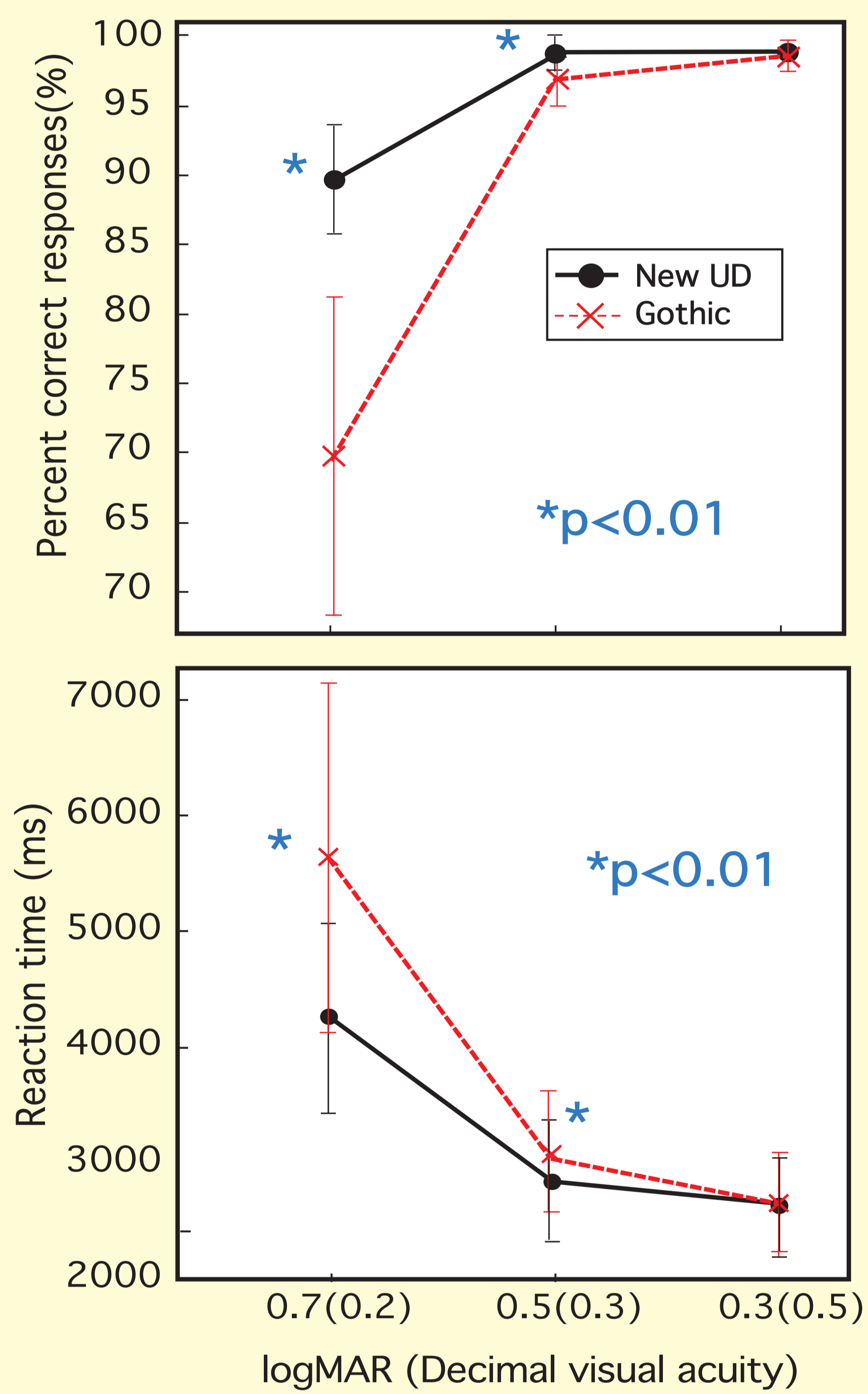
- Participants observed the strings of letters and numbers, and read aloud them in the time course shown below.



Experimental Conditions

Types of Fonts	Simulated Visual Acuity
Gothic OSB3869	0.3logMAR (0.5) OSB3869
new UD OSB3869	0.5logMAR (0.3) OSB3869
	0.7logMAR (0.2) OSB3869

Results



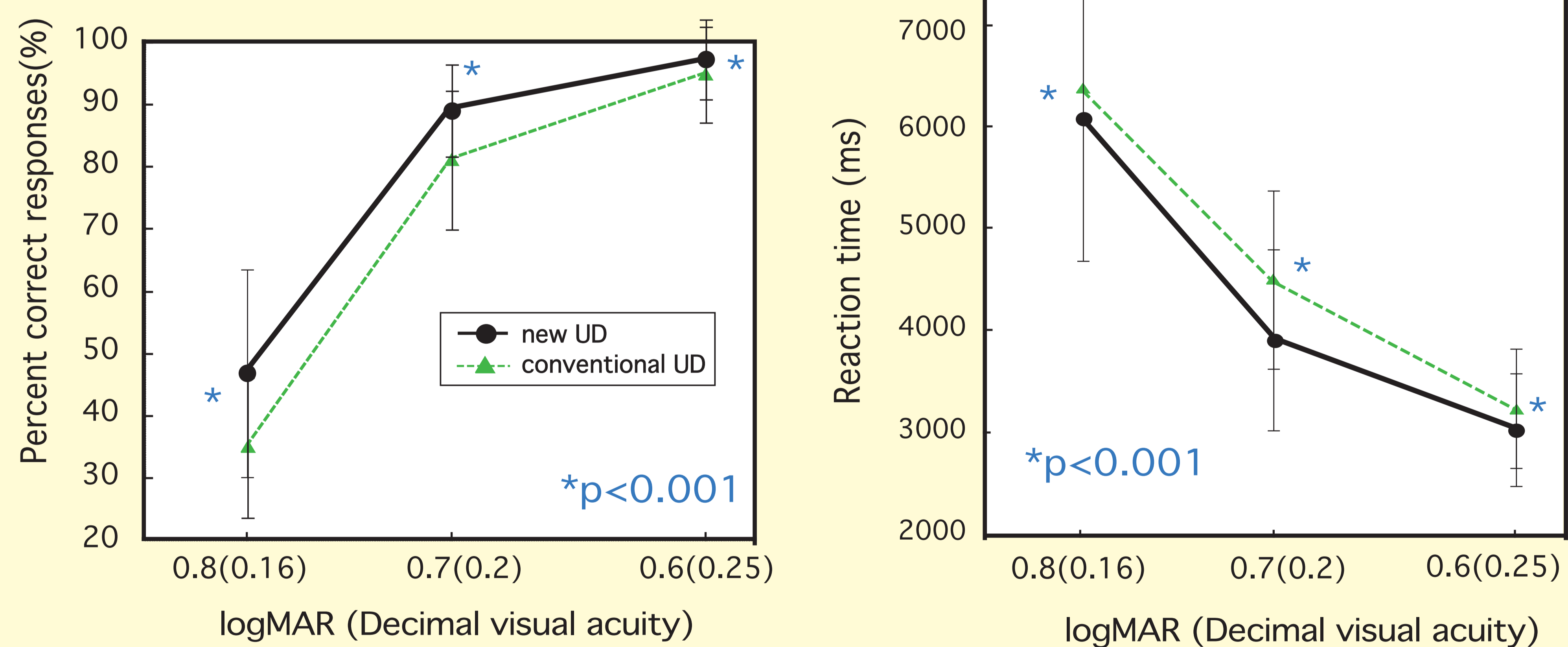
Exp2 Conventional UD vs New UD

The general method of Exp2 was the same as that of Exp1.

Experimental Conditions

Types of Fonts	Simulated Visual Acuity
new UD OSB3869	0.6logMAR (0.25) OSB3869
	0.7logMAR (0.2) OSB3869
conventional UD OSB3869	0.8logMAR (0.16) OSB3869

Results



Improvement

The differences between conventional fonts and the new UD are that the new UD was designed not to confuse similar characters, and that the effect was experimentally shown. However, the new UD font resulted in a certain proportion of incorrect responses, so letters and numbers that are often misread must be modified based on the results of this study.

0123456789

	0.6logMAR	0.7logMAR	0.8logMAR
6 → 4	1	2	23
6 → 8	—	—	9
8 → 6	—	16	6
8 → 4	—	—	12
8 → 9	—	—	6

0123456789

0123456789

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ

0123456789

abcdefghijklmnopqrstuvwxyz
ABCDEFGHIJKLMNOPQRSTUVWXYZ

4 6 f j l t G I J Q

Thus, changes were made to the design of fonts, particularly with regard to letters and numbers that were often misread, in consultation with font designers.

Conclusions

- The new UD font had letters and numbers that were quickly and accurately discerned under blur condition than conventional fonts did, revealing that new UD was not only readable, but also legible.