

# Fluctuations in (pseudo-)syllables occurrences in the speech of Italian children from 6 to 18 months old

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## 1. Introduction

The aim of this paper is multifaceted. It presents a research grounded on the phonetic description of the speech of four Italian children from 6 to 18 months old. Part of the observations were aimed at describing the conditions in which the quantitative balance of vocal and speech events of different kind evolves by allowing communicative and linguistic products to prevail. By taking into account the most relevant works on the speech of Italian children about phonological acquisition (Camaioni *et alii*, 1976, Bortolini, 1993, 1995a&b), we decided to pay more attention to phonetic facts in order to illustrate both general and specific strategies of convergence towards prosodic structures of the parents' language (Zmarich & Miotti, 2002). Another challenge was, then, to describe phonetic realisations of syllables (or similar units) with a degree of accuracy allowing to investigate the specific patterns in which segmental refinements take place, mainly in reference to MacNeilage & Davis (1998).

## 2. Method

Speech events produced by four male children (born 2005÷2010 in Italian families living in Turin) have been collected and labelled from 6 to 18 months.

All the children (D, M, A, C) considered for this study were normal-hearing and did not suffer of any known speech or breathing pathology (only one of them, M, was affected by *OSAS* and underwent a surgical intervention of tonsillectomy and adenoidectomy at 47 months: M, A and C are brothers).

A longitudinal corpus has been built by regularly collecting 10-minute recordings each ten days for 26 sessions during intensive production phases in everyday family life (parents were involved in the recording sessions). This amounts in about 35 hours of recording, even though only 9h35 have been labelled with an estimate of speech/silence ratio varying between 35% to 68%.

Speech events including communicative vocal gestures, babbling and vocal play events have been taken into account as well as a limited number

of extra-communicative events (such as swallowing, coughing, purrs, raspberries and so on; see various chapters in Schindler, 2009). Occurrences of these events, as well as ‘words’ in *SAMPA* transcription (an example is shown in Fig. 1) were assessed and ranked together with the early more conventional Italian ‘words’ (Capirci *et alii*, 1996; cp. Caselli & Casadio, 1995).

Phonetic segments have been labelled through an attentive assessment (see fig. 1), supervised by a trained phonetician, trying to avoid any phonological conditioning (cp. Locke, 1983) whenever a delimitation or a clear-cut distinction between consonant and vocalic gestures was difficult to establish (Jakobson, 1971: 70-71).

However, a segmentation in syllables of words and speech chains has been

attempted, with particular attention to positional and prosodic effects, in order to observe the progressive refinement of (pseudo-)syllable types and to let emerge different convergence strategies towards the phonologically constrained types (>11-13 months; cp. Boysson-Bardie, 1996, Bosch, 2004).

Intrasyllabic and intersyllabic variation phenomena have been described within the theoretical framework proposed by MacNeilage and Davis (1998) by observing a progressive selection of sound clusters within the syllabic frame with respect to the rhythmic properties of the speech chains and mean-distance assimilation or dissimilation phenomena (Demuth, 1996, Fikkert *et alia*, 2004).

Table I summarises the types of events that have been taken into

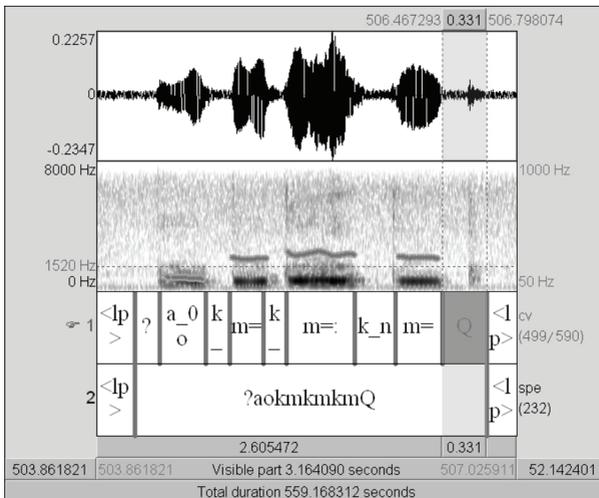


Fig. 1. Pseudo-word (*SAMPA*) transcription for session 6 with the 14 month child M (15/ 10/2006, 10:20).

Table I. Events

COMMUNICATIVE				EXTRA-LINGUISTIC
<aa>	<egressive>	<laugh>	<shout>	<BEAT>
 	<ch>	<lipsmack>	<sigh>	<BURP>
<call>	<hey>	<mbr>	<sob>	<CLAP>
<creaky>	<ew>	<murmur>	<squeaky>	<HICCUP>
<croak>	<growl>	<nasal_release>	<V>	<SNEEZE>
<cry>	<hm>	<P>	<vocalfry>	<SWALLOW>
<crying>	<ingressive>	<purr>	<vocalplay>	<YAWN>
<e>	<jitter>	<raspberry>	<whispery>	

Table IIa. Communicative Events (>10)

<hm>	488
<ew>	380
<V>	270
<ch>	227
<laugh>	157
<sigh>	108
<crying>	99
<growl>	91
<cry>	82
<murmur>	63
 	56
<ingressive>	50
<sob>	40

Table IIb. Extra-ling. Events (>5)

<SWALLOW>	37
<COUGH>	27
<LAUGH>	19
<YAWN>	15
<BURP>	8
<HICCUP>	6
<BEAT><2>	6

account. 3103 events have been labelled and the overall occurrence numbers of the most frequent are listed in Table II.

Particular attention has been paid to repeated <BEAT> or <CLAP> events and their statistic emergence during babbling: longer sequences (6-10 beats) positively correlate with bite oscillations between 11 and 13 months for three children whereas one child (D) produced them exclusively during the 13<sup>th</sup> month.

We distinguished 2223 Communicative Events (CE), 149 Extra-ling.

guistic Events (EE) and 731 Words (W) within three main periods. According to Stoel-Gammon & Cooper (1984) and other studies, any particular *Hörstummheit* phase has been observed, even though during the last 3 weeks of the 13<sup>th</sup> month D let prevail communicative events over more language-oriented activities (see Fig. 2). Simultaneously, a raise in the production of extra-linguistic (more corporal) events may correlate with a temporary preference for gestural activities. Another sudden reduction in pseudo-word production was observed in session 24, just before the ever rising lexical acquisition curve observed after the 18<sup>th</sup> month (Mehler & Dupoux 1995: 56).

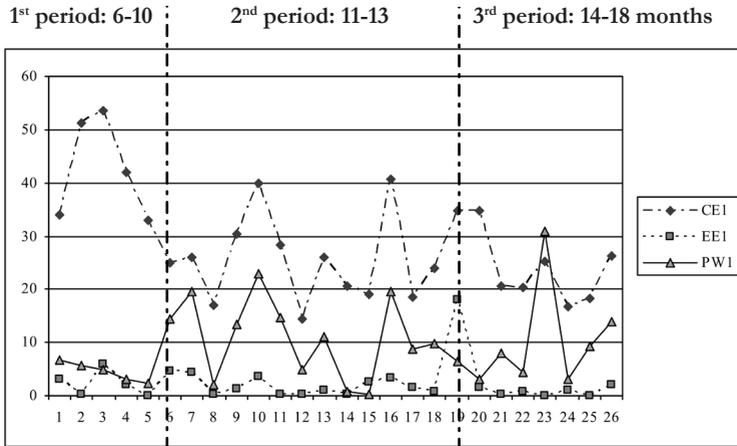


Fig. 2. Oscillations in the activities related to communication and body expression observed for D.

**3. Results**

Surprisingly, previous studies on Italian children never accounted for «Bantu clicks and Quechua implosives» (Mac Whinney 2001: 469) which instead we did often observe in our samples as well as bilabial trills and simultaneous articulations (such as  $\widehat{k}\widehat{p}$  and  $\widehat{g}\widehat{b}$  and  $\widehat{\eta}\widehat{m}$ ) and a relevant set of phenomena spanning from vowel nasalisation and syllabic nasals to vocalic rhotacism. The acoustical observation of *bababa* sequences confirmed that a significant

variation occurs both at the segmental and suprasegmental levels. The presence of implosive sounds as well as of different voice settings (which are still neglected even in recent studies) highlights interesting cues related to the coordination of articulatory gestures and the laryngeal activity. But the most striking result is the large inventory of affricate, aspirated and fricative sounds recorded especially in M in the 3<sup>rd</sup> period (cp. McCune & Vihman 2001 vs. the early convergence towards the rela-

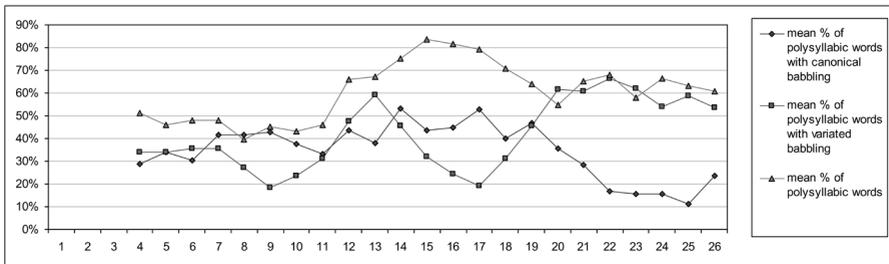


Fig. 3. Mean curves in pseudo-lexical activities in the 23 sessions (7-18 months) for the four children.

tively poor native-language-inventory indirectly suggested by the broad transcriptions provided in previous studies).

In our cases canonical babbling lives together with varied babbling realisations since the 6<sup>th</sup> month (Zmarich & Miotti 2002). The latter prevailed (around the 11<sup>th</sup> month) when the productions of the four children started to align (with some exceptions) with lexical structures (Fig. 3).

This seems to occur earlier than what is generally suggested in studies which deserve more care in the description of segmental contents (in our data these tend to fluctuate until the 18<sup>th</sup> month). Individual reduction strategies in syllable structure were also observed fluctuating along all the observation period.

Nevertheless, this was far less striking than the fluctuation in the segmental phonetic inventories which included exotic items even in the last observed phase. This accounted for top-down effects emphasizing prior attention to larger (even though not only syllabic) frames.

As regards phonetic details, segments were not observed as targets but as by-products of individual intersyllabic transition strategies which may explain the observed fluctuations (Stoel-Gammon 2002).

Specific syllable types (with explicit content) and their occurrence in the

three periods are displayed in Fig. 4. As a general feature, one may observe an overall decline of /ba/ syllables as compared to /ma/ syllables. The initial raise of syllables with empty onsets slows around 14 months when polysyllables become dominant (M and C produced longer 'words' of  $2.07 \div 2.23$  syllables).

Larger inventories of syllable types were shown by M, A and C with a more complex set of onset clusters, whereas D used to articulate a larger number of CV syllables with a labio-velar glide in the onset which was instead quite absent in the other individual inventories (see Fig. 5).

Fig. 5 accounts for a progressive dominance of CV type syllables. Nevertheless the considerable amount in CVC types in the 3<sup>rd</sup> period especially for D and A is mainly due to non-final checked syllables of bi- or tri-syllabic words (such as [ˈbob:o], [paˈpam:a], [ˈtan:ene]), whereas M offered a larger set of final or isolated (C(C))VC syllables ([gjaθ<sup>o</sup>], [djɛθ], [kɛçç], [gjaḱx̃]) and even isolated long fricative sounds ([ʃ:] [r:]). As for trills, which were fairly rare within this sample, we must acknowledge the long isolated trills of M, a relative diffusion of /dr/ and /tr/ clusters as well as frequent bilabial trill in words like [mBmˈbB:ma] by A at 16-18 months (an onomatopoeic form for «car», more than a tentative Italian [ˈmakːina]).

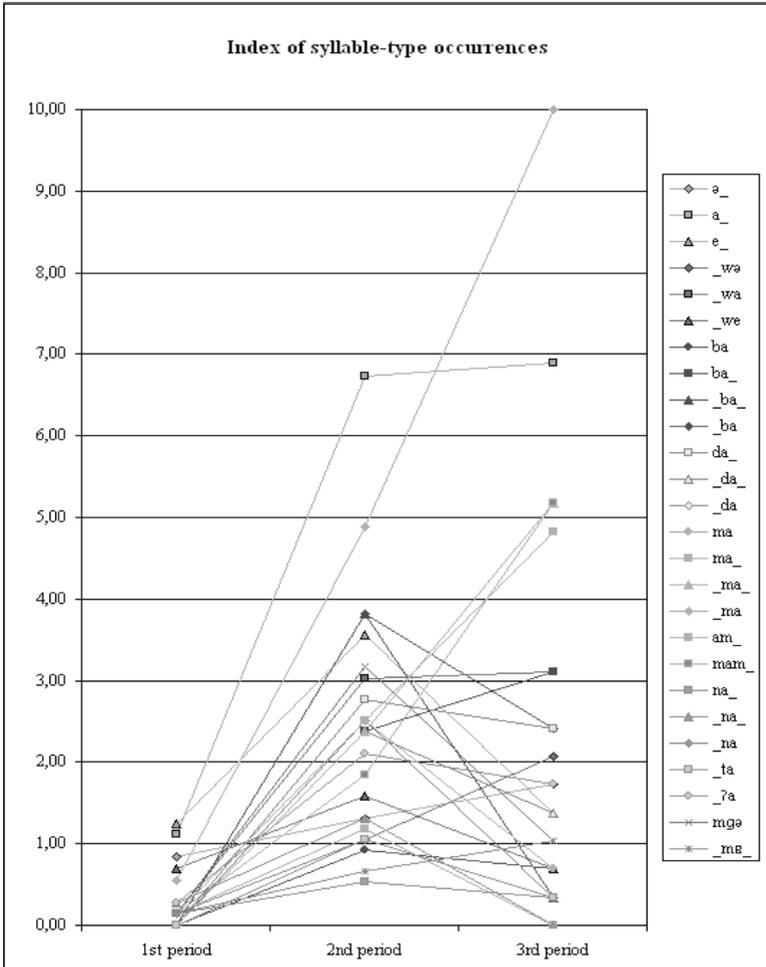


Fig. 4. Specific (initial, inner and final) syllable types for the four children in the three periods.

### Conclusions

A high degree of accuracy when labelling phonetic phenomena during language acquisition may reveal the gradual passage from universal articulatory settings towards the specialised phonological inventory of the mother tongue. Despite the fluctuations in syl-

lable types and in the overall syllabic and prosodic organisation of speech, an account of the convergence to mother tongue phonetic structures may allow to investigate the specific patterns in which segmental refinements take place and to let emerge the individual strategies in the selection

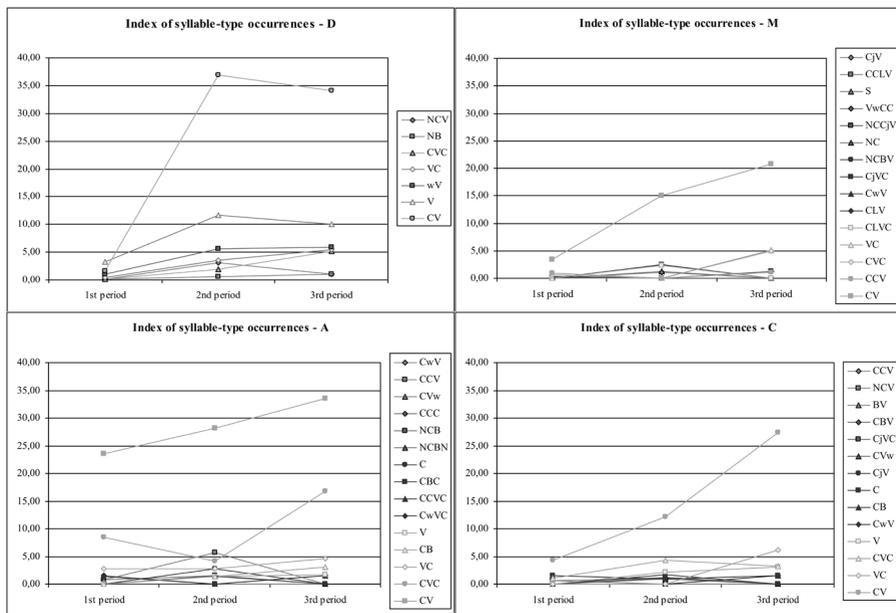


Fig. 5. (Pseudo-)syllable type (and token) occurrences in the three periods for the children D, M, A, C.

process. As an *a posteriori* judgement, we observed that the four children (now aged 7-13) all reached a native-like use of the native pronunciation between 36 and 40 months. While M was the only one who was not able to catch a complete control in the use of the [ʌ], A and C had some delay in replacing a temporary uvular articulation of /r/ and /rr/. As for the index of syllabic type occurrence, we observed a predictive use for it by observing that only the two children with the more reduced syllable inventories presented a delayed refinement of fricative articulations and got stuck to more personal prosodic patterns.

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