Development of a “universal design” font with blur tolerance (3): A comparison of the legibility of Gothic typeface and a UD font

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Objectives

Obtaining information in print is an essential part of life. An appropriately designed typeface is needed so that a variety of people can obtain information effectively.

This study sought to examine whether or not fonts would tolerate reduced contrast. Compared fonts were Gothic font which is often used in large print books for people with low vision, and a new UD font. Nakano et al. (2010) and Arai et al. (2010) studied the readabilityand legibility of this font in response to blurring.

Participants

・18 people with normal vision ages 20 to 40 ・Visual acuity was 1.0 or better.

Patterns

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

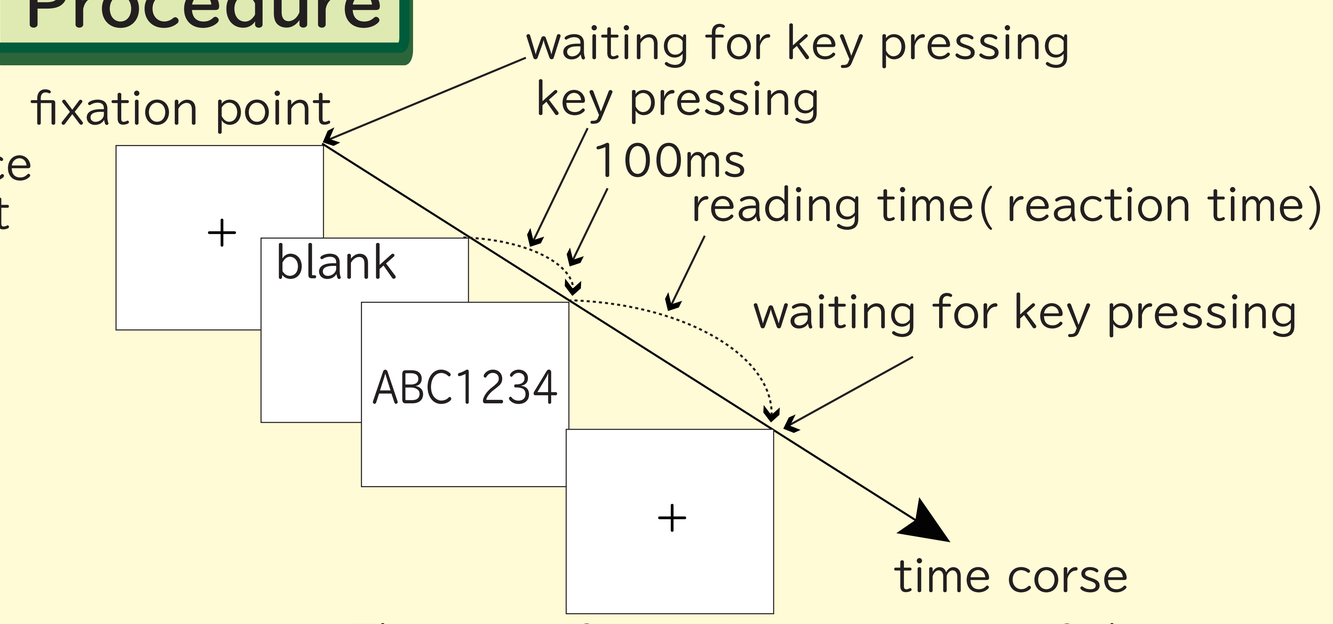
Equipments

・An image display program created in Microsoft Visual C++ was run on a desktop PC.
・BITS++ from Cambridge Research Systems (CRS) and original gamma correction software written in Visual Basic ver.6.0 were used to ensure that strings of letters and numbers and their background and luminance remained constant.
・Photometry for gamma correction was done using a ColorCal colorimeter from CRS.
・Strings were shown on a 21” flat-screen Trinitron CRT monitor (GDM-F520, SONY).

Experimental Conditions

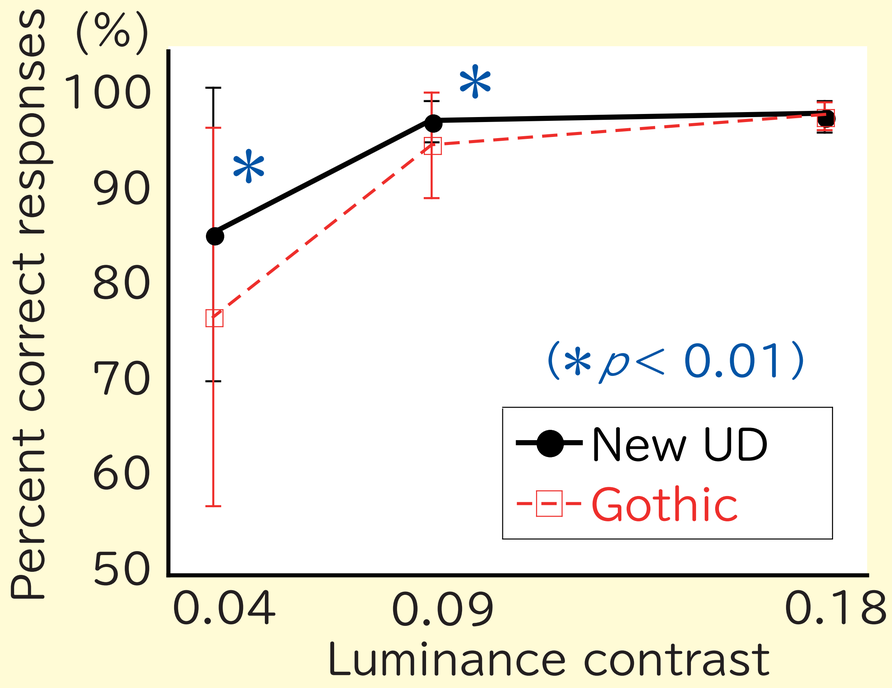
Contrast	Gothic	New UD	Luminance Contrast
	OSB3869	OSB3869	
100.5cd/m² → 70.3cd/m²	OSB3869	OSB3869	0.18
92.6cd/m² → 77.9cd/m²	OSB3869	OSB3869	0.09
88.9cd/m² → 82.1cd/m²	OSB3869	OSB3869	0.04

Procedure

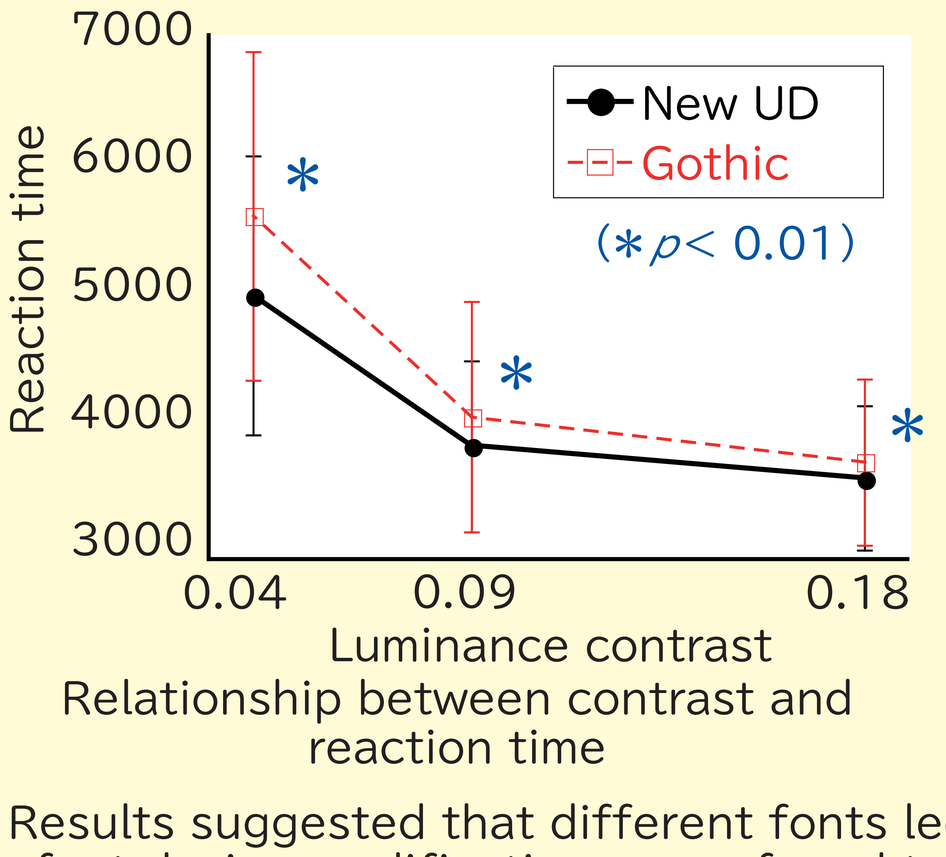


・The error for timing accuracy of the image display program was within 2.5 ms.

Results & Discussion



Relationship between contrast and percent correct responses



Relationship between contrast and reaction time

Misread characters and the number of misreadings.

Misredings \ Contrast	Gothic 0.18	Gothic 0.09	Gothic 0.04	New UD 0.18	New UD 0.09	New UD 0.04
l → i / I	26	54	31	25	39	28
l → f / F	—	1	3	—	3	6
j → i / I	—	8	11	—	1	3
Q → o / O	—	—	6	—	—	18
O → q / Q	3	—	8	3	6	10
6 → 8	1	3	10	—	1	1
8 → 6	—	3	15	—	1	3

		Displayed Answer	Misreadings (%)	Simulation
blurred (0.2)	Gothic	G O / o	35	
		5 6	28	
		Q O / o	27	
	New UD	l F / f	25	
		l I / i	17	
		Q O / o	17	
Contrast (0.04)	Gothic	l l / i	31	
		8 6	15	
		j l / i	11	
	New UD	l I / i	28	
		Q O / o	18	
		O Q / q	10	

・Results suggested that different fonts led to differences in the level of legibility at reduced contrast, so font design modifications were found to lead to improved legibility.