

Cardio-Audio Synchronization and Neural Surprise Response Across Sleep Stages

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About Me



- Arabic and Neuroscience double major at Michigan State University
- Senior, Class of 2023
- Long-term Goal: Medical School



Patterns in stimuli:

- Internal
- External

If you find the pattern, you can find when it changes.



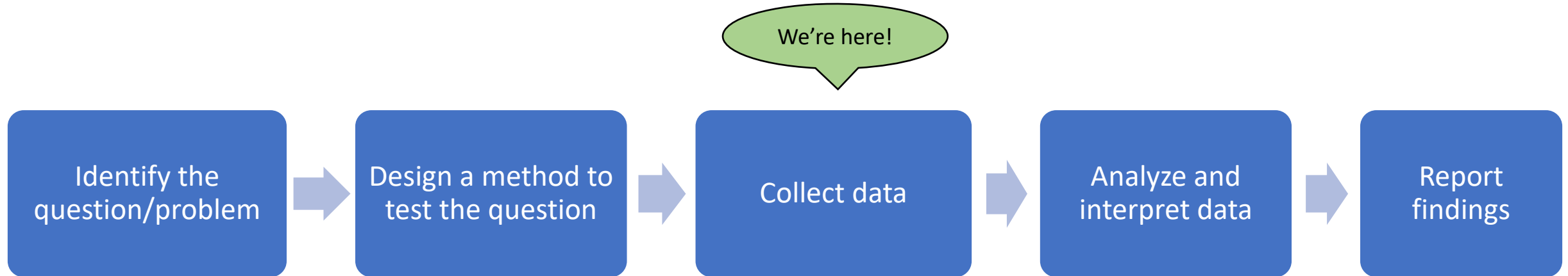
Do internal stimuli become more important as you decrease in awareness of outside stimuli?

The brain learns patterns in space, but also over time.



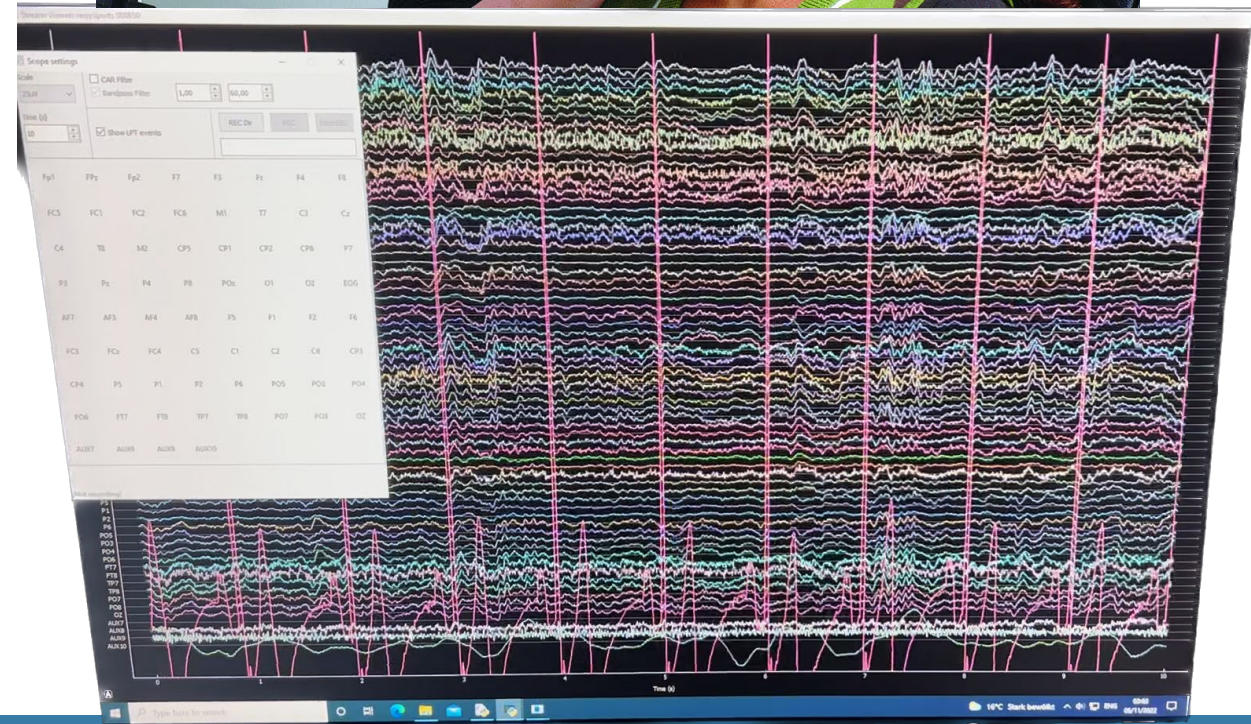
My Focus

- Behind-the-scenes study organization:
 - learning about participant selection, best practices, logistics of research
- Coding for data analysis using Python
- Data collection using EEGs, ECGs, etc.

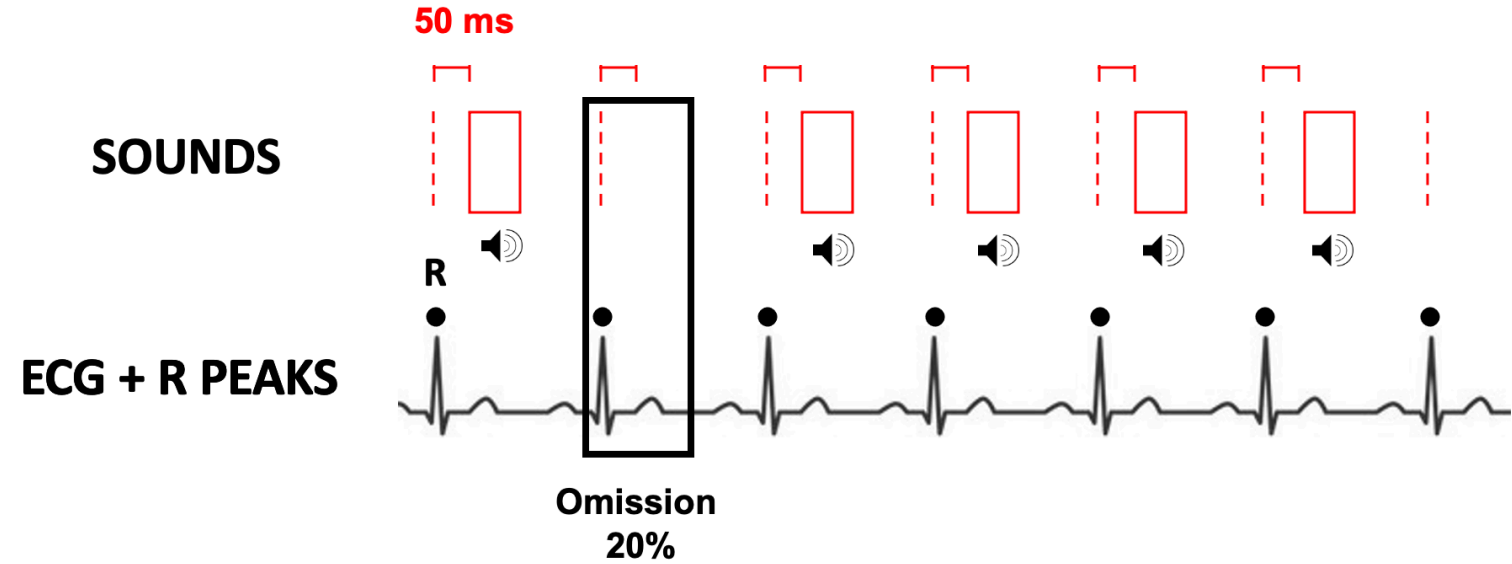


What is an EEG?

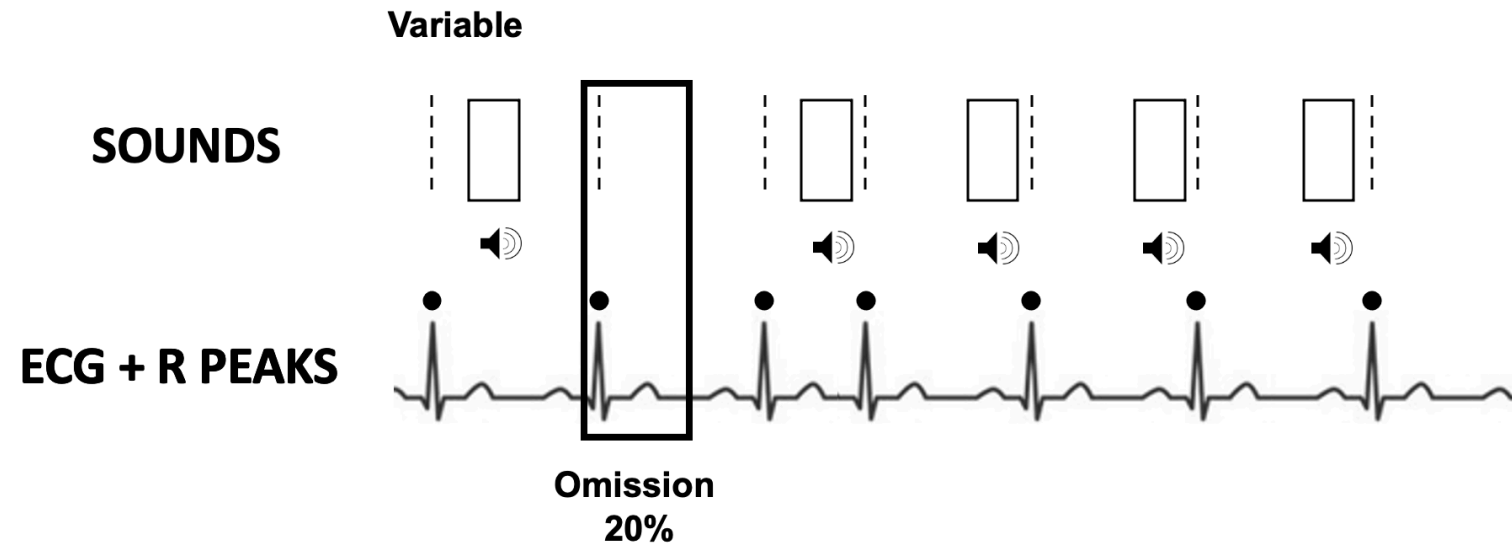
- EEG = Electroencephalography
- Records the electrical activity of the brain through electrodes on the scalp
- Use in the study: measuring neural response to stimuli



Synchronous



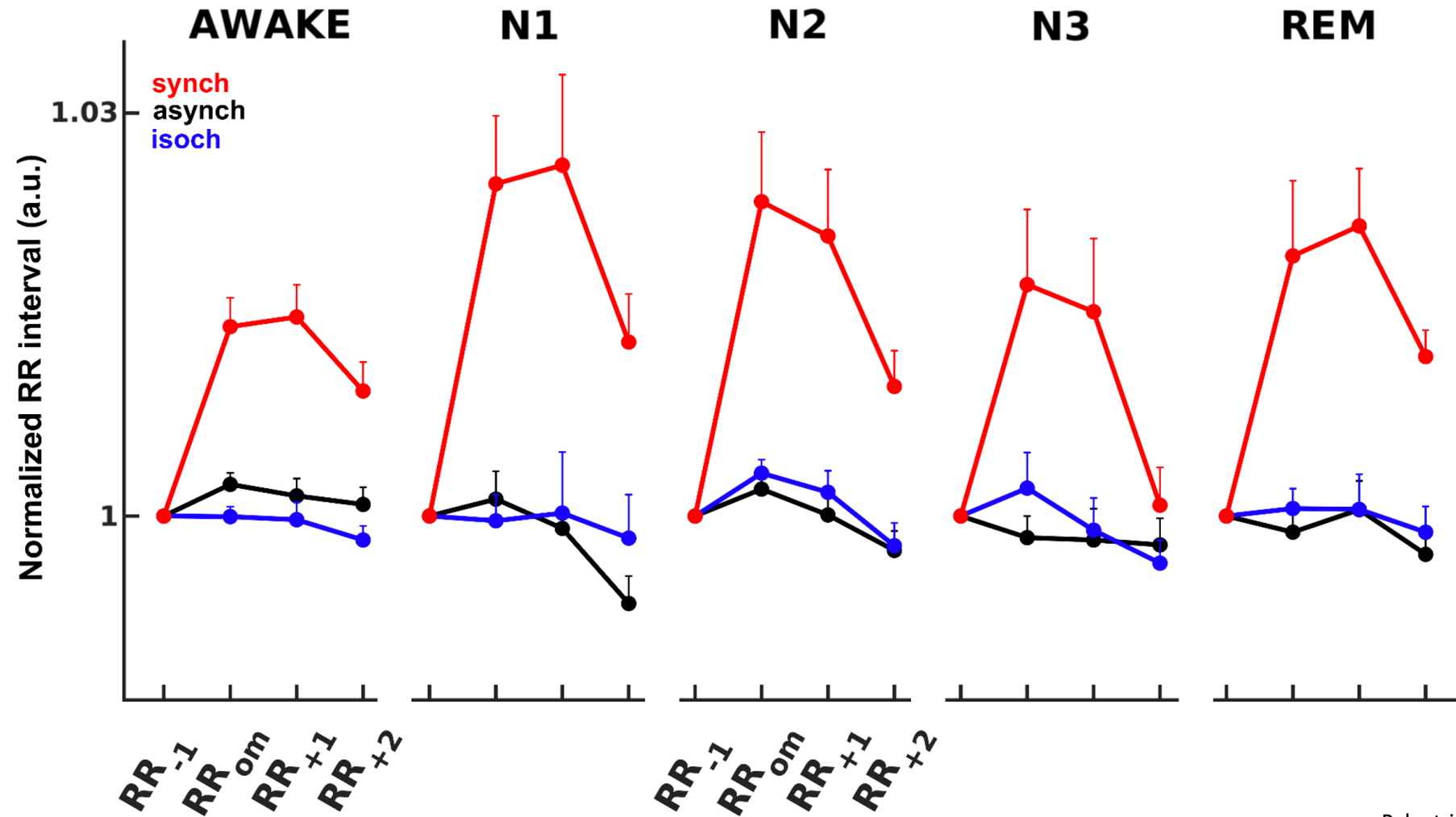
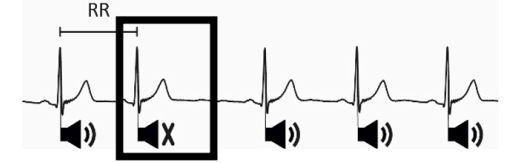
Asynchronous



Previous study's results

- Neural omission response when the synchronous and isochronous sounds were omitted in wakefulness and N2 stage of sleep
- Most notably, delay in heart rate following the omission of a synchronous sound (Cardiac omission response)

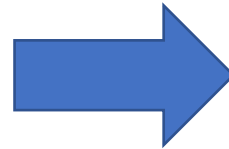
Cardiac omission response in wakefulness and sleep



Pelentritou et al., (2022). BioArXiv

Previous Study's Results:

- In some vigilance states, neural omission response when sounds with a pattern were omitted
- Cardiac omission response following the omission of a synchronous sound in all sleep stages



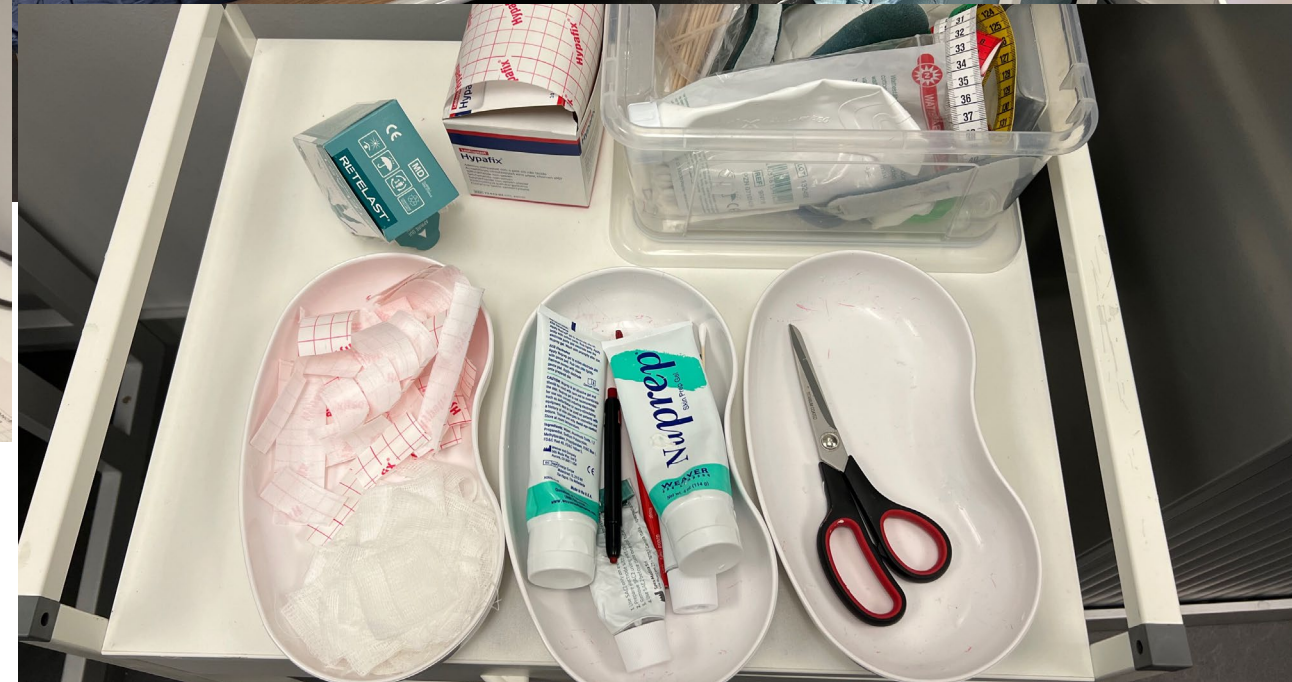
Goal for Current Study:

- Collect sufficient data to determine if there is a neural and/or cardiac omission response in all stages of sleep
- if there is a response, does it change based on sleep stage?

The Current Study

- 3 night sessions: one adaptation night, 2 data acquisition nights
- 1 awake session: 3-4 hours of data acquisition
- Three conditions: Synchronous, Asynchronous, Isochronous





Questions?