

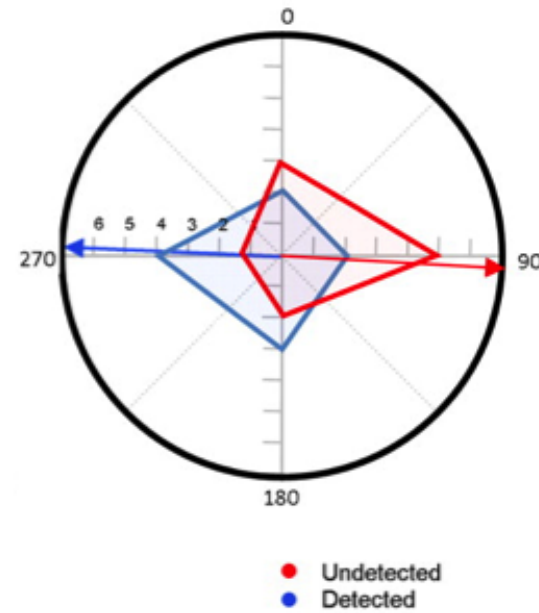
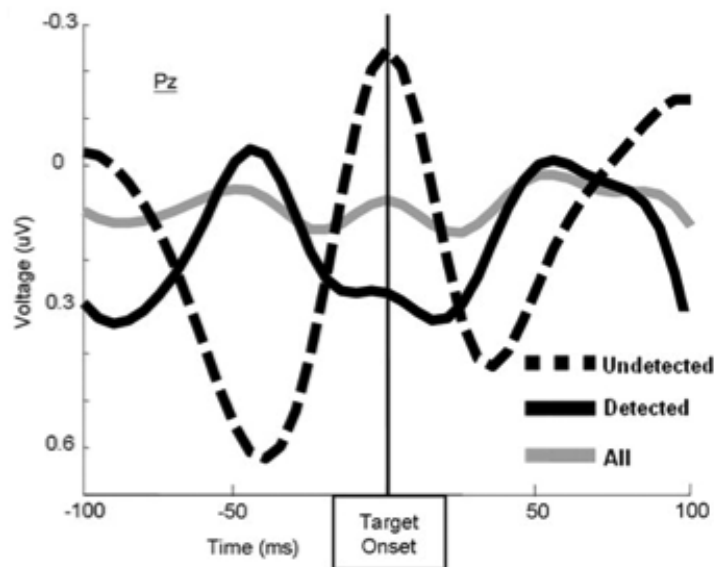
# Top-down control of alpha phase as a mechanism of temporal prediction

Phoebe Bauer, Jason Samaha, Sawyer  
Cimaroli, & Bradley R. Postle

Reed College

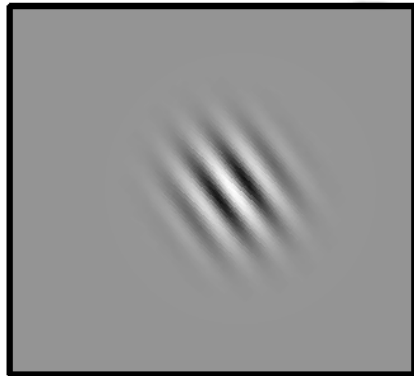
University of Wisconsin-Madison

# Differences in alpha phase preceding detected and undetected targets



Mathewson et al., *J Neurosci*, (2009)

# An easy task made difficult



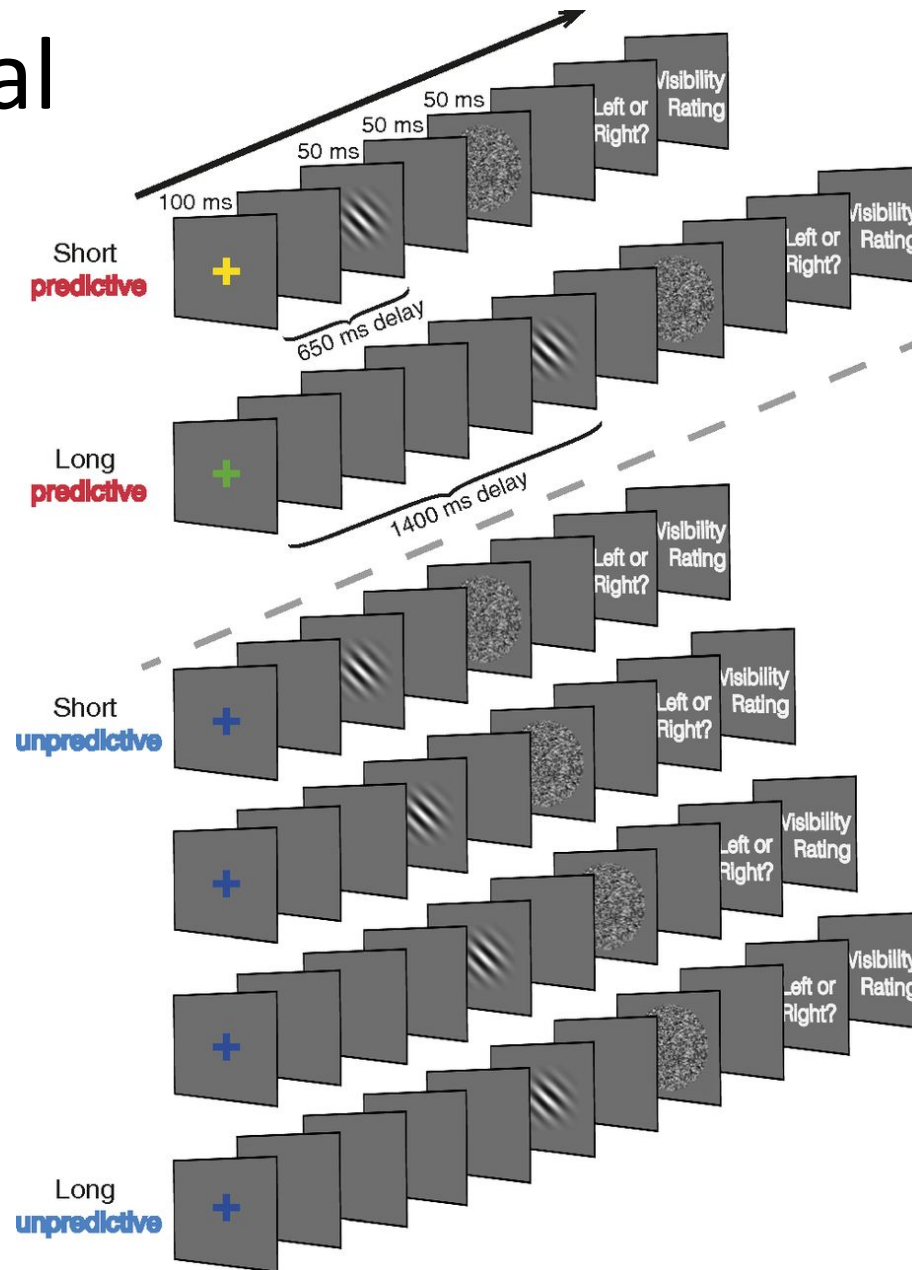
Left oriented



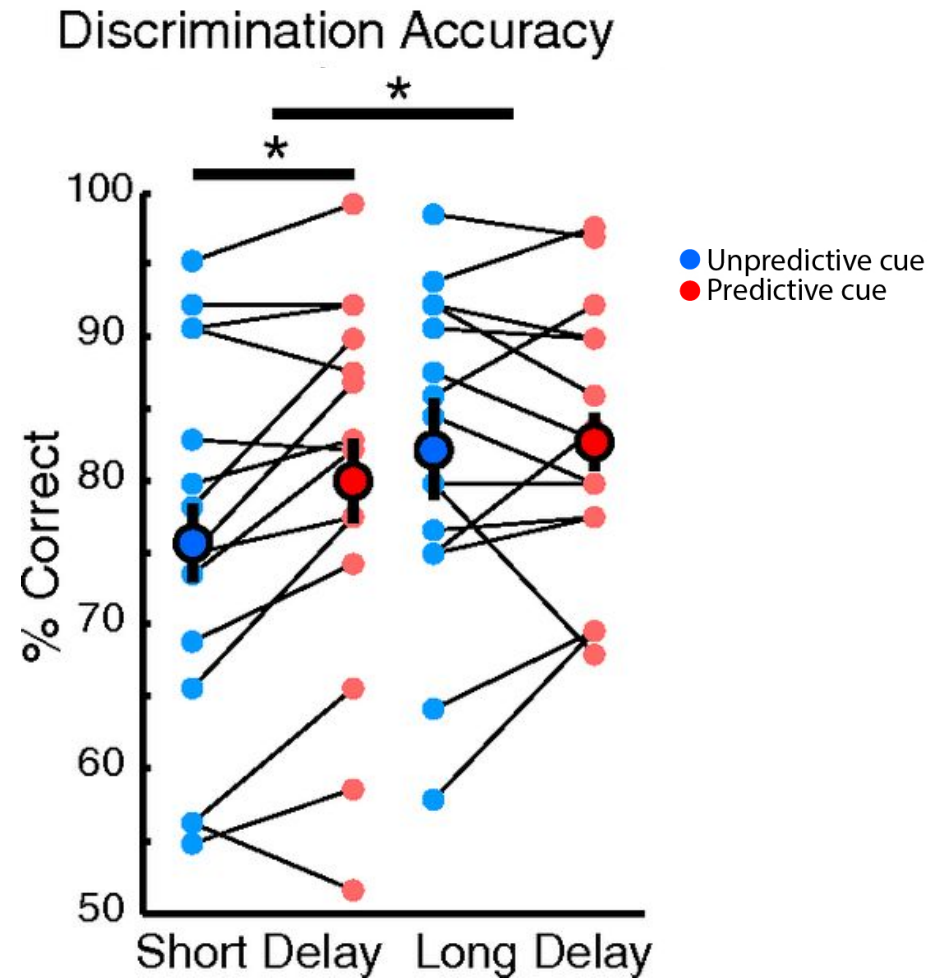
Right oriented

# Cueing temporal prediction

2 (cue type: predictive vs. unpredictable) x 2 (delay: short vs. long) within subjects

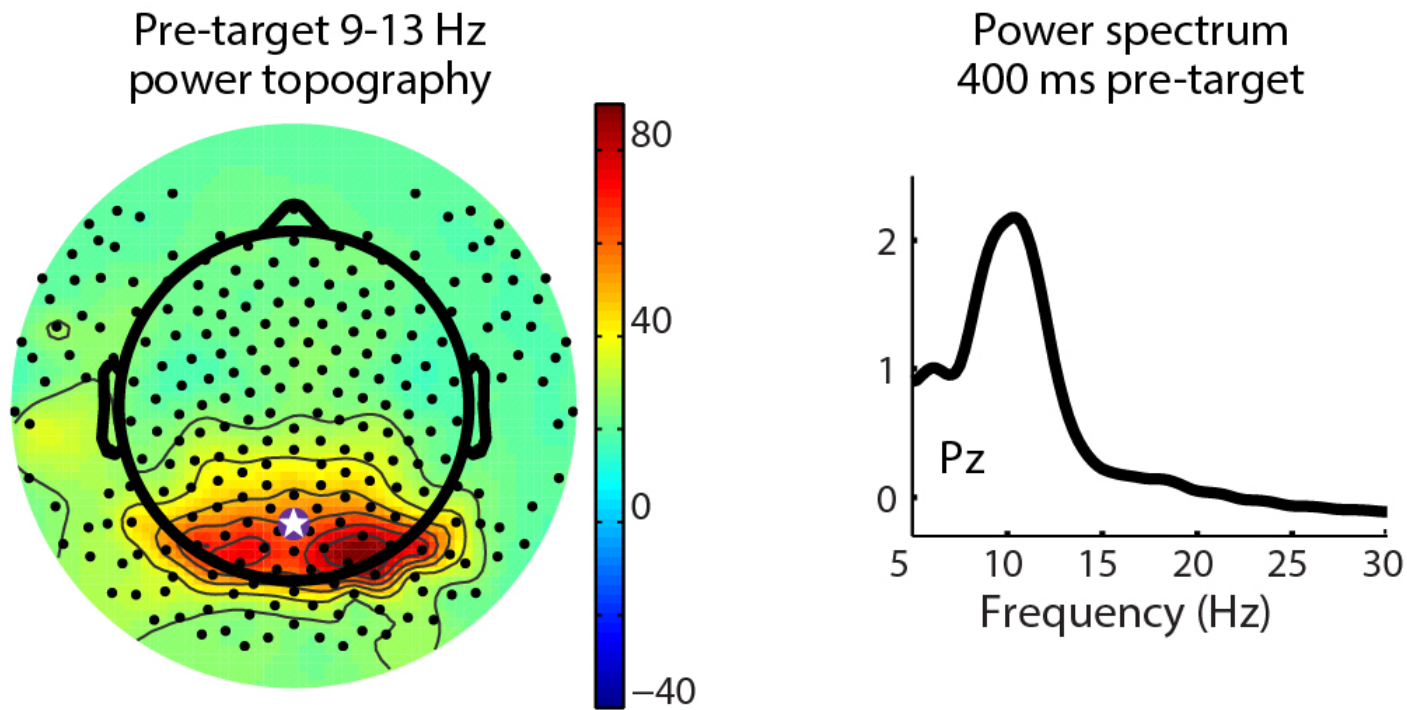


# Temporal predictions improve visual perception



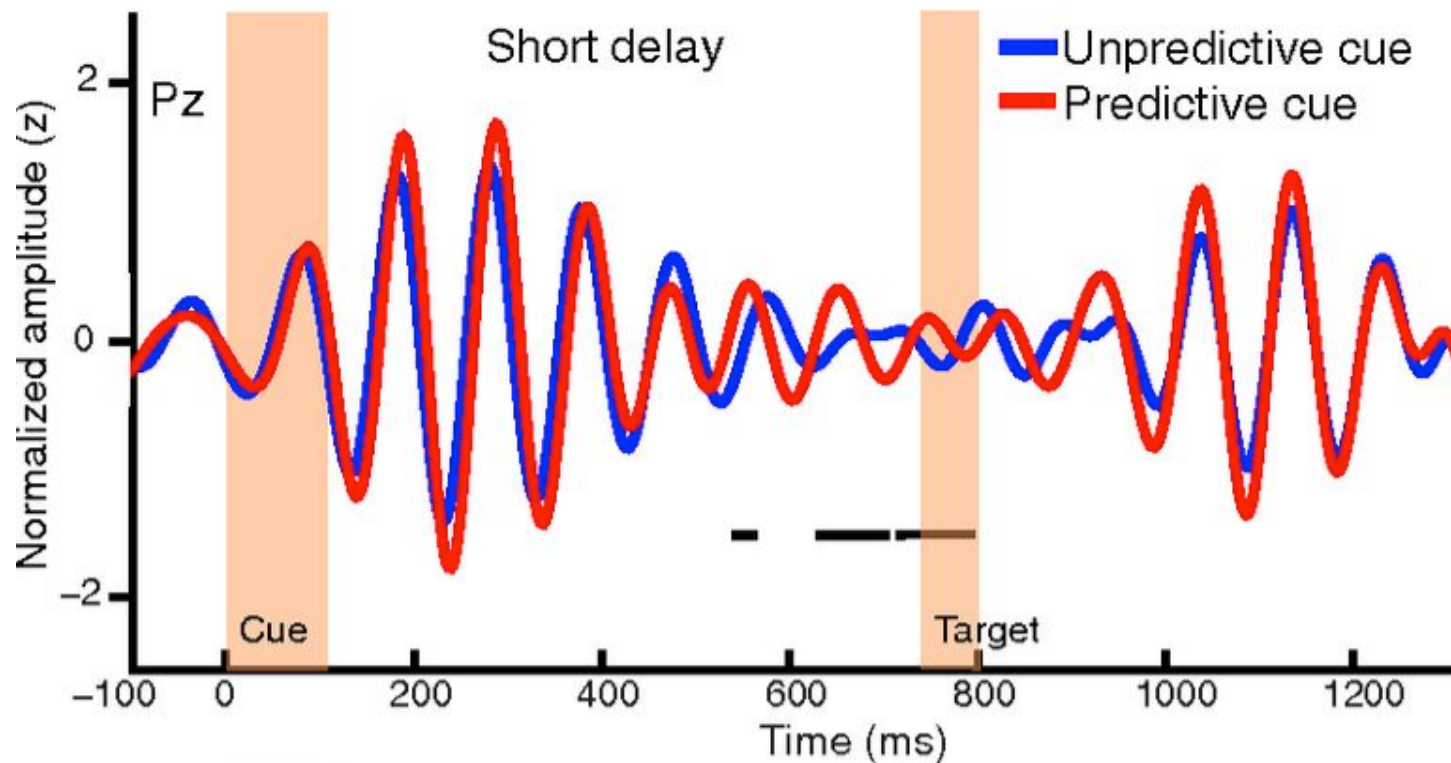
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Spatial and frequency specificity of the pre-target alpha signal



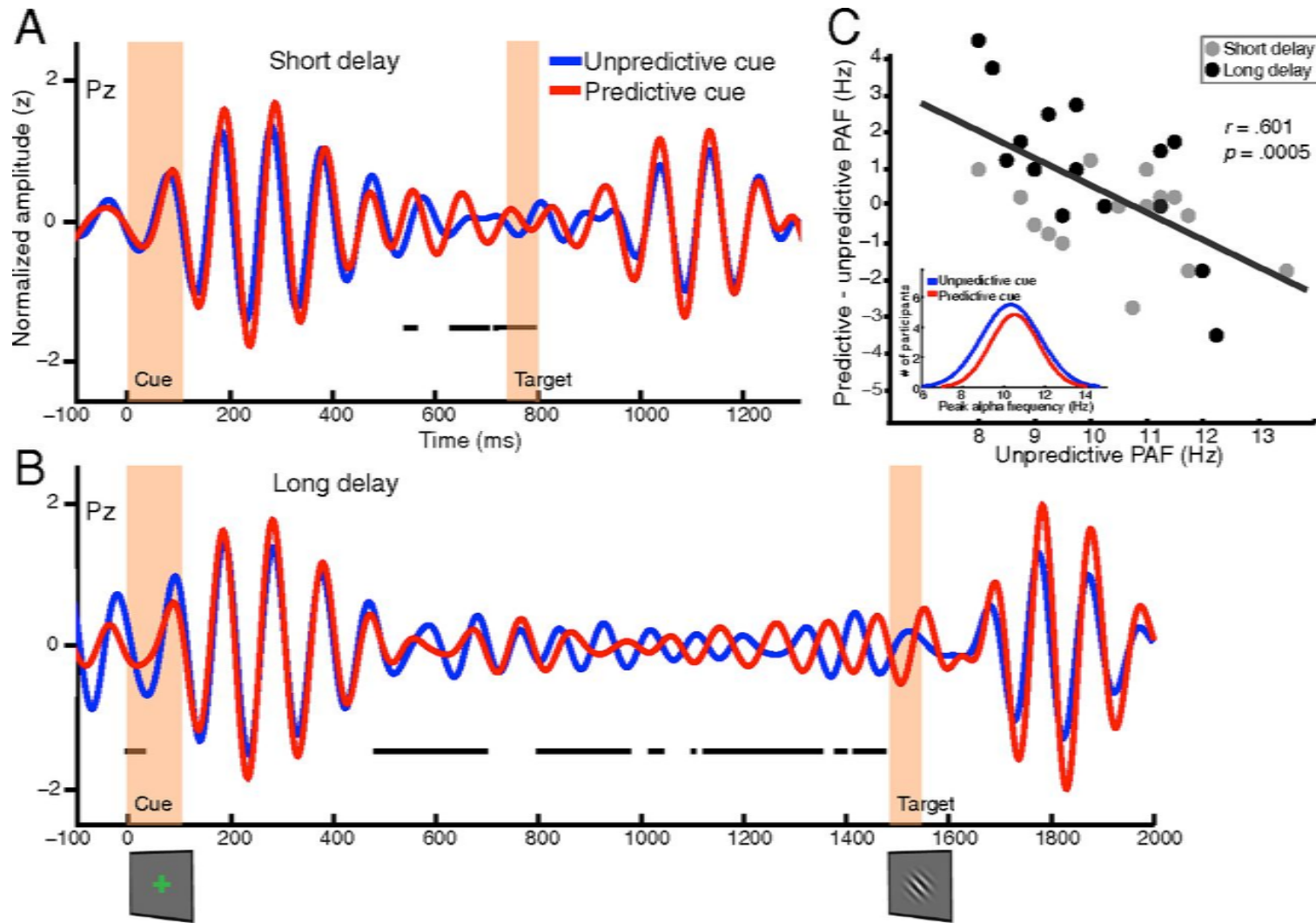
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Temporal cueing modulates alpha phase



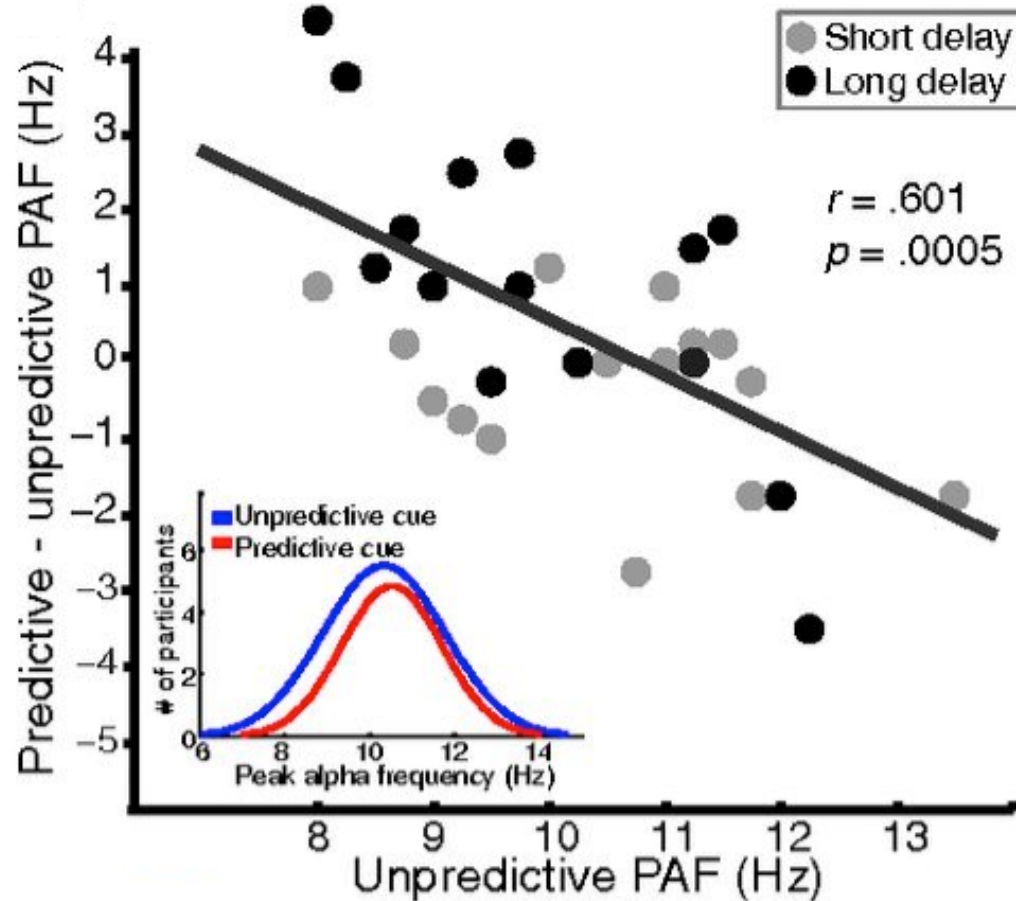
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Temporal cueing modulates alpha phase



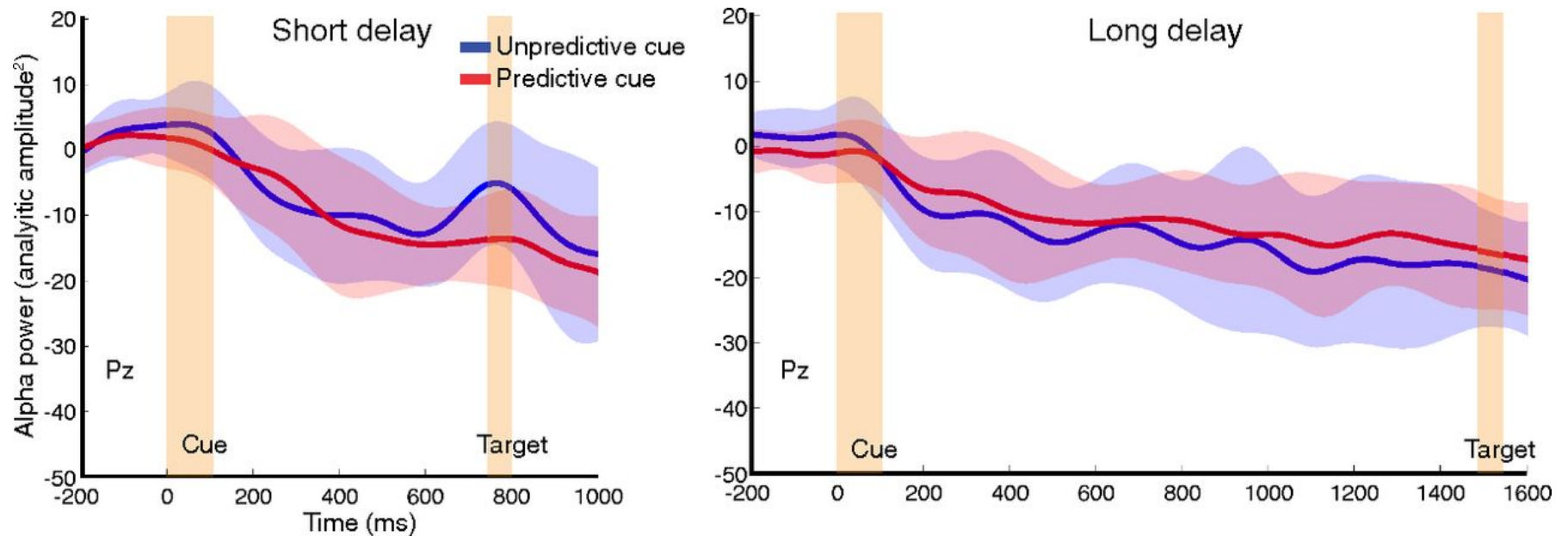
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Alpha oscillations converge on an ideal frequency



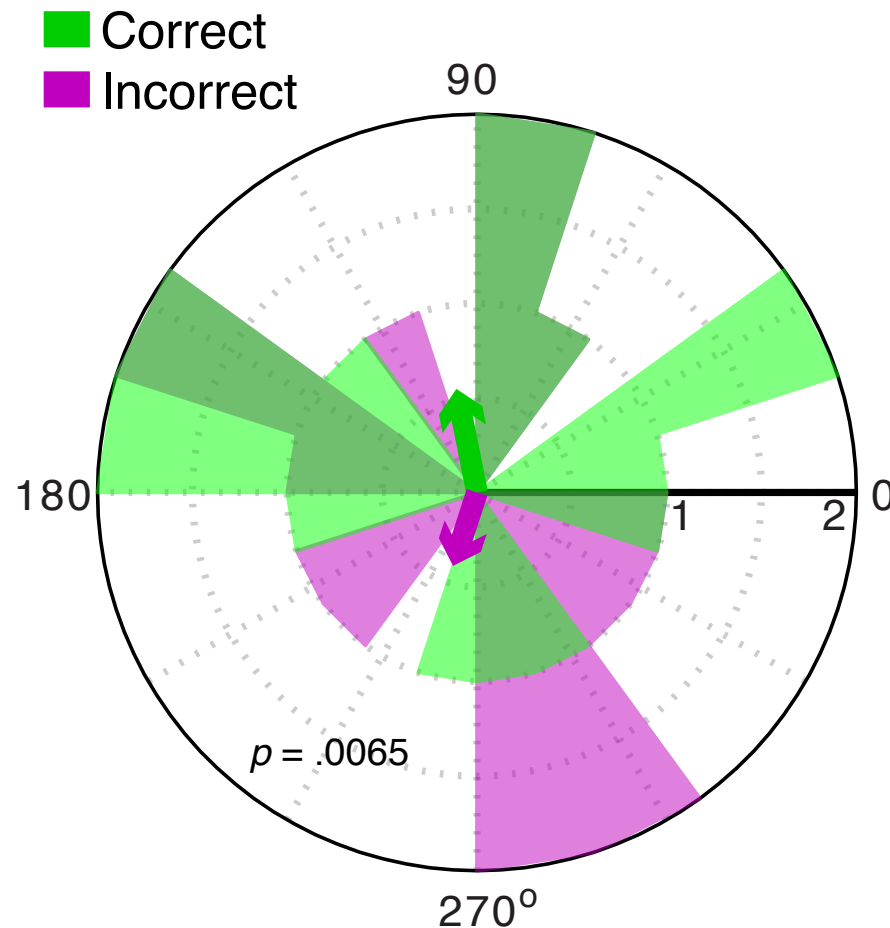
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Differences in alpha power cannot account for phase effects



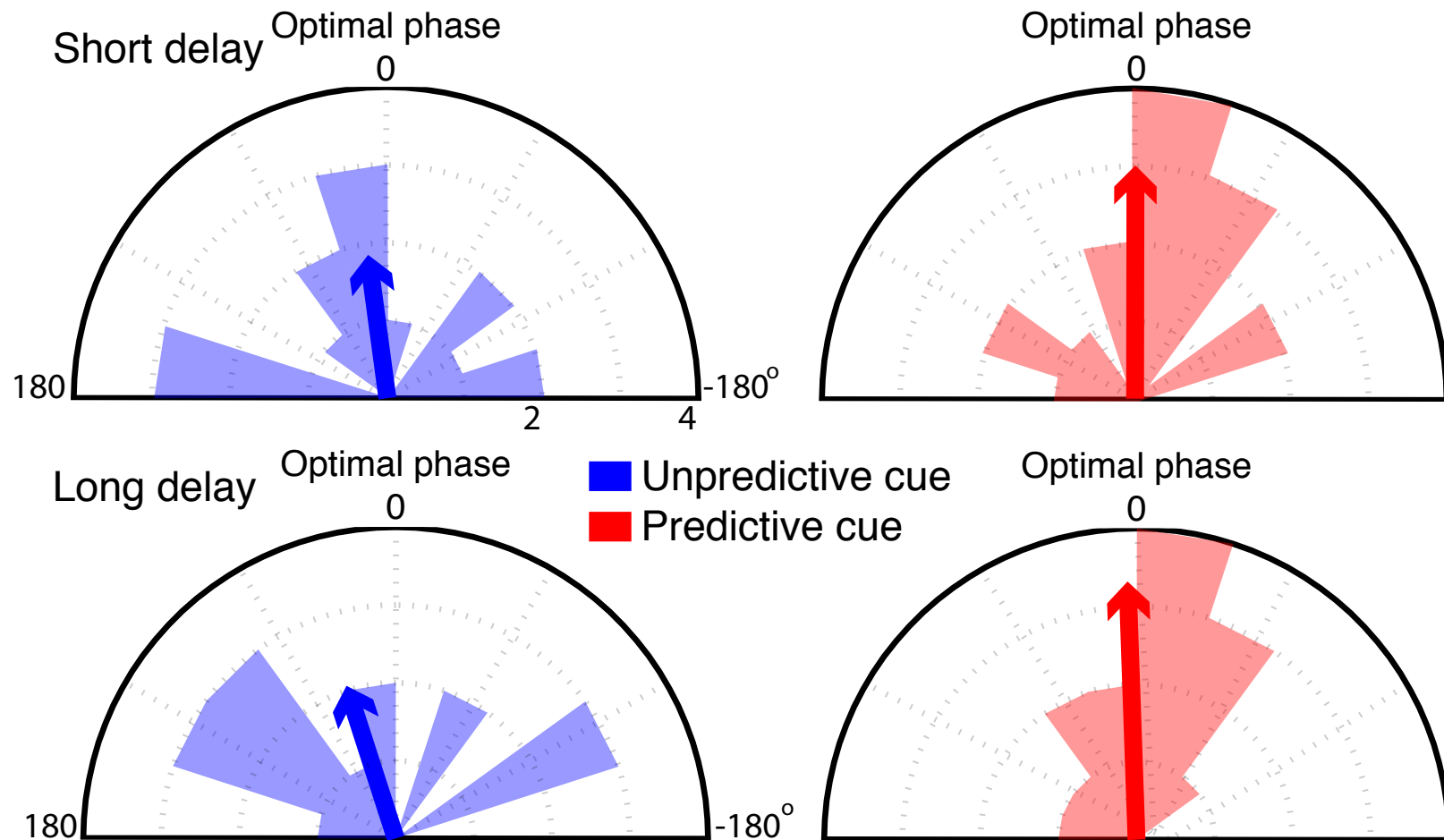
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Differences between correct and incorrect trials: Evidence for an optimal phase for stimulus detection



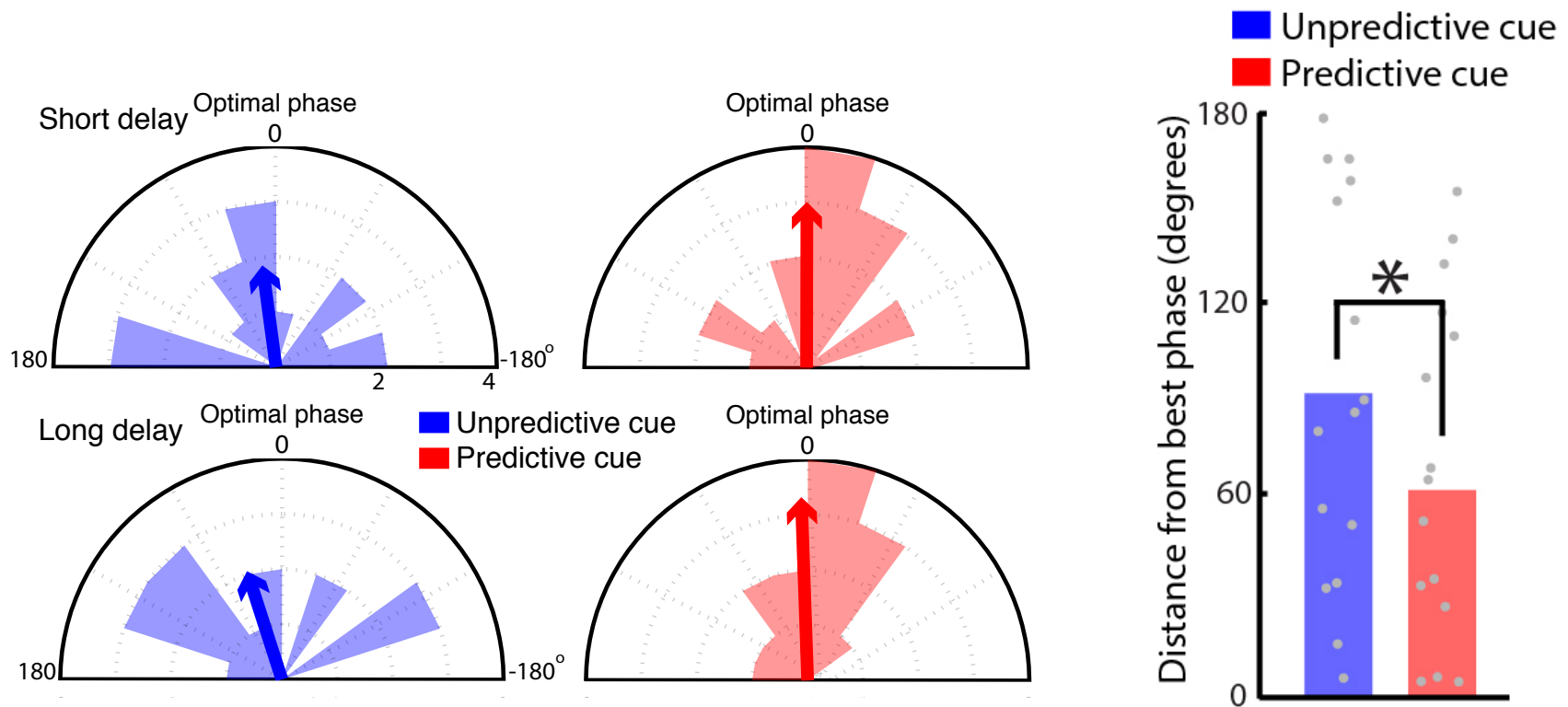
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Are subjects aligning to this optimal phase on predictively cued trials?



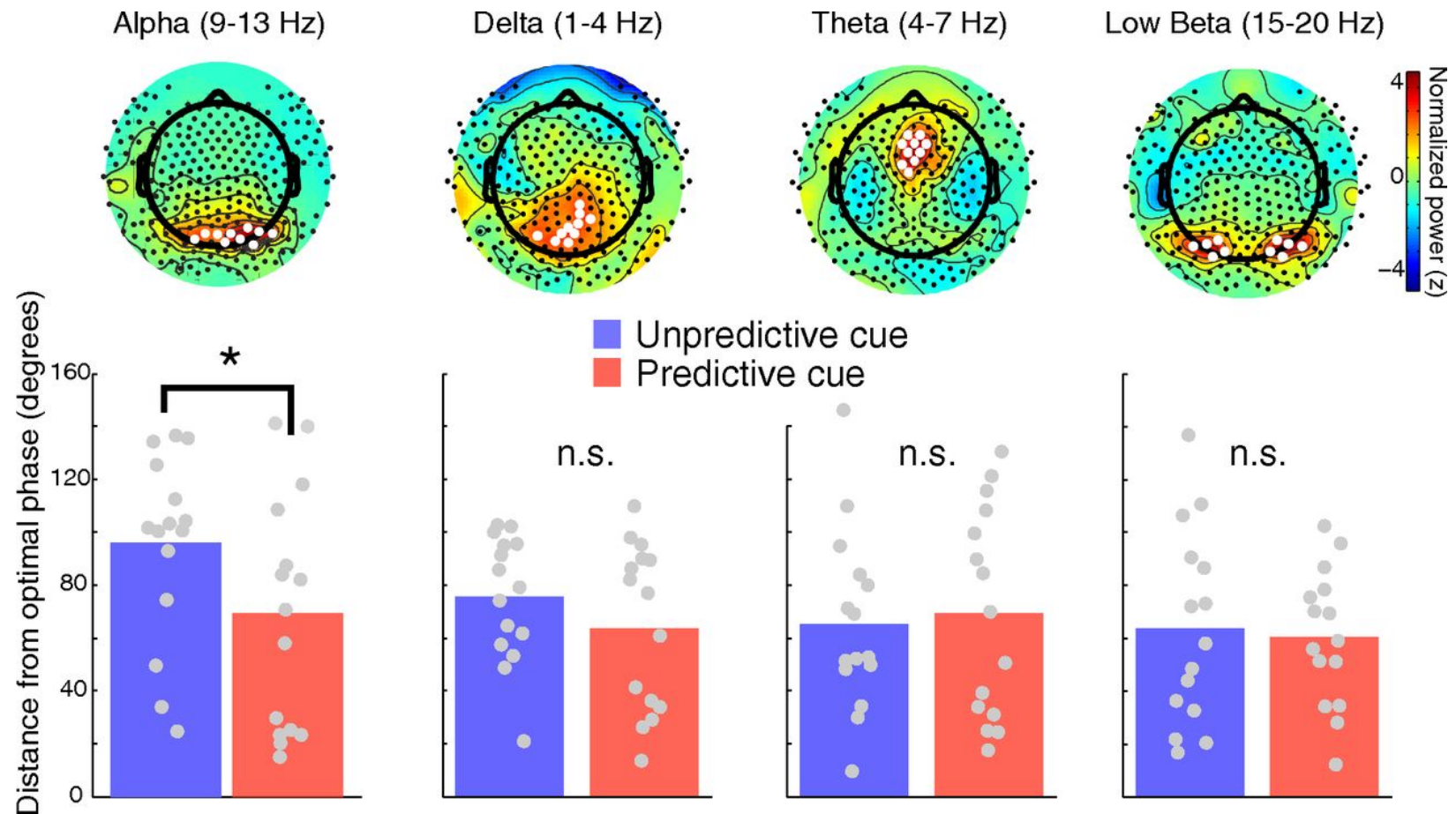
Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Are subjects aligning to this optimal phase on predictively cued trials?



Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Frequency specificity of effects



Samaha, Bauer, Cimaroli, & Postle, *PNAS*, (2015)

# Conclusions

- Top-down temporal predictions improve perceptual processing
- Temporal predictions modulate alpha phase on correct trials only
- The phase during attended windows is biased towards individuals' optimal phase for detection

Alpha phase has an active role in information processing, serving as a mechanism for the top-down control of visual processing guided by temporal predictions

Many thanks to Jason Samaha  
and Brad Postle

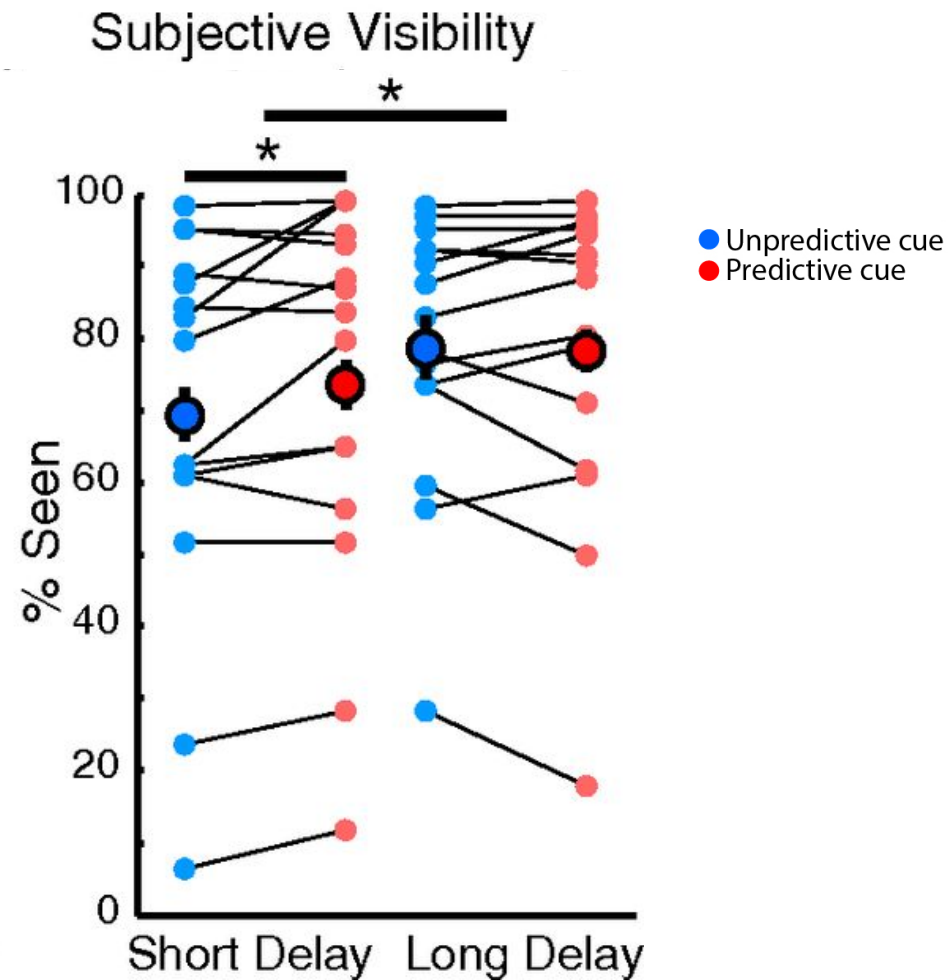


PO•STL•AB



This research was supported by NIH MH095984 to  
Brad Postle, and NSF REU Award No. 1358340

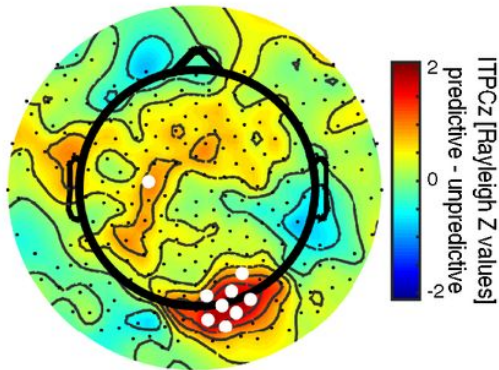
# Temporal predictions improve visual perception



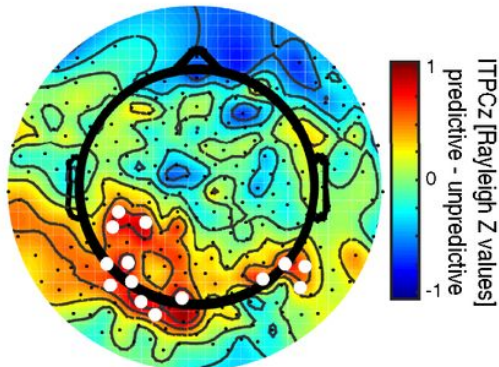
# Intertrial Phase Clustering

A

ITPCz at target onset

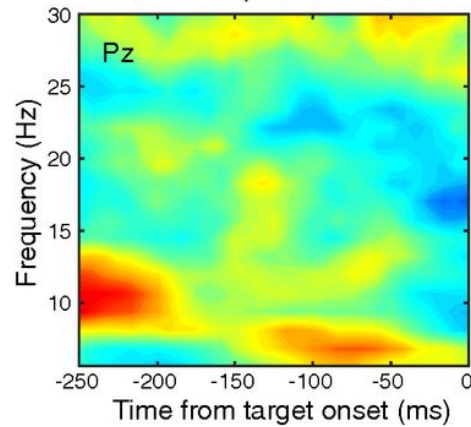


ITPCz at target onset  
(catch trials)

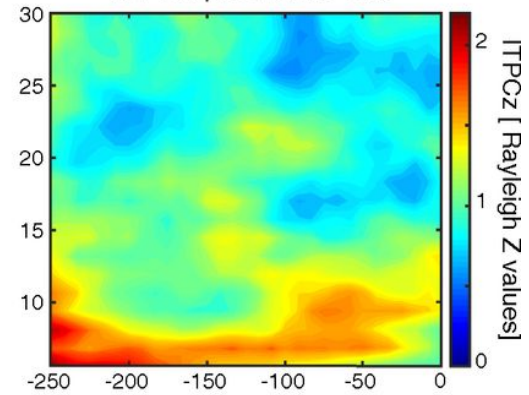


B

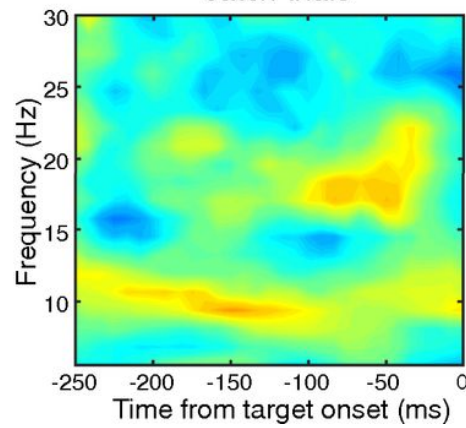
ITPCz unpredictable cue



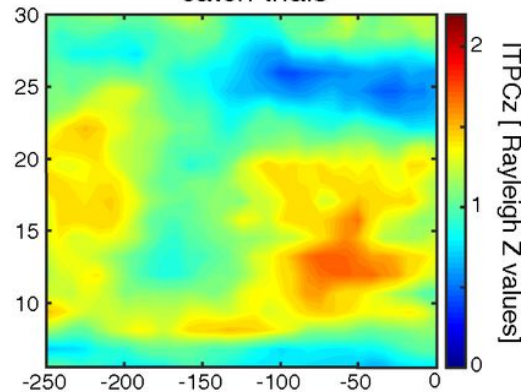
ITPCz predictive cue



ITPCz unpredictable cue  
catch trials



ITPCz predictive cue  
catch trials



# Spectral decomposition of EEG data

