Regressions in Braille Reading

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Background

- Regressions are the rereading of text or words
- Regressive saccades in visual reading are related to understanding text[1,2]
  - More regressions while reading occur in response to higher linguistic complexity
- Regressive movements in braille reading are generally regarded as causing reading problems, rather than a symptom[3]
- Our goal was to see whether reducing the stimulus quality increases regressions in braille reading
- A secondary goal was to look at the role of the second hand in two-handed braille reading

Methods

Participants:
- 12 blind adults (*mean age* = 38.3 years, *SD* = 13.2 years)
- Fluent in American English contracted braille

Stimuli:
- Six IReST English texts (one additional for practice)[4]
- 3 braille heights: high = 0.38mm, med = 0.18mm, low = 0.04mm

Experimental Design

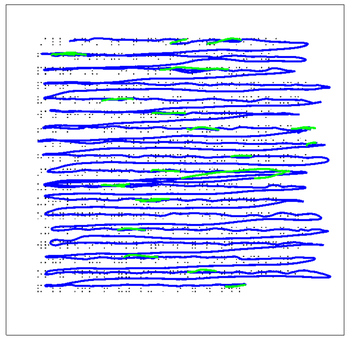
3 different heights (high, medium, low)
X
2 hand conditions (one hand, two hands)

Finger Tracking:
- Sensors on index & middle fingers (3DG trakSTAR system)

Analyses:
- Performed ANOVAs with post-hoc t-tests, Holm corrected

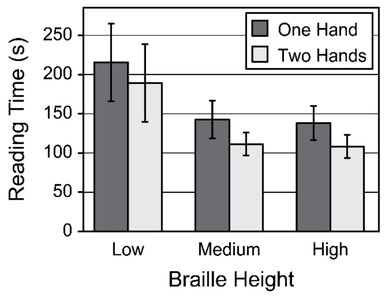
Results

Identifying Regressions



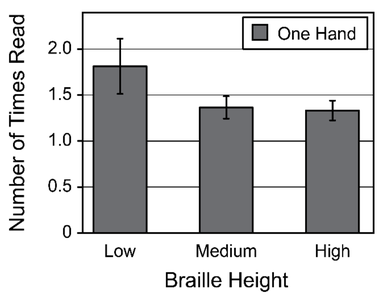
- Regressions identified as leftward movements of at least 0.25 inches
- Reading motions defined as forward movements of at least 0.25 inches
- Average number of forward movements through a word used as dependent measure

Reading Times



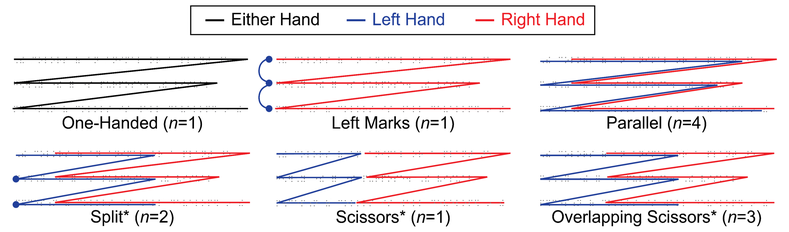
- Significant main effects of braille height, hand condition, and interaction (all $p < 0.05$)
- One-handed slower than two-handed (all adjusted $p < 0.05$)
- Low braille significantly slower than medium and high (all adjusted $p < 0.01$), medium and high n.s.

One-handed Regressions



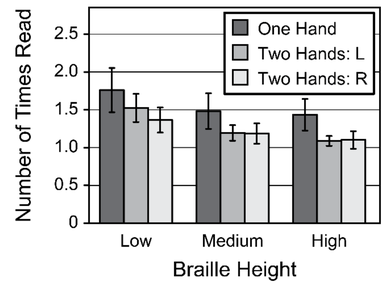
- Significant main effect of braille height ($p < 0.001$)
- Low braille had significantly more than medium and high, (both adjusted $p < 0.01$), medium and high n.s.

Reading Strategies



* Boundary locations may not be where shown

Two-handed Regressions



- Only split and parallel strategy users
- We only compared one-handed reading to right hand of two-handed reading
- Significant effects of braille height and hand condition (both $p < 0.001$), interaction n.s.

Conclusions

- Regressions are increased in braille reading when changes of stimulus quality make understanding the text more difficult
- This brings tactile reading regressions into agreement with visual reading regressions
- Left hand in some two-handed reading strategies reduces the number of regressions by the leading (right) hand

References

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3. Wright, T., Wormsley, D. P., & Kamei-Hannan, C. K. *J Vis Impair Blind,* 2009; *103*, 649-661.
4. Hahn, G. A., Penka, D., Gehrlich, C., Messias, A., Weismann, M., Hyvärinen, L., ... & Vital-Durand, F. *Br J Ophthalmol*, 2006; *90*, 480-484.

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