

# School-age children perceive fast radial optic flow in noise more accurately than slow linear flow

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## MOTIVATION

Optic flow evokes different cortical activation patterns across the scalp depending on the pattern of flow (radial vs. linear) and speed. These effects are seen both in adults [1] and children [2]. This study examined whether the detection of optic flow in child observers varies by pattern and speed in similar ways to adults [3],[4], and the extent to which behavioral detection accords with patterns of brain activation.

## METHOD

Child observers (n=31; 5.2-8.6 years,  $M=6.7$ , 19 female) participated for \$10 in compensation. Observers judged which of two side-by-side optic flow displays contained coherent motion. Each run contained 5 blocks of 16 trials in which one display depicted random (0% coherent) motion while the other depicted radial or linear motion at one of four fixed coherence levels in one of two coherence level profiles (20, 40, 60, 80%) or (15, 30, 45, 60%). Observers fixated centrally and judged which side contained coherent motion, indicating the choice by pointing to the monitor. The choice was entered by the experimenter via keypress. Within a single run, speed was either 2 or 8 deg/s. Four runs were collected per participant in a single visit lasting approximately 1 hour. Participants were given the option to take a break half way through the experiment.

We analyzed the proportion of correct responses and response times using generalized linear mixed effects modeling in R.

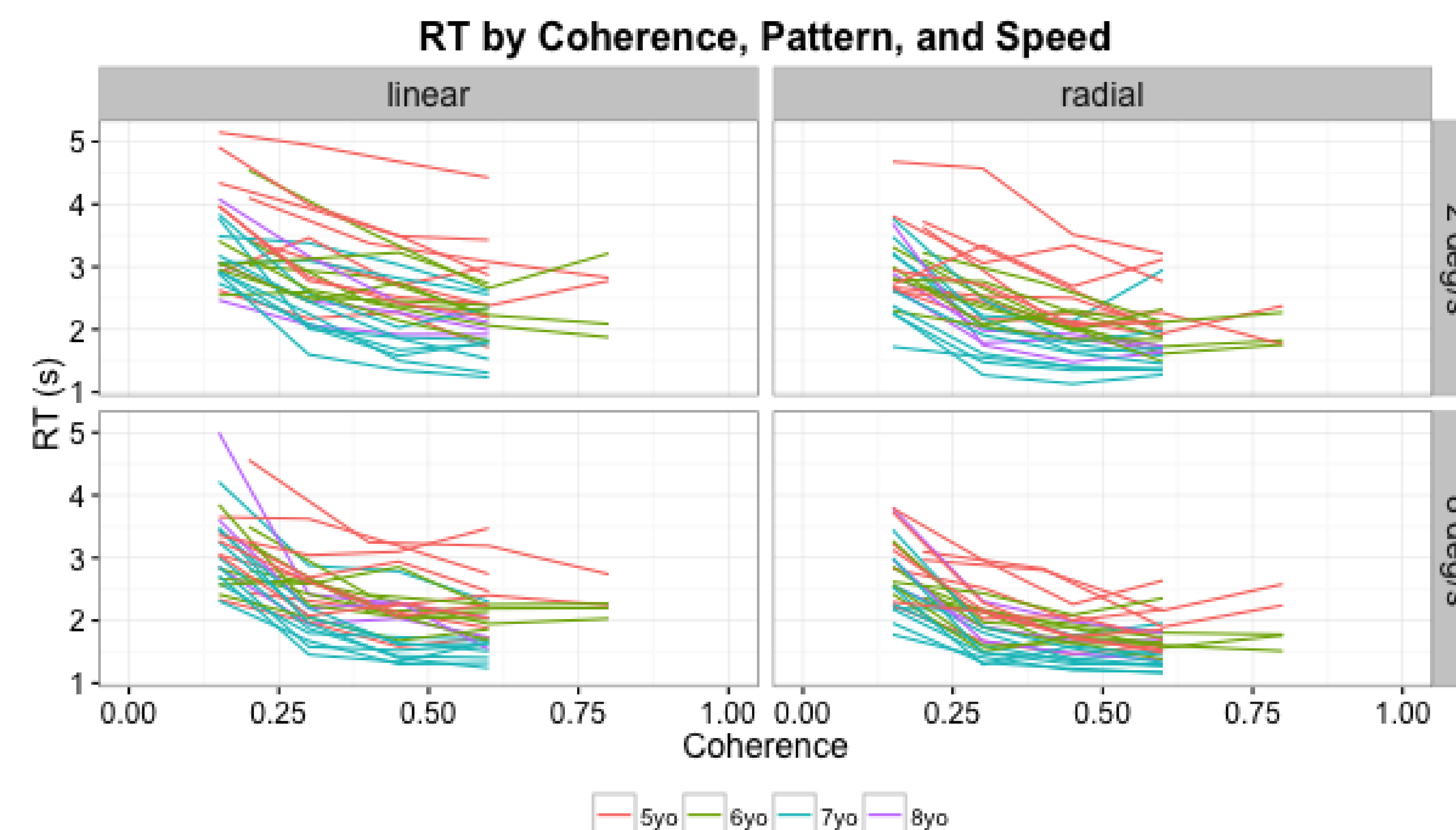
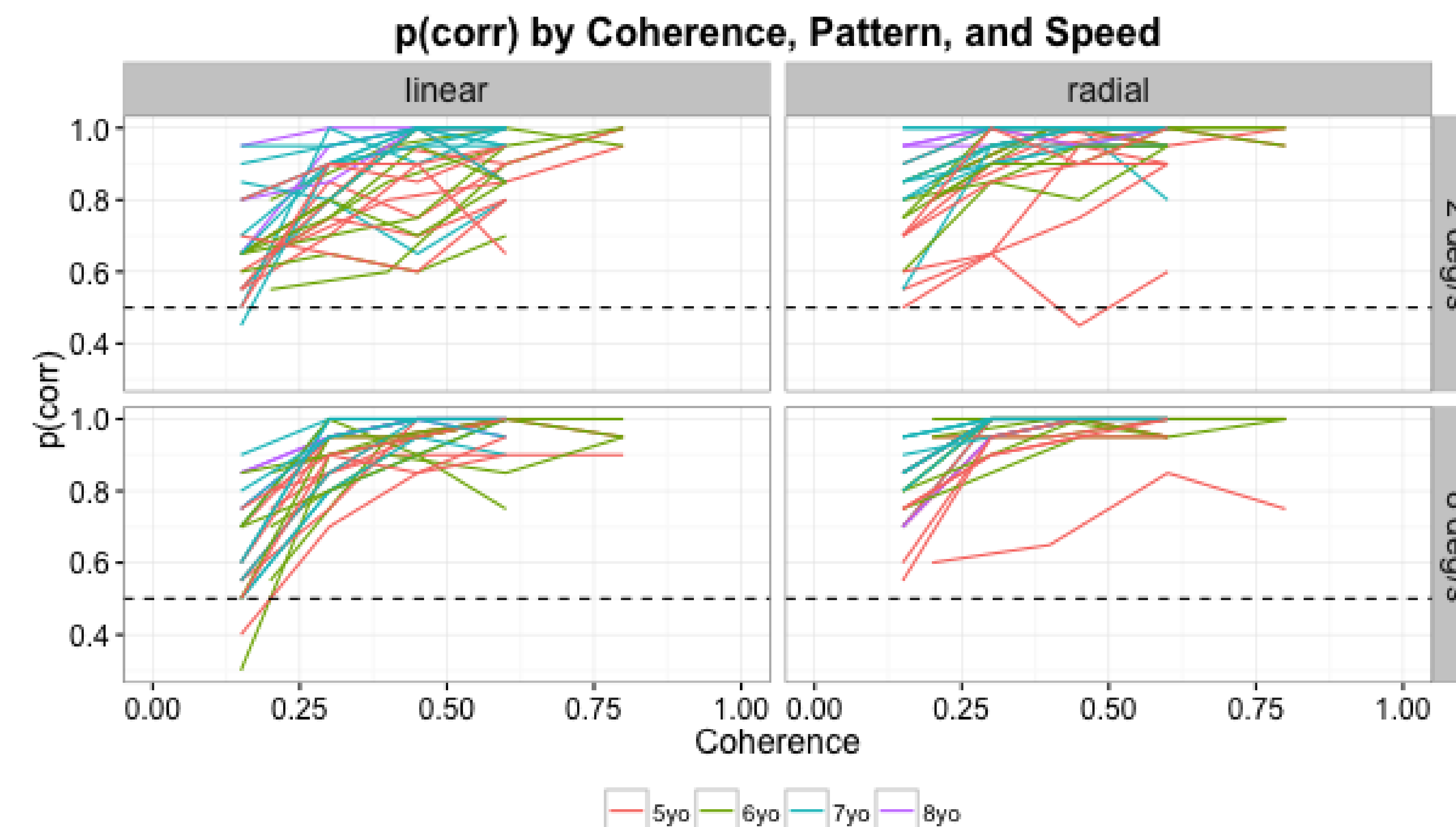
## RESULTS

Coherence  $\chi^2(1) = ??, p < .??$ , pattern type  $\chi^2(1) = ??, p < .??$ , coherence by pattern type  $\chi^2(1) = ??, p < .??$ , and speed  $\chi^2(1) = ??, p < .??$  remained in the final model for proportion correct judgments.

As coherence increased from 15 to 80%, accuracy to detect radial flows increased from .x to .x and for translational flows from .x to .x.

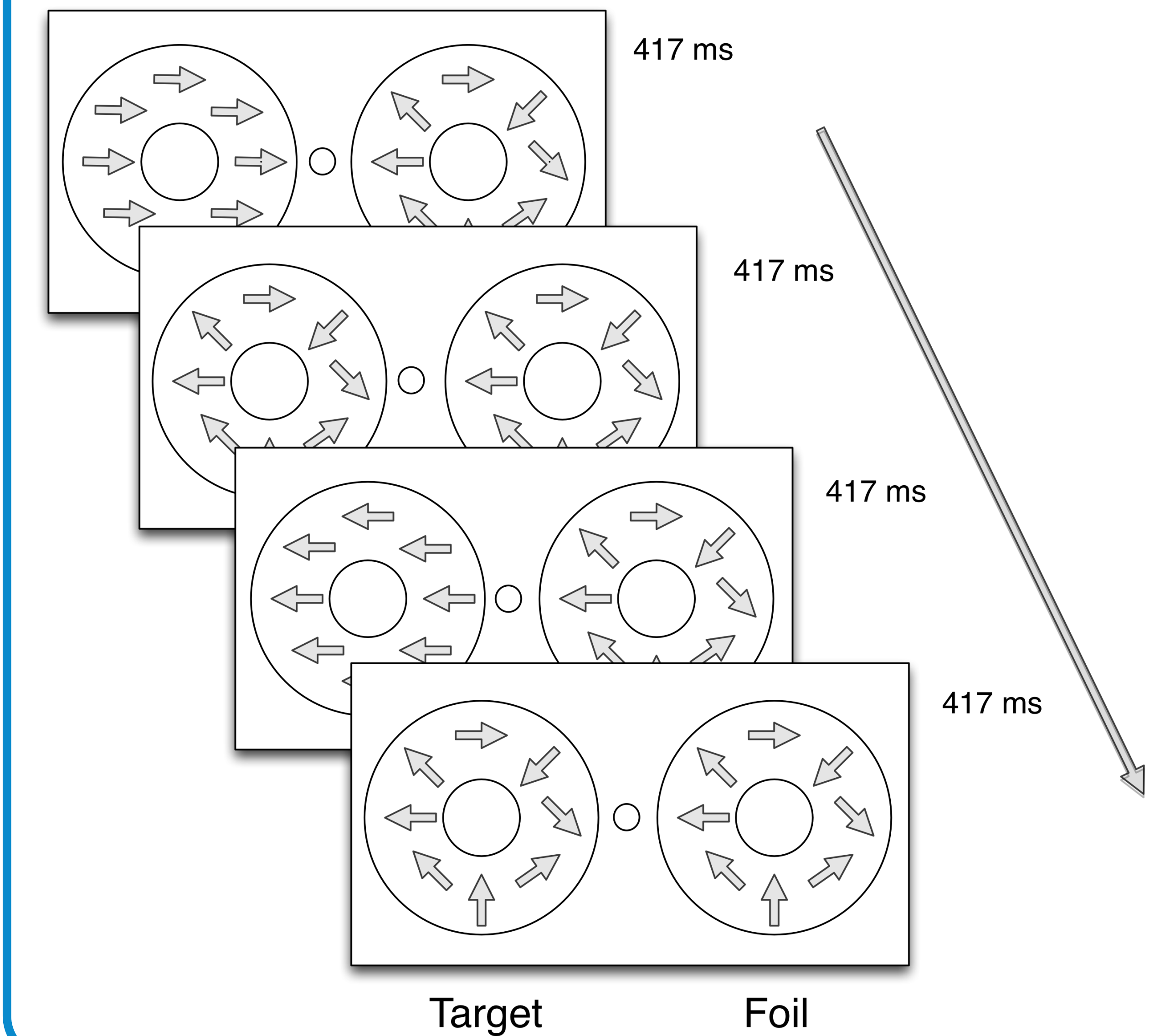
We found comparable effects for reaction time.

As predicted, the proportion of correct judgments increased and the response times of correct judgements declined with increasing motion coherence. Fast optic flow patterns were perceived more reliably than slow, and radial patterns were perceived more reliably than linear patterns. Taken together the results suggest that school-age children's abilities to detect radial and linear optic flow patterns in noise are somewhat less precise than adults', although their biases toward faster radial patterns are adult-like.



## DISPLAYS

Two side-by-side, time varying (1.2 Hz coherent/incoherent cycle) annular-shaped (18° outer/5° inner diameter) optic flow displays were presented at a viewing distance of 60 cm. Optic flow was generated by random dot kinematograms with white dots (110 cd/m, 7 amin) presented on a black background. In each trial, one display depicted random (0% coherent) motion while the other depicted radial or linear motion at one of four fixed coherence levels in one of two coherence level profiles (20, 40, 60, 80%) or (15, 30, 45, 60%).



## DATA SHARING

Movies of the displays, metadata about the participants, and raw data files are available at: <http://databrary.org/volume/218>.

## ACKNOWLEDGEMENTS

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## REFERENCES

- [1] J. D. Fesi, A. L. Thomas, and R. O. Gilmore, "Cortical responses to optic flow and motion contrast across patterns and speeds," *Vision Res.*, vol. 100, pp. 56–71, Jul. 2014. [Online]. Available: <http://www.sciencedirect.com/science/article/pii/S0042698914000765>
- [2] R. O. Gilmore, A. L. Thomas, and J. Fesi, "Children's brain responses to optic flow vary by pattern type and motion speed," *PLoS One*, vol. 11, no. 6, p. e0157911, 21 Jun. 2016. [Online]. Available: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0157911>
- [3] W. N. Adamiak, "Adult observers' sensitivity to optic flow varies by pattern and speed," Ph.D. dissertation, 21 May 2015. [Online]. Available: <https://honors.libraries.psu.edu/catalog/25288>
- [4] W. Adamiak, A. Thomas, S. Patel, and R. Gilmore, "Adult observer's sensitivity to optic flow varies by pattern and speed," *J. Vis.*, vol. 15, no. 12, p. 1008, 1 Sep. 2015. [Online]. Available: <http://jov.arvojournals.org/article.aspx?doi=10.1167/15.12.1008>