

## Background

- Synchronous audiovisual stimulation elicits enhanced attention relative to asynchronous or unimodal stimulation in infancy<sup>1</sup>
- Additionally, research indicates a preference for faces versus non-faces in infancy<sup>4</sup>
- However, it is not well understood whether synchrony differentially impacts the processing of face and non-face stimuli
- In the current study, **EEG data was collected to measure neural correlates of processing of social and non-social audiovisual synchronous and asynchronous stimuli**
  - Event-related potentials (ERPs) were examined, including:
    - **N290, P400**: associated with face processing and recognition
    - **Negative Central (Nc)**: associated with attention allocation and stimulus salience

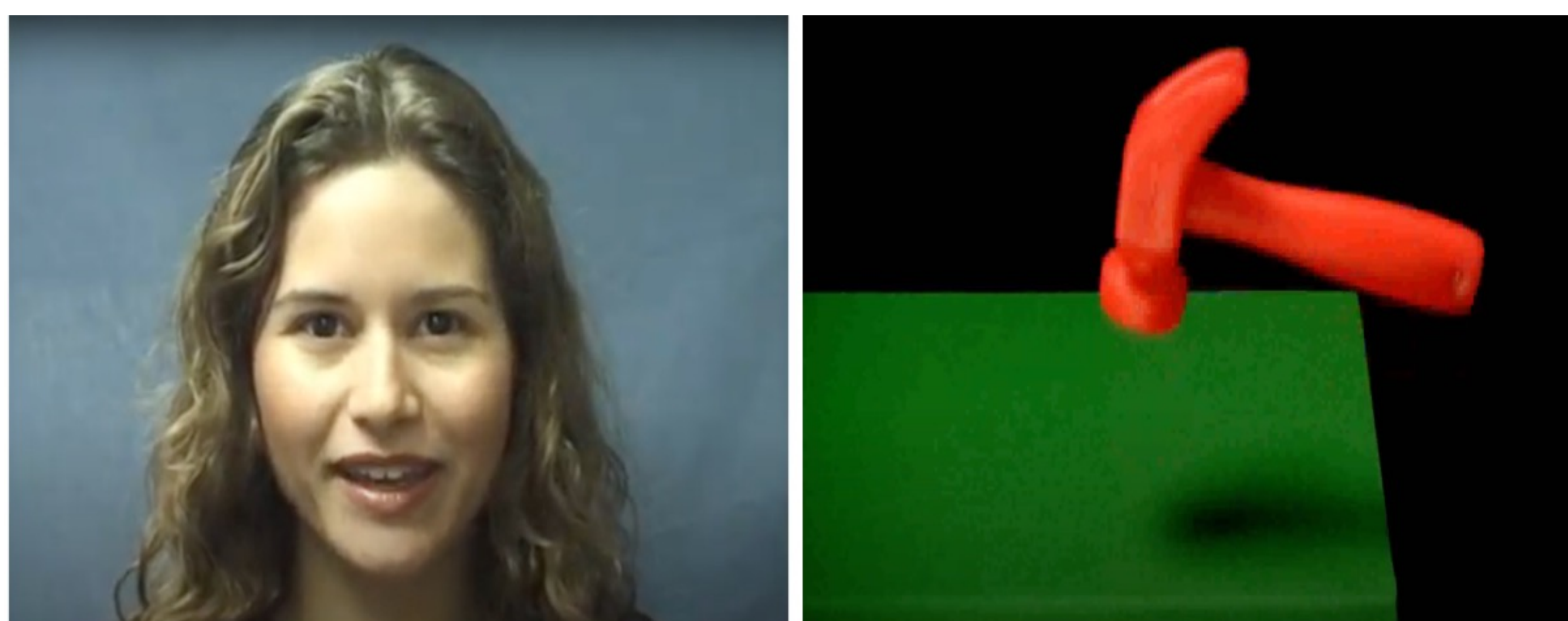
## Hypotheses

1. Synchronous stimuli will elicit a greater attentional response, reflected in the **Nc**, than asynchronous stimuli<sup>3</sup>
2. Synchronous-social stimuli will elicit a greater attentional response, reflected in the **Nc**, than synchronous-non-social stimuli
3. Both the **N290** and the **P400** will be greater in response to social than nonsocial stimuli, reflecting face specialization

## Method

### Participants:

- **12-month-olds (N = 16)** were included in analyses.
  - Gender: 7 male, 9 female
  - Race: 7 White, 5 Latine, 1 East Asian, 3 multi-racial (White, Latine, American Indian/Alaska Native)
- An additional 6 infants participated, but were excluded for insufficient data



Dynamic video presentations (social or non-social) were paired with audio tracks (synchronous or asynchronous)

**Procedure:** ERPs were recorded using a Magstim EGI 128-channel EEG system. Stimuli were presented at random.

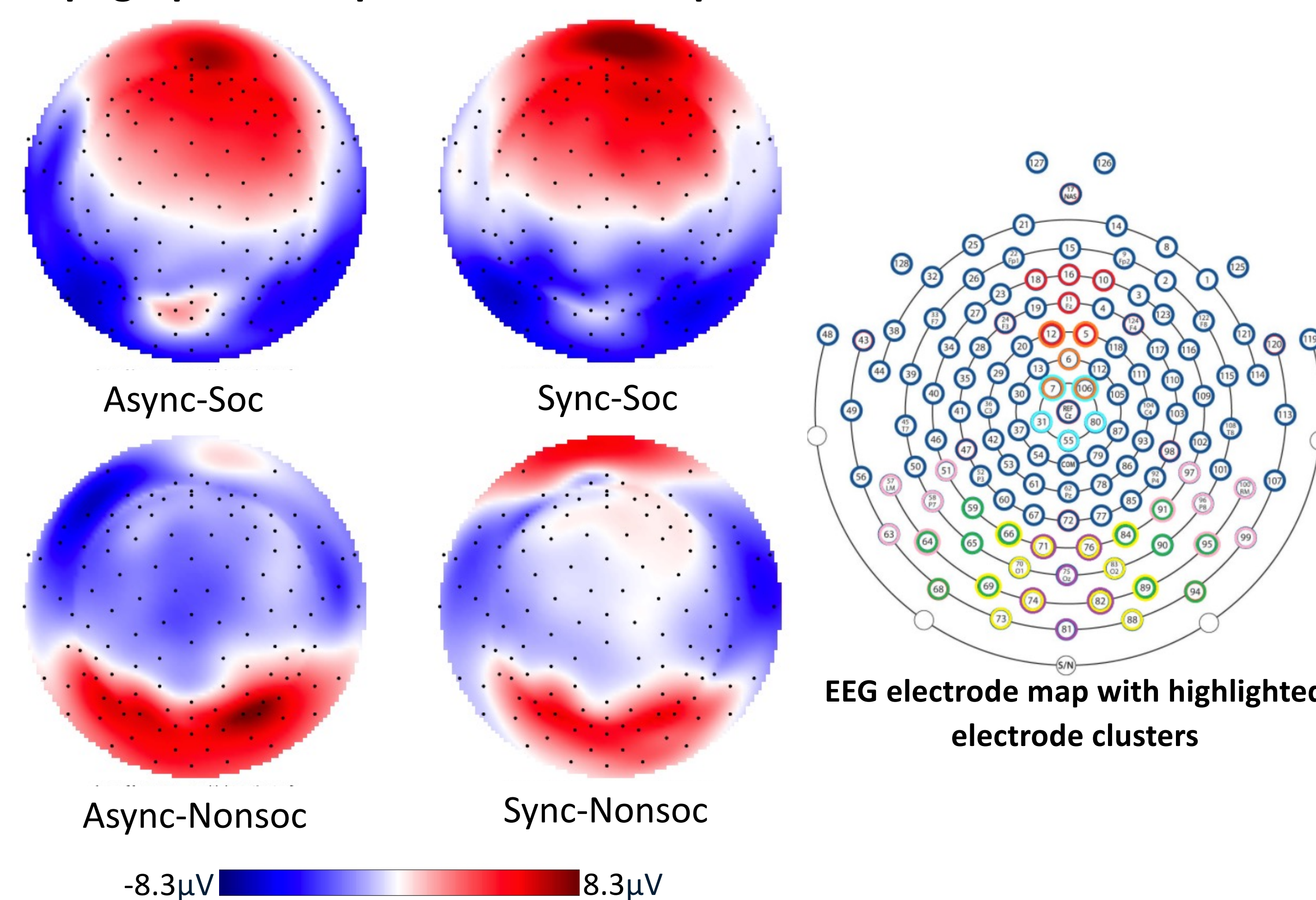
**Stimuli:** 1.75 s dynamic, audiovisual stimuli, including

- **Social:** video of a female actor speaking
  - **Synchronously** with the matching audio track (**Sync-Soc**)
  - **Asynchronously** with a mismatched audio track of the actor speaking (**Async-Soc**)
- **Non-social:** video of a hammer tapping 4-beat rhythm
  - **Synchronously** with the matching audio track (**Sync-Nonsoc**)
  - **Asynchronously** with a mismatched audio track of a 4-beat rhythm (**Async-Nonsoc**)
- **Data processing:** Raw EEG filtered with 0.10-30 Hz bandpass filter, the video was coded for looking, ERPs segmented 100ms before to 1000ms after stimulus onset, EEG inspected for artifact and poor recording, participants required to submit at least 10 trials per stimulus type

**Statistical Analyses:** Repeated-measure ANOVAs were used to test for effects of stimulus type (2: social, nonsocial), synchrony (2: sync, async), and electrode cluster on ERP amplitude.

- **N290:** Minimum amplitude at parietal occipital clusters (250-350 ms)
- **P400:** Maximum amplitude at occipital clusters (300-500 ms)
- **Nc:** Mean amplitude at the frontocentral clusters (300-500 ms)

### Topographical Map of N290 ERP Response

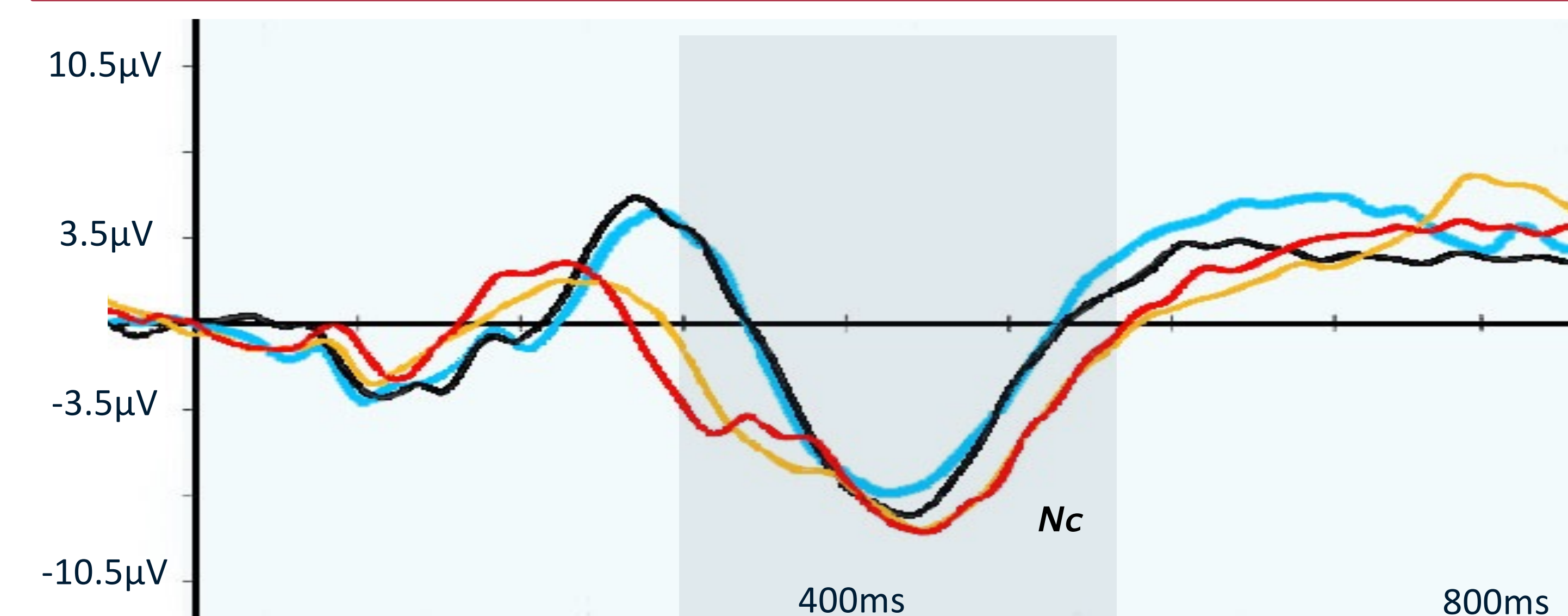


### References

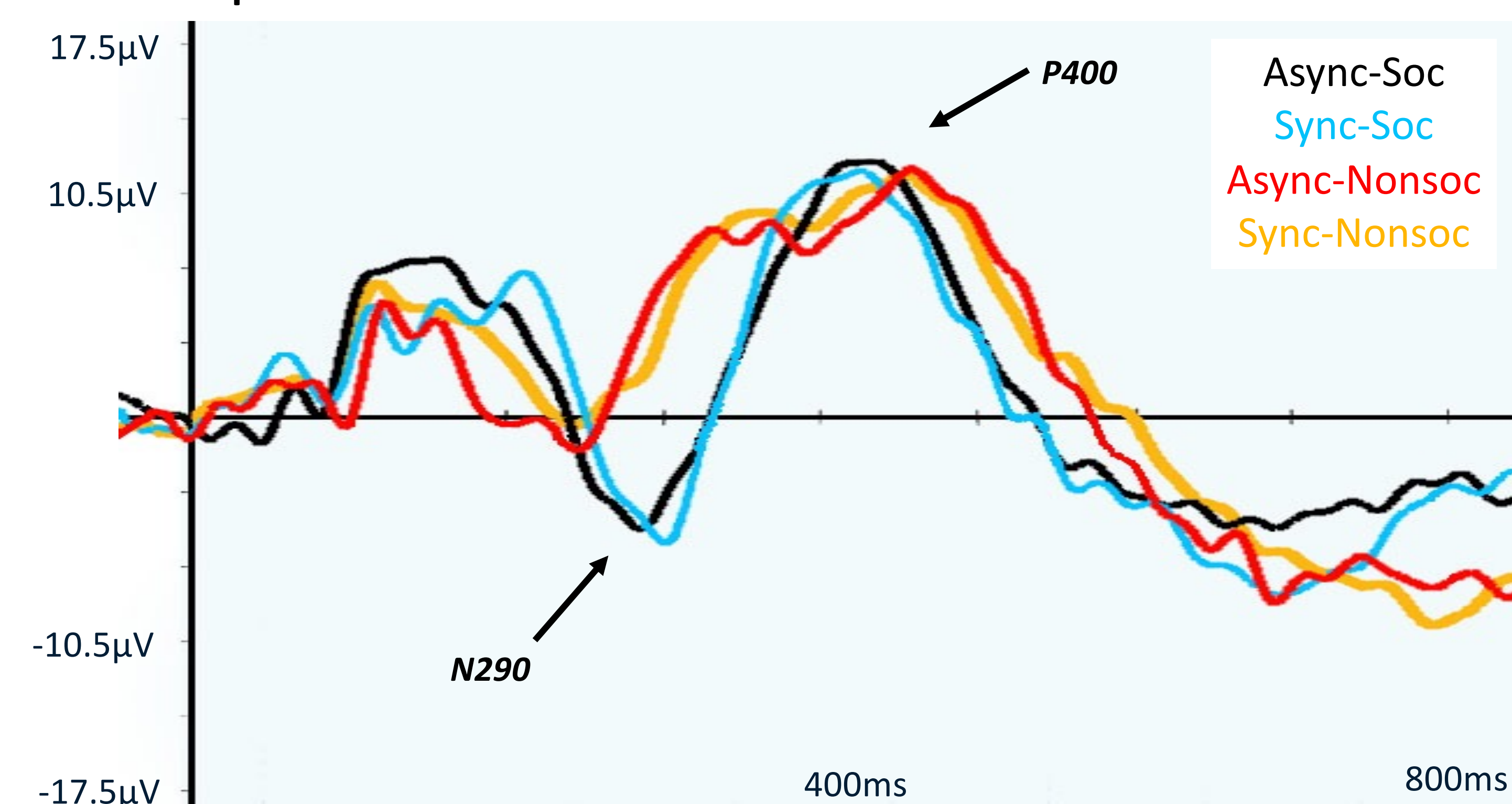
1. Bahrick, L. E., & Lickliter, R. (2000). Intersensory redundancy guides attentional selectivity and perceptual learning in infancy. *Developmental Psychology*, 36(2), 190–201. <https://doi.org/10.1037/0012-1649.36.2.190>
2. Conte, S., Richards, J. E., Guy, M. W., Xie, W., & Roberts, J. E. (2020). Face-sensitive brain responses in the first year of life. *NeuroImage*, 211, 116602.
3. Reynolds, G. D., Bahrick, L. E., Lickliter, R., & Guy, M. W. (2014). Neural correlates of intersensory processing in 5-month-old infants. *Developmental Psychology*, 50(3), 355–372. <https://doi.org/10.1002/dev.21104>
4. Reynolds, G. D., & Roth, K. C. (2018). The development of attentional biases for faces in infancy: A developmental systems perspective. *Frontiers in Psychology*, 9. <https://doi.org/10.3389/fpsyg.2018.00222>

## Results

- **N290** more negative to social than nonsocial stimuli,  $F(1, 14) = 11.5, p = .004$
- **P400** no significant effects
- **Nc** more negative to nonsocial than social stimuli,  $F(1, 14) = 8.22, p = .012$ 
  - However, these differences were accounted for by the strong positive peak for social stimuli immediately preceding the Nc
- **No impact of synchrony on any component**



### Nc ERP response at frontocentral electrodes



### N290 and P400 ERP response at occipitoparietal electrodes

## Discussion

- The **N290** is sensitive to faces in response to audiovisual stimuli
- The **P400** was not sensitive to stimulus characteristics
  - Corroborates literature indicating the P400 may not be a face-specialized component<sup>2</sup>
- The **Nc** was greater to social than non-social stimuli, however, a preceding positive peak muted effects evident in ERP plots
  - Future analyses will consider peak-to-trough distance to account for these waveform differences
- Sensitivity to synchrony was not observed at components examined
  - Potentially reflects stimulus selection and participant age