The asymmetrical behaviour of syllabic sonorants in Southern British English

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This article presents original acoustic data on syllabic /l/ and syllabic /n/ in Southern British English and proposes a new phonological account of their behaviour. Previous analyses have proposed that syllabic /l/ and syllabic /n/ should be represented identically. This paper, however, shows that syllabic /l/ and syllabic /n/ behave in very different ways, and in light of this, a unitary analysis is not justified. Instead, a proposal is made that syllabic /l/ and syllabic /n/ have different phonological structures, and that these different phonological structures explain their different phonetic behaviours.

1. Introduction

This paper provides a rare empirical study of syllabic consonants in British English and in doing so raises questions regarding the role of phonetics in phonology. First we must establish what is meant by 'syllabic', or indeed, 'syllable'. In trying to establish what indeed a syllable is, many phonologists have attempted to describe and explain the possible forms a syllable may take. Typically a syllable is described as consisting of a vocalic centre, optionally accompanied by a consonantal onset or coda, either of which may be complex (cf. Selkirk 1982/1999, Blevins 1995). In most languages, every syllable has a vowel at its centre. However, some languages allow segments which are not traditionally classed as vocalic to form the nucleus of a syllable, for example the /n/ in /bʌtn/ 'button' or the /l/ in /mʌdl/ 'muddle', and it is these segments which are known as syllabic consonants.

One survey (Bell 1978) cites 85 languages with syllabic consonants yet relatively little work has focused on their phonological or phonetic nature. Are syllabic consonants phonetically different from their non-syllabic counterparts? Can syllabic consonants be flanked by (complex) onsets or codas in the same way vocalic nuclei can be? Answers to such questions will help refine our understanding of what it means to be a syllable.

When different authors transcribe syllabic consonants we must ask ourselves what do the different authors mean to represent with the syllabicity mark. It quickly becomes apparent that its interpretation varies from author to

author, and we are left asking a number of questions: Are syllabic consonants underlyingly (phonologically) vowel-consonant sequences? Do syllabic consonants actually have vowels of some sort associated with them on the surface (phonetically)? If so, are these vowels always present? Could it instead be the case that (some) syllabic consonants attach directly and uniquely to the syllable nucleus? These questions relate directly to discussions concerning what can and cannot occur in a nucleus, onset or coda, and thereby to the typology of the syllable. The answers to these questions are also of crucial importance to phonological theories where there are very strict conditions on syllable structure and the presence of epenthetic vowels. Such a phonological theory will be discussed in §5.

2. *Syllabic consonants in British English*

In British English it is widely recognised that different styles produce different phenomena with respect to syllabic consonants (Roach, Sergeant and Miller 1992). In semi-formal registers /n/, /l/ and /r/ may be syllabic, the latter only in some rhotic dialects. Such syllabics are found in post tonic stress positions and almost always before a morpheme boundary. Syllabic consonants in semi-formal registers are often described as obligatory, in as much as it is deemed to be a mispronunciation to say, for example, [piːpəl] rather than [piːp̩l] for 'people' (Jones 1976:56). In fast and/or casual registers, /m/, /ŋ/ and even obstruents have been argued to be syllabic, arising through processes of assimilation and elision. Such syllabics can be found in pre-stress positions and domain initially, and their syllabicity is entirely optional. Examples include [s̩pəʊz] (Roach, Sergeant and Miller 1992: 476), [prob̩bləi] (Sivertsen 1960, quoted in Bell 1978:185), and [n̩? ˈmaʔtʃ] (not much) (Beaken 1971, quoted in Wells 1982:321). In neither semi-formal, nor fast/casual registers may syllabic consonants themselves be stressed. [1]

In this paper I examine only syllabic /n/ and /l/ in semi-formal registers of non-rhotic speakers of British English. In the following section I describe a series of experiments designed to investigate whether segments which are transcribed as syllabic consonants ever have vowels (schwas) associated with them, and how syllabic consonants differ from their onset and coda counterparts in terms of durational characteristics.

3. Experiment Design

First a list of disyllabic words potentially containing syllabic /l/ or /n/ was drawn up from Wells' (2000) *Longman Pronunciation Dictionary*, Rockey's

[1] Whilst this generalisation holds true for most dialects and registers, we may note that some analyses of General American /r/, argue that /r/ can be both syllabic and stressed, in words such as 'bird' [b̩rd], curt [k̩rt] (Bloomfieldian transcription).

(1973) *Phonetic Lexicon* and an online pronunciation dictionary, *Beep*.[2] In order to control for contextual effects, potential syllabic consonants were preceded only by /p/, /t/, or /k/, either as singletons, or as part of a (homorganic) nasal + stop cluster. A second list, of monosyllabic words containing /l/ and /n/ in domain initial (onset) and domain-final (coda) positions was also drawn up from the same sources. Each target word was place in a carrier sentence ('How does _ translate?') to ensure that all target words occurred in the same prosodic context (i.e. within the word carrying main sentential stress). The two lists were the combined and the sentence order then quasi-randomised.

Eight subjects naïve to the purpose of the experiment read the list of sentences three times at normal conversational tempo. All subjects were female, native English speakers with a university education reporting normal speech and hearing. All subjects, bar one, spoke with a modified Southern British English accent showing close systemic similarities to RP English. A single subject spoke with a distinct North Eastern accent.[3] One important restriction was placed on selection of speakers: they were chosen such that they did not vocalize their /l/s as is typical of some English dialects.

Subjects were recorded onto minidisk in a sound-proofed room using a Brüel and Kjær condenser microphone (Type 4165) and measuring amplifier (Type 2609). These recordings were digitised at 22, 500 Hz using Goldwave and then imported in PRAAT where spectrograms for each sentence were produced and labelled. Labelling was done by visual inspection of the waveform and spectrogram, and by listening to the speech signal.

In total 1705 sentences were recorded and labelled (some tokens were discarded due to noise interference on the recording e.g. speaker coughing or page turning). Duration measurements were extracted by script[4] using PRAAT, and all results were analysed using SPSS, where the threshold of significance was set at 95%.

4. Experimental Results

4.1 Results concerning distributional data

With regard to the distribution of syllabic /l/ and syllabic /n/ post singletons, statistical tests showed that /l/ was found to be syllabic irrespective of context, whilst the distribution of syllabic /n/ was context dependent, being found primarily only after /t/, and not after /p/ or /k/.

[2] ftp://svr-ftp.eng.cam.ac.uk/pub/comp.speech/dictionaries/beep.tar.gz

[3] The results of this speaker at no time differed significantly from the results of other speakers. Thus, although her dialect was not that under main consideration, her results were nevertheless included in the final analysis.

[4] A random sample of these results were checked by hand and found to be accurate.

(1) Distribution of syllabic /l/ after /p/, /t/ and /k/

	Preceding context		
	/p/_ e.g. 'people'	/t/_ e.g. 'beetle'	/k/_ e.g. 'vocal'
Post-schwa	n[5] = 1, 0.93%	n = 2, 1.85%	n = 7, 6.42%
Syllabic	n = 106, 99.07%	n = 106, 98.15%	n = 102, 93.58%

A binomial statistic shows that all distributions of syllabic /l/ deviate significantly from chance ($p<0.001$). Statistically there appear to be just significant differences between the three contexts, /p/, /t/ and /k/ (χ^2 (2) = 6.261, p = 0.044). However, this chi-squared was obtained from a table where 50% of the cells have an expected count less than 5. As a consequence the value obtained for p may be inaccurately low.

(2) Distribution of syllabic /n/ after /p/, /t/ and /k/

	Preceding context		
	/p/_ e.g. 'deepen'	/t/_ e.g. 'beaten'	/k/_ e.g. 'beacon'
Post-schwa	n = 80, 73.39%	n = 16, 14.81%	n = 75, 70.09%
Syllabic	n = 29, 26.61%	n = 92, 85.19%	n = 32, 29.91%

Again, a binomial statistic shows that all distributions of syllabic /n/ deviate significantly from chance ($p<0.001$). Statistically there are highly significant differences between the three contexts (χ^2 (2) = 93.914, $p<0.001$). Visual inspection confirms that /n/ tends to be syllabic following /t/ and non-syllabic following /p/ and /k/.[6]

A pilot study (642 sentences) based on one speaker with an expanded set of contexts (/p, t, k, b, d, g, s, z, f, v/) supports this conclusion:

(3) Place: Distribution of syllabic /l/ after expanded set of contexts (1 speaker)

	Preceding context		
	labial_ e.g. 'bauble'	coronal_ e.g. 'sozzle'	velar_ e.g. 'beagle'
Post-schwa	n = 0, 0%	n = 4, 5.56%	n = 2, 5.41%
Syllabic	n = 70, 100%	n = 68, 94.44%	n = 35, 94.59%

With this expanded set of contexts we see that there is *no* statistically significant effect of place on the occurrence of syllabic /l/ (χ^2 (2) = 3.99 p= 0.14).[7]

[5] n = number of tokens

[6] It may be the case that where '/n/' was syllabic following a /p/ or a /k/ assimilation had taken place to /m/ or /ŋ/ respectively. This is an area for further research.

[7] Again, this chi-squared was obtained from a table where 50% of the cells had an expected count less than 5, and thus it is likely that the value of p is inaccurately low.

(4) Place: Distribution of syllabic /n/ after expanded set of contexts (one speaker)

	Preceding context		
	labial_ e.g. 'carbon'	coronal_ e.g. 'loosen'	velar_ e.g. 'pagan'
Post-schwa	n = 69, 95.83%	n = 7, 9.86%	n = 38, 97.44%
Syllabic	n = 3, 4.17%	n = 64, 90.14%	n = 1, 2.56%

As with the restricted set of contexts, so now with the expanded set of contexts we see that there is a highly statistically significant effect of place on the occurrence of syllabic /n/ (χ^2 (2) = 138.59, p<0.001).

These results give us the first difference in behaviour between syllabic /l/ and syllabic /n/: place of context influences distribution of syllabic /n/ but not of syllabic /l/. /l/ appears to be always syllabic when it is preceded by any consonant and followed by a word boundary, whilst /n/ must be preceded by a coronal consonant to be syllabic.[8]

A second area where syllabic /l/ and syllabic /n/ behave differently from one another concerns their distribution following nasal + stop clusters. Results of statistical tests confirm that /l/ is found to be syllabic irrespective of context, whilst /n/ is found never to be syllabic, not even when preceded by a /nt/, i.e. homorganic, cluster. These results, in conjunction with the singleton results, suggest that the distribution of syllabic /l/ is not affected by preceding structural complexity. The distribution of syllabic /n/, on the other hand is affected: syllabic /n/ is not found following a cluster.

(5) Distribution of syllabic /l/ after nasal + stop clusters

	Preceding context		
	labial_ e.g. 'trample	coronal_ e.g. 'dental'	velar_ e.g. 'wrinkle'
Post-schwa	n = 5, 4.20%	n = 9, 7.44%	n = 9, 7.63%
Syllabic	n = 114, 95.80%	n = 112, 92.56%	n = 109, 92.37%

A binomial statistic shows that all distributions deviate significantly from chance (p<0.001). For a target consonant /l/ there are no significant differences between the three contexts (χ^2 (2) = 1.469, p = 0.480).

[8] It must be acknowledged that my results are statistical rather than categorical. Thus, for example, not all potential syllabic /n/s preceded by (homorganic) /t/ were actually realised as syllabic. One factor that may play a role in the realisation of target consonants as syllabic is their relative frequency: Fidelholtz (1975) showed that relative frequency can significantly influence vowel reduction (the more frequent a word, the more likely it is to show vowel reduction). Thus, it may be demonstrable that frequency also plays a role in total vowel absence, i.e. in the distribution of syllabic consonants. In drawing up the target word lists used for experiments described in this paper, I did not control for word frequency for to do so would have resulted in a very restricted set of usable words.

(6) Distribution of syllabic /n/ after nasal + stop clusters

	Preceding context		
	labial_ e.g. 'dampen'	coronal_ e.g. 'Clinton'	velar_ e.g. 'drunken'
Post-schwa	n = 58, 96.67%	n = 114, 95.00%	n = 57, 96.61%
Syllabic	n = 2, 3.33%	n = 6, 5.00%	n = 2, 3.39%

Again, for a target consonant /n/, a binomial statistic shows that all distributions deviate significantly from chance ($p<0.001$) and that there are no significant differences between the three contexts (χ^2 (2) = 0.400, p = 0.819).[9]

To conclude this section, if we compare the the distribution of syllabic /l/ and syllabic /n/ following both singletons and clusters we note two different patterns of behaviour. When a potential syllabic consonant is preceded by a singleton, context in the form of place, does affect the distribution of syllabic /n/: /n/ will be syllabic if the context is coronal. The distribution of syllabic /l/, however, is not influenced by place context. When a potential syllabic consonant is preceded by a (nasal + stop) cluster we see a different pattern of behaviour: /n/ is never syllabic, not even when preceded by a coronal cluster, whilst /l/ continues to be syllabic irrespective of context.

4.2 Continuous data results: durations

In this section I first present data regarding the mean duration of four different /l/ allophones: onset (word initial), coda (word-final), syllabic and post schwa. We see that with regard to duration, *coda* /l/ is distinct from all other allophones, being significantly longer. In the second set of data we see how /n/ allophones pattern with respect to duration. /n/ allophones do not pattern like /l/ allophones with respect to duration: *onset* /n/ is significantly shorter than all other allophones.

(7) Summary of continuous data for /l/: Means (standard deviations)

	Syllabic (N=314)	Post Schwa (N=10)	Onset (N=114)	Coda (N=116)
Duration (ms)	86 (18)	70 (17)	81 (17)	116 (27)

If we look in detail at the mean duration of the different /l/ allophones, an ANOVA test for *target C allophone* shows significant differences between allophones ($F (3, 550) = 79.70$, $p<0.001$). A Tukey post hoc test shows that the duration of *coda* /l/ is significantly longer than syllabic /l/, post schwa /l/ and onset /l/ ($p<0.001$ in each case). A Tukey post hoc test also shows that the duration of syllabic /l/ is significantly longer than post schwa /l/ ($p=0.045$).

[9] In fact this p may in fact be inaccurately low given that 2 cells had expected counts of less than 5.

However, none of the other durational differences are significant. Thus, with regard to duration, we can argue that syllabic /l/ patterns like onset /l/, not like coda /l/, nor as a distinct category (on the grounds that the duration of syllabic /l/ is not significantly different from the duration of onset /l/).

(8) Summary of durational data for /n/: Means (standard deviations)

	Syllabic (n=153)	Post Schwa (n=171)	Onset (n=116)	Coda (n=114)
Duration (ms)	106 (20)	98 (18)	86 (24)	102 (22)

An ANOVA test for *target C duration* shows significant differences between the four /n/ allophones ($F(3, 550)$ 21.92, $p<0.001$) and a Tukey post hoc test shows that the duration of onset /n/ is significantly shorter than that of syllabic /n/, post schwa /n/ and coda /n/ ($p<0.001$ in all cases). A Tukey post hoc test also shows that the duration of syllabic /n/ is significantly longer than the duration of post schwa /n/ ($p = 0.006$), though none of the other differences in duration are significant. Thus we could say that syllabic /n/ patterns like coda /n/, and not like onset /n/, nor as a distinct category (in that the durations of syllabic /n/ and coda /n/ are not significantly different).

The results of this section show that syllabic /l/ and syllabic /n/ pattern quite differently with respect to duration: syllabic /l/ patterns with onset /l/ and not with coda /l/, whilst syllabic /n/ patterns with coda /n/ and not with onset /n/. To summarise and conclude §4, what we have seen above is three ways in which syllabic /n/ behaves differently from syllabic /l/: (i) distribution of syllabic /n/, but not syllabic /l/ is sensitive to the context's place of articulation; (ii) distribution of syllabic /n/, but not syllabic /l/ is sensitive to the context's structural complexity (i.e. whether or not it is preceded by a singleton or a cluster); (iii) the duration of syllabic /n/ is akin to the duration of coda /n/, whilst duration of syllabic /l/ is akin to the duration of onset /l/.

Having gone some way towards empirically establishing the behaviour of syllabic /l/ and syllabic /n/ we must now look for an explanation of the behaviour observed. To this end, in the following section I outline a phonological framework where there are severe restrictions on the syllable template and strict conditions govern the occurrence of epenthetic schwas.

5. A Phonological Framework

Government Phonology[10] (GP) aims to provide a non-arbitrary account of phonological events by replacing the rule component of a phonology with a finite set of universal principles and parameters (contra Bromberger and Halle 1989).

[10] With regard to constituency I shall primarily be following work by Kaye, Lowenstamm and Vergnaud (1990), Charette (1991) and Harris (1994) whilst with regard to melody my work shall be based on Harris and Lindsey (1995).

The only constituents available in Government Phonology are the Onset, the Nucleus and the Rhyme, each of which may be maximally binary branching[11] (Kaye, Lowenstamm and Vergnaud, henceforth KLV, 1990:198-199). No 'syllable' constituent is recognised (KLV 1990:200-201, Harris 1994: 45-46), but rather, domains are constructed of iterated Onset-Nucleus pairs: neither a Nucleus, nor an Onset may form a domain on its own, nor may two Onsets (or two Nuclei) follow one another, without an intervening Nucleus (or Onset) (Harris 1994:160). No 'Coda' constituent is recognised either (Kaye 1990a): Any word-final consonant is instead attached to an Onset, which is necessarily followed by a (licensed, empty) nucleus (see below).

Whilst it is no longer controversial to suggest that linguistic units of sounds are decomposable into smaller units, the nature of these subparts remains a topic of discussion. In those approaches which adopt traditional features, such as [+/- front], [+/- anterior] as the smallest phonological units, articulation is elevated to unwarranted levels of importance given the wealth of evidence showing that speech production is parasitic on speech perception.[12] The primacy of articulation is undermined not least by the fact (all too often dismissed) that the same acoustic signature can be achieved by very different articulatory means.

In contrast to feature based approaches, Government Phonology takes seriously the relationship between phonological information and information in the speech signal. Sounds are composed of one or more monovalent elements, which although not in themselves acoustic events, are directly mappable onto gestalt patterns in the acoustic signal.[13] I propose the following representations for the consonantal inventory of English.

(9) Internal representation of the consonantal inventory of Southern British English[14] (broadly based on Harris 1994)

/p/ (@.U.<u>ʔ</u>.h.H)	/θ/ (@.<u>R</u>.h.H)	/t/ (@.<u>R</u>.ʔ.h.H)	/ʃ/ @.I.R.<u>h</u>.H)	/h/(@.h)
/b/ (@.U.<u>ʔ</u>.h)	/ð/ (@.<u>R</u>.h)	/l/ (@.R.<u>ʔ</u>)	/ʒ/ (@.I.R.<u>h</u>)	
/m/ (@.U.ʔ.N)	/s/ (@.R.<u>h</u>.H)	/ɹ/ (@.R)	/k/ (<u>@</u>.ʔ.h.H)	
/f/ (@.U.<u>h</u>.H)	/z/ (@.R.<u>h</u>)	/dʒ/ (@.I.R.ʔ)	/g/ (<u>@</u>.ʔ.h)	
/v/ (@.U.<u>h</u>)	/d/ (@.<u>R</u>.ʔ.h)	/j/ (@.I)	/ŋ/ (@.ʔ.N)	
/w/ (@.U)	/n/ (@.<u>R</u>.ʔ.N)	/tʃ/ (@.I.R.ʔ.H)	/k/ (<u>@</u>.ʔ.h.H)	

A PE that contains only @, as an operator, is known as an empty expression, and the nucleus to which such an expression is attached is known as an empty nucleus. Special principles govern the manifestation of such empty nuclei and these are discussed below.

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[11]Some GP researchers adopt a strict CV approach (Lowenstamm 1996) where only the Onset and Nucleus are recognised constituents, neither of which may branch.

[12]Consider, for examples, studies showing how acquired deafness and distorted auditory feedback can impair speech production e.g. Perkell et al 2000.

[13] See Harris and Lindsey (1995) for details.

[14] By convention the head of a phonological expression is underlined

Many languages exhibit vowel-zero alternations. The vowels involved in such alternations are typically peripheral or reduced, for example the alternation i ~ ∅ in Moroccan Arabic (Kaye 1990b), and ə ~ ∅ in French (Charette 1991). In Government Phonology, vowels which have this special property of alternating with zero are argued to be underlyingly empty (or in terms of the theory of elements outline above, to contain only operator @) and their interpretation is subject to the Empty Category Principle (ECP) and concomitant parameters.

(10) The Phonological Empty Category Principle
(Charette 1990:235, precise wording here taken from Kaye 1995:295)
A p-licensed (empty) category receives no phonetic interpretation

There are four potential circumstances under which an empty category, or specifically here, an empty nucleus, can be p-licensed.

(11) (Parametric) Conditions on p-licensing
(Kaye 1995:295, precise wording here my own)
A p-licensed (empty) category may receive no phonetic interpretation iff: i. it is domain-final
ii. it is properly governed
iii. it is magically licensed
iv. it is within an Inter-Onset governing domain

Magic licensing (Kaye 1991) is concerned with nuclei preceding S+C clusters. As such it is not relevant to the discussion at hand and will not be considered further. Inter-Onset Government (Lee 1999) is a governing relationship which may, in languages where this particular parameter is ON, be contracted between two onsets separated by a nucleus if certain substantive constraints are met. The domain-final parameter, referred to in (i) above, is ON in those languages which allow apparent word-final consonants (e.g. English) and OFF in those languages where words may only end in vowels (e.g. Cayuvava, Hawaiian). Given that GP holds that phonological strings consist of Onset-Nucleus pairs, those words, which appear to end in consonants, actually end in a nucleus. This nucleus is empty (it has no melodic content) and because it is silent it must (by stipulation) be p-licensed. By convention, a p-licensed category is indicated by underlining.

An empty category may also remain without interpretation if the conditions for Proper Government are met (cf. (11.ii)).

(12) Proper Government
(Kaye 1995:295, precise wording here taken from Charette 1998:170)
A nucleus α properly governs and empty nucleus β iff:
i. α and β are adjacent on the nuclear projection
ii. α is not itself p-licensed
iii. α is not a government licensor (for its onset)

(13) Government Licensing (Charette 1990:242)
For a governing relation to hold between a non-nuclear head A and its complement B, A must be licensed to govern by its nucleus

The key issue to note here is that there are strict principles governing the (non) interpretation of empty nuclei. Unless certain conditions are met empty nuclei are phonetically interpreted as reduced vowels, typically as schwa.

6. Towards a Phonological Analysis

As we saw above, 'syllables' in GP are made up of Onset-Nucleus pairs. Thus the syllabification of a world like 'button' necessarily includes a nuclear constituent between the /t/ and the /n/. Furthermore, we have seen that GP has strict principles governing the non-interpretation of nuclei; only p-licensed empty nuclei can remain without phonetic interpretation. Given this let us consider the predictions we can make concerning the realisation of a word like 'button'.

(14) Phonological structure for 'button'

O	N^1	O	N^2	O	N^3
|	|	|	|	|	|
x	x	x	x	x	x
|	|	|		|	
b	ʌ	t	?	n	

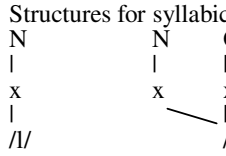
First, let us consider N^3: this nucleus is p-licensed by the domain-final parameter, and because it is itself p-licensed, it cannot act as a Proper Governor for N^2. Thus the conditions for Proper Government are not met. Are any of the other conditions for p-licensing met? Magic Licensing is not relevant here (we are not dealing with S+C clusters), and Inter-Onset Government could not be active here for /t/ could not enter into a governing relation with /n/.[15]

In fact we see that none of the conditions are met for the p-licensing of N^2 in (14): it is not domain-final, it is not properly governed, it is not magically licensed, nor is it subject to Inter-onset Government. From this we can conclude that N^2 must be phonetically realised, and our next question arises: how is this N^2 phonetically realised? The results given in §4 showed that words containing a potential syllabic /l/ never contained a schwa, whilst words containing a potential syllabic /n/ either contained no schwa, when the /n/ was preceded by a coronal, or such words contained a schwa-/n/ sequence, when the preceding syllable ended in a non coronal.

To explain this behaviour I propose the following structures for syllabic /l/ and syllabic /n/.

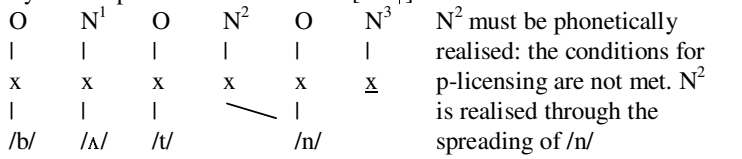
[15] For details see Lee (1999).

(15) Structures for syllabic /l/ and syllabic /n/



Syllabic /l/, unlike non syllabic /l/ is attached directly to a nuclear constituent, whilst syllabic /n/ is attached to both a onset constituent, and the preceding nuclear constituent, as a result of spreading (see below). This gives syllabic structures for words like 'button' and 'bottle' as in (16, 17).

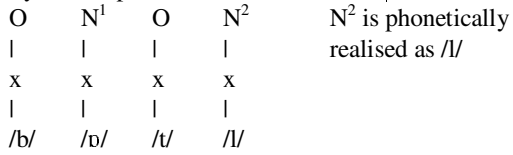
(16) Syllabic representation of 'button' [bʌtn̩]



N^2 must be phonetically realised: the conditions for p-licensing are not met. N^2 is realised through the spreading of /n/

/n/ is licensed to spread because it is preceded by a phonological expression with the same element (R) as head cf. Hawarth (1994), Harris (1994), Rennison (1993) (see below).

(17) Syllabic representation of 'bottle' [bɒtl̩]



N^2 is phonetically realised as /l/

It is clear from minimal pairs such as 'finally' [faɪnl̩i] vs. 'finely' [faɪnli], 'evening' (<vb. meaning 'to smooth') [iːvn̩ɪŋ] vs. 'evening' (time of day) [iːvnɪŋ], that syllabic /l/ and syllabic /n/ are not the same as their non-syllabic counterparts. This rules out representations whereby syllabic /l/ and syllabic /n/ are directly and uniquely attached to an onset constituent, as is the representation of non-syllabic /l/ and /n/.

The experimental results in §4 showed that for potential syllabic /n/ there is some free variation between [n̩] and [ən], irrespective of context. For example, following /t/, [n̩] occurred 85% of the time, whilst [ən] occurred 15% of the time. The possibility for this variation to exist must somehow be captured in whatever representation is proposed for syllabic /n/.

This variation can indeed be captured by proposing the structure for syllabic /n/ as given in (15), and *in addition*, a condition on the spreading of /n/: /n/ may only spread into the preceding nucleus when head licensed to do so by an onset adjacent at the relevant projection *with the same element as head*. Similar head based licensing proposals have been made by Hawarth (1994) for French, and

Rennison (1993) for Koromfe. When the onset preceding /n/ is not capable of Head Licensing the /n/, no spreading takes place. In such circumstances, the intervening nucleus must still be realised, but in these cases it is realised as a default vowel, or in other words, as a schwa (e.g. as in 'bacon' [beɪkən] where [k] and [n] do have the same element as head and thus /n/ is not licensed to spread).

Returning now to the representation of syllabic /l/, I proposed that this segment be directly attached to a nuclear constituent. Theory internally to Government Phonology there are no restriction on the set of elements which may attach to either a nuclear or non-nuclear constituent (cf. the one mouth principle, Anderson and Ewen 1987, Clements 1991). Theory externally, however, we must, as an upshot of my proposal, ask ourselves whether it is legitimate to treat syllabic /l/ as a vowel.

Let us consider definitions which have been made concerning what is and what is not a vowel or a consonant. A vowel can be defined articulatorily as involving no major stricture in the vocal tract (Ladefoged and Maddieson 1996:281), or acoustically as having relatively a long interval of periodic energy with three clear formants (Johnson 1997). Phonologically speaking, a structural definition is usually given for vowels: that which is found at the centre of a syllable, or acts as a syllable on its own. On each of these grounds it could be argued that syllabic /l/ is indeed very vowel-like. Phonetically speaking, /l/ is the most sonorous of oral consonants, having vowel-like formant characteristics, and can indeed be produced without any occlusion (Ladefoged and Maddieson 1996). Syllabic /l/ is also vowel-like phonologically speaking: it may occur after any onset (recall that syllabic /n/ does not show this behaviour), and can indeed form a syllable on its own, as in 'bottle'. Thus there seem to be no strong grounds for ruling out my proposal that syllabic /l/ is indeed attached directly to a nuclear constituent. Such an analysis would explain why no variation is seen in the realisation of potential syllabic /l/ (there is no 'space' in the syllabic structure, contrary to the case of syllabic /n/).

7. Conclusions

In this paper I have presented the results of an acoustic investigation into the nature of syllabic /l/ and syllabic /n/ in Southern British English. These showed that syllabic /l/ and syllabic /n/ behave quite differently from each other, in at least three ways. The distribution of syllabic /n/, but not syllabic /l/, is sensitive to the place of articulation of the immediately preceding singleton consonant. A potentially syllabic /n/ is only actually realised as syllabic when preceded by a homorganic, i.e. coronal consonant. When /n/ is preceded by a non-coronal consonant, the potential syllabic consonant is actually realised as /ən/. Syllabic /l/, on the other hand as no such restrictions on its distribution, for a potential syllabic /l/ is realised as a syllabic /l/ (distinct from a schwa-/l/ sequence) irrespective of the place of the preceding consonant.

Secondly, the distribution of syllabic /n/ is also affected by the structural complexity of its context: if a potential syllabic /n/ is preceded by a nasal-stop cluster, the potential syllabic /n/ is always realised as /ən/, even when preceded by a homorganic cluster. Once again, syllabic /l/ behaves in a different way: a potentially syllabic /l/ is always realised as an actual syllabic /l/ irrespective of the place of the preceding nasal-stop cluster. Thirdly, with respect to duration syllabic /n/ is akin to coda /n/, both being significantly longer than onset /n/. Syllabic /l/, however, is not akin to coda /l/ in duration, but is rather significantly shorter than coda /l/, and approximately the same duration as onset /l/.

In the second half of this paper I proposed that these differences in behaviour can best be explained by proposing differences in their syllabic structure. This is a new proposal, quite unlike those made by previous researchers (Chomsky and Halle 1968:354, Gimson 1989, Gussmann 1991, Wells 1995). If syllabic /n/ and syllabic /l/ are represented differently it is not surprising that they also behave differently.

By proposing that syllabic /l/ is attached directly to a nuclear constituent I capture that fact that potential syllabic /l/ is always realised as syllabic /l/ regardless of the nature of the preceding onset. As discussed in §6 above, there are no theoretical or definitional grounds for ruling out the interpretation of syllabic /l/ as a vowel. By proposing that syllabic /n/ is attached to a onset, and that this /n/ may spread when the conditions for head licensing are met, I capture and explain the variability of potential syllabic /n/, which is sometimes realised as [n̩] and sometimes as [ən], when preceded by a singleton. As for why syllabic /n/ is never found following a nasal-stop cluster, even when that nasal-stop cluster is coronal, I believe this is due to an interaction between Head Licensing and Government Licensing[16], which can only be given by a nucleus with content not shared with other constituents.

Government Licensing is concerned with the ability of a onset head to license its complement. In order for that head to license its onset, it must receive licence to do so. Languages vary as to what may provide the licence to govern to a onset head (Charette 1990, 1991). In some languages a p-licensed nucleus may act as a Government licensor, whilst in others only a realised nucleus, i.e. one with phonetic content, may act as a Government licensor. Thus occasions can arise when Proper Government and Government Licensing come into conflict and the solution depends on the language specific ranking of these two principles. I wish to extend these ideas in two ways (1) to propose that Head Licensing and Government Licensing can also come into conflict in those languages where both principles are active, and (2) to propose that a licence to govern can parametrically be given additionally by a nucleus which shares its content with an adjacent onset, or by a nucleus which does not share any content with an adjacent onset. A similar proposal has been made by Haworth (1994) for the treatment of French glides.

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[16] It might instead be argued that some sort of OCP effect is active but I do not believe this is the case: when a nasal is preceded by a nasal + stop cluster the two nasals are not adjacent at any level.

In conclusion I have shown that syllabic /l/ and syllabic /n/ behave in ways which do not justify a uniform analysis. Instead I have proposed distinct syllabic structures and new interactions of well-established principles in Government Phonology, providing an analysis which I believe can capture well different behaviours of syllabic /l/ and syllabic /n/ in Southern British English. I also hope that this paper has shown how phonological insight can be informed by phonetic research.

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