

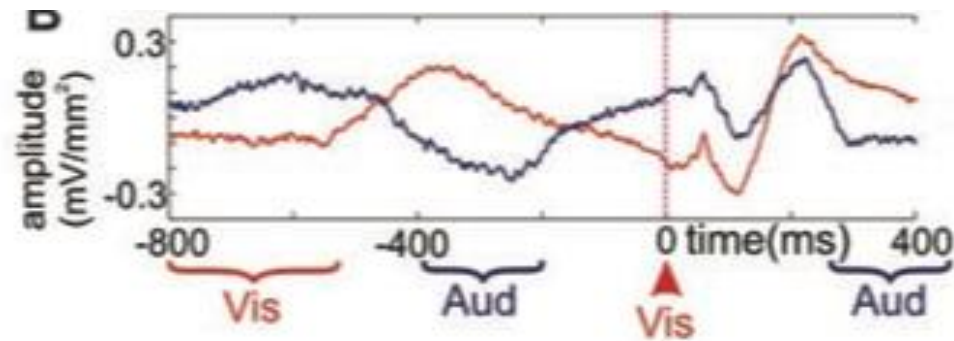
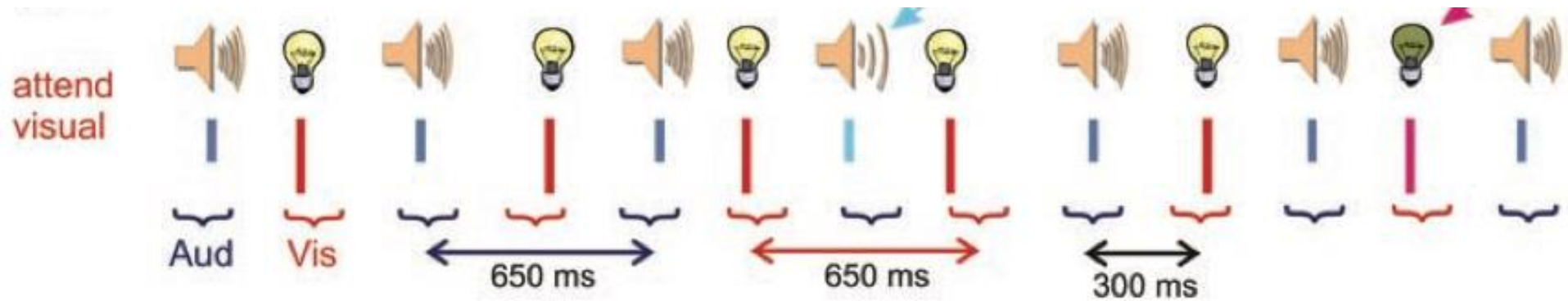


Temporal Expectation Improves Real-Time Decoding of Visual Feature Representations as Measured by MEG

Nicholas Myers, Gustavo Rohenkohl, Valentin Wyart, Mark Woolrich, Mark Stokes, and Kia Nobre
Oxford Centre for Human Brain Activity
Department of Experimental Psychology
University of Oxford

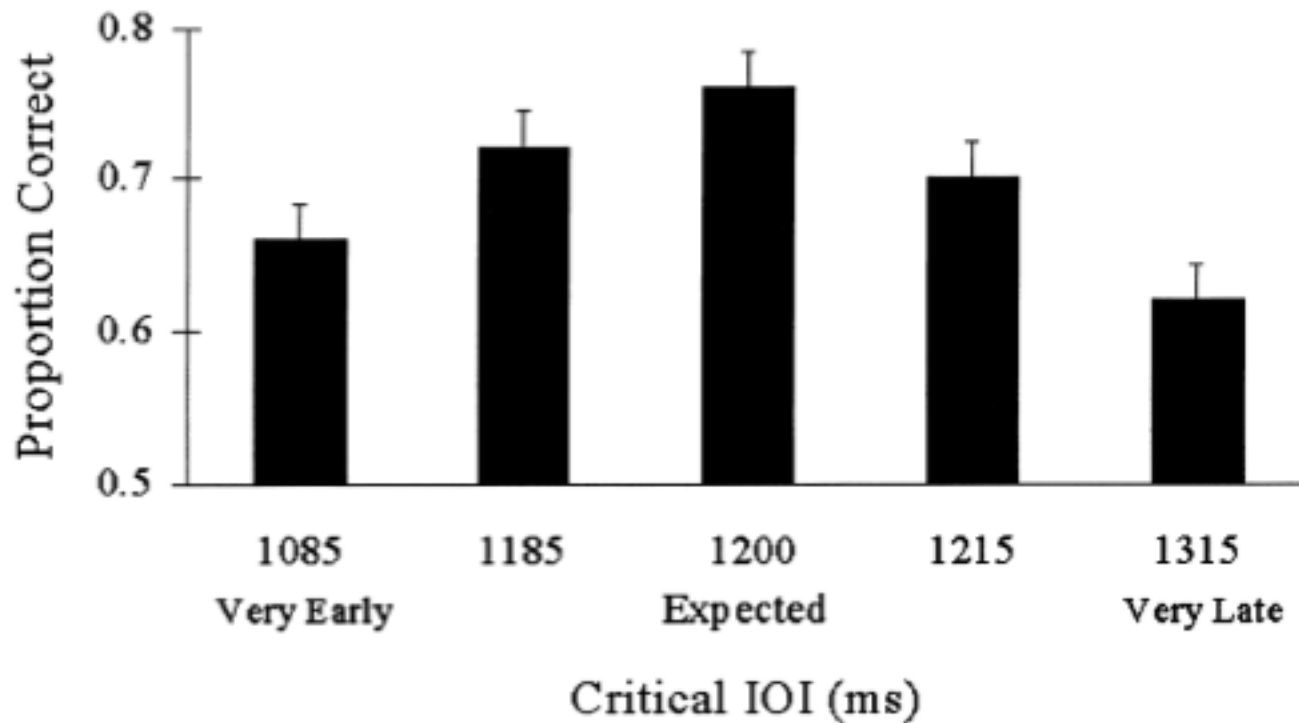
Rhythm is a ubiquitous attentional cue

Rhythm is a ubiquitous attentional cue



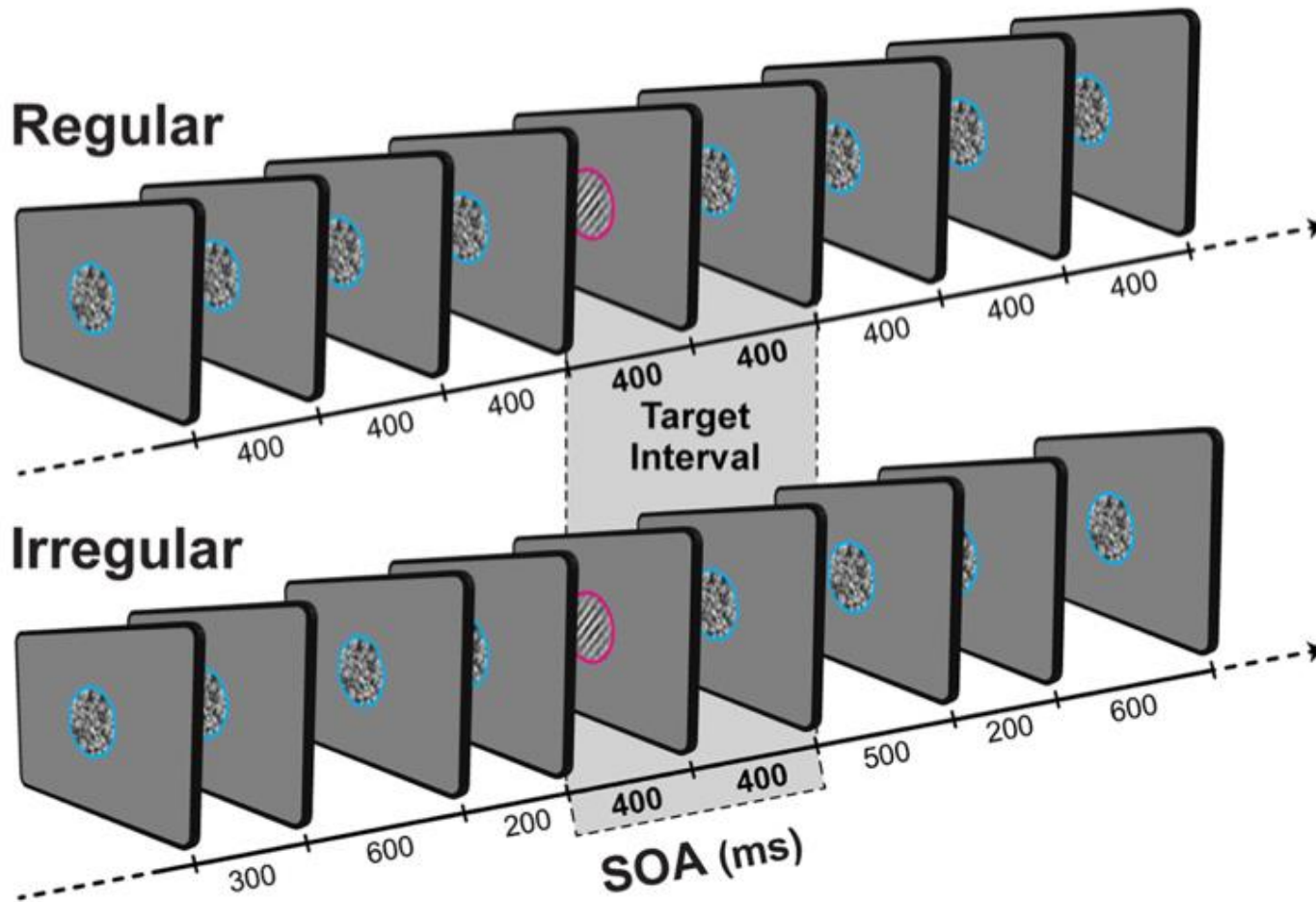
Lakatos et al., 2008

Rhythm is a ubiquitous attentional cue

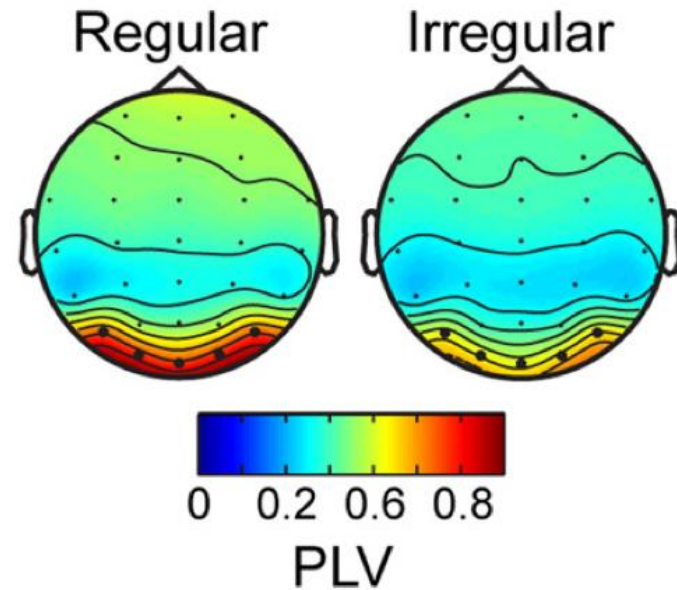
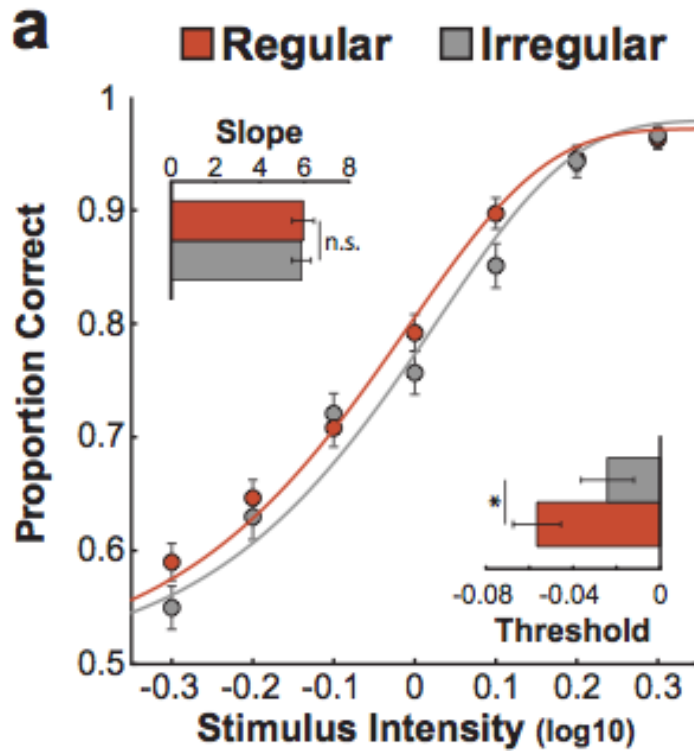


Jones et al., 2002

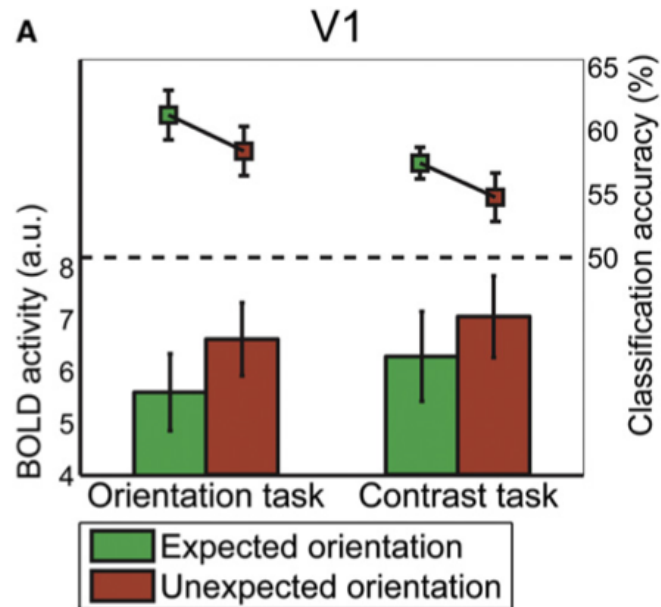
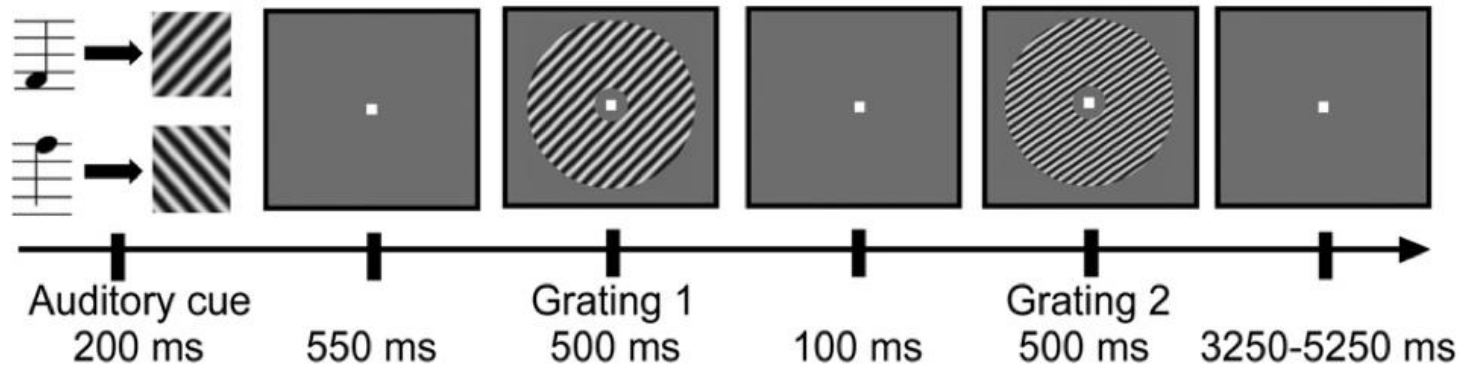
Rhythm is a ubiquitous attentional cue



Rhythm is a ubiquitous attentional cue



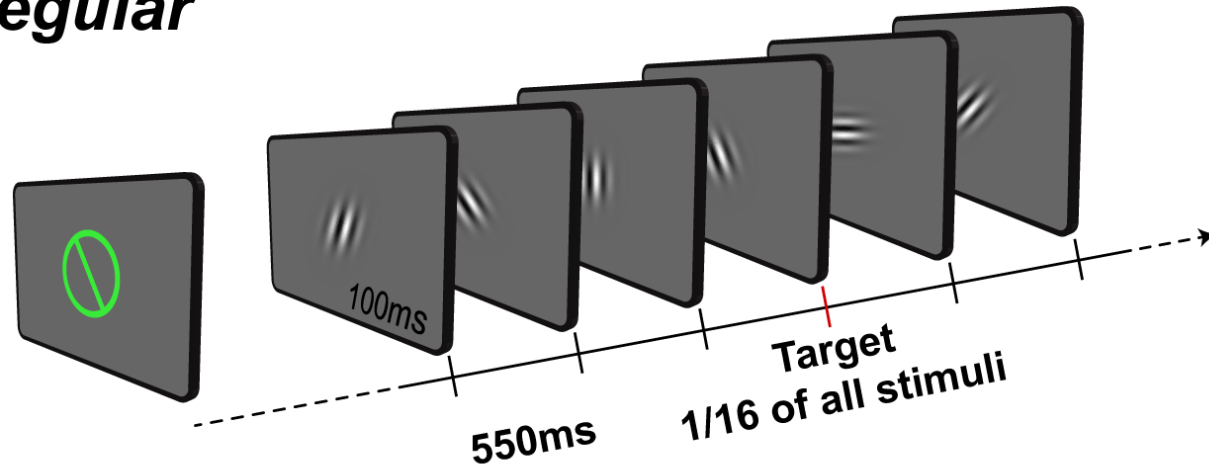
Expectation sharpens neural responses



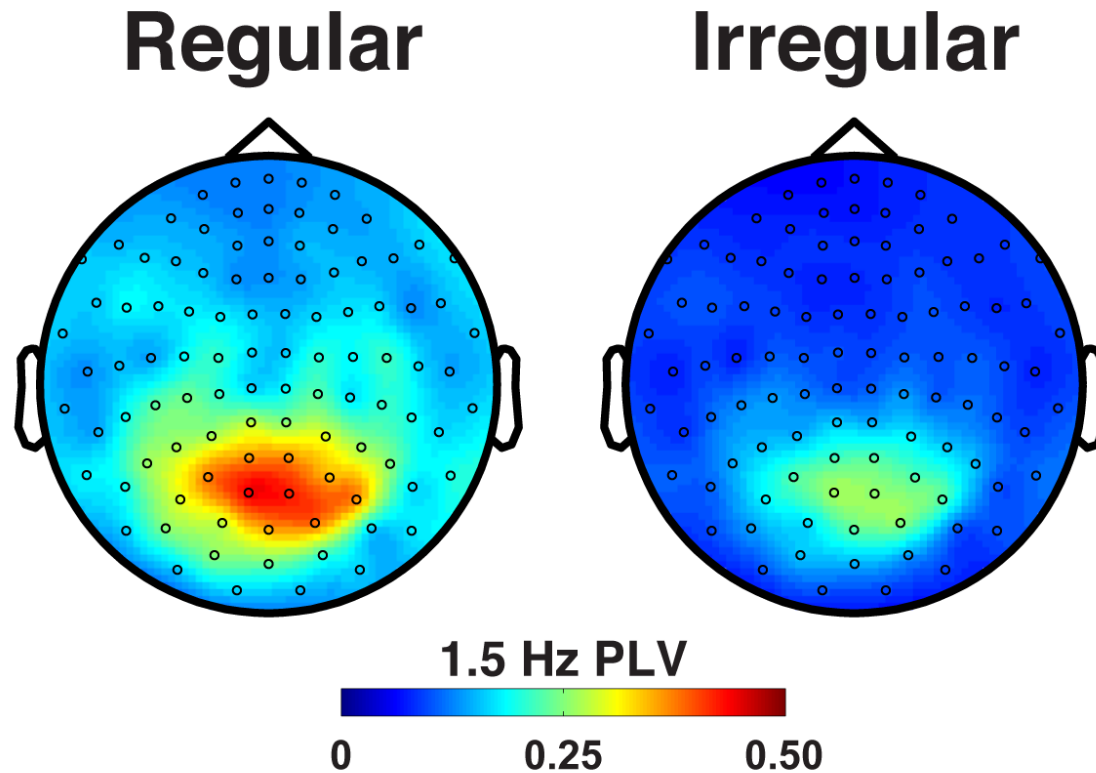
Kok et al., 2012

Visual Target Detection Task

Regular



Rhythmic Entrainment depends on Stimulus Regularity



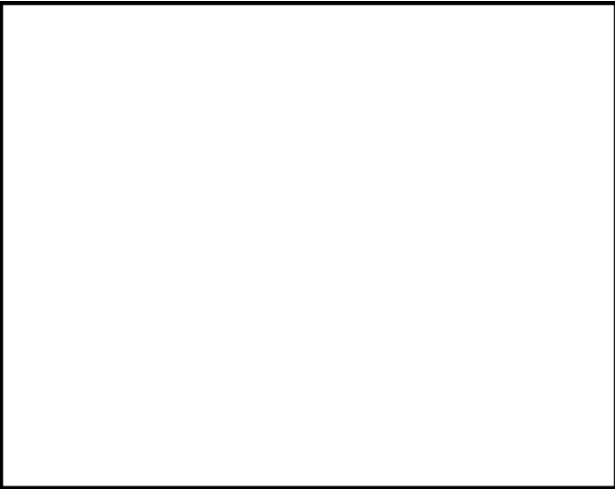
Analysis Approach

1. Can we recover information about the presented stimulus from MEG signals?
2. Does the information content of the MEG signal increase when temporal expectation is high?

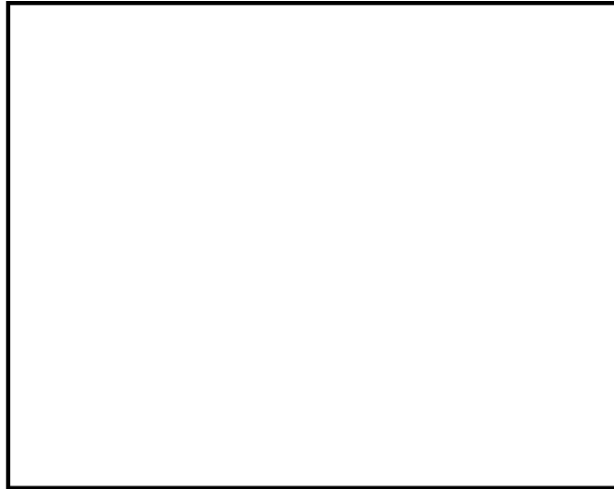
Analysis Approach

Step 1: Forward Modeling of Stimulus-Selective MEG Responses

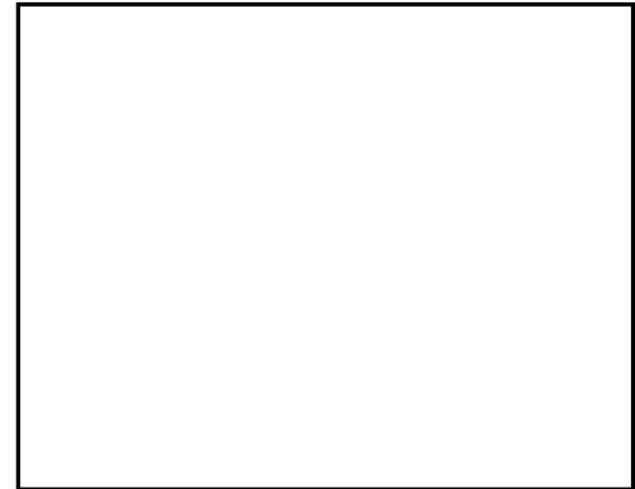
MEG Sensor 1



MEG Sensor 2



MEG Sensor 3 ...

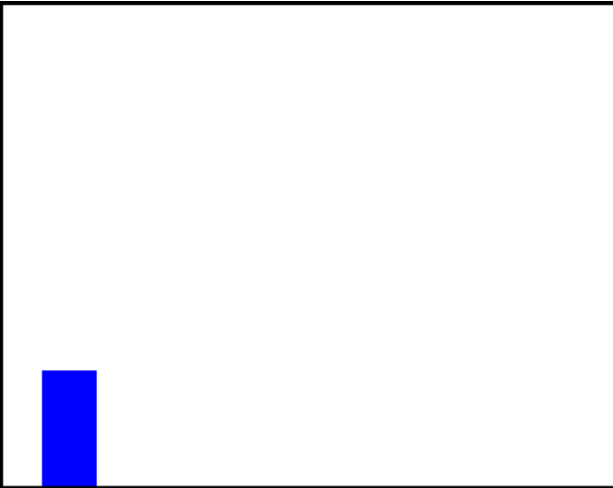


|

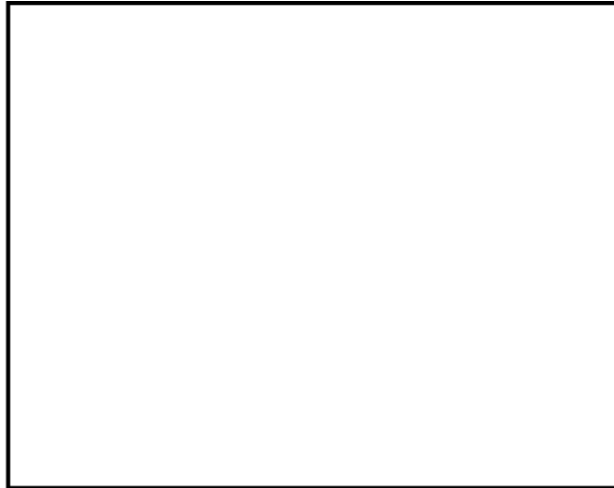
Analysis Approach

Forward Modeling of Stimulus-Selective MEG Responses

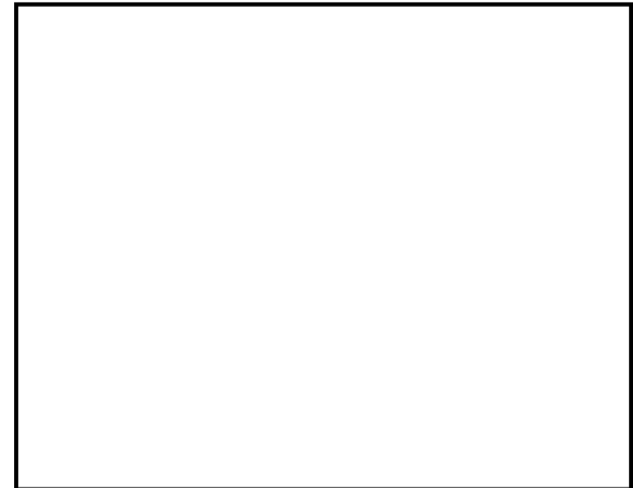
MEG Sensor 1



MEG Sensor 2



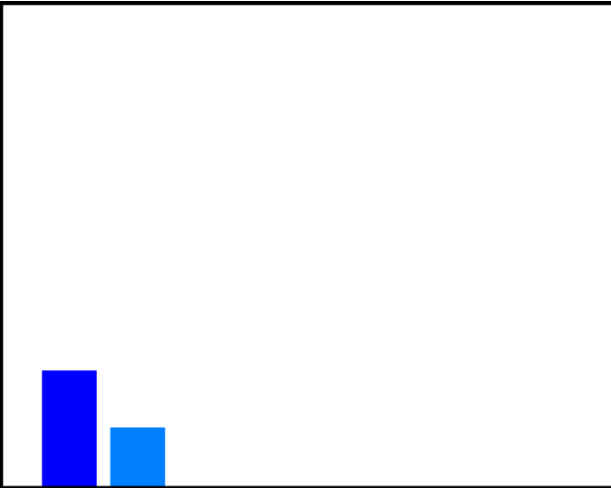
MEG Sensor 3 ...



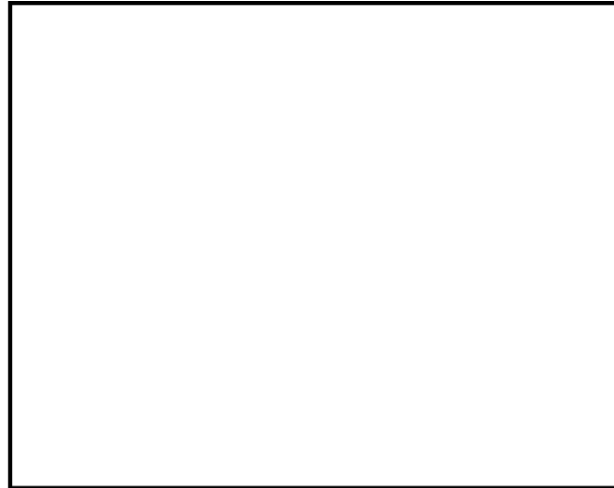
Analysis Approach

Forward Modeling of Stimulus-Selective MEG Responses

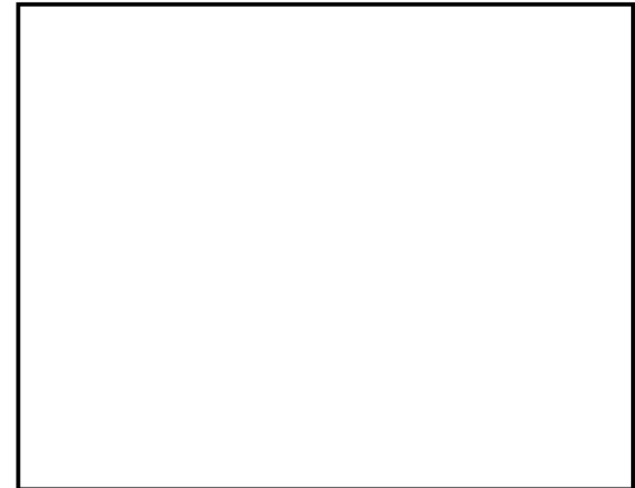
MEG Sensor 1



MEG Sensor 2



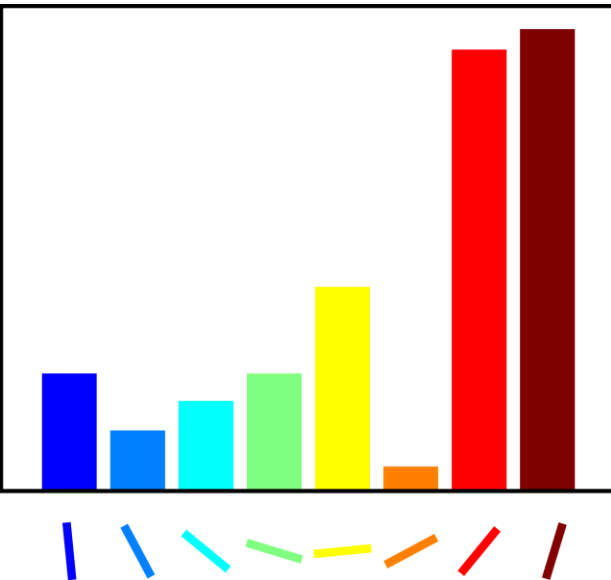
MEG Sensor 3 ...



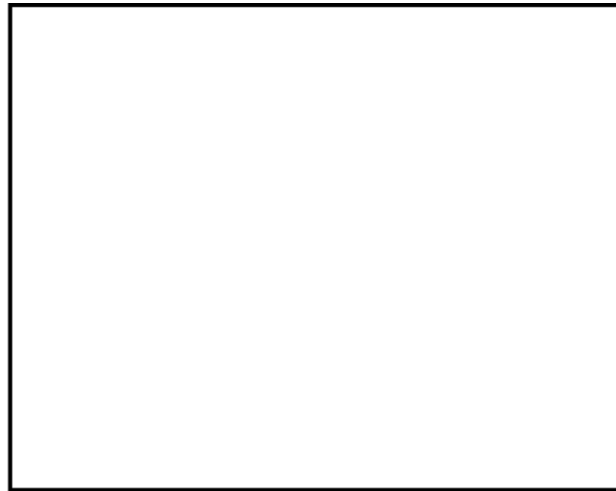
Analysis Approach

Forward Modeling of Stimulus-Selective MEG Responses

MEG Sensor 1



MEG Sensor 2



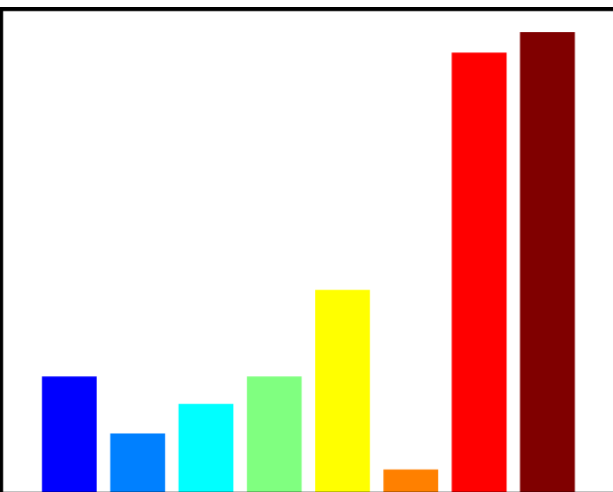
MEG Sensor 3 ...



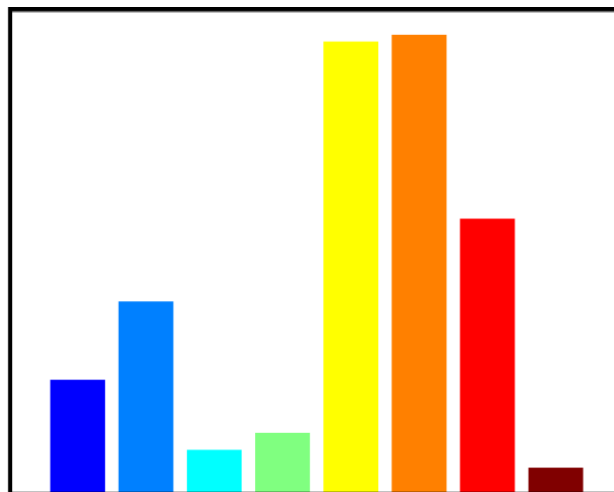
Analysis Approach

Forward Modeling of Stimulus-Selective MEG Responses

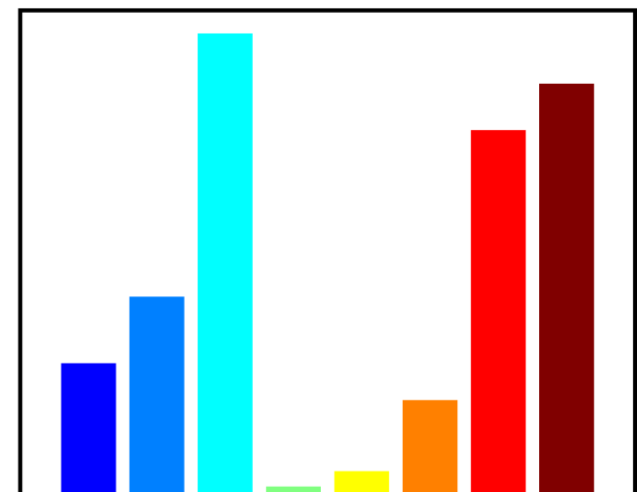
MEG Sensor 1



MEG Sensor 2

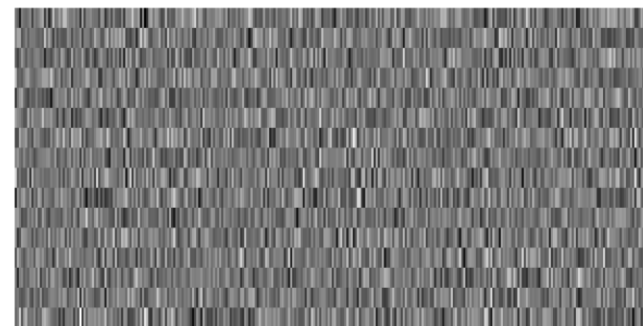


MEG Sensor 3 ...

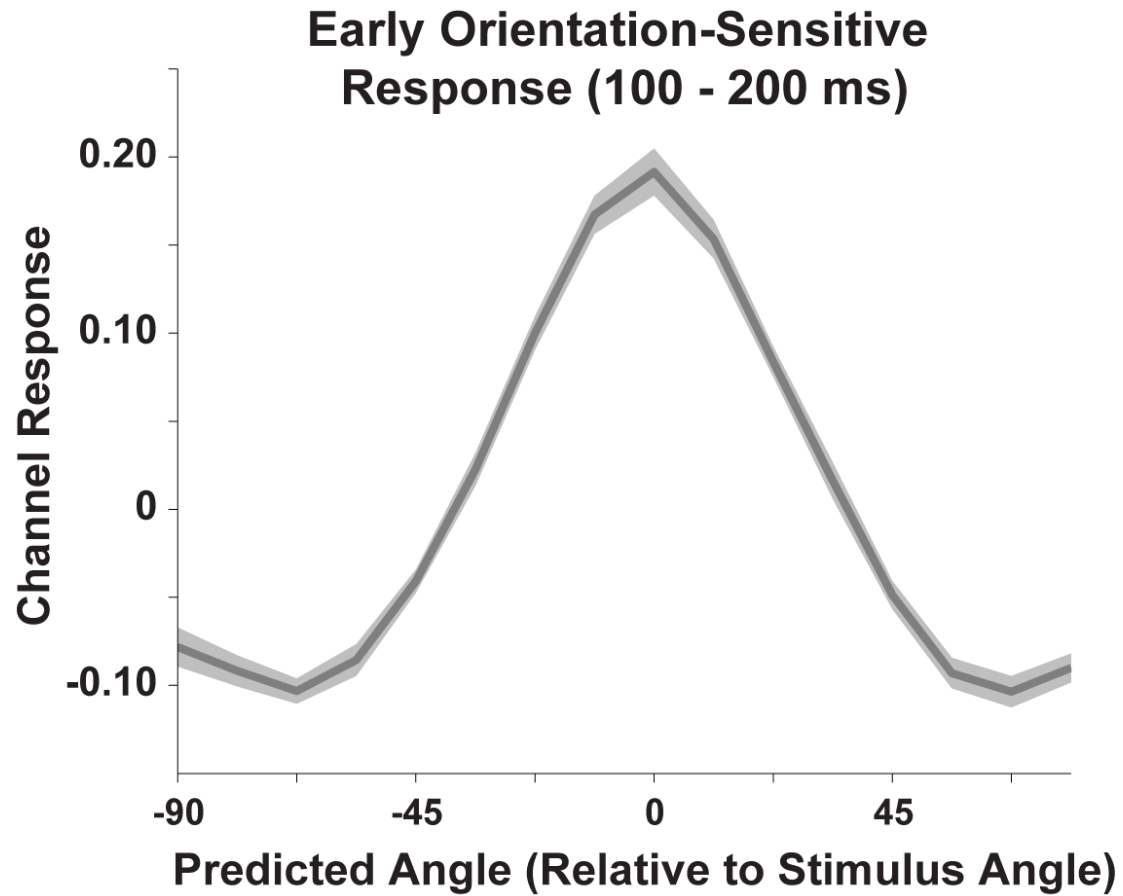


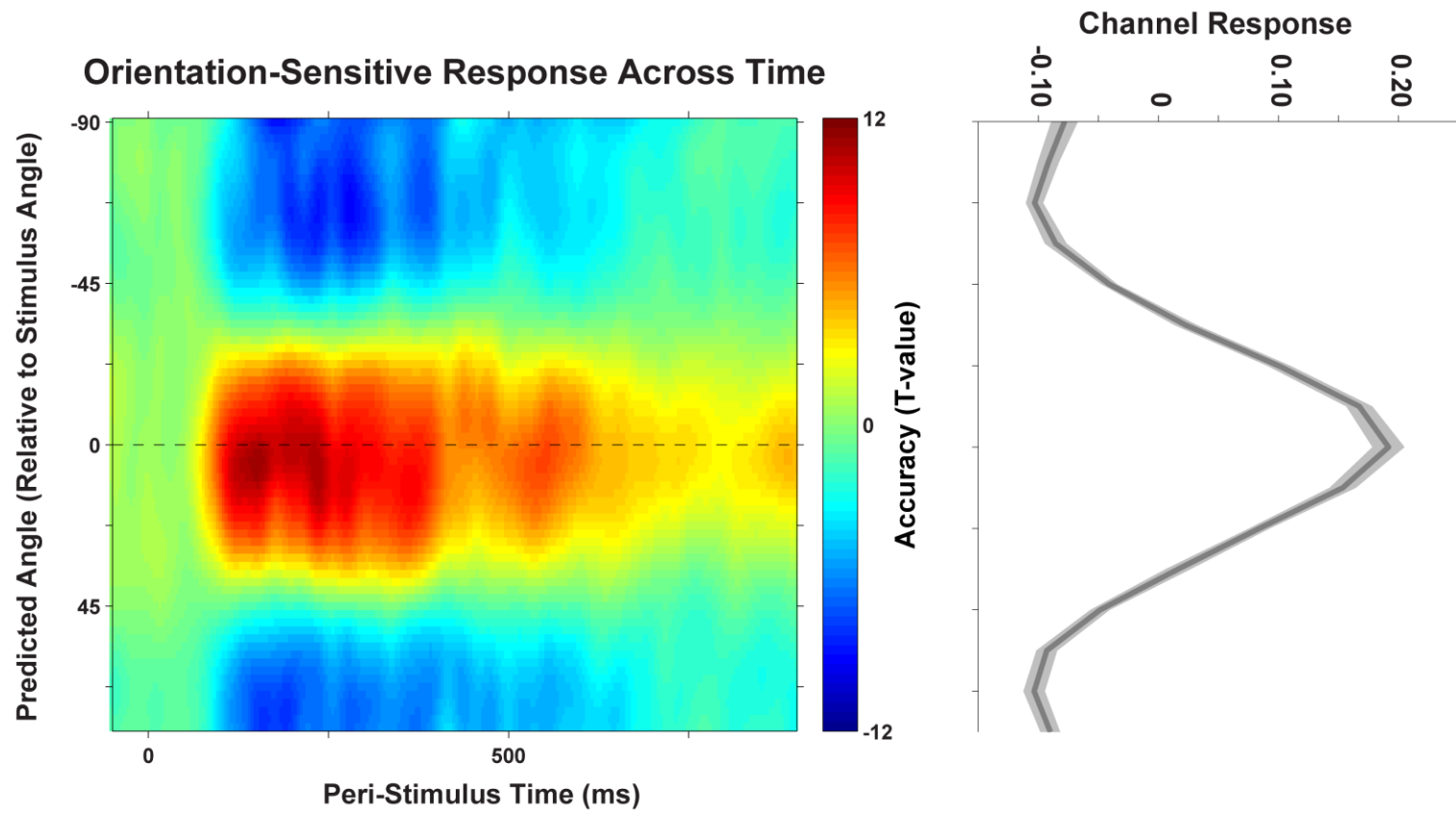
Weight Matrix W

16 Feature Channels
(Orientations)

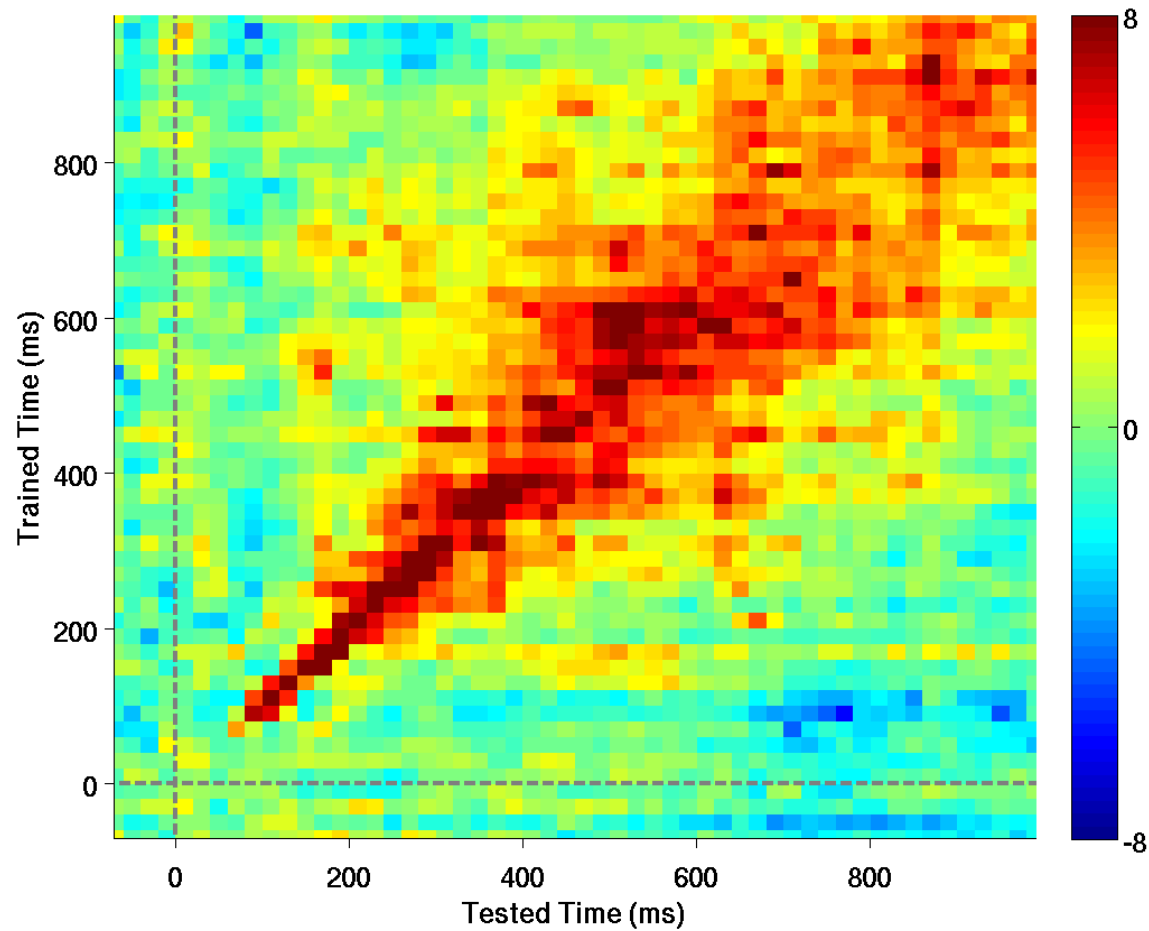


306 MEG Sensors

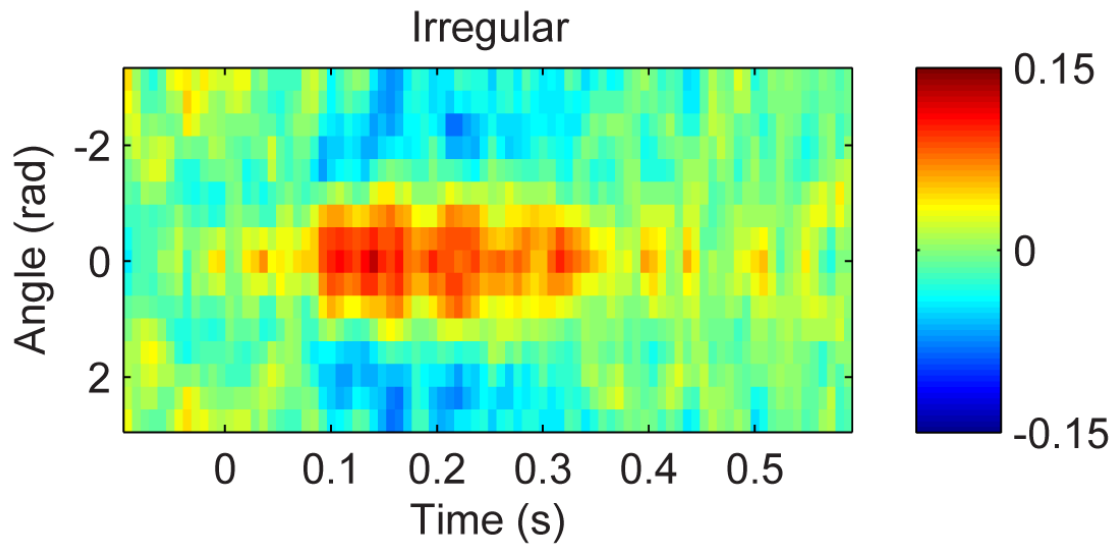
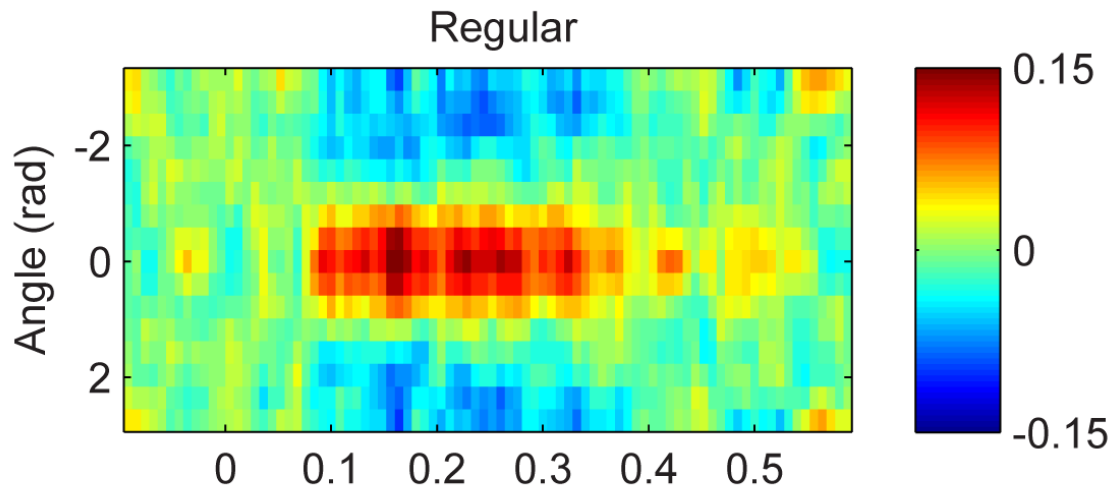




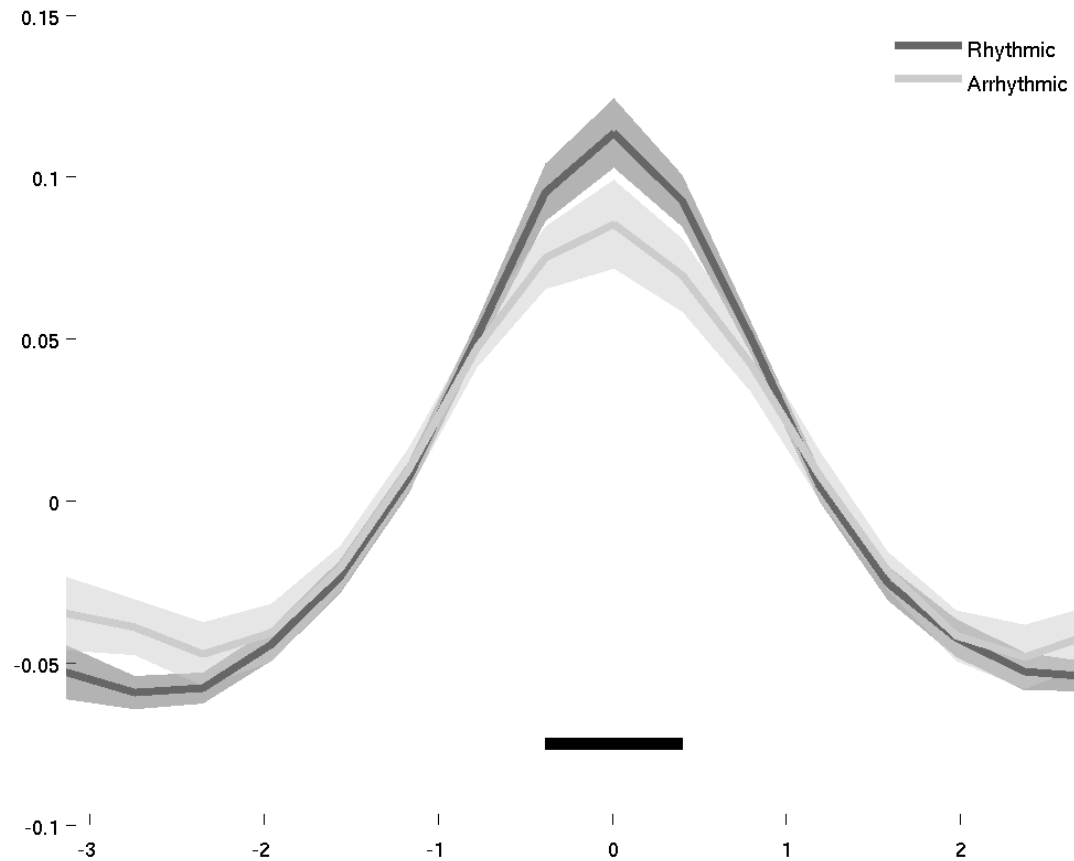
Orientation Selectivity Changes Rapidly



Effect of Rhythm



Effect of Rhythm



Conclusions

1. Multivariate analysis is a promising technique to mine the representation of parametric features
2. Stimulus decoding is improved by rhythmic presentation
3. Entrainment may improve the quality of perceptual representations by reducing temporal uncertainty

Thanks!

Collaborators



Kia Nobre (*OHBA Oxford*)



Mark Stokes (*OHBA Oxford*)



Mark Woolrich (*OHBA Oxford*)



Gustavo Rohenkohl (*ESI Frankfurt*)



Valentin Wyart (*ENS Paris*)

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NIHR
MRC

Phasic Representation of the Target Angle in the MEG Signal

