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Marginal phonological structure: Prosodic constituency that you cannot 'hear' in Québec French

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Introduction

- Theme for this session is “Phonological Structure on the Margins”.
- Focus of this paper is marginal prosodic constituency: motivating feet, the heads of which are not cued by pitch, duration or intensity.
- Language under focus is Québec French which, like other varieties of French, has phrase-final prominence.
- Formal status of phrase-final prominence is disputed: is it foot-based stress or is it intonational prominence where French is footless?
- Focus on another process, High Vowel Deletion (HVD), and argue from several experiments[1] that HVD motivates iterative footing in Québec French, despite the absence of lexical stress.
- Conclude that Québec French contains prosodic constituency that you cannot ‘hear’: footing without the cues to prominence normally associated with heads of feet.

[1] All experiments were done in collaboration with Natália Brambatti Guzzo and Guilherme D. Garcia.

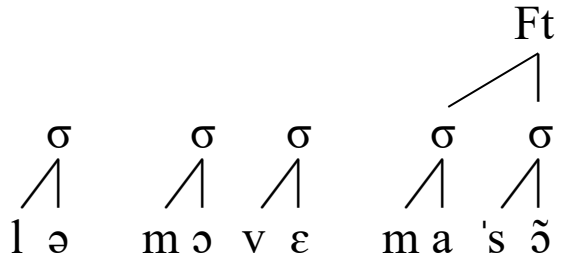
What kind of prominence system does French have?

Rightmost (non-schwa) vowel in phrase is 'prominent':

le mauvais maçon	[lə mɔvɛ maˈsɔ̃]	'the bad bricklayer'
le mauvais compositeur	[lə mɔvɛ kɔ̃poziˈtœʁ]	'the bad composer'

Prominence as stress:

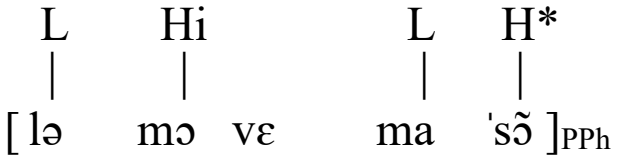
Right-headed foot aligned with right edge of stress domain



(e.g., Charette, 1991; Scullen, 1997)

Prominence as intonational prominence:

H* of LHiLH* contour aligned with final syllable in phonological (accentual) phrase



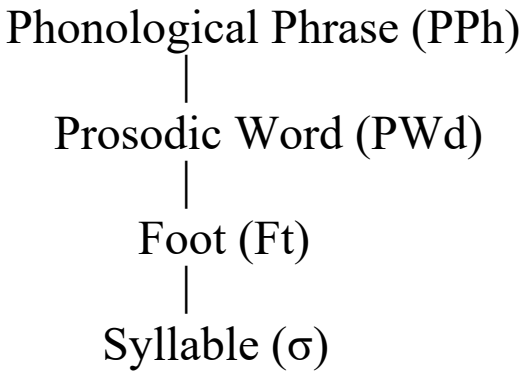
(e.g., Jun & Fougeron (2000) for Hexagonal French; see Thibault & Ouellet (1996) for same contour in Québec French)

Problems for prominence as stress:

- **Theoretical:** Domain in which stress is computed is PPh (e.g., Dell, 1984), not PWd; unexpected in languages with stress, because domain in which stress is realized (Ft) is organized directly by PWd, as per Prosodic Hierarchy (below).

- **Empirical:** Canonical iambic system builds feet iteratively from left edge of word (Hayes, 1995).

Prosodic Hierarchy (partial) (e.g., McCarthy & Prince, 1995; Nespor & Vogel, 1986; Selkirk, 1984):



Problems for prominence as intonational prominence:

- **Theoretical:** French is considered to be footless (e.g., Jun & Fougeron, 2000), but Prosodic Hierarchy is claimed to be universal (Selkirk, 1996; Vogel, 2010; cf. Özçelik, 2017).

- **Empirical:** Prominence can 'shift' to penult when heavy (e.g., Paradis & Deshaies, 1990 for Québec French). Why should intonational prominence be sensitive to a *word-level* property of weight? Penult prominence is marked by intensity in Québec French (Lamontagne & Goad, 2019), but intensity is proposed not to play a role in intonation (Féry, 2013).

Prominence 'shift':

- **Final prominence:**

  le mauvais maçon [lə mɔvɛ maˈsɔ̃] 'the bad bricklayer'

- **Optional retraction to penult (in Québec French):**

  le mauvais garçon [lə mɔvɛ gaʁˈsɔ̃] ~ [lə mɔvɛ ˈgaʁsɔ̃] 'the bad boy'

Can we find evidence for footing without lexical stress?

High Vowel Deletion (HVD) in Québec French:

- Applies variably in open syllables:
  précipiter [pʁesipite] ~ [pʁesØpite] ~ [pʁesipØte] 'to hasten'

- Cannot apply in adjacent syllables:
  précipiter *[pʁesØpØte]

- Cannot apply after branching onsets:
  appliquer [aplike] *[aplke] 'to apply'

- Cannot apply in closed syllables:
  délictueux [deliktɥø] *[delktɥø] 'criminal' (ADJ)

- Cannot apply word-finally:
  précis [pʁesi] *[pʁesØ] 'precise'

Previous studies on HVD:

- **Verluyten (1982):** HVD sensitive to alternating rhythmic structure: deletion preferably targets high vowels in even-numbered syllables from right word edge.

- **Cedergren (1986):** HVD insensitive to alternating rhythmic structure: any non-final high vowel can delete.

	S	W	S	W	S		S	W	S	W	S
	[a	lØ	mɑ̃	ta	sjɔ̃]		[ɔʁ	ga	nØ	za	tœʁ]
Verluyten:			✓						✗		
Cedergren:			✓						✓		
			alimentation						*organisateur*		
			‘nourishment’						‘organizer’		

Our goal:

- Probe for presence/absence of vestigial feet in Québec French;
- Undertake four experiments on HVD;
- Data analysis: Mixed-effects regressions (ordinal and logistic) with by-speaker and by-item random intercepts in R (R Core Team, 2017).

Experiment 1:

Research question (Garcia, Goad & Guzzo, 2017a):

- Is HVD sensitive to alternating rhythmic structure?
- If yes, this would be consistent with Québec French building right-headed feet iteratively from right-to-left in spite of the absence of cues normally associated with stress.

Experiment 1 – Methods

Stimuli:

- 2-6 syllable words (n = 355), with deletion or non-deletion of [i] in various positions in word (+ 144 fillers).

Task:

- Words orthographically and auditorily presented;
- Participants judged if word they heard was pronounced in a natural way on 5-point scale (1 = completely unnatural; 5 = completely natural).

Participants:

- 10 native speakers of Québec French from the Montréal area.

Variables controlled:

- **Position of deletion in foot:**

Foot dependent position (2 or 4 from R edge):	*robinet*	ʁɔ(bØnɛ)	'tap'
	manifestation	ma(nØfɛs)(tasjɔ̃)	'demonstration'
Foot head position (3 or 5 from R edge):	*organisateur*	ɔʁ(ganØ)(zatœʁ)	'organizer'
	capitalisation	(kapØ)(tali)(zasjɔ̃)	'capitalization'

- **Resulting cluster: mirrors well-formed branching onset or not:**

Well-formed:	[pʁ]	*soupirer*	supØʁe	'to sigh'
	[fl]	*filet*	fØle	'net'
Ill-formed:	*[bn]	*robinet*	ʁɔbØnɛ	'tap'
	*[lm]	*alimentation*	alØmɑ̃tasjɔ̃	'nourishment'

- **Morphology: deletion at suffix boundary vs. internal to root:**

Deletion at suffix boundary:	*exclusivité*	ɛksklyziv-Øte	'exclusivity'
	initialisation	inisjal-Øzasjɔ̃	'initialization'
Deletion in root:	*imitateur*	imØtatœʁ	'impersonator'
	alimentation	alØmɑ̃tasjɔ̃	'nourishment'

Experiment 1 – Predictions

Prediction 1: Deletion vs. non-deletion:

- Participants will judge application of HVD to be natural (consistent with Walker (1984) and Cedergren (1986) who report that HVD is frequently attested in Québec French).

Prediction 2: Position of deletion:

- *If* (Québec) French has feet, participants will prefer HVD in even-numbered syllables from right word edge.

Prediction 3: Resulting cluster:

- HVD will be preferred when cluster mirrors ill-formed branching onset: these can only map onto one input (ʁɔbVnɛ); words where HVD yields string corresponding to well-formed onset have indeterminate inputs (supØʁe *or* supʁe).

Prediction 4: Morphology:

- HVD will be preferred at suffix boundary, because deleted vowel is easily recovered in this context: there is a disproportionately high number of derivational suffixes in French that begin with [i].

Experiment 1 – Results

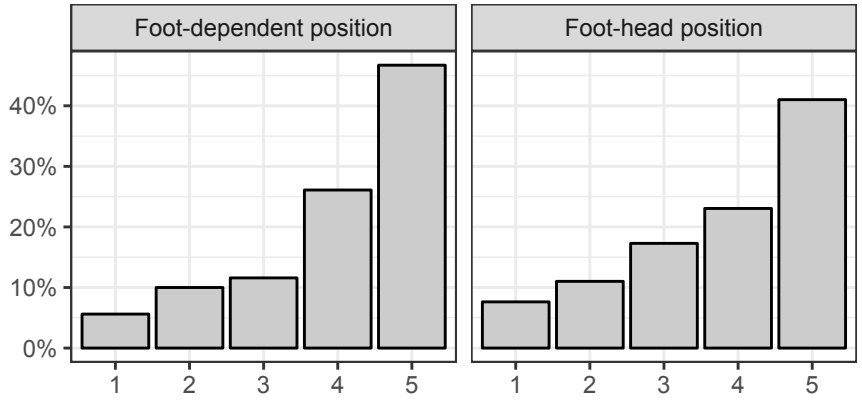
Prediction 1: Deletion vs. non-deletion:

- Overall, non-deletion preferred over deletion ($\hat{\beta}$ = 2.11, z = 6.96):

HVD dispreferred	>	HVD preferred	
kɔ̃bi̲ne		kɔ̃bØne	'to combine'
imi̲tatœʁ		imØtatœʁ	'impersonator'

- But participants *do* judge HVD to be natural:
  Deletion mean = 3.28 (SD = 1.50)
  Non-deletion mean = 4.48 (SD = 0.94)

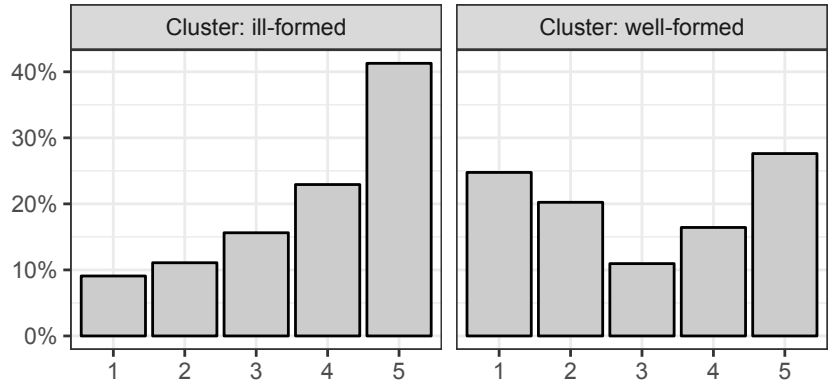
Prediction 2: Position of deletion:



- HVD preferred in foot dependent position ($\hat{\beta}$ = 0.46, z = 2.4).
- HVD in positions 2 and 4 equally preferred; HVD in positions 3 and 5 equally dispreferred.

Figure 1. Deletion in foot dependent vs. head position (1 = completely unnatural; 5 = completely natural)

Prediction 3: Resulting cluster:



- HVD preferred when it yields strings with profile of ill-formed branching onsets ($\beta = 1.05$, $z = 3.9$).

Figure 2. Deletion results in ill-formed branching onset profile vs. well-formed branching onset profile
(1 = completely unnatural; 5 = completely natural)

Prediction 4: Morphology:

- Deletion preferred over non-deletion when [i] is at left edge of suffix *and* in foot dependent position ($\beta = 1.62$, $z = 6$):

  [ɛksklyziv-Øte] > [ɛksklyziv-ite] ‘exclusivity’

Experiment 1 – Discussion and Conclusion

Position of deletion:

- Results consistent with (Québec) French building right-headed feet iteratively across domain (in the spirit of Verluyten, 1982), in spite of absence of cues to lexical stress.

Resulting cluster:

- HVD is *dis*preferred when it yields strings with profile of *well*-formed branching onsets.
- Suggests that syllabification (and footing) remain intact after deletion.

Representations:

Position in foot: a(lØmɑ̃)(taˈsjɔ̃) > ɔʁ(ganØ)(zaˈtœʁ)
alimentation *organisateur*

Resulting cluster: ʁɔ(bØˈnɛ) > su(pØˈʁe)
robinet *soupirer*

Conclusion:

- Québec French contains prosodic constituency that you cannot ‘hear’: footing without cues to prominence normally associated with heads of feet.

Experiment 2

Research question (Garcia, Goad & Guzzo, 2017b):

- Because the typical signatures for stress and footing are absent in Québec French and HVD applies variably:

  Can second language learners (whose native language employs footing for stress) ever come to understand the conditions under which HVD applies?

Experiment 2 – Methods

Stimuli and task:

- Identical to Experiment 1.

Participants:

- 10 native speakers of Canadian English, most of whom are from Québec and all of whom were living in Montréal at the time of testing;
- Use English for work and study purposes;
- Starting learning Québec French in primary school;
- Low- to high-intermediate proficiency in French.

Experiment 2 – Predictions

Prediction 1: Deletion vs. non-deletion:

- Learners, like native speakers, will judge application of HVD to be natural.

Prediction 2: Position of deletion:

- Learners will NOT be sensitive to rhythmic conditions that regulate HVD and thus, *unlike* native speakers, will not prefer HVD in even-numbered syllables from right word edge.

Prediction 3: Resulting cluster:

- Learners, like native speakers, will disprefer HVD resulting in clusters that mirror well-formed branching onsets.

Experiment 2 – Results

- *No* significant differences between native speakers and L2 learners ($\hat{\beta} = -0.11$, $z = -0.18$).

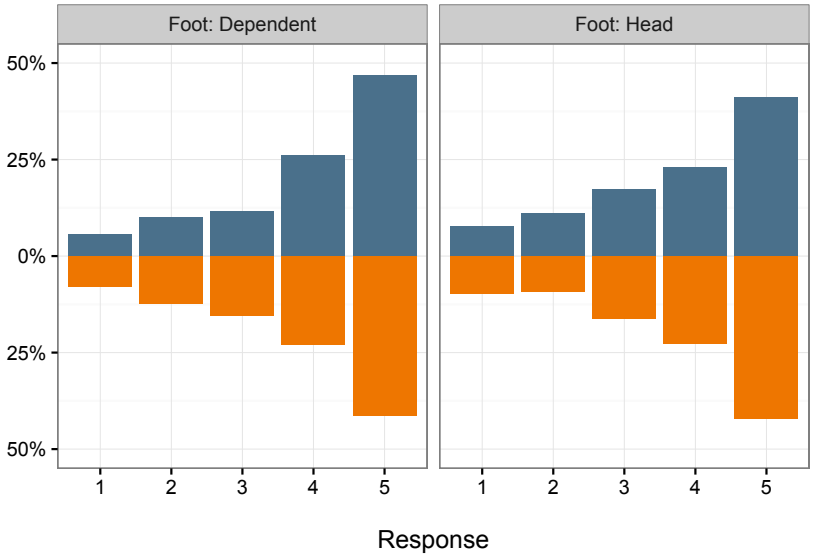


Figure 3. Responses based on position of deletion in foot (1 = completely unnatural; 5 = completely natural)

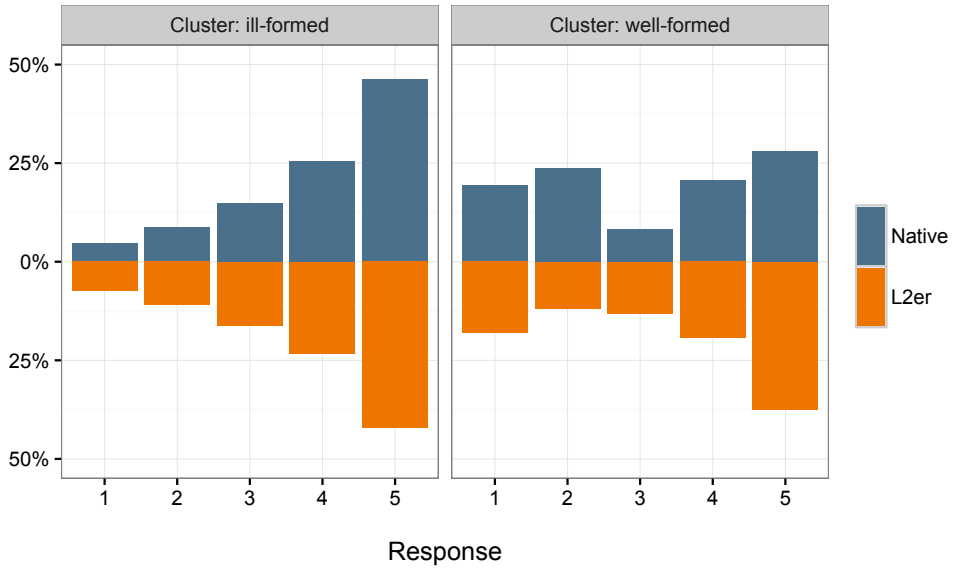


Figure 4. Responses based on resulting consonant cluster (1 = completely unnatural; 5 = completely natural)

Experiment 2 – Discussion

- Learners demonstrate command over both HVD process and subtle conditions regulating variation: They are sensitive to rhythmic constraints underlying HVD, even though French lacks cues to prominence to signal footing.

- Could learners' success be due to HVD in Québec French not being motivated by foot structure, but instead by tonal profile: to location of H tones (which can be detected in the input)?

Experiment 3

Research question (Guzzo, Goad & Garcia, 2018):

- Is HVD truly sensitive to foot structure or could it be sensitive to tonal profile?
- Specifically, could HVD be constrained by phrase-initial Hi tone (in addition to H*)?

Experiment 3 – Context

Prominence as intonational prominence (revisited):

Hammock pattern (e.g., Jun & Fougeron (2000) for Hexagonal French; see Thibault & Ouellet (1996) for same contour in Québec French)

- H* of LHiLH* contour aligned with final syllable in PPh
- Initial Hi typically aligned with initial syllable of leftmost lexical word in PPh

L	Hi		L	H*								
[lə	kɔ̃	po	zi	ˈtœʁ]PPh		L	Hi				L	H*
le compositeur	‘the composer’					[lə	mɔ	vɛ	kɔ̃	po	zi	ˈtœʁ]PPh
						le mauvais compositeur					‘the bad composer’	

Additional finding from Experiment 1:

- HVD dispreferred when it targets word-initial syllable:

vØzaʒ	<	ʁɔbØnɛ		fØnalite	<	manØfɛstasjɔ̃
visage		*robinet*		*finalité*		*manifestation*
‘face’		‘tap’		‘finality’		‘demonstration’

Is this because of initial Hi?

Experiment 3 – Methods

Stimuli:

- 2σ and 4σ nouns ($n = 120$), with and without deletion of [i] in first syllable, in three different types of phrases (+ 282 fillers).

Conditions:

• No Det (N):	viz̲aʒ	*visage*	'face'
	viz̲itasjɔ̃	*visitation*	'visitation'
• Det + N (DN):	lə viz̲aʒ	*le visage*	'the face'
	la viz̲itasjɔ̃	*la visitation*	'the visitation'
• Det + A + N (DAN):	lə jɔli viz̲aʒ	*le joli visage*	'the beautiful face'
	la jɔli viz̲itasjɔ̃	*la jolie visitation*	'the beautiful visitation'

Task:

- Words orthographically and auditorily presented;
- Participants judged if word/phrase they heard was pronounced in a natural way on 4-point scale (1 = completely unnatural; 4 = completely natural).

Participants:

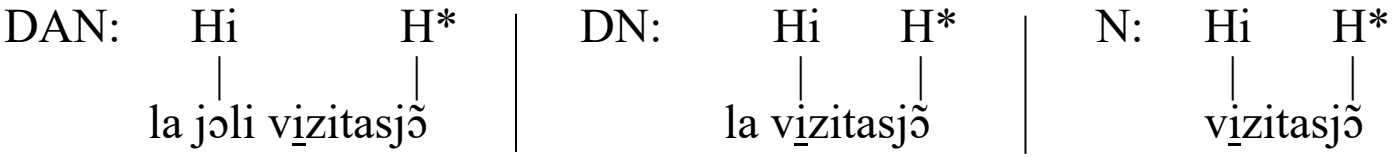
- 12 native speakers of Québec French from the Montréal area.

Experiment 3 – Hypotheses and Predictions

Tonal hypothesis:

- HVD is sensitive to tonal structure: it disfavours targeting high vowels in positions that may receive Hi tone.

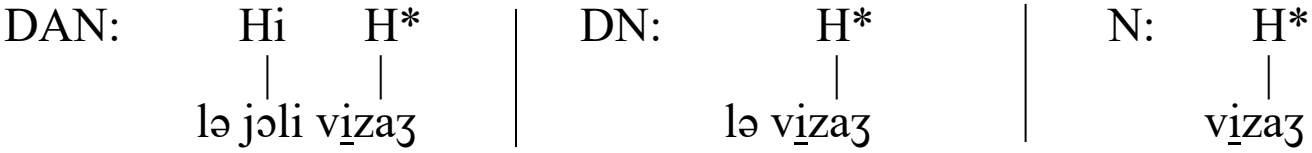
Predictions for four-syllable nouns:



HVD preferences: DAN > DN = N

- Only in DAN does Hi tone not fall on vowel targeted for deletion.

Predictions for two-syllable nouns:



HVD preferences: DAN = DN = N

- Hi tone cannot be realized in DN and N because clash would result;
- In all cases, vowel targeted for deletion does not bear Hi tone.

Footing hypothesis:

- HVD is sensitive to foot structure: it disfavours targeting high vowels in foot head position.

Predictions:

- Vowels targeted for deletion in experimental stimuli are all in foot dependent position. All stimuli should equally favour HVD, regardless of type of phrase and number of syllables in noun.

Two- and four-syllable nouns:

DAN:	lə (jɔli) (vi̲zaʒ)	DN:	lə (vi̲zaʒ)	N:	(vi̲zaʒ)
	la (jɔli) (vi̲zi)(tasjɔ̃)		la (vi̲zi)(tasjɔ̃)		(vi̲zi)(tasjɔ̃)

HVD preferences: DAN = DN = N

Experiment 3 – Results

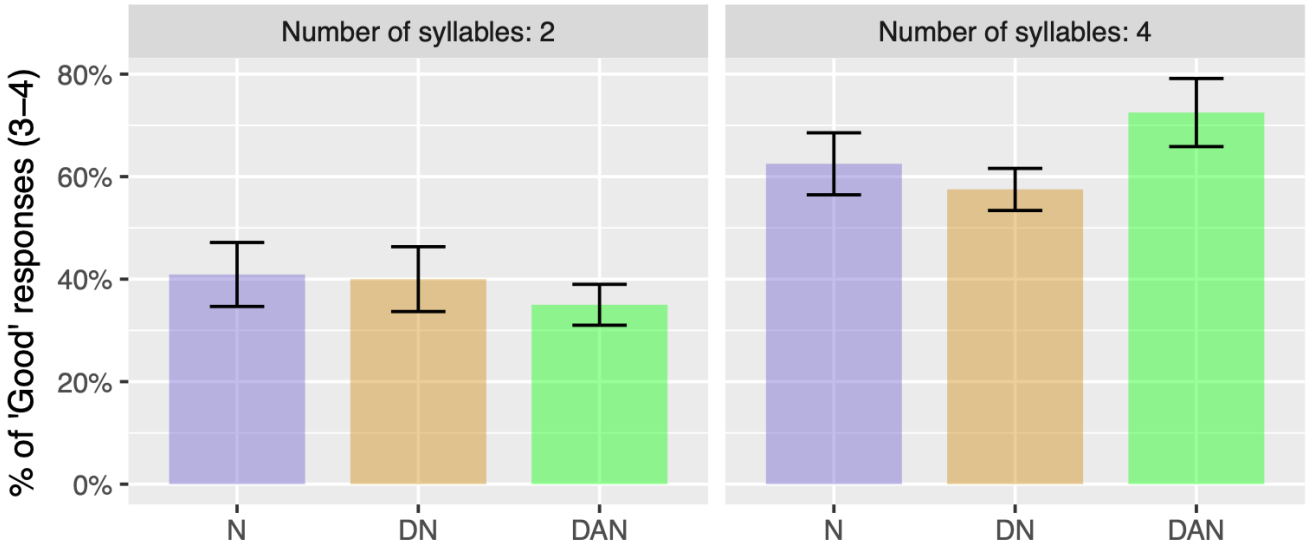


Figure 5. HVD preference by number of syllables and type of phrase

HVD is favoured in 4σ nouns relative to 2σ nouns ($\hat{\beta} = 1.4$, $z = 2.55$).

- Unexpected under both tonal and footing hypotheses.

Phrase type is not significant for 4σ nouns.

- Unexpected under tonal hypothesis; expected under footing hypothesis.

Phrase type is not significant for 2σ nouns.

- Expected under both tonal and footing hypotheses.

Experiment 3 – Discussion

Comparing hypotheses:

- Tonal hypothesis is not supported.
- Can the footing hypothesis be supplemented with an explanation for why HVD in 2σ nouns is dispreferred?

Options:

1. Head foot plays a role:
   HVD in 2σ nouns is dispreferred, regardless of phrase type, because it consistently targets the head (final) foot in the domain:

Hi	H*		Hi	H*
|	|		|	|
la (jɔli)$_{Ft}$ (vØzi)$_{Ft}$ (taˈsjɔ̃)$_{Hd\text{-}Ft}$	>		lə (jɔli)$_{Ft}$ (vØˈzaʒ)$_{Hd\text{-}Ft}$	

2. Word length plays a role:
   HVD is disprefered in shorter words, perhaps due to recoverability.

Experiment 4

Research questions (Guzzo, Goad & Garcia, in prep):

- Location of deleted vowel and word length are confounded in Exp 3:
  What role does the head foot play in constraining HVD?

- HVD is variable and previous research disagrees on its sensitivity to alternating rhythmic structure (Verluyten, 1982; Exp 1 vs. Cedergren, 1986):
  Could the phonotactic and morphological shapes of lexical items mitigate the preference for deletion in foot dependent over foot head position?

Experiment 4 – Methods

Stimuli:

- 4σ-6σ nonce words (*n* = 192 pairs);
- All syllables CV in shape;
- Each word contains two high vowels (always [i]), in non-initial position;
- When [i] is deleted, resulting CC never yields a well-formed coda-onset cluster or branching onset and order of consonants in CC is controlled across stimuli:
  dabinibeau [dabinØbo] vs. [dabØnibo] *[nb], *[bn]
  jainibineau [ʒɛnibØno] vs. [ʒɛnØbino] *[bn], *[nb]

- Word shapes and deletion sites (counting from right edge):
  - 4σ 2-3: 4σ words with deletion in position 2 (dependent) vs. position 3 (head):
    dabinibeau [(dabi)(nØbo)] vs. [(dabØ)(nibo)]
  - 6σ 4-5: 6σ words with deletion in position 4 (dependent) vs. position 5 (head):
    loguimigadéchais [(lɔgi)(mØga)(deʃɛ)] vs. [(lɔgØ)(miga)(deʃɛ)]
  - 5σ 3-4: 5σ words with deletion in position 3 (head) vs. position 4 (dependent):
    doviguivaché [dɔ(vigØ)(vaʃe)] vs. [dɔ(vØgi)(vaʃe)]
  - 5σ 2-4: 5σ words with deletion in position 2 (dependent of head foot) vs. position 4 (dependent of non-head foot):
    cabisaibiseau [ka(bizɛ)(bØzo)] vs. [ka(bØzɛ)(bizo)]

Task:

- Words were orthographically presented on computer screen, and auditorily presented in pairs;
- Participants judged which pronunciation of a target word they preferred with different sites of [i] deletion;
- Three versions of task where each participant heard 128 target pairs (+ 192 filler pairs).

Participants:

- 23 native speakers of Québec French from the Montréal area.

Experiment 4 – Predictions

- HVD should be robustly preferred in foot dependent position over foot head position:
  - 4σ 2 [(dabi)(nØbo)] > 4σ 3 [(dabØ)(nibo)]
  - 6σ 4 [(lɔgi)(mØga)(deʃɛ)] > 6σ 5 [(lɔgØ)(miga)(deʃɛ)]
  - 5σ 4 [dɔ(vØgi)(vaʃe)] > 5σ 3 [dɔ(vigØ)(vaʃe)]

- If head foot plays a role, dependent of non-head foot should favour HVD relative to dependent of head foot:
  - 5σ 4 [ka(bØzɛ)(bizo)$_{\text{Hd-Ft}}$] > 5σ 2 [ka(bizɛ)(bØzo)$_{\text{Hd-Ft}}$]

Experiment 4 – Results

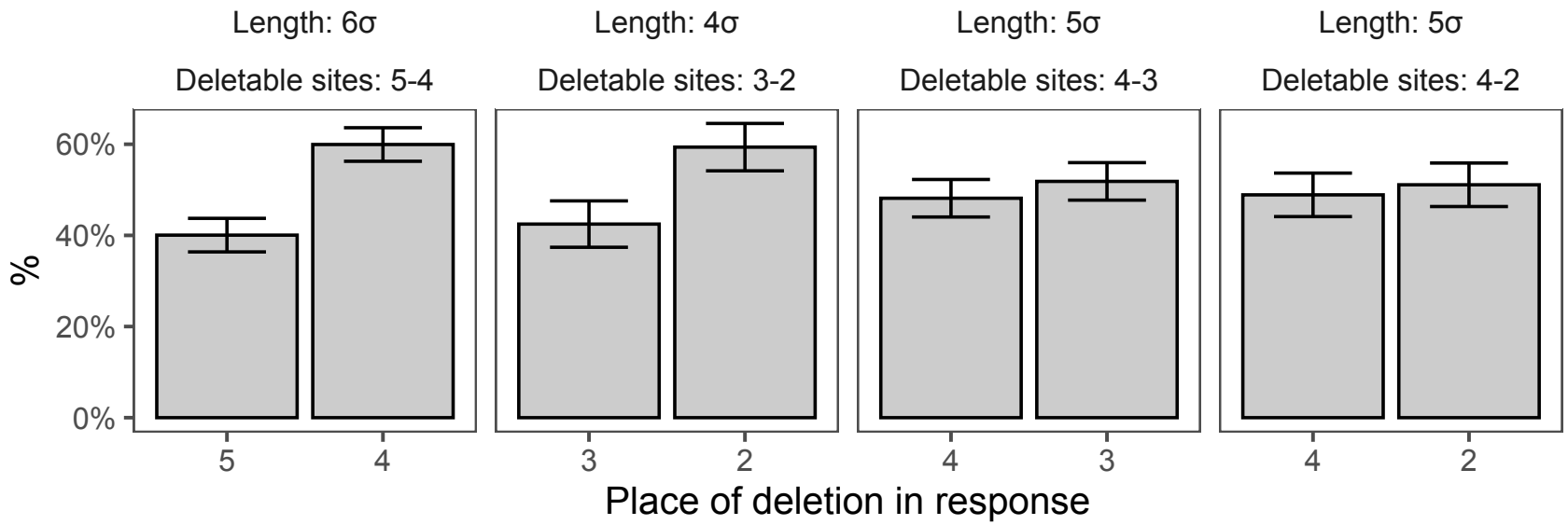


Figure 6. HVD preference by length of word in syllables and deletion site

- **Panels 1 and 2:** As predicted, HVD is robustly preferred in foot dependent position over foot head position, but only in even parity words (6σ 4 > 6σ 5 and 4σ 2 > 4σ 3 ($\hat{\beta}$ = –0.45, z = –2.55).
- **Panel 3:** Counter to prediction, HVD is not preferred in foot dependent position over foot head position in odd parity words (5σ 4 = 5σ 3; $\hat{\beta}$ = 0.08 z = 0.45).
- **Panel 4:** Counter to prediction, head foot plays no role in HVD (5σ 4 = 5σ 2; $\hat{\beta}$ = 0.05, z = 0.22).

Experiment 4 – Discussion

Role of head foot:

- In Exp 3, HVD was preferred in 4σ nouns over 2σ nouns. This was proposed to be due either to a dispreference for deletion from the head foot or to a dispreference for deletion in short words.
- No role for head foot was found in Exp 4.
- This necessitates future work exploring the role of word length in HVD.

Even vs. odd parity words:

- A role for iterative footing is evident, but only in even parity words: HVD is robustly preferred in dependent over head position, as predicted:
  [(dabi)(nØbo)] > [(dabØ)(nibo)]
  [(lɔgi)(mØga)(deʃɛ)] > [(lɔgØ)(miga)(deʃɛ)]

- A role for iterative footing is not evident in odd parity words: HVD is equally preferred in dependent and head positions, counter to prediction:
  [dɔ(vØgi)(vaʃe)] = [dɔ(vigØ)(vaʃe)]
- Proposal: Footing is not iterative when it cannot be exhaustive:
  [dɔvØgi(vaʃe)] = [dɔvigØ(vaʃe)]
  HVD in positions 3 and 4 should be equally preferred, as both syllables are unfooted.

- Consequences of proposal for 5σ 4-2 words: Footing would be:
  [kabØzɛ(bizo)$_{\text{Hd-Ft}}$] = [kabizɛ(bØzo)$_{\text{Hd-Ft}}$]
  As there would be no comparison to be made between dependent of non-head foot vs. dependent of head foot, no preference in HVD is observed.

- The proposal that footing is iterative in even parity words and non-iterative in odd parity words necessitates future work directly comparing HVD in these types of strings.

Conclusion

- HVD applies variably in Québec French. Aside from sociolinguistic factors (addressed in Cedergren, 1986), it is sensitive to: syllable structure and phonotactics, morphological complexity, initial vs. non-initial position in word, and rhythmic structure.
- Rhythmic constraints on HVD indicate that right-headed feet are built in Québec French, iteratively from the right edge (at least in even parity words).
- A LHiLH* contour is assigned over phonological phrases, but HVD is not sensitive to tonal pattern: Hi does not necessarily align with a foot head, suggesting that its location is independent of footing.
- H* does align with a foot head, suggesting that its location is not independent of footing. Foot-level prominence is only phonetically realized in the head foot in the phrasal domain, which aligns with H*.
- Québec French contains marginal phonological structure, namely, prosodic constituency that you cannot 'hear': iterative footing without the cues to prominence normally associated with heads of feet.

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