Speech rate and articulatory patterns of Italian nasal-velar clusters

Silvia Calamai (Università degli Studi di Siena)   calamai@unisi.it
Irene Ricci (Scuola Normale Superiore, Pisa)   i.ricci@sns.it

In Italian /nk/ and /n#k/ clusters, the nasal is said to assimilate to the point of articulation of the following stop: this process is merely allophonic (since no phonological velar nasal is present in Italian), contextually determined, and categorical [8]. By means of EPG analysis, [5] found that the process of nasal assimilation in Italian was complete in all the occurrences, for all the subjects, and independent of rate variations. The same process of allophonic assimilation in nasal-velar clusters at word boundaries has been investigated for English in a series of articulatory EPG studies [4, 6, 10, 11], whose major finding was that, while a few subjects demonstrated categorical assimilations, others clearly produced gradient assimilations.

According to an exploratory EPG analysis of Italian /nk/ and /n#k/ clusters [3], although nasal-to-velar assimilation appears to be more categorical and more massive than in English, it is nevertheless sensitive to speech style (slow *vs.* normal speech rate). The effects of speaking rate on connected-speech processes such as assimilation appear therefore to be a fruitful area for further research [1, 7], and they are little investigated as far as Italian is concerned. The principal aim of the present paper is to analyse how speech rate shapes assimilation processes in Italian nasal-to-velar clusters by means of EPG analysis. Secondly, we address the question whether at different speech rates external sandhi assimilation involves categorical modifications of segments as well as internal word assimilation. Thirdly, we offer a first, tentative study of the coarticulatory differences between voiced and voiceless velar sounds before nasals at different speech rates.

In the present study, five Tuscan subjects were asked to produce 10 repetitions of 16 meaningful isosyllabic sentences where /nk/ - /ng/ and /nt/ - /nd/ (as control) clusters were included in an invariable vowel context (aCCa). Three factors were considered: status (experimental *vs.* control target); position (word internal *vs.* word boundary); voicing (voiced velar *vs.* unvoiced velar). Subjects were asked to read the sentences at three different speech rates: normal, slow, and fast. All subjects underwent a period of palate adaptation of an hour, during which they engaged in focused practice [2]. Data analysis was qualitative as well as quantitative. As far the articulatory domain was concerned, the following parameters were considered: COG, maximum linguapalatal contact, velar and alveolar indices. As far as the acoustical domain was concerned, duration of the whole sentences, of aCCa clusters, and of nasal stops were measured. A statistical analysis was performed in order to obtain a reliable measure of inter- and intra-speaker variability.

Speech style appears to be a significant factor in shaping the assimilatory behaviour of subjects, with word-internal contexts and fast uttered items showing more assimilation than, respectively, across-boundary contexts and slow uttered items. Normal, slow, and fast speech are different not only with respect to duration but also with respect to articulatory patterns. Nevertheless, the relationship between speaker-specific variation in speech styles and speaker-specific variation in assimilation strategies appears to be a relevant methodological issue: speakers do not necessarily always transform their articulation in exactly the same way in response to a specific categorical instruction concerning speech rate; in addition, speech rate appears to be inextricably linked to the hyperarticulation-hypoarticulation *continuum*.

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