

Intersensory Redundancy, Selective Attention, and Neural Correlates of Perceptual Processing in Infancy

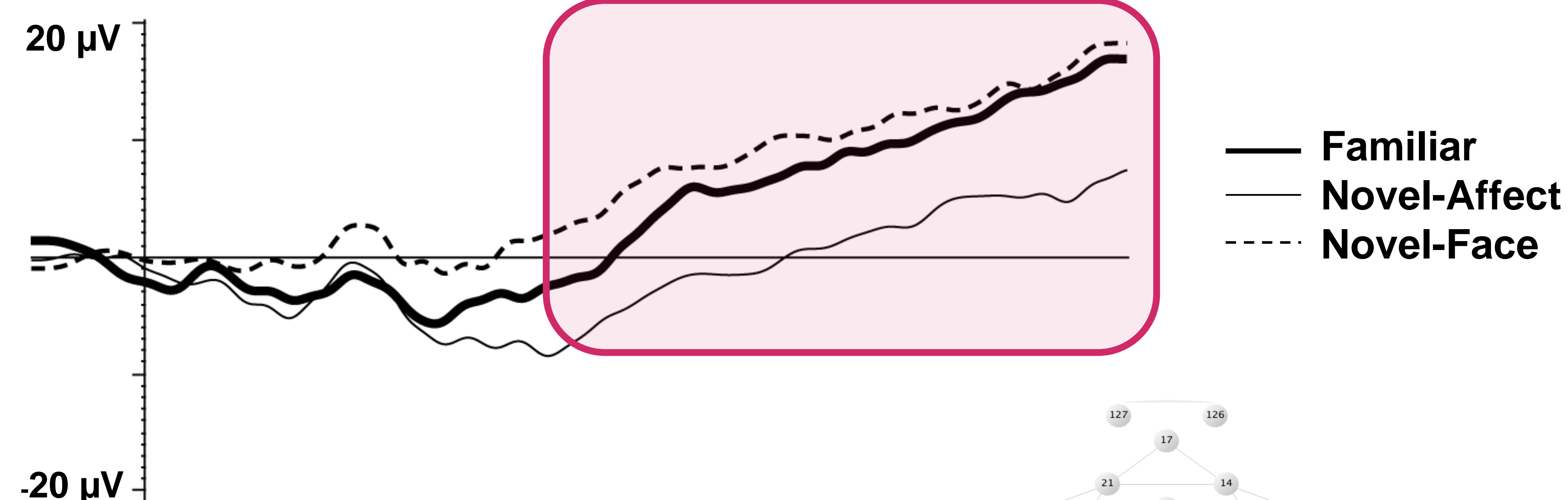
Kelly Roth¹, Lorraine E. Bahrick², Robert Lickliter², James T. Todd², & Greg Reynolds¹



Introduction

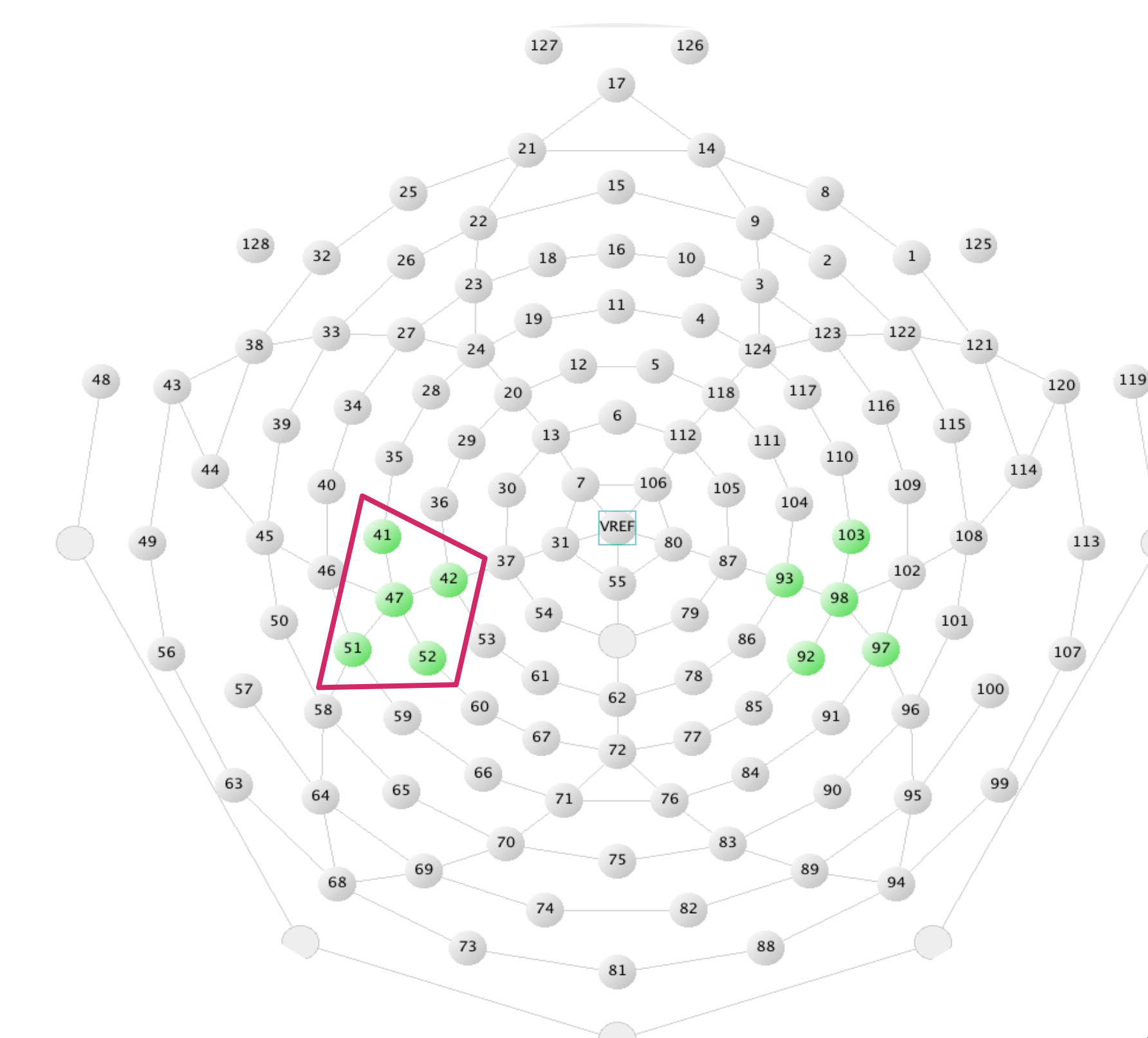
- Infants demonstrate enhanced attention and more efficient perceptual processing when provided with synchronous audiovisual presentations of a woman talking during initial learning in comparison to asynchronous audiovisual presentations or unimodal visual presentations of a woman talking. (Reynolds, Bahrick, Lickliter, & Guy, 2014)
- This intersensory facilitation is likely due to the intersensory redundancy provided by the synchronous and redundant presentation of perceptual information to multiple sense modalities.
- Bahrick and Lickliter (2012) proposed that intersensory redundancy leads to prioritization of selective attention to and perceptual processing of amodal information over modality-specific information provided by multimodal stimuli.
- This study utilized high-density EEG and analyzed the late slow wave (LSW), an ERP component associated with recognition memory, to test the hypothesis that infants would recognize a change in amodal properties, but not modality-specific properties, of a familiar multimodal face stimulus.
- We predicted that infants would demonstrate differential LSW amplitude to changes in affect (an amodal property) between familiar and novel face stimuli and no differences would be found based on changes in facial features (a modality-specific property).

Results



Late Slow Wave (LSW)

- Left Anterior Temporal
- Main Effect of Stimulus Type
- $F(2,32) = 4.40, p = 0.02, \eta_p^2 = 0.216$
- Post-hoc comparisons
 - Familiar to Novel-Affect $t(16) = 2.00, p = 0.06$
 - Familiar to Novel-Face $t(16) = -1.62, p = 0.22$



Methods

Participants

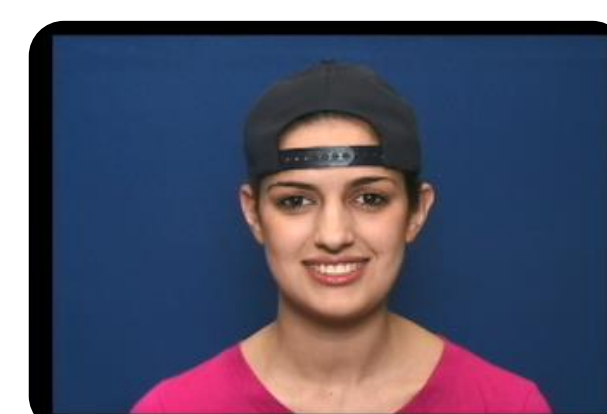
- $N = 17$ Five-month-old infants

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

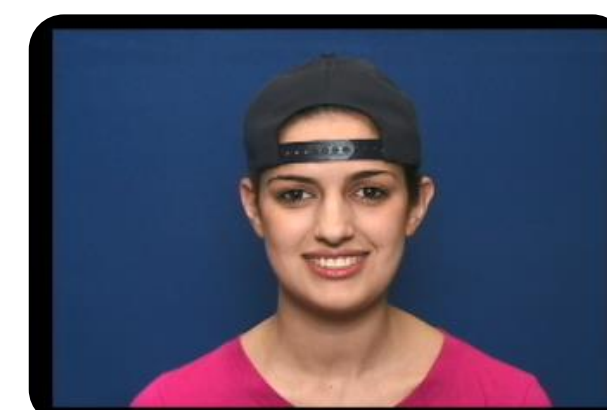


Phase 1: Familiarization

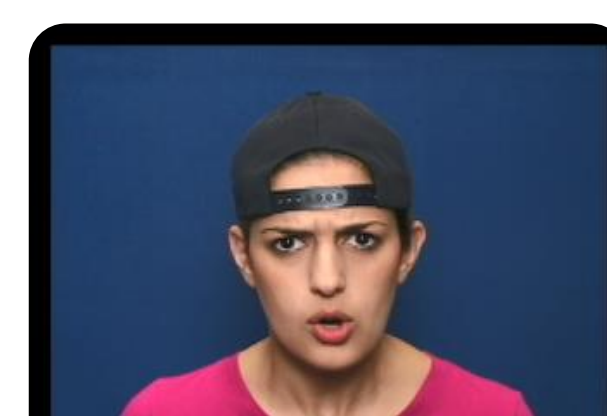


Same stimulus x20

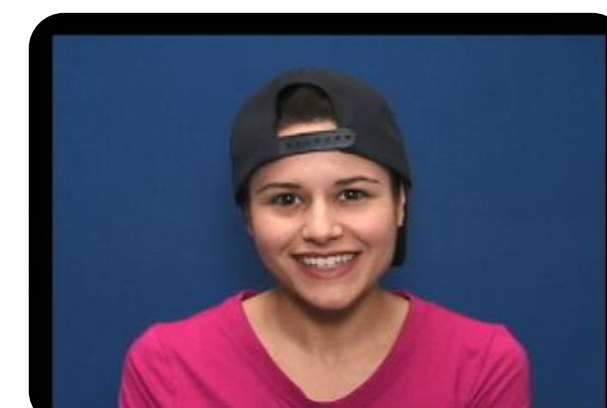
Phase 2: ERP Testing



Familiar



Novel-Affect



Novel-Face

Stimuli

- 1.7s audiovisual video clips of one of two women speaking a short phrase
- Conveying positive or negative affect

ERP Analyses

- Repeated-Measures ANOVA by Stimulus Type
- LSW analyzed as mean amplitude of ERP from 750 – 1700ms post-stimulus onset at temporal electrodes

Discussion

- Our analysis of the **late slow wave (LSW)** ERP component associated with infant recognition memory supported the prediction that the intersensory redundancy provided by audiovisual speech would lead infants to process the amodal property of affect during training over the modality-specific facial characteristics of the actor.
- At left anterior temporal electrodes, infants demonstrated significant differences in the amplitude of the **LSW** on novel-affect trials in comparison to familiar trials. In contrast, no differences were found for novel-face trials in comparison to familiar trials.
- These findings highlight the importance of initial learning conditions in directing infant selective attention and perceptual processing, and are among the first to identify neural correlates of intersensory facilitation involved in infants' processing of amodal information provided by multimodal face stimuli.