

# **Cortical Sources of Own- and Other-Species Face Processing in Infancy**

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# Introduction

- Perceptual narrowing is characterized by a narrowing of sensitivity from a broad range of stimuli in early development to a narrower range of stimuli commonly encountered in the native environment in later development (Maurer & Werker, 2014).
- Six-month-old infants are able to discriminate between monkey faces at the individual level. By 9 months of age, infants no longer demonstrate this ability, but they retain the ability to discriminate between individual human faces (Pascalis, de Haan, & Nelson, 2002).
- Studies utilizing ERPs have identified the P1 and N290 components as ERP components associated with face processing in infancy. The P1 is associated with low-level visual processing and categorization of faces and objects (Pekarjou et al., 2014), and the N290 is associated with more specialized face processing (de Haan, 2007).
- Work utilizing cortical source analysis on infant ERP data in response to human faces indicates that the P1 is generated in the lingual and parahippocampal gyri and the N290 is generated in the fusiform gyrus (Conte, Richards, Guy, Xie, & Roberts, 2020).
- The current study utilized cortical source analysis to identify the neural generator(s) of the P1 and N290 components for infants of 10 to 12 months of age during initial exposure to either human or monkey faces.

### **Participants**

• 30 infants, 10-12 months of age, shown either human (n = 19) or monkey (n = 11) faces

### **EEG** Recording

- 124 channel EEG recording system
- Average reference
- 1000 Hz sampling rate
- Band-pass filters 0.1- 30 Hz

#### **Procedure**

- Infants were shown 1000ms repeated presentations of a single monkey or human face during EEG recording
- Trials were separated into early (first 20 trials) and late blocks for analysis

#### **Cortical Source Analysis**

- Head measurements used to generate realistic head models and assign each participant a structural MRI from the Neurodevelopmental MRI Database
- A finite element method head model was then generated with source dipoles restricted to gray matter in ROIs
- Current density amplitude in source locations was estimated with the CDR technique and exact-LORETA (Pascual-Marqui et al., 2011).
- ERP data surrounding P1 (75-175ms) and N290 (225-300ms) time windows were used to estimate CDR values for each ROI.



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Methods

Repeated measures ANOVA: between subjects factor of species (monkey, human) and presentation (Early, Late) within subjects factor of ROI (anterior fusiform gyrus, posterior fusiform gyrus, lingual gyrus, parahippocampal gyrus).



(n = 11)

Gentle

human

(*n* =19)



## **Statistical Analysis**



- other-species faces.

Discussion

Our analysis of the cortical sources of the P1 may indicate an overlap in brain regions recruited during the early stages of visual processing of human and monkey faces. Infants showed greater CDR amplitude in the parahippocampal gyrus regardless of species. Previous cortical source analysis research found greater CDR amplitude in this area in response to faces than objects (Conte, Richards, Guy, Xie, & Roberts, 2020). The lack of significant difference in response to human vs. monkey faces may suggest 10- to 12-month-old infants maintain basic categories for faces which include

The greater recruitment of the anterior fusiform gyrus compared to the posterior fusiform gyrus in N290 generation response to human faces but not monkey faces may suggest increasing specialization of processing human faces by 10-12 months of age. This converges with prior research indicating that after 6 months of age, infants may rely on categorization of non-native stimuli instead of processing them at the individual level (Dixon et al., 2019; Nelson, 2001; Reynolds & Roth, 2018).

Future directions for this research aim to explore the role of initial learning conditions in face processing and the cortical sources associated with subordinate-level categorization of own and other species faces.







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