

From the proto-syllabic frame to the syllable: an audio-visual survey of 2 children from 6 to 15 months.

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Abstract

Babbling, as the first stage in speech development of series of open-close alternations of the vocal tract, has been the focus of a number of studies for many years. It has been considered as the emergence of proto-syllables: the first time when a baby is able to coordinate glottal gestures with supra-glottic rhythmic movements, i.e. the basic structure of human communication. In his “Frames, then Content” theory of speech communication, MacNeilage (1998) has put forward the idea that these proto-syllabic frames are due to the unique oscillation of the mandible in the absence of any other control over carried articulators. Many studies after this reference have endeavoured to test the weight of mandibular oscillations, and the extent to which they can alone explain the vocal products of babbling. The correlation between the places of articulation of consonants and vowels within one babbling “syllable” has been investigated and taken as an argument for the non-independence of these two parts of a protosyllabic sequence, therefore an evidence that these two parts are to be attributed to the same movement of one single articulator, the mandibular carrier (Davis et al. 2000, Matyear et al. 1998, Vérin 2001). Another study (Vilain et al., 1999) has tested the possibility that mandibular oscillations could actually be the source of babbling products, by reproducing them with articulatory models on which all degrees of freedom had been frozen except for the mandible. The results supported the theory: these models, in spite of being too small to constitute a representative sample, were sufficient to yield the two main consonantal place types observed in babbling databases. However if the controlling of mandibular oscillations can indeed be described as the basic carrier structure in speech, the development of an adult-like syllable will therefore imply three types of control in addition to that of the mandible (i) the control of the velum, which yields a fully oral vocal tract, therefore to produce salient consonant-vowel sequences, (ii) the control of the oro-laryngeal coordination to obtain the voiced vs unvoiced distinction and (iii) the rhythmic mandibular control which enables the child to adapt to the prosodic patterns of his mother tongue. We have studied the evolution of these controls from an audio-visual digital video corpus of 2 French children aged from 6 to 15 months recorded in their family from the date when the parents signalled the begin of the babbling and during 9 months. One element in this global control is that of the velum, which enables to have a fully oral vocal tract. Our observations lead us to think that the velum is already controlled at 6 months, because children can move their velum during the production of sound and movement of the mandible, but this control is not yet completely mastered. Indeed it should be achieved around 11 months, when they reach adult-like proportions of nasals against oral consonants. The final stage in the development of this control will be reached when the baby is able to produce fully nasal vowels, and this is to be tracked later in the development. The other element in this global control is the oro-laryngeal coordination to obtain the voiced vs unvoiced distinction. We measured VOT values and observed that the distinction between negative and positive

VOT were present for all the places. Nevertheless, negative values are shorter in children than in adults so we can suppose that there is no active control of the vocal folds during the occlusion until 12 months of age.

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