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Sensitivity to global form in the presence of noise is stimulus dependent

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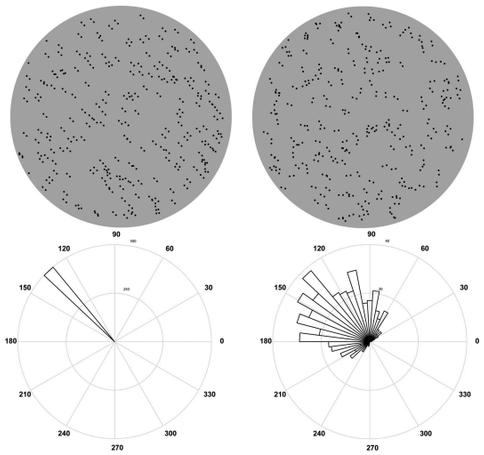
Introduction

Glass patterns and line segments are frequently used stimuli to investigate global form processing.[1] Higher sensitivity to these stimuli compared to *Random Dot Kinematograms* (RDKs) in clinical conditions such as amblyopia are interpreted as evidence of *dorsal stream vulnerability*.[2] But, it is not known whether Glass pattern and line segment stimuli target identical local and/or global form processing mechanisms compared to RDKs.

Methods

Observers: Five men, one woman with normal or corrected-to-normal VA; mean age: 35 (SD 6) yrs.

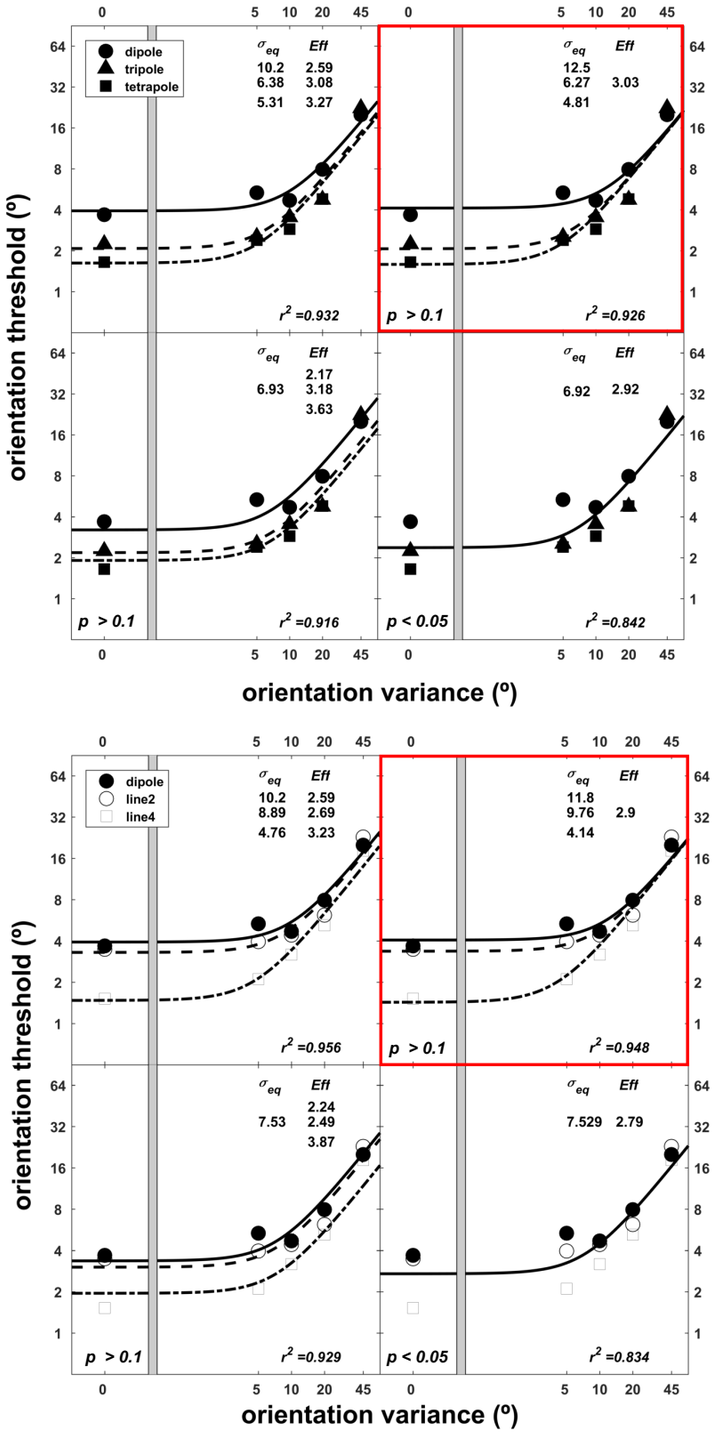
Stimuli: **Glass patterns**: dipole, tripole, and tetrapole (2, 3, and 4 dots). **Line segments**: 2 lengths, equivalent to dipole and tetrapole.

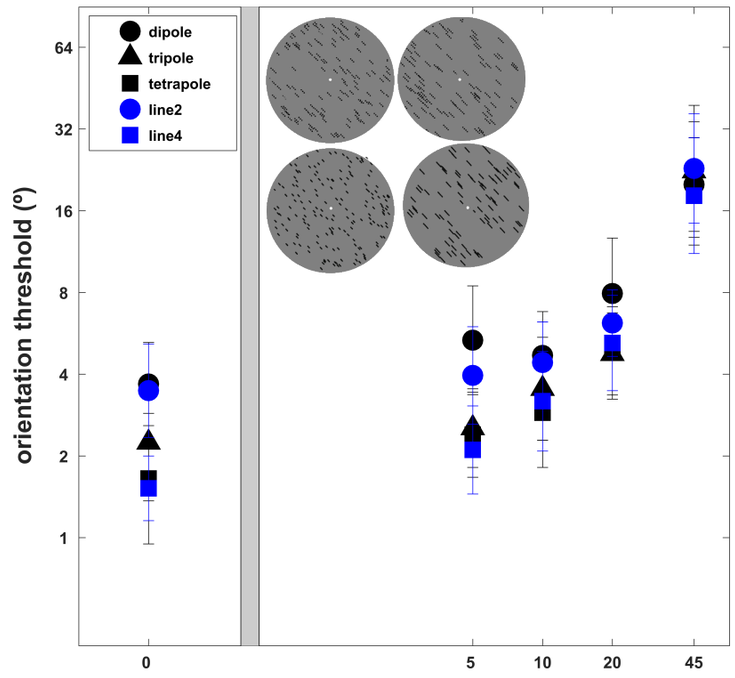


Equivalent noise paradigm: Sensory thresholds were related to amount of external noise through a *linear amplifier model*.[3]

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

where, τ_{obs} = threshold
σ_{eq} = equivalent internal noise
σ_{ext} = external noise
Eff = sampling efficiency





Results

The mean thresholds were highest for dipole and equivalent line segment stimulus with lowest thresholds for tetrapole and equivalent line segment at no noise condition. The mean thresholds for different stimuli were similar at the highest noise level. The nested modelling showed that the difference in thresholds was due to change in internal noise (σ_{eq}).

Conclusions

Sensitivity to Glass patterns with more than two elements and line segments is limited by *internal noise* rather than *sampling efficiency*. Therefore, these stimuli may not be ideal for investigating global processing mechanisms.

1. Grinter, E. J., M. T. Maybery and D. R. Badcock (2010). "Vision in developmental disorders: is there a dorsal stream deficit?" Brain Research Bulletin 82(3-4): 147-160. 2. Braddick, O., J. Atkinson and J. Wattam-Bell (2003). "Normal and anomalous development of visual motion processing: motion coherence and 'dorsal-stream vulnerability'." Neuropsychologia 41(13): 1769-1784. 3. Pelli, D. G. (1981). Effects of Visual Noise. PhD, Cambridge University.

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