Consequences of short-term language exposure in infancy on babbling

Nancy Ward\textsuperscript{1}, Megha Sundara\textsuperscript{1,2}, Barbara Conboy \textsuperscript{2,3} & Patricia K. Kuhl\textsuperscript{2}

\textsuperscript{1} UCLA Department of Linguistics, \textsuperscript{2} Institute for Learning & Brain Sciences, University of Washington, Seattle, \textsuperscript{3} Department of Communicative Disorders, University of Redlands

**Short-term Exposure in Infancy**

- In the first year of life, the ability to discriminate native contrasts increases.
- The ability to discriminate (at least some) non-native contrasts reduces.
- The decline in the discrimination of non-native phonetic contrasts can be reversed with as little as 5 hours of short-term exposure to a non-native language [4].

**Research Question**

**Is production by infants also affected by short-term exposure to a non-native language?**

**Experimental Design**

- **Subjects:**
  - 9-10-month-olds from monolingual English-speaking homes (n = 15).
  - Exposed to Spanish for 5 hours over 6 weeks (12 25-minute sessions).
- **Post-exposure recording sessions:**
  - Same infants (now 11-12-month-olds) in play sessions with:
    - (a) an English-speaking parent and
    - (b) a Spanish-speaking research assistant.
  - 30-minute recording sessions (or until the infant fussed out).
  - Recording set-up:
    - A wireless microphone attached to the infant's clothing.
    - Another wireless microphone attached to the adult.
  - 2 infants (4, 9) were excluded because they only participated in one babbling session.

**Infant Data Coding**

- Babbling coding based on Ravachew et al. (2002).
- Excluded:
  - Screams, cries, and laughter
  - Bad recording quality or with adult speaking over the child
- Infant vocalizations annotated as "utterances":
  - Single vocalizations or sequences flanked by > 450 ms of silence
  - With normal phonation
  - All had durations between 500ms and 5000ms
  - Then, transcribed consonant-like or vowel-like element
  - Voculars further classified as fully resonant or quasi-resonant
- Utterances classified as [7]:
  - Canonical syllables (CS): "At least one consonant (excluding glottals) and at least one fully resonant vowel, joined by formant transitions between 25 and 120 ms duration with total syllable duration between 100 and 500 ms."
  - Marginal syllables (MS): consisting of CV and VC syllables but do not meet criteria for canonical syllable.
- Fully resonant vowel (FRV): at least 2 measurable formants, with resonances above 1200 Hz.

**Acoustic evaluation of Babbling**

Based on input differences in English / Spanish, babbling may be distinguishable acoustically using:

- Supra-segmental differences: Evidence of differences from monolingual 11 to 12-month-olds learning several spoken languages and also for sign language.
- Segmental differences: Fewer studies, and evidence of differences from monolinguals 11 to 12-month-olds is mixed.

Here, we look at two supra-segmental characteristics:

- Utterance duration
- Utterance syllable count (monos vs. multisyllabic)

**Comparison of English and Spanish session**

Infants produced comparable number of utterances in the two babbling sessions.

**Perceptual evaluation of babbling**

Previous results on perceptual evaluation of babbling by monolingual 12-20-month-olds are mixed:

- Native listeners failed to distinguish the babbling of English, Russian, and Chinese-learning 5-7, 10-11, and 16-17-month olds (Atkinson et al., 1968).
- Native listeners were able for (some pairings) to distinguish babbling from French, Arabic, and Chinese 8- and 10-month olds (Boysson-Bardies et al., 1984).
- Trained phoneticians were able to distinguish reduplicative babble from French and Arabic 6- and 8-month olds (Boysson-Bardies et al., 1984).
- Depending on the subset of babbling used, trained phoneticians were sometimes able to identify babbling from 12- and 18-month olds as English or Swedish (Engstrand et al., 2003)

**Perceptual Experiments**

- **Subjects:**
  - 10 native English speakers and 5 native Spanish speakers
- **Tasks:**
  - Naive listeners:
    - Hear two babbling utterances separated by 750 ms.
    - Asked: "Which was from the English-speaking baby?"
  - Trained phoneticians:
    - Hear one babbling utterance
    - Identify as English or not English
  - Stimuli:
    - All canonical syllables and marginal syllables.
    - Naive listeners:
      - Blocked by speaker (randomized for each subject) and random order played within the block.
      - Randomly selected from each language setting for comparison.
      - Counterbalanced by position of the utterance (1st/2nd) across subjects.
    - Number of stimuli from parent and exposure sessions were matched by deleting extra utterances from the longer list.
    - Trained phoneticians:
      - Blocked by syllable type, randomized for each subject by speaker.
    - Results:
      - There were no statistically significant results for either the trained phoneticians or the untrained listeners.
      - We believe that these listeners may have been focusing on segmental rather than supra-segmental cues.

**Conclusions**

- 12-month-old monolingual English-learning infants with short-term exposure to Spanish produced comparable number and types of utterances in a babbling session with their parent and the Spanish-speaking RA.
- With just 5 hours of exposure, consistent with the differences in English and Spanish input:
  - Infants’ utterances were systematically longer in the Spanish session.
  - Infants produced more multi-syllabic utterances in the Spanish session.
- Neither phonetically trained adults nor naive listeners were able to reliably classify the utterances produced in the English and Spanish session.

**Future Steps**

- Recording monolingual and bilingual infants for comparison.
- Follow-up of acoustic evaluation:
  - Acoustic analysis of the rhythmic (e.g. %Vowel duration) and intonational (e.g. F0 range and profiles) qualities of the babbling.
  - Acoustic analysis of infants’ vowels (F1-F2 plots) evaluating segmental effects.
- Follow-up of perceptual evaluation:
  - Low pass filtering the babbling stimuli to look whether listeners can use supra-segmental information when not distracted by segmental information.

**References**


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