

POSTLEXICAL RULES AND GESTURAL OVERLAP IN A GREEK SPOKEN CORPUS

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Abstract

In this paper, we present preliminary acoustic data on the realisation of sandhi in Greek, based on a spoken corpus. Our data show that certain phenomena analysed as categorial postlexical rules of Greek have in fact gradient realisation, and thus are more appropriately accounted for as overlap between articulatory gestures, i.e. as the result of gradient rules of phonetic implementation. This evidence tallies with results from phonetic data in English and other languages, and questions the existing categorial analyses of Greek sandhi and their reliance on impressionistic data.

Introduction

From the phonological point of view, sandhi phenomena have been said to involve boundaries of different strength,¹ different syntactic structures,² different constituents of prosodic structure,³ or to be the result of lexical representations.⁴ In all approaches the rules involved assume categorial modifications of phonological segments or their features. Phonetic studies

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- ¹ Noam Chomsky and Morris Halle, 1968, *The Sound Pattern of English*, New York, Harper and Row.
- ² Ellen M. Kaisse, 1985, *Connected Speech: The Interaction of Syntax and Phonology*, New York, Academic Press.
- ³ Marina Nespors and Irene Vogel, 1986, *Prosodic phonology*, Dordrecht, Foris; Elizabeth O. Selkirk, 1980, Prosodic domains in phonology: Sanskrit revisited, in M. Aronoff and M. L. Kean (eds), *Juncture*, pp. 107-129, Saratoga, California, Anma Libri.
- ⁴ Angeliki Malikouti-Drachman and Gaberell Drachman, 1992, Greek clitics and lexical phonology, in W. U. Dressler, H. C. Luschützky, O. E. Pfeiffer, J. R. Rennison (eds), *Phonologica 1988*, pp. 197-206, Cambridge, Cambridge University Press.

in English, on the other hand, show that several, though not all, sandhi rules (alveolar assimilation, [s] to [ʃ] assimilation, palatalisation) have *gradient output* involving gestural overlap and gestural reduction.⁵

For Greek there exist several phonological analyses of sandhi,⁶ all of which espouse the categorial view mentioned above. Further, all analyses are based on impressionistic and/or introspective data. The nature of the data used in these studies has resulted in disagreements between analyses on the domains of application of the rules and—on occasion—on the exact formulation of the phenomena themselves (cf. vowel deletion rules, /n/-deletion). For this reason we decided to rely on naturally occurring data, and phonetic means of investigation for our analysis of sandhi in Greek.

Method

Our corpus consisted of texts read aloud, and naturally occurring speech (news broadcasting, interviews and spontaneous speech); it is in fact the corpus of Standard Greek created for the development of GRTToBI (Greek Tones and Break Indices), a system for the prosodic annotation of Greek.⁷

Our data come from part of the corpus, elicited from nine native speakers of Greek, three males and six females. All but one had Athenian accent; the other, a male, had the regional accent of Karditsa.

⁵ Francis Nolan, 1992, The descriptive role of segments: evidence from assimilation, in G. J. Docherty and D. R. Ladd (eds), *Papers in Laboratory Phonology II: Gesture, Segment, Prosody*, pp. 261-280, Cambridge, Cambridge University Press; Elizabeth C. Zsiga, 1997, Features, gestures, and Igbo vowel assimilation: an approach to the phonology/phonetics mapping, *Language*, Vol. 73, pp. 227-274.

⁶ Cleo Condoravdi, 1990, Sandhi rules of Greek and prosodic theory, in S. Inkelas and D. Zec (eds), *The Phonology-Syntax Interface*, pp. 63-84, Chicago, The University of Chicago Press; Kaisse, op.cit.; Malikouti-Drachman and Drachman, op. cit.; Nespoulopoulou and Vogel, op.cit.

⁷ Amalia Arvaniti and Mary Baltazani, 2000, Greek ToBI: A System For The Annotation of Greek Speech Corpora, *Proceedings of Second International Conference on Language Resources and Evaluation*, Vol. 2, pp. 555-562, Athens.

The corpus was annotated using GRToBI conventions, which allow one to mark sandhi with the diacritic *s*. Judgements concerning sandhi were based on the examination of the relevant waveforms, and on spectrographic analysis (where necessary).

Results

Consonant degemination: our data confirmed the description of consonant degemination, a sandhi rule described by Amalia Arvaniti.⁸ According to this rule, if a word ends in a consonant and the following word begins with the same consonant, the coda consonant is deleted. This rule appears to be categorial, and applies both within *prosodic words* (henceforth *PrWd*) and *intermediate phrases* (henceforth, *ip*, a constituent roughly equivalent to the phonological phrase, φ , of Nespov and Vogel); e.g. [o vo'rjas co 'iɫos sim'fonisan] > [o vo'rjas co 'iɫo sim'fonisan].

/s/-voicing: according to this rule described in Nespov and Vogel, /s/ becomes voiced if followed by a sonorant consonant across any prosodic boundary. Our data yielded nine cases of /s/+sonorant across a PrWd or ip boundary. Of these, five cases showed full voicing, while two showed no voicing at all, and two showed only partial voicing (i.e. only the first half of /s/ was voiced). Since the environments in which all three types of realisation occurred were the same, it is clear that the type of prosodic boundary does not affect realisation. Rather, /s/-voicing should best be treated as a gradient phenomenon, i.e. as the result of gestural overlap between the gestures of the vocal folds, and not as a phonological rule.

Vowel degemination: our data included 19 instances of identical vowels in hiatus, which should lead to *vowel degemination*, according to the analyses of Kaisse and Nespov.⁹ In fact vowel degemination occurred in nine cases, five of which were within the same PrWd (e.g. [na aɣo'raso] > [naɣo'raso]), and thus almost grammaticalised. Most importantly, vowel

⁸ Amalia Arvaniti, 1999, Illustrations of the IPA: Modern Greek, *Journal of the International Phonetic Association*, Vol. 19, pp. 167-172.

⁹ Marina Nespov, 1987, Vowel degemination and fast speech rules, *Phonology*, Vol. 4, pp. 61-85.

degemination did not apply in ten out of 19 cases; these cannot be easily explained, as they do not involve stressed vowels or stress clashes (factors that should block degemination according to the phonological analyses). However, as in our data all cases in which degemination did *not* take place involved vowels across a PrWd boundary within the same ip or intonational phrase (henceforth *IP*), we tentatively conclude that vowel degemination is obligatory within PrWd, but optional within ip and IP.

Vowel deletion: there were 49 instances of vowel hiatus involving non-identical vowels across a word boundary. The results showed that the complete deletion predicted by Nespor and Vogel's analysis occurred in only 17 cases (35% of total); 65% of these deletions occurred within a PrWd, while only 35% occurred across PrWds within an ip. There was no deletion in 13 cases (26.5%), while there were several gradient outputs: reduction (centralisation) of one vowel in 6 cases (12%), diphthongisation of the two vowels in 8 cases (16%), and coalescence in 5 cases (10%). Most of the cases where vowel deletion did occur can be accounted for using the rules of either Kaisse or Malikouti-Drachman and Drachman. However, it is clear that the rules are optional and do not apply across ips. Further neither the sonority hierarchy of Kaisse ([o] > [a]), nor that of Malikouti-Drachman and Drachman ([o] < [a]) appears to make the right predictions; e.g. [apo a'fton] > [apa'fton], but [ʔriʔora o] > [ʔriʔoro]. Further, variable output is also possible; e.g. [ospu o vo'rjas] can yield either [ospo vo'rjas] or [ospu vo'rjas]. Finally, as mentioned, gradient output (coalescence, diphthongisation, reduction) is both possible and frequent. Thus, vowel deletion is best treated as gradient gestural overlap; when overlap is complete one of the vowels is "deleted", i.e. its gesture is masked by that of the other vowel; however, in most cases an intermediate output is the result of the overlap.

Conclusion

In conclusion, the phonetic investigation of sandhi shows that we cannot take the existing phonological descriptions for granted: the rules are optional in most cases, while gradient output is very common. Further, these preliminary data show clearly that the exact nature and scope of the various sandhi rules requires further investigation, using a large corpus of naturally occurring speech examined by phonetic means.