

# Validating an iPad 3 Implementation of the MNREAD Reading Acuity Test

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## BACKGROUND

The MNREAD reading acuity test is a tool used in ophthalmic care and vision research settings. It allows for determination of the three key properties of reading vision<sup>2</sup> for both normal and low-vision people:

**Reading Acuity**- smallest print that can be read without significant errors

**Critical Print Size**- smallest print that can be read at the maximum speed.

**Maximum Reading Speed**- reading speed when print size is not a limiting factor

Implementing the MNREAD on an iPad will enhance usability of the test<sup>1</sup>. It also increases usefulness of evaluating low-vision reading difficulties.

## OBJECTIVES

- Testing if the iPad and printed chart yield comparable results for each of the three properties of reading vision
- Assessing the effect on performance when viewing the iPad MNREAD at nonstandard viewing distances (standard viewing distance is 40cm).

## METHODS

### Testing Apparatus

- 5 Charts
- 19 unique sentences per chart (1.3 to -0.5 LogMAR)
- 3<sup>rd</sup> grade vocabulary
- Normal and reversed polarity
- \* 0.0 LogMAR = 20/20 Snellen



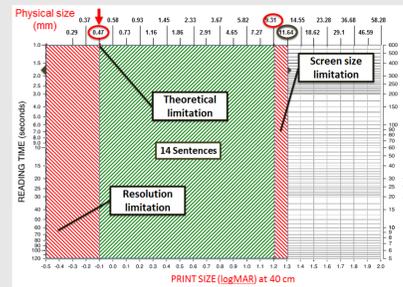
Top Left- testing apparatus set up<sup>4</sup>  
 Bottom Left- MNREAD iPad display<sup>3</sup>  
 Right- Printed MNREAD reversed and normal polarity<sup>2</sup>

### Subjects

- N=73
- Normal vision (visual acuity > 20/60)
- Subjects tested on each chart once
  - 5 charts read by each subject
- Sequence of version (print/iPad) and viewing distances randomized for each subject

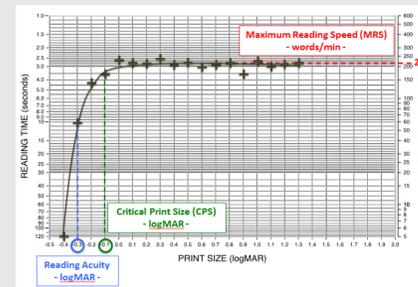
## METHODS

### iPad Restricted Print Range



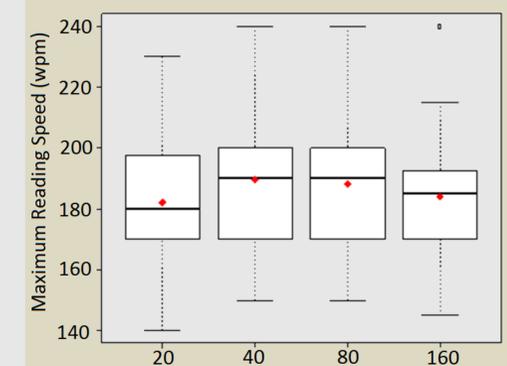
Missing MNREAD sentences on iPad due to size and resolution limits<sup>3</sup>.

### Scoring and Data Collection



Used for data collection and calculation of 3 key properties of reading vision<sup>3</sup>.

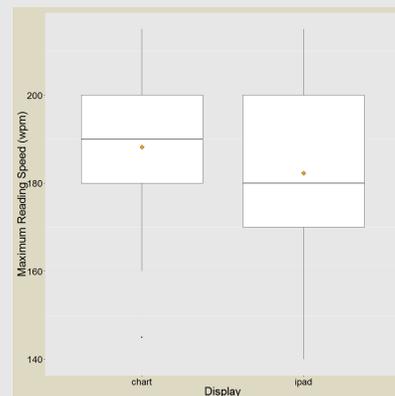
## RESULTS



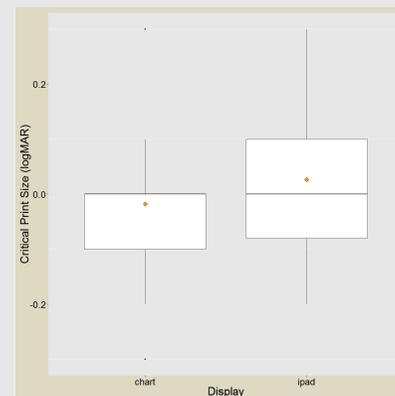
Comparing the effects of varying the viewing distance on *maximum reading speed* for both iPad and printed chart.

\* Linear mixed effect models used for data analysis

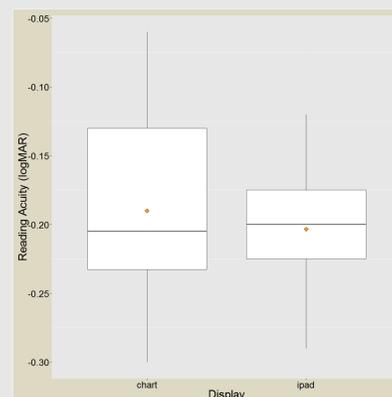
## RESULTS



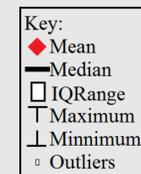
Comparing the effects of display on *maximum reading speed* between iPad and printed chart.



Comparing the effects of display on *critical print size* between iPad and printed chart..



Comparing the effects of display on *reading acuity* between iPad and printed chart.



## CONCLUSION

### Comparability of Reading Vision Properties Between iPad and Printed Chart

- Reading acuity and critical print size → no significant difference between iPad and printed chart
- Maximum reading speed → significantly faster on printed chart
  - 3% increase, 6wpm difference
  - Not clinically relevant

### Effect of Varying Viewing Distance on Performance for both iPad and Printed Chart

- Reading acuity and critical print size → significant difference across range of viewing distances
  - Not clinically relevant, a 100cm viewing distance change required for a 0.05 LogMAR difference in both properties
- Maximum reading speed → no significant difference across range of viewing distances

## FUTURE DIRECTIONS

- Assessing resolution limitation of reversed polarity MNREAD display on iPad
- Low-vision subject testing (visual acuity ≤ 20/60)
- MNREAD application development

### REFERENCES

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### ACKNOWLEDGEMENTS

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