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*Towards a (socio)phonetic explanation of progressive and regressive assimilation  
in NC clusters.*

It is well-known knowledge commonplace that NC clusters tend to be homorganic, with the nasal stop fully assimilated for place to the following oral stop. However, nasals are also able to alter the articulation of the post-nasals in different ways, as documented e.g. in many varieties of the Italo-Romance area.

As for place of articulation, nasals are notoriously the target of a regressive assimilation. Nasals always undergo the effect of postnasals and not vice versa (It. /'banka/ 'bank': [bʌŋka] and not \*[banta]), reflecting a fundamental tendency of coarticulation, anticipatory assimilations being more frequent than perseverative ones (e.g. Lass 1984: 199-200; Bybee & Easterday 2010). The constraint of homorganicity in NC clusters is at work in several (Italo-) Romance varieties (Mioni 1993:113, Celata, Calamai, Ricci & Bertini 2010).

Things are however different if we consider laryngeal assimilation, since voiceless post-nasals voice in some central and southern Italian dialects, "a sud di una linea che va dai Monti Albani fino ad Ancora attraverso l'Umbria" (Rohlf's 1966, §254): e.g., *dende* 'tooth' (It. *dente*), *cambo* 'field' (It. *campo*), *biango* 'white' (It. *bianco*).

Complete assimilations of homorganic clusters are also left-to-right: in some southern dialects, voiced post-nasals assimilate to nasals (e.g., *munno* 'world' [It. *mondo*], *piommo* 'lead' [It. *piombo*], *liŋga* 'tongue' [It. *lingua*]).

Both laryngeal and complete assimilations are generally believed to function as sociolinguistic variables in conveying the speaker's socio-cultural and geographical identity. Moreover, perseverative assimilation such as in *munno* appears to be a relatively marked phenomenon since it is only in few languages that voiced plosives assimilate to sonorants (Lass 1984). Most importantly, from a phonetic point of view, the crucial element in complete assimilations seems to be the laryngeal contrast of the post-nasals: post-nasals totally assimilate to nasals when voiced; on the contrary, in clusters with voiceless post-nasals, complete right-to-left assimilations are frequently observed (e.g. Old Norse *mun* 'mouath' <\*munða vs. *bekkr* 'bank').

According to Tuttle (1991), the reasons for these divergent paths – i.e., nasal "dominance" such as in Neap. *munna* 'world', as opposed to the different degrees of nasal assimilation such as in Ital. [bʌŋka] and Old Norse *bekkr* 'bank' – lie in an articulatory difference grounded in the laryngeal specification of the post-nasal, being nasals *longer* before voiced post-nasals and *shorter* before voiceless post-nasals. Several pioneer studies pointed out the different temporal behaviour of nasals according to the nature of the following consonant (e.g. Sweet 1877, Mayer 1903, Espinosa 1930). However, the available data are only indirectly focused on the possible relation between relative timing of segments and assimilatory outcomes, a relation which requires a closer investigation in order to be maintained as a phonetically-based explanation for the above mentioned sound changes. Moreover, more phonetic and socio-phonetic parameters should be investigated in order to elucidate the role of relative timing of consonant in cluster restructuring. One such parameter is speech rate. Speech rate enters into the picture because of its intrinsic complexity as an explicative parameter of both change initiation and transmission. The potential impact of speech rate variations on assimilation processes is clearly stated by Nolan & Kerswill (1990: 313): increased rates of speaking have demonstrable effects on the mechanics of articulators and on the relative organization of speech gestures (i.e., on change initiation), but on the other hand these effects "could be voluntarily overridden by the speaker, who could increase his articulatory explicitness", thus influencing the transmission of change in a non-deterministic manner. We therefore believe that speech rate variations must be included as a crucial factor in the investigation of the (socio)phonetic bases of NC progressive and regressive assimilations.

The poster presents an experimental study of the impact of the relative timing of nasals and postnasals on patterns of assimilation in nasal clusters under different speech rate conditions. Many historical changes have their origins in articulatory weakenings and simplifications and can be viewed as diachronic exponents of synchronically tangible Connected Speech Processes (CSP) such as reduction, lenition, assimilation, and deletion (Nolan & Kerwill 1990). Speech rate manipulations allow the

researcher to investigate the degree of gestural reorganization due to temporal compression, and specifically, for the purposes of the present study, the mutual influences of segments in NC clusters.

As for the experimental design, sixteen meaningful Italian words containing a N-to-Alveolar and a N-to-Velar cluster were embedded in short isosyllabic frame sentences. The postnasal stop could either be voiced (/nd/, /ng/) or voiceless (/nt/, /nk/). Target words were selected in order to preserve an invariable vowel context (/anCa/). Four native Italian speakers with no reported speech, language or hearing pathology, aged 30-35, speaking a Tuscan variety of Italian were recorded separately in an anechoic chamber. The recording session lasted between 90 and 120 minutes for each participant. The experimental sentences were randomized and the participants were asked to produce 30 repetitions of each sentence, at a normal, slow and fast rate of speaking. For the elicitation of normal speech, the target sentences were preceded by contextual questions. For slow speech, the subjects were asked to produce clear uttered sentences as if they were speaking to non-native listeners. Finally, for fast speech, they were asked to speak as quickly as possible, but in an intelligible way.

The aims of the experiment were the following:

- (i) To replicate in an experimental setting the conditions for a sound change which has clear socio-phonetic implications in some Italo-Romance areas (i.e.,  $nt > nd$ ,  $nd > nm$ ,  $nk > \eta\eta$ );
- (ii) To verify whether the different types of assimilation originate from different conditions in articulatory timing among sounds in sequences varying for both place and voicing of the postnasal consonant (the duration of both nasals, post-nasals, and adjacent vowels was measured);
- (iii) To verify whether the temporal relationship among sounds in /anCa/ sequences is consistent across different rates of speech, or rather, varies in accordance with some articulatory constraints which can be used as a potential for the explanation of attested sound changes.

Drawing together laboratory research and descriptive analysis of nasal distribution, we aim at investigating the main determinants of progressive and regressive assimilation in nasal clusters.

### References

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