Visual Span Constraints in Dyslexia
From Lab Measurement to Scalable Online Assessment

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READ-lab
Reading, Eye movements, Attention and Digital Interfaces

BACKGROUND

- **Visual span**: number of letters recognized reliably in a single fixation[1]
- Smaller visual span linked to slower reading in people with low vision[2]
- Prior work suggests visual processing differences in dyslexia[3,4,5]
- Previous unpublished lab experiment showed initial evidence for reduced visual span in dyslexic readers
- There is a need for larger, scalable validation using online methods with more diverse participant samples

AIM & QUESTIONS

Investigate the relationship between visual span and reading speed using scalable online methods, with a focus on dyslexia

- Can visual span be reliably measured online, and does it predict reading speed?
- Is reduced visual span observed in a large online dyslexia sample and does it relate to reading speed?

METHODS

MATERIALS & PROCEDURE

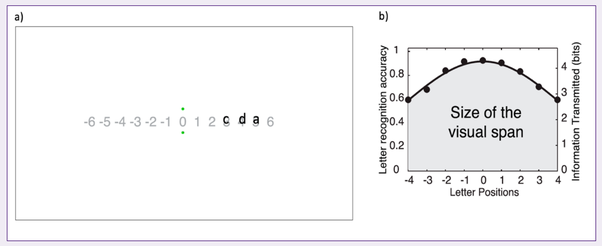
- Online study implemented in PsychoPy / Pavlovia
- Remote participation on personal computers
- Viewing distance calibrated using credit card scaling
- Two-part experiment: **visual span task + reading assessment**

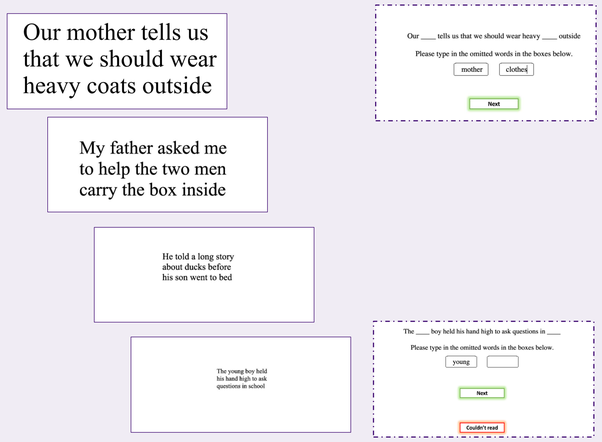
Visual span task

- Trigram letter recognition paradigm
- Brief peripheral letter presentation
- Letter positions spanning central and parafoveal locations
- Accuracy converted to **visual span size (bits)**

Reading assessment

- Online **MNREAD-based** reading speed task
- Sentence reading aloud
- Reading speed measured in **words per minute**
- Comprehension checks included





EXPERIMENT I

- Typical adult readers
- 25 native English speakers
- Age range: 18 - 75 (Mean: 44.2)
- Recruited through Prolific

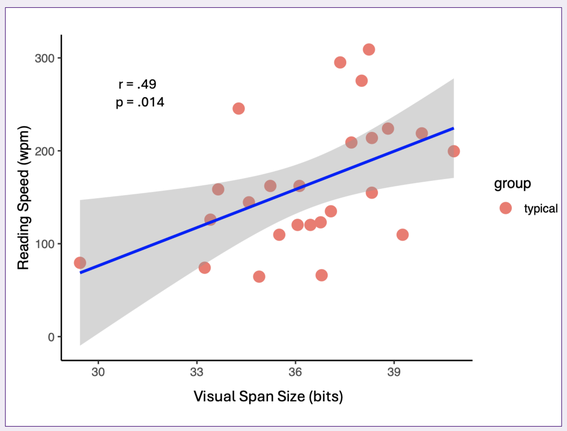
EXPERIMENT II

- Adults with self-reported dyslexia
- 66 native English speakers
- Age range: 19 - 59 (Mean: 34.3)
- Recruited through Prolific

RESULTS

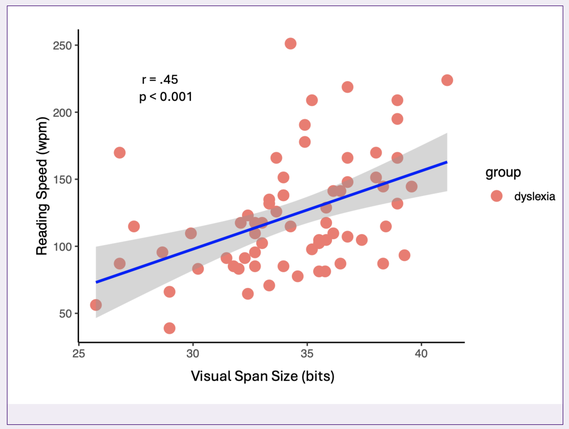
EXPERIMENT I

- Successful online validation of visual span paradigm
- The relationship between visual span and reading speed was preserved (**r = .49**)
- Meaningful psychophysical measurement online



EXPERIMENT II

- Adults with self-reported dyslexia showed a **reduced visual span** compared to typical readers.
- Visual span narrowing reflected a **constricted span width**, rather than uniformly poorer accuracy across all positions.
- The relationship between visual span and reading speed was preserved (**r = .45).**
- Despite greater heterogeneity and noisier online data, the overall pattern remained robust.



CONCLUSIONS

- Visual span size is reliably linked to reading speed across independent online samples.
- Findings support the idea that visual processing constraints contribute to reading difficulties in dyslexia.
- Reduced visual span in dyslexia appears to reflect limited parallel letter recognition, consistent with a sensory bottleneck account.
- Online psychophysical methods can successfully capture meaningful visual-reading relationships at scale.
- **Limitation:** Dyslexia status in the online sample was self-reported, introducing diagnostic heterogeneity and increased variability.
- **Future Directions:** Determining whether reduced visual span characterizes all individuals with dyslexia or specific subgroups and valuating whether targeted visual interventions (e.g., spacing manipulations) selectively benefit individuals with narrower spans.

REFERENCES

(Scan to view poster)

THE READABILITY CONSORTIUM

UNIVERSITY OF MINNESOTA