Babbling and Ambient Language Input: Crosslinguistic Comparison of Corner Vowels of 10-18 Month-old French and Arabic Infants

Abdulsalam Alhaidary¹,² and Susan Rvachew¹

¹School of Communication Sciences and Disorders, McGill University, Montreal, Canada; ²College of Applied Medical Sciences, King Saud University, Riyadh, Saudi Arabia

Introduction

- Infant vocalization undergoes dramatic changes during the first years of life. For example, an infant’s vowel space emerges as small and centered on neutral vowels (/a/), and then as the infant matures, the vowel space expands toward its corners [1].
- Many variables in the infant’s environment contribute to the changes in the infant vowel space, such as the maturation of the vocal tract and the nature of speech input. However, the age at which ambient language begins to shape the vowel space to become language specific is still controversial.
- Previous cross-linguistic investigations reported differences in the location of the infant vowel space in the prelinguistic period [2, 3].

Purpose of the study

- The aim of this study is to examine the role of ambient language input on the characteristics of the corner vowels of Arabic- and French infants from 10-18 months of age.

Hypothesis

- Cross-linguistic differences in the pattern of the expansion of vowel space will be observed.

Method

Participants

- The participants were Arabic infants (n=27) raised in Saudi Arabia, and French infants (n=20) raised in Quebec from 10-18 months of age.

Procedure

- Each syllable was phonetically transcribed and coded according to infraphonological categories [4]—for example, the canonical syllable (i.e., speech-like).
- Only fully resonant vowels produced with normal phonation were considered for the analysis.
- The first formant (F1) and second formant (F2) frequencies were obtained to calculate the diffuse-compact (F2/F1) and grave-acute ([F1+F2]2) [5] features for each vowel.

Results

- Vowels with the most extreme values on the diffuse-compact and grave-acute dimensions were submitted for comparison.

- Multiple regression analyses revealed language effects on most compact and acute vowels.

With respect to the compact vowel, a significant language effect \( \beta = 265.2, t = 2.02, p < .0496 \) and a significant language-age interaction \( \beta = -0.76, t = 2.48, p < .017 \) were found. As age increased, Arabic infants showed a decline in compactness value \( \beta = -0.741; SE = 0.202; F(1.25) = 13.44, p = 0.001 \), whereas French infants showed no effects.

With respect to the acute vowel, a significant age effect \( \beta = -0.306, t = -2.33, p < .025 \) and a significant language-age interaction \( \beta = 0.348, t = 2.65, p < .011 \) were found. As age increased, French infants showed a decline in acuteness value \( \beta = 0.654; SE = 0.236; F(11.16) = 7.7, p = 0.012 \), whereas Arabic infants showed no effects.

Discussion

- Our finding that the periphery of the infant vowel space expands towards its corners with age is in line with the previous research [1]. This age-related expansion is consistent with the phonetic explanation about the changes that occur in babbling, for example, due to the immaturity of the vocal tract and oral motor control.
- However, the findings of the cross-linguistic differences in the compact and acute vowels of 10 to 18-month-old Arabic and French infants is evidence that supports the presence of linguistic environmental influences on babble due to language-specific exposure.
- Our findings are consistent with our recent findings [3] of cross-linguistic differences in the proportion of the [u] vowels in English and French data from ages 10-18 months (i.e., more [u]s are produced by English babies).

Conclusion

- This study shows early influences of language-specific exposure on infant corner vowels. Thus, the processes underlying infant babbling are influenced by a complex interaction of the biological development of the vocal tract and the input of ambient language. This study supports the babbling drift hypothesis.

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