



NEUTRALIZATION OF CONSONANT LENGTH: THE CASE OF DUTCH INTERVOCALIC STOPS

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ABSTRACT

In a phonological perspective, single intervocalic consonants in Dutch are generally considered to be either tautosyllabic or ambisyllabic depending on the nature of the preceding vowel. On the basis of a review of the relevant literature and recently obtained experimental results, it is argued that this phonological distinction does not have any clearly defined phonetic correlates. In this perspective, the concept of neutralization is discussed theoretically with respect to the degemination rule in Dutch. This discussion reveals a number of serious problems regarding the precise nature of neutralization in the case of the degemination rule in Dutch, i.e. whether it is contextual or absolute.

1. INTRODUCTION

Single intervocalic consonants in Dutch are considered to be tautosyllabic with the following vowel or ambisyllabic depending on the nature of the preceding vowel. After a lax vowel the ambisyllabicity condition holds ($VC_1.C_1V$), while a consonant following a tense vowel is syllabified with the following vowel ($V.C_1V$). This analysis is generally accepted in the phonological literature (see Kager's [1] state-of-the-art overview). It is argued that the syllable in Dutch is minimally and maximally bimoraic, which means that a

long vowel, a diphthong and a sequence of a short vowel plus a consonant are legal syllables. It also follows from this *bimoraic constraint* that an unchecked short vowel cannot be syllable final. In other words, short vowels are restricted to preconsonantal positions in which 'close contact' exists between the vowel and the following consonant. Hence, a single intervocalic consonant after a short vowel is analysed as ambisyllabic while after a long vowel the consonant is syllabified in the following syllable.

As far as the phonetic correlates of this phonological distinction between geminates and single consonants are concerned, there is considerable disagreement in the observations.

Measurements of consonant duration in Dutch words by Nooteboom [2] reveal that ambisyllabic consonants following a short stressed vowel are significantly longer than tautosyllabic consonants following a stressed long vowel. Jongman & Sereno [3] and Kuijpers [4] found no durational differences of intervocalic consonants in this environment. These findings have been confirmed more recently by Verhoeven, Gillis & De Schutter [5], who made a detailed investigation of the durational characteristics of intervocalic oral and nasal stops in Dutch. In this experiment, 10 native speakers of Dutch were presented with a series of minimally different word-pairs in which one member of the pair contained an intervocalic oral or nasal stop which was related to a phonological geminate ($/\text{ad}\text{ər}/$ 'adder'), while the other member of the pair was related to an underlying single segment ($/\text{ad}\text{ər}/$ 'vein').

As for the results of this investigation, it was found that the durations of intervocalic stops

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that are related to an underlying geminate are virtually identical to stops that are related to an underlying single segment (80 vs. 79 msec).

In addition, it was found that this absence of significant durational differences is not compensated for in the durational characteristics of other segments in the test words. The only trace of a durational difference is situated in the prevocalic segment and the duration of the second syllable: the initial prevocalic segment in words with a long vowel is 5 msec longer than in words with a short vowel, whereas the duration of the second syllable is 5 msec shorter in the latter case. It should be stressed however that this difference is by no means significant.

Finally, it emerged from the data that place of articulation of the consonants is significantly correlated to segment duration: labial stops are inherently shorter than alveolars and alveolars are shorter than velars. This finding was interpreted as consistent with observations on intuitive syllabification reported in Gillis & De Schutter [6], in which place of articulation was found to be an important factor in that there is a stronger tendency for ambisyllabic splitting in consonants with a back articulation. This is consistent with an hypothesis that perceptual phonetic clues are used in intuitive syllabifications.

In this paper, we will discuss the consequences of these empirical data for the hypothesis of an underlying opposition between single and geminate consonants.

2. NEUTRALIZATION

The fact that no significant durational differences could be observed between two types of stops that are different with respect to their assumed phonological status suggests that absolute or complete neutralization takes place. Neutralization refers to a process that leads to identical surface realizations of distinct phonological segments. In this case, the opposition between underlying geminate and single stops in Dutch is neutralized at the phonetic level. As such degemination constitutes a genuine manifestation of neutralization: the underlying phonological opposition between ambisyllabic and monosyllabic intervocalic consonants is neutralized as the result of the application of the degemination rule that 'wipes out' the underlying distinction.

When an underlying phonological distinction is neutralized completely at the acoustic level (absolute neutralization), there are two types of phonological rules potentially responsible for that merging: context free and context sensitive rules. Consequently the term neutralization can be used to denote *context free* neutralization and *context sensitive* or *contextual* neutralization. This distinction deserves further clarification.

A first hypothesis about the Dutch degemination rule entails that it is a form of context free neutralization: every geminate is degeminated irrespective of the phonological context in which it occurs. If this context free neutralization is absolute, it leaves no phonetic reflex, and hence the underlying geminate becomes identical with its simple counterpart. Thus our finding that intervocalic consonants do not show a significant durational difference relative to whether they derive from underlying geminates or from underlying single consonants, would point at a form of absolute neutralization. It is an instantiation of *context free* absolute neutralization if every geminate irrespective of its phonological context, eventually surfaces as a single consonant and in no single context the degemination rule does not apply.

Consequently, in that case, whether a surface intervocalic consonant derives from an underlying (phonological) single consonant or from an underlying geminate cannot be decided on independent grounds because geminates never surface as such. Hence, it may well be argued that the whole derivational procedure proposed in phonological analyses is a mere descriptive artifact. The notion of context free neutralization is not appealing to most recent phonologists, as it does not add unequivocally to the explanation of facts (Kiparsky [7]).

An alternative hypothesis is that the Dutch gemination rule is an instance of contextual neutralization. Kiparsky [7] provides the following formal definition of contextual neutralization: "A rule of the form $A \rightarrow B / XC_DY$ is neutralizing if and only if there are strings of the form CBD in the input of the rule. Otherwise the rule is non-neutralizing." This definition clearly indicates the difference between a context free neutralization rule ($A \rightarrow B$) that does not require a context, and contextual neutralization that stipulates the context in which neutralization takes place ($A \rightarrow B / XC_DY$), and, consequently, implies

contexts in which it does not apply. Final devoicing in German and Dutch are well known examples of this phenomenon: voiced obstruents become voiceless at the end of a word, but (generally) not word-internally, whereas voiceless obstruents do not undergo a change. Thus the rule essentially stipulates that the underlying distinction between voiced and voiceless obstruents is lost in a given environment while the distinction is retained elsewhere. An important observation should be stressed: voiceless obstruents can occur word finally. This differentiates genuine contextual neutralization from phenomena such as English flapping, i.e., the fact that medial /t/ and /d/ become flaps after stressed vowels (Donegan and Stampe [8]). In contrast with the voiced obstruents in the final devoicing rule, the resulting flap cannot occur in the input of the rule because it has no phonemic status. Thus, according to Kiparsky's definition, English flapping is not an instance of contextual neutralization.

Dinnsen [9] argues against contextual neutralization. He maintains, on the basis of a review of the relevant literature, that the phonological merger of two distinct segments does NOT lead to phonetically identical segments. He phrases his thesis in the following biuniqueness conditions:

(i) "Every genuine phonological distinction has some phonetic reflex, though not necessarily in the segments which are the seat of the distinction."

(ii) "Two utterances which are identical phonetically must also be identical phonologically." (Dinnsen, [9], p. 276)

Contrary to Dinnsen's findings that the available evidence does not warrant the conclusion that contextual neutralization leads to phonetic neutralization, Lahiri et al. [10] present a case of genuine contextual neutralization. They investigate the neutralization of vowel length in Dutch plural formation. The plural of Dutch nouns can be formed by attaching the ending <en> (/ən/) to the singular, as in for instance in table 1 (a-b). In these cases vowel length is preserved in the plural.

The interesting case is (c) in which a long vowel is derived from an underlying short vowel by a rule of vowel lengthening.

	<i>Singular</i>	<i>Plural</i>
a	'bal' (/bɑl/, <i>ball</i>)	'ballen' (/bɑlə (n) /)
b	'baal' (/ba:l/, <i>bale</i>)	'balen' (/ba:lə (n) /)
c	'dal' (/dɑl/, <i>valley</i>)	'dalen' (/da:lə(n) /)

Table 1 : examples of Dutch plural formation.

Lahiri et al. [10] investigate the surface realizations of long vowels in plural nouns, and compare the duration of vowels that are underlyingly long with that of vowels that are underlyingly short but are lengthened in the plural. It appears that both types of vowels do not differ significantly, warranting the conclusion that the underlying difference in vowel length is neutralized in the surface realization. Thus it may be concluded that this type of vowel length neutralization is a genuine instance of contextual neutralization, a neutralization that is absolute and not incomplete.

Is degemination a case of contextual neutralization? For this characterization to hold, degemination should occur in specific circumstances, while being absent in other circumstances. Secondly, the resulting form of the degemination rule should itself be a possible input for the degemination rule.

As to the first condition, it does not seem to be met if we require 'particular circumstances' to be 'particular phonological environments'. However, we may consider it to be met as there is at least one mode of speech in which the degemination rule may be neglected, viz. that of intuitive syllabification, the speech mode in which all parts of the word are articulated very carefully.

The second condition requires that there are strings of the form VCV in the input of the degemination rule, in addition to strings of the form VC_iC_iV. The phonological analyses of Dutch discussed in the first section seem to dismiss this possibility for lexical words. They either posit VC_iC_iV in the lexicon or have VC_iC_iV as a necessary intermediate stage between VC-V and surface V-CV. However, there is one class of phonological words that exhibits a different picture, viz. Dutch has phonological entities that consist of a lexical item followed by a pronominal or adverbial clitic, as for instance '(dan) kom 'k' (/kɔmæk/, lit.: *(then) I come*), '(dat) is er' (/Isər/, lit.: *(that) is there*), 'of 't' (/ɔfət/, lit.:

if it). These words exhibit a VCV structure. They originate in a postlexical phase and it is implausible to posit a VCCV structure for them: as a matter of fact, a number of words (such as 'kom' /kɔm/ in '(dan) kom 'k' /kɔmæk/) have a long vowel when the word is suffixed with /ən/ (the infinitival form of 'kom' /kɔm/ is 'komen' /kɔ:mən/) which makes it virtually impossible to postulate a form like /kɔmm/ underlyingly. This means that, at least in clitic groups, VCV strings do occur and that, consequently, also the second condition for degemination to count as an instance of contextual neutralization, appears to be met.

This means that, given the present assumption of an underlying distinction between geminates and single consonants, degemination in Dutch may be considered as a case of contextual neutralization. The experimental results in Verhoeven, Gillis & De Schutter [5] show that the underlying distinction between geminates and single consonants does not surface phonetically and that it is not compensated for by the durational properties of other segments we investigated. The neutralization is absolute or complete: acoustic measurements point out that both geminate and single stops are produced by native speakers without significant durational differences. Thus, this is a case in which, contrary to Dinnsen's contention, an underlying phonological distinction has no phonetic reflex.

3. CONCLUSION

The phenomenon of contextual neutralization was discussed from a theoretical perspective. This discussion of the degemination rule reveals that the prevailing analysis of phonological syllable structure of Dutch runs into a number of serious problems:

- i. The degemination rule can only be seen as an instance of contextual neutralization provided that we accept a somewhat unusual interpretation of the phonological environment required in a contextual neutralization rule, viz. that the environment is interpreted as a speech mode instead of a specific phonological context.
- ii. The neutralization of the geminate versus single consonant is absolute, i.e., does not leave a trace at the surface. Thus it does not fulfil Dinnsen's requirement in this regard. On

the other hand, we must state that the actual length of the consonant articulations relate in a significant degree with intuitions of subjects in the field of syllabification: ambisyllabic splitting occurs more frequently if the intervocalic consonant is, judging from the acoustic signal, longer. Interestingly, ambisyllabicity is, for our subjects, restricted to those circumstances where recent phonological theory postulates geminate consonants.

4. REFERENCES

- [1] R. Kager. *A Metrical Theory of Stress and Destressing in English and Dutch*. Foris. Dordrecht 1989.
- [2] S. Nooteboom. *Production and perception of vowel duration*. Philips Research Reports Supplements 5. Eindhoven 1972.
- [3] A. Jongman, J. Sereno. *On Vowel Quantity and Post-vocalic Consonant Duration in Dutch*. Procs. of the XIIth International Congress of Phonetic Sciences 1991, pp. 294-297.
- [4] C. Kuijpers. *Temporal Coordination in Speech Development*. University of Amsterdam. Doctoral Dissertation.
- [5] J. Verhoeven, S. Gillis, G. De Schutter. "Intervocalic Geminate and Single Stops in Dutch Syllable Structure". Forthcoming 1995.
- [6] S. Gillis, G. De Schutter. "Intuitive Syllabification: Universals and Language Specific Constraints". Forthcoming 1995.
- [7] P. Kiparsky. "Abstractness, Opacity and Global Rules". In Koutsoudas, *The Application and Ordering of Grammatical Rules*. Mouton. The Hague 1976. pp. 160-186.
- [8] P. Donegan, D. Stampe. "The Study of Natural Phonology". In Dinnsen, *Current Approaches to Phonological Theory*. Indiana University Press. Bloomington 1979. pp. 126-173.
- [9] D. Dinnsen. "A Re-examination of Phonological Neutralization". *Journal of Linguistics* 1985. pp. 265-279.
- [10] A. Lahiri, H. Schriefers, C. Kuijpers. "Contextual Neutralization of Vowel Length: Evidence from Dutch". *Phonetica* 1987. pp. 91-102.