

VOWEL ACQUISITION IN FRENCH AND ITALIAN

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ABSTRACT

Disyllabic babbling and speech of 3 Italian and 3 French children has been transcribed and analyzed in order to evaluate claims for both basic sound-making propensities in babbling (including coarticulatory constraints [12]), and trends towards target language properties.

The consistencies within the groups and the differences between groups showed the influence of the target languages on the set of vocalic productions prior to the acquisition of the first words.

The CVCV forms were more consistent with the predictions regarding coarticulation [12] in Italian than in French, perhaps because of different relations between target language patterns and basic infant propensities in the two languages.

1. INTRODUCTION: GOALS OF THE STUDY

The goal of this paper is to describe the development of use of the vowel space in French and Italian babies from the babbling stage through use of the first words. The two groups have been investigated in order to see if they reflect target-language influences in their babbling.

An additional question beyond the sheer frequency of occurrence of vowels in babbling and speech, concerns consonant-vowel relationships: patterns of cooccurrences of vowels and consonants in disyllabic utterances have been analyzed in order to test an aspect of MacNeilage and Davis [10] "frame/content" theory of speech production: they predicted systematic coarticulatory constraints between the C-V segments within syllabic 'frames' of early babbling (see below).

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Vowels produced in disyllabic utterances by 3 Italian and 3 French monolingual children, in babbling and speech, have been analyzed.

The data have been obtained by monthly recordings of all productions of the children in their home environment; phonetic transcription of disyllabic utterances have been used for a distributional analysis.

The consistencies of individual patterns within groups and the differences between groups showed the influence of the target languages on the set of vocalic productions prior to the acquisition of the first words.

A general tendency in CVCV patterns was for cooccurrence of Front vowels with Palatal consonants, of Central vowels with Labials and of Back vowels with Velars in Italian babies, that seem to fit with MacNeilage and Davis predictions about early coarticulatory patterns. The French children, though, depart from this schema in Back vowels which appear mostly after Palatal consonants.

Also, Italian children productions are very dissimilar from target-language coarticulatory preferences whereas French show a closer fit and maybe evidence for an earlier shift toward language preferred complex articulatory abilities.

1.1. Background

Recent studies on babbling and speech ([2], [5], [10]) have confirmed prior studies of babbling (e.g. [8]) showing that there exists a favorite set of vowels in the front central-middle /low part of the articulatory space, that are the first to be produced by infants: these patterns may be universal in babbling. In addition, every language has at least one vowel in this region.

In addition to some consensus on the preference of lower left quadrant vowel-like sounds, there is some general tendency to favor different areas of expansion on the vowel space (i.e. toward high-front area for English and back for Cantonese: See [5]); such trends have also been tested in perceptual experiments [4].

MacNeilage and Davis theory of speech production [10] addresses the problem of coarticulation in acquisition of speech: an elementary unit of speech production is postulated, a pure "syllabic frame", observable in single or repeated episodes of mandible oscillation; when these episodes are accompanied by vocalization, the basic sequence of Labial consonant + Central vowel is produced.

Elementary movements of the tongue can cooccur with the frame produced by mandible oscillation: pre-fronting or "consistently-held" tongue fronting would result in a sequence of Alveolar consonant + Front vowel and a pre-backing, or "consistently held" tongue backing, would result in a Velar + Back vowel sequence. The C and V segments, at this stage ("nonvariegated babbling"), would not be independent, but produced with the "frame", as a whole unit.

In variegated babbling, local modifications due to tongue positioning on the front-back/low-high axes, can appear: in these forms, real differentiation between segments begins to emerge and the segments start to be produced independently within the frame.

This view of early babbling differs basically from the classical hypothesis on coarticulation in adult speech, that assumes "a) discrete and invariant units serving as input to the system of speech production" and b) eventual obscurations of the boundaries between units at the articulatory or acoustic levels" [7].

2. METHOD

2.1. Subjects

The subjects studied were 3 French monolingual children, Camille, Louis and Myrtille, and 3 Italian monolingual children, Luca, Francesco and Evelina. The age range was 0;9 to 1;5.

An average of 4 sessions has been considered for each child.

2.2. Data collection

The French material has been kindly provided by the Experimental Psychology Lab., C.N.R.S., Paris.

Two of the Italian children have been recorded in Rome, by a procedure similar to the one used for the French children in Paris: the sessions took place at home, every 15-20 days, in the presence of at least one parent and one or two experimenters; Luca's recordings have been kindly provided by the Phonetics Lab., C.N.R., Padua.

2.3. Data analysis

IPA Transcriptions of the disyllabic utterances by the babies have been stored on MacIntosh computer by IPAPLUS fonts, kindly made available by Prof. G. Boulakia, of the Institute of Phonetics of the Charles V University, Paris.

A distributional analysis has been performed on the database by the software "Quatrième Dimension": ad hoc formats and procedures were created by Mme C. Carcassonne of the Center of Mathematics applied to Humanities, C.N.R.S., Paris.

Two analysis have been performed, separately on babbling and speech:

- I) Computation of total number of vowels by class (nine classes are considered: BackHigh, BackMid, BackLow, CentralHigh, CentralMid, CentralLow, FrontHigh, FrontMid, FrontLow).
- II) Computation of child vowels in first syllable vs. second syllable, with respect to the consonant preceding every vowel (four consonant classes have been considered: Labials, Alveolars/Dentals, Palatals, Velars).

3. RESULTS

Results of the vowel frequency analysis show an overall preference for the MF, LC and MB vowels (Fig.1) by French and Italian babies, in both babbling and speech: LC appear to be more frequent, both in babbling and in speech; higher numbers of LC and MB, though, are found in Italian than in French.

FRENCH

| Front | | Central | | Back | | |
|-------|------|---------|------|------|------|------|
| B | S | B | S | B | S | |
| 6.4 | 5.1 | 1.2 | 0.3 | 6.7 | 6.7 | High |
| | | | | | | |
| 22.8 | 10.5 | 3.7 | 2.9 | 24.8 | 30.1 | Mid |
| | | | | | | |
| 2.3 | 1.2 | 29.7 | 43.2 | 0.2 | 0.1 | Low |

Tot. B = 1261
S = 688

Fig. 1: Total distribution of vowels in babbling (B) and speech (S) of Italian and French children (expressed as percentages).

ITALIAN

| Front | | Central | | Back | | |
|-------|-----|---------|------|------|------|------|
| B | S | B | S | B | S | |
| 7.7 | 3.1 | 1.1 | 1.2 | 5.2 | 3.1 | High |
| | | | | | | |
| 18.4 | 4.8 | 9.3 | 4.4 | 15.7 | 14.3 | Mid |
| | | | | | | |
| 2.5 | 1.0 | 40 | 67.9 | 0 | 0.3 | Low |

Tot. B = 440
S = 685

A comparison of the percentages shown above (Fig.1) with the frequency of occurrence of the phoneme classes in each language (from [6], [1]) shows that the LC presence in the data reflects the situation of the adult languages: [a] has a frequency of 31% in Italian and of 17% in French; actually, in Italian this vowel appears twice as often as in French.

MF vowels, the second preferred set, have 25% frequency altogether in Italian and 31% in French, although, according to my classification, the French MF space contains a higher concentration of phonemes than the Italian one (see Fig.2).

Overall French and Italian patterns are very similar, although Italian babies have significantly less MF in speech with respect to the French ones.

The CVCV results (Table 1) show highest frequency of cooccurrence of Front vowels with Palatal consonants in Italian, whereas in French Front vowels tend to be articulated after Palatal and Dental consonants.

Central vowels cooccur consistently with Labials in Italian, but they are equally frequent with Labials and Velars in the French data.

Finally, Back vowels cooccur with Velar consonants in two Italian subjects and with Labials in Luca, whereas in French they show a different tendency to be coarticulated with Palatals.

A comparison with the frequencies of vowels in CV syllables from the most frequent 200 disyllables in Italian (from [3]) and from the most frequent 100 words in French ([9]), shows some correspondence between the French babies preferences for Front Vowels to occur with A/D consonants, and the frequency of this constraint in the language (20%); also, Central vowels in French show high frequencies with Labial and Velar consonants (19- 14%), as well as in the babies productions. In French, though, occurrence of Central vowels is also high after A/D consonants (19%). Finally, Back vowels appear most frequently in an A/D environment in French (13%), but they are preferred after Palatals in the data.

The Italian language frequency pattern favors A/D consonants in the environment of all classes of vowels (F:29%, C:15%; B:22%); this tendency is not reflected by the Italian children.

4. DISCUSSION

The differences that have emerged between the French and Italian patterns and the English patterns reported in MacNeilage and Davis [12] can be interpreted as follows:

1) The higher number of LC found in Italian with respect to French/English can be attributed to a target-language influence.

2) The drop in MF vowels from babbling to speech, stronger in Italian than in French, reflects different properties of the target-vowel spaces, as well: French children are drifting toward a space where four phonemes are concentrated in the MF area (see Fig.2), whereas the Italian space is more [a]-centered, and MF vowels are represented only by two phonemes ([e]-[E]).

Overall French and Italian patterns differ from English in the following: a) MF are not present in high percentages in English babbling; accordingly, MF have a low frequency (11%) in the language.

b) The greater number of LF vowels reported by MacNeilage and Davis [11] reflects the high frequency of [ae] in English; the result could also be due to the classificatory system adopted in this study, where both French and Italian [a]'s are included in the LC category, even if the French articulation is intermediate between the English and the Italian one (see Fig. 2).

3) The Italian CVCV data reflect the scenario postulated by the 'frame/content' theory; French data, on the other hand, show an overall preference for Front and Back vowels to be produced in Palatal/Dental context, and for Central vowels to occur in Labial/Velar context. The question therefore arises as to whether there exists a progressive shift towards coarticulatory patterns preferred in the target language, as has been shown for single vowels.

The comparison with the frequencies of vowels in the most frequent CV syllables in the language shows some evidence for a drift towards target coarticulatory patterns for Front and Central vowels in French children; this trend is absent in Italian children.

This effect might be due to a slower rate of transition from infant to adult articulatory patterns. It could be argued that the acquisition of coarticulatory constraints develops after the ability to produce independent segments is acquired: in this view, acquisition of speech production consists in separating segments from a holistic production 'frame' and consequently reassemble them as independent units in the speech chain.

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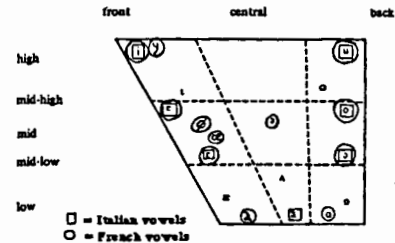


Fig. 2 - A vowel chart of the American, French and Italian vowels (Adapted from : P. Ladefoged: "A course in Phonetics")

Table 1: Pattern of occurrence of Vowels and Consonants in CV syllables produced by French and Italian babies.

| | Italian | | | French | | |
|-------|---------|---------|---------------|-----------------|---------|----------------|
| | L | F | E | M | L | C |
| Vowel | | | | | | |
| C | Labial | Labial | Labial | Velar/ Labial | Labial | Velar |
| F | Palatal | Palatal | Palatal | Palatal | Dental | Labial/ Dental |
| B | Velar | Velar | Labial/ Velar | Dental/ Palatal | Palatal | Palatal |

Italian: L = Luca
F = Francesco
E = Eva/No
French: L = Louis
M = Myrtille
C = Camille

Vowels: Front
Central
Back