A PHONOLOGY OF METHOW

by

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0. The following paper is a brief sketch of a Methow phonology. It was delivered at the January 17, 1967, University of Kansas Linguistics Colloquy in partial fulfillment of the degree of Honors in Linguistics.

Methow is an American Indian language of the Salish family. The speakers were never very widely distributed, living mainly in the Methow River valley and in a small enclave on the Okanogan River in north central Washington. At the present time there are four native speakers left who are reasonably competent in the language.

The following analysis of the phonemic system of the language is a result of two months field work among the Methows during the summer of 1966 as a University Research Assistant in Anthropology, and further research under a University General Research Fund grant during the fall of 1966. Due to the limited nature of the corpus collected, this analysis can hardly be considered to be definitive.

1.0 There are thirty-three segmental phonemes and five suprasegmental phonemes in Methow. The segmental phonemes are divided into twenty-nine consonant and four vowel phonemes. The suprasegmental phonemes are: one phoneme of length, two phonemes of stress, and two phonemes of juncture. Length applies only to the vowels. In addition, expressive length and pitch are present, usually co-occurring. No rigorous statement of Methow suprasegmen-

tals will be attempted in this paper.

1.1 Three types of consonants are found in the language: stops, fricatives, and resonants. The stops and fricatives are always voiceless, the resonants always voiced. Consonants occur in the following positions: bilabial, alveolar, palatal, lateral, lateral, velar, and glottal. In addition, there are two contrasts among the velars, front vs. back, and rounded vs. unrounded.

Non-glottalized stops occur in all positions except lateral, for a total of eight unglottalized stops. All stops except /ʔ/ may become glottalized, thus producing a series of glottalized stops. With the addition of the lateral glottalized stop, /ƛ̓/, this gives a total of eight glottalized stop phonemes.

Fricatives occur in all positions except lateral and palatal, for a total of seven phonemes. All fricatives may be glottalized, but there is no evidence in the corpus that this component of glottalization is phonemic.

Resonants are found in labial, alveolar, palatal, lateral, and velar positions. Glottalization may occur with resonants, but it is unclear whether this is phonemic or not. This problem will be considered later in section 3.2. The consonant phoneme chart of Methow, then, is as follows:

	bilab	alv	pal	lat	velar				glot
					f-unr	f-r	b-unr	b-r	
stop	p	t	c		k	k^w	q	q^w	ʔ
	p̓	t̓	c̓	ƛ̓	k̓	$k̓^w$	q̓	$q̓^w$	
fric		s		ɬ	x	x^w	$x̣^w$	$x̣̓^w$	h
res	m	n	y	l	r			w	

1.2 Vowels occur at two levels, mid and low, and there is a contrast of front vs. back at both levels, producing four vowel phonemes. They are /e, o, ɔ, a/. Each vowel may occur with the phoneme of length /·/. A vowel is defined as any phonemic sound which may occur as the peak of a phonemic syllable. All other phonemic segemntals are consonants.

1.3 Stress is phonemic, since it is not predictable in all positions. There are at least two phonemic levels of stress: high (ˊ), and low (unmarked). High or primary stress occurs typically in the last phonemic syllable, although there are numerous deviations from this morn recorded.

Particles are never stressed, even though, as clitics, they may occur as the last syllable of a word.

Words of recent foreigh origin generally retain their original stress. For instnace, [téki], 'turkey', [ʔàtomoʔpíl], 'automobile'.

Words generally have one phonetic high stress, but in exceptionally long words a phonetic secondary stress [ˋ] occurs. The evidence is insufficient at this time to decide whether this phonetic stress should be assigned a separate phonemic status or not.

As to juncture, little can be said at the present time. There are probably at least two phonemes of juncture, /+/ phrase final, and /#/ sentence final. Together these can provide a definition of the word: that is, any group of phonemes that may both precede and follow either juncture, though not necessarily at the same time.

2. Most phonemes can be attested by examples of contrast in analagous environments. Due to the small size of the corpus, and the common occurrence of roots with affixes of various sorts, few minimal pairs were found. Minimal contrasts will be provided where possible, as will sub-minimal contrasts, in either pre-vocalic or post-vocalic position, or both. Where examples of contrast were unavailable, phonemes have been postulated on the basis of

their probable occurrence, as determined from related languages and from considerations of patterning.

2.1 The phoneme /p/ is in contrast with /ṗ, t, t̓, m/ as follows:

p/ṗ-- /spolólax^{w}/ 'grass': /sṗóƛnt/ "cloud'
/páh/ 'grey': /ṗá·s/ 'night-hawk'
/snq̓alép/ 'coyote': /slép̓/ 'wood'

p/t-- /páx̣t/ 'smart': /táx̣t/ 'bitter'
/spowáp/ 'breaking wind': /stowáp/ 'flow'
/cowép/ 'tree': /laprét/ 'bridle'

p/t̓-- /páx̣t/ 'smart': /t̓áx̣t/ 'sugar'
/péwq/ 'white': /t̓énx/ 'sinew'

p/m-- /pós/ 'cat': /mós/ 'four'

The phoneme /ṗ/ is in contrast with /p, t, t̓/ as follows:

ṗ/p-- see above

ṗ/t-- /sṗóƛnt/ 'cloud': /stónx/ 'beaver'
/slép̓/ 'wood': /laprét/ 'bridle'

ṗ/t̓-- /ṗá·s/ 'night-hawk': /t̓aʔ̓ xq^{w}éq^{w}/ the sound a gun makes

The phoneme /t/ contrasts with /p, ṗ, t̓, k̓, s/ as follows:

t/p, t/ṗ-- see above

t/t̓-- /ʔntémʔn/ 'in-law': /nt̓ét̓mlps/ 'gooseberry'
/táx̣t/ 'bitter':/t̓áx̣t/ 'sugar'
/selx^{w}ést/ Chillowist Creek: /sk^{w}ést̓/ 'name'

t/k̓-- /talé^{ʔ}/ an intensifier: /k̓a·lé^{ʔ}/ 'slow'

t/s-- /tx̣áylps/ 'grey': /sx̣áyq^{w}/ 'onion'

The phoneme /t̓/ is in contrast with /p, ṗ, t, q^{w}, ƛ̓/ as follows:

t̓/p, t̓/ṗ, t̓/t-- see above

t̓/q^{w}-- /t̓ópaʔ/ 'great grandparent': /q^{w}ópsaʔ/ 'great grandchild'

t̓/ƛ̓-- /t̓áx̣t/ 'sugar': /ƛ̓áx̣t/ 'fast'

The phoneme /c/ is in contrast with the phonemes /c̓, k^{w}, s/ as follows:

c/c̓-- /mcáɬt/ 'vomit': /c̓áɬt/ 'cold'
/ncé·cn/ 'wolf': /spéc̓nt/ 'rope'
/sq̓^{w}écm/ 'full': /séc̓m/ 'blanket'

c/k^w-- /scó$\dot{l}$m/'bull': /sk^wó·$\dot{l}$/ 'yellowjacket'

c/s-- /ca·máp/ 'is melting': /sa·máp/ 'the melting'

The phoneme /$\dot{c}$/ is in contrast with /c/ as above.

q The phoneme /$\dot{x}$/ is in contrast with /$\dot{t}$/ as above.

The phoneme /k/ contrasts with /$\dot{k}$/ in the following instance: /skká$\dot{?}$ka$\dot{?}$/ 'bird': /scá$\dot{k}$a/ 'pine cone'.

The phoneme /$\dot{k}$/ contrasts with /t, k, $\dot{q}$, $\dot{x}$/ as follows:

$\dot{k}$/t, $\dot{k}$/k-- as above

$\dot{k}$/$\dot{q}$-- /slá$\dot{k}$s/ 'mosquito': /s$\dot{p}$sá$\dot{q}$s/'nose'

$\dot{k}$/$\dot{x}$-- /$\dot{k}$ást/ 'bad': /$\dot{x}$ást/ 'good'

The phoneme /k^w/ is in contrast with /$\dot{q}^w$, c/ as follows:

k^w/c-- see above

k^w/$\dot{q}^w$-- /sca$\dot{?}$ák^w/ 'summer': /sca$\dot{?}$á$\dot{q}^w$/ 'flower'

For the phoneme /$\dot{k}^w$/, as well as for /$\dot{x}^w$, w, y, $\dot{?}$/, see section 2.3, "Unattested Phonemes", below.

The phoneme /$\dot{q}$/ contrasts with the phonemes /$\dot{k}$, q, $\dot{q}^w$/ as follows:

$\dot{q}$/$\dot{k}$, $\dot{q}$/q-- see above

$\dot{q}$/$\dot{q}^w$-- /s$\dot{q}$é$\dot{l}$t/ 'sick': /s$\dot{q}^w$é$\dot{l}$t/ 'pack'

The phoneme /q^w/ contrasts with /$\dot{t}$, $\dot{q}^w$, h/ as follows:

q^w/$\dot{t}$-- see above

q^w/$\dot{q}^w$-- /q^wáy/ 'blue: /$\dot{q}^w$áy/ 'black'
/cq^wáq^w/ 'cry': /cmá$\dot{q}^w$/ 'hill'

q^w/h-- /sq^wóy/ 'mother': /shóy/ 'the going'

The phoneme /q/ is in contrast with /$\dot{q}$, $\dot{q}^w$/ as follows:

q/$\dot{q}$-- /sqélx^w/ 'people': /s$\dot{q}$élt/ 'sick'

q/$\dot{q}^w$-- /sqélx^w/ 'people': /s$\dot{q}^w$é$\dot{l}$t/ 'pack'

The phoneme /$\dot{q}^w$/ contrasts with the phonemes /k^w, q, $\dot{q}$, q^w/, as the above examples indicate.

No examples of contrast of /$\dot{?}$/ with stop phonemes was found. However,

it does contrast with /x/ in the following instance: /tén$^{\text{ʔ}}$/ 'ear: /ténx/ 'sinew'.

The phoneme /s/ contrasts with the phonemes /t, c, ɬ/ as follows:

s/t, s/c-- see above

s/ɬ-- /s/ third person singular suffix: /ɬ/ postclitic 'and'

The phoneme /ɬ/ is in contrast with the phonemes /s, x/ as follows:

ɬ/s- see above

ɬ/x-- /cáɬt/ 'cold': /táxt/ 'sugar'

The phoneme /x/ contrasts with the phonemes /ɬ, x^{w}, x̣, ʔ/ as follows:

x/ʔ, x/ɬ-- see above

x/x^{w}--/cʔétx/ 'sleeping': /cétx^{w}/ 'house'

x/x̣-- /táxt/ 'sugar': /táx̣t/ 'bitter'

The phoneme /x^{w}/ is in contrast with /x/ as indicated above.

The phoneme /x̣/ is in contrast with /k̓, x/ as above.

The phoneme /h/ contrasts with the phonemes /q, s/ as above.

The phoneme /m/ is in contrast with the phonemes /p, n/ as follows:

m/p-- see above

m/n-- /mós/ 'four': /nos/ future prefix

The phoneme /n/ is in contrast with /m, l, r/ as follows:

n/m-- see above

n/l-- /mólx/ 'cottonwood': /stónx/ 'beaver'

n/r-- /siramnáɬkm/ 'gusty': /sminép/ 'bull frog'

The phoneme /l/ is in contrast with /n, r/ as follows:

l/n-- see above

l/r-- /sq̓^{w}lq̓^{w}ált/ 'mountain': /cárt/ 'salt'

The phoneme /r/ contrasts with /n, l/ as above.

2.2 The phoneme /e/ contrasts with /o/ thus: /lka·pé/ 'coffee': /lkapó/ 'coat'.

The phoneme /a/ contrasts with /o/ as in : /ʔahém/ relative 'when': /ʔohám/ the bark of a dog.

2.3 The phonemes /k̓ʷ, xʷ, y, w, ɔʔ/ have been called "unattested phonemes" because there is insufficient evidence to delineate their phonemic status. /k̓ʷ, xʷ, ɔʔ/ occur only a total of five, three, and eight times, respectively. The eight occurrences of /ɔʔ/ have been recorded in only three morphemes. These sounds have been posited as phonemes despite this, however, because of considerations of patterning and of the phonemic systems of cognate languages, and because no phonetic factor has been found which would account for their appearance as allophones of attested phonemes. Collection of further data would, no doubt, bring to light examples of these sounds in contrast with attested phonemes.

In the case of /y/ and /w/, there are adundant occurrences of both sounds. There is but little evidence, however, to decide their status vis-a-vis the /e/ and /o/ phonemes, respectively. On the basis of what little evidence there is, though, it has seemed best to consider phonetic diphthongs (and triphthongs) as sequences of consonant(s) and one vowel. In pre-vocalic position, the general syllable structure of the language, basically CV(C), seems to require their analysis as /y/ and /w/, rather than as vowels. For instance, 'hard', phonetically [yoʔyáwt], is written phonemically as /yawyáwt/, and not as /eaoeaót/. If the second analysis and transcription were to be adopted, it would seem necessary to add a special morphophonemic statement yielding /yaoeaót/, or something similar, since every Methow word begins with a consonant. This rule would have to be adhered to, it appears to me, even if a VV(C) syllable were admitted to the language. So it is simpler in the long run to posit CV(C), and thus omit an unnecessary morphophonemic statement.

2.4 A striking feature of the language is the variation between the

full phonemes /n/, /l/, and /r/ in certain forms. There are two types of variation, /r/-/l/, and /l/-/n/.

The /r/-/l/ variation is the most clear-cut. For instance, 'cricket' can be rendered as either /ssársr/ or /ssársl/. 'Grape' has been recorded as /kréps/ and /kléps/.

The /l/-/n/ variation is the more common of the two types. One can find clear-cut variation, as /lacnéɬkʷsx̓ʷƛ̓elx/-/nacnéɬkʷsx̓ʷƛ̓elx/ 'I'm flying'. One can also find similar variation which could theoretically be analysed as a sequence of two phonemes, /ln/. Such a sequence does in fact occur in the language, as in /sq̓élnq̓/ 'stomach ache'. A nasalized l sound, [l̰] can occur, as in[ƛ̓ƛ̓kl̥oˁáɬn]-[ƛ̓ƛ̓kl̥oˁáɬn] 'poison ivy'; or a laterally released n can occur ([nˡ]), as in [sp̓n̥tíˇn]-[sp̓n̥ˡtíˇn] 'hit with a stick'. These two sounds are quite distinct, however much their descriptions may seem equivalent. As indicated in the examples, these two sounds vary freely in the given forms with [l] and [n], respectively. Further examples of /l/-/n/ variation are as follows: /ƛ̓c̓láp/-/ƛ̓c̓náp/ 'Brewster'; /sɬawáll/-/sɬawáln/ 'strong south wind'.

3.1 There is not much that is necessary to say about the phonetic values of the bilabial and alveolar stops. They are always voiceless, almost always slightly aspirated, and sometimes heavily so. In final position they, as all stops, are often not released. Sequences of the same stop are always rearticulated, never being combined in one long stop.

The glottal series of stops is similar in phonetic value to the regular series, except, of course, they are glottalized, and the amount of aspiration is usually less. The glottal release of these stops is often quite distinct, but can be so slight as to be unnoticeable.

The palatal and lateral stops are, in fact, affricates. They differ from the corresponding (and occurring) consonant clusters in Methow. For

instance, /ts/ in /lotas•máps/ a nominalized form of 'it does not melt' contrasts, though not minimally and across morpheme boundary, with /c/ in /ca•máp/ '(it) is melting'. The cluster /kɬ/ contrasts with /ƛ̓/ (again not minimally) in /pckɬán/ April' vs. /xʷécaɬn/ 'I gave it to him'.

The palatal affricate stops /c/ and /c̓/ have two principal allophones each. The allophones of /c/ are the alveopalatal affricate [c] and the palatal affricate [c̠] in free variation. Analagously, [c̓] and [c̠ˀ] are in free variation as allophones of the phoneme /c̓/.

The lateral affricate stop /ƛ̓/ has been written with the glottalized symbol instead of the homorganic non-glottalized symbol ƛ since it is the typical form of the phoneme. From the present corpus [ƛ] and [ƛ̓] seem to be in free variation, but whether this is so, or whether they are full phonemes related in a morphological process, as in some cognate languages, is not certain.

In the velar stops, as well as in the velar fricatives, the phonemic contrast front-back is realized phonetically as mid-velar vs. back-velar. No true front-velar sounds have been recorded. The rounded velar stops and fricatives are rounded throughout their articulation. They do not consist of a stop (or fricative) plus rounding. The corresponding unrounded velar phonemes are never found before a back vowel or /w/. Evidence from related languages indicates that some of these rounded phones are in fact unrounded phonemes that have become rounded by assimilation with the following rounded sounds. Or, stated in a different way, the contrast between the rounded and the unrounded stops and fricatives is neutralized in this position. Such phones will be written as they occur, that is, rounded, whether or not this evidence indicated that they may be assimilated unrounded phonemes. No definite evidence from the Methow corpus, say reduplicated forms, has been found which would bear on this question.

The glottal stop /ʔ/ has two allophones, [ʔ] and [əʔ]. The latter occurs after a consonant and unaccented, and especially in word-final position. Examples of [əʔ] are: [sɪlxʷəʔɬšxən] 'boulder', [nṭəʔxaǩáyoʔs] 'temporary dam', [scɪmáləʔ] 'children'. These are written phonemically as /selxʷʔésxn/, /ntʔxǩáyoʔs/, and /scemálʔ/, respectively. Before a stop or bilabial or alveolar resonant, the glottal stop may also have a secondary articulation, that of the following conconant.

Some forms exhibit [ʔ] in intital position before a vowel, when other occurrences of the form do not have it. Reduplication and prefixation are the principal mechanisms that produce this phenomenon. It seems best to account for this by a special statemtnt positing /ʔ/ when no other consonant is present initially. If this were done, then a loss of /ʔ/ in the reduplicated syllable would systematically occur. This would be preferable to trying to describe a completely unsystematic occurrence of /ʔ/ in these forms.

The phonetic nature of most of the fricatives is apparent from a glance at the chart of Methow phonemes. In addition, all fricatives except /h/ have been recorded with glottalized variants. As previously stated, this glottalization is not phonemic. That no glottalized variant of /h/ has been found may be a function of its limited occurrence, rather than any intrinsic limitation of the phoneme itself. All fricatives may have allophonic realizations as schwa + fricative or fricative + schwa in unaccented position. This is especially true in long consonant clusters and reduplicated forms. For example, /xxayǽɬnxʷ/ 'clock', the reduplicated form of /xayǽɬnxʷ/ 'sun', is phonetically [xəxayǽɬnxʷ]; /loteskseóɬkʷ/ 'I have no water' is phonetically [lòtesəksióɬkʷ].

The alveolar fricative /s/ has two main non-glottalized allophones, an alveolar fricative [s] and an alveo-palatal fricative [š]. They are in

free variation with each other. No occurrence of a glottalized alveopalatal phoneme has been recorded, but like the /h/ phoneme, this may be related to the relatively small number of times it occurs in the corpus.

The unrounded front-velar fricative /x/ has a not-too-uncommon voiced homorganic allophone [ɣ] in inter-vocalic position. Thus the /x/ in /sca·méxe sx^{w}oéntk/ 'the ice melted' could be realized as either [x] or [ɣ].

The back velars /x̣/ and /x̣^{w}/ each have four main allophones. In addition to the plain and glottalized fricative allophones [x̣], [x̣ˀ]; [x̣^{w}], and [x̣^{w}ˀ], respectively, there are plain and glottalized voiceless pharyngeal allophones. [ħ] and [ħˀ] are allophones of /x̣/, and [ħ^{w}] and [ħ^{w}ˀ] allophones of /x̣^{w}/. It appears that all four allophones of each phoneme are in free variation with each other, no conditioning factors for their occurrence having been found. An example of this variation can be found in the verb /péx̣/ 'to hunt'. Contrast [ʔaykn̥píx̣ə] 'I want to hunt' with [ʔaynosknpíɬm̥] 'I will hunt'.

The resonants have the widest allophonic range of all the consonants. It seems likely that eventually the following types of allophones could be discovered for each phoneme:

[m], [m̥], [ə m], [mə].

All these types are in free variation with each other, with the schwa occurring in an unaccented syllable. The schwa may be colored by contiguous rounded consonants, being rounded slightly (or it may not be affected at all.)

All four types of the bilabial allophones have been recorded.

The alveolar resonant, /n/, also has the four types of allophones indicated before. And, in addition to the previously mentioned laterally released nasal, there is a further allophone of vocalic nasalization. For

example, [ləm̥ɔ̨tɔ̨́] 'sheep' is phonemically /lmontón/; [siˀʕístkǫ] 'December' is /siˀʕístkon/ phonemically. There are, then, a total of six allophones of the phoneme /n/.

The lateral resonant phoneme /l/ has a total of eight allophones. In addition to the four typical for resonants, and the nasalized lateral in certain forms, there are also three allophones containing the flapped lateral: [ľ], [ľ̩], and [əľ]. No occurrence of [ľə] was recorded, although it is not improbable that it would show up in a larger corpus. This flap is characterized by a tongue-tip contact on the alveolar ridge with simultaneous lowering of the anterior section of the tongue, thereby producing the flapped effect. These are in free variation with the rest of the lateral allophones.

Two further allophones must be added to the allophonic inventory of /r/, in addition to the four types characteristic of resonants. They are a flapped r, [ř], and a trilled r, [r̃]. These sounds occur in only a limited number of forms, but they have been recorded in free variation with each other and with [r]. This analyiis of the [r̃] is not completely satisfying, but little else can be done with it at the present time. It is not impossible that the trilled r is, in fact, a reduplicated r, /rr/. This is possible since my informants did not make any consistant distinction in meaning between many reduplicated and non-reduplicated forms.

There are eight allophones of the /w/ phoneme in the present analysis. There are:

[w], [əw], [wə]
[ʕ], [əʕ]
[ʕʷ], [əʕʷ], [ʕʷə].

Thr rounded pharyngeals occur in association with back vowels, but the other allophones occur freely. This particular section of the analysis is

another suspect area, since closely related languages have phonemic pharyngeals. With no examples of contrast in the corpus, however, and in view of the fact that there are a few instances of free variation, they are psoited as allophones of /w/.

It seems likely that further data would uncover a series of phonemic glottalized resonants. For this reason, no mention of glottalized allophones of resonants have been made. In related languages such a series is typical in diminutuve reduplication. Two forms in the corpus seem to be evidence to warrant further elicitations at some later date to decide this conjecture. They are [sᵊsářsə̀ř], another form obtained for 'cricket'; and [ʔəřʔə́ř] 'tangled up', from [ʔə́ř], a root of undetermined meaning. Whether it would be best to analyse these occurrences as a series of perhaps six phonemic resonants, or a component of glottalization, similar to the suprasegmental of stress, cannot of course be determined at this time.

3.2 At least eleven vowel phones have been discovered in Methow: [i, ɪ, e, ɛ, æ, ə, a, u, ʊ, o, ɔ]. When arranged in the familiar vowel chart, they may be rather neatly compared with the phonemes of which they are respective members:

i ɪ e ɛ	u ʊ o ɔ
æ	ə a

/e/	/o/
/æ/	/a/

[i], [ɪ], [e], and [ɛ] are in free variation. The article /e/, for instance, may be realized (word-finally) as any one of the four allophones. Most words recorded do not show an allophonic range through the four phones, although a great number do exhibit various combinations of three of the four allophones in free variation. Since [e] is the most commonly used of the four allophones, they are all assigned to the phoneme marked by /e/.

[u], [ʊ], and [o] are similarly in free variation, as in [múlx]-[mólx]-[mʊ́lx] 'cottonwood'. In the few words in which it occurs, [ɔ] is in free variation with [o] : [lɘkɔ́so]-[lɘkóšo] 'pig, bacon'; [mɔ́qčín]-[moqčín], the rock point between Omak and Okanogan. [o] is by far the most often used of the allophones, and will be utilized to mark the phoneme /o/.

The vowel phoneme with the most limited occurrence is /æ/. It occurs in the form for 'April' (cited earlier); in /nqʷpǽnk/, a mountain near Beaver Creek; in /xayǽɬnxʷ/ 'sun/moon'; and with length in the lexical suffix /-ǽ•lqʷ/ 'underbrush'.

[ə] and [a] are in free variation in the phoneme /a/ instressed position: [ʔa•mə́p]-[ʔa•máp] 'melt'. When unstressed, this phoneme has only the member [a]. Thus it is seen that [ə] has a phonemic value only in stressed position. An analysis of the unstressed schwa as being in free variation with silence (thus reducing drastically the number of allophones of fricatives and resonants) appears to be plausible in describing this sound. However, not enough work has been done on the corpus with this hypothesis to warrant its inclusion in this description.

3.3 Vocalic length /•/ is what its name implies--a lenghtening of the vowel associated with it. The vowel may be merely long, with no rearticulation, or the vowel may be rearticulated, with either (phonetic) vowel receiving the relatively stronger stress.