INTRODUCTION

• Performance across the visual field is not homogeneous, even at equal eccentricities.
• Performance is generally better in the horizontal compared to the vertical direction – the **Horizontal-Vertical Asymmetry** (Cameron, Tai, & Carrasco, 2002; Carrasco, Giordano, & McKone, 2004; Carrasco, Talgar, & Cameron, 2001; Carrasco et al., 1995; Rusj, Kroon, & van der Wildt, 1980; Royama & Vese, 1979).
• Performance is often better in the lower than the upper visual field – the **Vertical Asymmetry** (Alpeter, Machelen, & Trauzettel-Klosinski, 2000; Edgar & Smith, 1980; He, Cavanagh, & Intellig Quant, 1996; Levine & McNamara, 2005; Piven, 1990).
• Performance is superior for stimuli that are placed below compared to above the horizontal meridian on the vertical meridian – the **Vertical Meridian Asymmetry** (Cameron, Tai, & Carrasco, 2002; Carrasco, Giordano, & McKone, 2004; Carrasco, Talgar, & Cameron, 2001; Talgar & Carrasco, 2000).
• Performance can be poor at the location directly above the point of fixation (Carrasco, Talgar & Cameron, 2001); this has been referred to as a **North Effect** (Anderson & Cameron, 2014; Cameron & Rathej, 2006). 
• Performance can also be poor at the location directly below the point of fixation (Carrasco, Talgar & Cameron, 2001); this has been referred to as a **South Effect** (Anderson & Cameron, 2014).
• Performance has typically been explored at more than 8 locations – the cardinal and intercardinal axes. The two previous studies (Cameron & Rathej, VSS 2006 and Abramo, Nizam & Carasco, 2012) that explored more locations were limited in the number of stimuli placed very near the vertical meridian (VM).
• Here we explore whether poor performance is restricted precisely to the vertical meridian by testing a greater range of stimulus locations, particularly near the vertical meridian, than previous studies.

METHODS

Participants
• 3 non-naive (LC & LK) & 1 naive (college-aged) observers
• Normal or corrected-to-normal vision
Stimuli
• 2 and 8cpd Gabor patches, tilted clockwise or counterclockwise about the horizontal axis, presented for 54 ms at one of 36 isoeccentric locations (4.5 deg.)
• Target size: 1.0 deg of visual angle (2cpd); 0.5 deg of visual angle (8cpd)
Task
• 2AFC orientation discrimination task; no feedback
• Trials ran continuously (initialized by the response keys)
• Prior to data collection we established "baseline" contrast to obtain ~80% performance across all 36 locations for each observer
• 50 trials per location
Analysis
• Data were fit with hemi-ellipses and performance was compared to expected performance based on the ellipse fit (see Anderson, Cameron, & Levine, 2014).

RESULTS

**Hemi-ellipse fits demonstrate that performance near the VM in the upper visual field is even worse than predicted.**

**COMPARISON WITH OUR PREVIOUS RESEARCH**

Abrams, Nizam & Carrasco (2012)
2AFC orientation discrimination task; 6cpd, 1 deg at half height Gabor patches; 4.25 deg. eccentricity; 20 possible target locations; set size 4 (1 tilted, 3 vertical)

**COMPARISON WITH OTHER PREVIOUS RESEARCH**

Data from Abrams et al. (2012) replotted and fit by a shifted ellipse. Our results are broadly consistent. Note: Performance relative to the ellipse is poor only for the target on the VM, but this is a result of the restricted range of target locations tested. There is a lower visual field advantage that is not observed in the current study.

**MECHANISM: One Slope or Two?**

The slopes from the regression lines (left) are shown for this experiment (blue) and for a pilot experiment (orange) using a larger Gabor stimulus.

Given the similarity, these data are combined (below).

At 8cpd, the data are best fit with 2 line segments.

**SUMMARY & DISCUSSION**

• Performance is poor on the VM, particularly above fixation, but poor performance is not restricted precisely to the VM.
• Using hemi-ellipse fits to measure the difference between expected and actual performance we find that
  - The greatest effect was observed within 20 angular degrees on either side of the VM, which corresponds to 1.5 degrees of visual angle.
  - The extent of the poor performance near the VM depends upon spatial frequency, indicating that it is probably not a retinal phenomenon.

REFERENCES


