

# P6 Perceptual narrowing in speech and face recognition in infants:

## Domain-general vs. domain-specific mechanisms in attunement and its modification

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### Neural correlates of perceptual narrowing in speech and face processing in infants and adults:

#### Research Question:

- Can neural discrimination of non-native speech and other-race faces be maintained in the absence of behavioral discrimination as suggested by Scott et al. (2006) for monkey faces and Rivera-Gaxiola et al. (2005) for speech at 9 months? And are these effects also maintained in adults?
- **If perceptual reorganization is a domain-general process, we assume to find such residual neural evidence for speech and face processing**

#### Hypotheses:

- Speech perception: weaker neural mismatch response to a non-native compared to a native sound (Conboy & Kuhl, 2011)
- Face perception: weaker neural mismatch to other-race faces compared to same-race faces

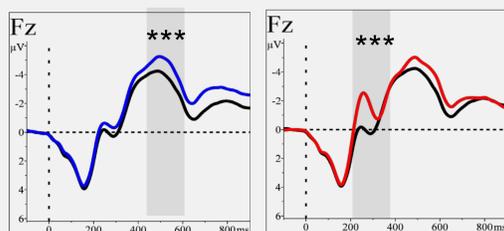
### Method

	Face	Speech
<b>Participants</b>	<ul style="list-style-type: none"> <li>• 24 German adults</li> <li>• 31 German 9-month-old infants (n = 12 included in analysis)</li> </ul>	<ul style="list-style-type: none"> <li>• 29 German adults</li> <li>• 28 German 9-month-old infants (n = 18 included in analysis)</li> </ul>
<b>Stimuli &amp; Paradigm</b>	Single Oddball <ul style="list-style-type: none"> <li>• Other-Race faces</li> <li>• Same-Race faces</li> </ul>	Double Oddball <ul style="list-style-type: none"> <li>• Tone Deviant Cantonese high-rising (T25) vs. mid-level tone (T33)</li> <li>• Vowel Deviant /e/ vs. /i/</li> </ul>

### Results: Adults

#### Speech

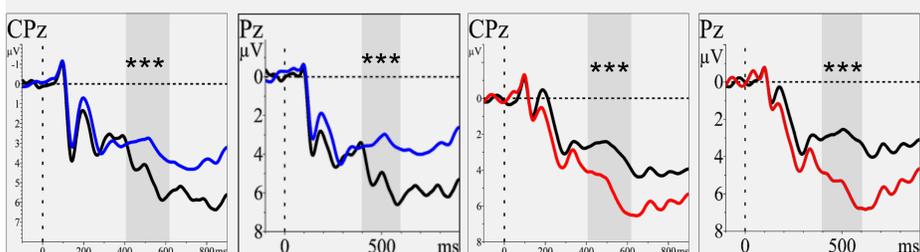
Standard vs. **Tone Deviant**  
Standard vs. **Vowel Deviant**



- Mismatch Negativity for Tone and Vowel Deviants in adults; stronger neural response for vowels compared to tones

#### Face

Asian Standard vs. **Asian Deviant**  
Caucasian Standard vs. **Caucasian Deviant**

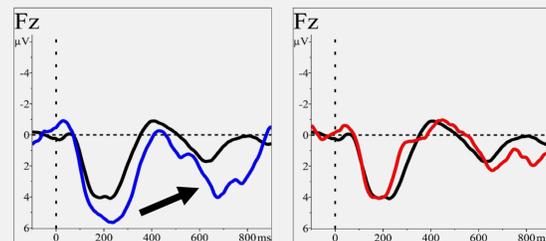


- Mismatch response to deviants for both (same- and other-race) faces; reversed polarity for Asian vs. Caucasian faces

### Preliminary results: Infants

#### Speech

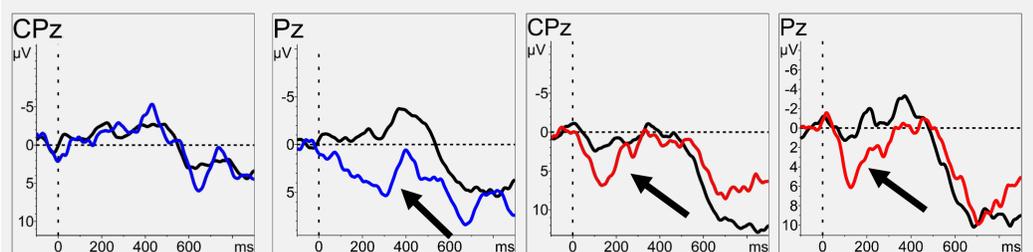
Standard vs. **Tone Deviant**  
Standard vs. **Vowel Deviant**



- In infants only mismatch response to tone deviant not to vowel deviant

#### Face

Asian Standard vs. **Asian Deviant**  
Caucasian Standard vs. **Caucasian Deviant**



- Mismatch response is less clear compared to adults; data suggests different ERP pattern for Asian vs. Caucasian faces

### Discussion:

- Adults show mismatch response to non-native tone contrast. This is in line with findings from our behavioral experiment (Götz et al., 2018)
- Adults show for both (same- and other-race) faces a mismatch response, but the other-race effect is manifested in a reversed polarity for Asian vs. Caucasian faces
- Preliminary results from infants provide evidence of neural maintenance of tone discrimination at an age where behavioral discrimination was not found (Götz et al., 2018)
- Preliminary results from infants' face perception indicate a mismatch response to other-race as well as same-race faces; additionally the data suggest different ERP pattern for Asian vs. Caucasian mismatch responses (e.g., at CPz electrodes)
- Preliminary results from infant data may indicate residual neural evidence of non-native speech and other-race face perception

### Research questions for second funding period:

#### Neural underpinnings of perceptual narrowing in speech and face perception using fNIRS

- Does perceptual narrowing between the ages of 6- and 9-months go along with changes in the brain regions that are activated during the processing of speech and faces?
- Comparing hemodynamic responses to the exposure to native or non-native speech or own- and other-race faces.

### References:

- Conboy, Barbara T. & Patricia K. Kuhl. 2011. Impact of second-language experience in infancy: brain measures of first- and second-language speech perception. *Developmental science* 14(2). 242–248.
- Götz, Antonia, H. Henny Yeung, Anna Krasotkina, Gudrun Schwarzer & Barbara Höhle. 2018. Perceptual Reorganization of Lexical Tones: Effects of Age and Experimental Procedure. *Frontiers in psychology* 9. 477.
- Rivera-Gaxiola, Maritza, Juan Silva-Pereyra & Patricia K. Kuhl. 2005. Brain potentials to native and non-native speech contrasts in 7- and 11-month-old American infants. *Developmental Science* 8(2). 162–172. doi:10.1111/j.1467-7687.2005.00403.x.
- Scott, Lisa S & Charles A Nelson. 2006. Featural and Configurational Face Processing in Adults and Infants: A Behavioral and Electrophysiological Investigation. *Perception* 35(8). 1107–1128. doi:10.1068/p5493.