

Pitch and vowel duration make schwa invisible to Passamaquoddy Stress



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The Puzzle

Passamaquoddy-Maliseet (E. Algonquian; Maine & New Brunswick; ~500 speakers) has a stress system that **occasionally skips over reduced vowels**.

(1) **Basic stress pattern**
(LeSourd 1993, 75):

Example	Gloss
.wá.sis.	'child'
.le.wés.tu.	's/he speaks'
.wí.ke.wés.tu.	's/he likes to talk'
.seh.tá.je.wés.tu.	's/he speaks while walking backwards'

(2) **Reduced vowels "ignored"**
(LeSourd 1993):

Example	Gloss
.pə.nápsk ^w .	'rock' (61)
.sú.kə.lan.	'it pours (rain)' (81)
.pe.té.kə.pu.	's/he comes to be located here' (81)
.ní.se.kə.pí.sit.	'ghost (antiq.)' (90)

Previous analyses have claimed that reduced vowels are **structurally deficient**, and cannot be **accessed by the stress system**.

- **LeSourd (1988, 1993)**: reduced vowels are **not linked** to a timing slot.
- **Hagstrom (1995)**: reduced vowels **cannot be the head** of a syllable.

Main Claim

Reduced vowels (schwas) are generally **too short** to establish adequate separation between the **itches** that are the primary cue to stress.

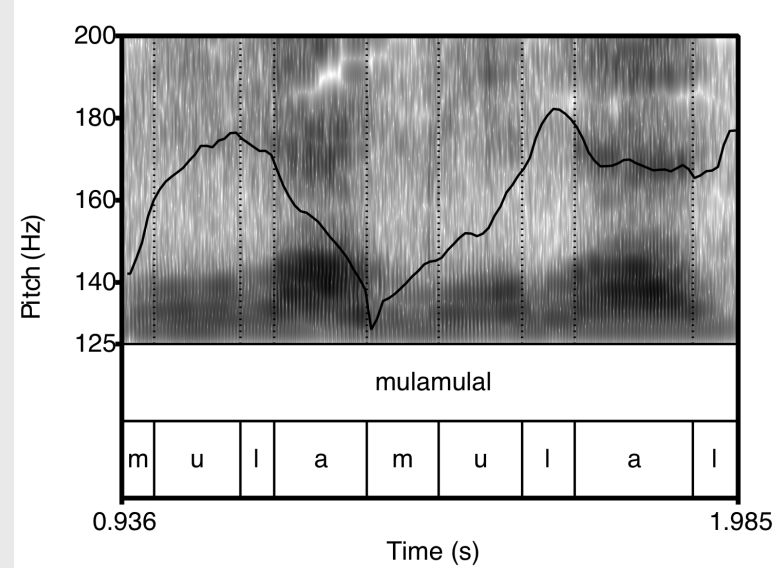
Study I: Pitch and Stress

Hypothesis

Syllables which LeSourd (1988, 1993) & Hagstrom (1995) have identified as **stressed** will correspond to syllables which bear **high pitch accent**.

Method

- Searched **Passamaquoddy-Maliseet online dictionary** for words meeting desired criteria.
- Words spoken **in isolation**.
- Words **hand-segmented** by author.



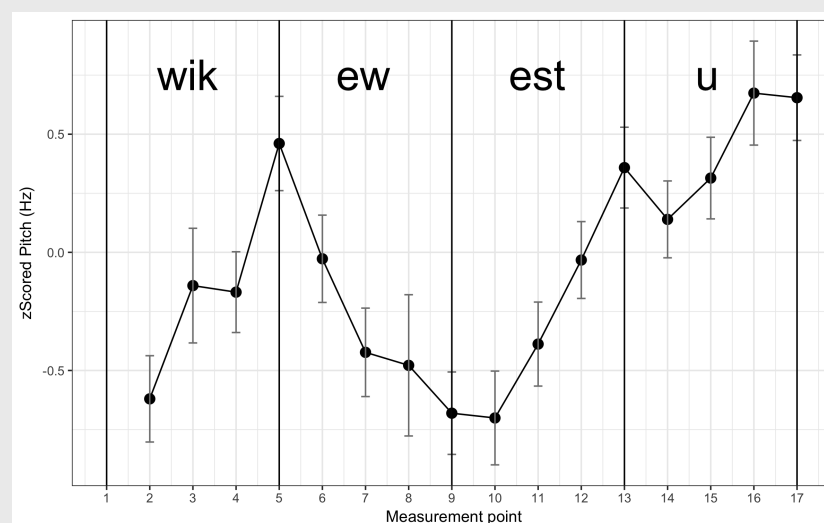
's/he puts him/her in deep' (PMDP)

- Time-normalized **pitch** measurements taken in Hz – five for each V-to-V **interval**.
- Pitch **z-scored** by speaker.

Selected Results

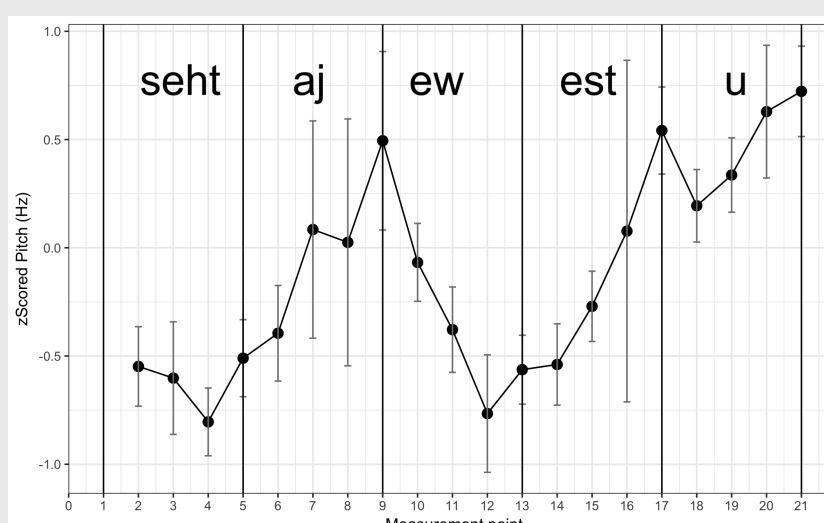
Four-syllable words:

- Predicted: .wí.ke.wés.tu., 's/he likes to talk'
- Observed:



Five-syllable words:

- Predicted: .seh.tá.je.wés.tu., 's/he speaks while... (see above)'
- Observed:



Main finding

Stress is **strictly alternating**; associated with pitch **rise**, L+H.

Pitch Alignment in OT

- L-ANCHOR: L is located **at the beginning** of the **stressed** vowel.
- H-ANCHOR: H is located **at the beginning** of the vowel **following** stress.
- T-DIST: Two tones are **at least 50%** of a syllable apart (cf Cho, 2011)

	/wikewestu/	L-ANCHOR	H-ANCHOR	T-DIST
a.	L ₁ H ₂ L ₃ H ₄ wí ke wés tu			
b.	L ₁ H ₂ L ₃ H ₄ wí ke wés tu	* (L1)	* (H4)	*! (L3-H4)

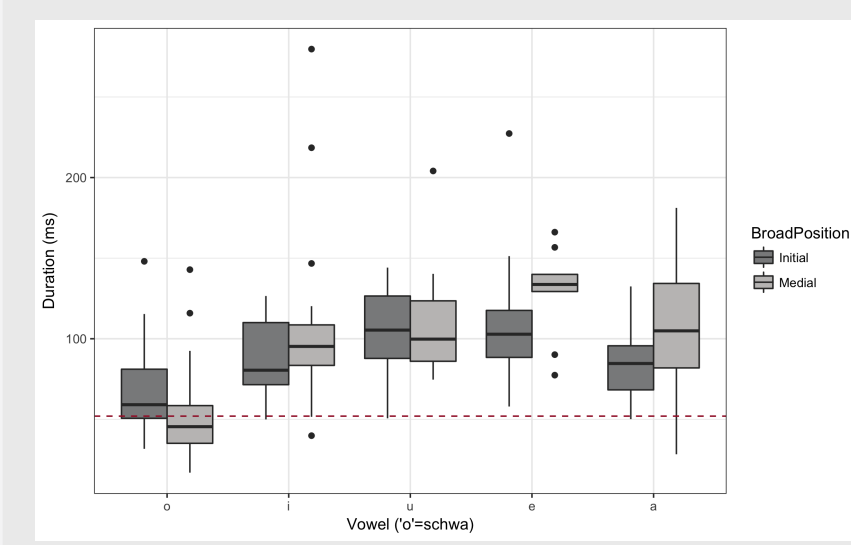
Study II: Schwa Duration and Pitch

Hypothesis

Syllables which contain **schwa** will cause pitch to **shift** and be significantly **shorter** than other vowels.

Duration

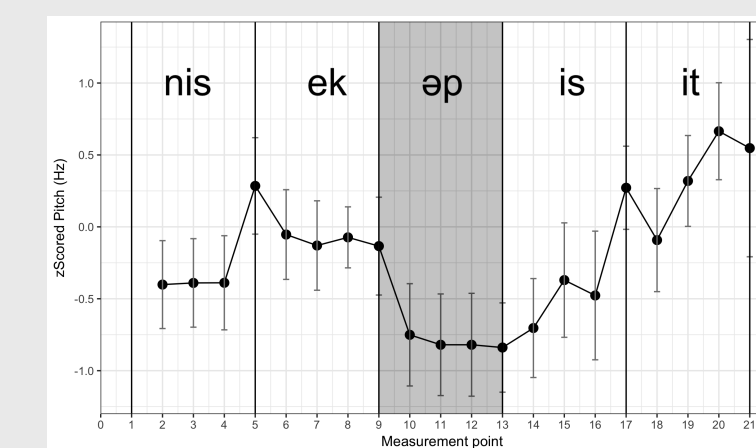
- Vowel **durations** (ms) measured.
- Linear mixed effects model run with fixed effects of **Position** (Initial vs Medial, $t = 0.46$) & **Quality** ([ə] vs [i], $t = 15.21$) & random slopes for speaker.



Pitch

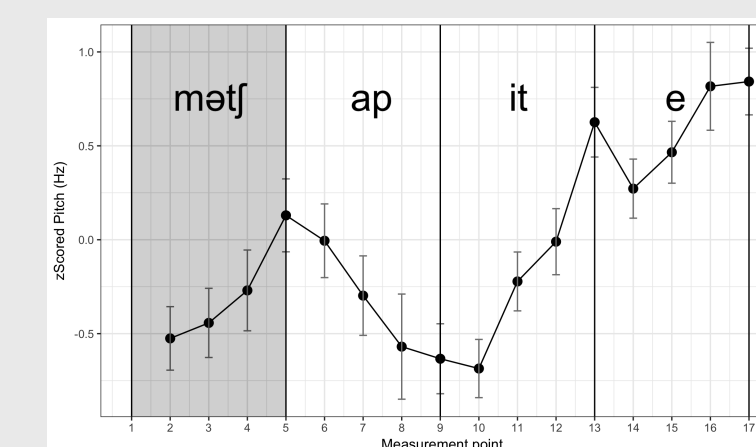
Majority of cases observed:

- Predicted: .ní.se.kə.pí.sit., 'ghost'



Words with initial schwa:

- Predicted: .mə.tʃə.pí.te., 's/he has crooked/bad teeth'



The Proposal

Schwa is **always visible** to stress (Gordon, 2002) and pitch. Alignment of **rising pitch accent**, in combination with **short duration of schwa**, drives apparent invisibility effects.

	/kisəlukemu/	L-ACHR	H-ACHR	T-DIST	*LAPSE
a.	L*H L* H kí sə lu ké mu			*!	
b.	L* HL* H kí sə lú ke mu			*!	*
c.	L* H L* H kí sə lu ké mu				*

Predicts similar behaviour with short vowels of other qualities.

Study III: Increased Schwa Duration and Pitch

Background

LeSourd (1988, 1993) observed that in certain environments, schwa behaves identically to other **full vowels** and causes **no deviations** from basic stress.

(5) **Environments where schwa behaves as a full vowel:**

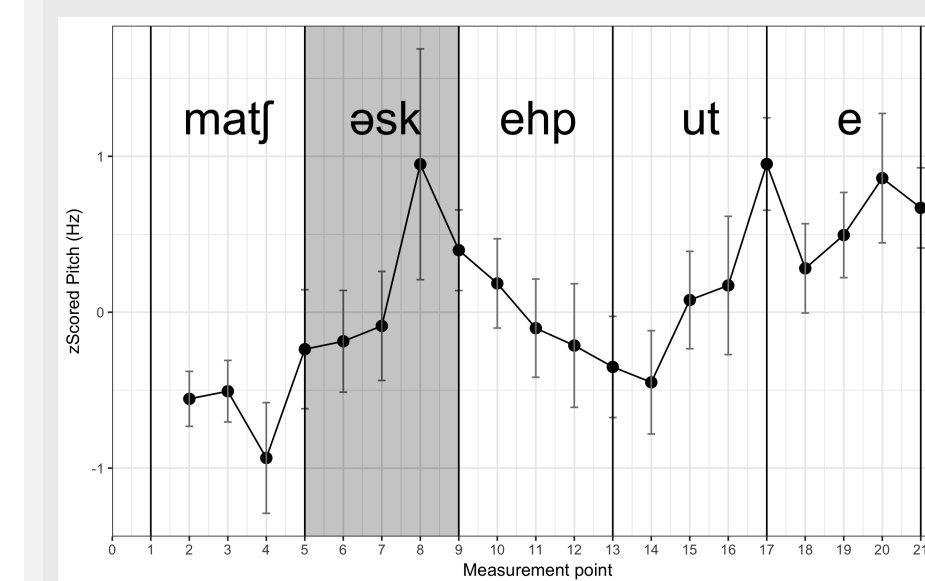
Environment	Example	Gloss
...C ₀ #	.a.má.kən.	'fishing tackle' (PMDP)
[~h]C//...	.pís.kó.lan.	'it rains so hard that it is dark' (LS93,81)
hl...	.á.lón.tʃis.	'orange' (PMDP)
s...ss	.á.tʃeh.ló.su.	's/he changes self' (LS93,82)
#C ₀ ...Rə	.ská.ni.sés.sis.	'bone (DIM)' (LS88,260)
C ₀ əC ₀htʃé.lə.kíp.tun.	's/he squeezes it once, quickly' (PMDP)
	.na.tə.má.kil.	's/he is fairly tall' (PMDP)

Hypothesis

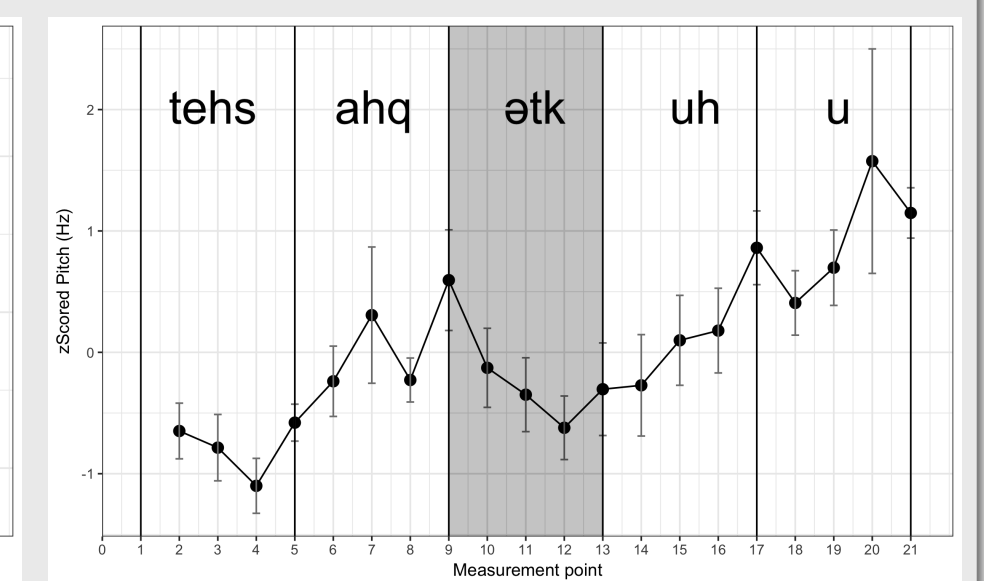
Environments where schwa behaves as a full vowel are environments where schwa can **lengthen** enough to exceed the minimum tone distance threshold.

Pitch

Location of pitch is **identical** to the basic pattern, regardless of vowel **quality**.



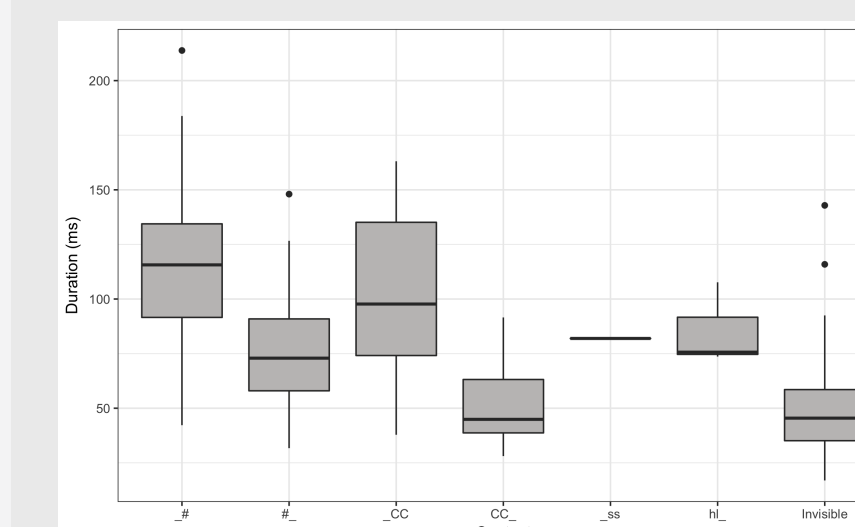
'it begins to vibrate'



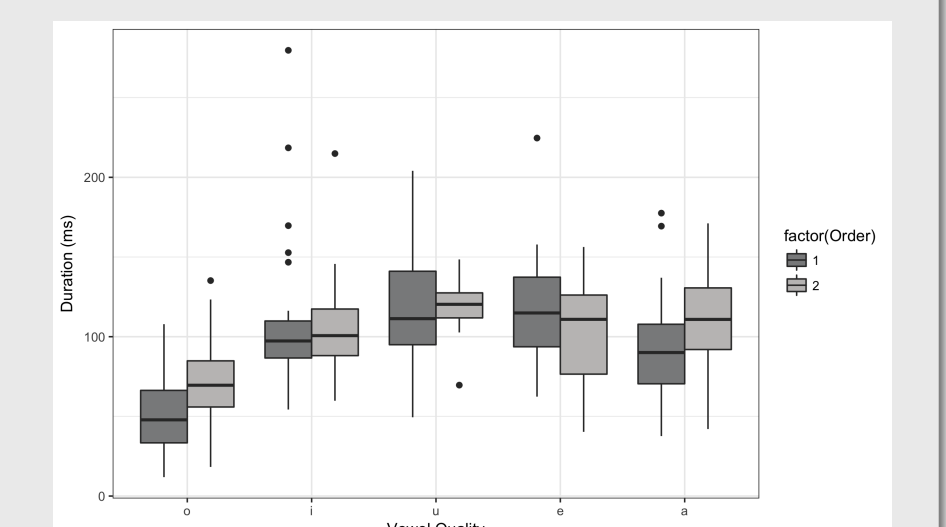
's/he jumps on top'

Duration

In general, contexts mentioned by LeSourd are accompanied by **lengthening** of schwa.



Sequences of syllables with identical vowels generally show lengthening of the **second** vowel.



Selected References

Cho, Hyesun. 2011. The timing of phrase-initial tones in Seoul Korean: a weighted-constraint model. *Phonology* 28:293-330. ✦ Gordon, Matthew. 2002. A factorial typology of quantity-insensitive stress. *NLLT* 20:491-552. ✦ Hagstrom, Paul (1995). *When a Passamaquoddy unstressable /ə/, that's a mora*. Ms., MIT ✦ Language Keepers & Passamaquoddy-Maliseet Dictionary Project (2016). *Passamaquoddy-Maliseet language portal* www.pmportal.org ✦ LeSourd, Philip S. (1988) *Accent and syllable structure in Passamaquoddy*. Ph.D. Diss., MIT. Published ver. (1993), Taylor & Francis.

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