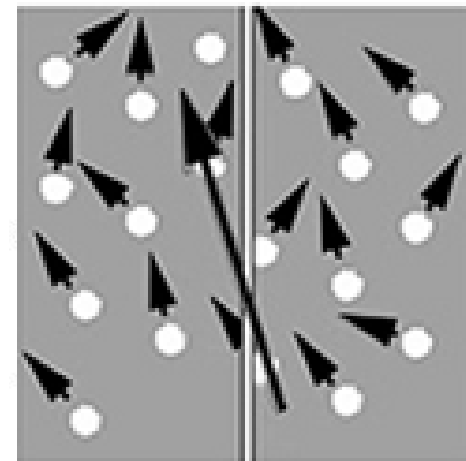
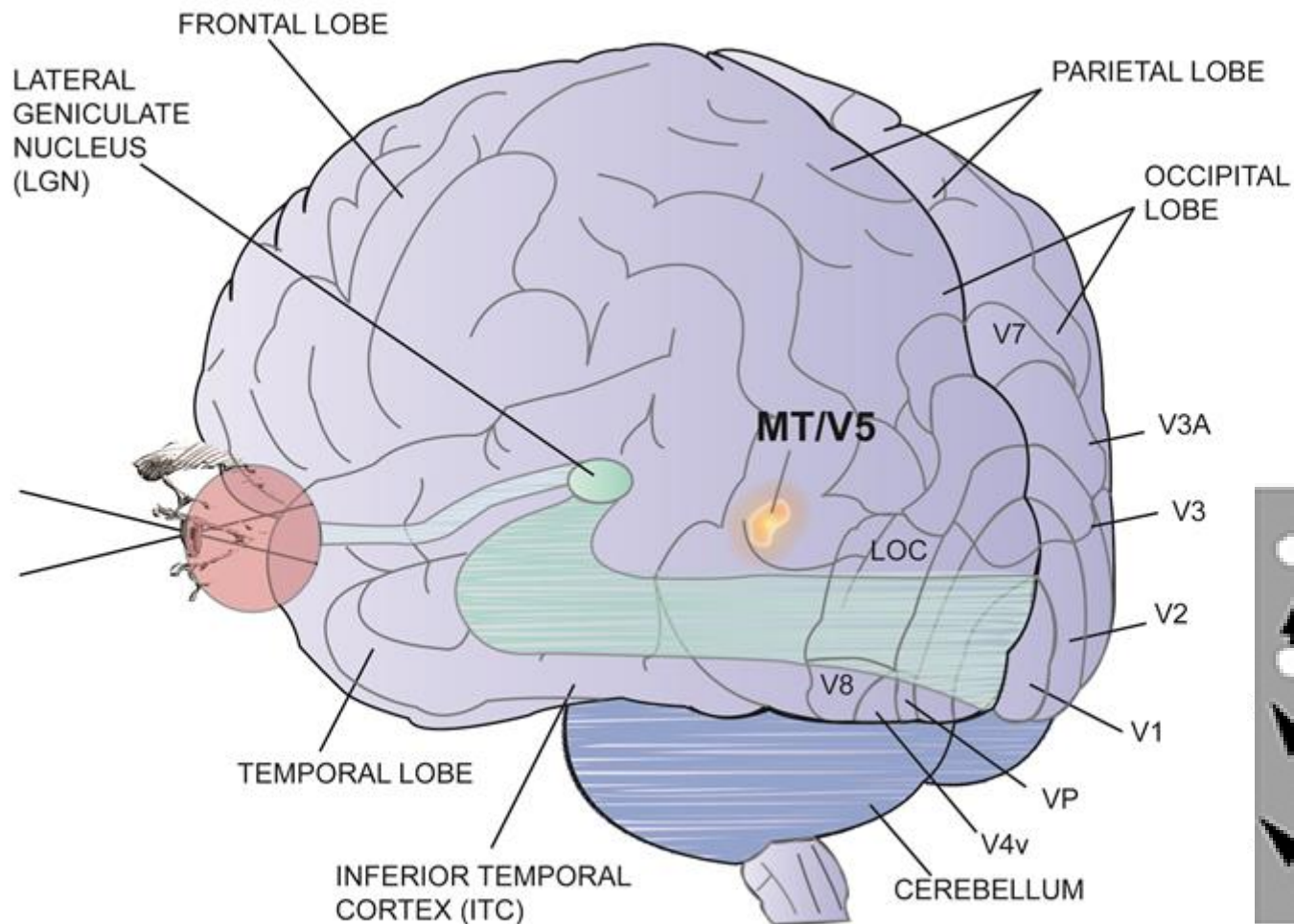


Deficits in integration of global motion and form in noise is associated with the severity and type of amblyopia.



Motion & Form Processing in Amblyopia

global motion

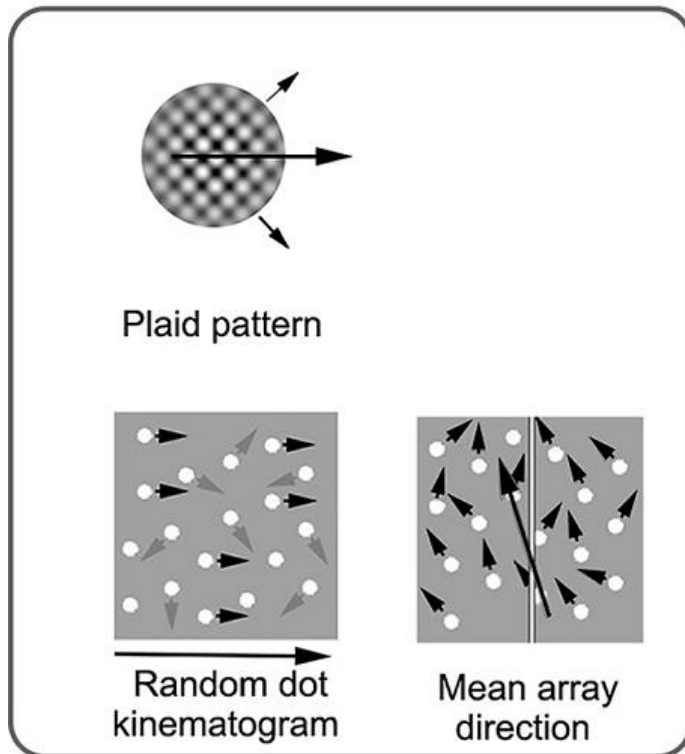


✓ Fine direction discrimination

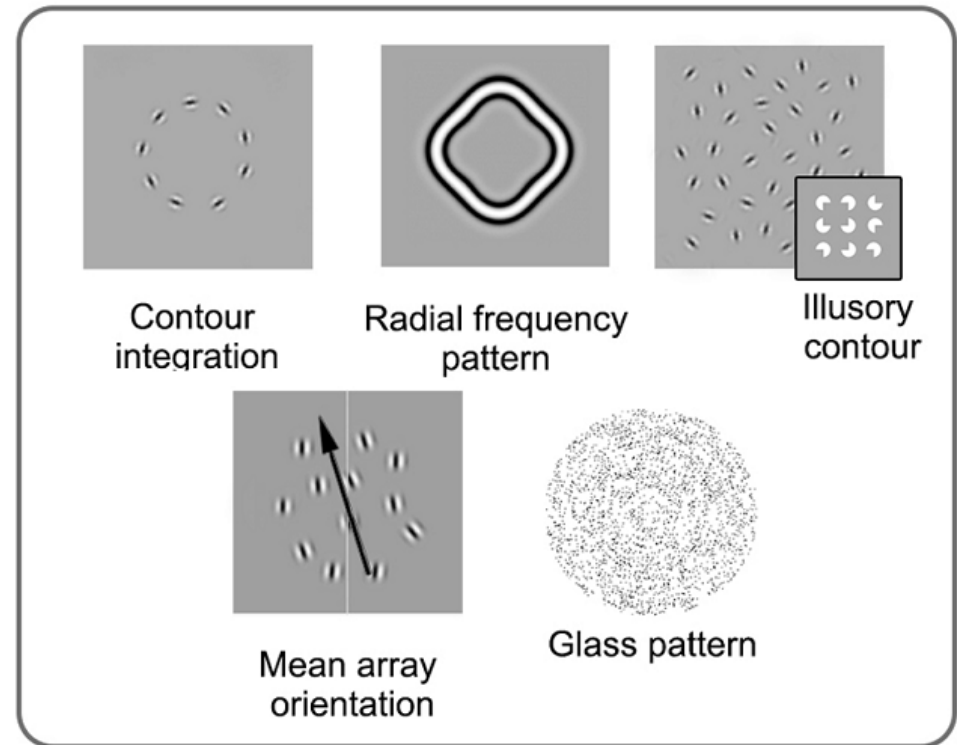
Previous Studies – Issues

- Measured performance reflect the mixture of local (V1) and global (MT/V4) processing.
- Due to the dissimilarities in the test stimuli, parallel comparison of the local/global processing between the pathways can be tricky.

Motion Stimuli



Form Stimuli

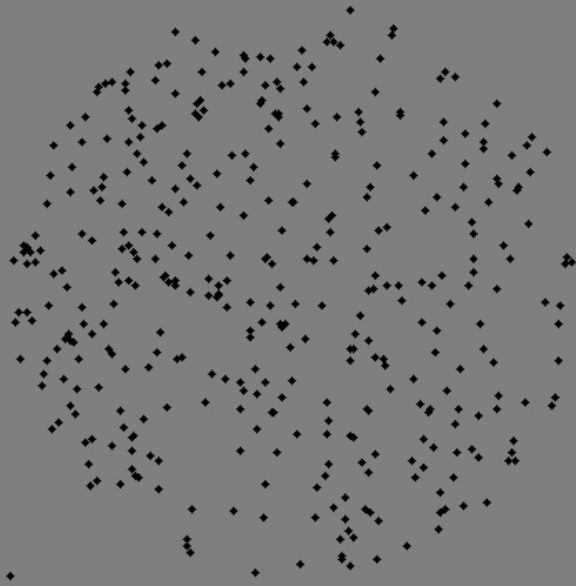


Current Study

- Measured performance reflect the mixture of local (V1) and global (MT/V4) processing.
 - **Adopted equivalent noise paradigm** (Barlow, 1957 & Pelli, 1980) to **separate the effect of local vs. global processing**
- Due to the dissimilarities in the test stimuli, parallel comparison of the local/global processing between the pathways can be tricky.
 - **Designed the experimental stimuli for each pathway essentially identical except for the pathway-specific parameters (i.e., moving vs. static for motion & form respectively)**

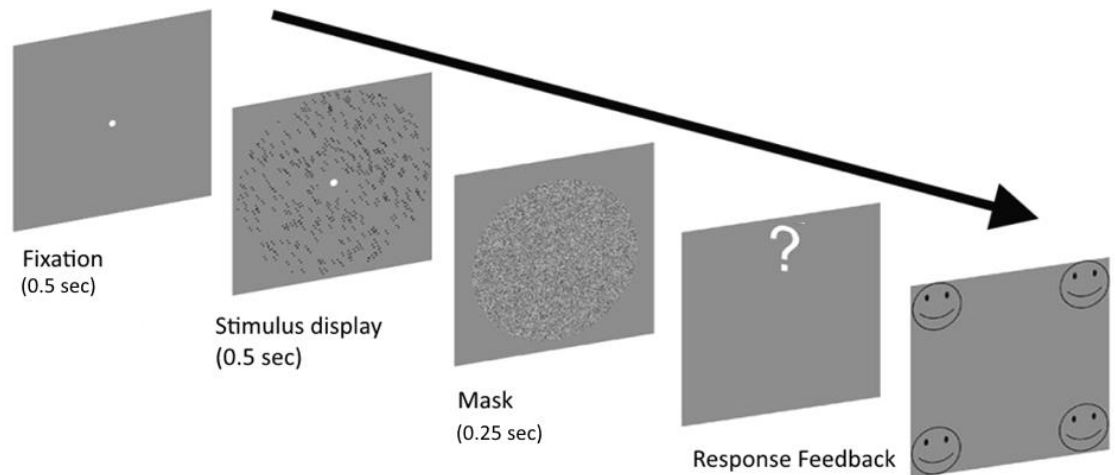
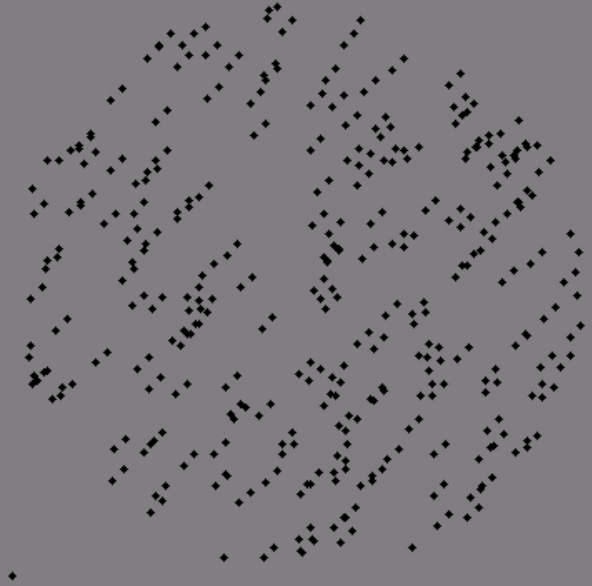
RDK

Mean direction =Right;Noise =Low



Glass pattern

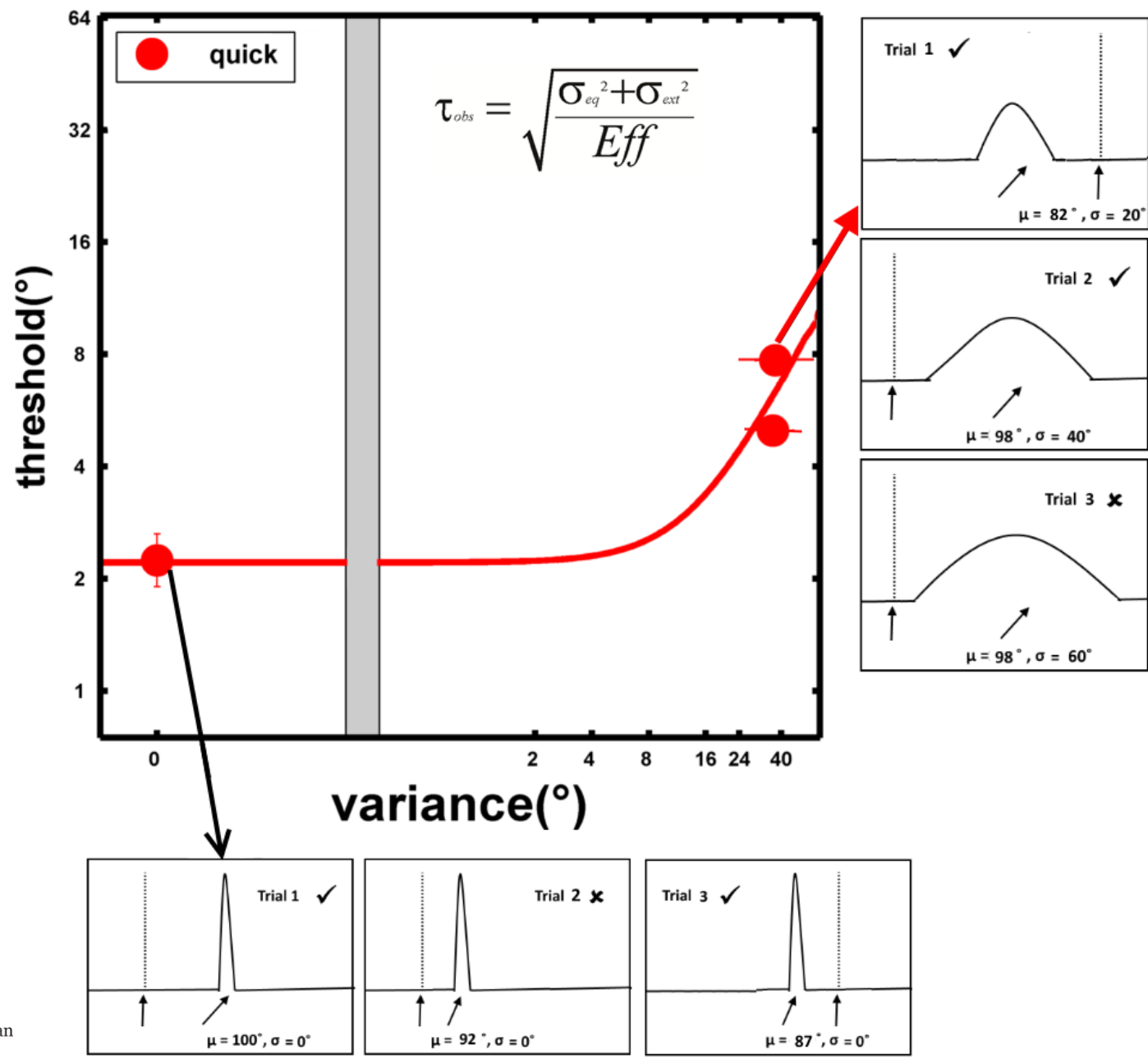
Mean orientation =Right;Noise =Low



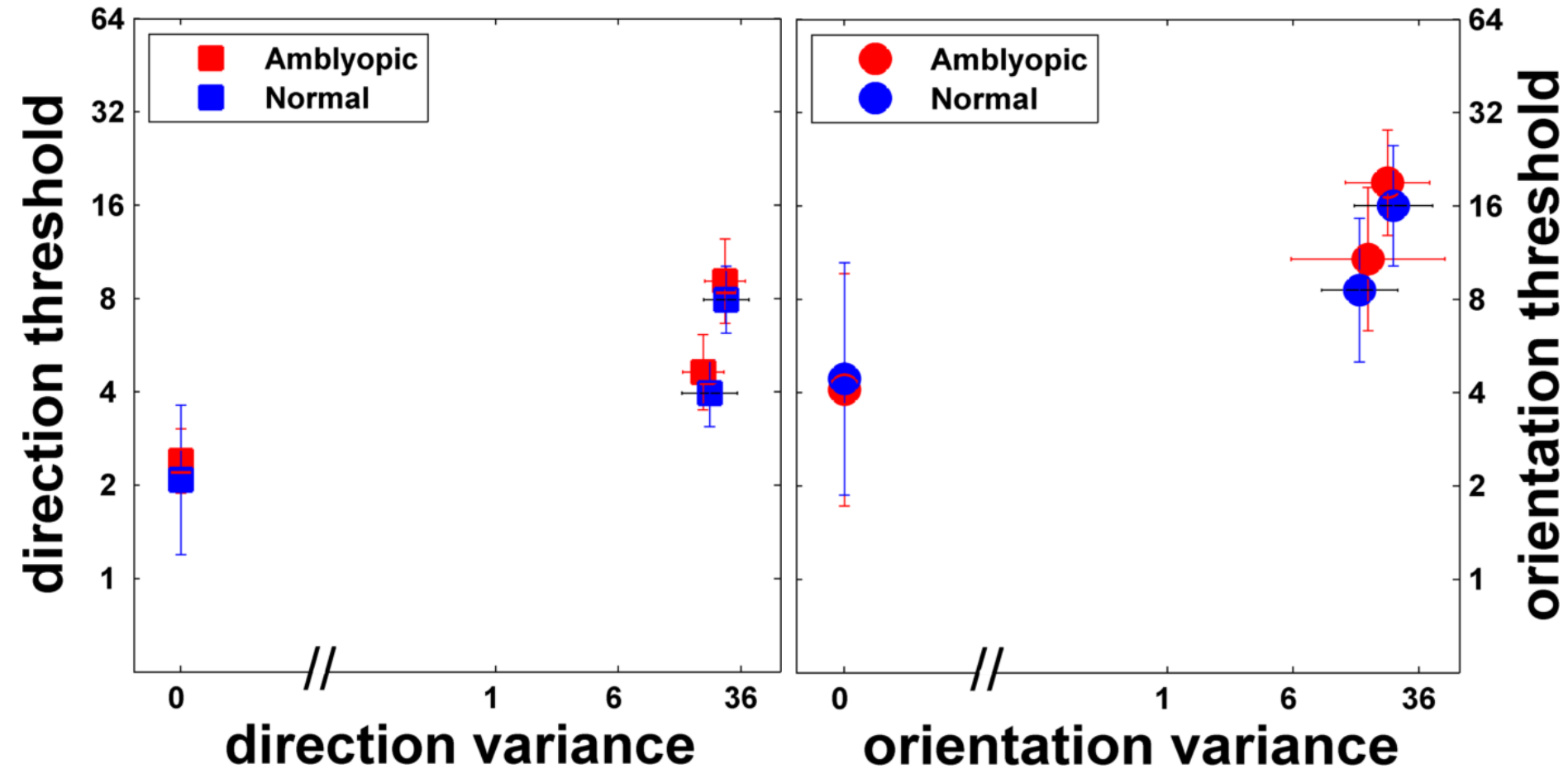
Methods

- Stimuli: RDK (motion) & Glass pattern (form)
 - Dot size: 0.166°
 - Number of dots: 500
 - Dot speed (RDK): $10^\circ/\text{sec}$
 - Dipole distance (Glass): 0.266°
- Participants:
 - 6 normal controls
 - 7 amblyopes (5 anisos/2 strabs), mean IOD = 0.24 logMAR
- Data collection (adapted from Tibber *et al.*, 2014)
 - (1) a direction/orientation discrimination threshold at no noise
 - (2) variance thresholds at two multiples (2x & 4x) of the threshold from (1)

Methods – quick method

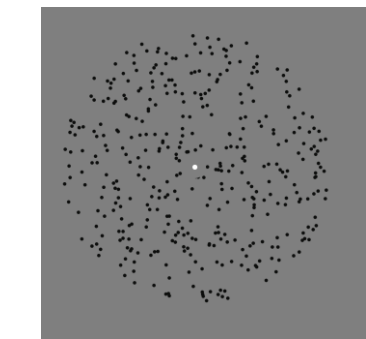


Results – Anisometropic Amblyopes



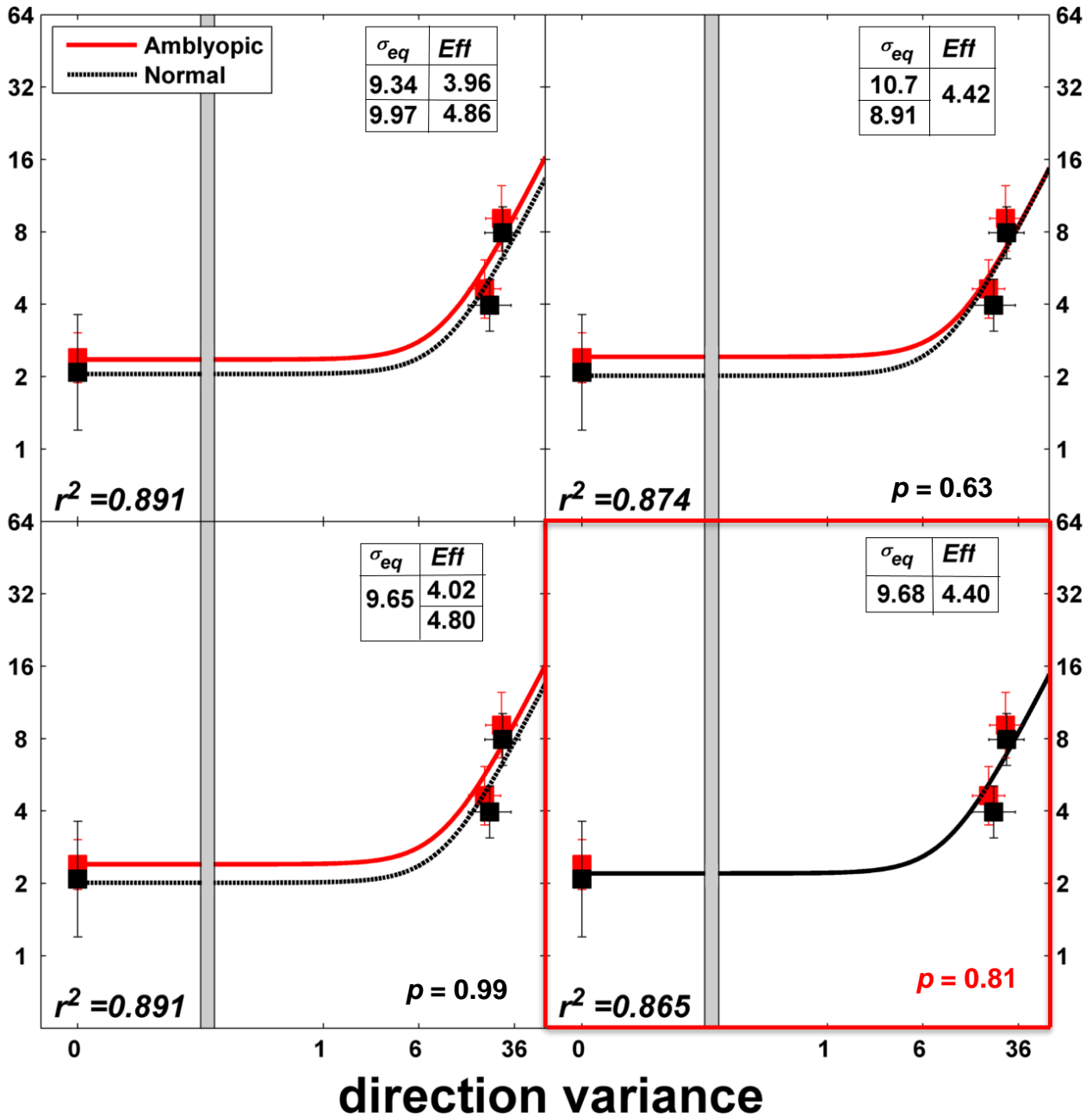
- MANOVA - No difference between the fellow, amblyopic, dominant and non-dominant eye ($p > 0.05$) ; Glass pattern > RDK ($p < 0.001$)

Nested Modelling: Motion

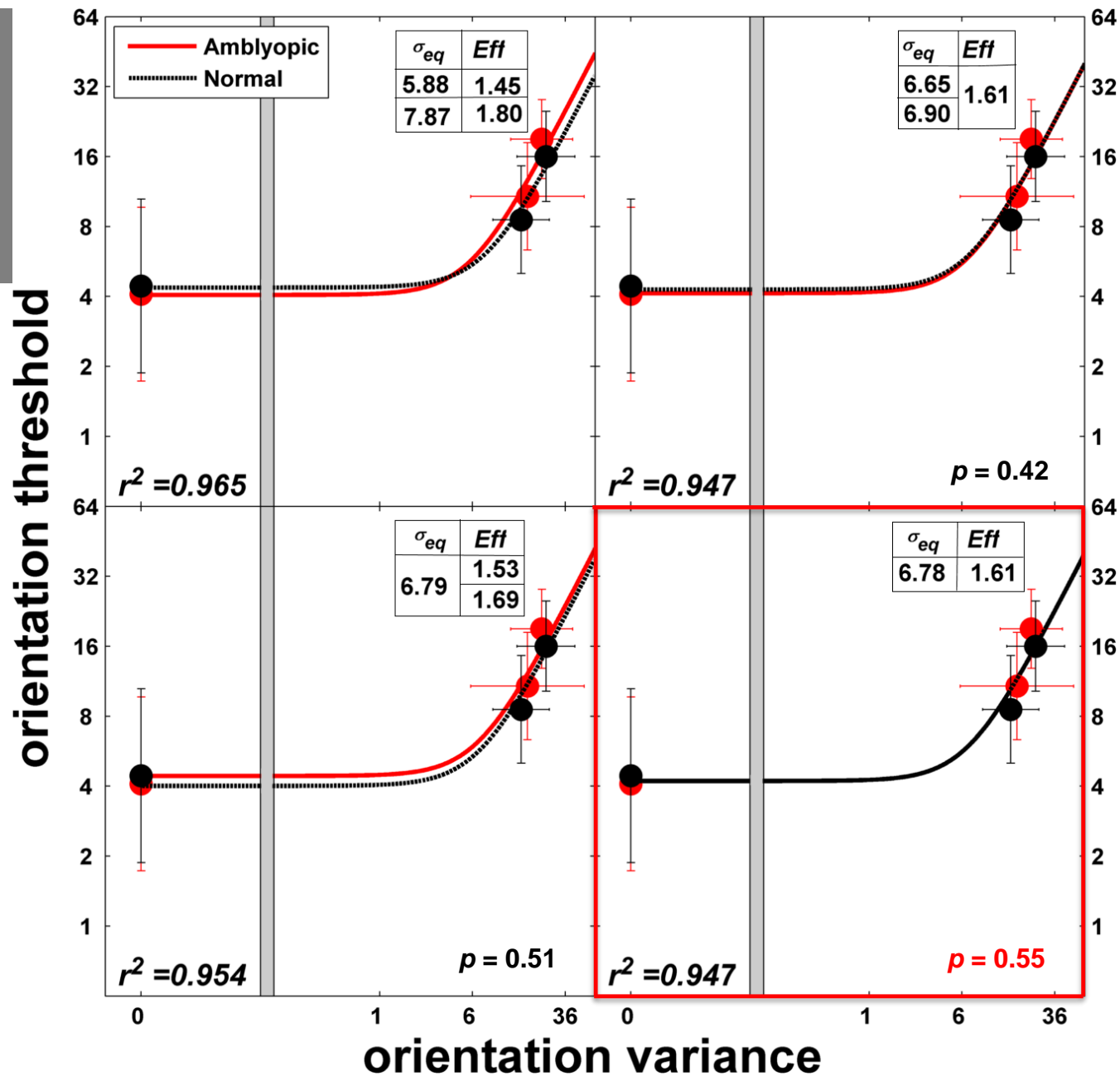
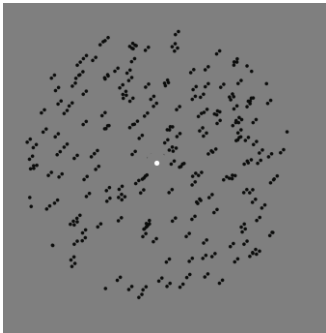


$$\tau_{obs} = \sqrt{\frac{\sigma_{eq}^2 + \sigma_{ext}^2}{Eff}}$$

direction threshold



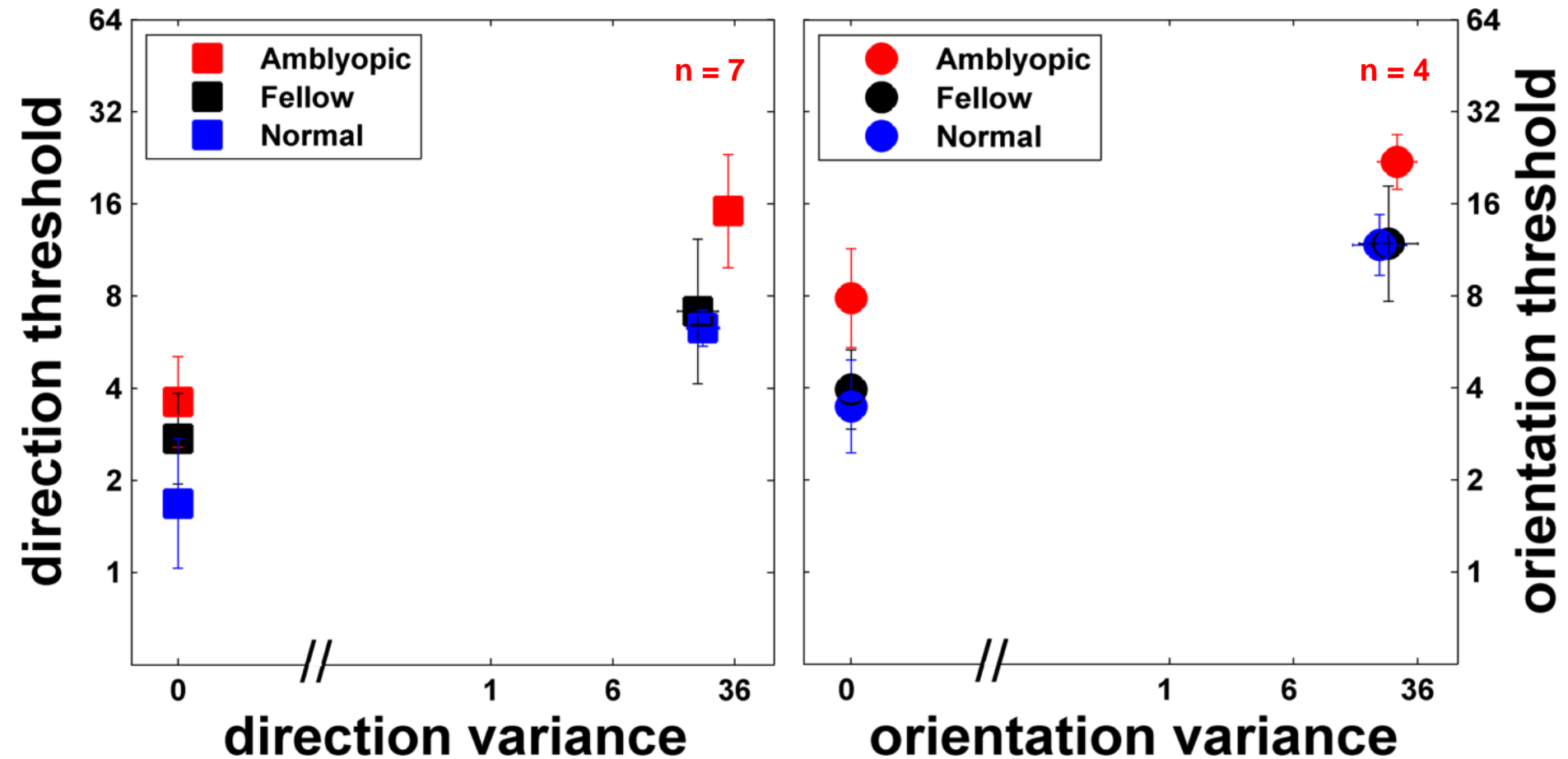
Nested Modelling: Form



Strabismic Amblyopes

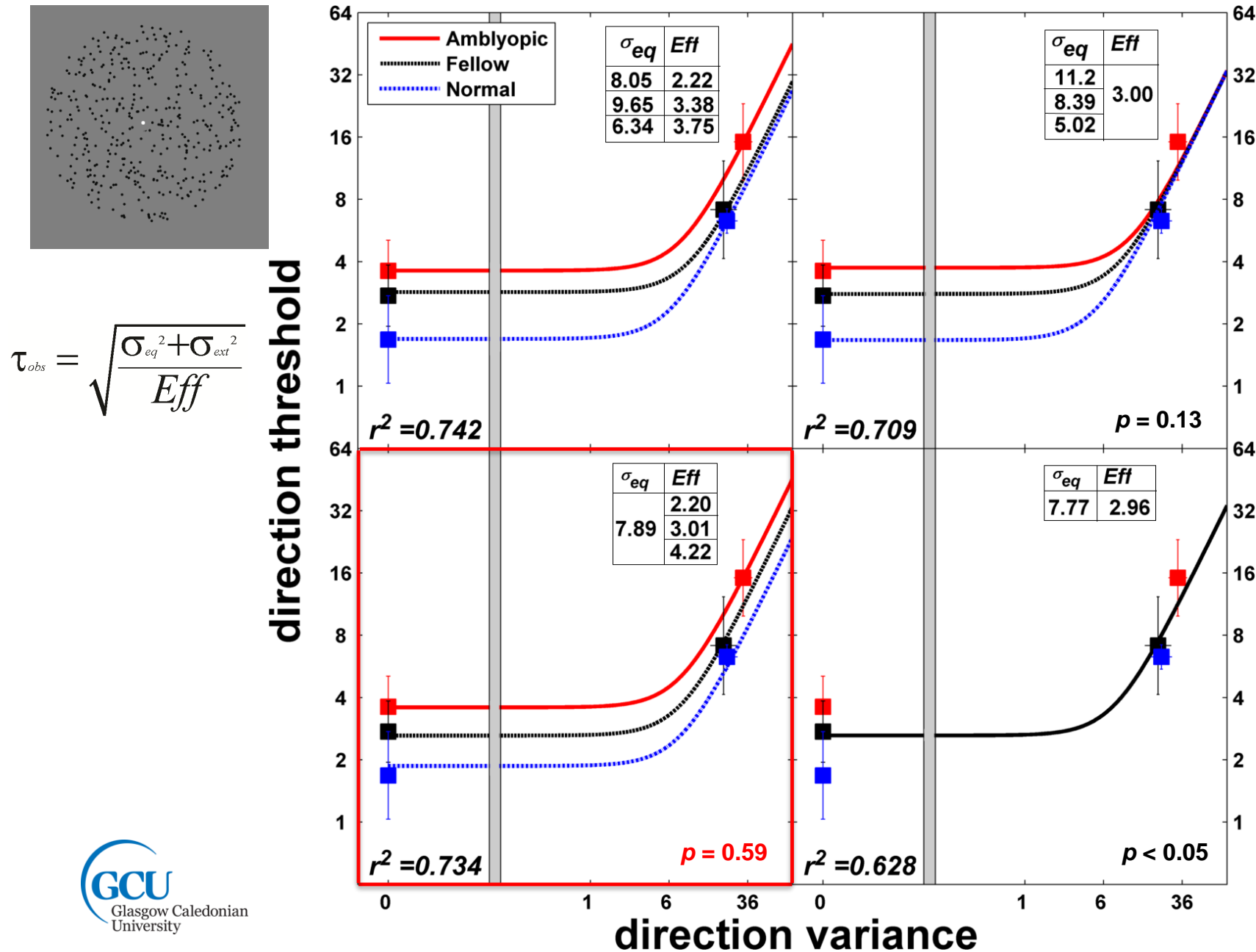
- Stimuli: modified RDK & Glass pattern
 - Number of dots reduced to 240 from 500, all other parameters same
 - Only one variance threshold measured at 3x threshold in no noise
- Participants:
 - 7 strabismic amblyopes, Mean IOD = 0.43 logMAR
 - 6 normal controls – performed with either dominant or non dominant eye

Results: Strabismic Amblyopes

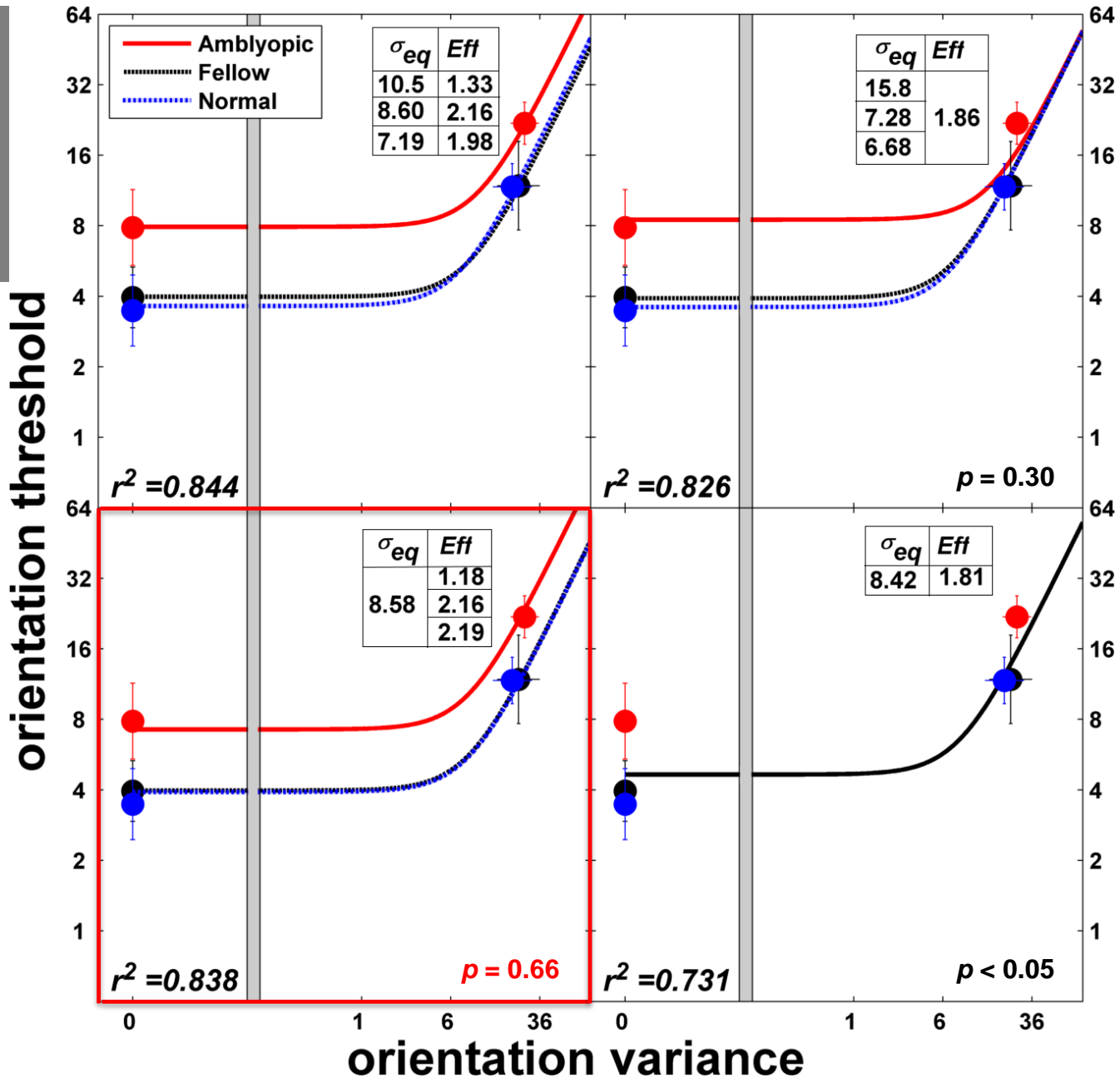
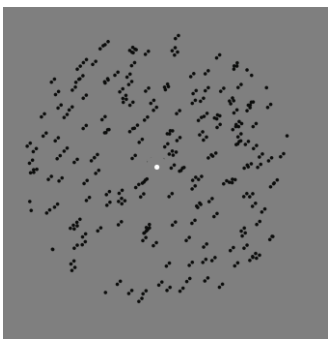


- MANOVA: Threshold for amblyopic eye > fellow eye ($p < 0.05$) and normal eye ($p < 0.01$)
Fellow eye similar to normal eye ($p > 0.05$)

Nested modelling: Motion

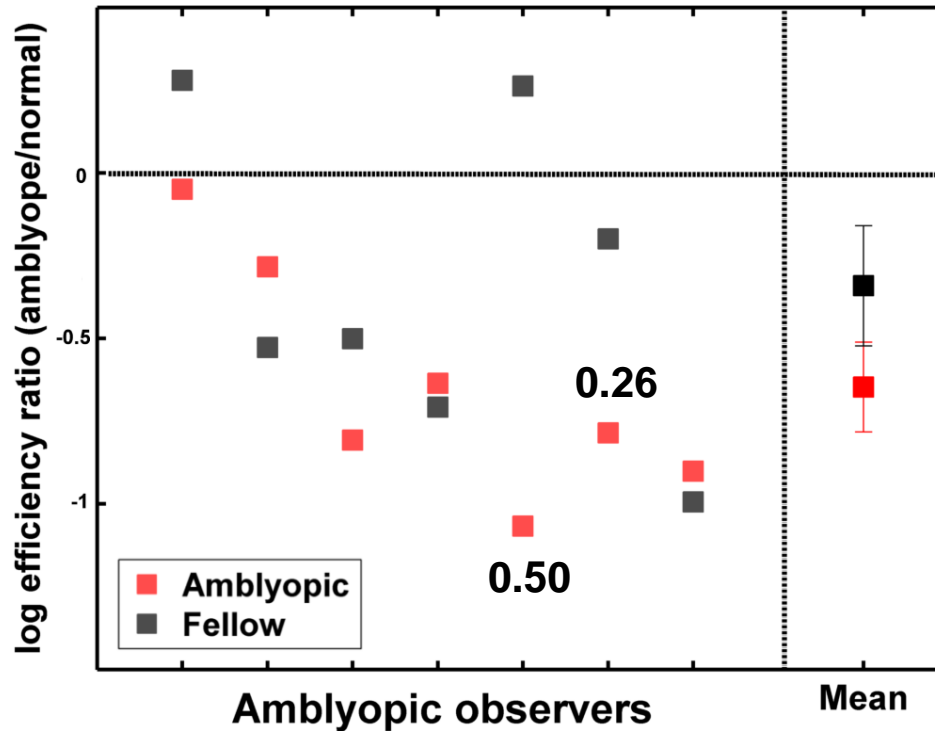


Nested modelling: Orientation

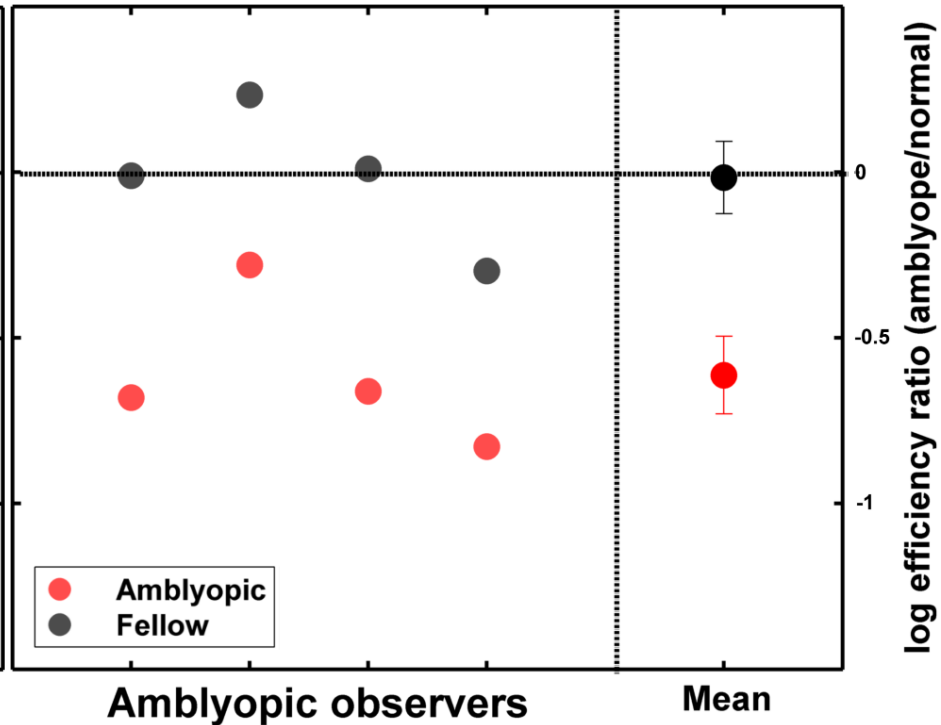


Comparing the Global Deficits: Motion vs. Form Strabismic Amblyopes

Global Motion



Global Form



Summary

- Fine global motion and orientation discrimination are normal in anisometropic amblyopes.
- However we find abnormal fine global motion and orientation discrimination in strabismic amblyopes.
- Amblyopic deficit is related to the global processing stage in both motion and form domains with local processing being normal. (Kiorpes et al., 1998; Thompson et al., 2011; Demanins et al., 1999, Simmers, Ledgeway et al. 2003; Simmers, Ledgeway et al. 2006; Aaen-Stockdale and Hess 2008)
- The inability of some strabismic amblyopes to detect Glass pattern
 - greater deficit for orientation discrimination.

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THANK YOU
FOR
your
ATTENTION!
ANY QUESTIONS?