



# Multiple timescale sensitivity of EEG components to statistical features in unattended tone sequences

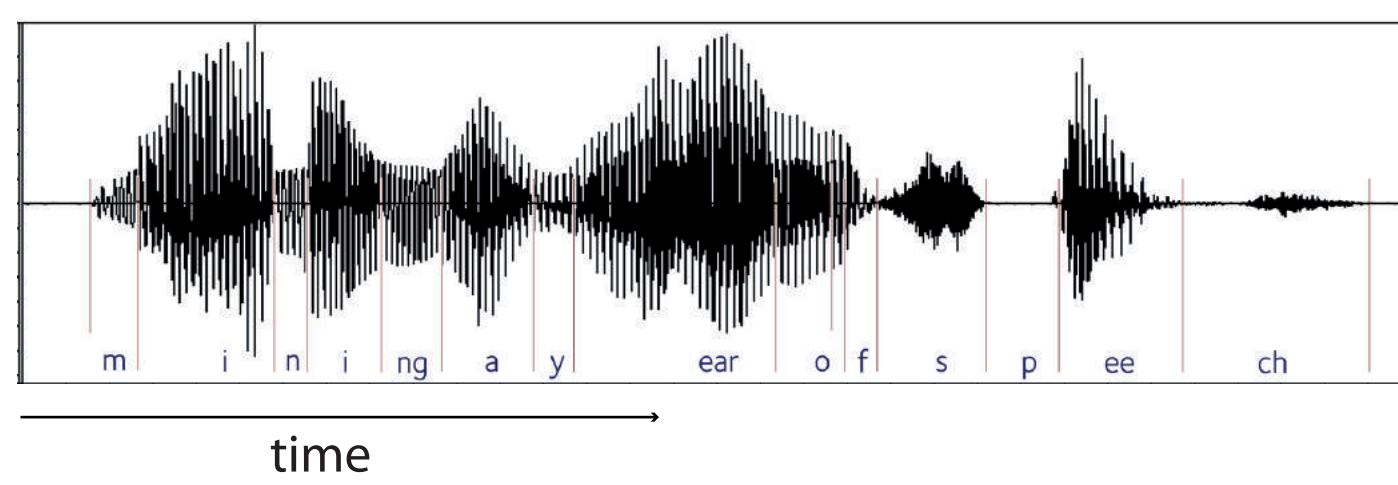
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## Introduction

- Auditory information is processed on various timescales:

Speech



Music

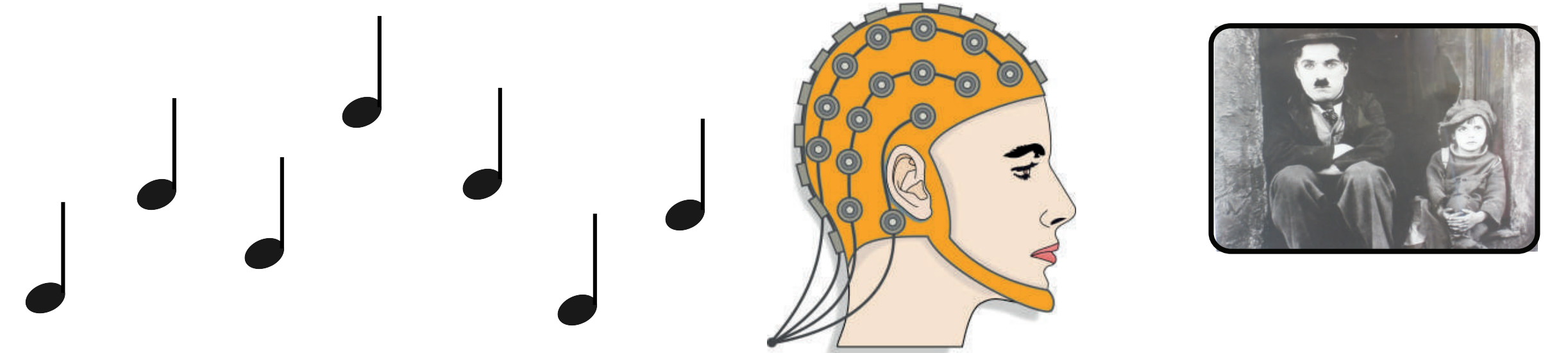


- Not much is known about the neural mechanisms

## Methods

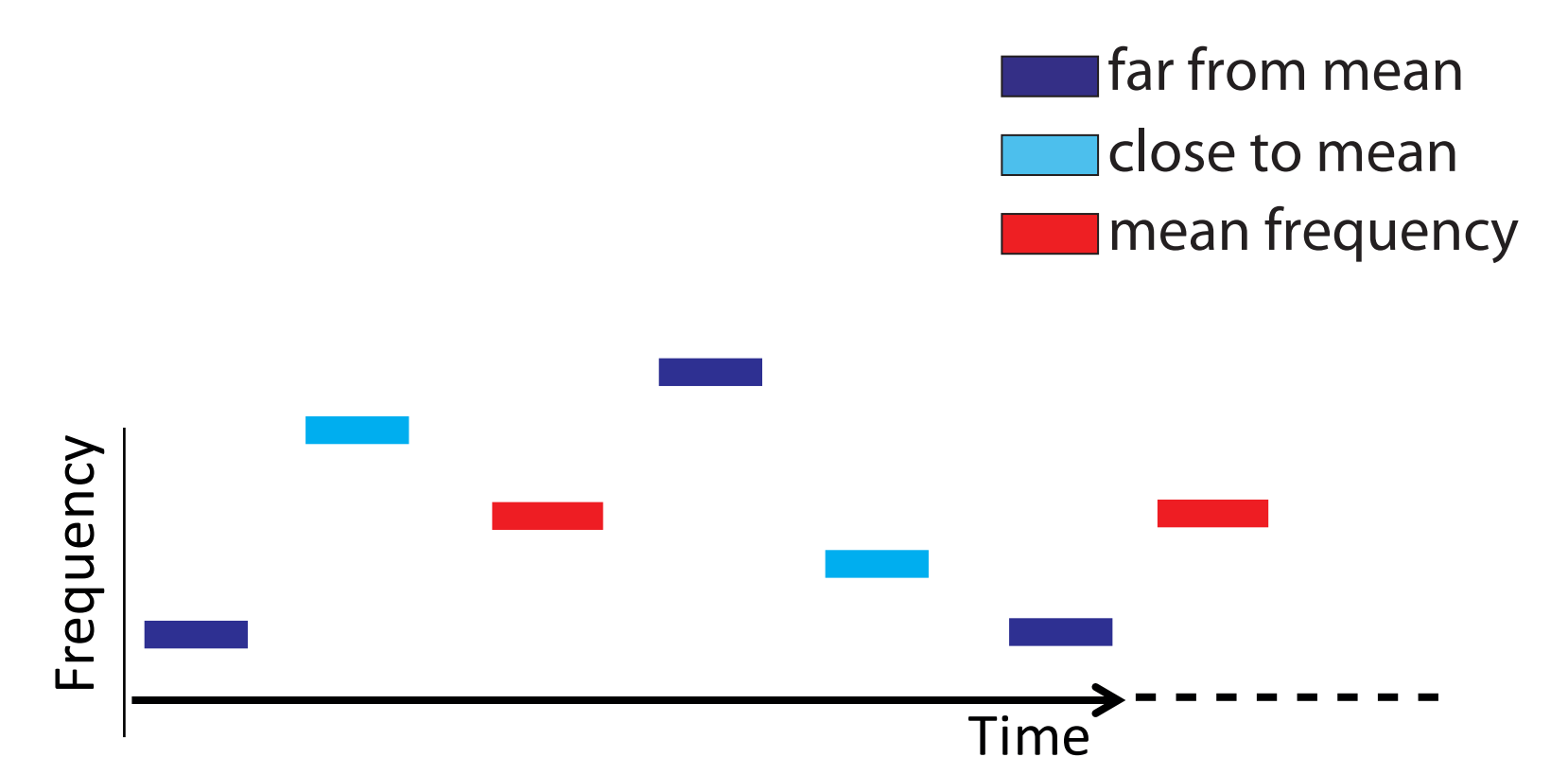
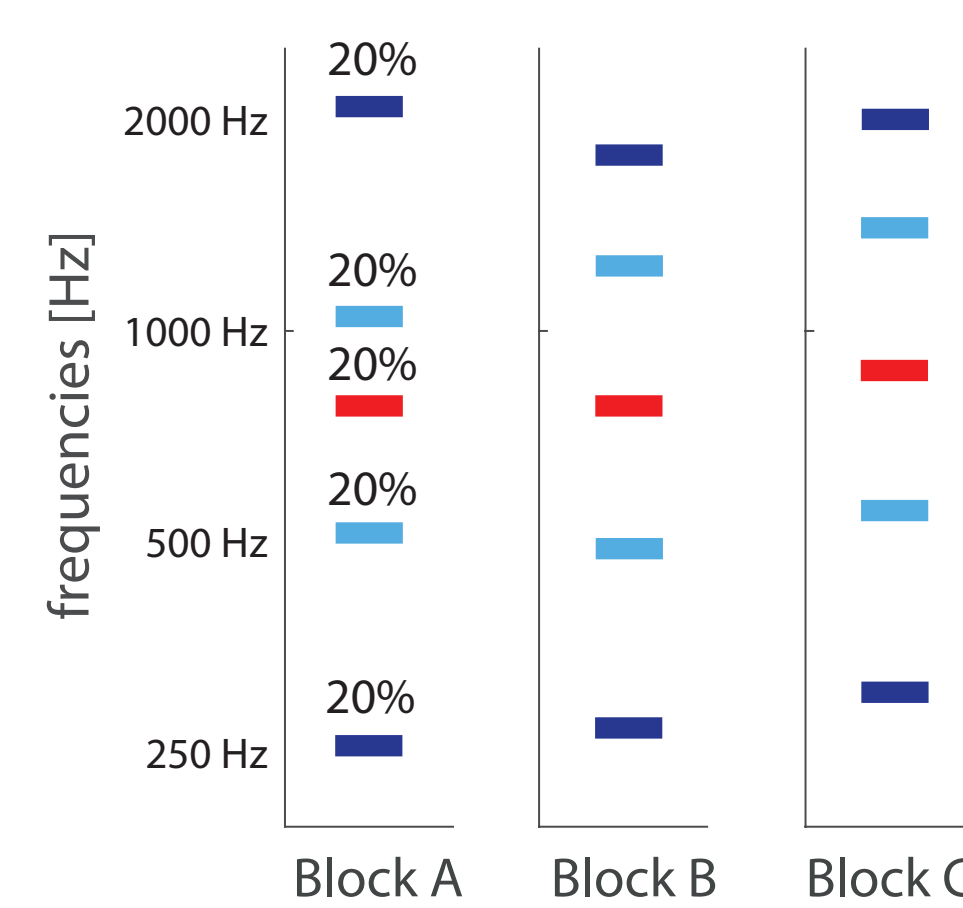
2 EEG experiments:

Experiment 1 - 21 musicians  
Experiment 2 - 27 musicians



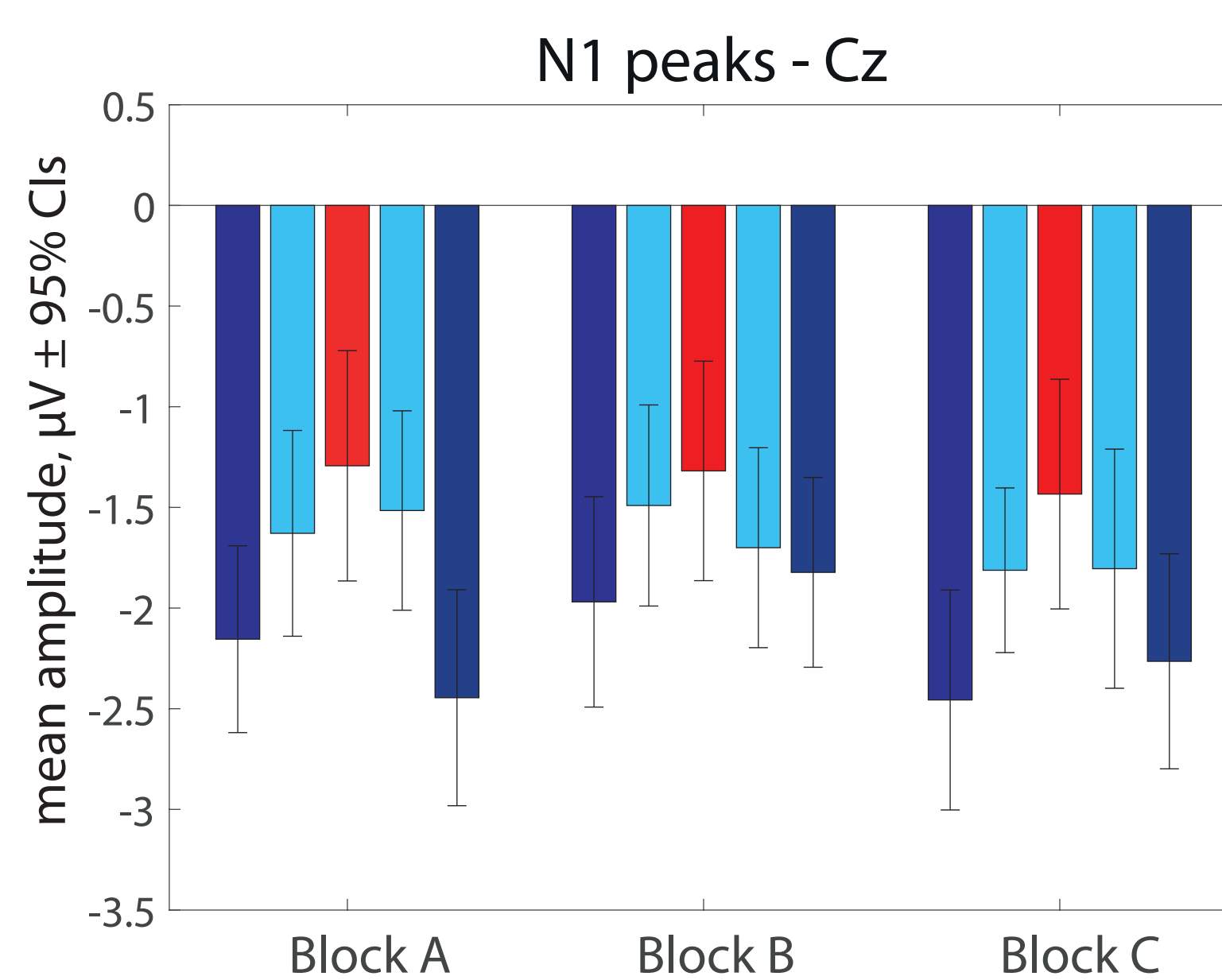
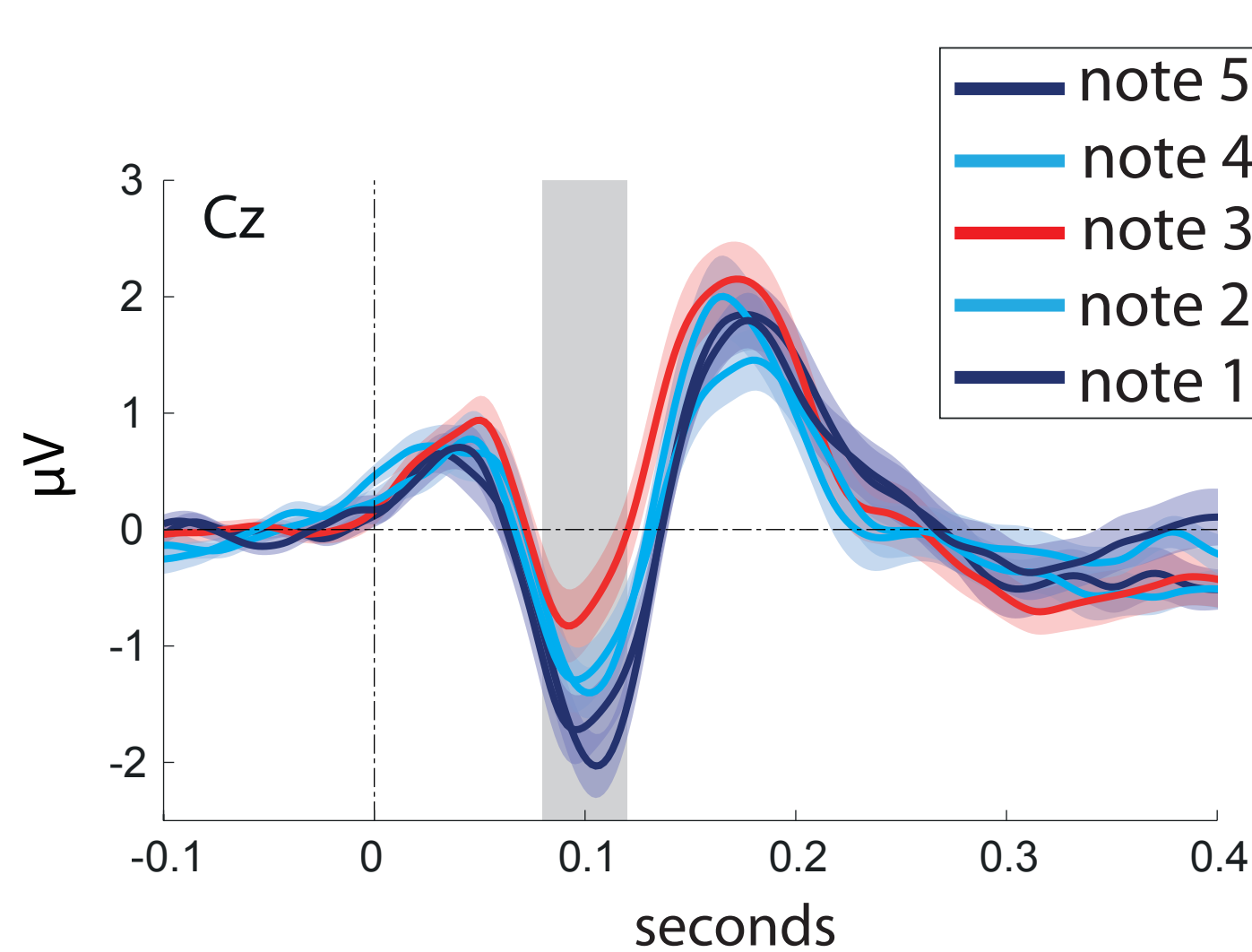
Participants were asked to ignore tone sequences while concentrating on a silent film

**Stimuli:**  
5 equi-probable notes  
Pure tones  
duration - 100 ms  
SOA - 500 ± 50 ms

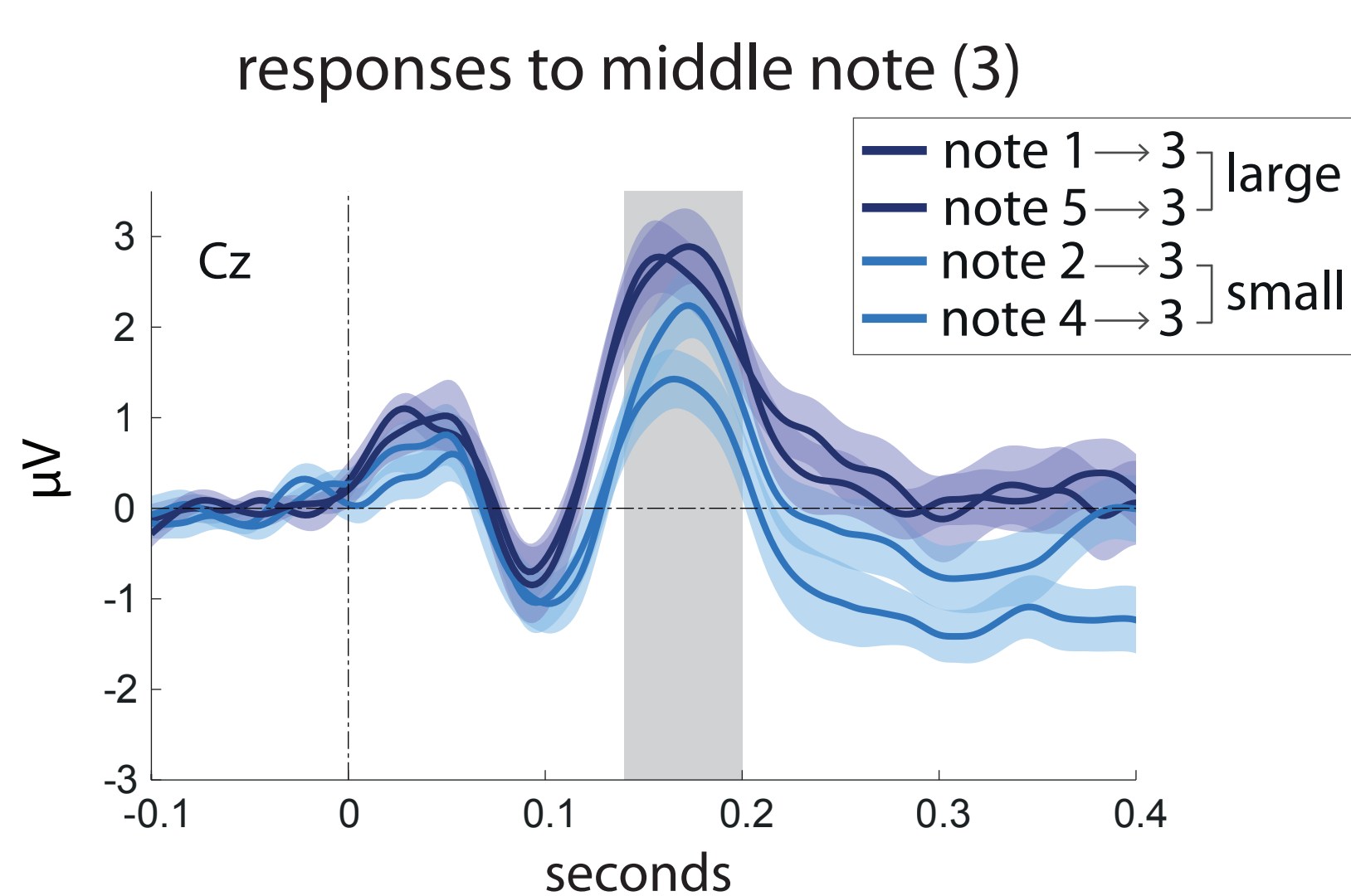
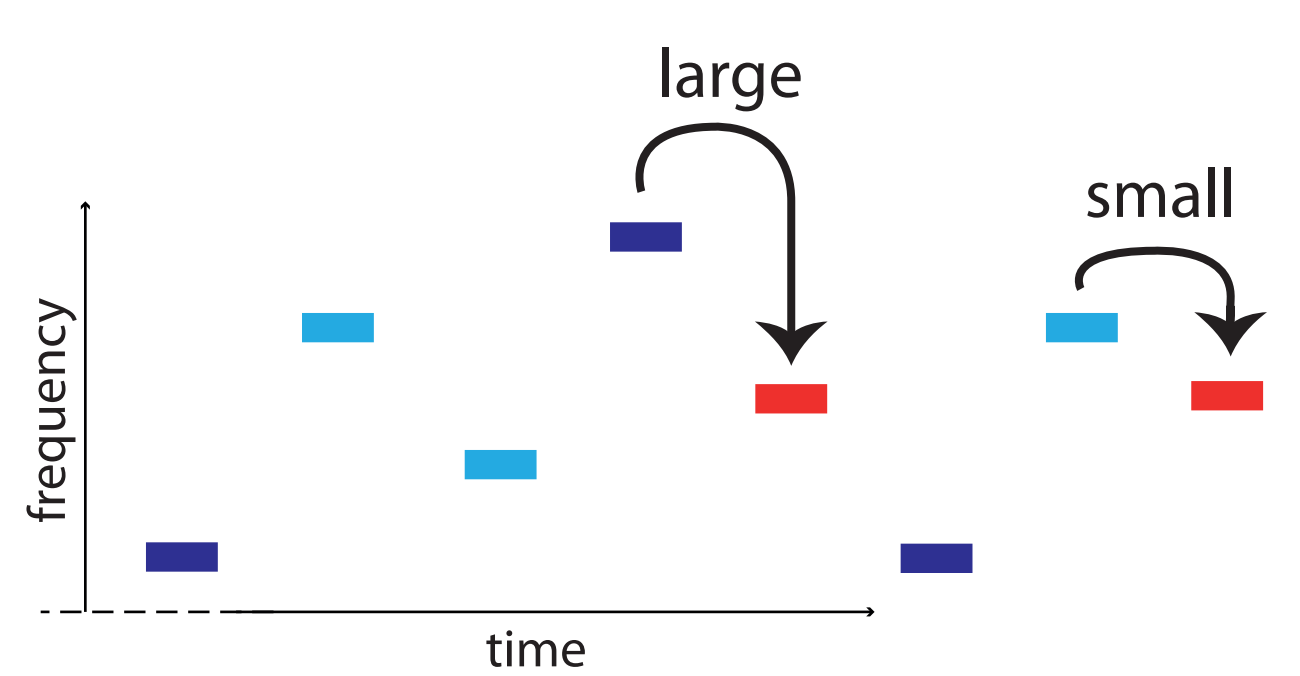


## Results

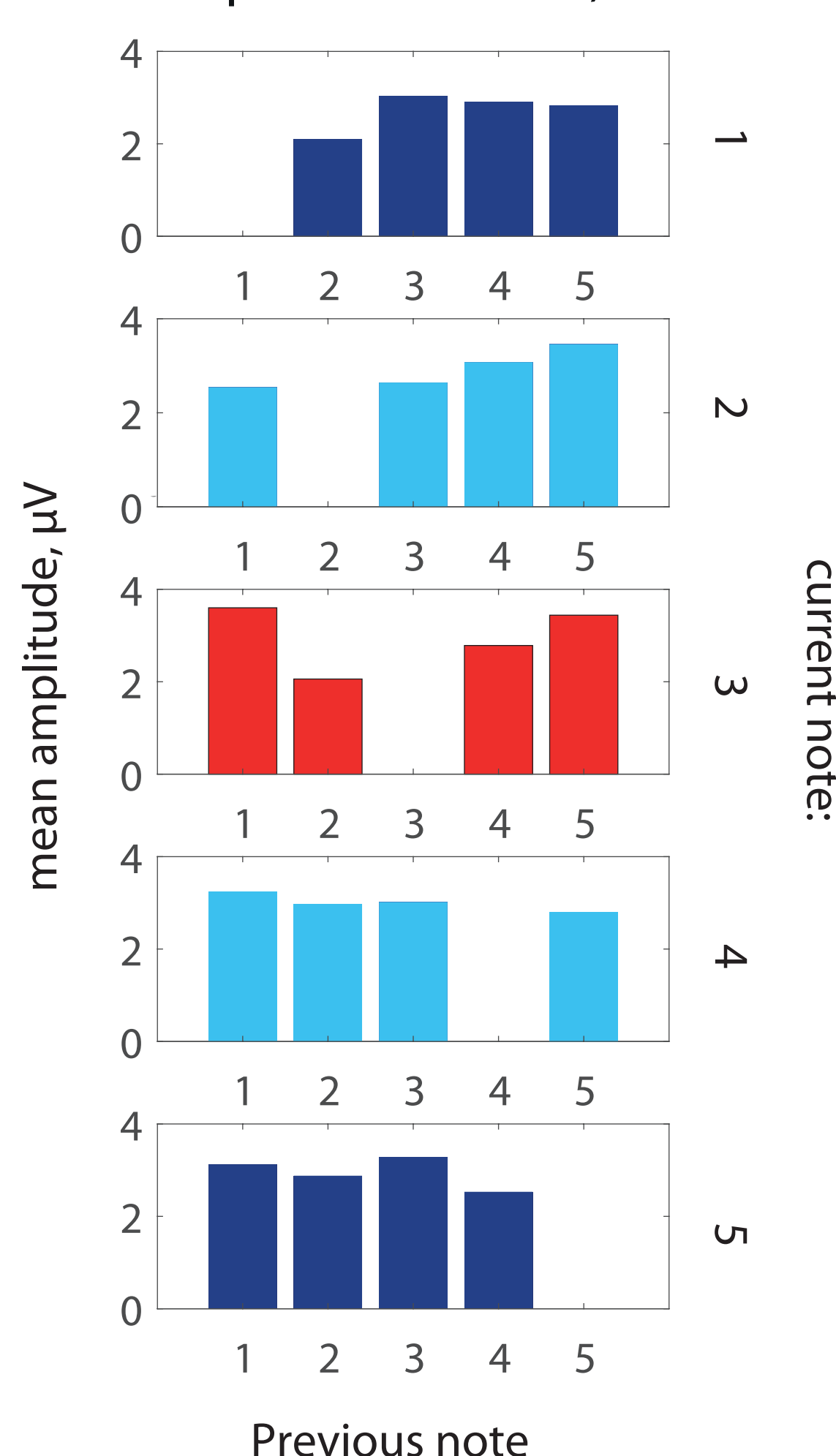
- N1 - modulated by distance from the mean**



- P2 - modulated by distance from previous note**



P2 peaks - block A, Cz

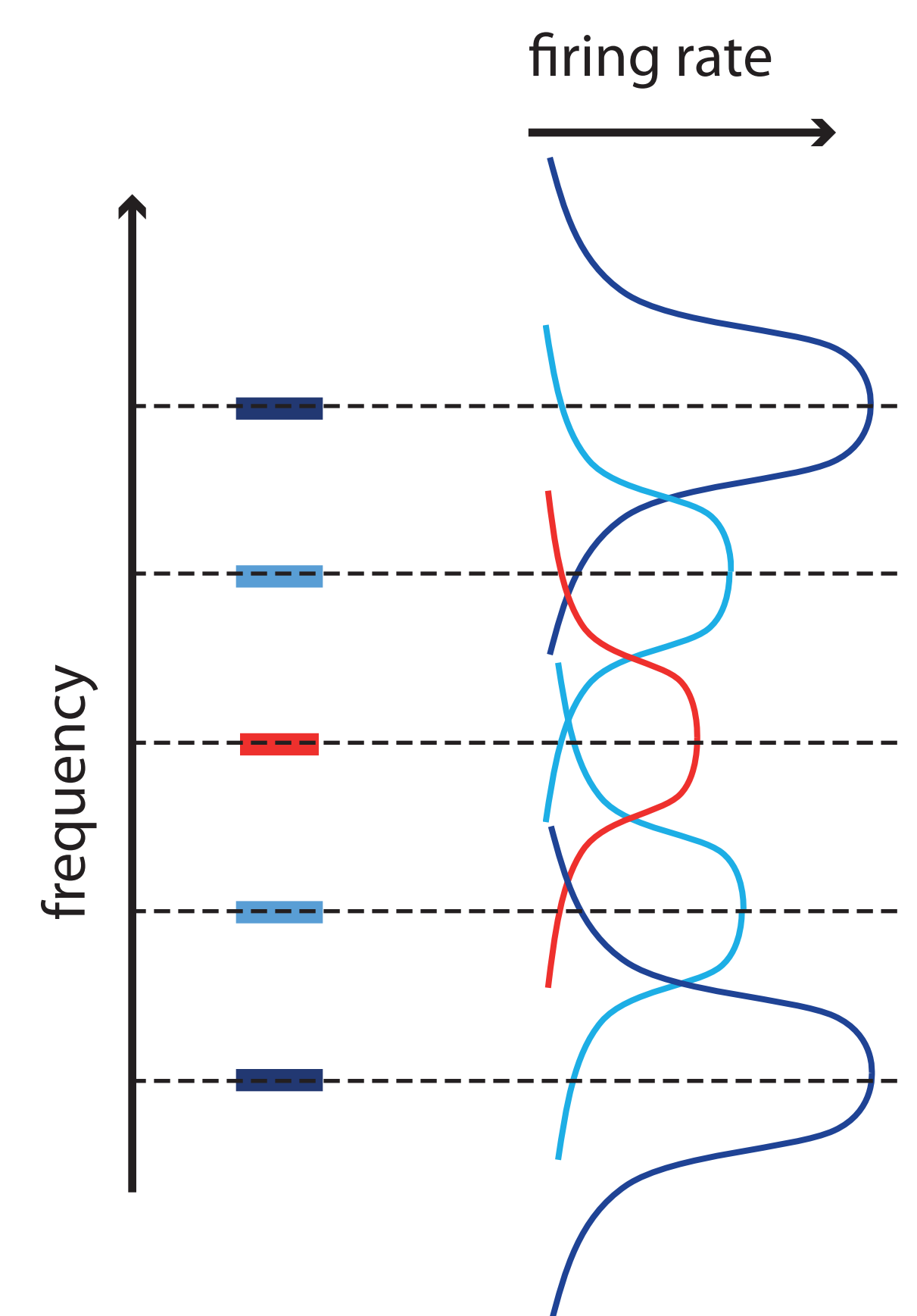


- Linear mixed effects analysis:

$$V \sim 1 + \text{distance from mean} + \text{distance from previous} + \text{current note} + (1|\text{subject})$$

dominant contribution:  $\uparrow$  N1  $\uparrow$  P2

## Model



- Neurons with wide frequency tuning curves cause co-adaptation by neighboring frequencies.
- Neurons responsible for the N1 response might have a longer time constant of recovery from adaptation, while neurons responsible for the P2 response have a shorter temporal constant.
- Allows estimation of temporal constants and width of tuning curves in the human cortex.

## Conclusion

- Evidence for neural representation of frequency distances on various timescales simultaneously in the human auditory cortex.
- N1 adaptation is based on a longer timescale than P2, which is more transient.
- Neural mechanism might be based on adaptation with wide frequency tuning curves and various temporal constants.