

Various phonological rules/constraints categorize syllables in terms of their size as heavy vs. light

[1] diagnostics

- stress (Latin stress rule: Amánda, Ramóna, Pámela: VC. V:. V.
- Minimality: *re, res, re:, *tra, *stra
- Tonal contour: Lithuanian:

matýti [íi] ‘to see’ kártis [áâ] ‘pole’ ántis [àn] ‘duck’ bìtè [í] ‘bee’

matỹs [ìí] ‘will see’ kaĩtis [àř] ‘bitterness’ aĩtis [àn] ‘breast’ mùsè [ú] ‘fly’

- rise vs. fall realized on two sonorous rhymal units; a single one does not support a tonal contour

[2] parameter of variation in coda consonants

- Sonorous rime duration for stress: CVV(C) > CVR > CVO > CV (R = sonorant, O = Obs)

Arabic: CVV, CVR, CVO vs. CV

Kwakwala: CVV, CVR vs. CVO

Mongolian: CVV vs. CVR, CVO

[3] traditional moraic vs. X-slot model of length

X-slot model

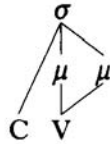
- In the default case, each segment is associated with a single timing slot counting each phoneme as equivalent for size constraints
- Geminate vowels and consonants associated with two slots
- For affricates and prenasalized stops, two ordered features associate with a single slot
- Heavy syllables defined as branching in syllable nucleus or rime (parameterized)

Moraic model (Hayes 1989)

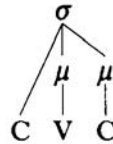
- Heavy syllable has two moras and light syllable has one mora
- Long vowel associated to two moras and short vowel to one
- Geminate consonant associated with a mora in the input
- Parametrized rule associates coda consonant with a mora (Arabic yes, Mongolian no)

Heavy (bimoraic) syllables

a. [CVV]

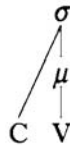


b. [CVC]

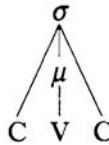


Light (monomoraic) syllables

a. [CV]



b. [CVC]



Hayes, Bruce. "Compensatory Lengthening in Moraic Phonology." *Linguistic Inquiry* 20, no. 2 (1989): 253-306. © MIT Press. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/help/faq-fair-use/>.

[4] typology: coda-cons \approx mora, *moraic [-sonorant] » *moraic [+cons]

Arabic: coda-cons \approx mora » *moraic [-sonorant] » *moraic [+cons]

Kwakwala: *moraic [-sonorant] » coda-cons \approx mora » *moraic [+cons]

Mongolian: *moraic [-sonorant] » *moraic [+cons] » coda-cons \approx mora

[5] moraic representation permits one heavy or two lights to form an equivalence class

- Latin theme vowel allomorphy (Mester 1994)

aud-i:-mus	‘we hear’	aper-i:-mus	‘we open’	cap-i-mus	‘we catch’
dorm-i:-mus	‘we sleep’	sa:g-i:-mus	‘we scent’	fac-i-mus	‘we do’
sent-i:-mus	‘we feel’	sepel-i:-mus	‘we bury’	fug-i-mus	‘we flee’

- Axininka genitive allomorphy (PGG p. 662)

no-sima-ni	‘my fish’	no-chimii-ti	‘my ant’
no-mapi-ni	‘my rock’	no-maini-ti	‘my bear’
no-mii-ni	‘my otter’	no-nokori-ti	‘my armadillo’

- Manam reduplication (PGG p. 659)

salága	lá?o	?arái	malabónj
salaga-lága	la?o-lá?o	?arai-rái	malabom-bónj
‘long’	‘go’	‘ginger sp.’	‘flying fox’

[6] Compensatory lengthening (Hayes 1989)

loss of a consonant may be reflected in lengthening of adjacent (typically preceding) vowel;
onset consonants rarely trigger CL (this is challenged by Yun (2014)¹)

- Coda consonant: Latin *kas.nus* > *ka:nus* ‘gray haired’
- Lower sonority C may fail to trigger CL: Greek *ke-komid-ka* > *kekomika*
- Loss of onset consonant: *newos* > *neos*, **ne:os*, **neo:s*
- Onset-coda asymmetry easily explained by moraic representation; indeed it was designed with this in mind

	σ		σ	
/	\	/	\	
	μ μ		μ μ	
k	a s	n	u s	->

	σ		σ	
/	\	/	\	
	μ μ		μ μ	
k	a	n	u s	

[7] some problems with moraic representation

- more granular weight distinctions occur that seem to track segment count:

Kashmiri: CVV > CVC > CV

Hindi: CVVCC > CVVC > CVV > CVC > CV (Gupta CLS 1987, Gordon 1999)

Stress leftmost heaviest

¹ paa.jaa.maa	tie
maa.yaa. ¹ hiin	CVVC > CVV
saam. ¹ raajy.vaad	CVVCC > CVVC
¹ maatr.bhaa.saa	CVVCC > CVV
da. ¹ kaa.re	CVV > CV
sil. ¹ vaa.nee	CVV > CVC
¹ a.nu.ma.ti	tie

- Lengthening before sonorant coda consonants occurs without deletion
 - French consonnes d’allongement (v, z, ʒ)

¹ Turkish (Sezer 1986:230) *fihrist* ≈ *fi:rist* ‘index’ but *ishal* ≈ *isal* ‘diarrhea’ but Cl Arabic glides /du9iw-ta/ -> du9i:ta ‘you were called’, /ja-qwul-u/ -> jaqu:lu ‘he says’

- vowel lengthening is not noticed until coda consonant is deleted, when it may be phonologized (Kavitskaya 2002)
- Québec Fr (Morasse 1995 UQC diss.)

b	d	s	ʃ	v	z	ʒ
85 ms	90	116	124	154	159	163

- Tranel (1991): in Selkup (Uralic) stress is attracted to rightmost heavy syllable; but CVC syllables count as light including geminates: qumo:qi ‘two humans’, qumo:qlif:, ámirna, qúminik, and úcikkak ‘I am working’
 - Under classic moraic theory, the geminate vs. singleton contrast implies a mora and hence a heavy syllable and thus ucikkak is expected instead of úcikkak
- In some languages like Hungarian a singleton vs. geminate contrast may appear in the coda along with a long vs. short vowel contrast; not clear how to represent this phonologically: four moras?

fed ‘covers’ ve:d ‘defends’
 fed-d ‘imper’ ve:d-d imper

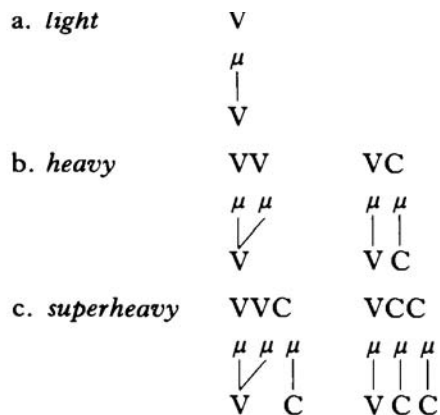
[8] phonetics of weight (Broselow, Chen & Huffman 1997)

Compares phonetic duration of long vs. short vowels in open and closed syllables in three lgs.

- Hindi stress: VVC, VCC > VV, VC > V

four sets like: naap-aa, naap-naa, nap-aa, nap-naa

two speakers: aa > a, but no difference of Caa vs. CaaC and Ca vs. CaC



Broselow, Ellen, Su-I Chen, et al. "Syllable Weight: Convergence of Phonology and Phonetics." *Phonology* 14, no. 1 (1997): 47-82. © Cambridge University Press. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/help/faq-fair-use/>.

- Malayalam: stress second syllable if first has short vowel and second has long; otherwise stress first syllable:

ká . r ^l a . ti	'bear'
káa . r ^l a . ŋam	'reason'
ka . r ^l áa . rə	'agreement'
pát . ta . ŋam	'town'
paṭ . taa am	'army'
aŋ . gáa . r ^l a . sàaṭ . mi . ka . r ^l a . ŋam	'carbon assimilation'

Broselow, Ellen, Su-I Chen, et al. "Syllable Weight: Convergence of Phonology and Phonetics." *Phonology* 14, no. 1 (1997): 47-82. © Cambridge University Press. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/help/faq-fair-use/>.

- CVV, CVVC > CVCC, CVC, CV,

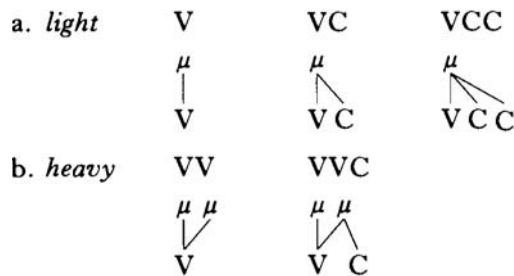
Three speakers: pati, patni, paati, paatram

Vowel durations: CVV > CVVC, CV > CVC

Cons duration: VVC = VC

Representation: coda consonant shares mora with preceding vowel; shortening of vowel duration compared to open syllable

Malayalam syllable rhyme structures



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- Levantine Arabic

Final: C^VVC, CVCC, CVV > CVC, CV

Syrian Arabic (Cowell 1964)

- ki . táab 'book'
- ma . fárr 'he did not escape'
- da . ras . túu 'you (PL) studied it (MASC)'
- ká . tab 'he wrote'
- da . rás . tu 'you (PL) studied'

Penult: CVVC, CVV, CVC, > CV

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Syrian Arabic (Cowell 1964)

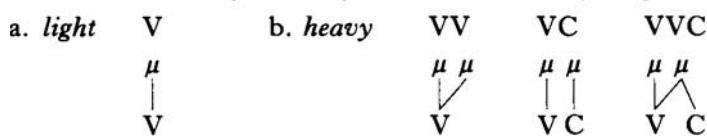
- a. da.ras.túu.ha ‘you (PL) studied it (FEM)’
- b. da.rás.hon ‘he studied them’
- c. ma.náam.hon ‘he did not dream them’
- d. mád.ra.se ‘school’
- e. dá.ra.su ‘they studied’
- f. má.sa.lan ‘example’

Broselow, Ellen, Su-I Chen, et al. "Syllable Weight: Convergence of Phonology and Phonetics." *Phonology* 14, no. 1 (1997): 47-82. © Cambridge University Press. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/help/faq-fair-use/>.

Two-way weight distinction; vowel length contrast implies one vs. two moras; CV vs. CVC weight distinction implies coda consonant is moraic

Thus, in CVVC mora sharing implied if syllable restricted to two moras

Levantine Arabic syllable rhyme structures: non-final position



Sample Arabic word-set

- a. ʔin.na.bi ‘the prophet’
- b. ʕi.nab.hum ‘their grape’
- c. ki.taa.bi ‘my book’
- d. ki.taab.hum ‘their book’

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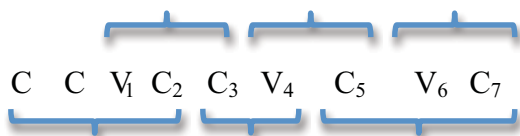
Jordanian speaker

	CVV	CVVC	CV	CVC
V duration:	161	131	80	80
C duration:		67		88

- Mora sharing is reflected in phonetic duration for CVVC vs. CVV for vowel and CVVC vs. CVC for coda consonant

[9] Intervals (Steriade 2012)

- The interval is a phonological constituent containing exactly one nucleus, plus any additional segments, up to the next nucleus or to the end of the domain.
- Intervals (top) and syllables (bottom row) for the segment string in *skeptical*



- The prosodic structure of the word: an onset plus a string of intervals, [Onset I*]_{Word}

[10] two asymmetries noted and compared to syllables

- VC.CV vs. VC#
 - other things being equal, these are equivalent domains in terms of syllable parsing but VCC is a longer interval and hence we can make sense of languages where VC# counts as light, such as Arabic where VCC.V and VCC# pattern together: kátabat, katábna, katábt
 - also predicts V:C > V:# (any examples?)
- allows for a greater than binary gradation among syllables and predicts that onset consonants that are inherently longer or shorter could distinguish among VCCV clusters
 - recall Icelandic V:.CCV vs. VC.CV where former parse is found with voiceless stop/s + r,j,v:
 - to draw this distinction in string-based terms possibly the glides are counted as part of the following vowel or their duration is more difficult to assess?

[11] implies that a consonant will contribute to weight regardless of its location in the interval, while the syllabic parse distinguishes onset vs. coda positions

- stop-liquid rising sonority clusters parse as onsets in Italian: ánatra vs. anárco² and [r] is short; but if this is a real contrast then why is prevocalic [r] less “weighty” than preconantal? (it’s not; the obstruent onsets differ according to McCrary, motivated by the singleton-geminate contrast)
- similar divergence noted by Lowenstamm & Kaye (1982): stop-liquid (onset) clusters block devocalization in French

loue	[lu]	louer	[lwe]	vs.	troue	[tru]	trouer	[truwe]
tue	[ty]	tuer	[tqe]	vs.	influe	[ɛfly]	influer	[ɛflyqe]
lie	[li]	lié	[lje]	vs.	plie	[pli]	plié	[plije]

- this contrast can apparently be extended to medial position: arguer [argqe] vs. affrioler [afrijole] ‘tempt’
- so why is there a difference between a prevocalic and a preconsonantal liquid in terms of weight/maximal cluster size? traditional onset.coda parse expresses this as restriction on onset size to a maximum of two positions and hence ar.gqe vs. a.fri.jole *a.frjo.le, while intervals seem to lose this distinction or require a different characterization of the contribution of liquids to the cluster restriction that might recapitulate onset-coda distinction?
- if a difference is found, is this a contribution of the phonology to the phonetics or vice versa or do they work in tandem?

² though *ánarco is not judged so bad (Adriana Belletti p.c.)

- predicts distinctions like VCV < VCCV < VCCCV for weight; while VVVC > VVC > VC are well established (Dinka), we are not aware of the former (except for geminates)
- in a series of phoneme monitoring experiments in the 1980's, Jacques Mehler and colleagues find that in monitoring for [ba] French subjects are faster for *balance* [balãs] than *balcon* [balkõ] while monitoring for [bal] they are faster for *balcon* [balkõ] than *balance* [balãs]. They conclude that the syllable is a perceptual template for speech processing. Pallier et al. (1993) extend this paradigm to clusters; not clear how string based model would capture this difference

[12] onsets relevant for stress

a. initial onsets count for weight in Aranda (Davis 1989)

kútura kútungùla wóratàra
ergúma artjánama utnádawàra

#VCC has longest interval and should be heaviest?

b. destressing of –ative nouns (Nanni 1979, Davis 1989)

(26) a. invéstigàtìve	b. consérvative	c. nóminative
írritàtìve	arguméntative	généralive
ínnovàtìve	infórmative	manípulative
límitàtìve	cáusative	óperative
inhábitàtìve	evócative	imáginative
quálitàtìve	lájative	cúmulative
admínistràtìve	presérvative	ítérative

Davis, Stuart. "Italian Onset Structure and the Distribution of "il" and "lo". *Linguistics* 28 (1990): 43-55. © De Gruyter. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/help/faq-fair-use/>.

a. V̇CVO __ b. V̇CC __ c. V̇CVR__

is sonorant shorter than obstruent making for a clash context?

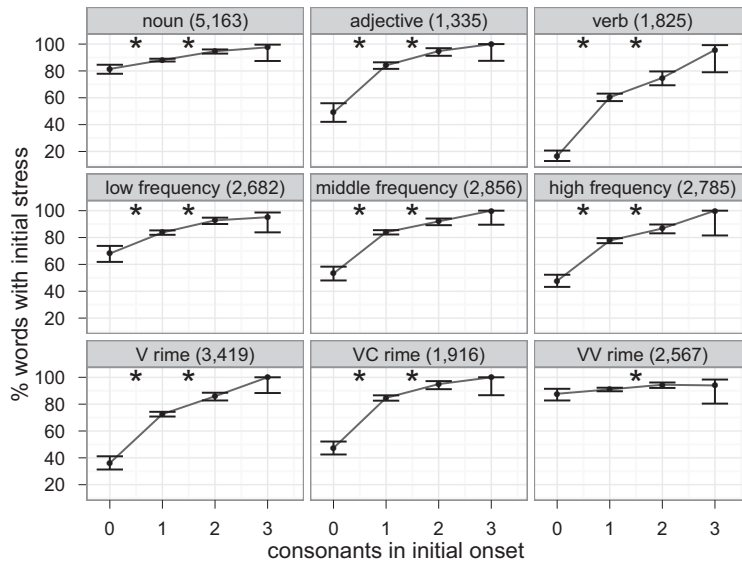
c. Piraha (Everett & Everett 1984)

- stress on strongest syllable in trisyllabic window at right edge
- weight hierarchy based on vowel length as well as voiced vs. voiceless nature of the onset: taa > daa > aa > ta > da
- apparently holds for both word initial (extra-interval) and medial (intra-interval) positions

'ka:gai 'word' ?apa'ba:si 'square'
'aba'pa name '?íbogí 'milk'

d. Ryan (2013)

- corpus of 8,323 disyllabic morphologically simplex English words from CELEX
- as word-initial onset increases percentage of initial stress does as well: V < CV < CCV < CCCV
- but weight of rime is more significant factor



RE 2. Correlations between initial onset size and stress within various subsets of the English lexicon, as labeled, with the population of each subset given (cf. Fig. 1).

Ryan, Kevin M. "Onsets Contribute to Syllable Weight: Statistical Evidence from Stress and Meter." *Language* 90, no. 2 (2014): 309–41. © Linguistic Society of America. All rights reserved. This content is excluded from our Creative Commons license. For more information, see <http://ocw.mit.edu/help/faq-fair-use/>.

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