

Independent attentional resources explain the object-based shift direction anisotropy

Adam J. Barnas and Adam S. Greenberg

Department of Psychology, University of Wisconsin-Milwaukee, Milwaukee, WI

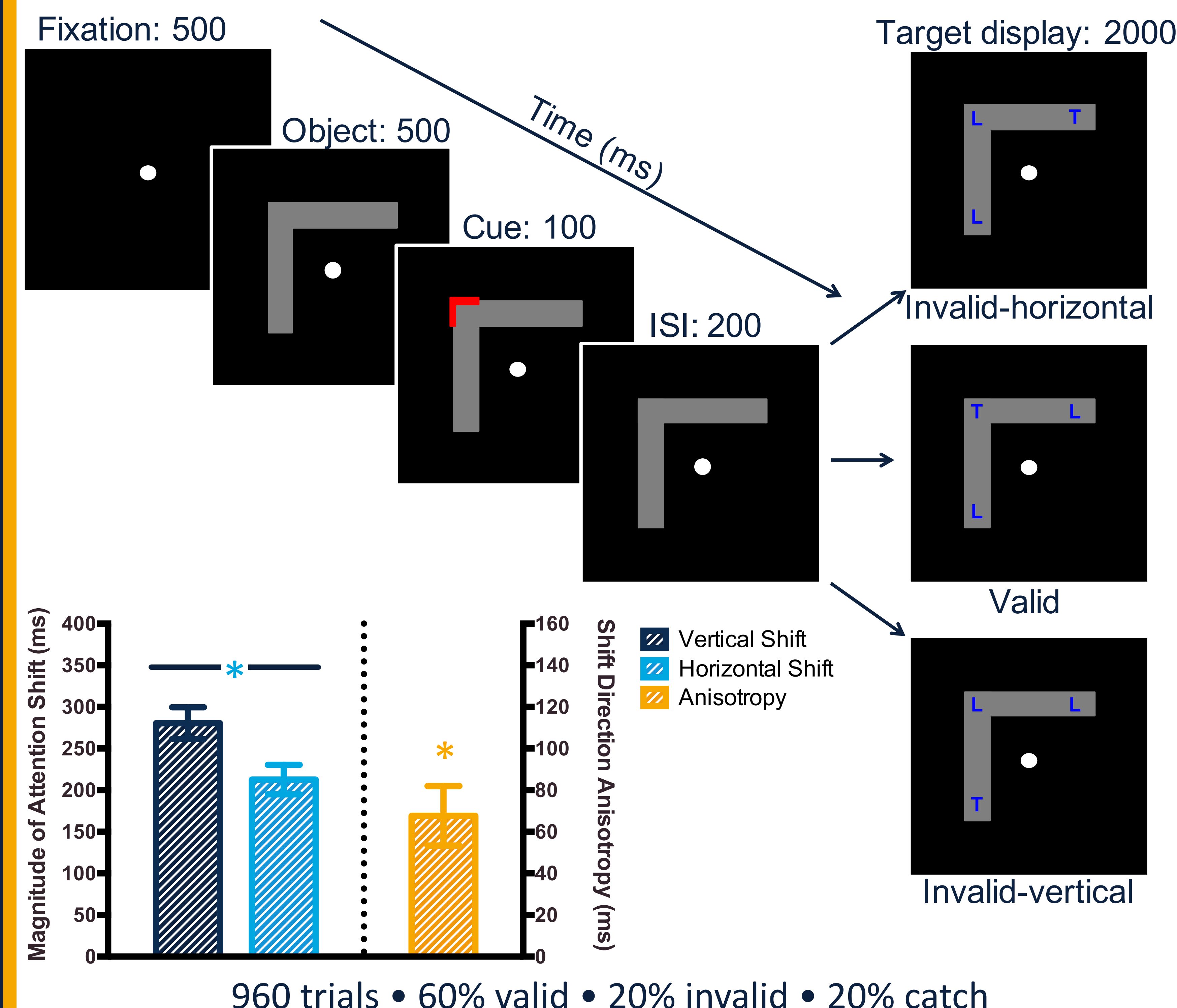
Introduction

- Object-based attention (OBA) prioritizes visual information contained within boundaries of attended vs. unattended objects^{1,2}
- Larger object-based effects for horizontal objects than vertical objects³; no difference when controlling for attention shifts across meridians⁴
- Reallocating OBA across meridians is faster horizontally than vertically, referred to as a **shift direction anisotropy** (SDA)^{5,6}, which we've shown is:

- Observed whether attention shifts occur within or between objects⁵
- Not present when targets/objects are sequestered into quadrants⁵
- Driven by target location, not object placement⁶

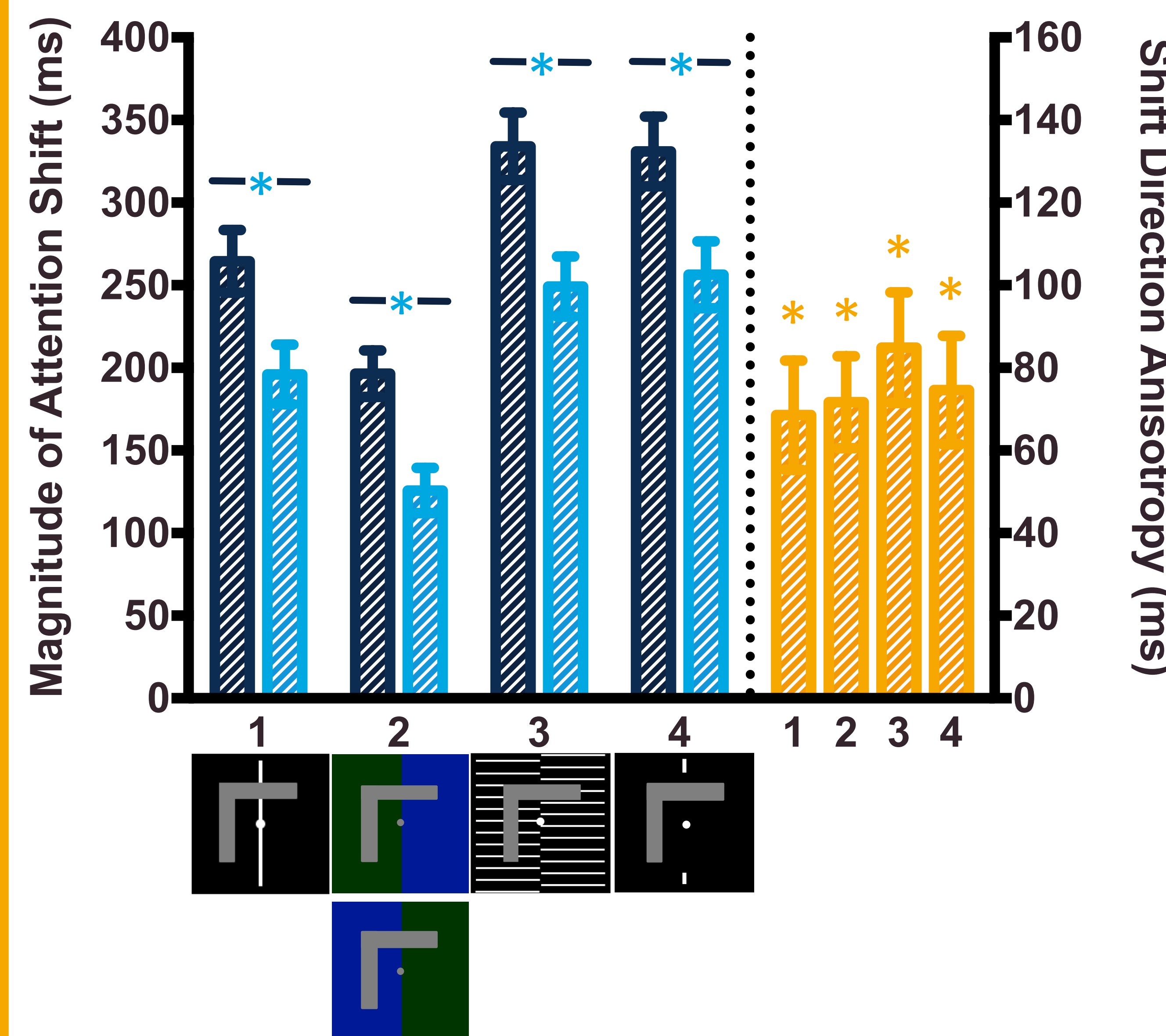
How does visual system neuroanatomy account for the object-based shift direction anisotropy?

Method



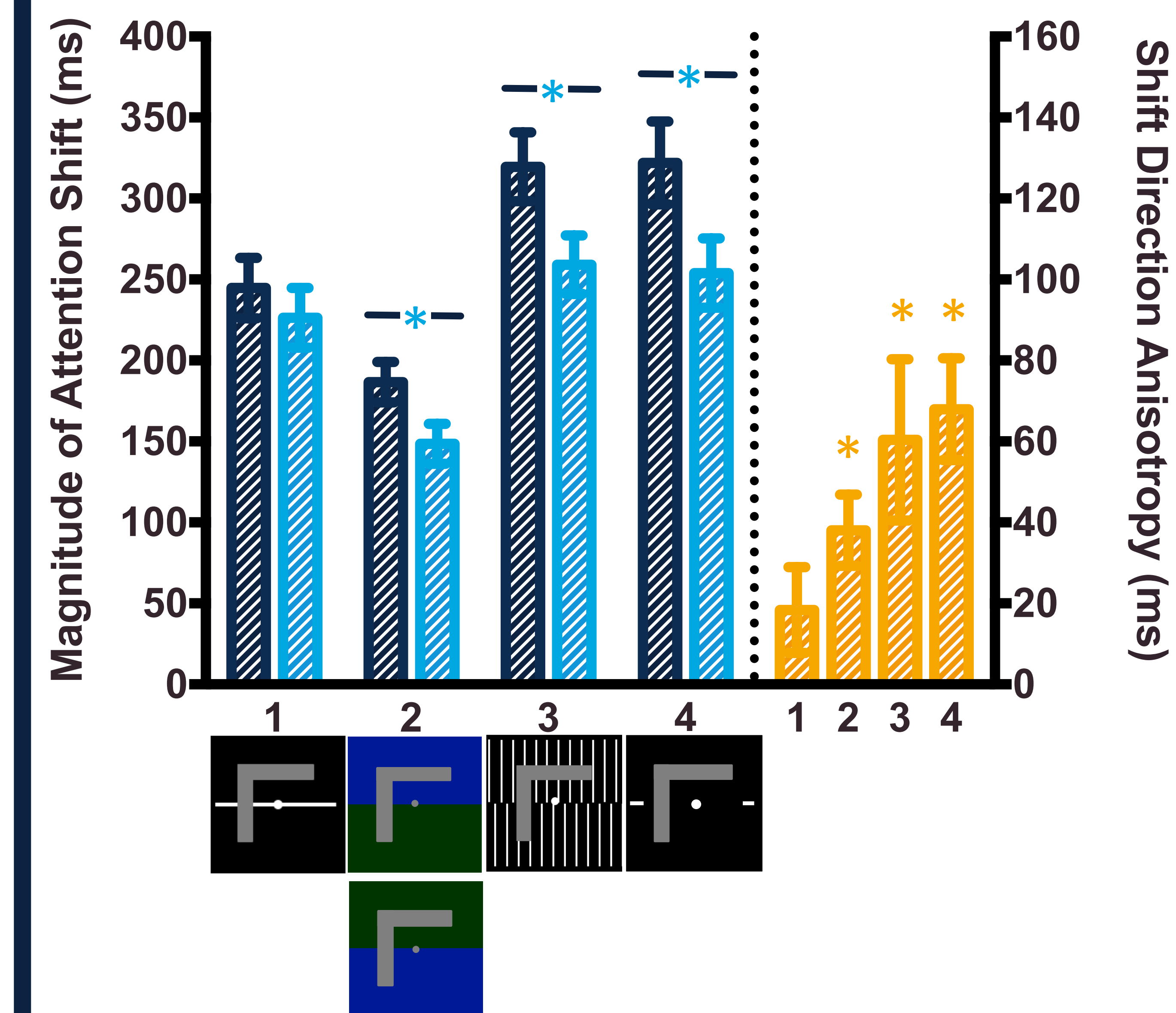
Results

Vertical Meridian



Horizontal shifts faster than vertical shifts
SDA unchanged with vertical meridian emphasis

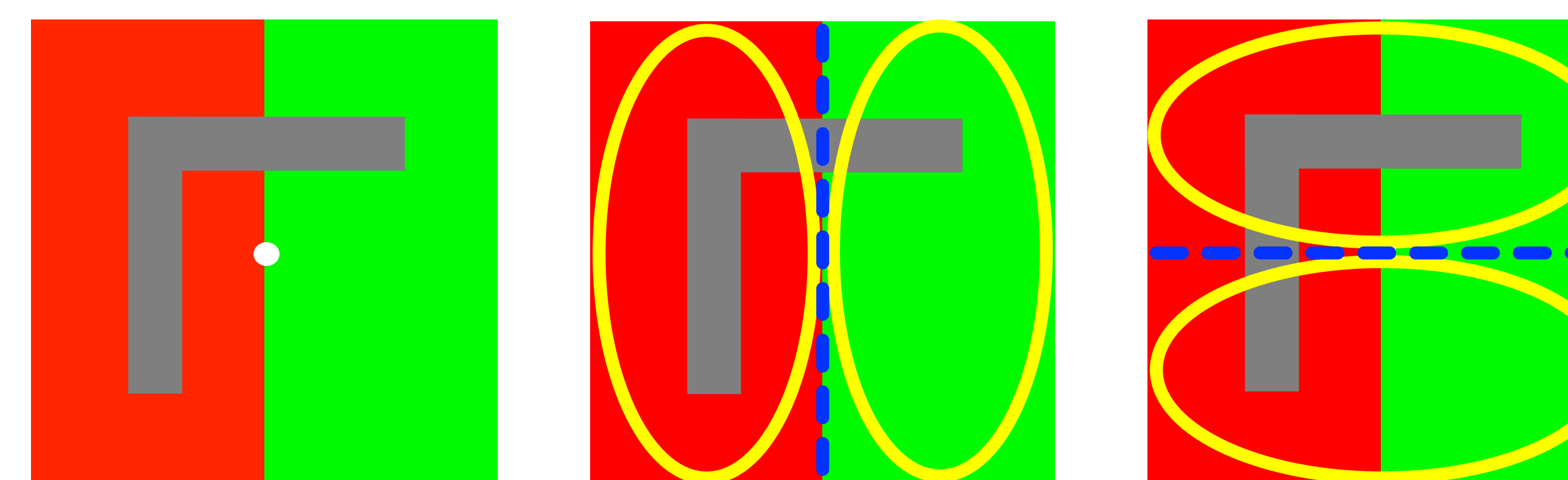
Horizontal Meridian



Horizontal shifts faster than vertical shifts
SDA modulated/eliminated with horizontal meridian emphasis

Discussion & Conclusion

- Cerebral hemispheres have independent attentional resources^{7,8}
- Emphasizing vertical meridian has no effect on SDA due to anatomical segregation (**interhemispheric boundary**) separating hemispheres
- Emphasizing horizontal meridian establishes artificial **intrahemispheric boundary** within hemispheres, further subdividing and sequestering attentional resources into four distinct pools



References

- Duncan, J. (1984). *JEP: General*
- Egley, R., Driver, J., Rafal, R.D. (1994). *JEP: General*
- Pilz, K. S., Roggeveen, A. B., Creighton, S. E., Bennett, P. J., & Sekuler, A. B. (2012). *PLoS One*
- Greenberg, A. S., Hayes, D., Roggeveen, A., Creighton, S., Bennett, P., Sekuler, A., & Pilz, K. (2014). *JoV*
- Barnas, A. J., & Greenberg, A. S. (2016). *AP&P*
- Barnas, A. J., & Greenberg, A. S. (submitted)
- Alvarez, G. A., & Cavanagh, P. (2005). *Psychological Science*
- Clevenger, J., & Beck, D. M. (2014). *Visual Cognition*

Acknowledgments

- Thanks to Erin VandenBosch, Souriyio Dishak, Dominic Bieniewski, and Sana Shakir for assisting with data collection and interpretation.
- This research was supported by US-Israel Binational Science Foundation, UWM Research Growth Initiative, and Greater Milwaukee Foundation.

Reprint requests: ajbarnas@uwm.edu