Adjustment of viewing distance of students with low vision
-- Can low vision students change viewing distance reasonablly? --

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Objectives
Comparison between Preferred Print Size (PPS) and Reading Performance

Theoretically, critical print size (CPS) of MNREAD should be a good predictor of selecting print size. But the CPS just show the smallest retinal size. To decide the real print size for the large print, we must study best combination of print size and viewing distance. The aim of this study was to clarify what is the best combination of real print size and viewing distance according to their preference.

Methods
Participants were 78 high school students with low vision.

1. Interviews were conducted with regard to their PPS and large print.
2. Visual acuity was measured with the logMAR near acuity charts.
3. Reading performance was measured with the MNREAD-J charts.
   a) Standard testing: Measurement was conducted at 30cm.
   b) Free Viewing Distance: The distance between charts and a participant could be adjusted so that he/she could read the charts at his/her preferred distance.
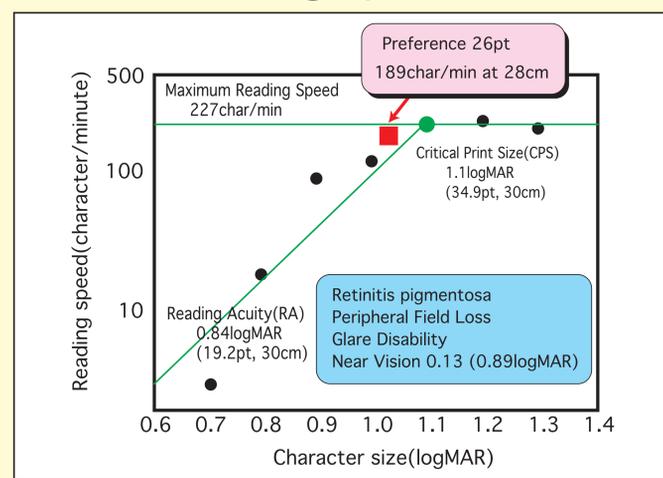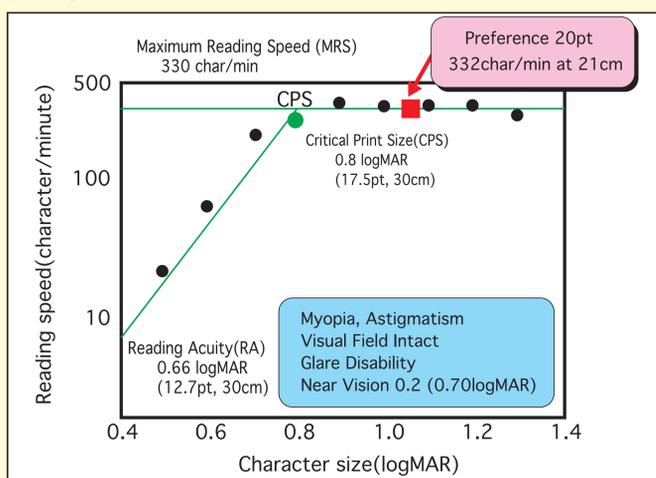
Results
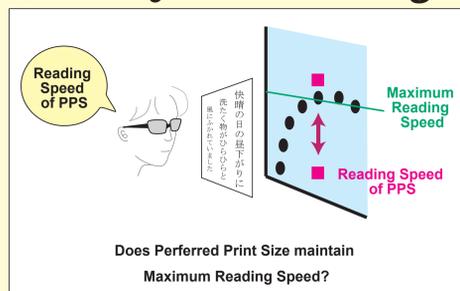
1) Relationship between Visual Acuity and PPS
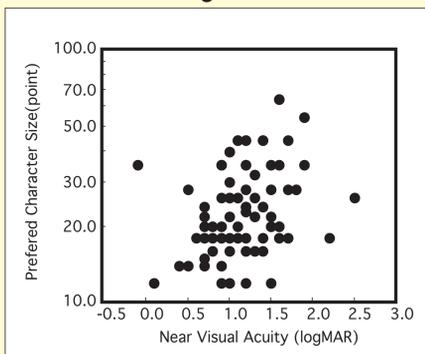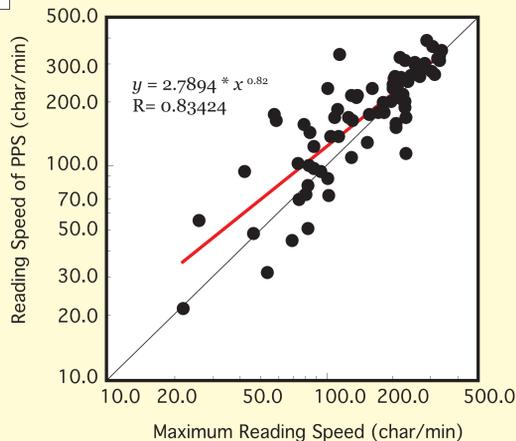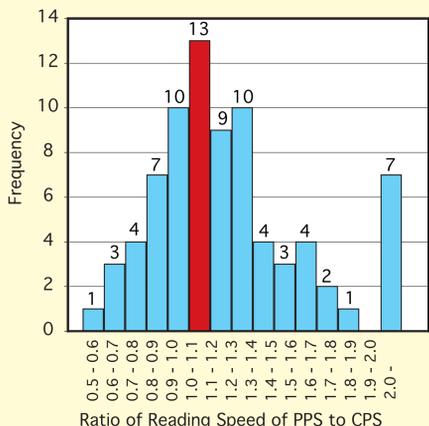
There were no correlation.

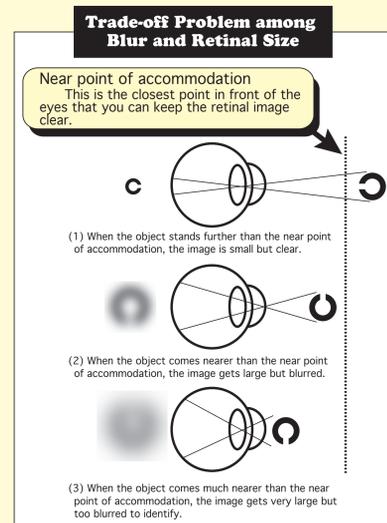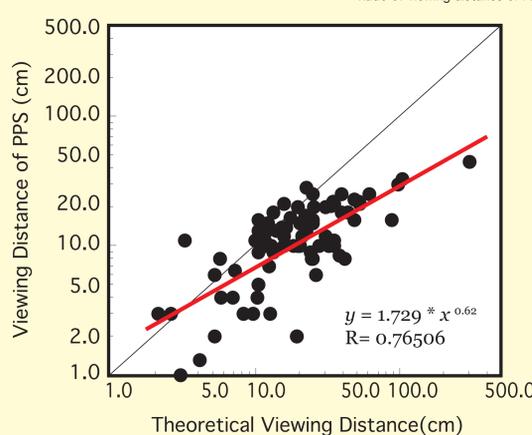### 2) Typical Result of MNREAD Performance and Reading Speed of PCS

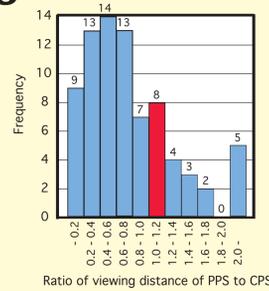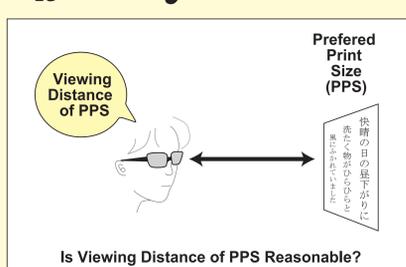Maximum Reading Speed (MRS) 330 char/min
CPS
Preference 20pt 332char/min at 21cm
Critical Print Size(CPS) 0.8 logMAR (17.5pt, 30cm)
Reading Acuity(RA) 0.66 logMAR (12.7pt, 30cm)
Myopia, Astigmatism Visual Field Intact Glare Disability Near Vision 0.2 (0.70logMAR)

Maximum Reading Speed 227char/min
Preference 26pt 189char/min at 28cm
Critical Print Size(CPS) 1.1logMAR (34.9pt, 30cm)
Reading Acuity(RA) 0.84logMAR (19.2pt, 30cm)
Retinitis pigmentosa Peripheral Field Loss Glare Disability Near Vision 0.13 (0.89logMAR)

3) Analysis of Reading Speed

Reading Speed of PPS
Maximum Reading Speed
Reading Speed of PPS

Does Perferred Print Size maintain Maximum Reading Speed?

There were strong correlation between maximum reading speed and reading speeds of PPS.

$y = 2.7894 * x^{0.82}$
R= 0.83424

Ratio of Reading Speed of PPS to CPS

4) Analysis of Viewing Distance

Viewing Distance of PPS
Preferred Print Size (PPS)

Is Viewing Distance of PPS Reasonable?

Ratio of viewing distance of PPS to CPS

$y = 1.729 * x^{0.62}$
R= 0.76506

Theoretical Viewing Distance(cm)

Trade-off Problem among Blur and Retinal Size

Near point of accommodation
This is the closest point in front of the eyes that you can keep the retinal image clear.

(1) When the object stands further than the near point of accommodation, the image is small but clear.

(2) When the object comes nearer than the near point of accommodation, the image gets large but blurred.

(3) When the object comes much nearer than the near point of accommodation, the image gets very large but too blurred to identify.

a) Viewing distances of PPS tended to be closer than MRS.
b) Low vision students gave priority to retinal size.

They kept high reading speed in their PPS and favorite viewing distance (FVD). The low vision students were able to reasonably select the PPS and FVD based on preference alone, but their PPS tends to be larger than their critical print size. And there are a few students that they can't change viewing distance to keep retinal size larger than their CPS.