Motion cues aids perception of implied motion in amblyopia

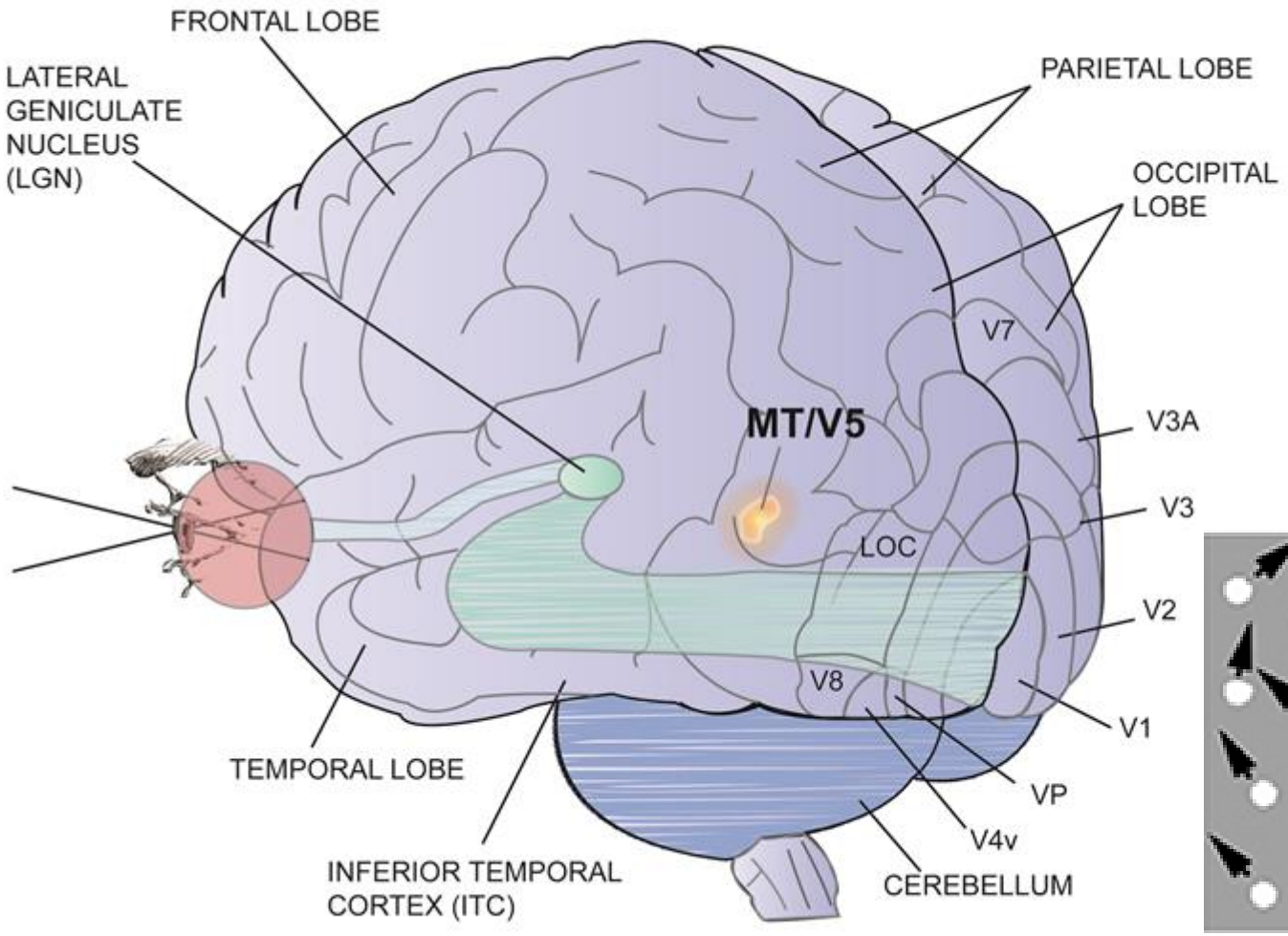
Mahesh R Joshi
Anita J Simmers
Seong T Jeon

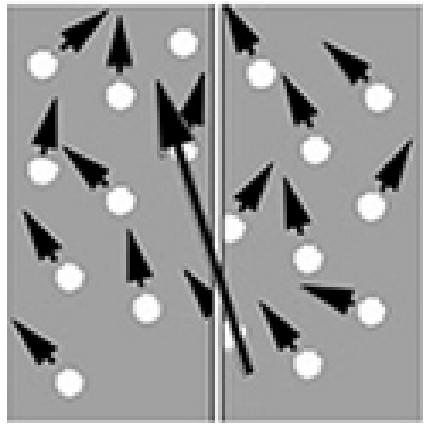
GCU
Glasgow Caledonian University
University for the Common Good

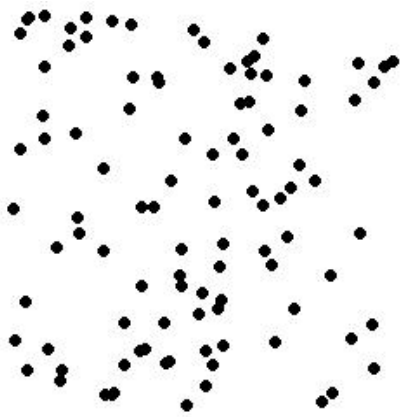
UWI
ST. AUGUSTINE CAMPUS
TRINIDAD & TOBAGO, WEST INDIES

Amblyopic Processing of Global Motion

global motion

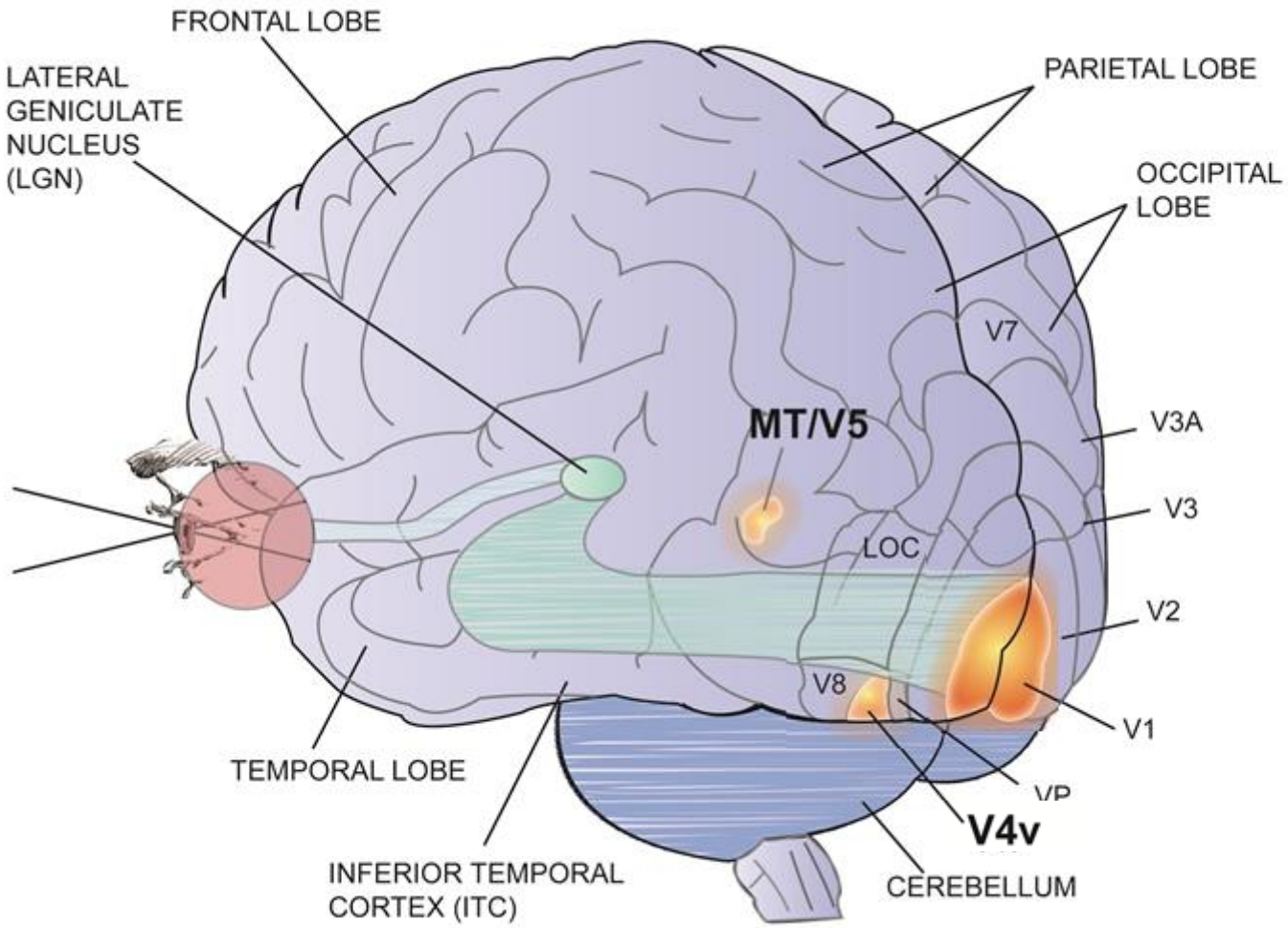


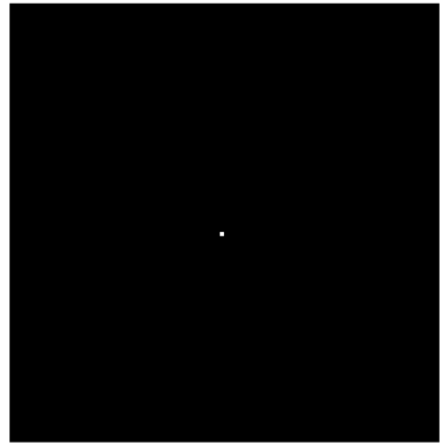




✘ Global motion

Amblyopic Processing of Motion + Form

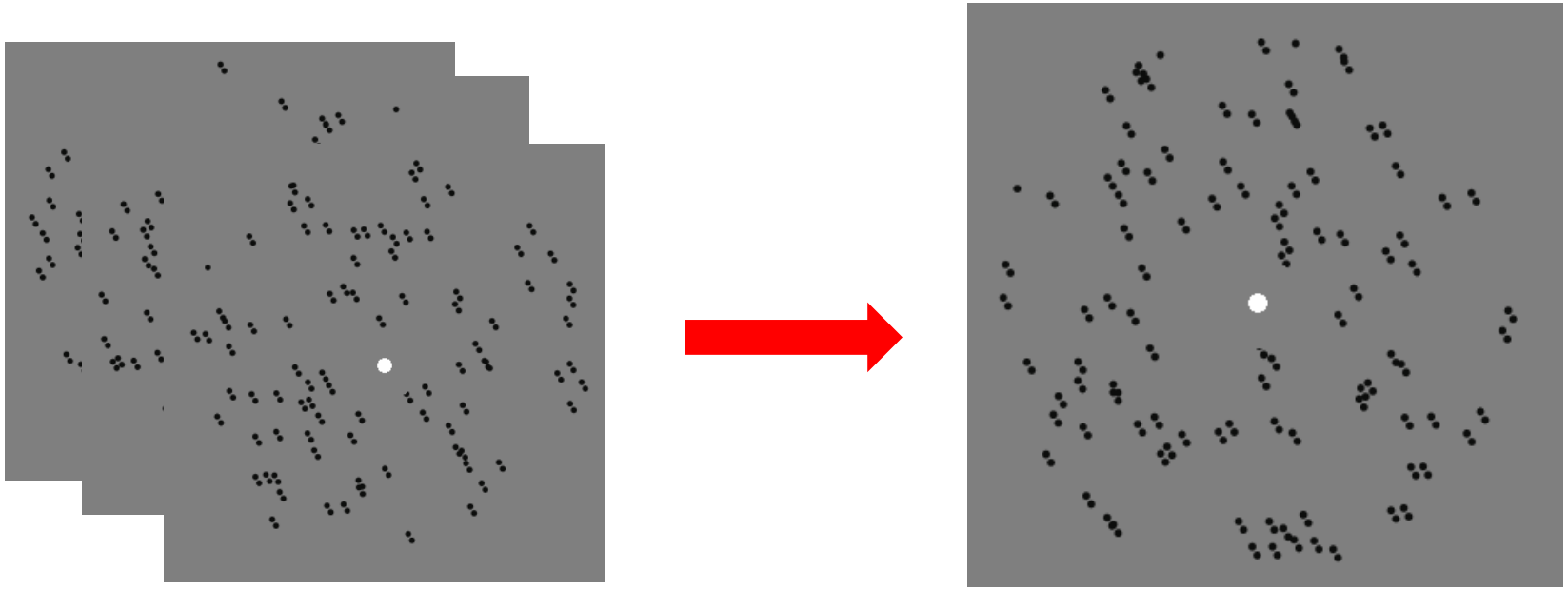




✘ Structure from motion

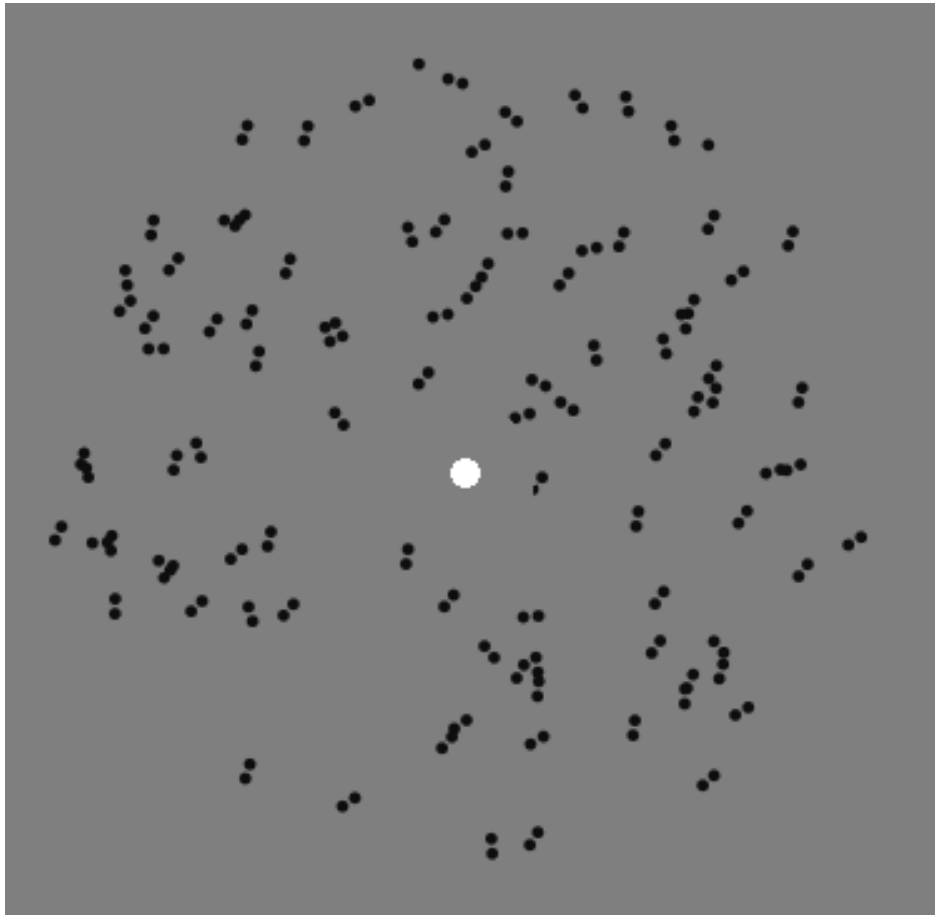
Current Study

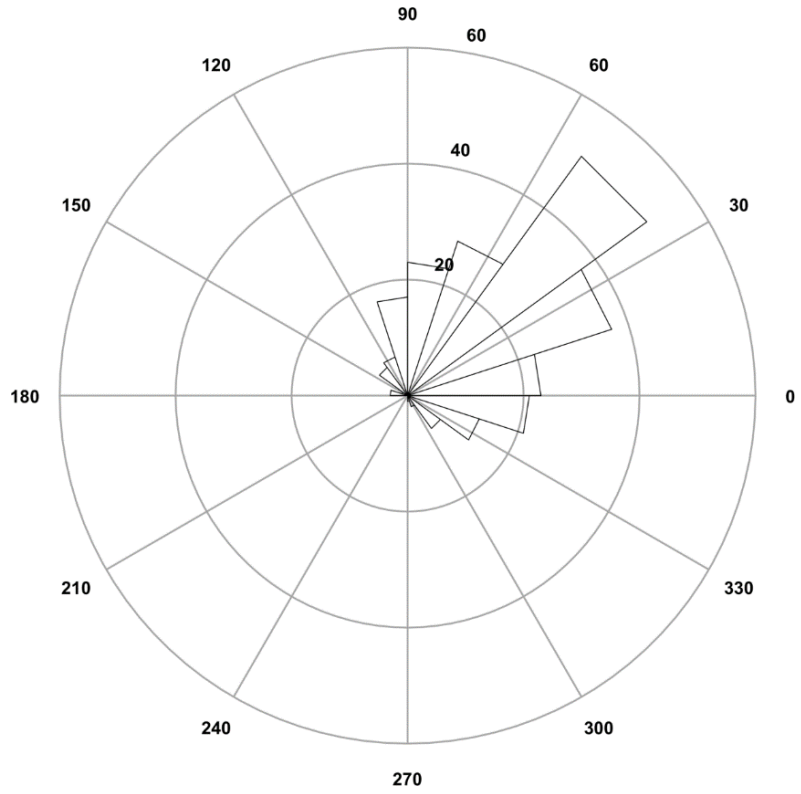
- Stimuli – difficult to decompose into motion and form component – to understand the contribution of each.
  - Used dynamic Glass pattern stimuli – implied motion.
    - Independent static Glass patterns with same global orientation, displayed over time.



Current Study

- Paradigm used cannot separate interaction at local/global stages of processing
  - Adopted equivalent noise paradigm (Barlow, 1957; Pelli, 1980) to separate the effect of local *vs*. global processing





μ = 45° , σ = 40°

Methods

- Stimuli: dynamic Glass pattern
  - Dot size: 0.166°
  - Number of dots: 240 (120 dipoles)
  - Dipole distance (Glass): 0.266°
  - 9 independent static Glass patterns displayed for a total of 0.5 secs

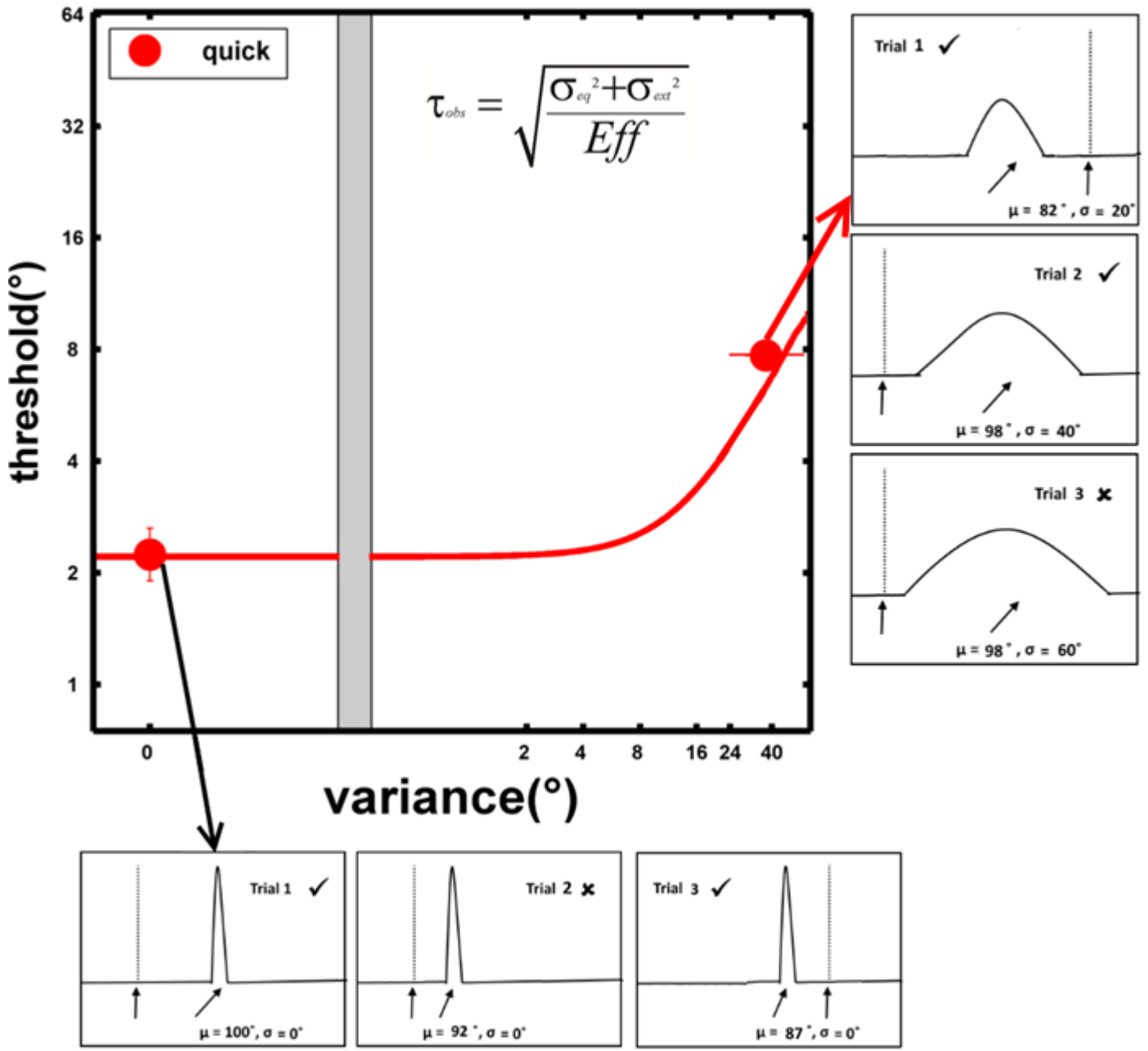
- Participants:
  - 6 normal controls
  - 13 amblyopes (8 strabs/5 anisos), mean IOD = 0.30 ± 0.12 logMAR

- Data collection (adapted from Tibber *et al*., 2014)

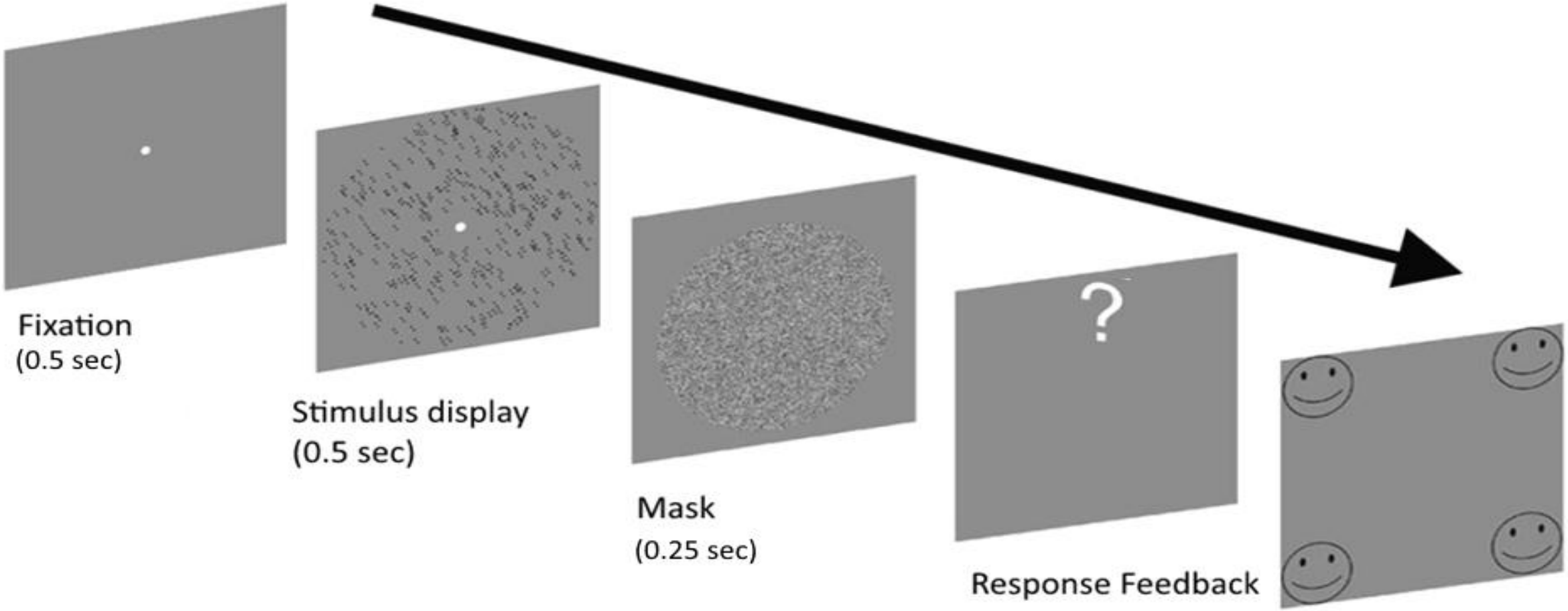
  (1) a implied motion discrimination threshold at no noise

  (2) variance thresholds at 3x of the threshold from (1)

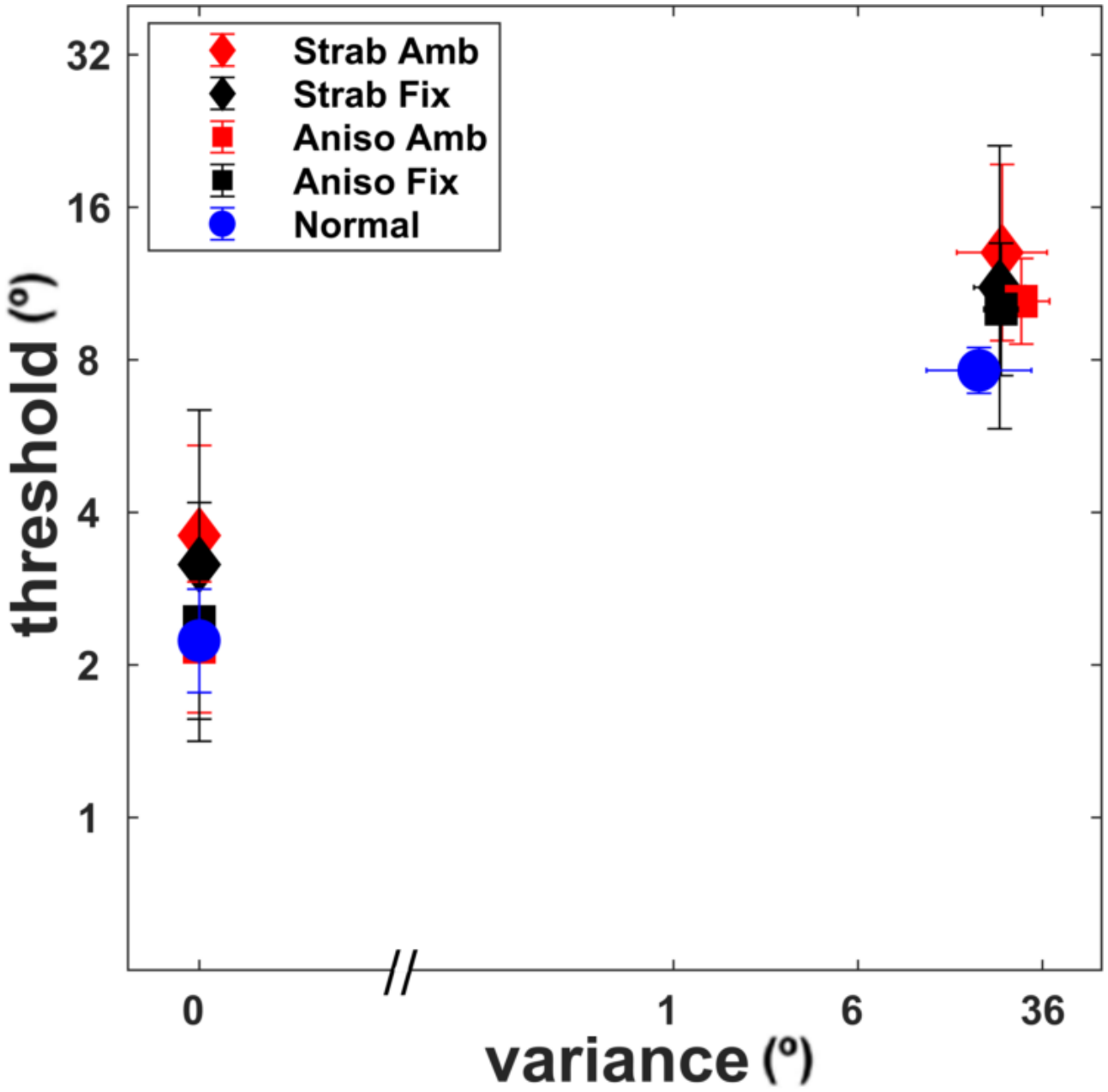
Methods: Two-points Estimation



Methods: A Trial Sequence



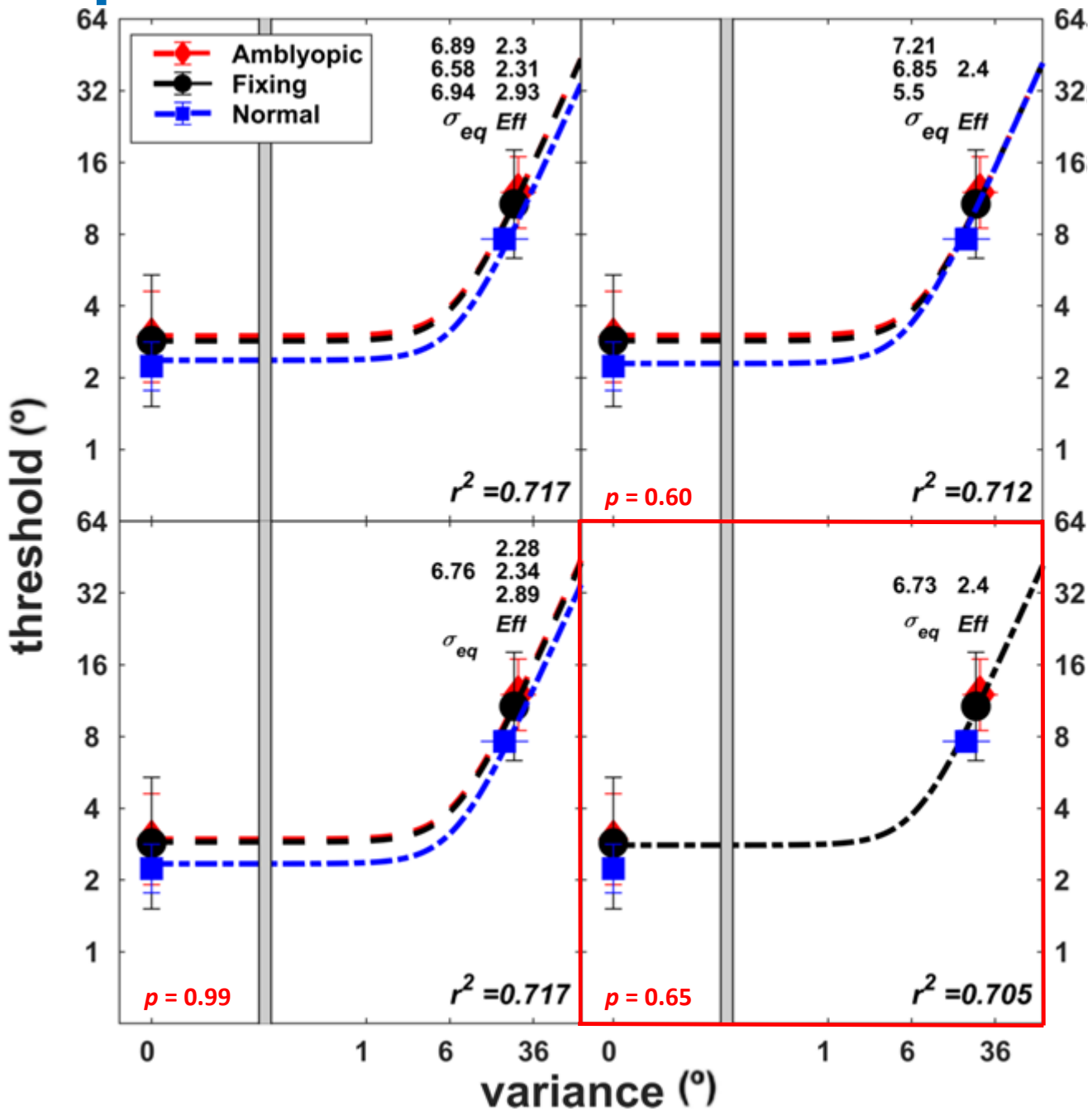
Results: Implied Motion



MANOVA - No difference between fellow, amblyopic and normal eye ($p > 0.05$)

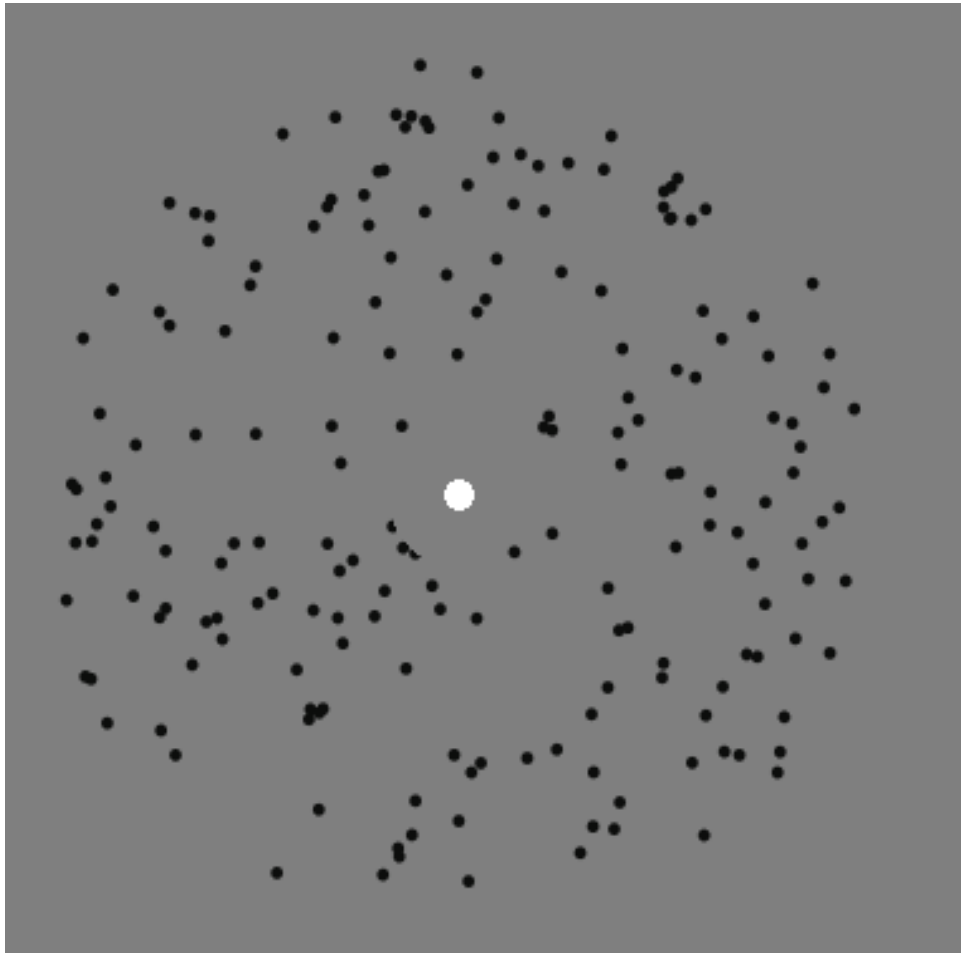
Nested Modelling: Implied Motion

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

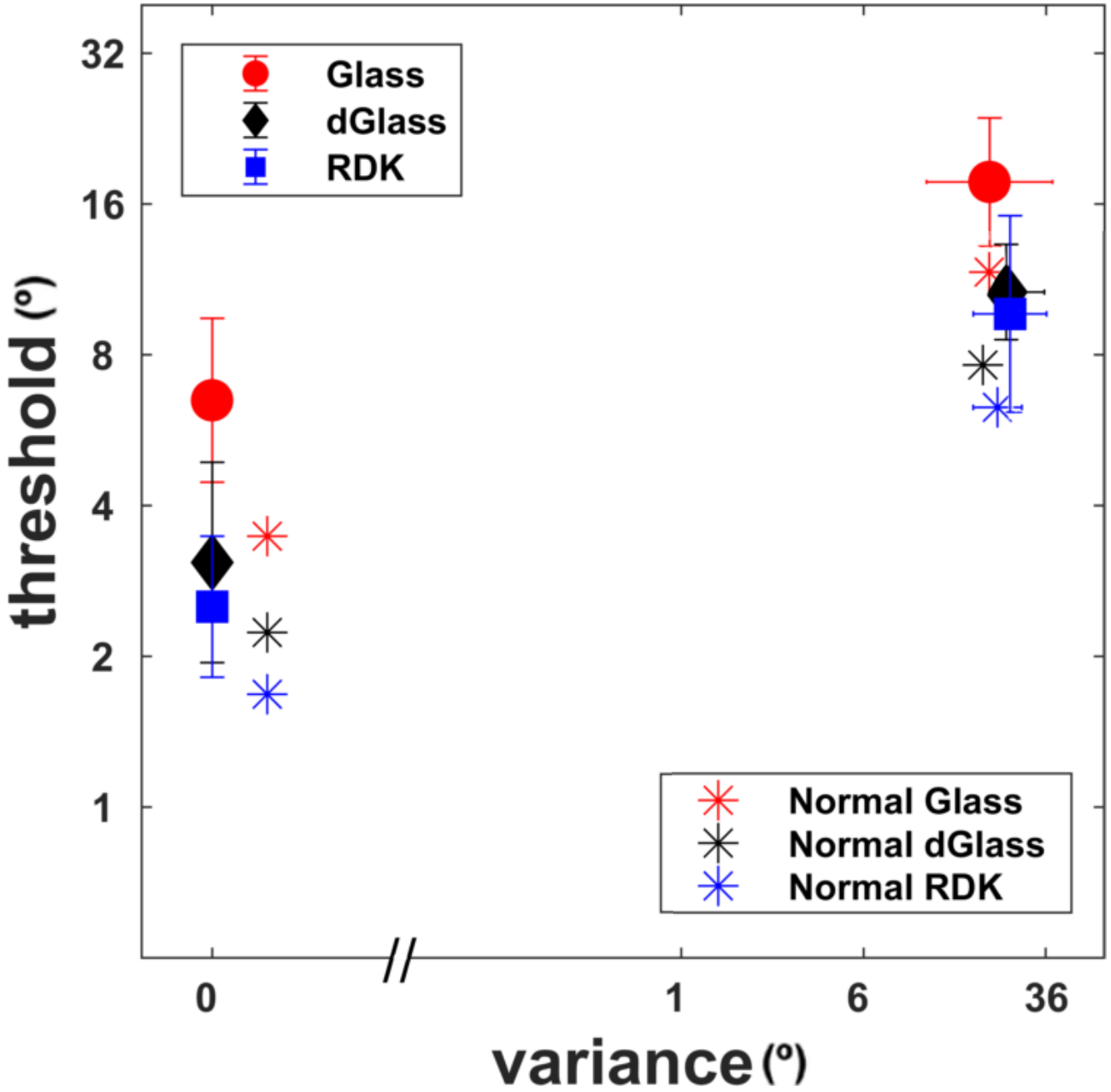


Motion *vs*. Form

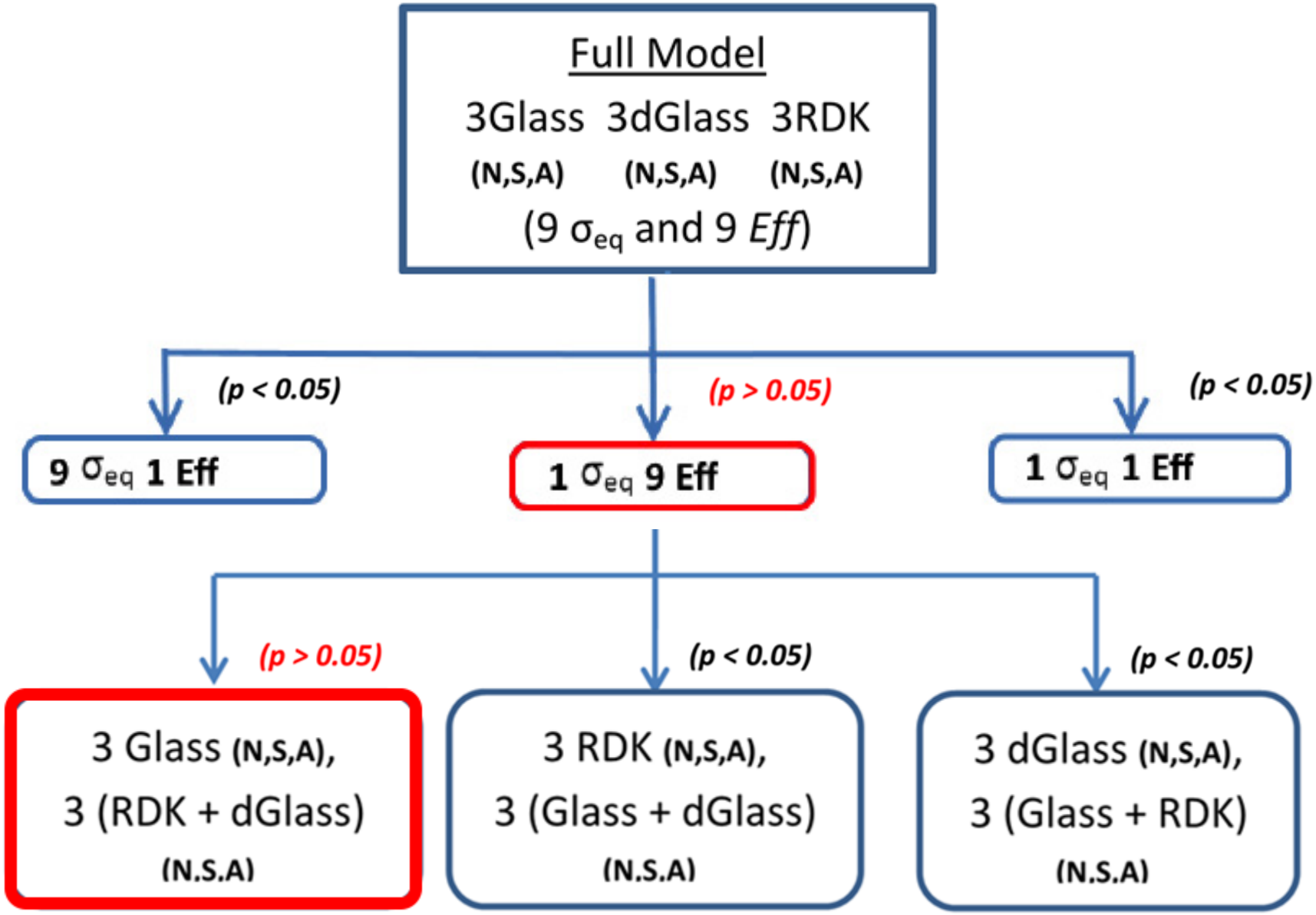
- Form stimuli: static Glass pattern
  - Dot size: 0.166°
  - Number of dots: 240
  - Dipole distance (Glass): 0.266˚
- Motion stimuli: RDK
  - Dot size: 0.166°
  - Number of dots: 240
  - Speed: 10˚/s
- Participants:
  - 6 normal controls
  - 11 amblyopes (6 strabs /5 anisos)



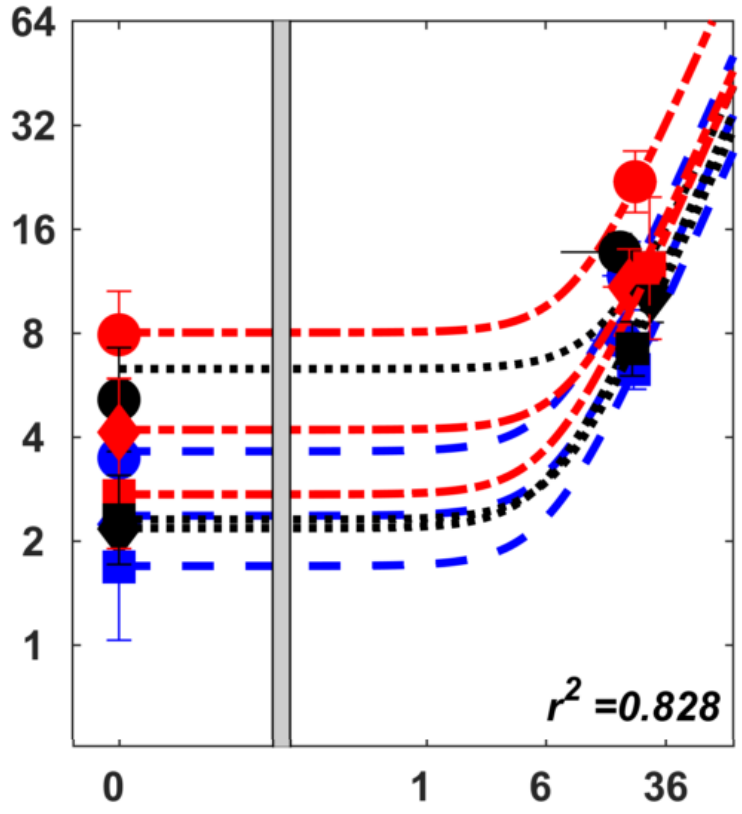
Amblyopic Thresholds



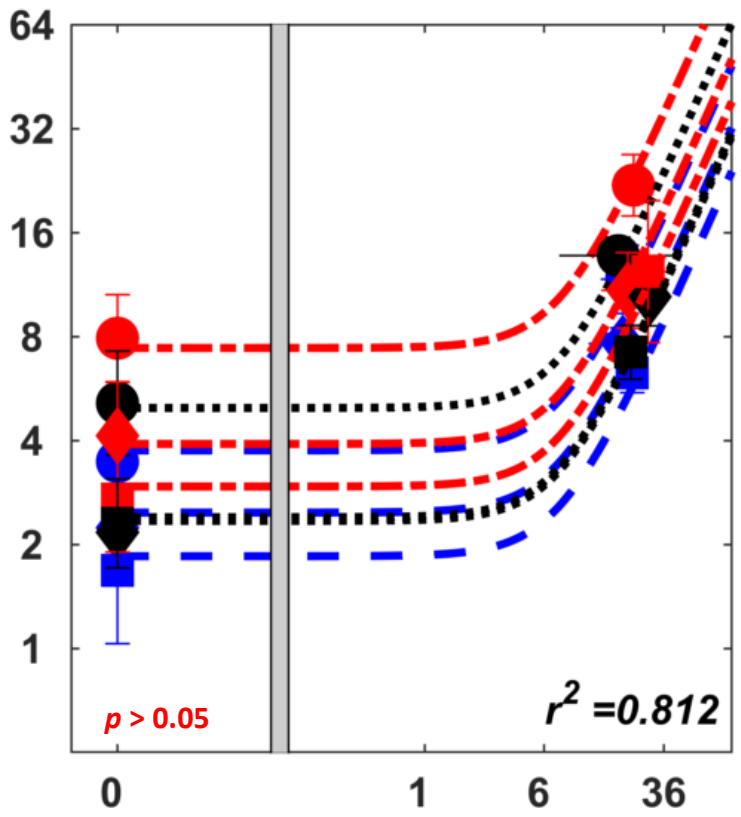
Nested Model Testing



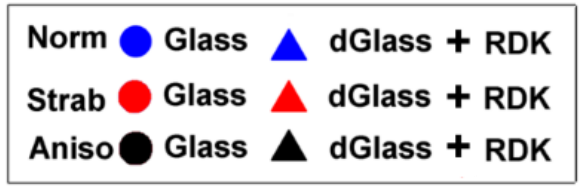
Nested Model Testing

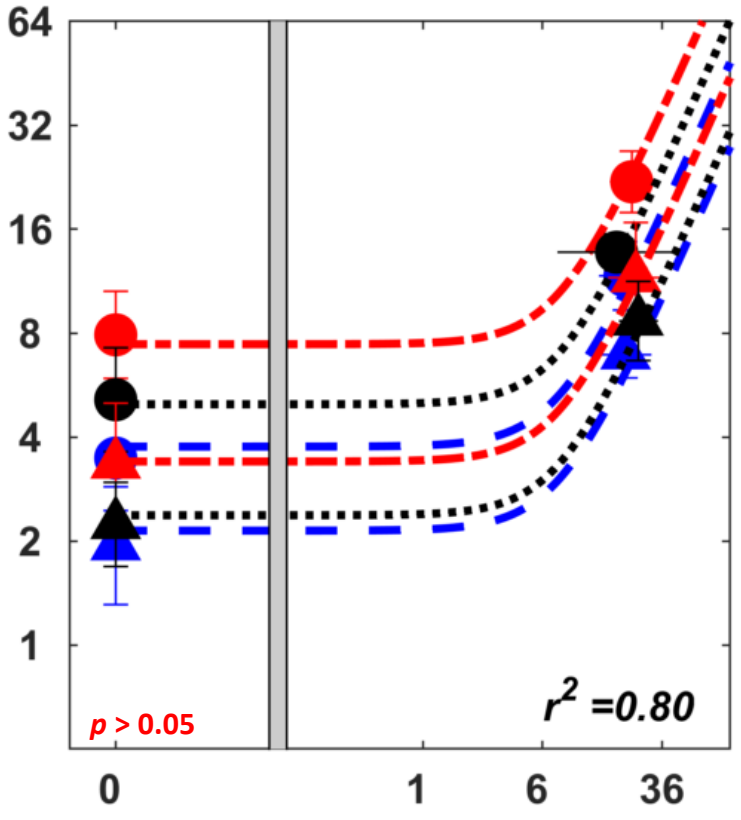


Full Model : 9 Int , 9 EFF



Reduced Model: 1 Int, 9 Eff





Reduced model: 1 Int, 6 Eff

Summary

- Implied motion thresholds are normal in both anisometropic and strabismic amblyopes.
- Temporal cues enhances the perception of Glass patterns in amblyopes.
- The findings challenges the dorsal stream deficiency hypothesis in developmental disorders such as amblyopia.

References

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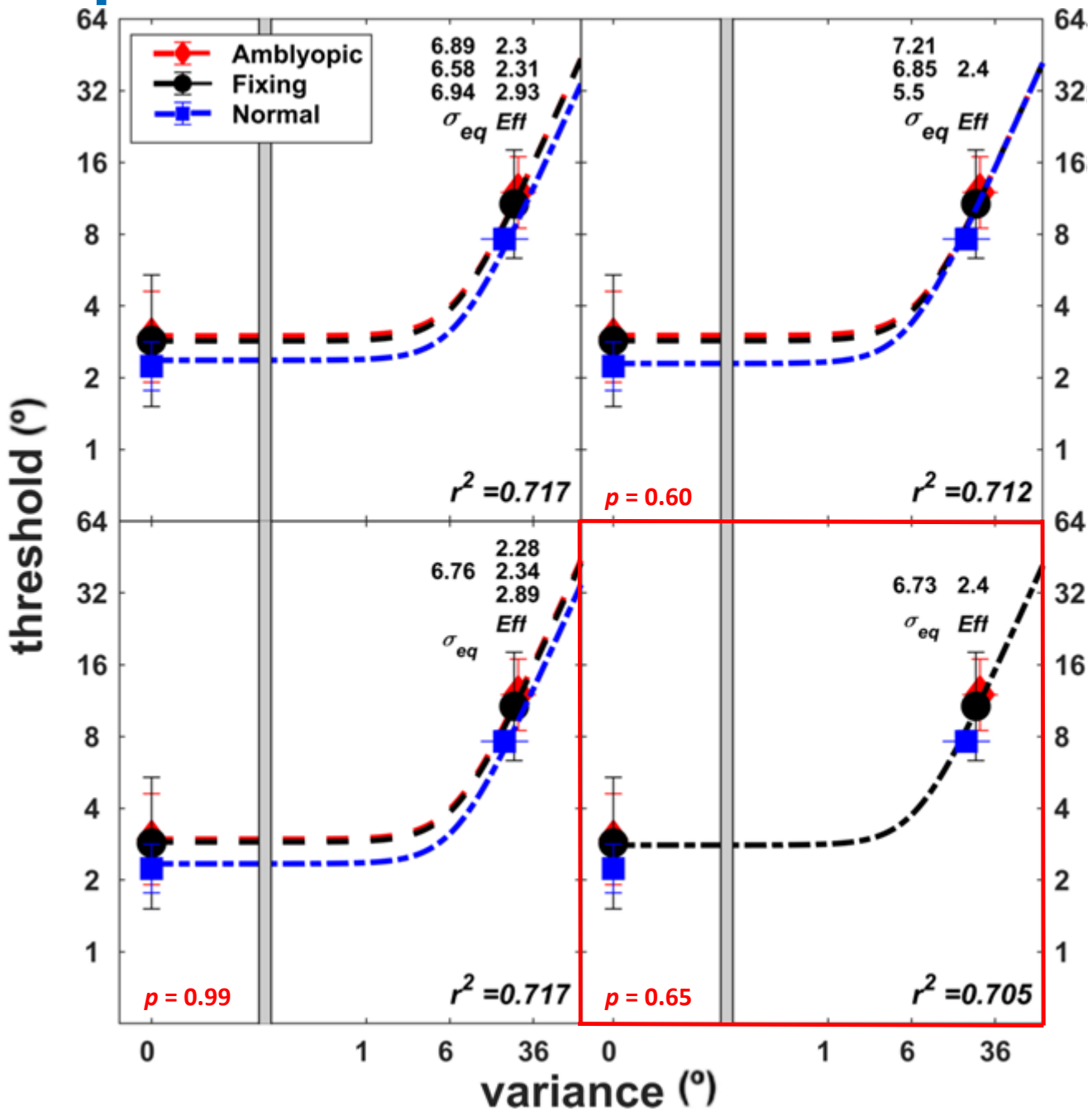
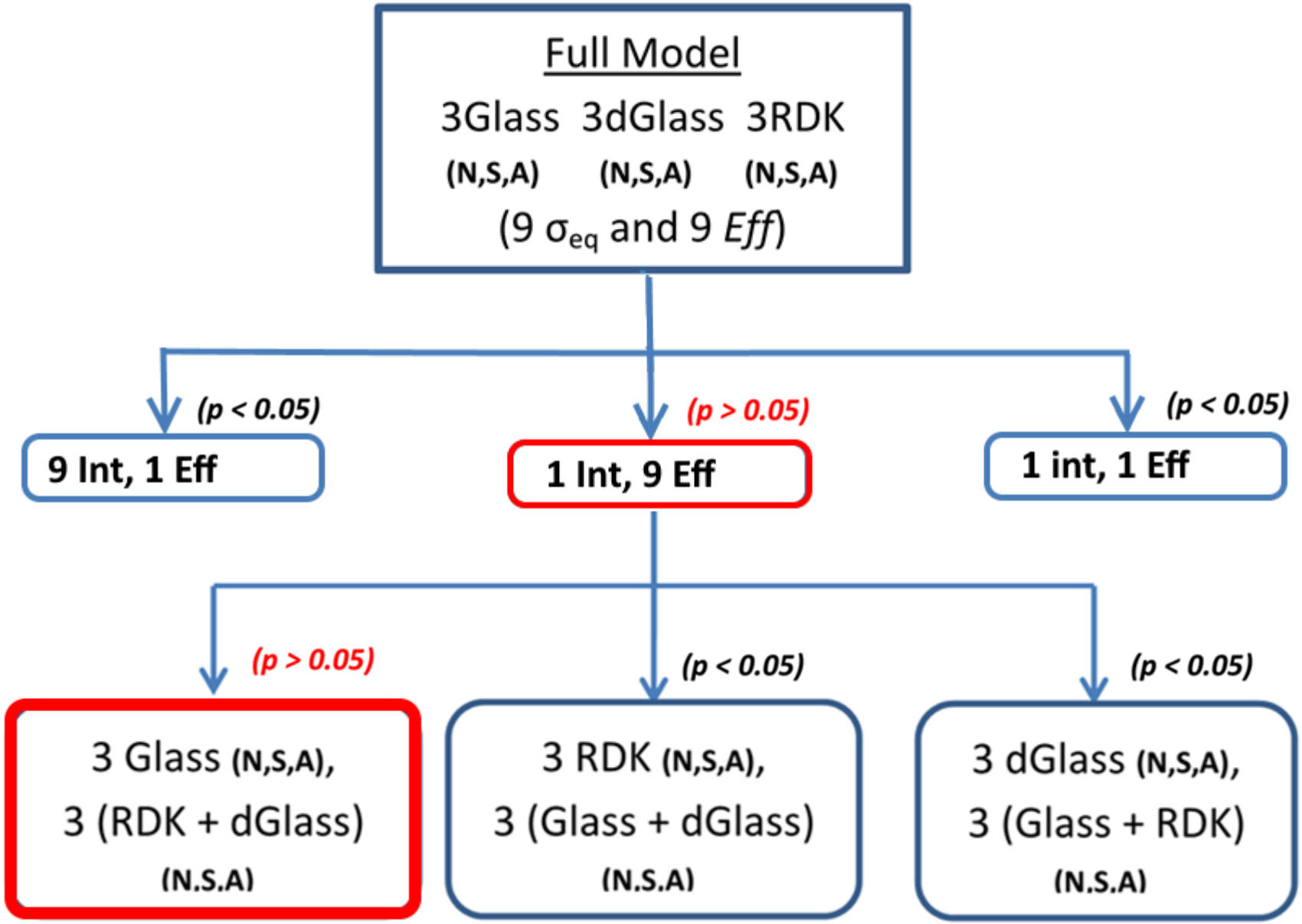
THANK YOU
FOR
your
ATTENTION!
ANY QUESTIONS?

Nested Modelling: Implied Motion

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



Nested Model Testing



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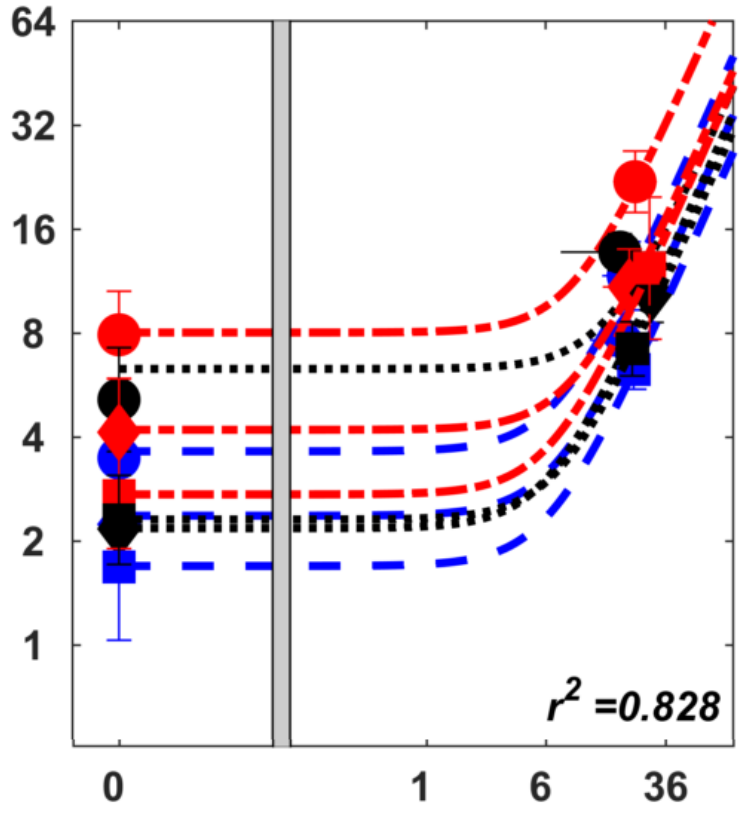

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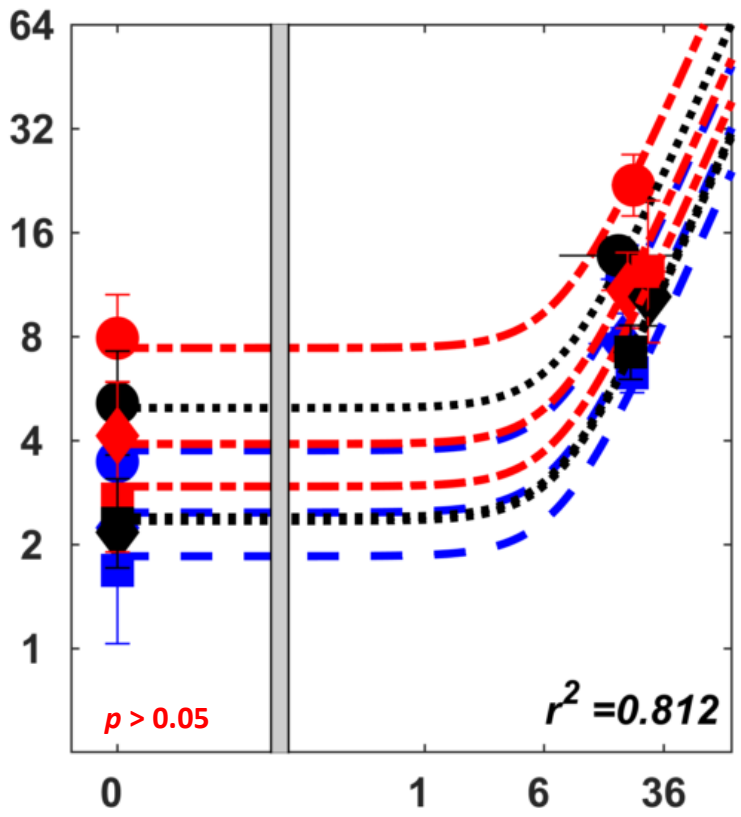
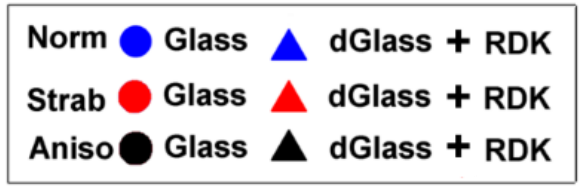
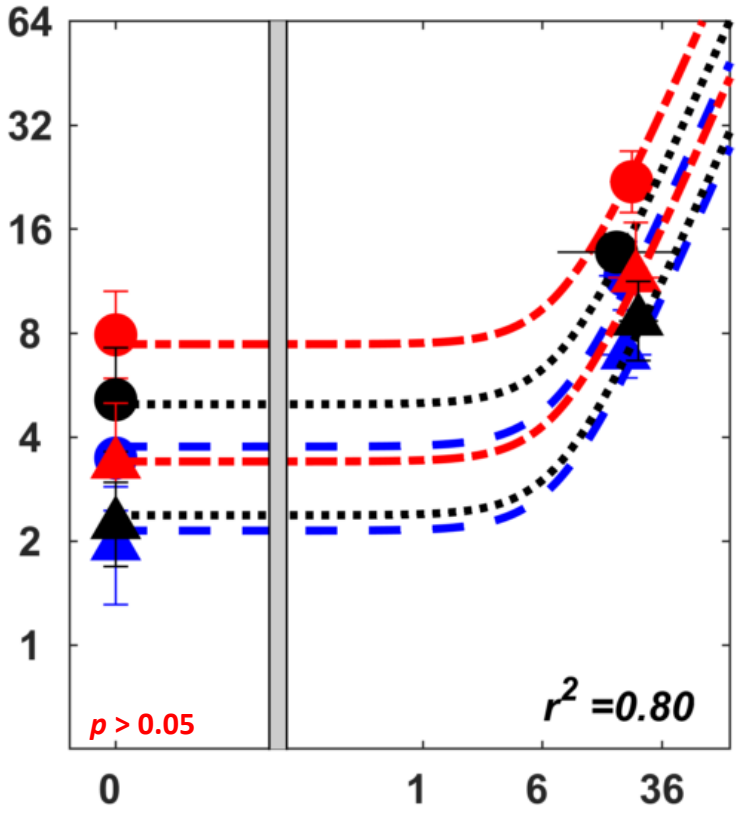


Reduced Model: 1 Int, 9 Eff





Reduced model: 1 Int, 6 Eff

Type	ID	Refraction			Cover Test	Stereo (arc sec)
		IOD*	OD**	OS***		
Strabismic	SS	0.41	+4.50/-0.50*172	+5.75/-1.00*22	Esotropia	No
	NJ	0.4	+1.00	+3.00	Esotropia	No
	CO	0.34	+4.00/-1.50*175	+4.50/-1.50*90	Int. Esotropia	200
	HQ	0.50	-1.50/-2.00*5	-1.50/-2.00*5	Exotropia	No
	MR	0.26	+3.00/-2.50*90	+1.50	Esotropia	No
	JR	0.48	-2.50	-2.50	Esotropia	No
	KH	0.2	+8.50/-3.50*25	+9.00/-3.00*170	Esotropia	No
	JW	0.24	+0.75/-0.25*25	+3.25/-0.50*25	Esotropia	No
Anisometropic	RK	0.22	+1.75/-1.00*180	0.00	Exophoria	85
	KW	0.1	-6.25/-1.25*170	-6.50/-1.50*180	Exophoria	20
	HMc	0.26	-0.25	+1.00/-1.00*90	Exophoria	20
	MI	0.2	-3.50/-0.50*60	-8.50/-1.50*140	Exophoria	40
	KS	0.33	0.00	+2.00/-1.00*150	Exophoria	100