The development of tongue gestures at the babbling stage

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Babbling is a developmental period which takes place in the age of 8 months through 12 months. It is characterized by the emergence of the first syllabic structures of the type /babababa…/. After having learned how to control its respiration and its phonation throughout the vocalization period, the baby will learn to open and close his vocal tract in a continuous rhythm during vocal emissions. Productions then seem to become more refined at the babbling stage, but are still under the influence of strong physiological constrains. Thus, babbling, defined as a speech precursor, is characterized by reduplicated mandibular movements and a relative inertia of the other articulators (MacNeilage 1998). The « Frame/Content » theory of MacNeilage assumes the dominance of mandibular activity at this stage and a limited implication of the tongue. Thus, a systematic intra syllabic correlation between consonants and vowels exists, resulting in several co-occurrence patterns. Initial position of the tongue would be maintained during several mandibular cycles. Experimental studies (Davis & MacNeilage 1995), for which babies' productions were transcribed from acoustical and video recordings, have confirmed the fact that bilabial consonants, such as [b], are primarily associated with [a], which can be produced with a quasi neutral tongue position, associated with jaw lowering, while coronal consonants, such as [d], mostly occur with front vowels like [e], and velar consonants mainly appear with back vowels like [u].

The aim of this work is to give an experimental assessment of this theory based on the association of articulatory and acoustic data. Assuming that speech motor control development could result in the dissociation of tongue and jaw movements, it is expected to observe a progressive decrease of tongue/jaw correlation with age.

To test this hypothesis, simultaneous acoustical and kinematic recordings were carried out on 27 subjects, between 8 months and 12 months of age. Jaw and the head movements were captured using Optotrack, and, since F2 is a good indicator of tongue position in the anterior-posterior dimension (Fant 1960), the second formant was measured.

Preliminary results seem to confirm our assumption and show the evolution of the independence of tongue and jaw trajectories.