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Is the domain for weight computation the syllable or the interval?

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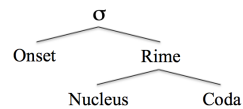
What is the unit of weight?

- The distribution of lexical stress is sensitive to the weight of rhythmic units: heavier units more strongly attract stress.
- Two approaches to defining the unit over which weight is computed:
 - Syllables
 - Intervals (Steriade 2012)
- Goal: to experimentally arbitrate between them.

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Syllables

- Internal constituency:

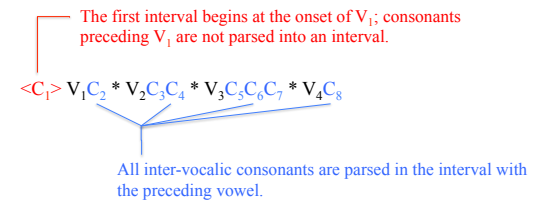


- Weight is computed over the **rime**:
μ (light), μμ (heavy), μμμ (super-heavy)
- Gradient effects of **onset**-sensitivity (Kelly 2004, Ryan 2011, 2012)

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Intervals

- Interval = the string from the beginning of one vowel to the beginning of the next vowel (or the end of the domain).
- E.g. interval parse:



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Intervals

- The weight of an interval is determined by its phonetic duration.
- The longer the interval, the heavier the interval.
- Intervals have no internal constituency; all consonants contribute weight commensurate with their duration.

VCCC > VCC > VC > V

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Intervals

- *Some evidence for intervals:*
- **Finnish:** Secondary stress on the penultimate vowel only when there is a following consonant.

(t^é) (le) (vi) (**sⁱ**) (**o**)
 (k^ó) (lest) (er) (**ò**) (**li**)

} Unexpected on a syllable parse

(Karvonen 2008)

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Intervals

- *Some evidence for intervals:*
- **Finnish:** Secondary stress on the penultimate vowel only when there is a following consonant.

<t> (él) (ev) (is) (**i**) (**o**)
 <k> (ól) (est) (er) (**òl**) (**i**)

} Expected on an interval parse

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Intervals

- *Some evidence for intervals:*
- Phonetic evidence from vowel duration (McCrary 2005, Farnetani & Kori 1986), perception of speech rate (Kato et al. 2003).

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Where syllables and intervals dissociate

- Certain inter-vocalic consonants are differently parsed in the two theories.
- Testing ground: nonce di-vocals

VCV	<i>aka</i>	
VCCV	<i>akra</i>	(CC licit word-initially, "CC1")
VCCV	<i>arka</i>	(CC illicit word-initially, "CC2")

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C vs. CC1

- **Syllables:** Inter-vocalic Cs are preferentially parsed in the onset of the syllable headed by the **subsequent** V.

C	V.CV	<i>a.ka</i>
CC1	V.CCV	<i>a.kra</i>

- **Intervals:** Inter-vocalic Cs are parsed in the interval with the **preceding** V.

C	VC*V	<i>ak*a</i>
CC1	VCC*V	<i>akr*a</i>

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C vs. CC1

- Different parse for C(C) = different weight contribution.

C/CC contribute **no weight** (rime-based), or contribute gradient weight to the **final** syllable (onset-sensitive).

Syllables	
V.CV	<i>a.ka</i>
V.CCV	<i>a.kra</i>

Intervals	
VC*V	<i>ak*a</i>
VCC*V	<i>akr*a</i>

C/CC contribute weight to the **initial** interval.

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C vs. CC1

- Diagnostic for weight contribution = stress placement ...

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C vs. CC1: Syllables

C	V.CV	<i>a.ka</i>
CC1	V.CCV	<i>a.kra</i>

- Equivalent initial syllable; V = V.

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C vs. CC1: Syllables

C	V.CV	<i>a.ka</i>
CC1	V.CCV	<i>a.kra</i>

- Equivalent initial syllable; V = V.
- If weight is rime-based, equivalent final syllable; CV = CCV.
⇒ **No effect of C vs. CC1 on stress.**
- If weight is onset-sensitive, heavier final syllable in CC1; CCV > CV.
⇒ **Stress should be attracted finally more strongly with CC1.**

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C vs. CC1: Intervals

C	VC*V	<i>ak*a</i>
CC1	VCC*V	<i>akr*a</i>

- Assume (V)CC is of greater duration than (V)C.
- Heavier initial interval in CC1; VCC > VC.

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C vs. CC1: Intervals

C	VC*V	<i>ak*a</i>
CC1	VCC*V	<i>akr*a</i>

- Assume (V)CC is of greater duration than (V)C.
- Heavier initial interval in CC1; VCC > VC.
- Equivalent final interval; V = V.
⇒ **Stress should be attracted initially more strongly with CC1.**

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C vs. CC1

- Dissociative prediction:

C vs. CC1	Syllable parse	Interval parse
C	V.CV (<i>a.ka</i>)	VC*V (<i>ak*a</i>)
CC1	V.CCV (<i>a.kra</i>)	VCC*V (<i>akr*a</i>)
Stress prediction	No effect, more final in CC1	More initial in CC1

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CC1 vs. CC2

- Syllables:** Inter-vocalic Cs are preferentially parsed in the onset of the syllable headed by the **subsequent** V.

CC1	V.CCV	<i>a.kra</i>
CC2	VC.CV	<i>ar.ka</i>

- Intervals:** Inter-vocalic Cs are parsed in the interval with the **preceding** V.

CC1	VCC*V	<i>akr*a</i>
CC2	VCC*V	<i>ark*a</i>

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CC1 vs. CC2: Syllables

CC1	V.CCV	<i>a.kra</i>
CC2	VC.CV	<i>ar.ka</i>

- Heavier initial syllable in CC2; VC > V.

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CC1 vs. CC2: Syllables

CC1	V.CCV	<i>a.kra</i>
CC2	VC.CV	<i>ar.ka</i>

- Heavier initial syllable in CC2; VC > V.
 - If weight is rime-based, equivalent final syllable; CCV = CV.
 - If weight is onset-sensitive, heavier final syllable with CC1; CCV > CV.
- ⇒ **Stress should be attracted initially more strongly with CC2.**

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CC1 vs. CC2: Intervals

CC1	VCC*V	akr*a
CC2	VCC*V	ark*a

- Initial interval in CC1 = initial interval in CC2, except the order of the consonants is reversed, *akr* vs. *ark*.
- Does reversing the order of the consonants affect duration?
- Unclear (durations measures being extracted from experimental data).

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Summary

C vs. CC1	Syllable parse	Interval parse
C	V.CV (<i>a.ka</i>)	VC*V (<i>ak*a</i>)
CC1	V.CCV (<i>a.kra</i>)	VCC*V (<i>akr*a</i>)
Stress prediction	No effect, more final in CC1	More initial in CC1

CC1 vs. CC2	Syllable parse	Interval parse
CC1	V.CCV (<i>a.kra</i>)	VCC*V (<i>akr*a</i>)
CC2	VC.CV (<i>ar.ka</i>)	VCC*V (<i>ark*a</i>)
Stress prediction	More initial in CC2	?

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Experiment

- Which of the syllable or interval predictions are borne out?
- How likely are participants to produce nonce VCV vs. VCCV (CC1) vs. VCCV (CC2) sequences with initial vs. final stress?

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Stimuli

- 18 items, minimal triples:

C (C)VVCVV(C)
keefoos (12 items) or *keeloos* (12 items)

CC1 (C)VVCCVV(C)
keefloos
 C₁C₂ **licit** word-initially, *fleet*

CC2 (C)VVCCVV(C)
keelfoos
 C₂C₁ **illicit** word-initially, **lfeet*

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Stimuli

- 3 item types, 6 items/type:

obstruent ≠ [s] + sonorant C keefoos, keeloos CC1 keeffloos CC2 keelfoos “OS”	[s] + sonorant C keesoo, keeloo CC1 keesloo CC2 keelsoo “sS”
--	---

[s] + stop C weesoof, weetsoof CC1 weestoof CC2 weetsoof “sT”
--

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Stimuli

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--	---

[s] + stop C weesoof, weetsoof CC1 weestoof CC2 weetsoof “sT”
--

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Stimuli

- Nonce words were presented orthographically in a carrier sentence:

C *I want keefoos/keeloos.*

CC1 *I want keeffloos.*

CC2 *I want keelfoos.*

- Carrier sentences were identical for all conditions within an item; varied by item, but with certain properties constant ...
- Nonce word = verb
- Nonce word is between unstressed *to* and the utterance boundary, so can be stressed initially or finally without clash with an adjacent stress.

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Method

- Two tasks
- 1: Planned production**
Participants are presented with a carrier sentence containing a nonce word, and are recorded saying the sentence aloud. (Latin square)
- 2: Syllabification judgment**
Participants select between possible syllabifications of the nonce word.
- 48 trials (24 experimental, 24 filler)
- 28 participants (run at McGill prosodylab)

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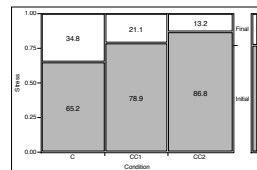
Annotating production data

- Two annotators (including the author) listened to participants' productions, and **perceptually coded** whether the nonce word was produced with stress on the **initial** or **final** vowel.
- Data were analyzed in a mixed model controlling for item and participant with random effects.
- Results from one annotator are reported.

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Production results

- % initial vs. final stress, by condition, all items, all participants:

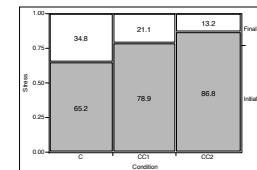


- Significantly greater occurrence of initial stress in CC1 than in C ($|z| = 2.52$).
No significant interaction with item type.
- No significant effect of CC1 vs. CC2 ($|z| = 1.82$).

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Production results

- % initial vs. final stress, by condition, all items, all participants:



- Significantly greater occurrence of initial stress in CC1 than in C ($|z| = 2.52$).
No significant interaction with item type.
- No significant effect of CC1 vs. CC2, $|z| = 1.82$.

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Syllabification

But: alternative versions of syllable theory may make different predictions.

- Three versions of syllable theory to consider:
 - All CC licit word-initially are syllabified medially as a complex onset.
 - Only rising sonority CC are syllabified medially as a complex onset.
 - Syllabification intuitions

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Syllabification

- Version assumed so far:

All CC licit word-initially are syllabified medially as a complex onset.

- Resultant predictions:

C	V.CV	}	CCV ≥ CV, no effect or more final stress in CC1
CC1	V.CCV		

CC1	V.CCV	}	VC > V, more initial stress in CC2
CC2	VC.CV		

- Full inventory of CC in CC1:

OS: pl, br, tr, gr, fl, fr sS: sl, sm, sn sT: sp, st, sk

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Syllabification

- Alternative:

Only CC with rising sonority is syllabified medially as a complex onset.

- Effect: sT would be heterosyllabic in CC1.

- Resultant predictions:

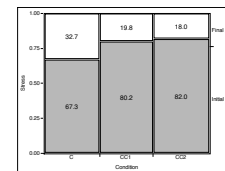
C	V.sV, V.TV	}	VC ≥ V, more initial stress in CC1
CC1	Vs.TV		

CC1	Vs.TV	}	No effect
CC2	VT.sV		

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Syllabification

- Results, with sT excluded:



- C vs. CC1: trend towards more initial in CC2 (not significant, |z| = 1.79).

CC1 vs. CC2: No difference (|z| = 0.96).

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Syllabification

- Alternative:

Syllabification is variable and detectable by *intuition*.

- Treiman et al. (1992):

	OS	sS	sT
V.CCV	62%	26%	24%
VC.CV	36%	68%	75%

- Only way to ensure V.CCV in CC1 is to elicit a syllabification judgment in each trial and eliminate trials where the participant gives a VC.CV judgment.

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Syllabification

- > **Syllabification judgment task** (cf. Côté & Kharlamov 2011)

- Participants are "asked to divide the fake word into one or more parts in a way that seems natural according to the way the word sounds."

- Options e.g. for an OS item:

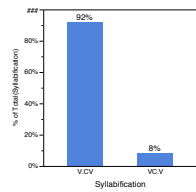
C	CC1	CC2
V.CV KEE.FOOS	V.CCV KEE.FLOOS	V.CCV KEE.LFOOS
VC.V KEEF.OOS	VC.CV KEEF.LOOS	VC.CV KEEL.FOOS
	VCC.V KEEFL.OOS	VCC.V KEELF.OOS

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Syllabification

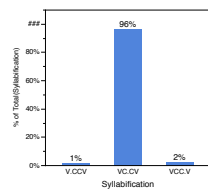
- Syllabification intuitions, by condition/item type.

- C, all items:



(~categorical V.CV)

- CC2, all items:



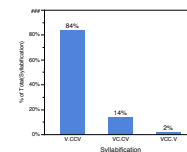
(~categorical VC.CV)

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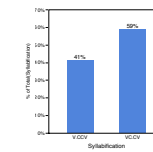
Syllabification

- Syllabification intuitions, by condition/item type.

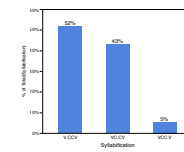
- CC1, OS:



- CC1, sS:



- CC1, sT:

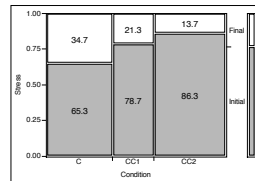


(syllabification is variable in CC1 with sS and sT)

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Syllabification

- Include only CC1 trials with V.CCV syllabification:



- More initial in CC1 than C (with random slopes for item, $|z| = 2.14$; with random slopes for participant, $|z| = 1.72$).

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Conclusion

- Results are **inconsistent with syllable theory**:
 - No subset of the data show no effect/more final in CC1 vs. C concurrent with more initial in CC2 vs. CC1.
- More initial in CC1 vs. C supportive of **interval theory** (assuming $VCC > VC$).
- Next step: to extract durational measures from participants' productions and correlate stress placement directly with interval duration.

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Acknowledgments

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Compounding

- Most English compounds are stressed initially:
 - grèen hòuse* (compound) vs. *grèen hòuse* (phrase)
 - white wàsh*, *brèak dânce* (verbal compounds)
- Suppose participants sometimes construe the nonce word as a compound, **and are more likely to do so in CC1 than C**.
- More compounding in CC1 would = more initial stress in CC1, independent of phonological factors.
- So, the question becomes: are participants more likely to construe the nonce word as a compound in CC1 than C?

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Compounding

- Task: complexity judgment.
- As part of each trial, participants were asked to judge whether “*the fake word seems like a **compound** (like black-board or down-size), or a **simple word** (like dog or eat)?*”

(cf. Hay 2003)

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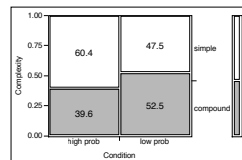
Compounding

- Sub-experiment to verify the task: replicate Hay (2003).
- Compare VCCV where CC has a **high probability** of occurring internal to a morpheme vs. a **low probability** of occurring internal to a morpheme.
- 12 items (subset of Hay’s stimuli), 2 conditions:
 - I want to **niz**mip. (high probability, e.g. *asthma*)
 - I want to **nist**mip. (low probability)
- Hay: compound judgments more likely in the low probability condition.

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Compounding

- **Hay sub-experiment**
- % simple word vs. compound, by condition (low/high probability):

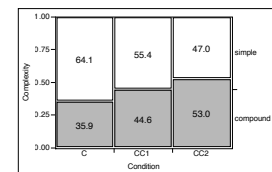


- Compound judgment more likely in the low probability condition.
- ⇒ Hay’s results replicate; task seems to be working?

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Compounding

- **Main experiment: is compounding more likely in CC1 than C?**
- % simple word vs. compound, by condition:



- Compound judgment equally likely across conditions.
- No compounding confound?

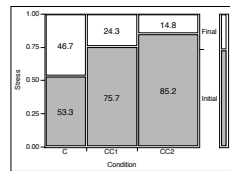
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Compounding

- Caution: is the task really working?
- Increased likelihood of initial stress not observed with compound judgment.

- Stress by condition,

trials with compound judgment:



trials with simple judgment:

