Mechanisms of visual spatial attention in reading in children.

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Background

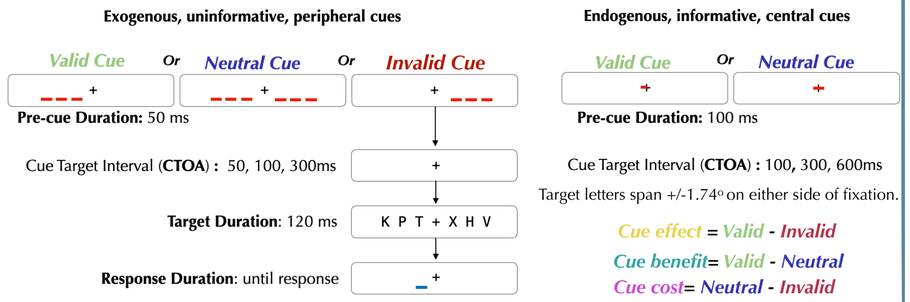
- Shifting and focusing attention is a key mechanism in the extraction of sensory information, to allow for adaptive behavior like reading.
- Covert spatial attention, the selective processing of information in different regions of visual space without eye movements, can be (i) exogenously captured by a **salient** stimulus or (ii) endogenously allocated by voluntary effort [1].
- There is growing argument for an association between spatial attention and developmental dyslexia [2-4].
- The interplay between the development of spatial attention and reading ability has yet to be measured in an ecologically valid paradigm in children.
- In our previous work on skilled readers (18-40yrs, n=22), we reported the effects of exogenous and endogenous attention in a task relevant for reading [5, 6].

Our goal is to investigate the effect of visual spatial attention in the multi-letter processing task, a task relevant for reading, in children between 7-13yrs.

Participants: 58 children, 7 to 13 yrs. All children performed the exogenous version online and did the endogenous version in-lab with eye-tracking to ensure fixation. All participants completed a battery of reading assessments and standardized scores <85 are classified as group Dyslexia.

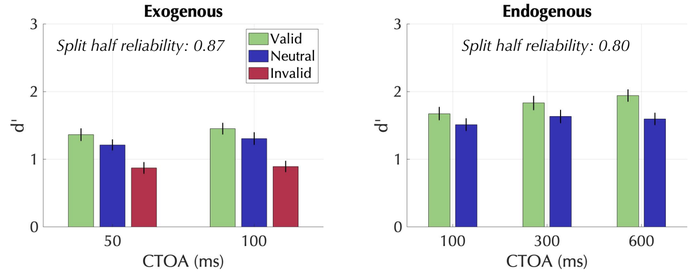
	Total #	# Dyslexia	#Controls	Age (SD)	IQ (SD)
Endogenous	57	9	48	9.91 (1.61)	110 (12.7)
Exogenous	42	5	37	10 (1.53)	110 (12.5)

Manipulating spatial attention in the multi-letter processing task

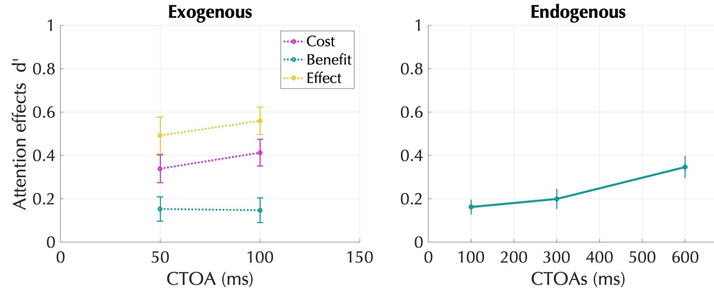


***Task**: Participants report the letter in the post-cued location from a set of 12 letters.*

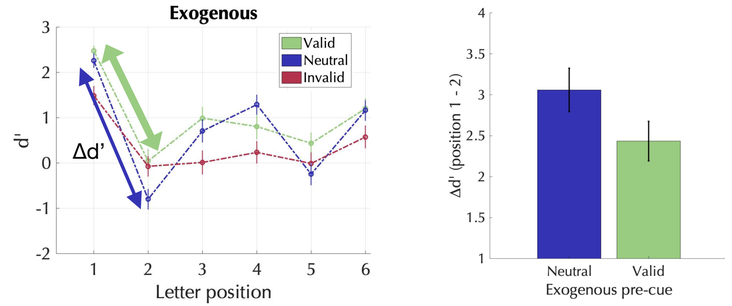
Spatial cues affect task performance in the multi-letter processing task.



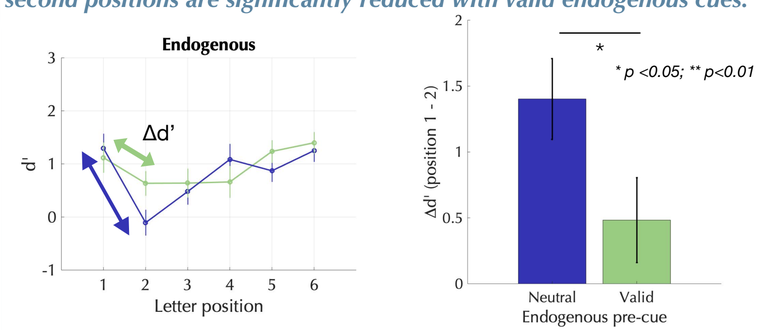
Children do not show a time course for exogenous cue-benefits. However, endogenous cue benefits are greatest at the longest CTOA.



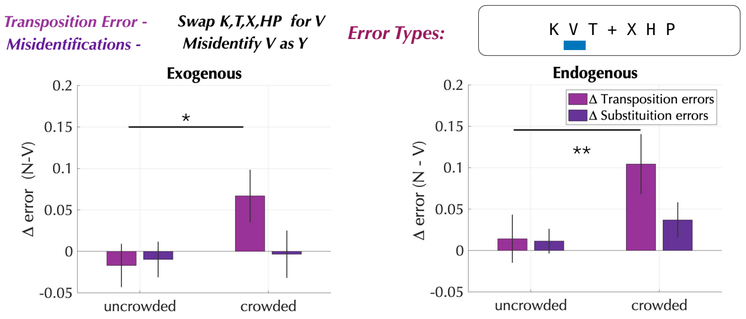
Serial position function (performance as a function of letter position) in the neutral and valid trials are W-shaped, with greater differences in d' across letter positions.



Endogenous valid trials are not W-shaped. Δd' between the first and second positions are significantly reduced with valid endogenous cues.



Valid cues are especially helpful in reducing transposition errors.



Conclusions & Discussion

- Children did not show temporal dynamics for exogenous effects but endogenous effects were greatest at the longest CTOA interval.
- The magnitude of endogenous cues (600ms) are twice the exogenous cue effects.
- Endogenous valid cues reduce the difference in encoding across letter positions.
- Valid cues are especially helpful in reducing transposition errors, i.e., they help correctly perceive letter order.
- Our goal is to investigate these effects in children with dyslexia to understand the role of visual spatial attention in developmental dyslexia.

References

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This work was funded by NIH NICHD R01HD095861O1, research grants from Microsoft and Jacobs Foundation Research Fellowship to J.Y.