

*Prenasalisation and melodic complexity**

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Abstract

In the northern Tohoku dialect of Japanese (Kanai 1982), it has been assumed that the melodic structure of prenasalised plosives is more complex than that of voiced plosives. This paper questions that view, however, calling upon the argument that prenasalisation occurs only in truly voiced plosives in an intervocalic environment. The analysis refers to the principle of Licensing Inheritance (Harris 1994, 1997), and examines its influence on the headship status of the nasal prime (Nasukawa 1998).

1 Introduction

In the northern Tohoku dialect of Japanese (henceforth NTJ), voiceless plosives in intervocalic position are subject to consonantal weakening or 'lenition' in the form of spirantisation and vocalisation. Within the context of Licensing Inheritance (Harris 1994, 1997), lenition results from a depletion of licensing potential in a prosodically weak position. In the same environment the prenasalisation of truly voiced plosives also occurs, this having been analysed (Kanai 1982) as a nasal insertion process in which the nasal phase of a prenasalised expression is inserted before voiced plosives occurring between vowels.

The fact that these two processes — lenition and prenasalisation — share the same environment suggests the possibility that they can be united by a common analysis. Below I reject Kanai's approach, and instead, identify prenasalisation in NTJ as lenition: a particular property of voiced plosives fails to be licensed and the outcome is interpreted as prenasalised. The success of this analysis rests on the assumption that the melodic structure of prenasalised plosives is less complex than that of their voiced oral reflexes. My account is based on the notion of Licensing Inheritance, and refers directly to the influence of this principle on the headship status of the nasal prime.

The paper is structured as follows. In §2 I describe prenasalisation in general, then focus on voiced plosive prenasalisation in NTJ (§3.1) and outline an orthodox account of the process (§3.2). Following that, §4 explores the neutralising mechanism of voiceless plosive spirantisation and vocalisation in the light of Licensing Inheritance.

*This paper has benefited greatly from the comments and suggestions of Phillip Backley and John Harris.

Finally, in §5 I propose an intrasegmental representation of prenasalised plosives in the context of Element Theory (Kaye, Lowenstamm and Vergnaud 1985; Harris 1990, 1994, 1997; Harris & Lindsey 1995) and analyse prenasalisation as a case of lenition. This is achieved by adopting the idea of headship switching on the nasality/voice-bearing prime.

2 Prenasalisation

While the majority of languages do not use prenasalisation as a contrastive property, we find a concentration of language systems in Africa and the Pacific area that contain prenasalised segments. It has been claimed that prenasalised segments arise via one of two prenasalisation processes (Herbert 1986). In the first of these, the nasal phase of a prenasalised sound exists by virtue of nasality being lexically present in either the target of the process or its given environment. This is illustrated in the following examples (taken from Herbert 1986):

- (1) a. **Tonga of Inhambane**¹ (Herbert 1986: 74, cf. Lanham 1955):

(N = nasal noun class)

N + <i>loy</i> + <i>i</i>	ⁿ <i>doyi</i> ‘witch’
N + <i>banyis</i> + <i>i</i>	^m <i>banyisi</i> ‘saviour’
N + <i>yuyu</i>	^ŋ <i>guyu</i> ‘fig tree’

- b. **Fe?Fe?-Bamileke**² (Herbert 1986: 47, cf. Hyman 1972):

(N- = non-complete and consecutive)

N- + <i>pɛn</i>	^m <i>bɛn</i> ‘to accept’
N- + <i>ɣɛn</i>	^ŋ <i>gɛn</i> ‘to go’
N- + <i>lɛn</i>	ⁿ <i>dɛn</i> ‘to say’

- c. **Ndali**³ (Piggott 1997: 449):

<i>iN-</i> + <i>puno</i>	<i>i</i> ^m <i>buno</i> ‘nose’
<i>iN-</i> + <i>tunye</i>	<i>i</i> ⁿ <i>dunye</i> ‘banana’
<i>iN-</i> + <i>ku</i> ⁿ <i>da</i>	<i>i</i> ^ŋ <i>gu</i> ⁿ <i>da</i> ‘dove’

The prefixes in (1a) and (1b) consist solely of nasality, while the Ndali prefix in (1c)

¹A Chopi language of the Narrow Bantu group (Niger-Kordofanian family).

²A Nun-Bamileke language of the Bane group (Niger-Kordofanian family).

³A Nyika-Safwa language of the Narrow Bantu group (Niger-Kordofanian family).

contains nasality at its right edge. In each case, the nasality that is lexically specified on the prefix is manifested as prenasalisation after attaching to the stem.

In the second type of prenasalisation process, an alternation between truly voiced plosives and prenasalised voiced plosives takes place in the absence of any obvious lexical source for nasality. This is observed in some dialects of Japanese, some Western Indonesian languages and in several Bantu languages.⁴

(2)	Northern Tohoku Japanese		
	<i>çi</i>	+ <i>daruma</i>	<i>çiⁿdaruma</i>
	'fire'	'Dharma'	'be covered with flames'
	<i>tsuu</i>	+ <i>gakko</i>	<i>tsu^ŋgakko</i>
	'middle'	'school'	'junior high school'
	<i>o</i>	+ <i>baasaN</i>	<i>o^mbaaN</i>
	(polite prefix)	'grandmother'	'grandmother (polite form)'
	<i>niyu</i>	+ <i>dʒaⁿga</i>	<i>niyuⁿdʒaⁿga</i>
	'meat'	'potato'	(name of a dish)

The NTJ examples⁵ given in (2) illustrate the process of compounding in this dialect: if the first segment of the second member of a compound is a truly voiced obstruent, then this segment is interpreted as its prenasalised reflex. For prenasalisation to occur, the target of the process must be in an intervocalic environment. It is not necessary, however, for nasality to be lexically present in either the target or the environment.

In the type of prenasalisation illustrated in (1), the source of the nasal phase in the output forms is clearly apparent. In the case of the phenomenon exemplified in (2), on the other hand, we fail to identify any obvious trigger for prenasalisation since, on the face of it, nasality is not present lexically. The remainder of this paper discusses this latter type of prenasalisation in TJ, and attempts to identify the source of nasality and the mechanism behind the process.

3 Northern Tohoku Japanese

3.1 The distribution of prenasalised segments

The NTJ dialect is spoken in the northern part of the Tohoku area of Mainland Japan,

⁴The status of the process varies from language to language: it is optional in Nea (Wurm 1972), some dialects of Malay (Hendon 1966) and many Melanesian languages (Ray 1926); but in Nambakaengo (Wurm 1972) and the northern Tohoku dialect of Japanese, it is obligatory.

⁵Some exceptions exist. See Inoue (1967) and Iitoyo (1998) for discussion.

and is distinguished by the prenasalisation process shown in (2). This occurs only in an intervocalic environment, and targets only **truly voiced** oral plosives. The characteristics of this dynamic process are also reflected in the lexical distribution of prenasalised plosives:⁶

(3)	Tokyo Japanese	NTJ
a.	<i>kagi</i> ‘key’	<i>ka^ŋgi</i>
	<i>saga</i> ‘destiny’	<i>sa^ŋga</i>
	<i>igaiga</i> ‘thorny’	<i>i^ŋgai^ŋga</i>
b.	<i>hada</i> ⁷ ‘skin’	<i>haⁿda</i>
	<i>kuda</i> ‘pipe, tube’	<i>ku^ŋda</i>
	<i>ido</i> ‘well’	<i>i^ŋdo</i>
c.	<i>kabu</i> ‘turnip’	<i>ka^mbu</i>
	<i>kiba</i> ‘tusks’	<i>ki^mba</i>
	<i>sabi</i> ‘rust’	<i>sa^mbi</i>

Comparing these Tokyo dialect forms in (3) with the corresponding NTJ forms, it can be seen that all intervocalic plosives may exhibit prenasalisation.

In comparison, truly voiced oral plosives in either word-initial or foot-initial position (see Vance 1987), together with the voiceless cognates of plosives in intervocalic

⁶It has been argued from both diachronic and synchronic perspectives that prenasalised plosives in NTJ are derived from the prenasalisation of truly voiced oral plosives (Inoue 1967, Ashworth 1976-77, Kanai 1982).

⁷This dialect exhibits other alternations involving alveolar: voiced alveolar obstruents are prenasalised and interpreted as prenasalised affricates before high vowels:

<i>midzu</i> ħwater _H	<i>m^ɥɥⁿɥⁿ</i>
<i>kudzi</i> ‘lottery’	<i>ku^ɥɥⁿɥⁿ</i> (regional)

Not only in cases involving prenasalisation but also in all other cases, alveolar obstruents become affricates when they are followed by high vowels:

<i>tumiki</i> ħbrick _H	<i>tumiki</i>
<i>katwo</i> ħbonito _H	<i>kaⁿɥⁿwo</i>

This kind of alternation can be analysed as local place assimilation, but it is beyond the scope of the present discussion to pursue its mechanism here.

position, do not undergo the process. This is illustrated below.⁸

(4)	Tokyo Japanese	NTJ		
a.	<i>gakkoo</i> ‘school’	<i>gakkoo</i>	* ^ŋ <i>gakkoo</i>	
	<i>daruma</i> ‘Dharma’	<i>darɯma</i>	* ⁿ <i>darɯma</i>	
	<i>baku</i> ‘tapir’	<i>bayɯ</i>	* ^m <i>bakɯ</i>	
b.	<i>kaki</i> ‘persimmon’	<i>kayi</i>	* <i>ka</i> ^ŋ <i>gi</i>	* <i>ka</i> ^ŋ <i>ki</i>
	<i>saka</i> ‘slope’	<i>saya</i>	* <i>sa</i> ^ŋ <i>ga</i>	* <i>sa</i> ^ŋ <i>ka</i>
	<i>hata</i> ‘flag’	<i>haɭa</i>	* <i>ha</i> ⁿ <i>da</i>	* <i>ha</i> ⁿ <i>ta</i>
	<i>kata</i> ‘shoulder’	<i>kaɭa</i>	* <i>ka</i> ⁿ <i>da</i>	* <i>ka</i> ⁿ <i>ta</i>

As shown in (4a), word-initial position fails to support the prenasalisation of truly voiced oral plosives. Furthermore, the process may only target voiced plosives: the alternation in (4b) shows that intervocalic voiceless plosives never become prenasalised. Instead, the voiceless stops are potential targets for vocalisation.⁹

Interestingly, the neighbouring dialect of Southern Tohoku Japanese also exhibits voiceless plosive vocalisation in the (4b) environment. In the Southern system, however, it is truly voiced cognates, as well as voiceless plosives, that undergo the process. The examples in (5) show the neutralisation of voiced and voiceless plosives in the Southern dialect.

(5)	Tokyo Japanese	Southern Tohoku Japanese		
a.	<i>kaki</i> ‘persimmon’	<i>kayi</i>	* <i>ka</i> ^ŋ <i>gi</i>	* <i>ka</i> ^ŋ <i>ki</i>
	<i>kagi</i> ‘key’	<i>kayi</i>	* <i>ka</i> ^ŋ <i>gi</i>	* <i>ka</i> ^ŋ <i>ki</i>
b.	<i>hata</i> ‘flag’	<i>haɭa</i>	* <i>ha</i> ⁿ <i>da</i>	* <i>ha</i> ⁿ <i>ta</i>
	<i>hada</i> ‘skin’	<i>haɭa</i>	* <i>ka</i> ⁿ <i>da</i>	* <i>ka</i> ⁿ <i>ta</i>

⁸In the consonantal inventory of modern Japanese (including the dialect in question), the distribution of the voiceless bilabial plosive is lexically restricted: it can appear only as a full geminate (e.g. *kappa* ‘water imp’) or as the second part of a NC sequence (*sampo* ‘stroll’). Therefore, it is never found in the intervocalic environment in (4b).

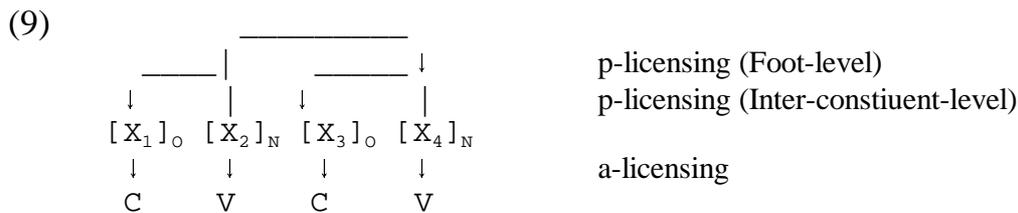
⁹The intervocalic reflexes of voiceless plosives in the Tohoku dialect in general have been regarded as voiced counterparts — *g* and *d* (Inoue 1968, Kanai 1982). However, my own research shows that the reflexes are not *g* and *d*, but the voiced fricative *ɣ* and voiced lateral tap *ɭ* respectively.

context a number of English systems show *t*-tapping.

In addressing the question of why phenomena of this type are particularly prevalent in intervocalic position, Harris (1994, 1997) draws on the notion of licensing — a head-dependent relation that controls all aspects of phonological architecture in accordance with (8):

- (8) **PHONOLOGICAL LICENSING PRINCIPLE** (Kaye 1990)
 Within a domain, all phonological units must be licensed save one, the head of that domain.

Phonological licensing manifests itself in one of two guises: **p[rosodic]-licensing** defines a licensing relation established between two positions in prosodic structure, while **a[utosegmental]-licensing** describes the licensing relation between a melodic unit and a prosodic position. The following structure illustrates these two kinds of licensing relation:¹⁰

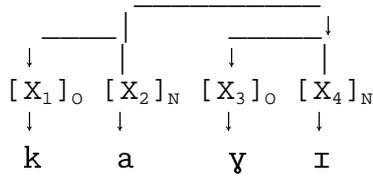


In (9), x_2 is a nucleus and the ultimate head of the p-licensors in the domain. x_1 (its preceding onset) and x_4 (another nucleus in the domain) are directly p-licensed by x_2 at the inter-constituent and the foot level respectively, whereas the onset x_3 is indirectly p-licensed by x_2 through x_4 at an inter-constituent level.¹¹ Differences in the architecture of the p-licensing paths shown in (9) are mirrored by differences in a-licensing potential. A position located relatively low down a licensing path will enjoy less distributional freedom than one located higher up. A direct implication for consonant distribution is that a greater number of contrasts may be supported by x_1 than by x_3 , owing to differing amounts of a-licensing potential inherited by a p-licensee from its p-licensor. The following formulation defines this asymmetric relation:

- (10) **LICENSING INHERITANCE** (Harris 1992, 1994, 1997)
 A licensed position inherits its a-licensing potential from its licensor.

¹⁰Following Harris (1997), Xs are used instead of O(nset)-N(ucleus) for the sake of convenience.

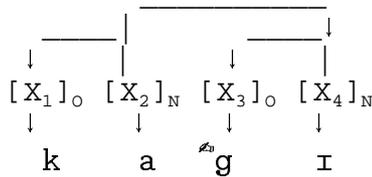
¹¹Thus an onset is universally licensed by its following nucleus. For details, see the definition of Onset Licensing in Harris (1994: 160).



To account for lenition of this type we can adopt an approach similar to that taken in the case of (11), the one difference being that lexically voiced and voiceless plosives lose their voicing contrast in this particular context.

These facts indicate that the prenasalisation observed in NTJ is similarly a consequence of lenition in foot-internal weak positions.

(14) Voiced plosive prenasalisation in NTJ



In accordance with Licensing Inheritance, we can expect the melodic structure of x_3 in (14) to be less complex than that of x_1 , because a position relatively low down the licensing path inherits a reduced amount of a-licensing potential. This result is inconsistent with Kanai’s analysis, in which prenasalised plosives are treated as being more complex than voiced plosives.

If we accept the analysis in (14), then two questions must be addressed. First, what is the source of nasality in prenasalisation? Second, is it possible to analyse prenasalised plosives as being less complex than voiced plosives? To answer these questions, we must identify the melodic organisation of the relevant segments.

5 Prenasalisation as lenition

5.1 Melodic primes and prime suppression

Phonologists are united in the assumption that segments can be decomposed into smaller, indivisible units or primes, although some degree of variation in the nature and the identity of these units can be observed between different theoretical frameworks. In this paper I adopt the set of privative primes known as **elements** (Kaye, Lowenstamm & Vergnaud 1985, 1990; Harris 1994, Harris & Lindsey 1995),

which are privative,¹² independently interpretable and redundancy-free. Those elements pertinent to the present discussion are given below with specifications of their acoustic signal mapping:

(15) ELEMENTS ACOUSTIC PATTERN

[U]	Rump: low spectral peak
[@]	Neutral: no salient spectral peak
[R]	Rise: high spectral peak
[?]	Edge: abrupt and sustained drop in overall amplitude
[h]	Noise: aperiodic energy
[N]	Murmur: low broad resonance peak
[L]	‘Slack’: F0 down

Employing the elements given above, foot-internal lenition is illustrated in the following schemata (Harris 1997):

(16) a. Labial plosive vocalisation	<i>b</i>	→	<i>β</i>
	[U, ?, h]		[U, <?>, <h>]
b. Velar plosive vocalisation	<i>k</i>	→	<i>ɣ</i>
	[@, ?, h]		[@, <?>, <h>]
c. <i>t</i> -tapping	<i>t</i>	→	<i>r</i>
	[R, ?, h]		[R, <?>, <h>]

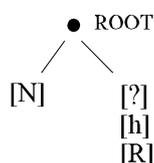
The vocalisation process is represented in (16) as the suppression of [?] and [h]; the remaining elements [U], [@] and [R] then define a labial approximant, a velar approximant and a tap respectively. Each instance of element suppression is a reflection of the reduced a-licensing potential available in the prosodically weak foot-internal position.

As (17) shows, vocalisation in both NTJ and STJ receives a parallel analysis. Note that the remaining [R] element in (17b) is interpreted in isolation as an alveolar lateral tap.

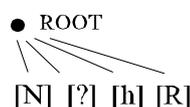
(17) a. Velar plosive vocalisation	<i>ka k i</i>	→	<i>ka ɣ i</i>
	[@, ?, h]		[@]

¹²Recent studies have shown how a commitment to privativeness can contribute significantly to a reduction in the generative capacity of a system of phonological contrasts.

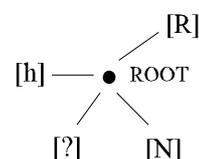
(19) a.



b.



c.



Further criticism of (19a) is expressed in Takahashi (1993), where it is noted that this structure is unable to encode any chronological distinction between the phonetic manifestation of the left melodic branch and that of the right branch. This follows from the generalisation that the sequential ordering of melodic units is determined exclusively by the prosodic structure, and manifest at the skeletal level. Any specific grouping of elements at the melodic level is rendered insignificant, under the assumption that each prime behaves autonomously and resides on its own autosegmental plane (Goldsmith 1976, 1990; Kaye, Lowenstamm & Vergnaud 1985). For this reason, the respective interpretations of the three structures in (19) will be identical. If intrasegmental components were to encode timing properties, then a great number of unattested ‘contour’ expressions would inevitably be generated — such as the segments in (19b) and (19c) that carry more than two timing differences. Overgeneration of this sort would have immediate repercussions for generative restrictiveness.

Within a cognitive model of speech sounds, it should be expected that phonological representations accommodate only information that is lexically contrastive. Accordingly, the timing difference observed in the phonetic interpretation of prenasalised plosives should be deemed phonologically irrelevant for two reasons: first, the difference can never create a phonological opposition; and second, the two supposedly ‘phonetic’ phases of a prenasalised stop always behave as a single segment for contrastive purposes. This would appear to provide ample justification for treating timing differences of this kind as a product of the Articulatory-Perceptual system, and I therefore omit these details from the representations of prenasalised plosives to be given below.¹⁴

Let us assume that the voiced alveolar plosive in (20a) comprises the components of a plain alveolar plosive ([R, ?, h]) and a voicing-bearing element ([L]) (Brockhaus 1992). The internal structure of an alveolar nasal (20b), on the other hand, is expressed

¹⁴For similar reasons, Rennison (1998) proposes a melodic representation for prenasalised alveolar plosives that introduces a floating or ‘lazy’ element which contributes to the phonetic manifestation of the second part of the prenasalised segment. With the option of applying ‘floating’ status to any element, however, we immediately re-introduce overgeneration problems of the sort already noted (cf. the impossibility of expressions such as s^l and f^p).

by the set [R], [ʔ] and [N] (the nasal element) (Harris 1990, 1994). Turning to the prenasalised stop ${}^n d$ in (20c), I tentatively assume that this consists of all the elements found in (20a) and (20b), a proposal based on the fact that ${}^n d$ is the derived reflex of d in voiced plosive prenasalisation in NTJ.

(20)	Provisional representations of d , n and ${}^n d$		
	a. d	b. n	c. ${}^n d$
	[R, ʔ, h, L]	[R, ʔ, N]	[R, ʔ, h, L, N]

The representations in (20) successfully establish the necessary phonological contrasts: the distinction between d and ${}^n d$ refers to [N]; and ${}^n d$ is distinguished from n by the presence of [h] and [L].

However, these melodic structures do not square with the analysis given in §4. Recall that lexically given voiced plosives are neutralised in foot-internal position, this environment receiving only a reduced amount of licensing potential that is insufficient to a-license all the lexically specified elements. As discussed in §4, this leads us to propose that the melodic structure of ${}^n d$ must be less complex than that of d . Yet, by adopting the representation in (20c) for a prenasalised plosive, we fail to uphold the account of neutralisation already given.

As already mentioned in §4, another problem is the appearance of [N] during the course of the process. If ${}^n d$ has the representation in (20c), then the appearance of [N] during the derivation from d remains unexplained. The arbitrariness of this account sheds little light on the question of why the prenasalisation process only targets voiced plosives.

In order to establish an alternative representation for prenasalised plosives, let us focus on the fact that the prenasalisation process never affects voiceless plosives, but only voiced plosives in intervocalic position. What this indicates is that the correlation between voicing and nasality — [L] and [N], in elemental terms — must be a key factor in identifying the representation of prenasalised plosives. Evidence for a strong correlation between voicing and nasality is not restricted to the process in question, but is also to be found in postnasal voicing assimilation, Yamato-Japanese Rendaku (Itô *et al* 1995, Nasukawa 1998) and Dahl's Law (Armstrong 1967, Davy & Nurse 1982).

In order to capture the relation between [L] and [N], Nasukawa (1998) proposes that the two primes are in fact the same object (see also Ploch 1995), with the difference between voicing and nasality being captured by recourse to the notion of headship: the headed element [N] contributes voicing, while its headless counterpart manifests itself as nasality (the underscore denotes headedness).

(21)	MURMUR ELEMENT	HEADSHIP STATUS	PHONETIC INTERPRETATION
	[N]	non-headed	nasality
	[<u>N</u>]	headed	true voicing

In the earliest models of Dependency Phonology (Anderson & Jones 1974), melodic headedness had been developed chiefly to encode vocalic oppositions. Making use of these initial ideas, Harris & Lindsey (1995) describe languages exhibiting an ATR contrast using the same structural property — if [U] is headed, for example, then it is interpreted as tense *u*; on the other hand, if [U] is headless, then it is interpreted as its lax counterpart *ʊ*.

Following (21), I propose the melodic representations in (22):

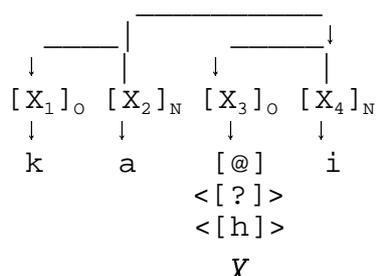
(22)	a. <i>d</i>	b. <i>n</i>	c. ^{<i>n</i>} <i>d</i>
	[R, ?, h, <u>N</u>]	[R, ?, N]	[R, ?, h, N]

In these representations, ^{*n*}*d* is distinguished from *d* by the absence of headedness on [N], and the same sound is differentiated from *n* by the presence of [h] (noise).

5.3 Headedness and melodic complexity

Given the representations in (22), voiceless plosive vocalisation in NTJ consists in the suppression of [?] and [h] — see §5.1 above. Position X₃ in (23) is prosodically weak and does not receive enough a-licensing potential to sustain [?] and [h].

(23) a. Voiceless velar plosive vocalisation



it captures the fact that voiceless segments, since they lack [N], are not subject to prenasalisation in a weak context. Voiceless plosive prenasalisation can be observed only if an adjacent morpheme or position possesses [N] in its melodic structure and triggers a fortition process (see §2). This contrasts with Kanai's rule-based analysis, which predicts not only voiceless plosive prenasalisation but also other kinds of prenasalisation, even if no nasal category is lexically specified. As already mentioned in §3.2, this kind of rule-oriented analysis can never establish any formal link between a process and the context where it occurs.

6 Summary

In this paper, I have discussed the mechanism of voiced plosive prenasalisation in NTJ, and developed an analysis which treats the process as an instance of lenition.

In accordance with Licensing Inheritance (Harris 1994, 1997), lenition is viewed as a reduction in melodic complexity occurring in prosodically weak sites. In my analysis, this reduction takes place via two mechanisms: the suppression of elements and the loss of melodic headedness. In NTJ, element suppression is found in voiceless plosive vocalisation, while the loss of headed status accounts for voiced plosive prenasalisation.

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