

## **A study of the development of speech motor control using ultrasound recordings**

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In this talk, we explore the processes involved in the development of speech motor control using ultrasound recordings. More specifically, we investigate the effects of increased intraoral pressure on tongue positions and acoustic values in 4-year-old children and adult French speakers. In adult speakers, it is well known that cavity enlargement strategies, such as tongue advancement, are exploited in order to decrease intraoral (supraglottal) pressure and allow the maintenance of voicing in voiced plosives. Since in typically-developing children, the control of the tongue is not adult-like until the end of the first decade of life (Nittrouer et al., 1993), it is possible that those cavity enlargement strategies are not fully realized at that stage. The corpus consisted of CVC syllables, where C corresponds to one of the stops /b d/ and V is one of the vowels /i a u/. Target words were embedded in carrier sentences. Five 4-year-old children and five adult speakers (all native speakers of French) produced ten repetitions of each sequence. The audio signal, tongue shapes and intraoral pressure values were recorded using a digital camera, a Sonosite 180 plus ultrasound system, and the Pcquirer aerodynamic system. Formant frequencies, RMS values, duration and tongue contours corresponding to each vowel were extracted. For each initial consonant, duration, maximal intraoral pressure ( $IOP_{max}$ ) and tongue shape corresponding to  $IOP_{max}$  were also measured. Preliminary analyses show that even at 4 years of age, children produce [b] consonants (in [bVb] syllables) with tongue positions more similar to the upcoming vowel than adults do. Thus, 4-year-old children show larger anticipatory coarticulation than adults. Furthermore, children may not have the ability to use lingual cavity enlargement strategies (fronting the tongue body, for instance) in voiced stop consonants to maintain voicing despite increased IOP. It is hypothesized that motor control abilities and aerodynamic constraints shape children's phonetic implementation of the rhythmic structure in French (Goffman and Malin, 1999).

Nittrouer, S. (1993): "The Emergence of Mature Gestural Patterns is Not Uniform : Evidence from an Acoustic Study", *Journal of Speech and Hearing Research*, 36, 959-972.

Goffman, L. and Malin, C. (1999): "Metrical Effects on Speech Movements in Children and Adults", *Journal of Speech, Language, and Hearing Research*, 42 (4), 1003-1015.