Cross-linguistic Influences on Infant Vowel Productions

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Introduction

- The age at which ambient language begins to shape vowel categories to be language specific is still controversial with some researchers stating that cross-linguistic differences do not emerge until well after the emergence of meaningful speech [1].
- Previous studies have reported cross-linguistic variation in the location of the centre of the infant vowel space in the prelinguistic period [2, 3].
- Efforts to document cross-linguistic differences in vowel inventories have been hampered by small sample sizes and unreliable transcription of infant speech.

Purpose of study

- To expand on this earlier work by searching for cross-linguistic differences in infant production of grave corner vowels in a study involving large samples of both infant vocalizations and adult listeners.

Hypothesis

- Cross-linguistic differences is found in the frequency of occurrence of the vowel /u/ in the grave corner vowel of the infants’ vowel spaces, reflecting differences in the inventory of high vowels found in English versus French.
- More grave vowels will be observed in both language groups as infant age increases.
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Participants

- Canadian infants aged between 8 and 18 months who were learning either English or French (nCE = 24; nCF = 29).

Listeners

- 5 adult Anglophones and 5 adult Francophones with experience in phonetic transcription.

Method

- Vowel selection:
  - The first formant (F1) and second formant (F2) frequencies of vowels produced within a canonical syllable [1] were obtained.
  - The diffuse-compact (F2-F1) and grave-acute ([F1+F2]/2) [4] features were calculated for each vowel.
  - The vowels with most extreme 10% values with respect to these features in each sample were selected, yielding a set of 582 infant vowels.
- Participants

- Infants
  - 5 adult Anglophones and 5 adult Francophones with experience in phonetic transcription.

- Procedure

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Figure 1. Corner vowels selected from the infants’ speech samples, plotted in F1-F2 space. In the adult system of both language groups, vowels that are in the diffuse, compact, grave and acute corners should sound like [i], [u], [a] and [o] respectively. Notice that the selected infant corner vowels are overlapping and also some of these vowels may not sound like adult corner vowels.

Listener judgments:

- Corner vowels [i.e. those with maximum and minimum 10% value of (F1+F2)/2 and (F2-F1)] were submitted for perceptual judgment by native speakers.
- Listeners choose one out of [i], [æ], [u], [ɑ] or ‘other’ for each vowel.

Listeners’ judgments for vowels in the extreme 10% grave corner in the vowel space (minimum (F2- F1)) were submitted for statistical analysis.

- The Listener judgment for grave vowel was coded as ‘1’ for expected judgment (i.e. [u]) and ‘0’ for unexpected judgment (i.e. [i], [u], [æ], [ɑ] and ‘other’).
- Listener judgments were collapsed across listener groups and each vowel received a score ranging from 0-10.

Results

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Discussion

- Our finding of expansion of the infant vowel space with age towards its corners, in this case grave corner, is in line with previous research. More high-back vowels were perceived as infant age increases [3, 5, 6].
- Cross-linguistic differences in infant production of grave corner vowels (i.e. more [u’s in English sample] could be because /u/ appears to be strong attractor for CE infants.
- A support for this assumption is stemmed from:
  1. Less crowded English vowel space in which any variation on the production of /u/ for CE infants may result in a vowel that may not sound like any English vowel which is not the case for CF infants.
  2. Cross-linguistic difference in CE and CF infants’ preference to the corner vowels in which the preference for /u/ versus /i/ is maintained in 12-month old CE infants whereas CF infants show weaker preference for /u/ because both these vowels are phonemic in French [7].

Conclusion

- Early changes in infant vowel space are not due solely to maturation changes in oral structure and function; rather the process is more complex and involves the infant’s intake of ambient language input. This study supports the babbling drift hypothesis.

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References