NC-Phonology in Modern Greek

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Abstract

The clusters formed by nasals and other consonants in Modern Greek undergo a variety of changes. These changes include assimilation of place by a nasal to a following stop, postnasal voicing of stops, complete assimilation of nasals to fricatives, and nasal deletion in tri-consonantal clusters. A series of constraints is introduced to account for the data, which are based on the idea that consonants in a cluster should share a feature. Specifically, we posit that consonant clusters are least marked when the consonants involved share place, voicing, and continuancy. The various NC-phenomena found in Modern Greek are analyzed as results of the staggering of these "Identical Cluster Constraints" with the relevant faithfulness constraints.

1 Introduction

Nasal-consonant (henceforth NC) clusters have interesting features in many languages, and a considerable body of literature has developed around this fact. Kager[1] posits that much of this is related to a constraint *NC̥ which motivates different behaviors depending on its ranking with respect to faithfulness constraints in individual languages. Specifically, Kager[2] indicates that there are five reasonable ways for a language to resolve an *NC̥ violation:

[1]Kager pp. 61ff.
[2]Kager pp. 61,64.

coalescence, deletion (of the nasal), epenthesis, post-nasal voicing, and denasalization. According to Kager, all of these are attested solutions with the exception of epenthesis. Hyman, however, cites data from Tswana where voiced stops are devoiced after nasals, which poses problems for *N$\underset{\circ}{\text{C}}$ that Kager fails to address.

Pulleyblank[3] argues instead for a type of constraints called Identical Cluster Constraints (ICC), which demand that consonant clusters agree on a certain (parameterized) feature. Post-nasal voicing would then be the result of a high ranking ICC[Voice]. Although this does not by itself remedy the problems in Tswana, it gives us a chance to break down the phenomena associated with NC clusters into a few smaller constraints that facilitate finer ranking arrangements.

In this paper, we will examine NC-related phonological issues in Modern Greek. Following Pulleyblank, we posit three ICCs, one each for [Voice], [Place], and [Cont(inuancy)]. These constraints are ranked with the relevant faithfulness constraints in Modern Greek, staggered in such a way that the language exhibits four major changes in NC clusters: post-nasal voicing, assimilation in place by the nasal to a following stop, full assimilation to a following fricative, and deletion of a nasal in tri-consonant clusters. We treat each of these phenomena in turn, examining the relationship between the markedness constraints or the constraints militating for faithfulness.

2 Post-nasal voicing

(1) (a) /pempo/ → [pembo] 'I send'
(b) /tan-topo/ → [tandopo] 'the place'

The data in (1) demonstrate the phenomenon of post-nasal voicing in Modern Greek. Post-nasal voicing is common in the world's languages, which is phonetically grounded in the fact that the transition from a nasal to an obstruent involves first a period of nasal-leak

[3]Pulleyblank p. 64.

as the velum closes, followed by continued raising of the velum, which rarifies the air in the oral cavity. Both of these contribute to the tendency to voice the following consonant. With this phonetic grounding in mind, we posit (2), along with its competing faithfulness constraint (3).

(2) ICC[Voice]: consonants in a cluster should share the same value for voicing.

(3) Ident[Voice]: corresponding segments in the input and output should share the same value for voicing.

Because Optimality Theory adheres to a doctrine of strict domination, here are two ranking possibilities with these two constraints. Either Ident[Voice] could outrank ICC[Voice], or vice-versa. If Ident[Voice] were the higher ranking constraint, that would mean that preserving underlying voicing contrasts was of enough importance to speakers of Modern Greek that they would sacrifice the articulatory ease of pronouncing clusters of uniform voicing. The data in (1) shows that this is not the case, which is confirmed and demonstrated in (4).

(4) /pemp-o/ → [pembo] 'I send'

Input: /pemp-o/	ICC[Voice]	Ident[Voice]
a. pempo	*!	
b. ☞pembo		*

ICC[Voice] ≫ Ident[Voice]

3 Assimilation to place

(5) (a) /ton-kako/ → [toŋgako] 'the bad'
(b) /kalon-peðin/ → [kalombeðin] 'good child'

We demonstrate in (5) the process in which a nasal assimilates to the place of articulation of a following stop. This process shows another interaction between a constraint of the form ICC[feature] (6) and Ident[feature] (7).

(6) ICC[Place]: consonants in a cluster should share a common place articulation.

(7) IDENT[PLACE]: corresponding segments in the input and output should have the same place of articulation.

Because the realization of the items in (5) are not faithful to their underlying representations, we know that the markedness constraint (6) is ranked higher than the faithfulness constraint (7). We illustrate that fact in (8), which also shows that (6) and (7) fail to eliminate the form *[tondako] (8c), which also satisfies the higher ranking constraint without incurring a more grievous violation of the lower constraint than our desired winner.

(8) /ton-kako/ → toŋgako 'the bad'

Input: /ton-kako/	ICC[PLACE]	IDENT[PLACE]
a. tongako	*!	
b. ☞ toŋgako		*
c. 💣 tondako		*

ICC[PLACE] ≫ IDENT[PLACE]

We resolve this problem through the introduction of a more specific constraint (9), which gives us the desired effect, namely candidate (8c) is eliminated. Notice that with our current inventory of constraints it does not matter what ranking we give ICC[PLACE]$_{Obs}$; every violation of ICC[PLACE] entails a violation of the more specific constraint, so the form preserving the nasal's point of articulation can never win. Other data from the language, (10), however, gives us evidence that IDENT[PLACE]$_{Obs}$ outranks ICC[PLACE] (ignore the deletion of the nasal for the moment).

(9) IDENT[PLACE]$_{Obs}$: corresponding obstruents in the input and output share the same place of articulation.

Naturally, these constraints must work properly when combined with the voicing constraints. The tableau presented in (11) shows all of the voice and place related constraints and how they match up with each other. ICC[VOICE] and IDENT[PLACE]$_{Obs}$ are undominated in Modern Greek; all consonant clusters have uniform voicing, and obstruents never assimilate to the place of articulation of any other sounds.

(10) /ton-psefti/ → [topsefti] ‘the liar’

Input: /ton-psefti/	IDENT[PLACE]$_{Obs}$	ICC[PLACE]
a. topfefpi	*!*	
b. ☞topsefti		**

IDENT[PLACE]$_{Obs}$ ≫ ICC[PLACE]

(11) /kalon-peðin/ → [kalombeðin] ‘good child’

Input: /kalon-peðin/	ICC [VOICE]	IDENT [PLACE]$_{Obs}$	ICC [PLACE]	IDENT [PLACE]	IDENT [VOICE]
a. kalonpeðin	* !		*		
b. kalondeðin		*!		*	*
c. kalonbeðin			*!		*
d. ☞kalombeðin				*	*

Full tableau for place and voice features.

4 Full assimilation to fricative

(12) (a) /ton-ɣamon/ → [toɣɣamon] ‘the marriage’
(b) /an-ðoki/ → [aððoki] ‘if he gives’

The data in (12) show that full assimilation takes place when a nasal is followed by a fricative. We already have constraints to account for much of this. First of all, the nasal and the fricatives (at least in this data set) already agree on voicing. Even if they did not, we could easily explain their shared voicing with the ICC[VOICE] constraint. On the matter of place, the constraints we introduced in the previous section predict that all nasals will assimilate to the place of articulation of a following obstruent. What remains, then, is to explain the assimilation in manner. To this end, we posit the existence of a third ICC constraint (13), as well as a corresponding faithfulness constraint (14). The tableau in (15) shows that the markedness constraint outranks the faithfulness constraint.

(13) ICC[CONT]: consonants in a cluster must have the same value for continuancy.

(14) IDENT[CONT]: corresponding segments in the input and output must agree on the feature [±continuant].

(15) /tonɣamon/ → [toɣɣamon] 'the marriage'

Input: /tonɣamon/	ICC[CONT]	IDENT[CONT]
a. tonɣamon	*!	
b. ☞toɣɣamon		*

ICC[CONT] ≫ IDENT[CONT]

One reasonable candidate was omitted from (15), namely the candidate in which the fricative assumes the continuancy of the nasal: [toŋgamon]. Just as in (9) and (10), we are forced to posit a more specific constraint—IDENT[CONT]$_{Obs}$ (16)—, whose ranking is established in (17).

(16) IDENT[CONT]$_{Obs}$: Corresponding obstruents in the input and output must have identical continuancy.

(17) /ton-psefti/ → [topsefti] 'the liar'

Input: /ton-psefti/	IDENT[CONT]$_{Obs}$	ICC[CONT]
a. topdefθi	*!*	
b. ☞topsefti		**

IDENT[CONT]$_{O}bs$ ≫ ICC[CONT]

In this section and the section on place assimlation we have seen rankings that have been of the form shown in (18). By comparing (15) and (17) with (8) and (10), we see that the constraints in Modern Greek conspire to protect obstruents from change. Modern Greek obstruents maintain their continuancy and place features regardless of their environment. It would be elegant if we could posit the same ranking for voicing, but that would seem to violate our findings in section 2, where we showed that obstruents in NC clusters assimilated to the voicing of the nasal. The pattern in (18) can be salvaged for voicing, however, if we posit a constraint against voiceless nasals (19) that outranks IDENT[VOICE]$_{Obs}$, as shown in (20).

(18) IDENT[FEATURE]$_{Obs}$ ≫ ICC[FEATURE] ≫ IDENT[FEATURE]

(19) *N̥: no voiceless nasals

(20) /pemp-p/ → [pembo] 'I send'

Input: /pemp-o/	*N̥	IDENT[VOICE]$_{Obs}$	ICC[VOICE]	IDENT[VOICE]
a. pempo	*!			*
b. ☞pembo		*		*

*N̥ ≫ IDENT[VOICE]$_{Obs}$

5 Deletion in tri-consonantal clusters

(21) (a) /e-pemp-sa/ → [epepsa] 'I send (aorist)'
(b) /ton-psefti/ → [topsefti] 'the liar'

The final phenomenon that we will examine in this paper is the deletion of nasals in (some) tri-consonantal clusters. We believe this is due to the difficulty these clusters cause for syllabification. We assume that output forms are subject to a constraint which demands that syllables conform to the Sonority Sequencing Principle. This constraint is defined in (22). The exact nature of the sonority hierarchy in Modern Greek is outside the scope of this paper, but is suffices for our purposes to assume that the minimal sonority difference is greater than that between [p] and [m] but less than that between [d] and [r].

(22) SON-SEQ: complex onsets have rising sonority and complex codas have falling sonority, subject to minimal sonority distance.
Minimal Sonority Distance: For a series of segments to be classified as having rising or falling sonority, the difference in their sonority must be greater than the language-specific minimum.

The critical ranking in this case is with MAX, a constraint that militates against deletion. In (23) we demonstrate that it is impossible to syllabify [epempsa] in such a way that it respects SON-SEQ. In order to satisfy SON-SEQ, a segment must be deleted. Like in the other situations the victim of the process is the nasal segment. Perhaps the deletion of the nasal gives the maximal sonority distance between the second syllable's peak and coda, or perhaps there is another constraint that militates specifically against the deletion of obstruents; the latter would certainly be in line with the patterns we have observed in Modern Greek.

(23) /e-pemp-sa/ → [e.pep.sa] 'I send (aorist)'

Input: /e-pemp-sa/	Son-Seq	Max
a. e.pem.psa	*!	
b. e.pemp.sa	*!	
c. ☞e.pep.sa		*

Son-Seq ≫ Max

We said at the beginning of this section that deletion occurs in *some* tri-consonantal clusters. When a nasal is followed by two consonants that have rising sonority, the nasal is not deleted; the form can satisfy Son-Seq without violating Max. The fact that the ICC constraints are not resolved through deletion also indicates that Max is a high-ranked constraint. An tableau showing a form which maintaints its tri-consonantal cluster is given in (24).

(24) /antras/ → [an.dras] 'man'

Input: /antras/	Son-Seq	Max	ICC[Cont]
a. ☞an.dras			*
b. an(.)d(.)d(.)as	*!		
c. an.das		*!	
d. ad.ras		*!	

Max ≫ ICC[Cont]

6 Conclusions

In this paper we have examined four phenomena that occur in NC clusters in Modern Greek. Three of these phenomena involved some type of assimilation. We saw first assimilation in voicing, then place, and finally continuancy. After inroducing and ranking constraints to account for these three processes, a pattern began to emerge; it seemed more important for consonants in clusters to share features than it was to preserve underlying contrasts, but only as long as that agreement could come without altering the feature make-up of any obstruents involved. This pattern fit our analysis of the place and continuancy features, but it only became fully apparent when we added a stipulation that avoiding voicless nasals was even more important than leaving obstruents unmodified. With that stipulation we were able to

write the generalization in (18).

After dealing with the assimilation phenomena, we turned out attention to the deletion of nasals in certain tri-consonantal clusters. To explain this behavior, we appealed to the notion of the Sonority Sequencing Principle, which maintains that complex onsets must have rising sonority and that complex codas must have falling sonority. Then nasals were deleted when they were in clusters that could not be syllabified in accordance with Sonority Sequencing Principle. The fact that the nasal and not either of the obstruents was deleted was thought to point to the same protection of obstruents that we saw in the assimilation processes.

References

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