

# Auditory-verbal short-term memory span and rehearsal timing in adults with dyslexia

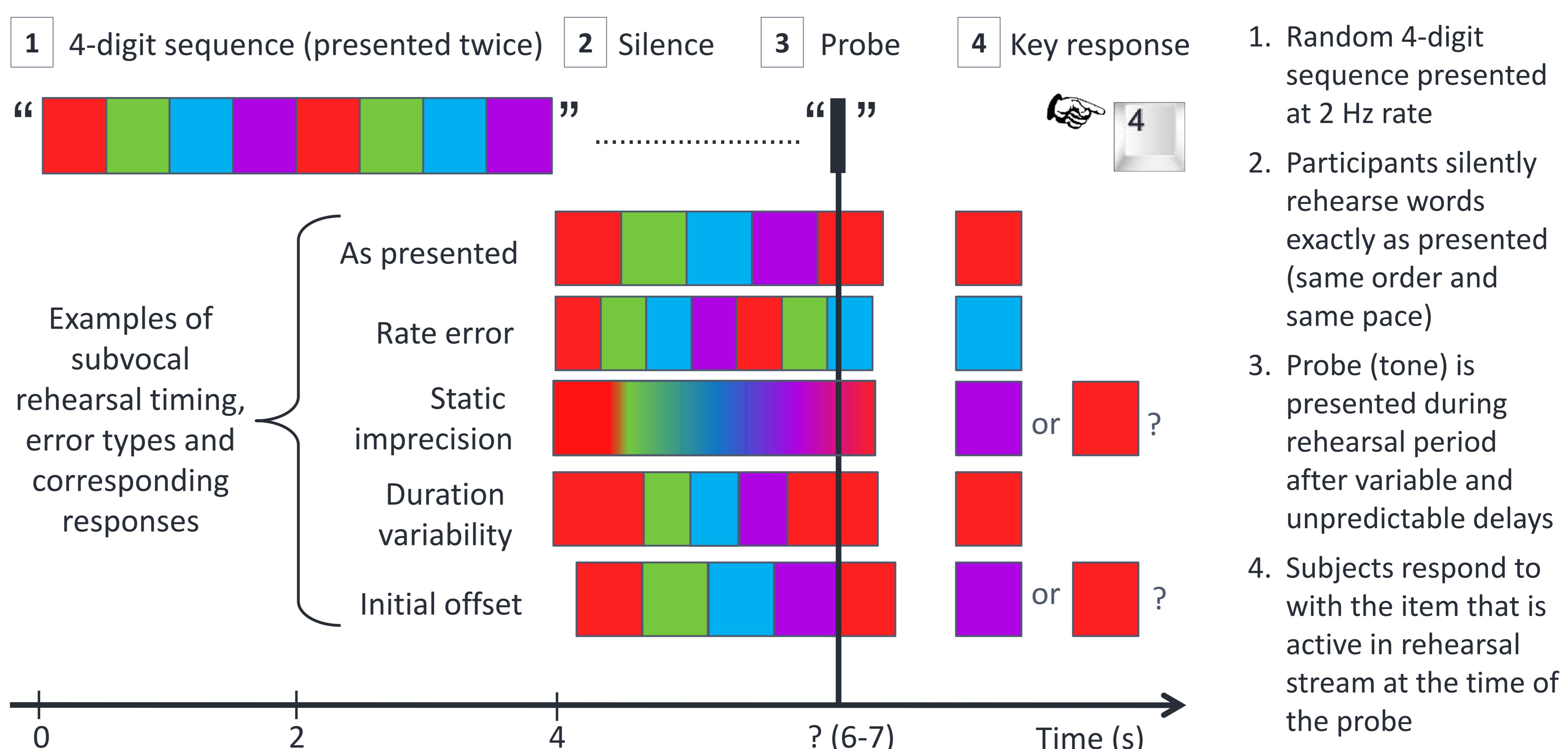
THE UNIVERSITY of York

Rebecca A. Gilbert, Tom Hartley, Graham J. Hitch

## Background

- Speech is a complex signal characterised by rhythmic fluctuations on many time scales<sup>1</sup>
- Temporal accuracy in auditory-verbal STM
  - speech segmentation
  - phoneme-grapheme mapping<sup>2</sup>
  - serial order recall and word learning<sup>3</sup>
- Adults with dyslexia: more variability in behavioural<sup>4</sup> and neurological<sup>1</sup> measures of entrainment to slow rhythms
- Theoretical causes of poor PA in dyslexia
  - deficits in rhythmic entrainment<sup>5</sup>
  - increased neural noise<sup>6</sup>
- Rehearsal-timing task: access STM timing accuracy without sensory feedback or motor-timing confounds
- Hypothesis: dyslexia group will show more response variability in a test of subvocal rehearsal timing

## Rehearsal Timing Task



## Participants and Methods

	Dyslexia	Control
Native language	English	English
N (no. of men)	18 (3)	18 (3)
Mean age in years	20.8 (3.1)	20.4 (2.2)
Mean years of ed.	13.7 (1.0)	13.9 (0.9)
Mean WASI MR	28.2 (4.4)	29.2 (3.6)
Mean digit span	5.7 (0.8)	7.3 (1.0) *

Note: MR, Matrix Reasoning; SD in parenthesis for means, \* significant group difference at  $p < .001$

### Recruitment

- University of York, York St. John, York Dyslexia Action
- Dyslexia group: diagnosis within last 5 years

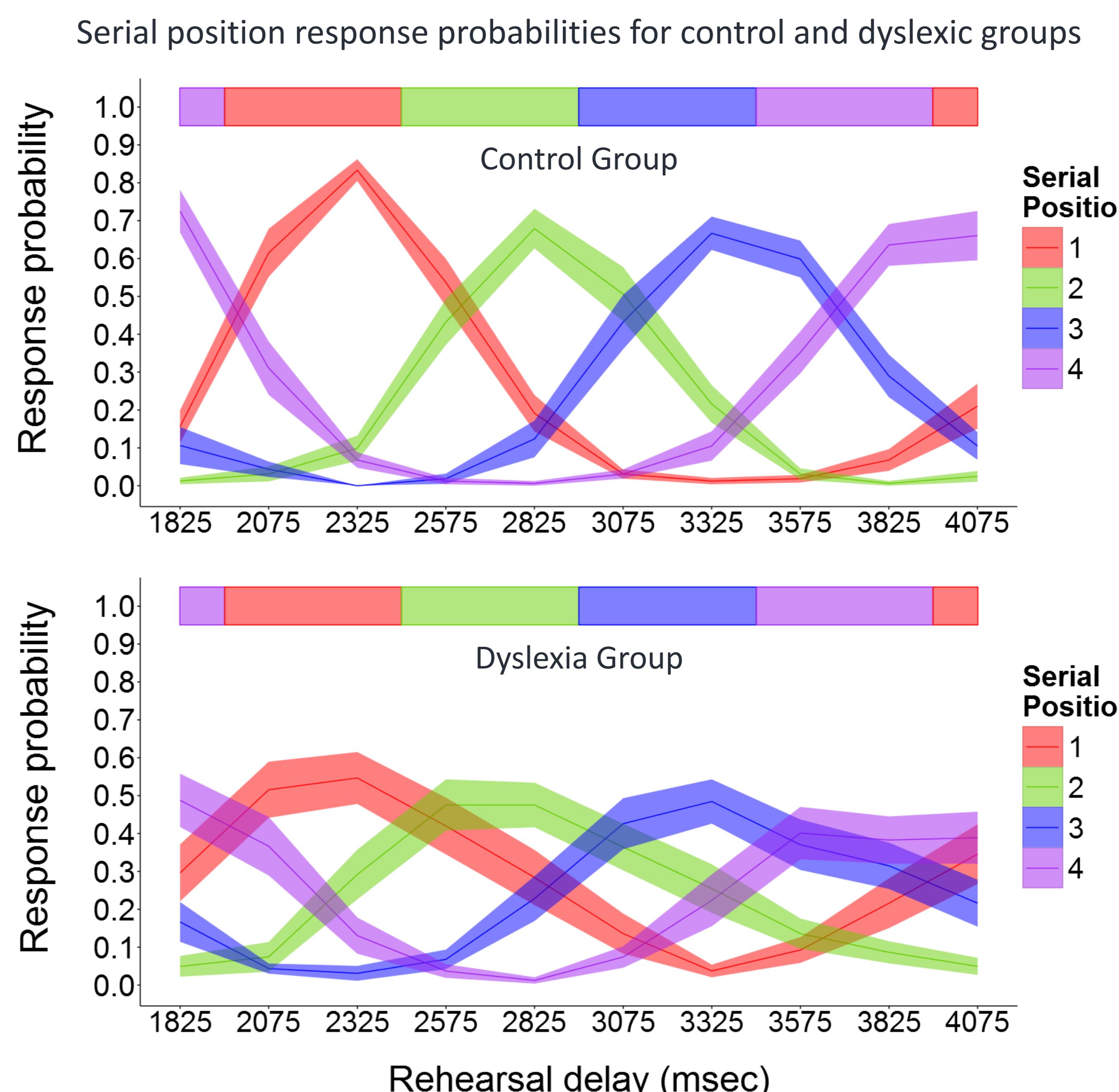
### Dyslexia screening

- YAA-R Spoonerisms, RAN
- TOWRE SWE, PDE
- CTOPP Phoneme Elision

### Rehearsal timing task

- 90 trials (10 rehearsal durations x 9 trials)
- 24 min (3 blocks x 8 min/block)

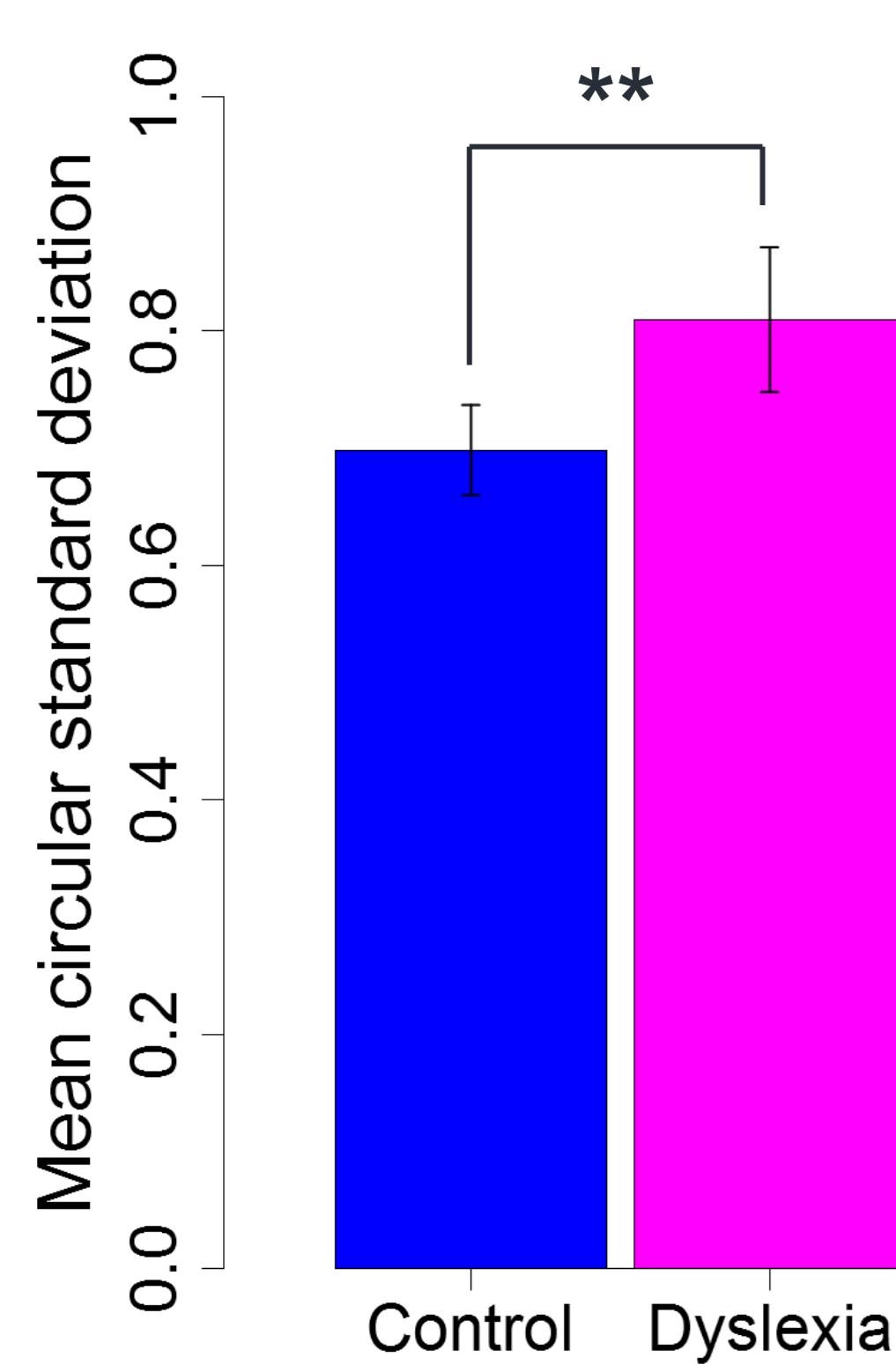
## Results



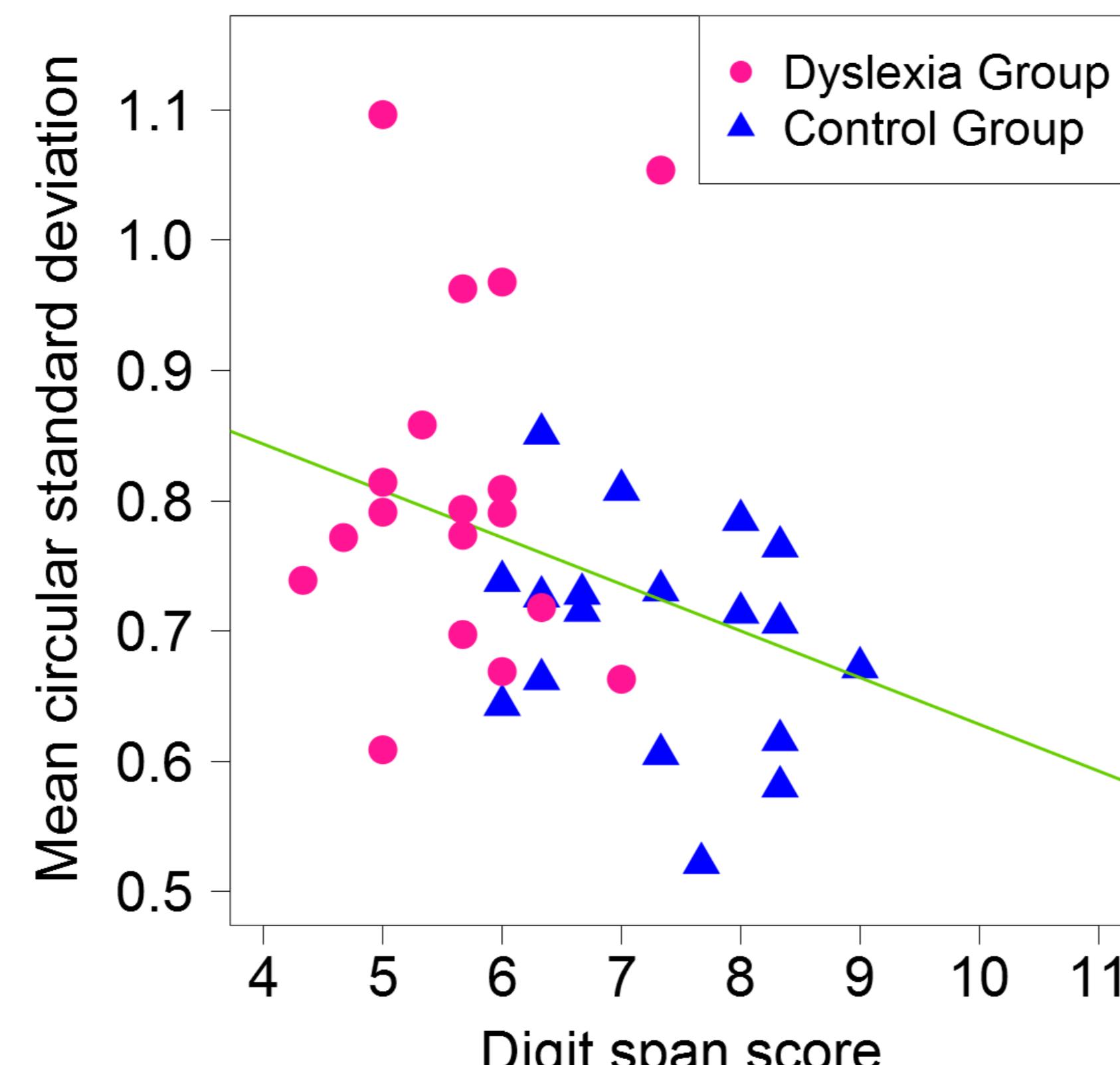
Note: Colours indicate serial position. Filled boxes above curves show correct item timing (i.e. as presented). Solid lines show mean probability of the serial position of the response. Ribbons surrounding mean lines indicate SE of the mean.

## Results

Dependent variable: mean circular standard deviation (CSD), rehearsal timing variability averaged over serial positions



Note: error bars represent 95% CIs



### Mean CSD in dyslexics and controls

- Significantly higher mean CSD in dyslexic vs. control group
  - $F(1,34) = 9.00, p = .005$
- No main effect of serial position of response
- No group x serial position interaction

### Correlation: digit span and mean CSD

- Significantly negatively correlated with digit span
  - $r = -.35, p = .036$
- No significant correlation with WASI Matrix Reasoning or dyslexia screening measures

## Conclusions

- Dyslexia group: significantly higher timing variability during rehearsal of sub-span digit sequences
- Significant correlation between timing variability and measure of auditory-verbal STM capacity
- The novel rehearsal timing task provides a fine-grained measure of timing properties of subvocal speech, and has potential to provide insight into the role of rehearsal in STM, as well as links between timing, rhythm and speech

## References

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