

The emergence of vocalic gesture control

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Key words

coproduction, development, anticipatory coarticulation

Abstract

When studying coarticulation in a developmental point of view, we find that very few articulatory studies have been dedicated to the acquisition of speech segment control abilities, certainly because of the methodological constraints involved in studying young children. However, the numerous acoustic studies on temporal and spectral characteristics in CV coproduction contributed to shed a light on anatomical development from canonical babbling to adult speech as well as speech motor control [1] [2] [3]. Our present study concerns the emergence of vocalic control. Every vowels are present in babbling (some of them, mid and low vowels being predominant) and so have shown little experimental interest. [4] noticed that their frequency in early words is in no way homogeneous but often reflects babbling preferences. In addition, one might remind that vowels control is difficult to acquire and non uniform as the development of vocal tract. In accordance to the Frame then Content theory [4], the early acquisition of the vowel [a] is favoured by the mandible oscillations typical of canonical babbling around 7 months. The acquisition of other vowels needs a progressive expansion of the use of vocalic space. For high front vowels such as [i], their production involves a larger contraction of geniogloss than usually recruited for babbling and are said to be stable around 36 weeks [4] [5]. However, high back vowels such as [u] require finer articulatory movements from styloglossus and stylohyoid muscles but also rounding control and so seem mastered later than high front vowels.

We recently ran a longitudinal study on 8 French children aged from 3,5 to 8 in which we explore the extent of labial anticipatory coarticulation in [iCny] sequences (with C corresponding to a varying number of consonants from 0 to 3). The lip area tracking device used for these recordings allowed us to track lip area variations as small as 0,5 cm² on line [6]. Our results suggest that the rounding movement needed for the production of the vowel [y] is mastered as early as 3,5 years old. Indeed, as predicted by Constriction *M.E.M* [7] (tested on French adults) taken as reference in our study, we found regular anticipatory behaviour for 7 out of 8 of the children tested (the remaining 4,5 years old child being not yet stabilized), with an execution constant for the basic gesture [iy] extending linearly with an expansion coefficient that is speaker specific. Children as early as 3,5 years old displayed the same regular temporal rounding pattern as adults [7] [8], their behaviour remaining quite stable with a year interval between the two recording sessions. Therefore, 3,5 years old seem

to be part of a critical period for the acquisition of anticipatory control in the timing of vocalic gestures. Further investigation of 3 to 5 years old children is needed to confirm such trend that goes against Kent suggestions of a later maturity of supralaryngeal articulators. In addition, experimental studies on anticipatory coarticulation in very young children undoubtedly contribute to shed a light on ontogenetic development of speech as regards the acquisition of speech segment control.

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