Hemispheric brain-rhythm asymmetries in speech-in-noise comprehension

University of Dundee

Dr. Tanja Atanasova & Dr. Anne Keitel

Psychology Division

University of Dundee, Scotland

tab

context

- The way we comprehend speech—and how the brain encodes information from a continuous speech stream—is of interest for neuroscience, linguistics, and research on language disorders.
- Resting-state brain activity has the potential to index intrinsic features that might be related to behavioural performance, e.g. speech comprehension.

aim

- **In this proof-of-concept study, we aimed to identify which intrinsic brain rhythms predict individual speech comprehension in a challenging listening situation.**
- **To this aim, we analysed the region-specific brain activity in magnetoencephalography data and linked it to the performance of a speech-in-noise word comprehension task.**

SUMMARY

Both theta and beta effects were specific to the respective hemisphere.

Our results suggest specific functional hemispheric asymmetries correlated to speech perception.

Individual differences in the rhythmic make-up of the brain are linked to differences in speech-in-noise comprehension

method

Participants

- 20 healthy right-handed British native speakers (9 female, age 23.6 ± 5.8 years, age range: 18 to 39 years).

MEG data acquisition

- MEG was recorded with a 248-magnetometer,
- Whole-head MEG system at a sampling rate of 1 KHz
- Sounds were transmitted binaurally through plastic earpieces

Stimuli

- 18 target words, each repeated 10 times
- During the experiment, **speech stimuli were embedded in noise**, i.e., ecologically valid environmental sounds combined into a uniform mixture of 50 different background noises

Task

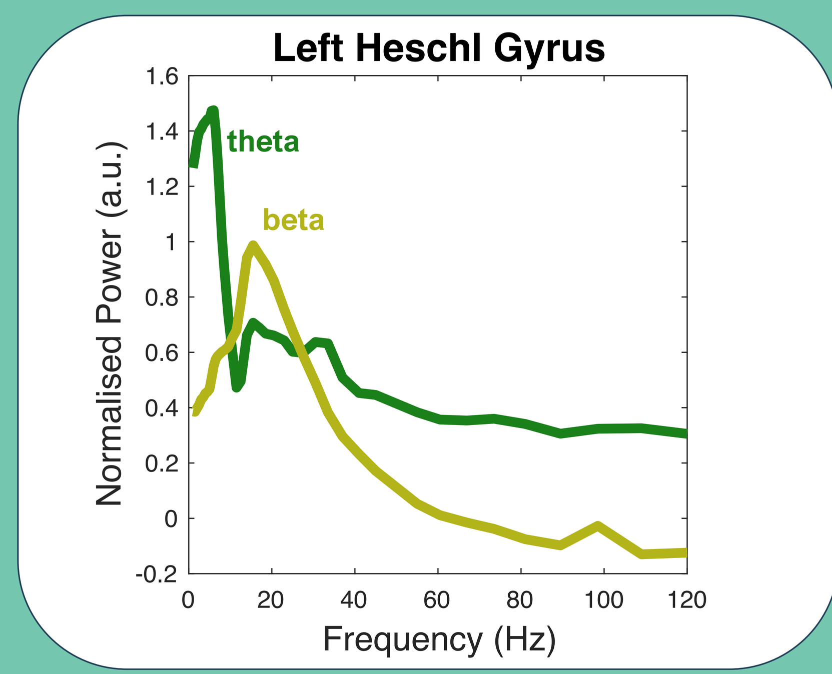
- Participants were presented with a single target word embedded in noise and had to choose between two alternatives.

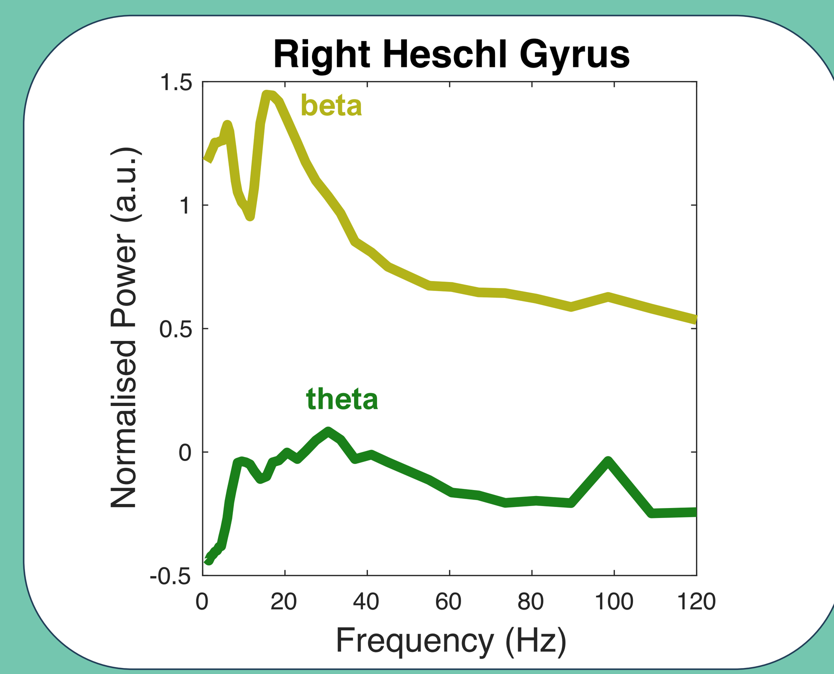
Example: '*fantastic*' *(embedded in noise)*

Which adjective did you hear?

beautiful **fantastic**

results

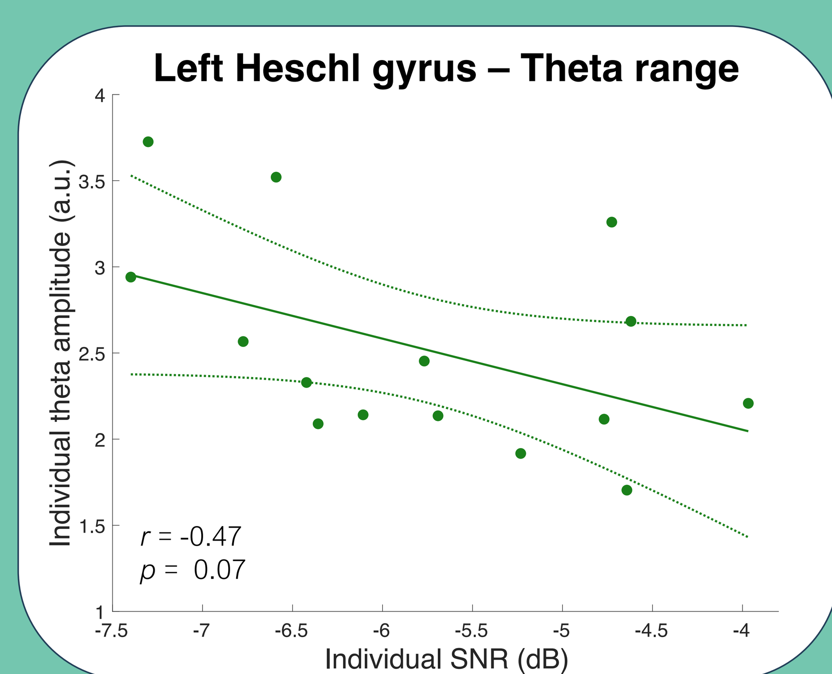


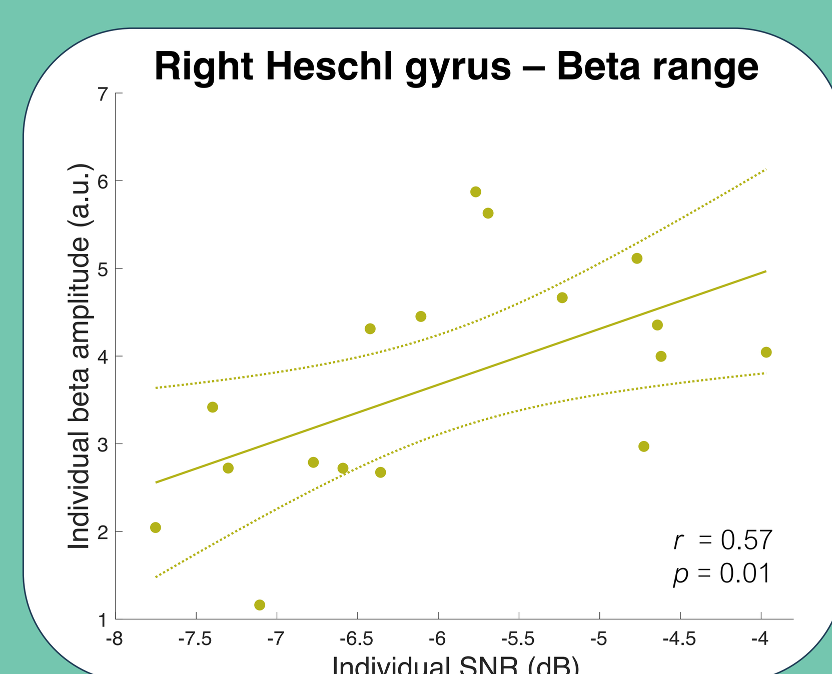


All participants showed prominent theta and beta rhythms in left and right Heschl gyrus.

Left Heschl gyrus

Right Heschl gyrus





- Participants with higher theta amplitudes in the left Heschl gyrus showed better speech comprehension than those with lower theta amplitudes.
- Participants with lower beta amplitudes in the right Heschl Gyrus showed better speech comprehension than those with higher beta amplitudes.

References

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