Articulatory data on tonal alignment in Italian, Catalan and Spanish productions of different focus conditions

Antonio Stella*, Maria del Mar Vanrell**, Pilar Prieto* & Barbara Gili Fivela*
antonio.stella@unisalento.it; mariadelmar.vanrell@upf.edu; pilar.prieto@upf.edu; barbara.gili@unisalento.it

*CRIL & Università del Salento (Italy); **Universitat Autònoma de Barcelona (Spain); *Pompeu Fabra University (Spain); ^ICREA-UPF (Spain)

Tonal alignment refers to the timing relation between tonal targets (high (H) and low (L)) and the segmental string. Recent articulatory investigations on tonal alignment have already been conducted in various languages ([1], [2], [3], [4], [5]) and showed that tonal targets tend to be more closely aligned with articulatory landmarks than with acoustic ones. [5] described the coordination between tones and supralaryngeal tracts in Central Catalan and Vienna German LH pitch accents using the Coupled Oscillator Model [6] and showed that the onset of the H gesture is coordinated with the onset of the oral constriction gesture: both onsets are in synchrony in Catalan broad and contrastive focus and delayed in German contrastive focus.

This work is part of a wider project aiming at investigating the tonal features involved in the production and the perception of broad focus (BF) and narrow-contrastive focus (CF) productions in Majorcan Catalan (CAT), Lecce Italian (IT) and Central Peninsular Spanish (SP). In these three varieties, BF accents have late peaks - L>H* in CAT and SP and L+H* in IT - while CF accents have earlier F0 peaks - L+H* in CAT and SP, H*+L in IT - see Figure 1 (for CAT, [7]; for SP, [8], [9], [10], [11], [12]; for IT, [13]). As for tonal alignment features, previous crosslinguistic investigations on some of these accents showed that their alignment may be located within the acoustic boundary of a segment with a difference of few milliseconds (e.g. see [7]). A crosslinguistic investigation involving articulatory aspects of alignment may possibly offer more precise patterns of alignment that will better inform the phonological analysis of these pitch accents; further, the study involves language varieties which have not yet been studied.

A corpus per language was designed to allow a direct comparison between acoustic and articulatory data. These corpora consist of target pseudo-words showing various segmental and syllabic compositions as well as different stress positions. In this paper we will focus on open and closed syllables with three different consonants plus [a] (i.e. [na, nan, ma, mam, la, lal]), in paroxitonic and paraparoxitonic pseudo-words (e.g., [mi.'ma.mi], [mi.'ma.mi.la], [mi.'mam.li], [mi.'mam.li.la]) inserted in carrier sentences within question-answer pairs that trigger an interpretation of either BF or CF. Acoustic and articulatory (EMA – AG500) data were obtained for 3 speakers for each language (130 tokens per subject). In order to investigate the synchrony between targets and articulatory gestures, the latency of the tonal targets from onsets/offsets of consonantal and vocalic gestures, from their velocity peaks, and from the beginning/end of the attainment phases was measured.

Results on CAT and IT productions show that low targets are more stable than high targets. IT data show a better coordination with positional landmarks (consonantal and vocalic closing gestures) in BF, and peak velocity (consonantal closing gestures and vocalic opening gestures) in CF (see Fig. 2). Further, no statistical differences between open and closed syllables were found, and neither between paroxitonic and paraparoxitonic words. CAT data instead show a strong interspeaker variability: there seems to be a better coordination with positional landmarks in BF, and with consonantal closing gesture and peak velocity of vocalic gesture in CF (Fig. 3). At the present, we are calculating the lags between tonal and oral gestures using the medians in order to search for a more stable pattern of alignment in CAT and are processing the SP productions. Furthermore, in the paper an analysis of the phase relations among the gestures in the Coupling Oscillator Model will be shown for the 3 languages.
Figures

**Figure 1**: diagrams of the tonal alignment in broad and narrow-contrastive focus in Majorcan Catalan and Central Peninsular Spanish (left panel) and in Lecce Italian (right panel).

**Figure 2**: pattern of alignment of TT, TD and tone gestures in BF (top panel) and CF (bottom panel) in Lecce Italian productions with LA syllable in paroxitonic words. Yellow lines correspond to the peak velocity of the gesture.

**Figure 3**: pattern of alignment of TT, TD and tone gestures in BF (top panel) and CF (bottom panel) in Majorcan Catalan productions with LAL syllable in paroxitonic words. Yellow lines correspond to the peak velocity of the gesture.

References


