When is a Cluster not a Cluster?: A Northern East Cree Case Study

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Background: Two different kinds of clusters in NE Cree

Type 1: Primary (Underlying) Clusters

Orthography	IPA	Translation
iskwâu	[ɪ**sk**ɑw]	'woman'
mishtikw	[mɪ**ʃt**ɨkʷ]	'tree'
nihpin	[nɪ**hp**ɪn]	'my lung'
uskin	[ʊ**sk**ɪn]	'his/her bone'

- maximally CC
- first consonant is either [s, ʃ, h]
- assumed to be underlying

Type 2: Secondary (Derived) Clusters

Orthography	IPA	Translation
tihchikâchâu	[tɪ**htʃk**atʃaw]	's/he kicks'
pâyikushtâmitiniu	[payɪ**kʃt**a**mt**ɪnɪw]	'ninety'
ushîmishish	[ʊʃi**mʃʃ**]	'his/her younger sibling'

- can be many consonants in a row
- first consonant can be a wider variety of consonants
- assumed to result from **deletion**
  (e.g., [payɪ**kʃt**a**mt**ɪnɪw] is underlyingly /payɪ**k**ʊ**ʃt**a**m**ɪ**t**ɪnɪw/)

Proposal: secondary clusters are CVC sequences that are produced with a vowel that has been devocalized (shortened or weakened) to the point that it is not perceived.

Two Kinds of Evidence:

Evidence 1: Duck Evidence

- In many languages phonological vowel deletion has been reanalyzed as vowel **devocalization** – a shortening or weakening process
- Devocalization has similar characteristics cross-linguistically
- NE Cree shares these characteristics

Cross-linguistic characteristics*		Shared with Algonquian??
1. Prosodic Enviro. & Vowel Type	• Metrically weak positions	√
	• Schwa & short/lax	√
	• At least hi vowels	√
2. Segmental Enviro.	• Obstr. ___ Son. or Sibilant Fric.	√
	• Obstr. ___ Obstr.	√?
	• Adjacent voiceless consonants	√?
3. Position	• At least final position	√
4. Variation & Gradience	• Faster more casual speech	√
	• Presence of Intermediate forms	√?
5. Word Freq.	• High frequency words	?

*See second handout "Duck Evidence Expanded" for further details

Evidence 2: Gestural Hiding

Proposal: vowel gestures are 'hidden' by the gestures of adjacent consonants

The study:

- Investigate data for presence of a phonetic correlate of gestural hiding: phonetic lengthening of consonants in secondary clusters
- I compared the relationship between the duration of **C1** &**C2** in secondary clusters and CVC sequences in the word list reading by NE Cree speaker Luci Bobbish-Salt
- If consonants in secondary clusters are longer in duration than those in CVC sequences (*after* considering other possible factors, e.g., MOA, position of consonant within word) then we have evidence of phonetic lengthening in secondary clusters, and hence, gestural hiding

ANOVA Results (two 2x3x2 ANOVAs):

- 2 levels of **position of consonant within word** (word-medial, word-initial (for C1) / word-finial (for C2))
- 3 levels of **manner of articulation** (plosive, nasal, fricative)
- 2 levels of **sequential environment** (secondary cluster, CVC sequence)

Table 1. ANOVA, C1 Duration

Effect	F Statistics	p-value
Word position	**F(1,219)=95**	**<.001**
MOA	**F(1,219)=51**	**<.001**
Sequential enviro.	**F(1,219)=24**	**<.001**
Position*MOA	F(1,219)=1.2	.27
Position*Seq. enviro.	F(1,219)=0.13	.72
MOA*Seq. enviro.	F(1,219)=0.69	.50
Position*MOA*enviro.	**F(1,219)=8.6**	**.004**

Table 2. ANOVA, C2 Duration

Effect	F Statistics	p-value
Word position	**F(1,219)=95**	**<.001**
MOA	**F(2,212)=12**	**<.001**
Sequential enviro.	F(2,212)=1.3	0.26
Position*MOA	F(2,212)=1.7	0.11
Position*Seq. enviro.	F(2,212)=1.6	0.20
MOA*Seq. enviro.	F(2,212)=1.7	0.18

Table 3. Descriptive Statistics, C1 Interaction

		N	Mean	SE	SD	95% CI Lower	95% CI Upper
Word-initial							
Plosive	CC	6	80	23	56	21	138
Plosive	CVC	17	34	6.5	27	21	48
Nasal	CC	8	59	19	54	14	103
Nasal	CVC	19	44	4.1	18	35	61
Word-medial							
Plosive	CC	59	128	4.7	36	119	138
Plosive	CVC	45	126	4.8	32	116	135
Nasal	CC	28	131	6.2	33	118	143
Nasal	CVC	14	83	6.1	23	70	96
Fricative	CC	15	206	15	56	175	237
Fricative	CVC	18	167	6.0	26	155	180

Table 4. One-Way ANOVA Results for C1

Position	Manner	F statistics	Significant? (F > 3.84?)
Word-initial	**Plosive**	**F(1,219)=7.41**	**yes**
Word-initial	Nasal	F(1,219)=0.98	no
Word-medial	Plosive	F(1,219)=1.4	no
Word-medial	**Nasal**	**F(1,219)=18**	**yes**
Word-medial	**Fricative**	**F(1,219)=9.9**	**yes**

*word-initial fricatives could not be assessed

*Results were considered significant if the F statistic ≥ $F_{CRIT}(1, 219)=3.84$

Table 5. Removed Cases of /m/ Realized as [p]

Effect	F Statistics	p-value
Word position	**F(1,215)=58**	**<.001**
MOA	**F(1,215)=52**	**<.001**
Sequential enviro.	**F(1,215)=34**	**<.001**
Position*MOA	F(1,215)=5.5	.02
Position*Seq. enviro.	F(1,215)=2.8	.099
MOA*Seq. enviro.	F(1,215)=2.4	.094
Position*MOA*enviro.	F(1,215)=1.8	.117

Table 6. Descriptive Statistics, C1 Wi Nasals

Enviro.	N	Mean	SE	SD	95% CI Lower	95% CI Upper
CC	4	96	25	50	17	175
CVC	19	44	4.1	18	39	67

Findings:

For C1: interaction effect

For C2: No significant difference in C2 duration in secondary clusters than in CVC sequences

Findings for C1:

- wi plosives longer in secondary clusters (CC) than in CVC sequences
- wm nasals longer in CC than in CVC sequences
- wm fricatives longer in CC than in CVC sequences

Further findings for C1:

- wi nasals longer in CC than in CVC sequences

$F(1, 215)=7.58 > F_{CRIT}(1, 215)=3.84$

Conclusion: Secondary clusters in NE Cree do not result from vowel deletion. Rather, they can be analyzed as CVC sequences in which lengthened consonants cause the vowel to be difficult to perceive.

Characteristics	**Non-Algonquian**	**Algonquian**
Prosodic Environment & Vowel Type	• Metrically weak positions • Schwa, short vowels, lax vowels (e.g., English, German) • At least high vowels (e.g., Greek, Montreal French, Japanese) Zwicky 1972; Hooper 1978; Dauer 1980; Cedergren & Simoneau 1985; Beckman, 1996; Gordon 1998	• Short/lax vowels in metrically weak positions (Nishnaabemwin; Passamaquoddy, East Cree, Western Cree) • High vowels in NE Cree affected MacKenzie, 1982; LeSourd, 1993; Wolfart, 1996; Valentine, 2001; Dyck et al., 2006
Variation	• Variation between devocalization and no devocalization (Berber, English, European French, German, Greek, Korean, Lushootseed, Montreal French, Japanese) • Correlated with speech rate and style • Fewer vowels are perceived when the speech is faster and more casual • More vowels are perceived when the speech is slower and more formal Delattre, 1951; Zwicky, 1972; Dauer, 1980; Strauss, 1982; Beckman & Shoji, 1984; Cedergren & Simoneau, 1985; Dalby, 1986; Kohler, 1990; Hall, 1992; Manuel et al., 1992; Jannedy, 1994; Urbancyzk, 2001; Coleman, 2001; Davidson, 2006	• Secondary clusters can optionally be produced as CVC sequences • In Western Cree, the alternation in 2 with secondary clusters (see below), occurs in faster, more casual speech, and the alternation in 1, with a perceived vowel, occurs in slower, more formal speech (Wolfart&Carroll's 1981). **Orthography** / **Alternation 1** / **Alternation 2** / **Translation** konita / [ko**nit**a] / [ko**nt**a] / 'in vain, without reason' tanisi / [ta**nis**i] / [ta**ns**i] / 'hot; how are you' • Vowel deletion in Odawa is a "kind of casual speech phenomena" (Rhodes 1976b) Rhodes 1976b, Wolfart&Carroll 1981, MacKenzie 1982
Gradience & Intermediate realizations (forms between fully deleted and fully realized vowels)	• Acoustic cues suggest the presence of a vowel even if it's not perceived (Manuel et al., 1992; Fokes & Bond, 1993; Fougeron & Steriade, 1997; Davidson, 2006) • Gradient/Intermediate realizations (e.g., Modern Greek: Dauer, 1980; Andean Spanish: Delforge, 2008) Fully voiced > Reduced duration > Weakened voicing > No voicing > No perceived vowel	• In NE Cree <u> is often perceived as devoiced or as labialization instead of deleted (MacKenzie, 1982) • In Western Cree a trace of a 'deleted' vowel can still be present, possibly as a whispered vowel (Pentland 1979:120) • For certain varieties of Ojibwe a trace of a `deleted' vowel can be found, often in the form of labialization (Rhodes&Todd 1981:58)
Position	• Vowel devocalization favoured in word-, phrase-, or utterance-final positions (45/50 languages surveyed by Gordon 1998) • Exceptions: languages with stress or high tone in these positions (e.g., Turkish, Montreal French, Inuktitut)	Word-final 'deletion' of short vowel suffixes exists in dialects of Cree and Innu. For example, in East Cree *-a* suffixes are perceived as deleted or as a whispered final [a] (MacKenzie, 1982:123).
Segmental Environment	• Between an obstruent and a sonorant or sibilant fricative English and German: Zwicky, 1972; Hooper, 1978; Beckman, 1996 • Between voiceless consonants Andean Spanish: Delforge, 2008; Greek: Dauer, 1980; Lushootseed: Urbancyzk, 2001; Montreal French: Cedergren & Simoneau, 1985	• Between most consonants (East Cree: MacKenzie 1982) • Between homorganic consonants (e.g, between [t, s]; between [t, n]) (Western Cree: Wolfart 1996)
Word Frequency	• Devocalization favoured in high freq. words Hooper 1978, Patterson et al. 2003	No data

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