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## The contribution of sensory-motor interactions to imagined speech

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## RECONSTRUCTING SPEECH USING A BRAIN-MACHINE INTERFACE

Reconstructing speech from neural activity using brain-computer interfaces could make it easier for people with severe speech production deficits to communicate.

The decoding of **imagined speech** has met with only limited success, mainly because the **neural features of covert speech** are not precisely described.

Would sensory-motor interactions be a feature to exploit?

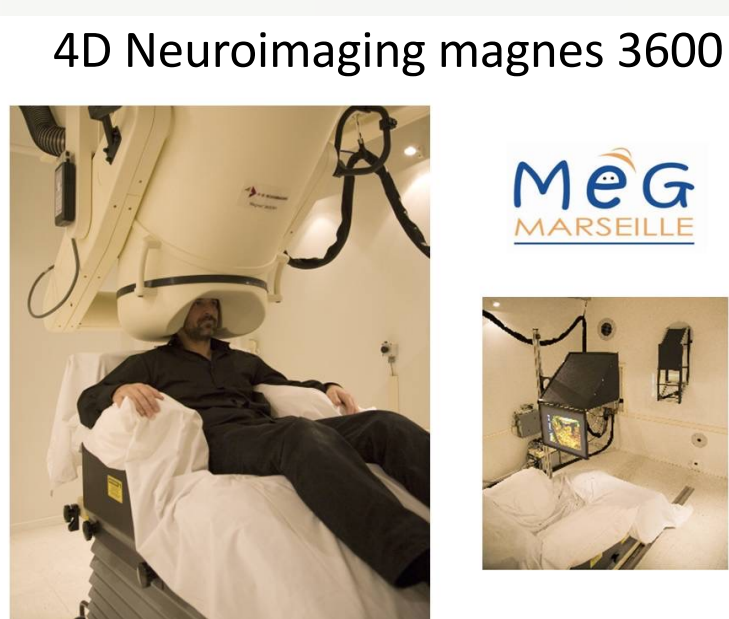
## COMPARING SILENCE READING AND IMAGINED SPEECH

Data from 21 participants were analysed

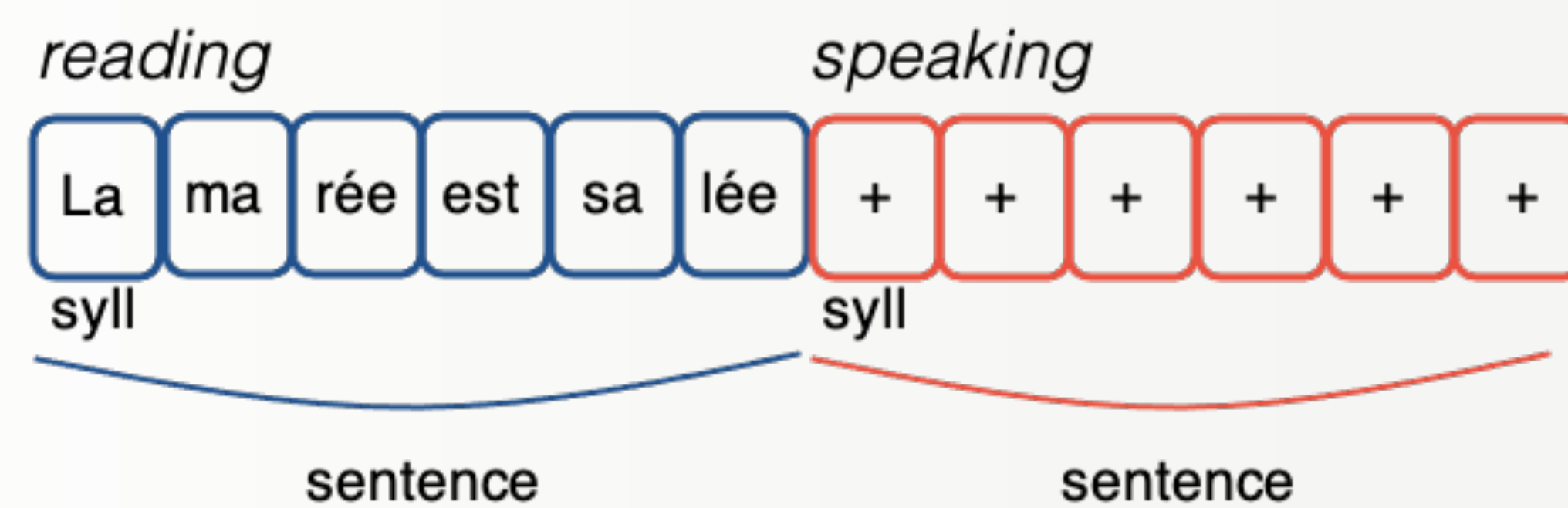
26 participants took part in the experiment. No triggers N = 2 participants, metallic object in the mouth N = 2, task not completed N = 1

The MEG experiment consisted of a 1 h-long session.

- whole-head acquisition
- recording sampling rate of 2,035 Hz
- 3 EEG channels synchronized (2 for EOG, 1 for ECG)
- Polhemus



Paradigm

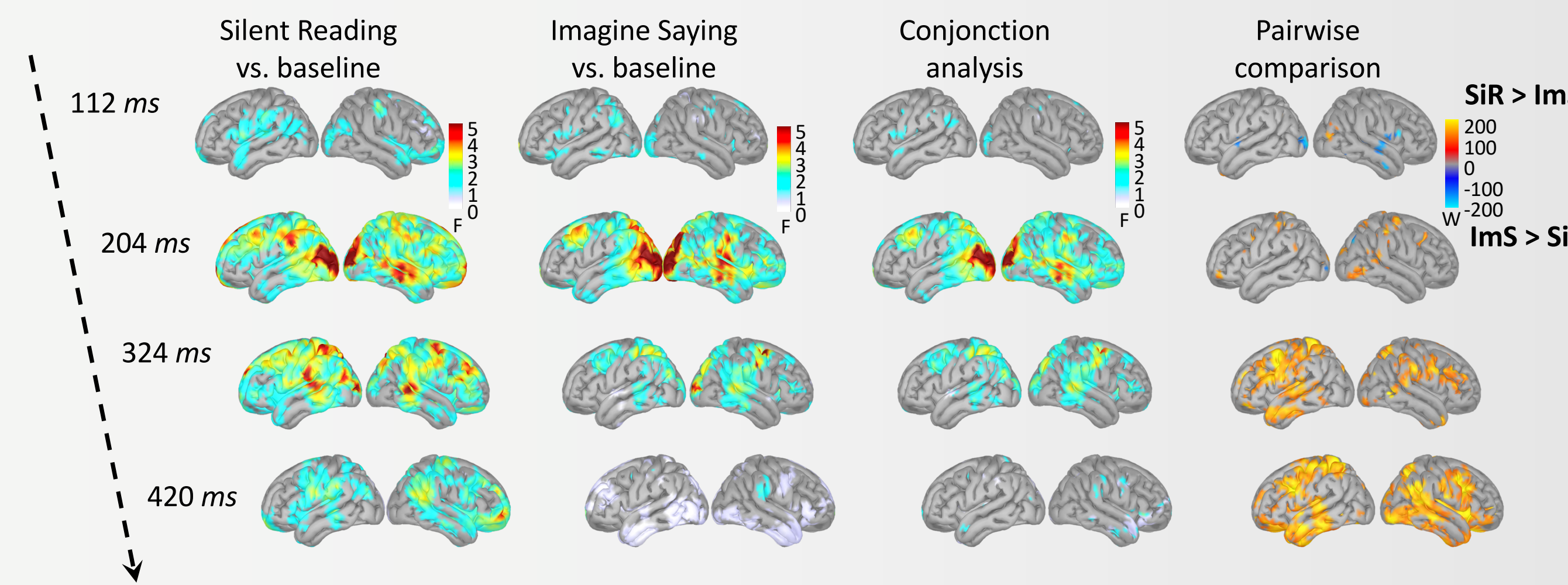


Syllabic stimulation sampling rate: 1.25 Hz

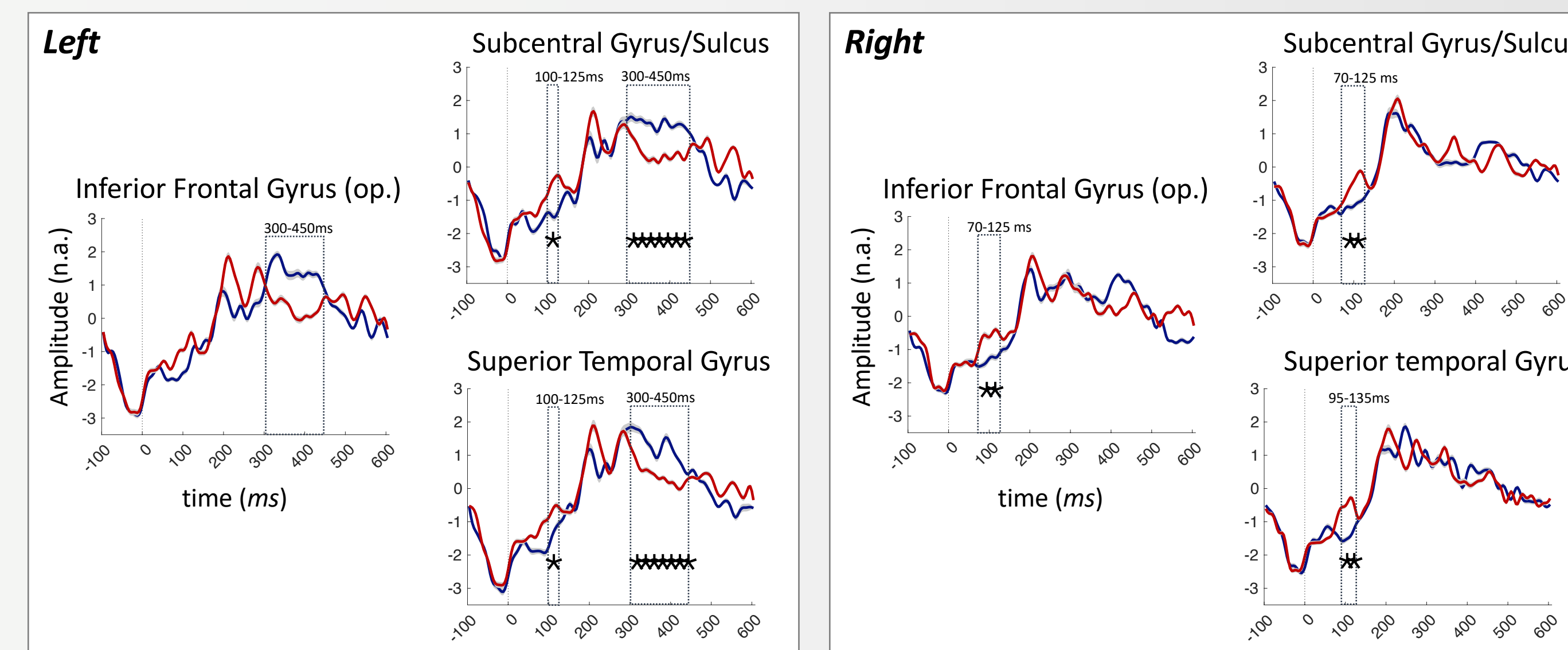
Hypothesis

The coupling between the **sensory-motor systems** is at the origin of the activation of syllabic and phonemic representations of **silent speech**.

## ERP – Analyses

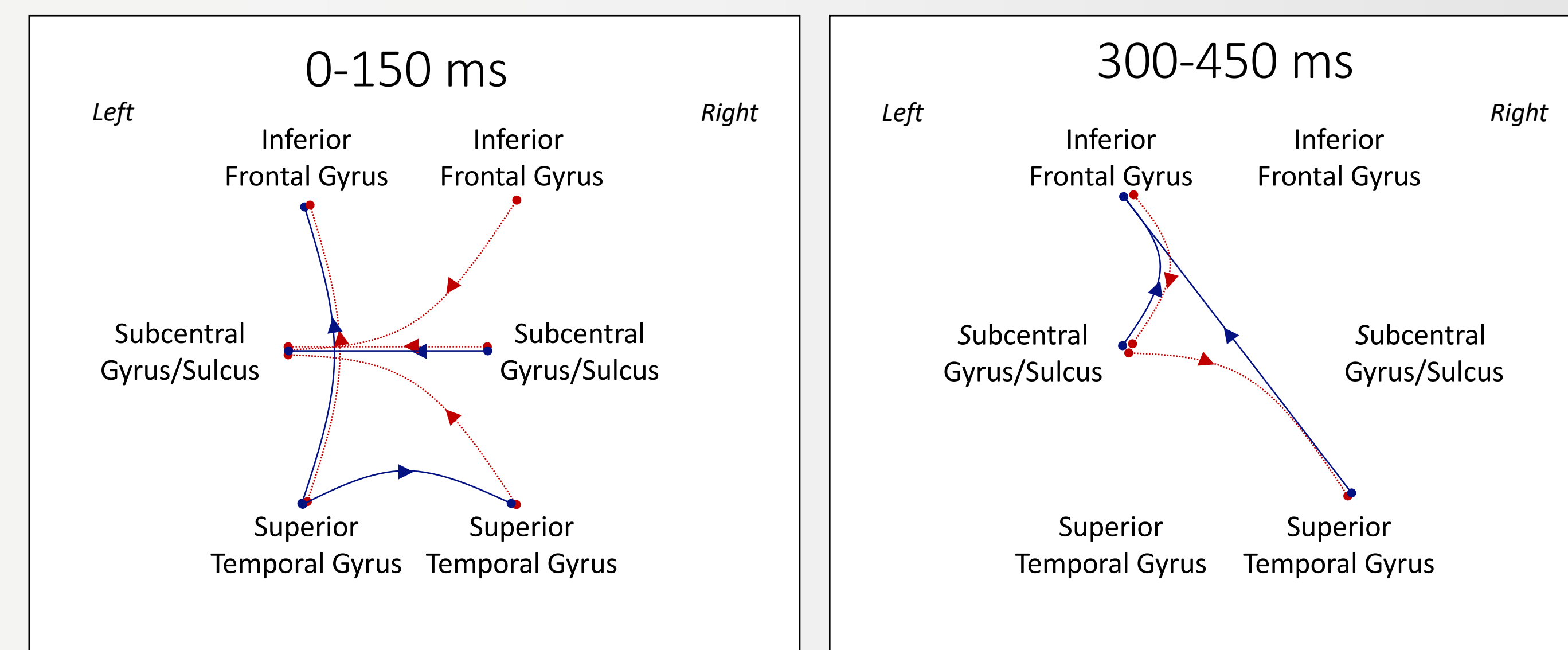


Regions of interest



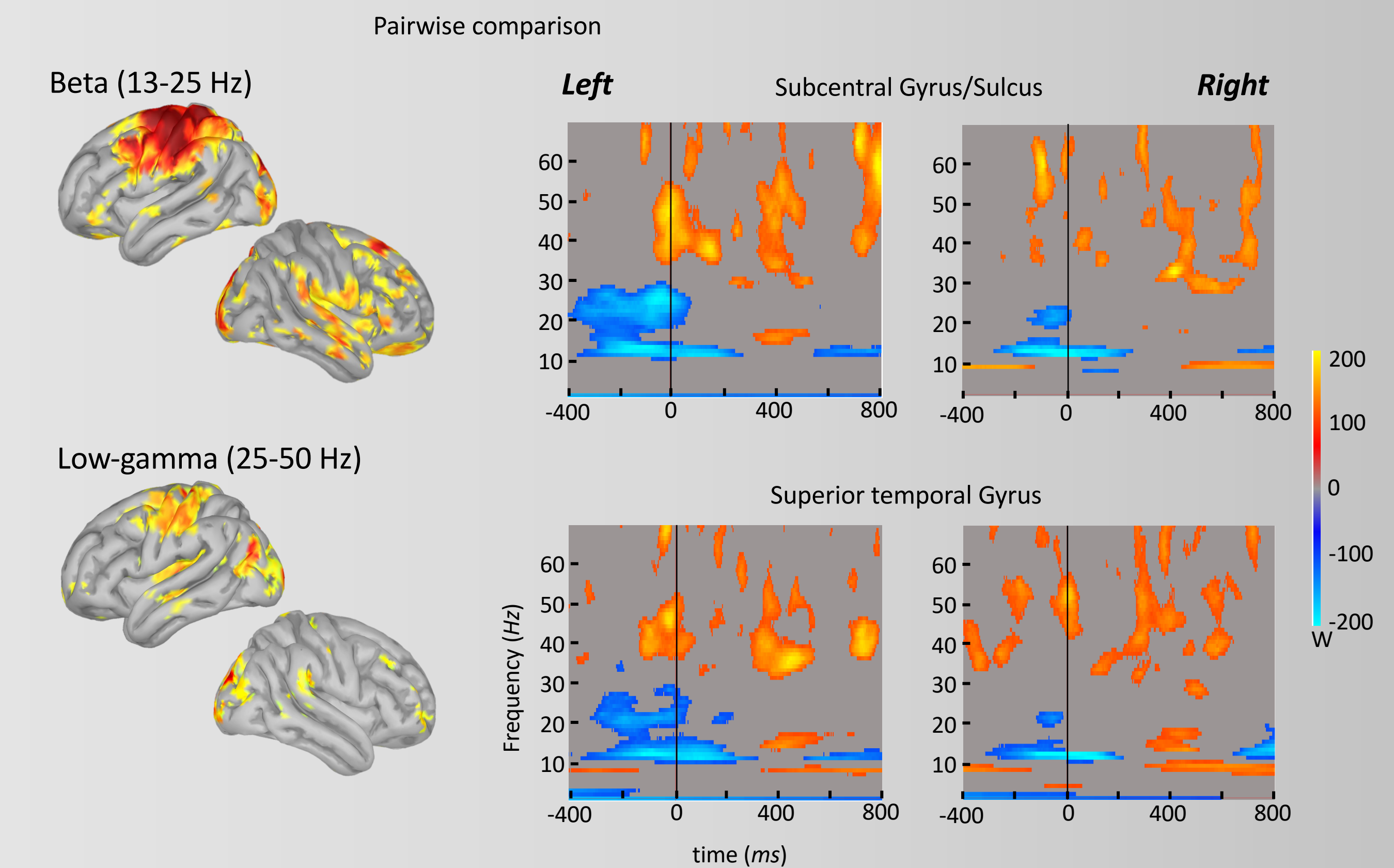
Silent Reading  
Imagine Saying

## Connectivity – granger analysis



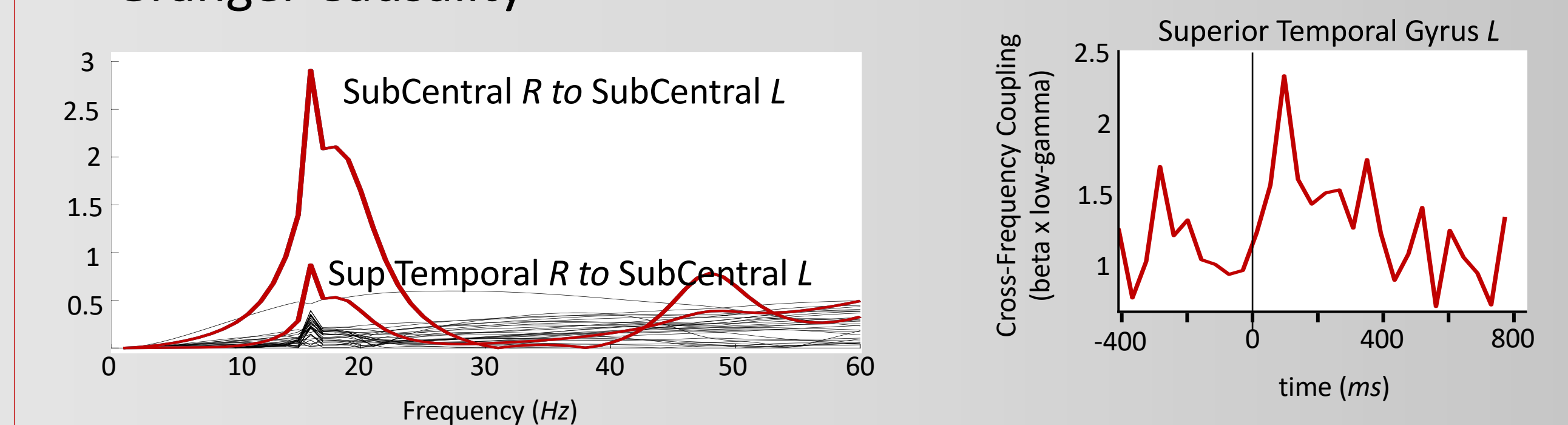
**Temporal and motor** areas show an earlier evoked response, and a stronger **early** information transfer in the **Imagine Saying** condition compared to the Silent Reading condition

## TF – Analyses



The production of **imagined speech** is associated with bursts of **beta (13-25 Hz)** neural oscillations in the **sensory and motor** areas.

## Granger Causality



In the **imagined speech** condition the propagation of information between motor and sensory areas is based on a **cross-frequency coupling** between beta and low gamma frequencies.

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