

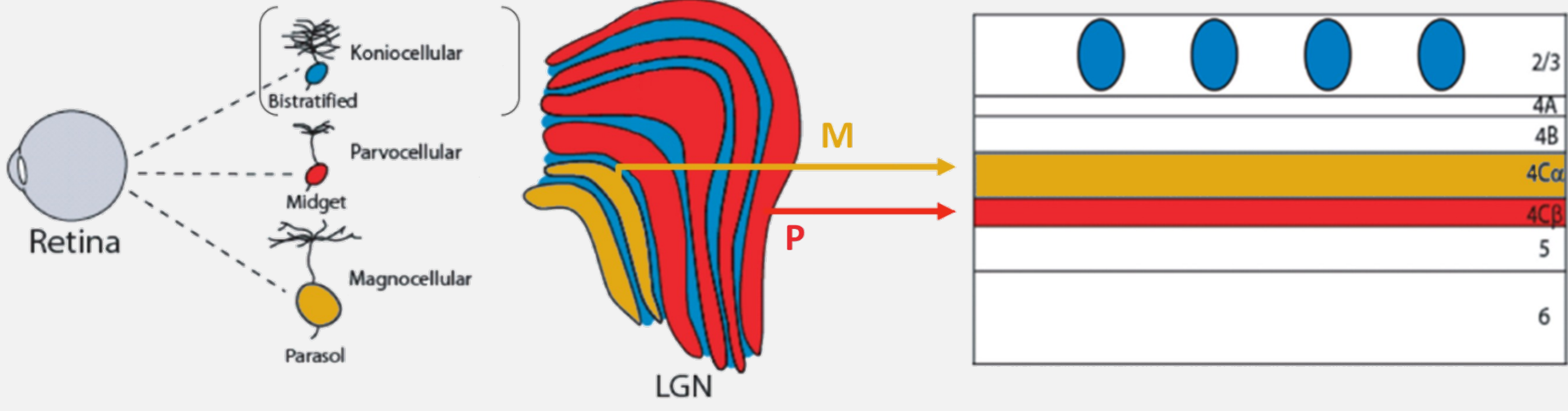
Magnocellular-parvocellular imbalance hampers mirror image discrimination

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INTRODUCTION

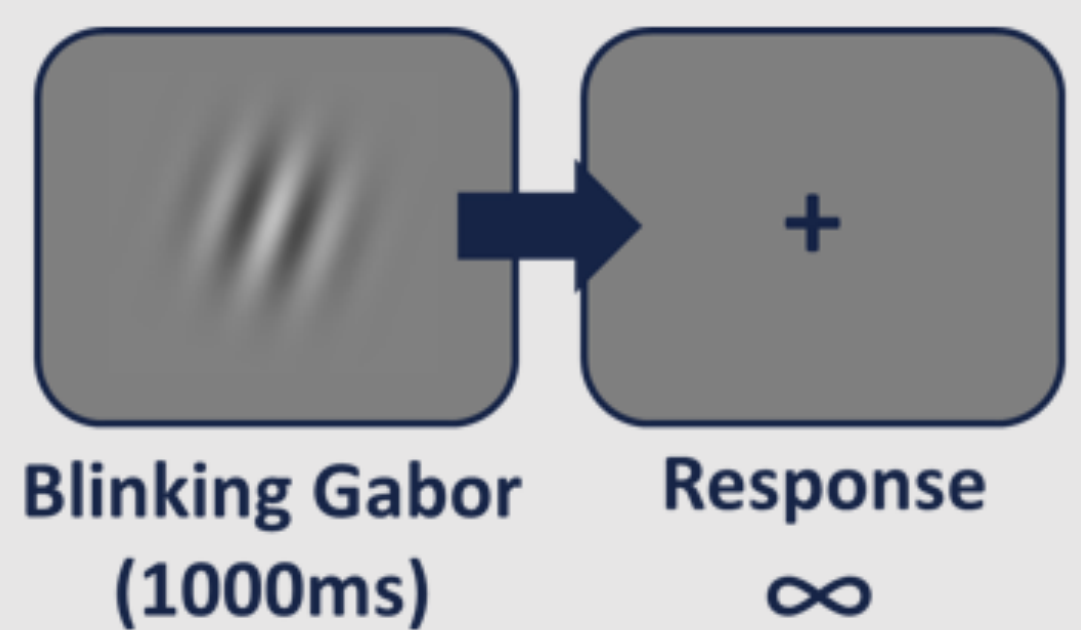
- From the retina to the primary visual cortex, the human visual system processes visual information in two parallel and complementary streams¹:
 - The **parvocellular (P) stream**
 - sensitive to sharp-edged, fine, stationary, and high-contrast stimuli;
 - The **magnocellular (M) stream**
 - sensitive to coarse, large, moving, brief, and low-contrast stimuli.
- AH², PR³ and Davida⁴ are three individuals who couldn't discriminate mirror images of high-contrast and high-spatial frequency shapes (biased toward the **P-stream**), but had far less or no difficulty at all for low-contrast, low-spatial frequency shapes.
- The goal of this study is to test the hypothesis that efficiency at discriminating mirror images may depend on the balance between the involvement of **M-** and **P-** streams in processing a visual stimulus.



METHOD

- 40 students** (21 ± 1.85 yo, 29 females, 11 males, 9 dyslexics) with normal or corrected vision
- Two-alternative forced-choice orientation discrimination task (staircase procedure) to measure **M-** and **P-** streams efficiency :

(1) Contrast sensitivity thresholds for M-biased stimuli



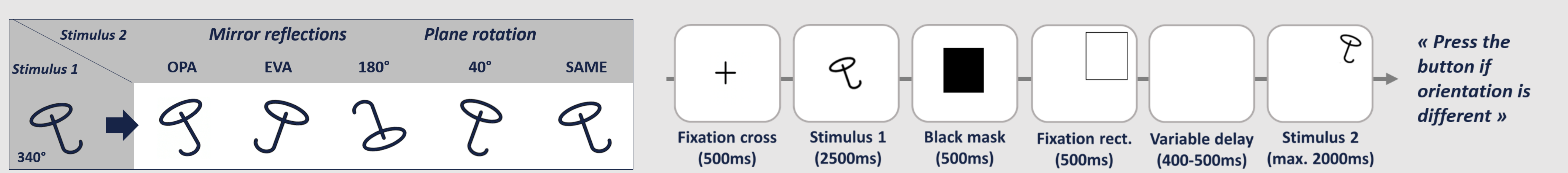
« Were the lines oriented to the left or to the right? »

(2) Contrast sensitivity thresholds for P-biased stimuli



« Were the lines oriented to the left or to the right? »

- Same/different judgment task assessing **orientation perception** on tilted asymmetrical shapes (BACS⁵ symbols) :



RESULTS

Spearman's correlations (one-tailed p-values) between the M- and P-streams efficiency and the ability to discriminate plane rotations (40°) and mirror images (180°, OPA, EVA) of the BACS symbols :

		M	P	M - P
40°	Spearman ρ	0.165	-0.248	0.249
	P-value	.155	.062	.061
180°	Spearman ρ	0.265	-0.379	0.396
	P-value	.049	.008	.006
OPA	Spearman ρ	0.226	-0.390	0.366
	P-value	.081	.006	.010
EVA	Spearman ρ	0.167	-0.340	0.268
	P-value	.152	.016	.047

DISCUSSION

- In line with our hypothesis, we found significant positive correlations between an index of M-P imbalance (**M-efficiency** – **P-efficiency**) and individuals' ability to discriminate every types of mirror images, but not stimuli differing by a plane rotation of 40°.
- These results suggest that an adequate balance between M- and P- streams could be determinant in our ability to discriminate mirror images.
- This finding may have implications for understanding the origin of mirror letter confusions in dyslexia.