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# Investigating Synchrony Perception of Audiovisual Speech With a Continuous Carry-Over fMRI Design

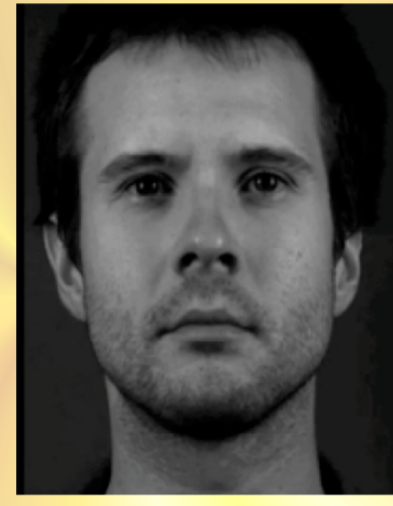
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## Aim:

- Add to a growing literature on the neural mechanisms involved in the perception of synchrony for audiovisual speech (Stevenson et al, 2010; Macaluso et al, 2004; Miller et al, 2005). Investigate parametrically modulated direct effects and carry-over neural responses to a large set of asynchronous audiovisual speech movies. Differentiate between orthogonal physical and perceptual carry-over effects (Charest et al, 2009).

## Participants:

- 20 participants (10 male)
- Age range 20-30 (mean 25)
- Native English speakers



## Stimuli:

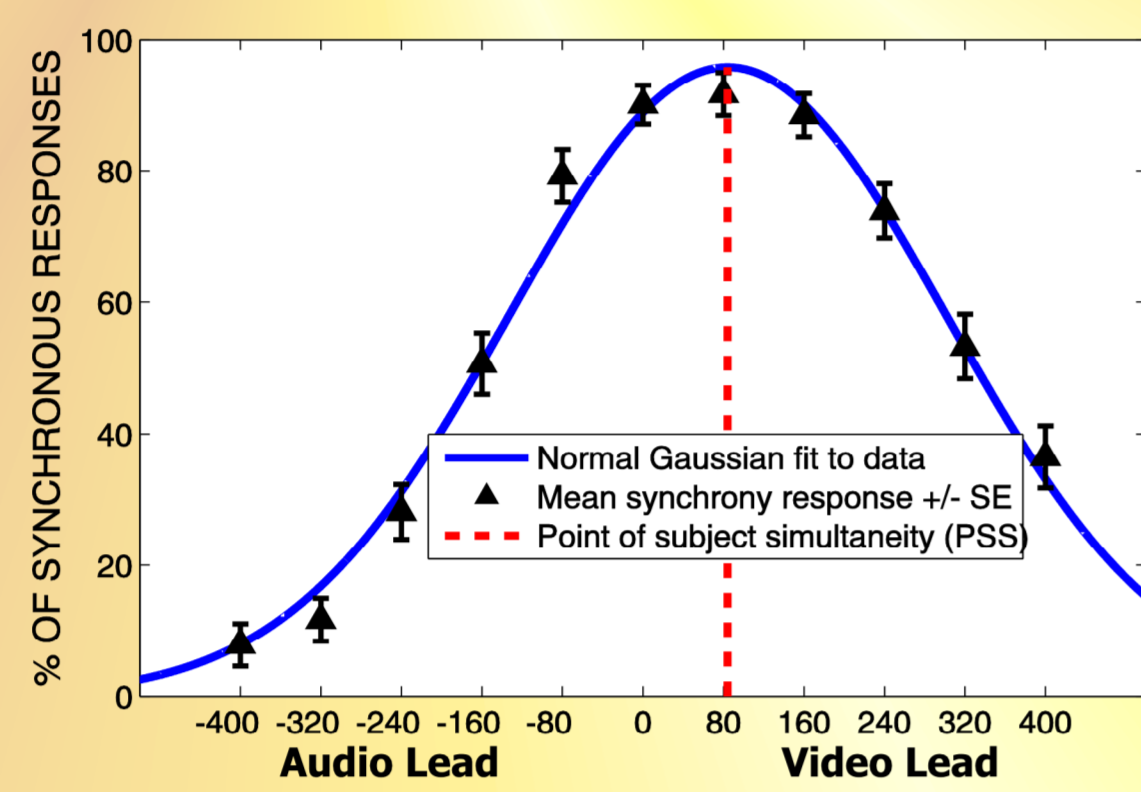
- Dynamic audiovisual speech
- 1 synchronous & 10 asynchronous levels
- 1.8 - 2.2 sec duration
- 4.4 sec fixation duration

## Continuous carry-over fMRI Design (Aguirre, 2007):

- Stimulus ordering of 1 run followed 3 n=12 T1|1 sequences e.g. -160, -160, 320, 80, -240, 400, -320, 240, -400, Fix, Fix, 0, 160, -80, -80, 160, 240, 320, Fix, Fix, 400, -160, -320, 80, -400, -240, 0
- 2 runs of 543 volumes
- 72 repetitions of each asynchrony level

## Behavioural Analysis:

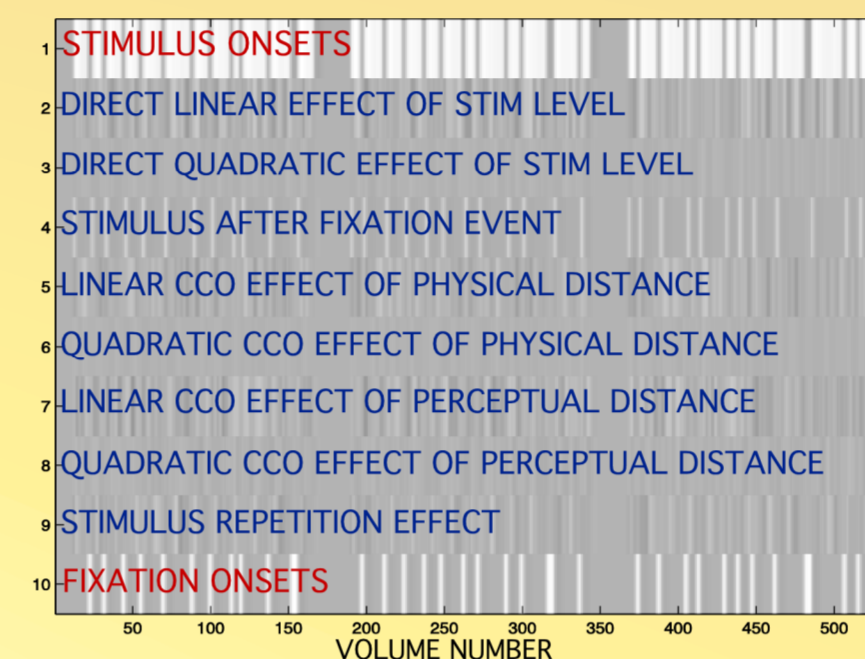
- After each stimulus participants were required to respond whether the audio and visual information were "in or out of synch"



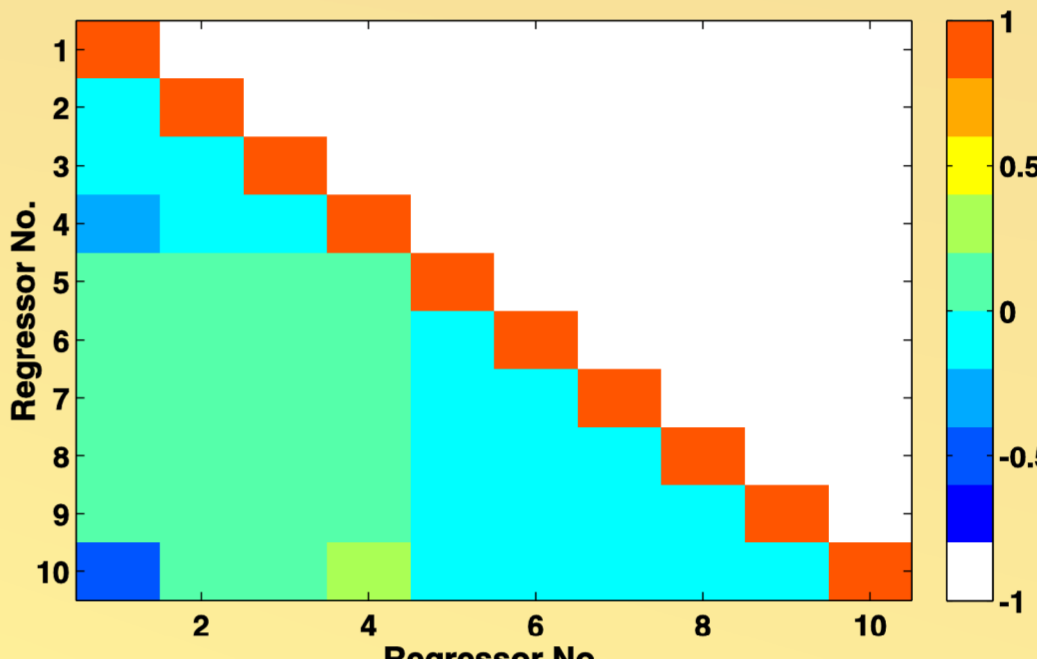
## Functional Scan Parameters:

- 3T Tim Trio Siemens scanner
- TR = 2500ms
- TE = 30ms
- 3x3x3mm voxels
- 34 slices

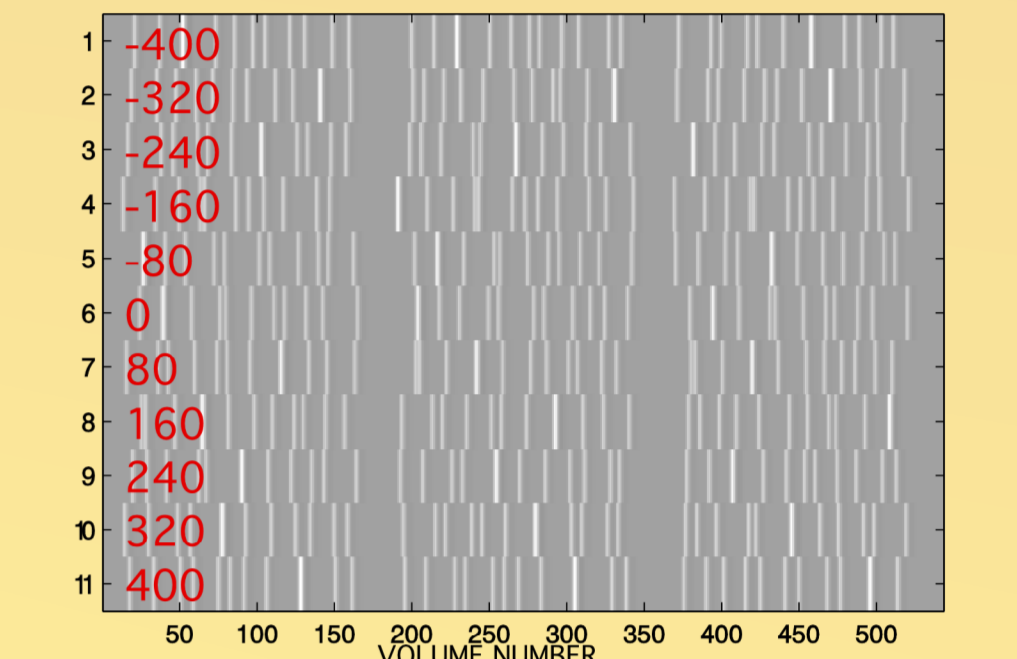
## Continuous Carry-Over Design



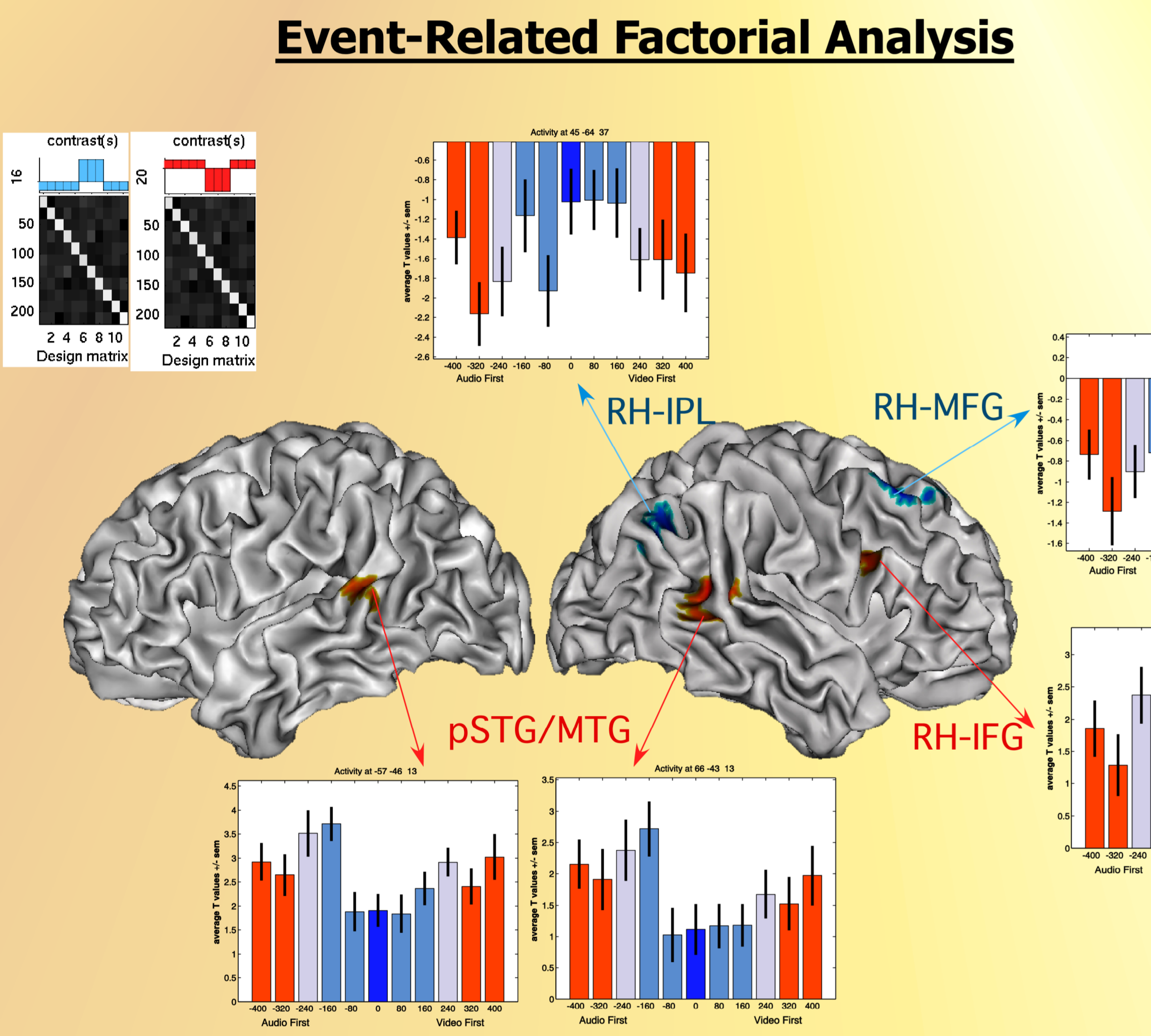
## Correlation Between Regressors



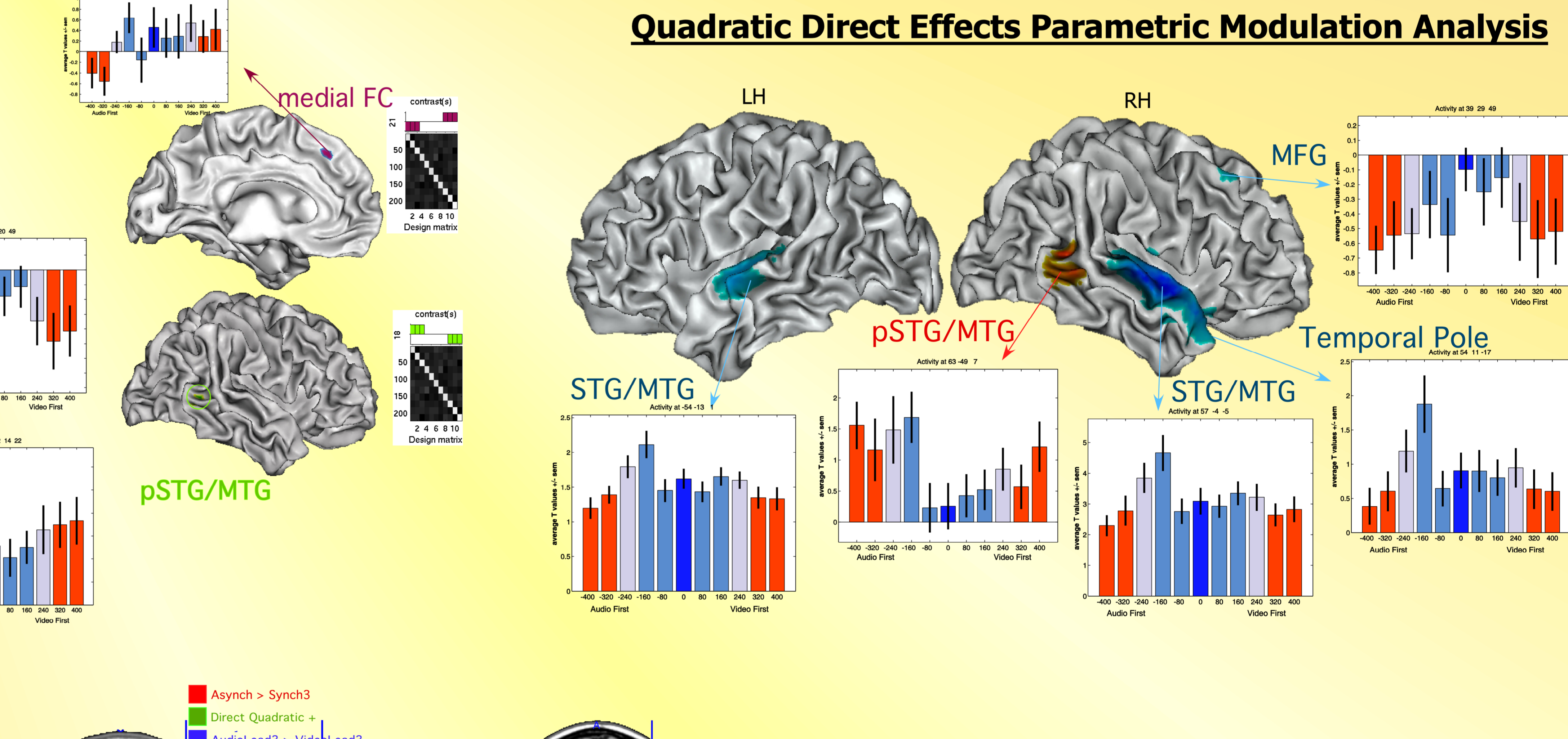
## Event-Related Condition Design



## Event-Related Factorial Analysis



## Quadratic Direct Effects Parametric Modulation Analysis



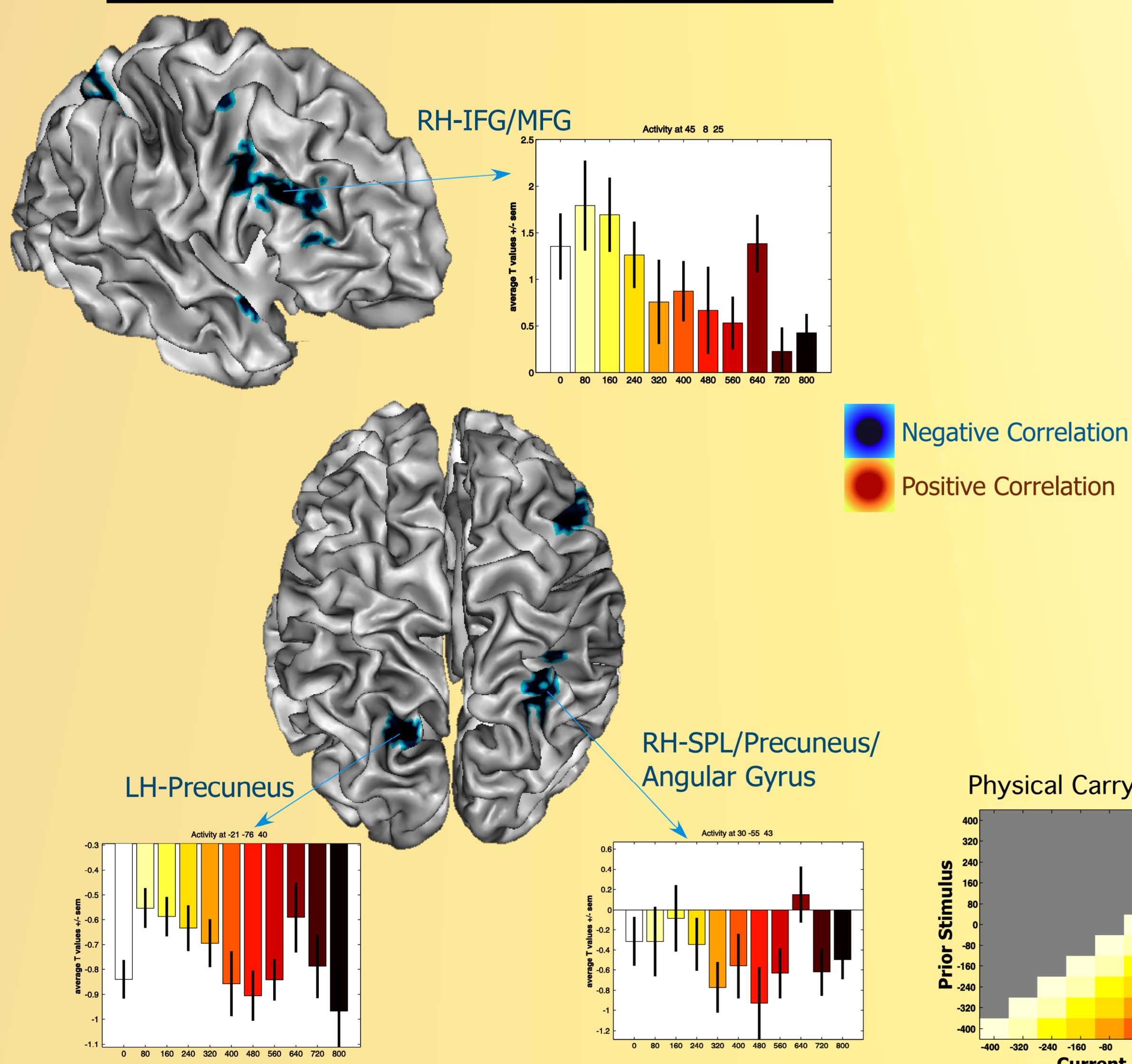
- No area showed a larger positive activation for synchronous than asynchronous stimuli.

- However, several areas showed less negative activation for synchronous compared to asynchronous stimuli.

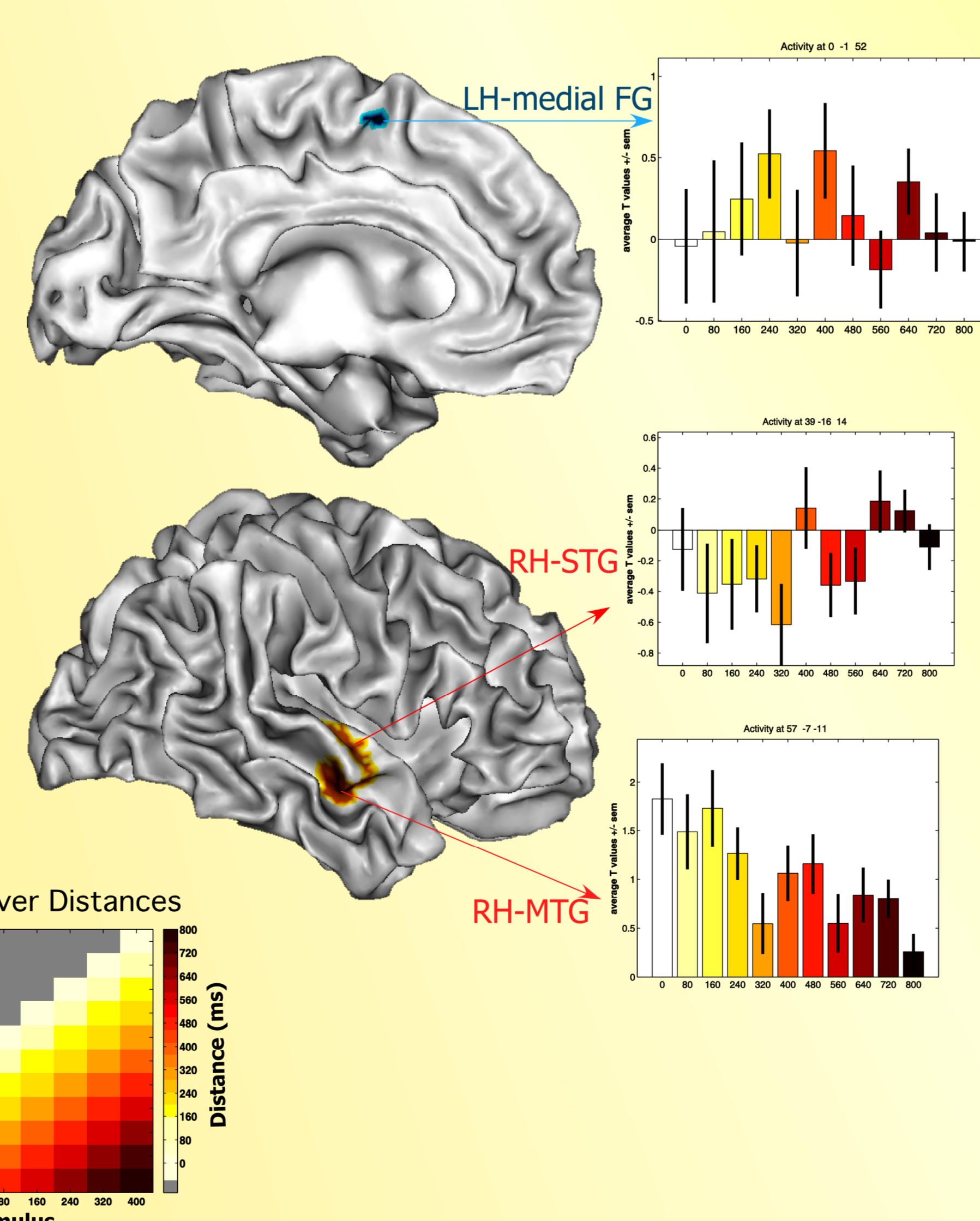
- Areas in posterior Superior Temporal Gyrus and middle Temporal Gyrus show, parametric responses for video lead stimuli but a consistent response for audio lead

- Middle Superior Temporal Gyrus seems to show parametric modulation with decreasing levels of asynchrony

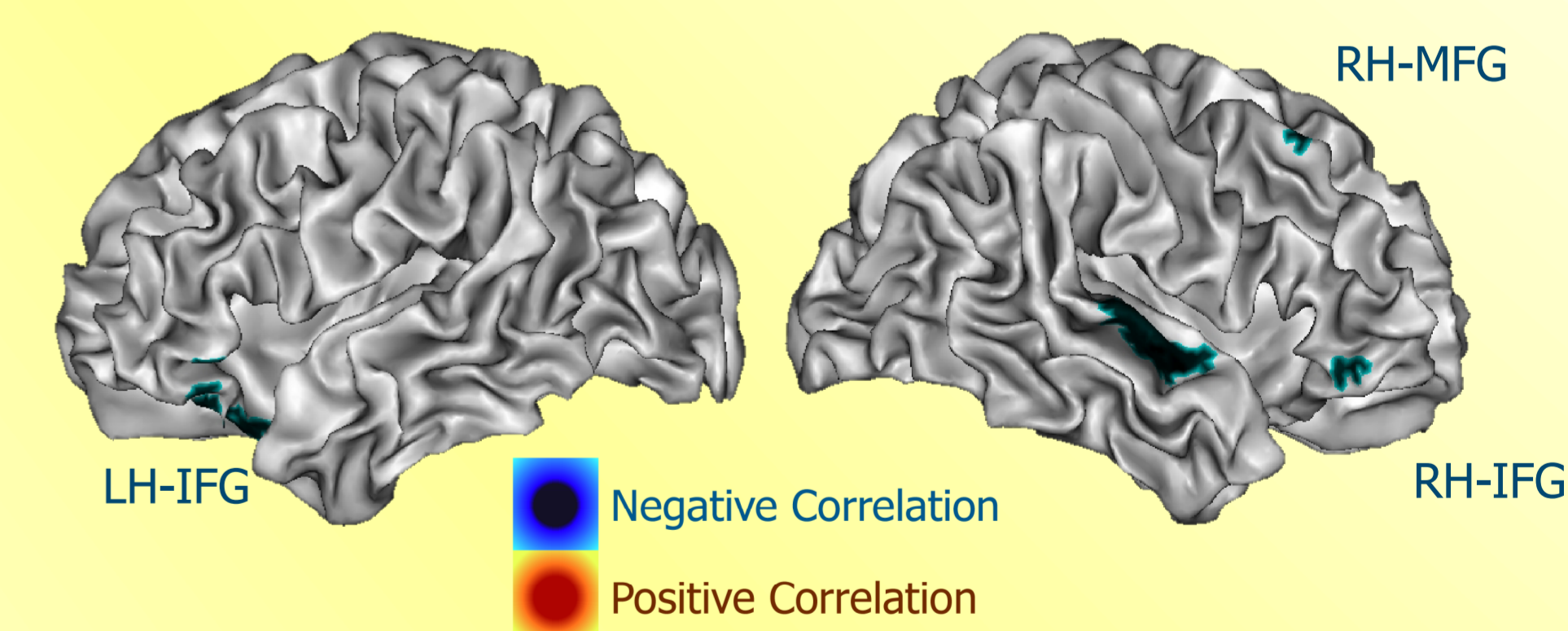
## Linear Carry-over Physical Effects



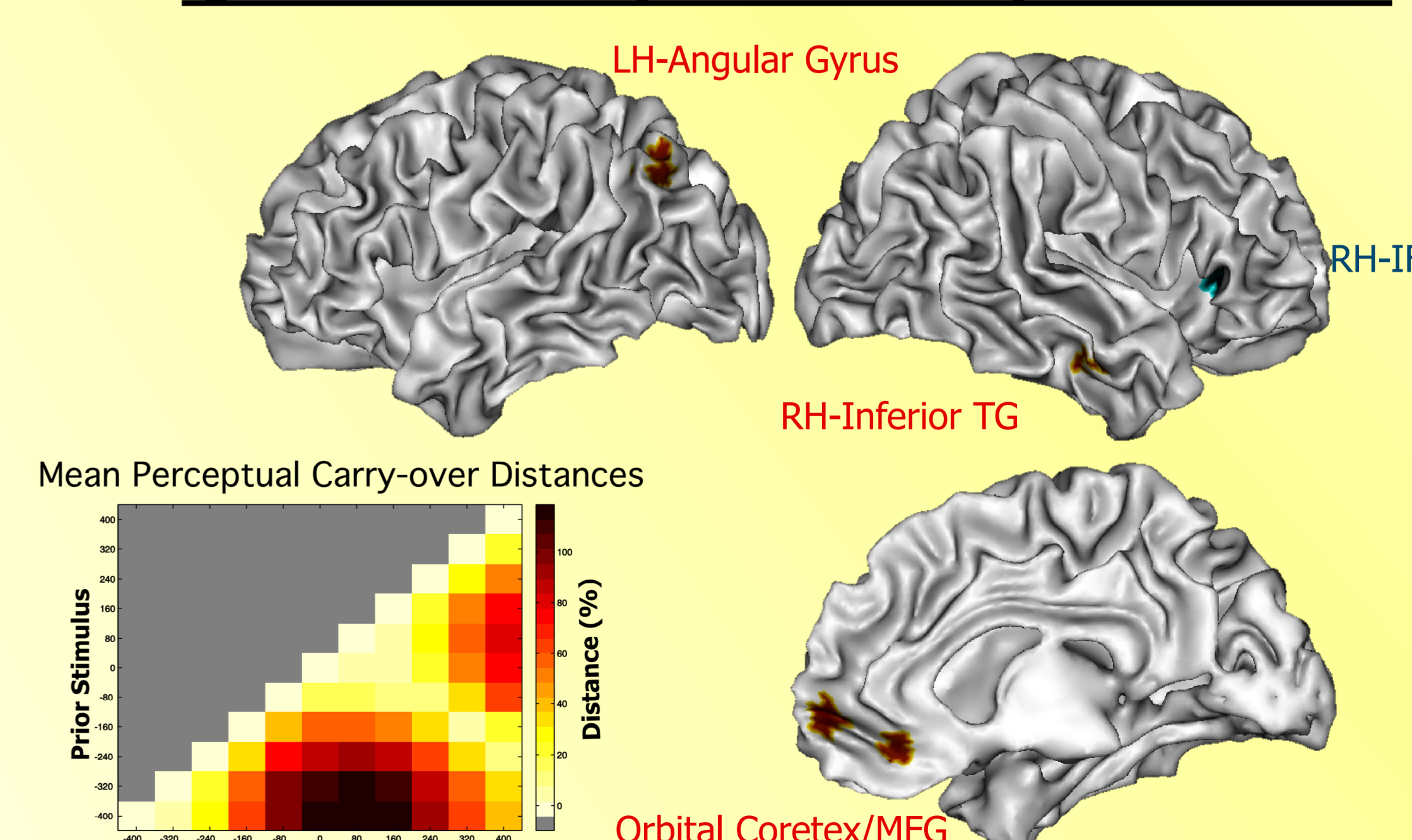
## Quadratic Carry-over Physical Effects



## Linear Carry-over Perceptual Effects



## Quadratic Carry-over Perceptual Effects



## References:

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- Stevenson, R.A., Altieri, N.A., Kim, S., Pisoni, D.B., & James, T.W. (2010) Neural processing of asynchronous audiovisual speech perception. *NeuroImage* 49(4): 3308-3318.