**Introduction**

Behavioral Studies of Infant Speech Perception

- Effects of the ambient language on infant speech perception are noted by the 2nd half of the first year.
- By 10-12 months of age, infants behaviorally discriminate native phonetic contrasts to a far greater degree than nonnative contrasts. 1,2
- There is improvement in discrimination of native contrasts from 6-12 months3 and a decline in discrimination of nonnative contrasts.1,2,4
- At 6-8 mos., infants discriminate many nonnative consonant contrasts at similar levels as native contrasts1,2,3 and at 8-10 mos. They perform at a level intermediate to 6-8 and 10-12 month-olds. 1,2

- A previous study4 demonstrated that the decline in nonnative discrimination could be reversed at 9-10 months when infants were provided with naturalistic experience with a language containing the nonnative contrast. However, audovisual or audio-only exposure to the language from a DVD did not result in phonetic learning.

**ERP Studies of Infant Speech Perception**

- Event-related potentials (ERPs) are averaged scalp recordings of cortical activity time-locked to a stimulus. ERP studies of speech perception in infants have revealed a mismatch detection response (mismatch negativity) to native contrasts, which resembles, but is not identical to, the phonological MMN in adults.14
- The MMN is an enhanced negativity to the less frequent (deviant) stimulus compared to the more frequent (standard) stimulus, elicited preattentively in oddball tasks.

- Using a double-oddball ERP paradigm, Rivera-Gaxiola and colleagues observed changes in ERPs to native (English) and nonnative (Spanish) Voice Onset Time (VOT) vocing contrasts from 7 to 11 months in infants from monolingual English homes.7
- By 11 mos. all infants showed a greater amplitude negativity to the deviant vs. standard stimulus (N250-550 effect) for their native contrast (English /d/-/t/), but the N250-550 effect to the nonnative contrast (Spanish /d/-/t/) was significantly reduced or absent. 7,4
- At 11 mos., the absence of a N250-550 effect to the nonnative-language contrast, in the absence of experience with that language, was linked to faster subsequent vocabulary acquisition in the native language, indicating a more advanced stage in primary language acquisition. 6

References


**Research Questions**

1. **After short-term experience with Spanish**, do infants from monolingual English homes show a mismatch response (N250-550) to a Spanish voicing contrast (lead vs. short-lag voice onset time), a phonetic contrast that is not linguistically relevant for English?

2. **Are there individual differences across infants?**

**Methods**

**Participants:** 20 infants from monolingual English-speaking homes (12 female). All infants were full-term, and had experienced no more than 2 ear infections. One infant (female) refused to wear the ERP cap for the post-tests. Two others were excluded due to excessive artifacts.

**Study Design:** All infants completed the following tasks in the same order:

- **ERP Testing:**
- **Procedure:**

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Stimuli: Double-oddball paradigm (Rivera-Gaxiola et al., 2005a,b)</th>
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<tbody>
<tr>
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<td>Spanish Deviant <em>ms</em></td>
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<td></td>
<td>Voice Onset Time (VOT)</td>
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<td>9.5 - 10.5 months 12 Spanish sessions</td>
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<td>9 months (pre-tests)</td>
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<td>11 months (post-tests)</td>
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This poster results only on the 11 month (post-exposure) ERP syllables results. This ERP syllables results.

**Results**

- At the group level (n=17), larger N250-550 peak amplitudes were noted to the deviant vs. standard for both contrasts across all electrode sites: Stimulus, F(2,16)=3.6, p<.05 (H-F) (Fig. 1). There was no significant difference between the N250-550 amplitude for the Spanish vs. English deviant. Over the electrode sites F2, Cz, Pz, Fp1/2, F34/1, C34/1, Czp1/2, the N250-550 effect was significant for both Spanish, F(1,16)=4.5, p<.05 (H-F) and English, F(1,16)=8.1, p<.01 (H-F).
- Inspection of individual infants’ data indicated that approximately 2/3 of the sample (n=11) showed a reliable mismatch (N250-550) effect to Spanish over multiple electrode sites (Figure 2) whereas the remaining infants (n=6) did not show the effect (Figure 3).

**Discussion**

- Infants with short-term exposure to Spanish at 9-10 months showed an ERP mismatch response to a phonemic contrast from that language (prevoiced /da/ vs. voiceless-unaspirated /ta/) at 11 months. The group level results indicate a larger mismatch effect for the Spanish than that reported in previous studies of 11-month-old infants without exposure to Spanish who were tested on the same paradigm.
- However, a subgroup of infants did not exhibit the mismatch negativity to Spanish.
- We are currently exploring correlates of these individual differences in phonetic learning, including cognitive flexibility/control factors and social-cognitive abilities. Preliminary analyses are indicating better visual attentional and cognitive control skills in the infants who showed the mismatch response.