

Syllables, Vowel Length and the Spread of Suprasegmentals

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6.1 Introduction

The syllable has had a checkered history in linguistics, emerging from exile only relatively recently (see, for instance, Clements and Keyser 1983, Mohanan 1985, Blevins 1995). In Palu'e, an Austronesian language of southern Indonesia, we find conflicting evidence concerning the status of phonetically long vowels.¹ On the one hand we wish to consider the length to be purely due a moraicity constraint on foot size; long vowels are long (and monosyllabic) because the word needs lengths. On the other hand evidence from the interaction of a word-boundary effect that induces breathiness on the left edge (see Hajek (in press) for an areal overview), and nasal spreading from the right within the word implies that long vowels should be treated as two separate segmental units, and thus two syllables. In this note I shall explore the phonetics of nasality and breathiness in Palu'e, concluding that phonetically long vowels are ambiguous, sometimes showing the behaviour of monosyllables, and sometimes that of disyllables.²

¹Palu'e is described, briefly, only in Donohue (2005a, 2005b); this is the first work to deal with aspects of the phonology of the language. The language has the following segmental phonemes (aspiration is contrastive only initially; voiced stops are generally restricted to medial position): p^h t^h k^h; p t k ?; b d (dʒ) g; ʔ ŋ m b n d ŋg; m n ŋ; v s; r l; i e a o u.

²Shortly after moving to Singapore and meeting Mohanan, I considered learning (some) Malayalam. I could already speak (some) Malay and (some less) Mandarin, two languages useful in Singapore (after Singlish), and it seemed only fair to learn something Dravidian as well, to be more respectful to the Indian community. Malayalam certainly is one of the great sounding languages of the world, so why not? Balanced against the presence of Tara and Mohanan, two

6.2 Lexical Roots in Palu'e and the Monosyllabicity of V:

The lexical root in Palu'e is bimoraic, with representative examples shown in (1); bimoraicity can be achieved by having either two short vowels, or else one long vowel, in the root. We can note that long vowels are found only in roots of the form /CV/ (or /V/), where they are obligatory, and so should not be considered to be phonemic. The forms in (2) all violate bimoraicity, by containing more than just two short vowels in one root. In (3) we see that a root that contains only one vowel cannot be realised with that vowel short: it must be long. (Many other phonotactically impossible words are of course conceivable, such as any consonant-final root; the only codas permitted are found in words with a clitic, as in (4), (6) and (7). These nasals are not moraic.) In (4) we can see that a root that shows a long vowel in isolation shows only a normal-length vowel when the 1SG nominative clitic *ak-* is added; when another mora is present, the vowel is not lengthened.

- (1) a. [ta.ba] 'head' b. [ta:] 'small bamboo'
 [tu.ba] 'blunt' [tu:] 'knee'

(2) */CV:CV/, */CV.CV:/, */CV:CV:/

(3) *[CV]

- (4) a. *thu* 'push' b. *ak-thu* 'I push'
 [t^hu:], *[t^hu] [ɛ.t^hu], *[ɛ.t^hu:]

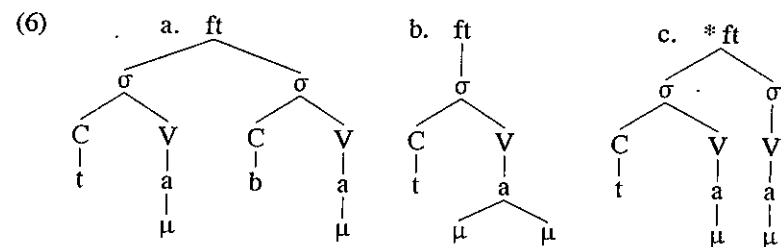
The C position in the syllable is optional: VCV, CVV and VV are also valid words, with the proviso that V₁ cannot be the same as V₂. There is a general ban on heterosyllabic long vowels, as can be seen in the behaviour of the emphatic clitic on the words in (5). While it can be added to any word, the combination of a word ending with /e/ and the emphatic clitic is a single, non-long, vowel. (Sequences of two vowels, including those seen in (5), are invariably syllabified as separate syllables; thus /teitei/ 'wait' is four syllables long, [te.i'te.i], not two, *[tei.tei].³

teachers available whose skills are nothing short of superlative, was the fact that Tamil is the more widespread language in Singapore, (and so more useful), and that there is no agreement system in Malayalam (which Tamil, sensibly, does display; I have my linguistic prejudices). And then there are all those pesky VOT and manner contrasts in Malayalam (p^h p b b^h), something which Tamil does without. So Malayalam was put on the back burner, though a language in which one can say [nunt'maɪ] for 'minimally' must be worth studying. I never got started on Tamil either; instead, by chance, I made friends with some people living on the nearest Indonesian island, and started hanging out and learning their language instead. These people are from a live volcano in the shape of a tropical island with nice food, killer chili sambal, and a wonderful language. To my surprise, I have enjoyed the experience of learning a language that has no agreement, and a number of VOT contrasts (p^h p b 'b, as well as mb). I have as yet no idea how to say 'minimally' in Palu'e, but I'm sure it will be good.

³Examples such as those in (1b) should not be considered to be disyllabic (that is, *[tu.u] for 'knee') since stress does not treat the two vowels as separate nuclei, and they do not show

- (5) [ti.lu] 'ear' [ti.lu-e]
 [to.bo] 'ceremonial sword' [to.bo-e]
 [ta.ba] 'head' [ta.ba-e]
 [ke.be] 'cloudy' [ke.be], *[ke.be-e], * [ke.be:]
 [tu.bi] 'necklace' [tu.bi-e]

We can suppose that the structures in (6a) and (6b) represent the syllables seen in (1a) and (1b), respectively; because of the ban on the occurrence of identical adjacent vowels, and the fact that long vowels are not underlyingly specified, as well as the reasons presented in the remainder of this paper, (6c) cannot be taken to represent the syllable type seen in (1b) (specifically, *ta* 'small bamboo').⁴



Nasality spreads leftward from a nasal consonant. This is true both of root-internal nasals, as in (7), and of nasals that are part of genitive clitics, as in (8).

- (7) [tã.na] 'land'
 *[ta.nã], *[tã.nã], *[ta.na]
- (8) [ta.ba-gu] 'my/our (exclusive) head(s)'
 [ta.ba-de] 'our (inclusive) head(s)'
 [ta.bã-mo] 'your head(s)' ~ [ta.bẽ-m] 'your head(s)'
 [ta.bã-ne] 'her/his head(s)' ~ [ta.bẽ-n] 'her/his head(s)'
 *[tã.bã-mo], *[tã.bã-ne], etc.

short-vowel allophones when followed by a monoconsonantal nasal clitic (see (8); knee-3GEN is not realised as *[tu.ẽ-n] or *[tu.ẽ-n]; compare with (10) to see the behaviour of a true sequence of vowels in this environment). Finally, when monosyllabic verbs take the 1SG agreement prefix *ak-*, length is lost; thus [t^he:] 'hear', but [akte] 'I hear.'

⁴For the purposes of this short note I shall ignore the phonology of epenthetic vowels, which are found when a root has the shape CCV. There are many reasons to believe that we should treat these CCV roots as not being completely "normal": the penultimate syllable is never stressed, in contrast to the more modal roots in (1), and this syllable always has a reduced vowel: C3'CV, [t^hɔ'bu] 'grow'. Further evidence of differentiation of these roots from normal roots can be found in co-occurrence restrictions between C₁ and C₂, which are different in CCV roots than in CVCV roots.

Nasality can spread beyond a single syllable, provided there is no intervening supralaryngeal consonant. (8) additionally shows that nasality cannot spread through a supralaryngeal consonant, while (9) shows that a glottal stop is transparent for the purposes of nasal spreading.

- (9) [tʰʔ.ĩ-n] 'her/his faeces'
*[tʰʔ.ĩn], *[tʰʔ.ĩ-n], *[tʰʔ.ɪn]

(10) demonstrates that, in the absence of any intervening consonant, nasality can continue to spread leftward beyond the syllable on which it is specified.

- (10) [tũ.ẽ-n] 'her/his palm wine'
*[tu.ẽ-n], *[tũ.ẽ-n], *[tu.ẽ-n] (*[tũ.ẽ-n], etc.)

When a word does not have an initial consonant, the initial vowel is realised with breathy voice, as in (11a). In the event of a root of the form VV, (11b), the breathiness is only realised on the first vowel. In the event of a root of the form V, (11c), the vowel being necessarily long due to the bimoraicity requirement (see (6)), the entire bimoraic vowel displays breathiness.

- (11) a. [ã.ta] 'person' *[ã.ta], *[a.ta], *[a.ta]
b. [ũ.a] 'rattan; tuber' *[ũ.a], *[u.a], *[u.a]
c. [ũ:] 'wake' (= [ũũ]) *[ũũ], *[uu]

The fact that breathiness is found all through the vowel of 'wake (of a boat)' in (11c), but not all the way through the sequence of two vowels in (11b), is another argument for the treatment of (C)V: roots such as those seen in (1b) as a single vowel that has been lengthened by a moraicity constraint, and not as a sequence of two vowels in separate syllables.⁵ As seen in (11a), breathiness does not spread through the medial consonant in a VCV root.⁶

The question that confronts us can be formulated as follows. There are two processes (other than stress assignment) which apply at units greater than the segment: (i) nasalisation spreads leftward in a word; (ii) breathiness applies to a word-initial vowel. How do these two phonological factors interact? What is the realisation of a syllable that is on the one hand expected to be nasal (because of a following nasal consonant), and breathy (because of its initial position)? Answering this question is not simple, and is discussed in the following sections.

⁵An alternative analysis would block breathiness spreading in all circumstances *except* when two vowels in an uninterrupted sequence had identical qualities. It is hard to imagine the phonetic motivations of such a constraint.

⁶Medial glottal stops following an initial onsetless syllable suppress breathiness in roots such as /iʔo/ 'tail'. This is a principled exception to initial breathiness, involving the syllabification of the glottal stop (see (9)), but is not discussed here.

6.3 Competition Between Breathiness and Nasality

As a first approximation, there are four possible answers to the question posed about competition between breathiness and nasality. The obvious possibilities are:

1. the syllable is realised with nasality, and is not breathy;
2. the syllable is realised with breathy voice, and is not nasalised;
3. the syllable is realised with modal voicing and no nasalisation;
4. the syllable is simultaneously nasalised and breathy. (can an initial vowel bear both breathiness and nasality (for example, [ũĩ])?)

Given the form in (12), the first answer appears to be correct. The lexical item is /une/, and the initial syllable is realised with nasalisation, and not with breathiness.

- (12) [ũ.ne] 'strait; inside' *[ũ.ne], *[u.ne], *[ũ.ne]

We might explain this by noting that nasalisation reflects features that are lexically specified for the word in question, while breathiness is a boundary phenomenon. The ultimate answer becomes more complicated when we consider data such as that in (13). Here the lexical root is /u/ 'wake', seen earlier in (11), shown here with the third person genitive enclitic *-ne*, seen earlier in (8).

- (13) [u:-ne] 'her/his wake' (= [ũũ-ne])
*[ũ:-ne], *[u-ne], *[ũ-ne]

Clearly the description of vowel nasalisation must refer to more than just segmental adjacency (in the model presented in Mohanan (1986), we would refer to nasalisation spreading in both strata 1 and strata 4). Based just on (13), and ignoring (12) for the moment, we see that breathiness 'wins' over nasalisation: the /u/ is both followed by a nasal consonant, and is initial, but only breathiness is realised. Note, however, that (13) is a morphologically complex word, employing a genitive clitic from the set seen earlier in (8). Any nasalisation in the root would be due to the presence of the genitive clitic, and not part of the lexical root itself, so that the explanation given following (12) would not hold. There is supporting evidence for the exceptionality of clitics: clitics are not part of the prosodic domain that determines stress (see (5) and (8)), nor do they count for moraicity requirements, as can be seen in (14). Here we see that 'my knee', formed with the lexical root seen in (1) and the morphology encountered in (8), preserves the long vowel seen in the uninflected word.⁷

⁷This fact results in surface contrasts in vowel length, such as those found when we compare /romo/ 'cloth (at the beginning of the weaving process)' versus the bimorphemic /ro-mo/ 'veranda piles+2GEN', which contrast as [rõ.mo] and [rõ:.mo], respectively.

- (14) ['tu:-gu] 'my/our (exclusive) knee(s)
*['tu.-gu]

Additional evidence for the phonological exceptionalness of clitics can be found in the fact that there are C-only variants of clitics, as seen in (8), and that the most common vowel in the language, /a/, does not appear in any clitics (see (8) again, as well as (5)).

(13) illustrated the effect of encliticisation (with a nasal element) on a /V/ root with an NV clitic; in (15) we can see that a /VV/ root with clitic behaves somewhat differently, accommodating both the breathiness on the initial syllable, and the nasalisation on the second syllable. Breathiness applies to the first syllable, as predicted, while nasality spreads left from its segmental origin into the root, respecting the breathiness. Again, the nasality is not part of the lexical root: it has to cross a morpheme boundary, and so can be considered to be weaker than the nasalisation seen in (12). Comparing (15) with (10) we can see that nasalisation did not spread as far as might have been expected; there is clearly competition between the regressive nasalisation and the progressive breathiness, and breathiness wins.⁸ (16) approximates the constraints on the realisation of quality in an initial vowel, based on (12), (13) and (15); the constraints are spelled out in (17) – (19).⁹

- (15) ['u.ã-ne] 'her/his rattan'
*['ũ.ã-ne], *[u.a-ne], *['ũ.ã-ne], *['ũ.ã-ne]

(16) Nasality_{LEXICAL} >> InitialBreathyBoundary >> Nasality_{NONLEXICAL}

(17) Nasality_{LEXICAL}
Realise and spread nasality that is part of the specification of a segment in the lexical root.

(18) InitialBreathyBoundary
The left edge of words should be bounded either by a segmental onset, or else by breathiness that distinguishes the first vowel.

(19) Nasality_{NONLEXICAL}
Realise and spread nasality that is not part of the specification of a segment in the lexical root, but appears through inflection.

The application of these constraints, along with an inviolable constraint against any syllable simultaneously showing both breathiness and nasality, is

⁸See Peng (this volume) for a similar case of two processes spreading and coming into competition; in Kikuyu place spreads regressively, and voicing spreads regressively. Peng shows that the progressive spread of voicing is blocked in highly specific circumstances; in Palu'e, as we shall see in section 1.4, it is the regressive process that is (partially) blocked.

⁹There are no known roots of the form VVNV or VVNCV. If any existed, they would be compound words spread over two feet.

shown in (20), dealing with the forms seen in (15).¹⁰

(20)

/ua/ + /-ne/ 'rattan-3GEN'	*Breathy Nasal	Nas _{LEX}	Initial Breath	Nas _{NON-LEX}
['ũ.ã-ne]			*!	
['u.ã-ne]				**!
['u.a-ne]			*!	**
☞ ['ũ.ã-ne]				*
['ũ.ã-ne]	*!			

The monomorphemic root seen in (12) is shown in (21); we presume that the initial vowel cannot be spread over two syllables to allow the same solution as was seen in (15) and (20) because of a general constraint against the proliferation of non-lexical structure (*STRUC_σ) (in order to allow the vowel lengthening seen in (1), we must rank this constraint below the constraint requiring bimoraicity). In (21) we can see that the fact that the nasality feature is part of the lexical item means that its preservation is more highly ranked than non-lexical nasality, such as appears in the genitive clitic, and so initial breathy voicing is not heard.

(21)

/une/ 'strait'	*Breathy Nasal	Nas _{LEX}	Initial Breath	Nas _{NON-LEX}
☞ ['ũ.ne]			*	
['u.ne]		*!		
['u.ne]		*!	*	
['ũ.ne]	*!			

For the sake of comparison, the segmentally identical, but morphologically distinct word seen in (13) is shown in (22). Because the only nasality specifications in this example are part of the genitive clitic, their preservation is less highly ranked, and the initial breathy boundary surfaces, despite the presence of the adjacent nasal segment. Note that the vowel is long, in keeping with the monosyllabic nature of the root /u/ (see (14) for discussion).

¹⁰This constraint might seem stipulative, but the fact that both breathiness and nasality require (significantly) greater airflow means that it is unlikely that nasalised, breathy-quality vowels can easily be produced, and certainly not that they would survive in a language in which no phonemic status is associated with either of breathiness or nasalisation.

(22)

/u/ + /ne/	*Breathy Nasal	Nas _{LEX}	Initial Breath	Nas _{NON-LEX}
['ū:-ne]			*!	
☞ ['u:-ne]				*
['u:-ne]			*!	*
['ū:-ue]	*!			

I shall not consider consonant-initial roots in detail, since the initial breathiness does not apply to them, and so nasalisation spreads without any competition.

6.4 Codas, A Discursion Concerning Short Vowels, and the Argument for *Disyllabic Long Vowels*

Another syllable type is relevant to this discussion, and merits a short aside for the purposes of clarity. We have seen, in (7) and (9), that when the monoconsonantal (and, consequently, nonsyllabic) variant of the third person genitive clitic *-n* is added to a root the final vowel is realised as a short, lax version of the lexical vowel; additional forms supporting this conclusion are shown in (23) and (24), where it is clear that [ū] (~ [ū̃]) alternates with [u], and [ī] with [i], in closed syllables. (Similar alternations between [ě] and [e], [ǔ] and [o], and also [ṽ] and [a], are also found.)

- (23) a. ['tu.tu] 'k.o. basket'
 b. ['tu.tū-n] 'her/his basket'
 c. ['tu.tū-ne] 'her/his basket'

- (24) a. ['tu.bi] 'necklace'
 b. ['tu.bī-n] 'her/his necklace'
 c. ['tu.bī-ne] 'her/his necklace'

This clearly allows the possibility of a following nasal consonant to be in coda position in the same syllable, rather than appearing in a following syllable. The same short, lax vowels are also found monomorphemically, for instance preceding prenasalised stops, as can be seen in (25).

- (25) a. ['tūm.ba] 'spear' b. ['tīm.ba] 'weigh'

Parenthetically, but to complete the phonetic picture, we can note that vowel-initial words with a medial prenasalised stop are vanishingly rare, but at least one is attested; here we can see that the short vowel does not allow enough time for the breathiness to be realised; this is a simple articulatory constraint, since breathy voice takes a longer time to activate than does modal voicing (eg., Gerfen 1999). It provides us, however, with evidence that the constraints shown in (16) do not represent the whole picture.

- (26) ['ūm.bu], 'door'
 *['ū̃m.bu], *['ū̃m.bu], *['ū̃m.bu]

The other source of final nasals on vowel-initial words is the nonsyllabic genitive clitics, which we have already seen in (6) and more recently (16) and (17). Before examining their use on vowel-initial words, we need to note that when these clitics occur with a long vowel (necessarily found in a /CV/ root), the entire long vowel is nasalised, and that the open syllable allophone of the vowel is heard even when the genitive clitic is monoconsonantal.

- (27) ['tū:-ne] 'her/his knee' (= ['tū̃.-ne])
 ['tū:-n] 'her/his knee' (= ['tū̃-n]) *['tū̃:n]

Now we can examine vowel-initial roots with a nasal coda added in the form of a genitive clitic. In (28) we can see a /VV/ root with the third person clitic *-n* added. The first syllable is realised with breathy voice, and the second syllable with nasalisation. This repeats the results seen when the *-ne* clitic was added in (15): the appearance of the nasal in the coda of the second syllable does not result in patterns any different to the appearance of a nasal in a syllable following the second syllable, other than resulting in a short, lax allophone of the /a/ vowel.

- (28) ['u.ū̃n] 'her/his rattan'
 *['ū̃.ū̃n], *['u.ū̃n], *['u.ū̃n], etc.

When we examine the addition of a *-n* clitic to monovocalic roots (/V/, thus realised as [V:] due to the bimoraicity constraint), we find intriguing differences with the forms that have the *-ne* clitic seen earlier in (12). In (29) we see /u/ 'wake, ripple' with *-n* added. The long vowel begins with breathy voicing, and then is realised as nasalised (and modal) at the end of its length.¹¹ This contrasts with the forms obtained when *-ne* was added, in (12), in which breathiness is found through the entire length of the vowel.

- (29) ['uū̃n] 'her/his wake' (*['ū̃ū̃n], *['uū̃n], *['uū̃n], *['ū̃ū̃n])

The forms found in (29) are analogous to those seen in (28), but (28) is a /VV/ root, and (29) represents a /V/ root. Are we now to treat [u:] as being underlyingly a sequence of two identical vowels, /uu/? If so, this presents a dilemma: the new data contradict much of the evidence that we have seen earlier that supports the idea that the long vowel monosyllables are not lexical,

¹¹The data shown here for *u* are identical for all monovocalic roots. Given that there are only five vowels in Palu'c, there are not many such roots: in addition to *u* 'wake' we also find *i* 'flesh' and *a* 'one' (the absence of mid vowels in monovocalic roots is not accidental, and reflects the continued operation of a low-ranked constraint against non-peripheral vowels, such as is commonly attested in Austronesian languages that have more than three vowels). Note also that these data are not simply low-level, automatic phonetic assimilations: speakers, when asked to speak very slowly, will clearly produce first a breathy mora, and then a nasalised mora.

but simply phonetic responses to foot binarity requirements. A summary of the different arguments is shown in (30).

(30)	TEST	[V:] = /V.V/	[V:] = /V/
	Phonotactically restricted?		✓
	Instability under procliticisation		✓
	[V _α V _β], but *[V _α V _α]		✓
	Nasal spreading	(✓)	(✓)
	Breathiness spreading		✓
	Breathiness/nasality interaction	✓	

In short, the data in (11) and elsewhere overwhelmingly differentiate [V_αV_β] and [V:] roots, yet in (28) and (29) we see that these two root templates behave identically.

6.5 In Lieu of a Conclusion

There is no simple and obvious solution to the question of syllabicity for the [(C)V:] roots in Palu'e, but I hope that this brief sketch of the issues has brought home one of the points that has made Mohanan's work not only so engaging, but also so enduring: the attention to detail, and the refusal to accept a hypothesis, no matter how well argued and how well it accounts for the facts, until we can be sure that the facts really represent *all* of the available facts (see also Wee [this volume] and Peng [this volume] for examples of cases where a close attention to detail shows that the initially attractive, and simple, explanation is not adequate to the facts). If we were to have reached our final conclusions about syllable and root structure in Palu'e excluding the final two examples, we would have arrived at a weaker understanding of the complexities involved in this issue, and a poorer understanding of the challenge of linguistics. Challenge has been a by-word of Mohanan to his students and colleagues for decades, and can, I hope, continue to be the by-word of those same people as they confront their students and their research. The reason I hesitate to draw a firm conclusion is that I believe (and hope) that, as my knowledge of Palu'e deepens, I will find that the account presented here fails to cover some as-yet unearthed specific cases. The linguist never really finishes, and the analysis is never really complete.

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