

Infant Selective Attention and Intersensory Processing of Audiovisual Speech

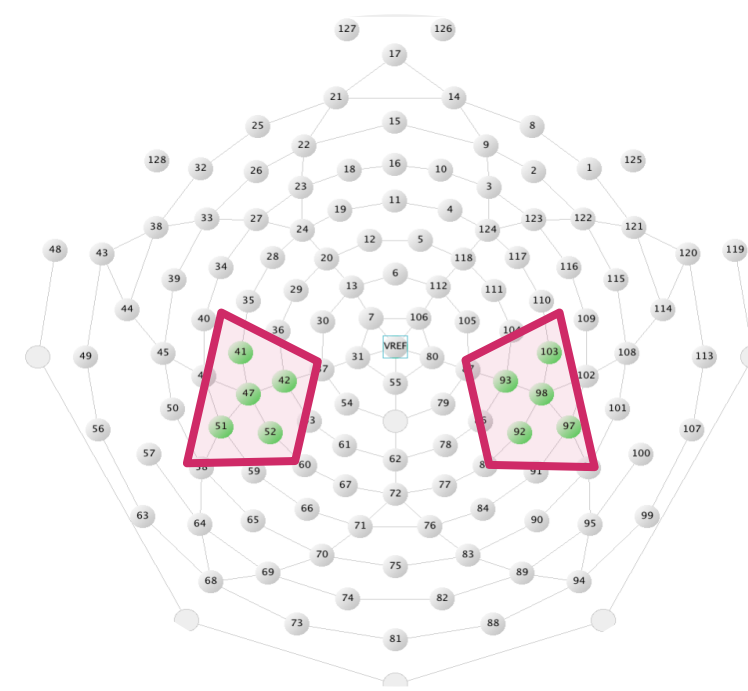
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Introduction

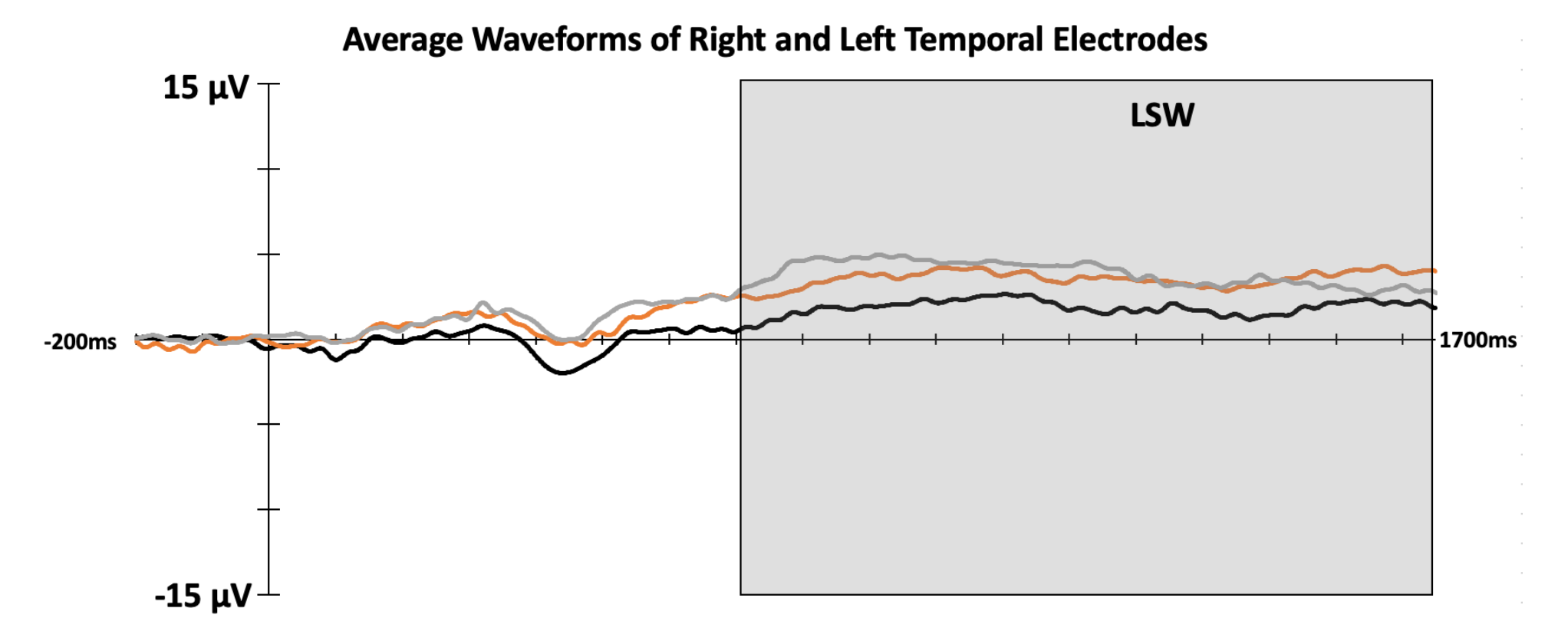
- Intersensory redundancy (IR) refers to simultaneous and synchronous presentation of amodal information across two or more sensory modalities.
- IR facilitates detection of amodal information in audiovisual speech events at the expense of modality-specific information (Flom & Bahrick, 2007; Bahrick et. al., 2019; Bahrick et. al., 2013)
- It is proposed facilitation is based on IR directing infant selective attention to amodal properties over modality-specific properties of multimodal events (Bahrick & Lickliter, 2000,2002,2014).
- No study has examined infants' ability to detect changes in both amodal (e.g., emotion or affect) and modality-specific (e.g., facial characteristics) stimulus properties conveyed within the same multisensory event.
- This study utilized high-density EEG and analyzed the late slow wave (LSW), an ERP component associated with recognition memory (de Haan & Nelson, 1999), to test the hypothesis that infants would recognize a change in amodal properties, but not modality-specific properties, of a familiar multimodal face stimulus when IR is present.
- Hypotheses:**
 - Synchronous group would detect amodal change (Novel Affect)
 - Asynchronous group would detect modality-specific change (Novel Face)

Results



Temporal Electrodes Synchronous (IR) And Asynchronous (no IR)

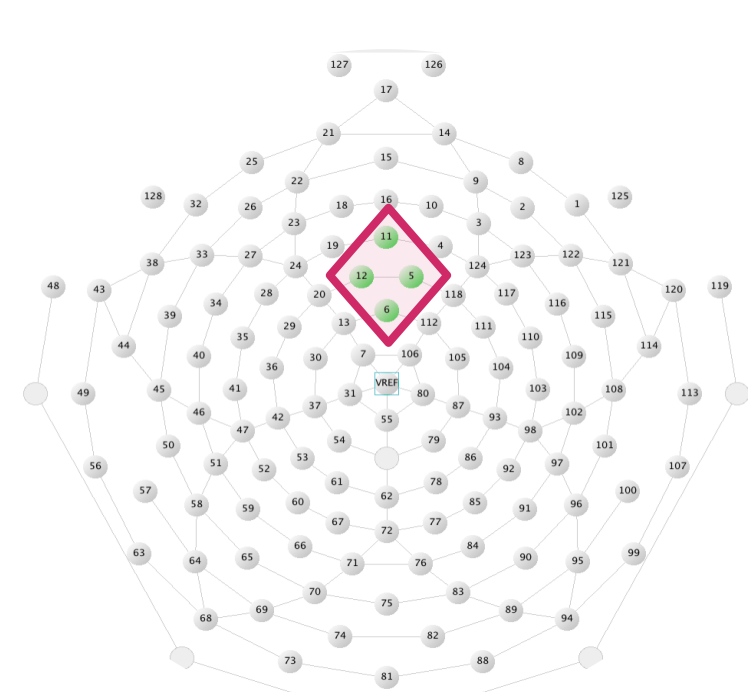
- Both conditions demonstrated effect of stimulus type
 - Familiar to Novel-Face
 - $t(34)=2.34, p=0.03$



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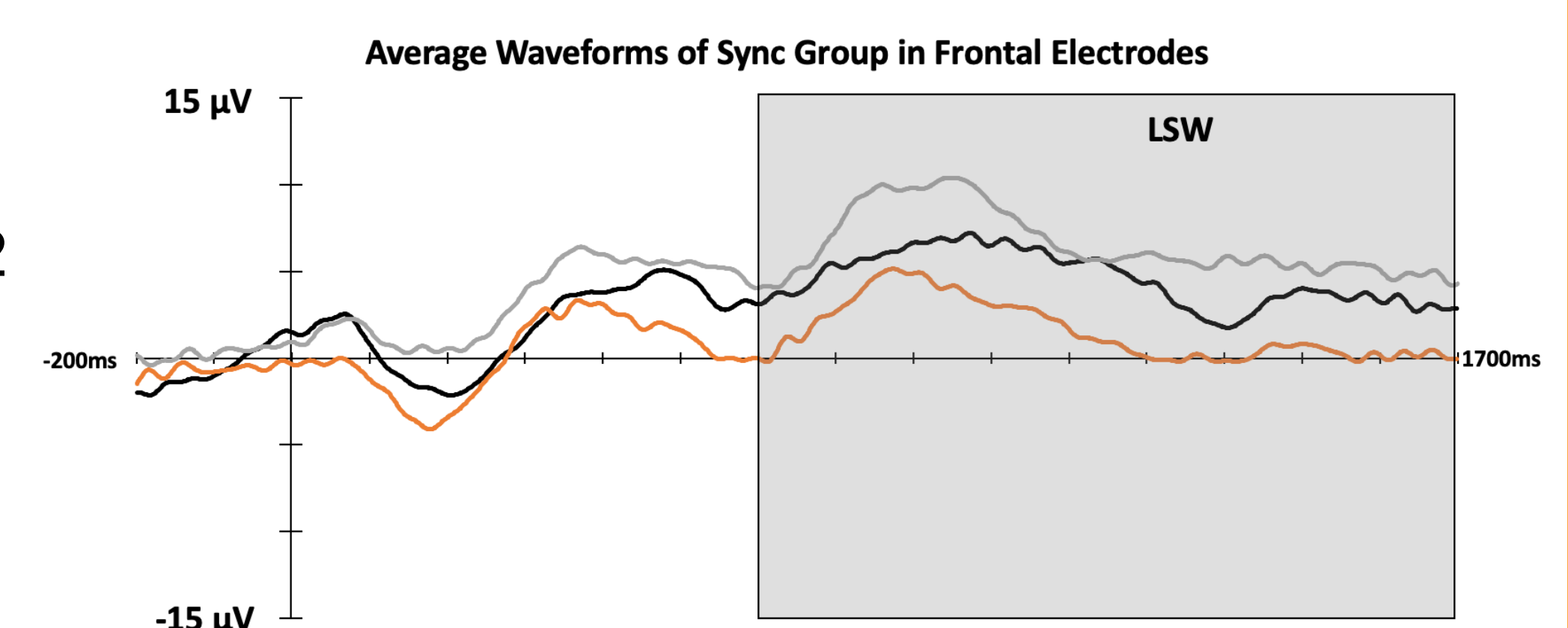
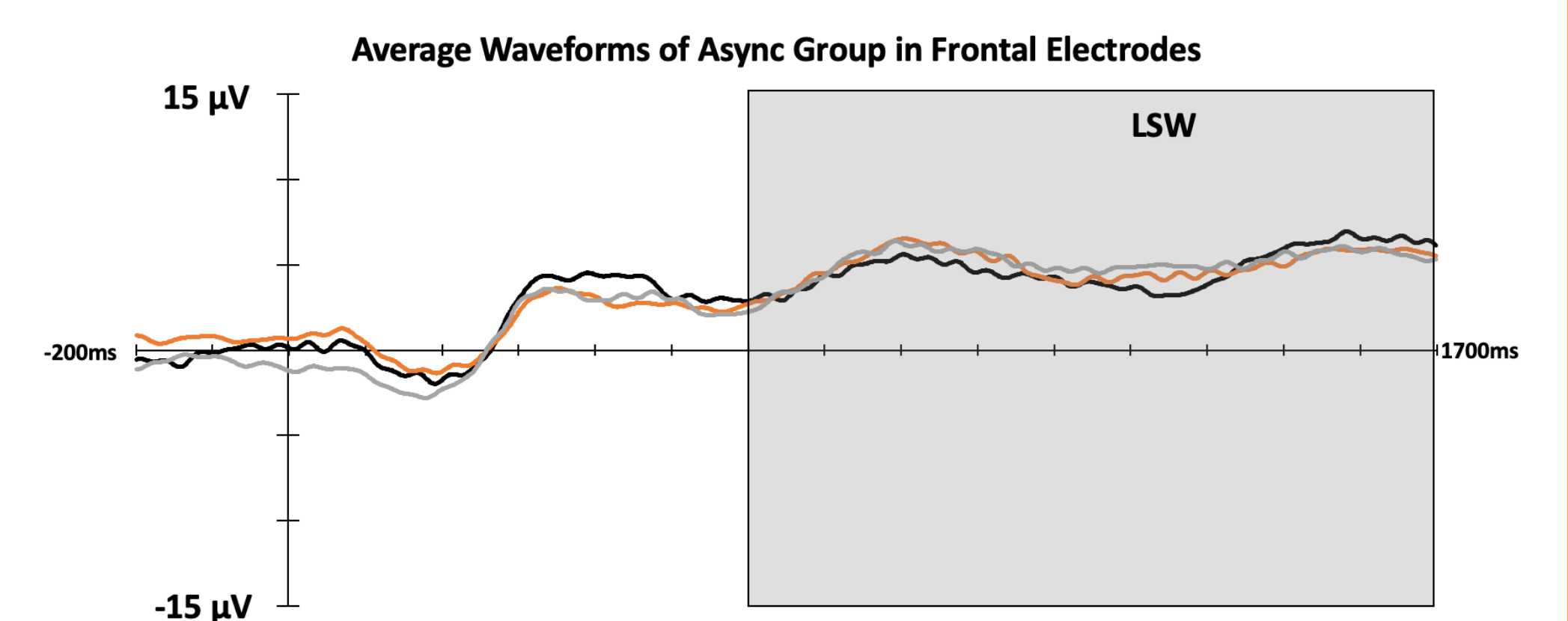
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Frontal Electrodes Synchronous (IR)

- Effect of Stimulus Type**
 - Familiar to Novel-Affect $p=0.02$
 - Familiar to Novel-Face
- Asynchronous (no IR)**
 - No Effect of Stimulus Type**
 - Familiar to Novel-Affect
 - Familiar to Novel-Face



Method

Participants

- $N=34$ Five-month-old infants
- $N=11$ Synchronous (IR), $N=23$ Asynchronous (no IR)

EEG Recording

- 124 channel EEG recording system
- Average reference
- 250 Hz sampling rate
- Band-pass filters from 0.3 to 30 Hz
- 20 K amplification

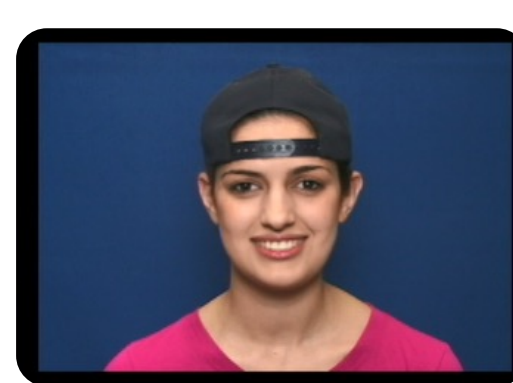
Stimuli

- 1.7s audiovisual clip of a woman speaking
- Conveying positive or negative affect

ERP Analyses

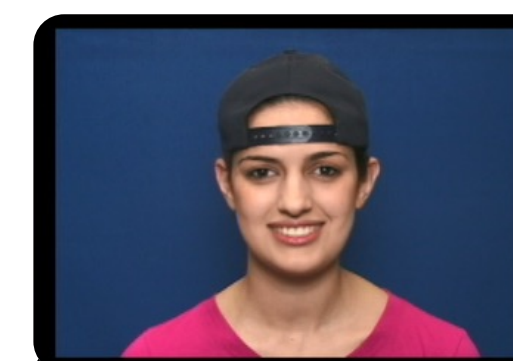
- Repeated-Measures ANOVA by Stimulus Type
- LSW analyzed as mean amplitude of ERP from 1000 – 1700ms post-stimulus onset

Phase 1: Familiarization



Same stimulus x20

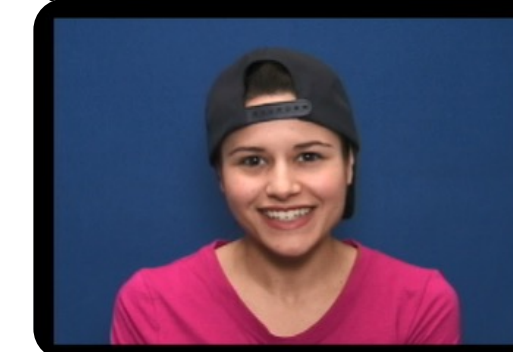
Phase 2: ERP Testing



Familiar



Novel-Affect



Novel-Face



Discussion

- At temporal electrodes, infants demonstrated significant differences in LSW amplitude between novel-face trials and familiar trials, regardless of whether they were tested in the synchronous or asynchronous condition; indicating infants can discriminate the familiar face from the novel face regardless of synchrony.
- At frontal electrodes, only infants provided intersensory redundancy in the synchronous condition showed significant differences in the amplitude of the LSW on novel-affect trials in comparison to familiar trials.
- No differences based on stimulus type were found at frontal electrodes for infants tested in the asynchronous condition.
- These findings indicate that intersensory redundancy facilitates 5-month-old infants' processing of amodal information (i.e., affect) provided by audiovisual speech.
- Intersensory facilitation of recognition memory for amodal properties of audiovisual speech may be associated with recruitment of anterior cortical regions.



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