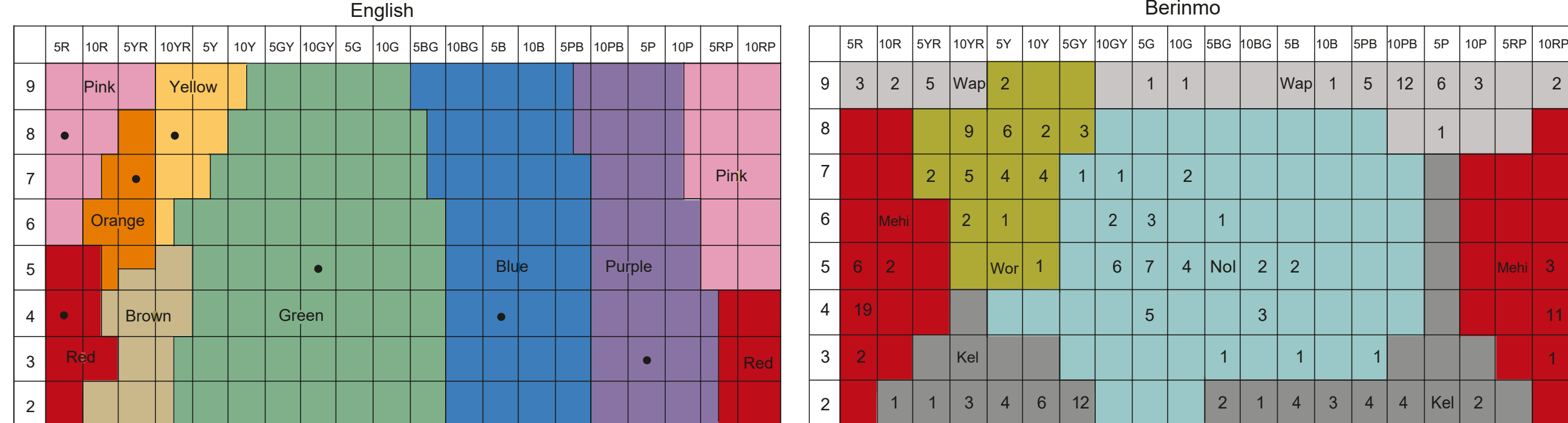


Objectives

Categorization is a hallmark of high-level cognition, studied extensively with color. How are colors categorized independent of language? We explored this question by measuring color categorization in macaques, a primate species which shares the same retinal color-encoding mechanisms as humans.

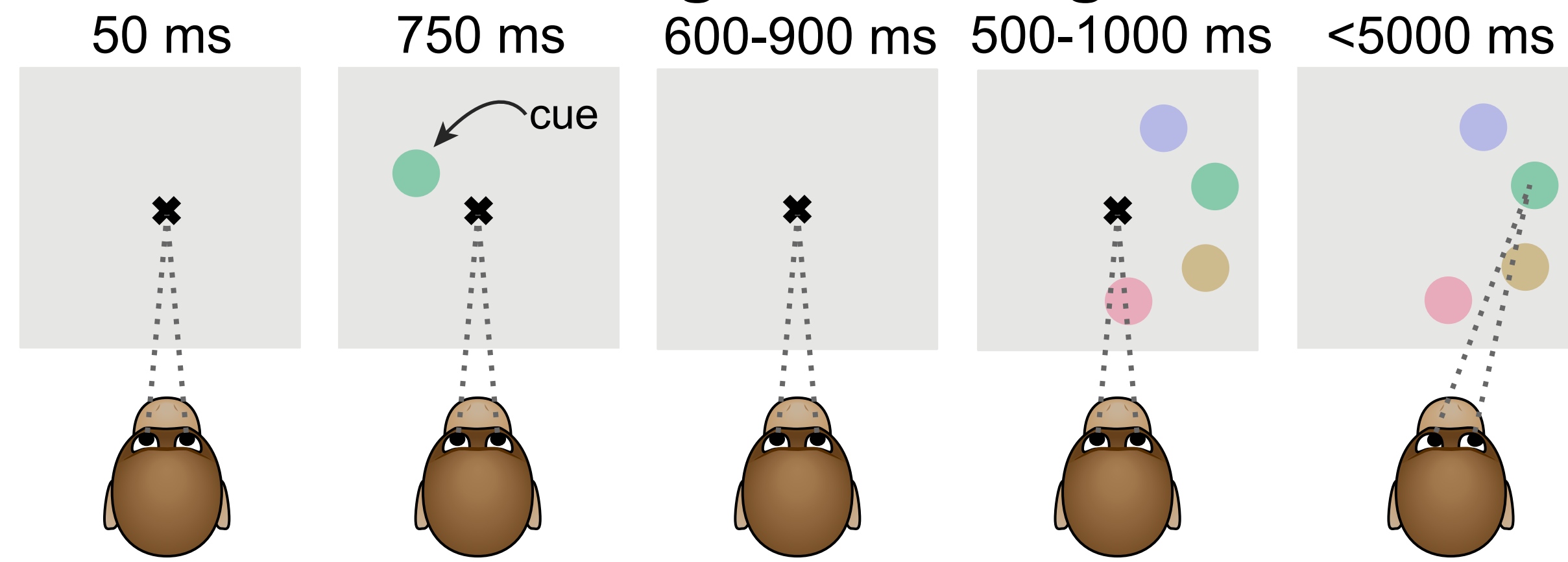
Color categorization in humans

Human categories show universal patterns and variability.

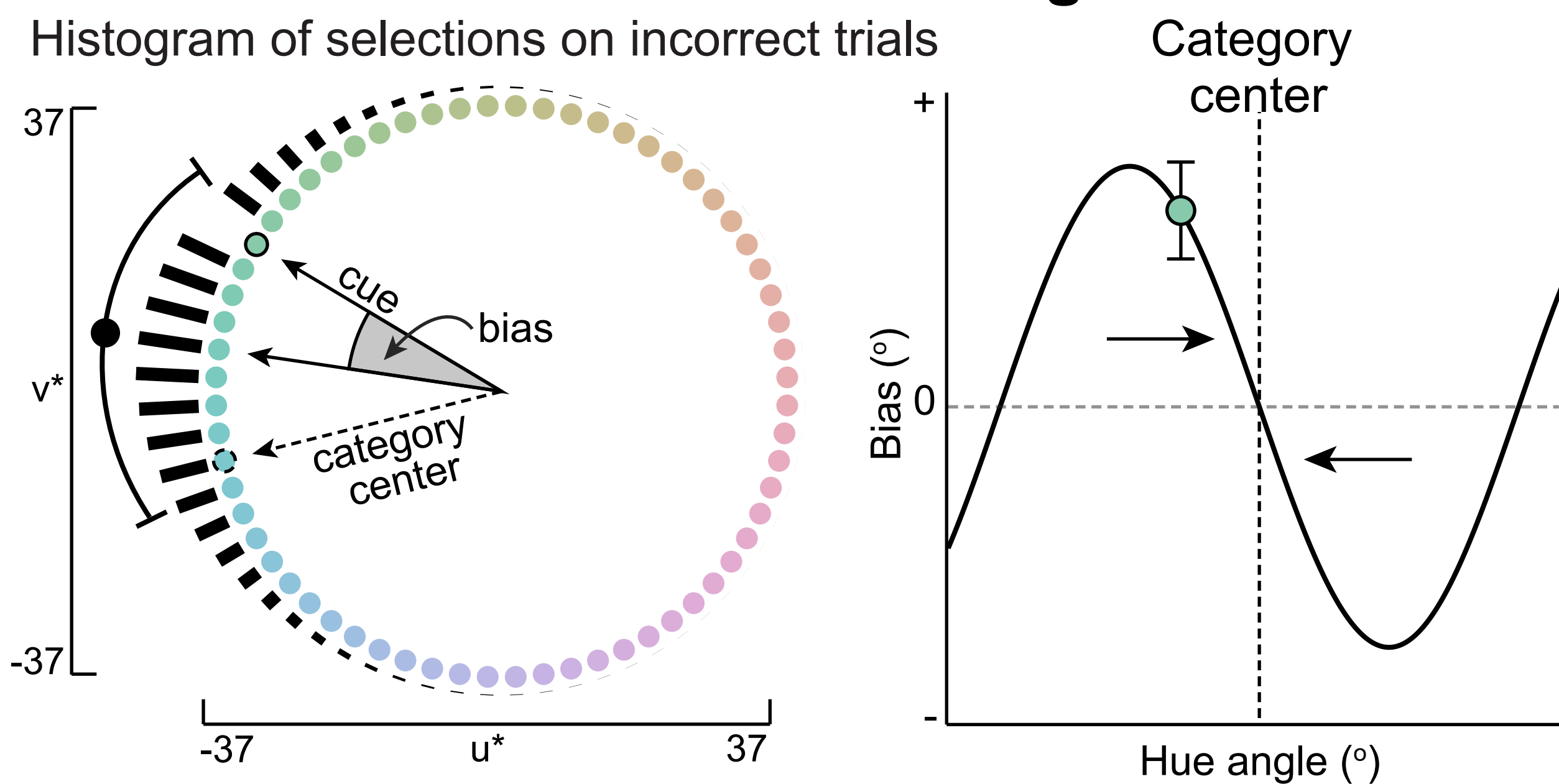


Davidoff et al. (1999)

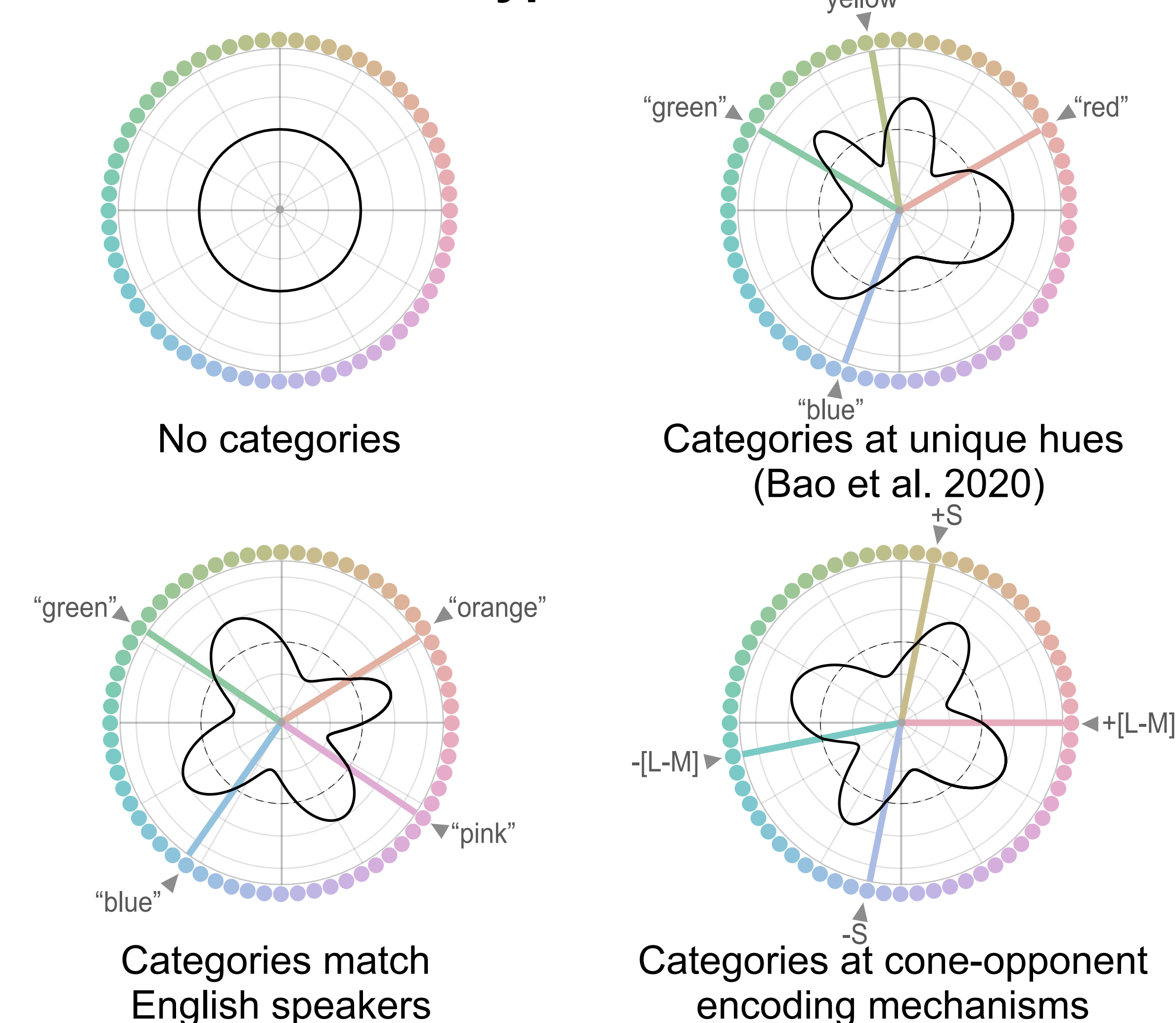
Non-verbal paradigm for determining color categories



Bias as a measure of categorization

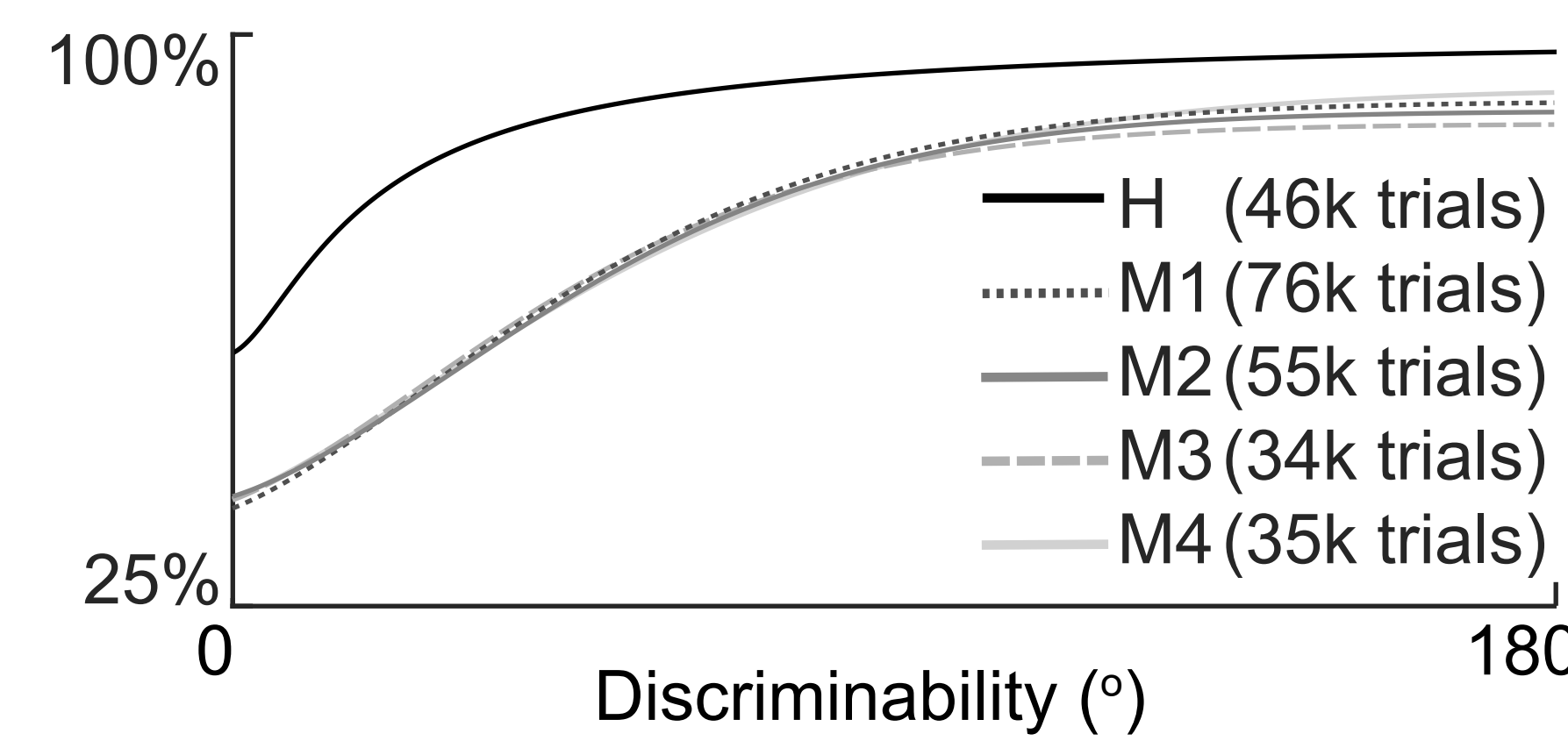
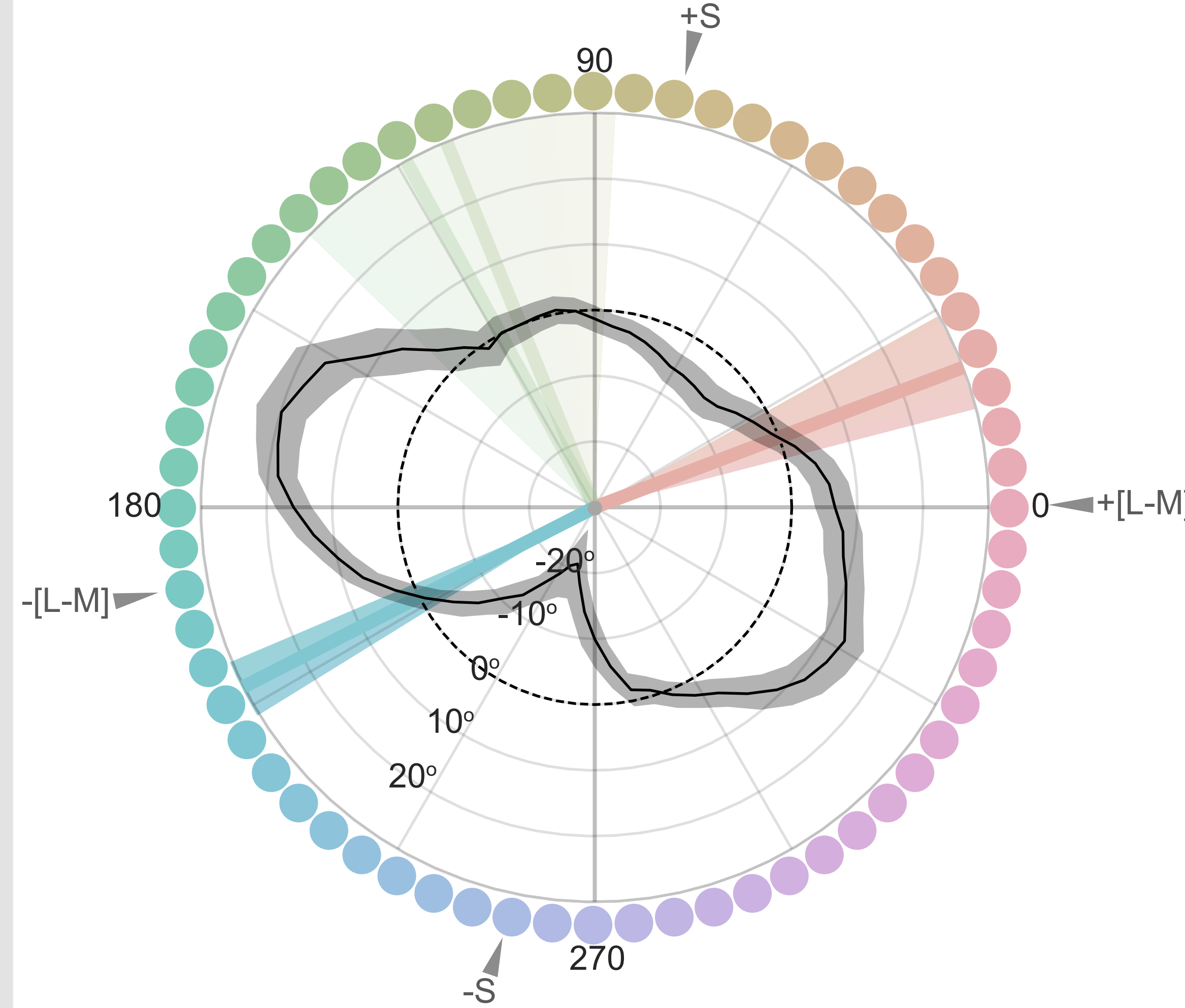


Hypotheses



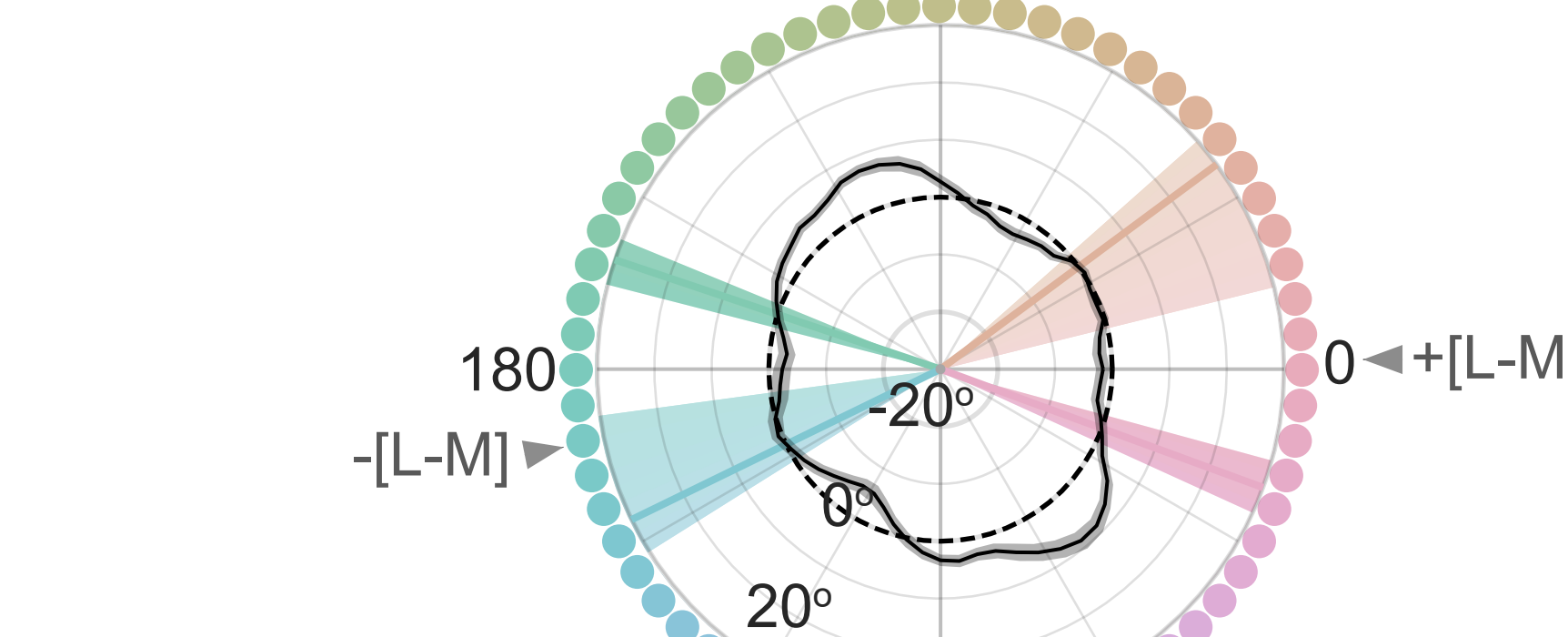
Macaques share two color categories with humans

Macaques (n=4, 200k trials)

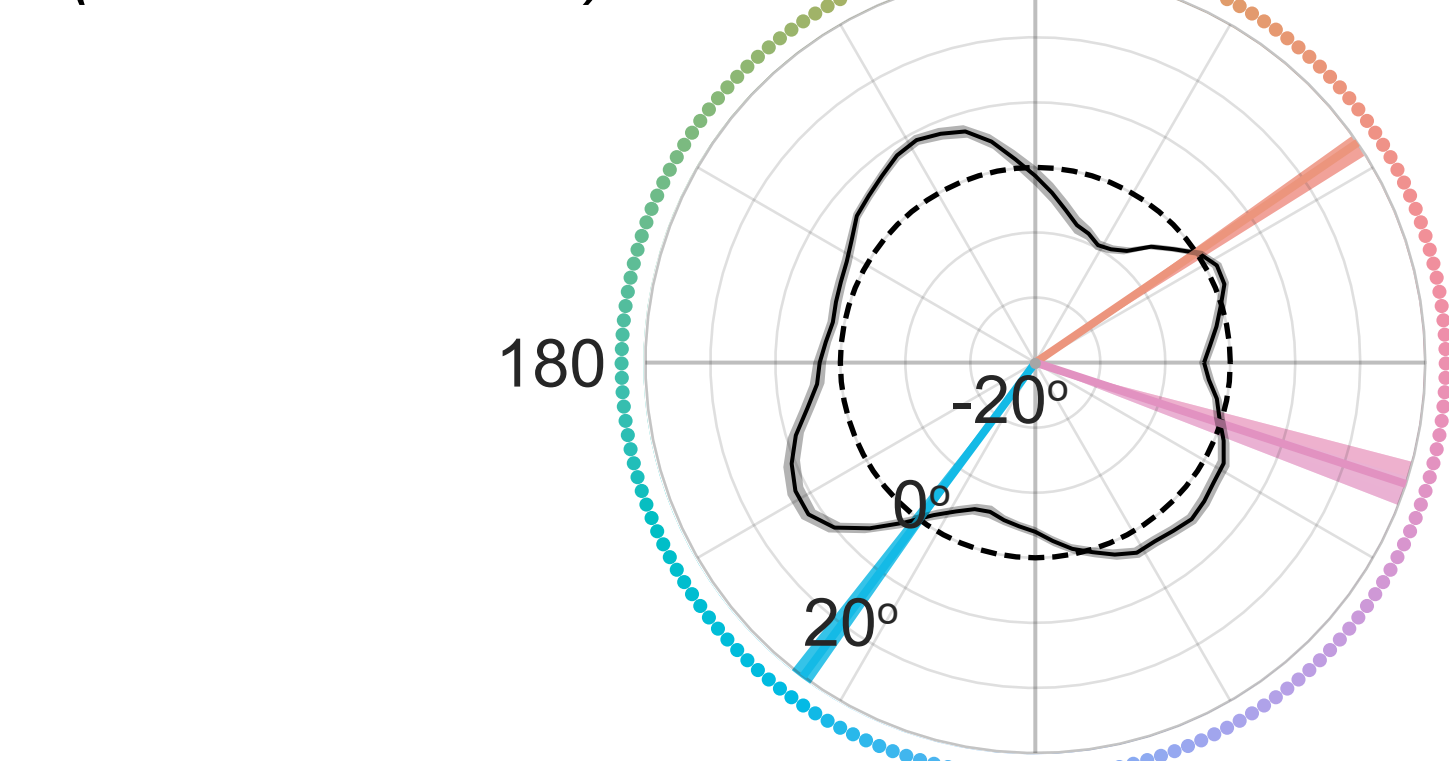


Macaques show consistently **two color categories**, which align with the primitive **“warm-cool”** categories evident in all human cultures.

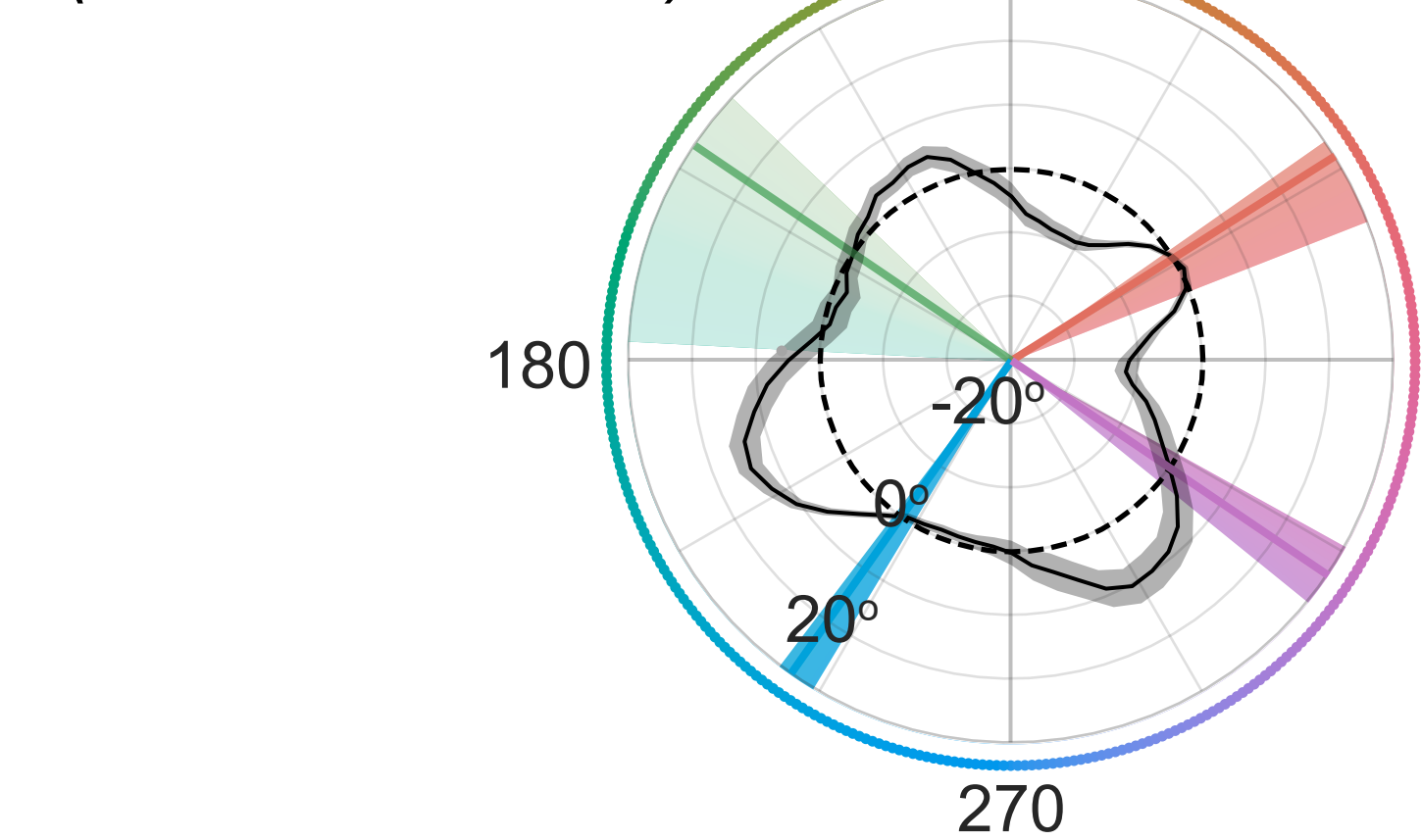
Crowd sourced with Amazon Mechanical Turk (n=72, 46k trials)



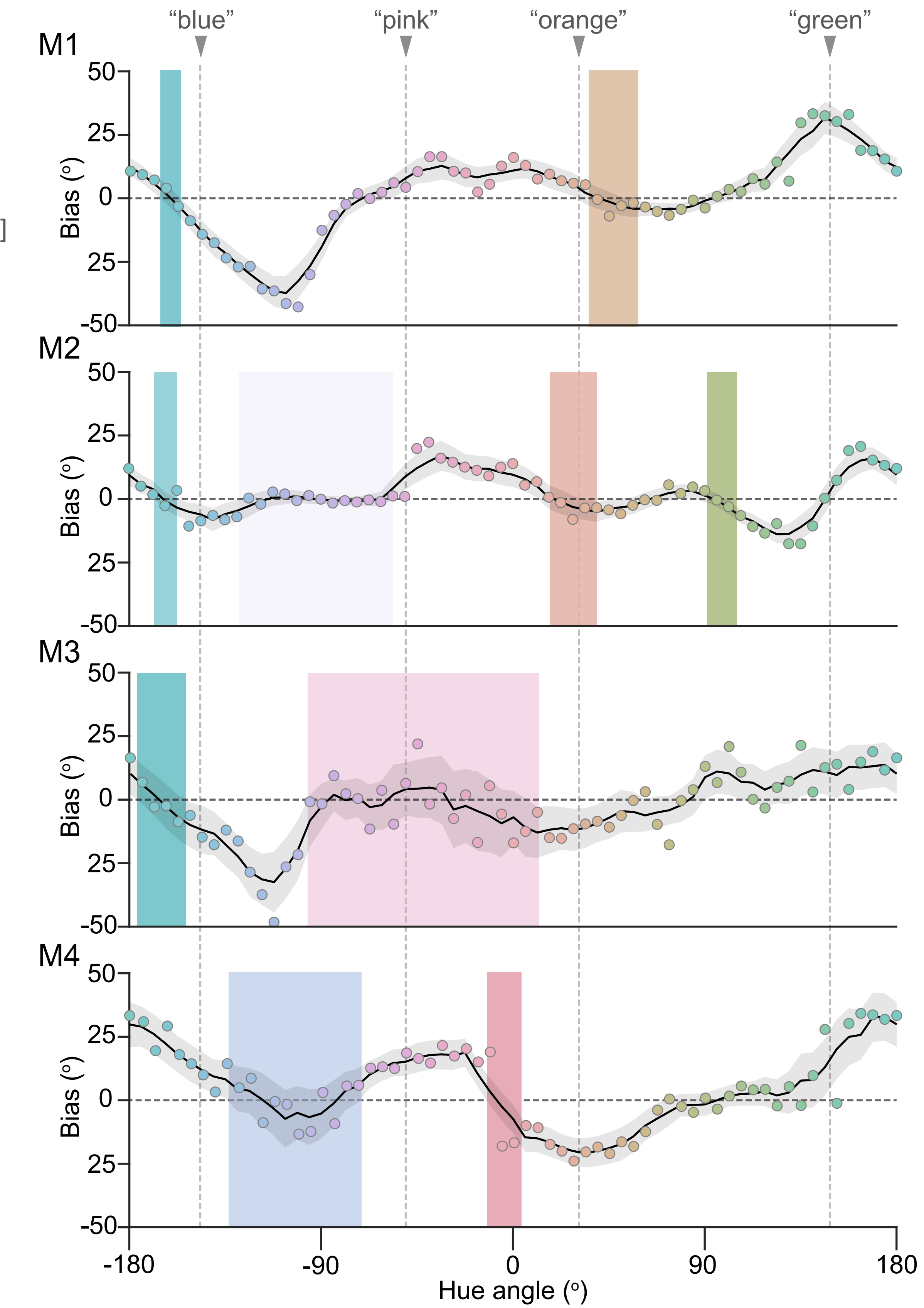
Bae et al. (2015) (n=3, 11k trials)



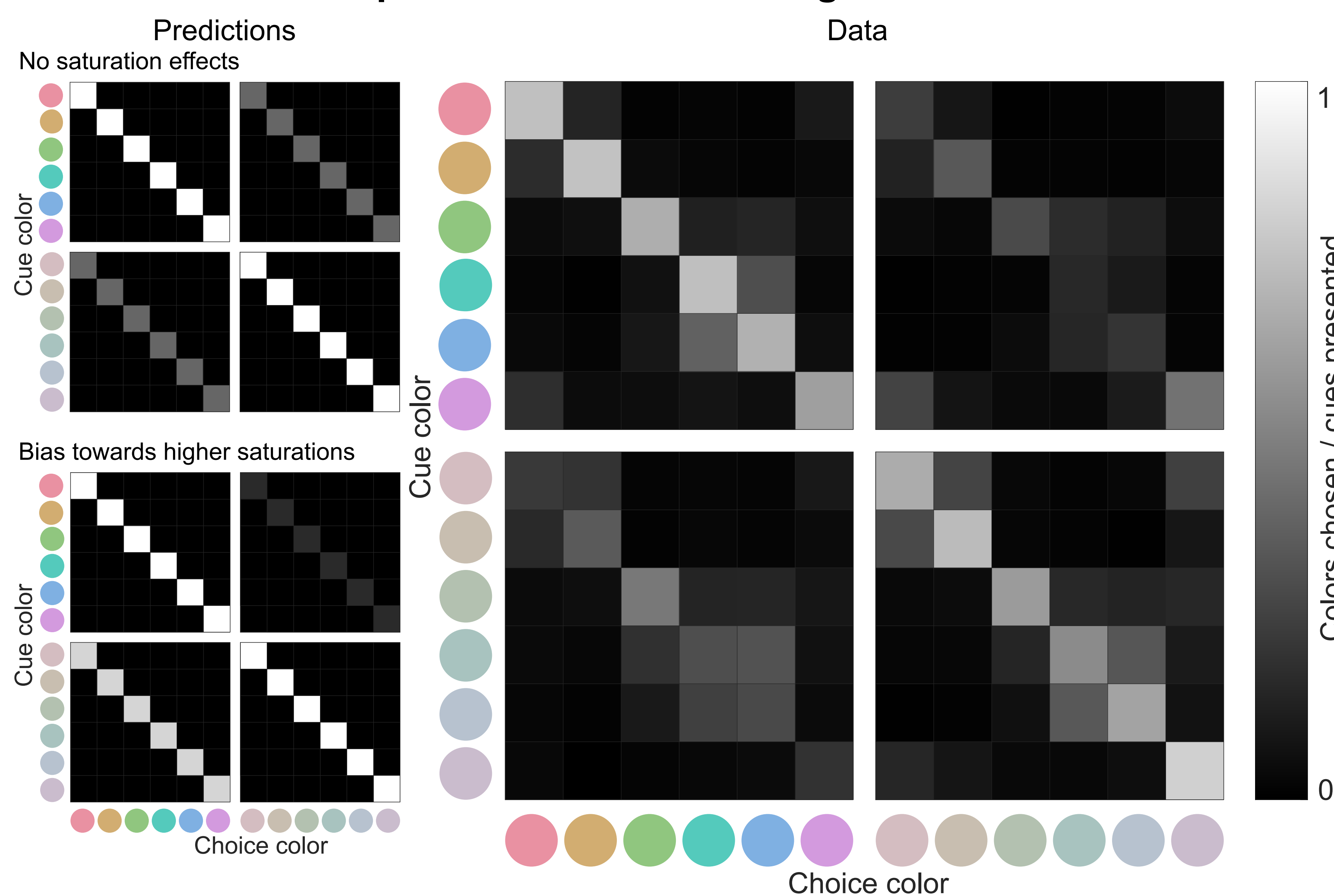
Panichello et al. (2019) (n=106, 17k trials)



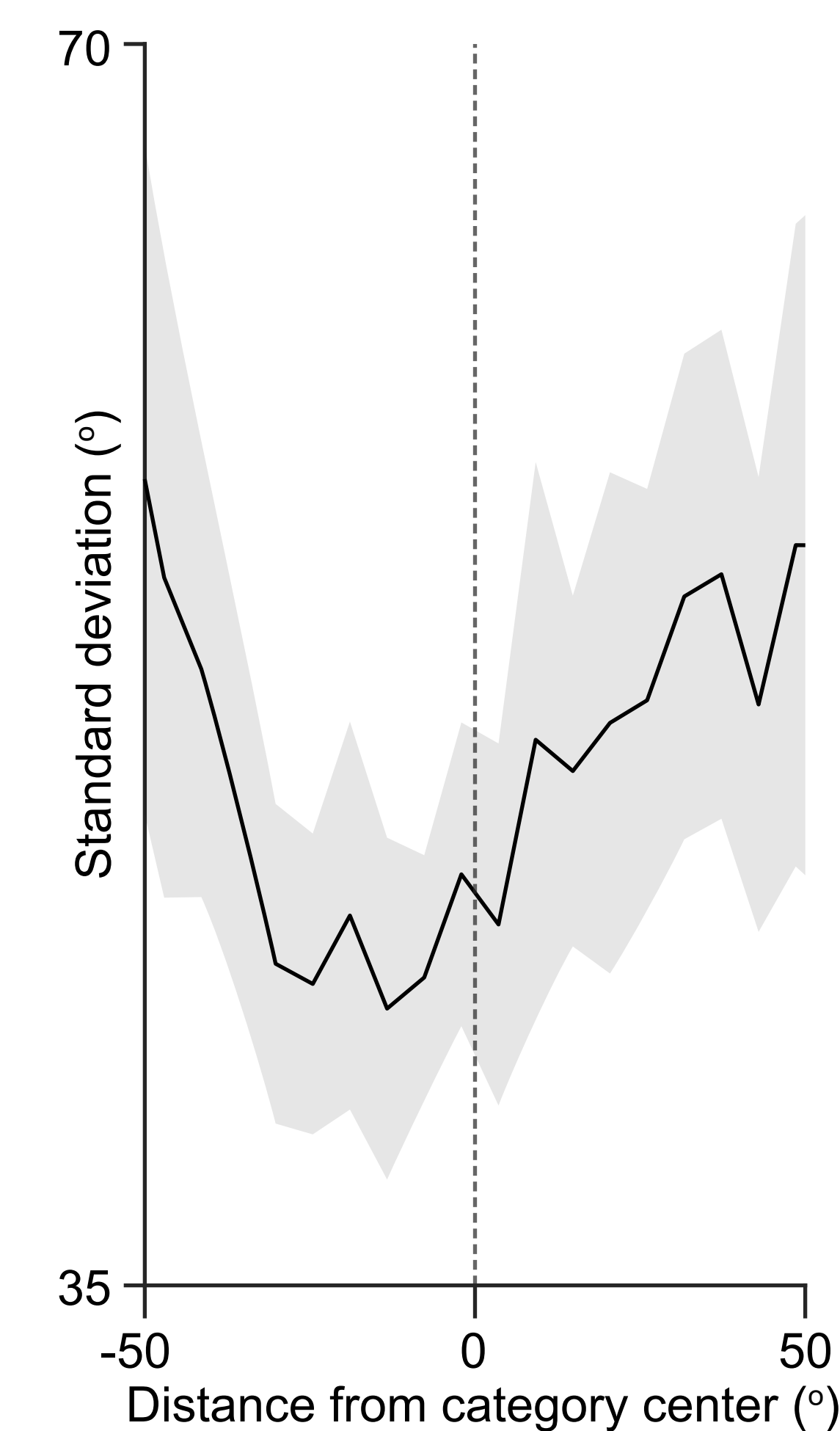
Individual variability between macaques



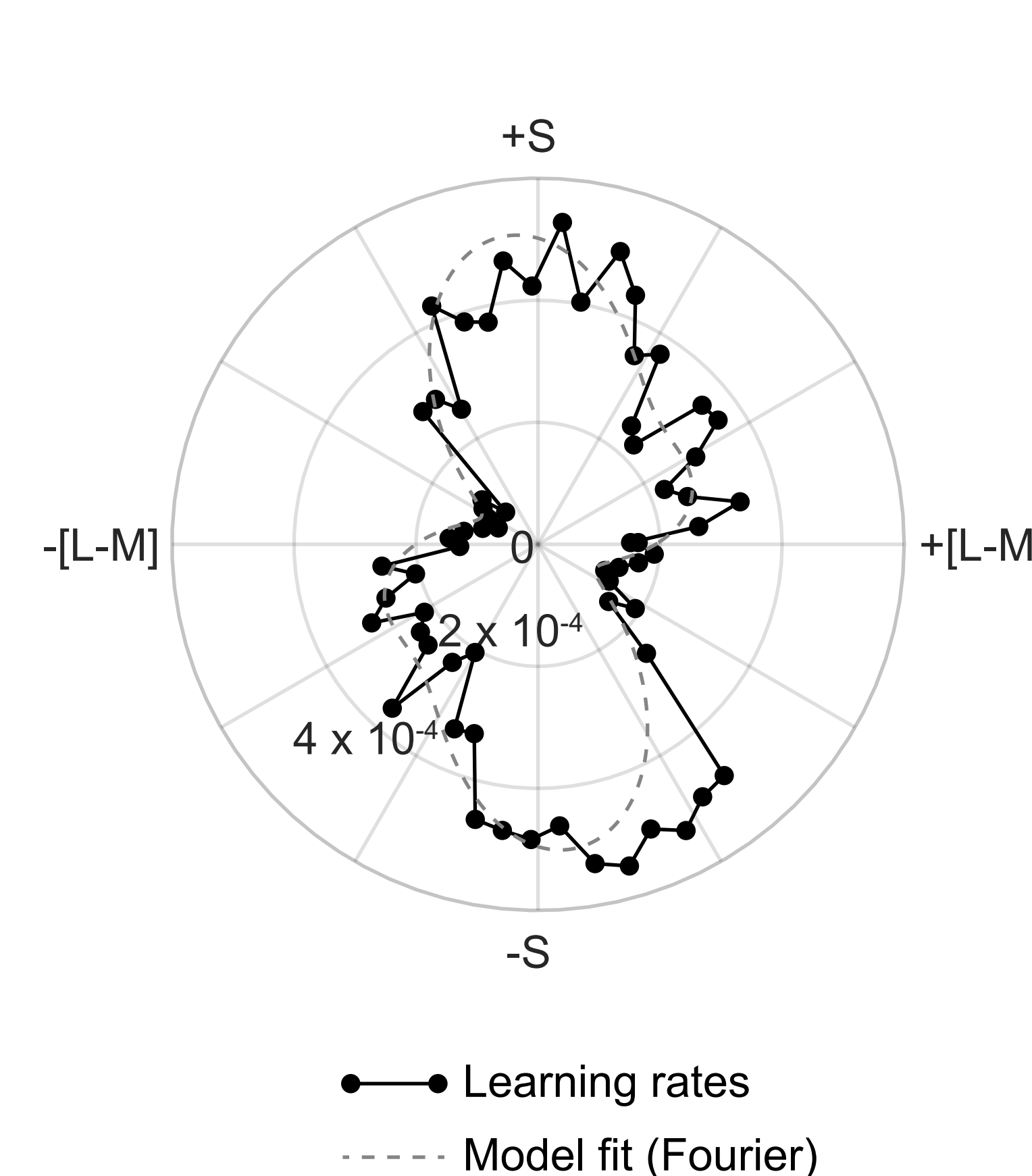
Macaques show no bias for higher saturations



Low behavioral variability at category centers



Learning rate is higher along S-axis



References

Bae, G. Y., Olkkonen, M., Allred, S. R., & Flombaum, J. I. (2015). Why some colors appear more memorable than others: A model combining categories and particulars in color working memory. *Journal of experimental psychology: General*, 144(4), 744–763. <https://doi.org/10.1037/xge0000076>

Bao, W., Wei, M., & Xiao, K. "Investigating Unique Hues at Different Chroma Levels with a Smaller Hue Angle Step." *Journal of the Optical Society of America A*, 37(4), 671 (2020). <https://doi.org/10.1364/josaa.383002>

Davidoff, J., Davies, I. & Roberson, D. Colour categories in a stone-age tribe. *Nature* 398, 203–204 (1999). <https://doi.org/10.1038/18335>

Panichello, M.F., DePasquale, B., Pillow, J.W. et al. Error-correcting dynamics in visual working memory. *Nat Commun* 10, 3366 (2019). <https://doi.org/10.1038/s41467-019-11298-3>