

## Phonological Restructuring in Odawa

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The primary goal of phonological theory is to characterize knowledge of the sound patterns of natural language and the acquisition of that knowledge.<sup>1</sup> Particularly useful sources of data for the theory are cases of grammatical RESTRUCTURING, where learners abruptly fail to acquire a grammar that generates the surface forms of the parental language (Kiparsky 1968; Venneman 1972; Schuh 1972; Flora 1984; Hayes 1999). Languages presumably restructure because veridical generation of the adult surface forms requires the construction of unlikely or impossible grammars; “incorrect” grammars thus become preferred. In the early twentieth century the Odawa and Eastern dialects of Ojibwe (Algonquian, Great Lakes) extended a post-lexical metrically conditioned reduction process to outright syncope (Bloomfield 1957). Speakers who were born during the time that outright syncope was present innovated a new prefix system and lost the classic metrically conditioned syncope alternations (Piggott 1980:2, Rhodes 1985a, 1985b). In order to keep the restructured and the stress-conditioned syncope varieties of Odawa distinct we will follow Richards (1997) and refer to the restructured language as “New Odawa” and the ancestral language as “Old Odawa”. The innovative features of New Odawa can only be explained if these speakers restructured the language.

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The paper presents evidence that New Odawa is restructured, details the grammar of New Odawa and seeks to explain why restructuring occurred. Section 1 provides an overview of Old Odawa phonology. Section 2 will discuss features that indicate that New Odawa is restructured from Old Odawa. Section 3 will describe the new grammar, focusing especially on prefix selection, a stratified two sided open syllable syncope process, and apocope. In the conclusion, the cause of restructuring is argued to be an inability to induce a serial stress-before-syncope grammar.

## **0.1 Preliminaries**

### **0.1.1 Previous Studies**

Odawa has been the subject of much scholarship. Baraga (1878a; 1878b) is the authoritative description of the pre-syncope stage of Odawa. Nichols and Nyholm (1995), and the Ojibwe People's Dictionary (University of Minnesota, 2010) provide parallel documentation of the non-syncoated dialects of Ojibwe spoken in Minnesota. Major phonological analyses of Old Odawa include Bloomfield (1957), Kaye (1973), and Piggott (1980, 1983). Both New and Old Odawa are documented in the Rhodes dictionary (Rhodes 1985a) and Valentine (2001). My examples are drawn primarily from the Rhodes dictionary, though the other sources above have been consulted for corroboration or for assistance in determining underlying forms.

The data in the sources above was augmented by field work carried out in the

summer of 2011 at Walpole Island, Ontario. Three speakers of New Odawa who were born between 1938 and 1942 were interviewed. Data was collected on the productivity of doubly open syllable syncope and the distribution of person prefix allomorphs in New Odawa. The two sided open syllable syncope data is discussed in section 3.1 and the prefix data in section 3.3.

Previous scholarship has shown Odawa to have highly complex morphology. Works discussing the morphosyntax of Algonquian languages include Valentine (2001), Bruening (2009), Ritter and Rosen (2009, 2005) and references therein. The majority of the morphology is not relevant to the discussion, so glosses will be fairly impressionistic.

### **0.1.2 Phoneme Inventory and Syllable Structure**

Both Old and New Odawa have a segment inventory of eighteen consonants and seven vowels, shown in figure (1). The transcription used in this article follows the transcription used in the Rhodes dictionary (Rhodes 1985a) and Valentine (2001), which represents the lenis-fortis contrast of the language with the characters for voiced and unvoiced segments, respectively. The only major departure in this transcription system from the traditional transcriptions used in Bloomfield (1957), Piggott (1980) and other early work is that fricative stop-sequences are represented with voiceless symbols instead of voiced symbols.<sup>2</sup> For simplicity, we will often refer to lenis consonants as voiced and fortis obstruents as voice-

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<sup>2</sup>Bloomfield indicates that fricative-stop clusters are phonetically intermediate between fortis and lenis. Such a designation probably comes from the fortis articulation of the fricative, but the unaspirated lenis-like articulation of the stop (Rhodes 1985a).

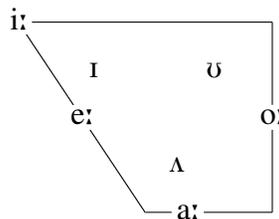
less, though nothing hinges on this terminology.

Figure (1): Odawa Consonant Inventory

	Bilabial	Alveolar	Post-Alv.	Palatal	Velar	Glottal
Plosive	p b	t d			k g	ʔ
Nasal		m	n			
Affricate			tʃ dʒ			
Fricative		s z	ʃ ʒ			h
Glide		w			j	

The vowel system contrasts three short vowels and four long vowels, shown in figure (2). The long vowels are more peripheral than the short vowels, and the low vowels are pronounced centrally. Nasalization is contrastive on long vowels in stem-final position, though this is not included in figure (2).

Figure (2): Odawa Vowel Inventory



Before syncope arose in Old Odawa, the surface syllable structure consisted of vocalic nuclei and optional onsets and codas. Word-initial onsets consisted of [b, d, g, z, ʒ, dʒ, m, n] and [w].<sup>3</sup> Complex onsets were [bw, dw, gw] word-initially. Acceptable intervocalic clusters were strident-voiceless stop [sp, st, sk, ʃp, ft, ʃk], nasal-homorganic obstruent [mb, nd, nz, nʒ, ndʒ, nɟ] and consonant/consonant

<sup>3</sup>Voiceless/fortis consonants were historically geminates and thus could not occur word-initially.

cluster-w (except glottals and [j]).<sup>4</sup> Word final clusters consisted of strident-voiceless stop [ʃk, sk] or nasal-homorganic obstruent [nd, nz, nʒ, nd̥ʒ, ng], clusters that fall into these natural classes but are not attested are assumed to be accidental gaps.

### 0.1.3 Theoretical Framework

The syncope and restructured stages of the Odawa dialect of Ojibwe are the chief concerns of this paper.<sup>5</sup> Note that because Old Odawa syncope relies on a serial interaction between stress and deletion, mappings from underlying forms to surface forms for Old Odawa will be illustrated with rule-based derivations for simplicity, though the choice of rules is purely for brevity. By contrast, the restructurings present in New Odawa are amenable to a surface-oriented constraint based approach, and the analysis of New Odawa will use Optimality Theory (OT, Prince and Smolensky 1993/2004).

Some New Odawa phenomena in sections 3.1 and 3.3 are variable. There are numerous proposals for generating variation within the OT tradition, including partial-order grammars (Anttila 1997), Stochastic OT (Boersma 1997, Boersma and Hayes 2001), Maximum Entropy (Goldwater and Johnson 2003) and Noisy Harmonic Grammar (Boersma and Pater to appear). The analysis will not endorse any particular theory of variation, but for continuity with the remainder of the analysis, variable ranking along the lines of Stochastic OT will be used.

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<sup>4</sup>Clusters of [ng] often simplify to [ŋ].

<sup>5</sup>Eastern Ojibwe appears to have restructured nearly identically (Rhodes 1985a, 1985b; Valentine 1994, 2001), differences between the dialects will be noted as they arise.

# 1 Old Odawa

Old Odawa was the syncopating language encountered by Bloomfield in 1938, a grammar of which was published in Bloomfield (1957). We will discuss four important processes in Old Odawa phonology: the stress-syncope system, apocope, hiatus resolution and a rule of stem-initial [ʊ]-lengthening.

## 1.1 Old Odawa Stress and Syncope

Old Odawa built iambic (right-headed) feet from left to right. Stress was quantity sensitive, where only long vowels were heavy. Word final syllables were always stressed. Unstressed vowels were severely reduced, or often even deleted entirely by the syncope rule in (1).

(1) Syncope

$$\left[ \begin{array}{c} \text{V} \\ \text{-stress} \end{array} \right] \rightarrow \emptyset$$

The stress-syncope interaction meant that the word /mʌkizɪn-ʌn/ surfaced as [m'kiz'nʌn] 'shoes', since the first and third vowels were unstressed and deleted by syncope, as illustrated in (2). Because syncope removed the contrast between stressed and unstressed vowels, stress will not be marked in surface representations below.

- (2) ‘shoe-pl’  
 /mΛkɪzɪn-ʌn/ UR  
 (mΛ'kɪ)(zɪ'nʌn) Stress  
 (m\_ 'kɪ)(z\_ 'nʌn) Syncope  
 [mkɪznʌn] SR

All long vowels were stressed, even if this resulted in a stress clash. For instance, since the first three vowels of /bo:po:da:dʒɪge:/ ‘he snorts’ are long, they all received stress and did not delete.

- (3) ‘he snorts’  
 /bo:po:da:dʒɪge:/ UR  
 ('bo:)('po:)('da:)(dʒɪ'ge:) Stress  
 ('bo:)('po:)('da:)(dʒ\_ 'ge:) Syncope  
 [bo:po:da:dʒge:] SR

The final syllable of the word was always stressed, even if it was not an even numbered syllable.<sup>6</sup> Thus in (4), the final syllable in /mΛkɪzɪn/ ‘shoe’ was stressed.

- (4) ‘shoe’  
 /mΛkɪzɪn/ UR  
 (mΛ'kɪ)('zɪn) Stress  
 (m\_ 'kɪ)('zɪn) Syncope  
 [mkɪzɪn] SR

Closed syllables did not count as heavy and thus did not attract stress. Hence, as we see in (5), the initial syllable in /dʌŋɪʃkʌmʌw-a:-d/ ‘that he kicks his thing (animate)’ had a coda but was still unstressed.<sup>7</sup>

<sup>6</sup>Published works disagree on whether the stress was actually present, depending on whether they countenance degenerate feet (cf. Hayes 1995; Valentine 2001). McCarthy and Prince (1993, pp 162-3) argue that OT analyses are forced to make the final syllable of odd-parity words extrametrical. The only crucial point is the descriptive generalization that the final syllable of odd-parity words was never deleted by syncope.

<sup>7</sup>In examples animate arguments will be glossed as ‘he’ or ‘him’ and inanimate arguments will be glossed as ‘it’.

- (5) ‘that he kicks his thing’  
 /dʌŋɪʃkʌmʌw-a:-d/ UR  
 (dʌn.'gɪʃ)(kʌ'mʌ)('wa:d) Stress  
 (d.n.'gɪʃ)(k.'mʌ)('wa:d) Syncope  
 [dŋɪʃkmʌwa:d] SR

Some analyses state that codas contributed morae in disyllabic words with a nasal coda in the first syllable (Kaye 1973, Piggott 1980; 1983, Hayes 1995, Rosenthal and van der Hulst 1999). Thus, the initial syllable of /bʌŋɪ:/ ‘a few’, /gʊndʌ/ ‘these (animate)’ and /ʒʊndʌ/ ‘here’ and a handful of other words was stressed and not deleted.

- (6) ‘a few’  
 /bʌŋɪ:/ UR  
 ('bʌn)('gɪ:) Stress  
 — Syncope  
 [bʌŋɪ:] SR

The data on this aspect of Old Odawa are disputed. Bloomfield listed the word in (6) as syncopated *bŋɪ:*, while the Rhodes dictionary (Rhodes 1985a) lists both *bŋɪ:* and *bʌŋɪ:*. Furthermore, the unsyncopated texts in Williams’ (1991) indicate that Old Odawa [gʊndʌ] and [ʒʊndʌ] were actually /ʌgʊndʌ/ and /ʌʒʊndʌ/, which would make their treatment with special rules unnecessary. The discussion here is not affected by this controversy.

Stress assignment applied in a domain that included the stem, suffixes and person prefixes. There could only be one prefix included in the stress domain of a stem, since all other prefixes, dubbed “preverbs” and “prenouns” in the Algonquianist tradition, were placed in their own stress domain.<sup>8</sup> The person prefixes

<sup>8</sup>When a preverb or prenoun was employed, the person prefixes were attached to the preverb or prenoun instead of the stem, where they could be expected to trigger stress alternations within the

took the form of a single light syllable; /ni-/ ‘first person’, /gi-/ ‘second person’, /u-/ ‘third person’. These prefixes attached to nouns and verbs with animate subjects, with the only exception being intransitive verbs, which in the third person were historically suffixed with -u, though our analysis treats them as being zero-marked (see section 1.3). Since footing applied from left to right, the addition of a person prefix could change the footing of stem vowels, leading to alternation where a different vowel was deleted in different members of the paradigm, as shown in (7).

(7)	‘I fish with a rod’	‘he fishes with a rod’	
	/ni-gʊndʌmo:dʒige:/	/gʊndʌmo:dʒige:/	UR
	(ni'gʊn)(dʌ'mo:)(dʒi'ge:)	(gʊn'dʌ)('mo:)(dʒi'ge:)	Stress
	(n_·gʊn)(d_·'mo:)(dʒ_·'ge:)	(g_n'dʌ)('mo:)(dʒ_·'ge:)	Syncope
	[ngʊndmo:dʒge:]	[gndʌmo:dʒge:]	SR

Such alternations affected large portions of the lexicon. Further examples are given below.

(8)	Prefixed	Unprefixed	
	n-nisɔpw-a:	nisɔpw-a:-d	recognize its (an) taste
	n-mʌznʌʔgʌn	mzmʔigʌn	paper
	n-dʌgnige:	dgʊnge:	mix things
	n-bizge:ʃin	bzʊge:ʃin	stumble
	n-zʌngito:	znʌgto:	have a hard time
	n-gʊtʊmɲʌgbɪn-a:	gtɪgmɪngɪbn-a:-d	roll someone

Since suffixes also were included in the domain of stress, words with light syllables near the right edge of the stem also attested alternations in Old Odawa.

We see this in (9).

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prefix complex. Though we will not discuss preverbs or prenouns, their entries in Rhodes (1985a) indicate that they restructured in the same way that free morphemes did.

(9)	‘shoe’	‘shoe-pl’	
	/mΛkizim/	/mΛkizim-Λn/	UR
	(mΛ'ki)(z'im)	(mΛ'ki)(zi'nΛn)	Stress
	(m_ 'ki)(z'im)	(m_ 'ki)(z_ 'nΛn)	Syncope
	[mkizim]	[mkiznΛn]	SR

Note that suffixes, unlike prefixes, could be stacked, meaning that in addition to stems, suffixes like the inverse theme sign *-igv* had the syncopated and unsyncopated allomorphs shown in (10).

(10)	‘it mends you’	‘they (inan) mend you’	
	/gi-bΛgʊw-igv-n/	/gi-bΛgʊw-igv-n-Λn/	UR
	(gi'bΛ)(gʊ'wi)(gʊn)	/(gi'bΛ)(gʊ'wi)(gʊ'nΛn)/	Stress
	(g_ 'bΛ)(g_ 'wi)(gʊn)	/(g_ 'bΛ)(g_ 'wi)(g_ 'nΛn)/	Syncope
	[gbΛgwiɡʊn]	[gbΛgwiɡnΛn]	SR

Words with light syllables near both edges of the stem had extensive allomorphy under both prefixation and suffixation in Old Odawa. For instance, compare the other affixed versions of /mΛkizim/ in (11) to the forms found in (9).

(11)	‘my shoe’	‘my shoe-pl’	
	/ni-mΛkizim/	/ni-mΛkizim-Λn/	UR
	(ni'mΛ)(ki'zim)	(ni'mΛ)(ki'zi)(nΛn)	Stress
	(n_ 'mΛ)(k_ 'zim)	(n_ 'mΛ)(k_ 'zi)(nΛn)	Syncope
	[nmΛkzim]	[nmΛkzimΛn]	SR

Syncope removed unstressed vowels regardless of the resultant cluster. This is illustrated in (12).

(12)	‘that he kicks him’	‘I kick him’	
	/dΛngɪfkΛw-a:d/	/ni-dΛngɪfkΛw-a:/	UR
	(dΛn'gɪf)(kΛ'wa:d)	(ni'dΛn)(gɪf.'kΛ)(wa:)	Stress
	(d_ n'gɪf)(k_ 'wa:d)	(n_ 'dΛn)(g_ f.'kΛ)(wa:)	Syncope
	[dngɪfkwa:d]	[ndΛngɪfkΛwa:]	SR

These words are noteworthy in that both of them attest cross-linguistically marked clusters, including word initial [dng] in the left-hand column and word medial [ngfk] in the right-hand column.<sup>9</sup> Unlike many other syncope systems (Gouskova 2003; McCarthy 2008), Old Odawa syncope was not structure-preserving.

### 1.1.1 Syncope as a Late Rule

Syncope has been motivated as the last rule in the derivations above on grammatical grounds, but it was also a process that appeared fairly late in the history of Odawa. As a late rule, it exhibited the gradience associated with post-lexical phonology or rules of phonetic implementation (Coetzee and Pater 2011). We conjecture that syncope arose gradually out of the phonetic process of vowel reduction, eventually eliding entire vowels frequently enough to become fundamentally a process of deletion.

Syncope probably did not appear any time before the late 1800s.<sup>10</sup> Bloomfield's texts collected in 1941 from a speaker born in 1868 show no syncope (Williams 1991). Furthermore, the pronunciation guide in Baraga's grammar (first published in 1853) emphatically states that vowels in his practical orthography are

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<sup>9</sup>There are some differences in the published literature on this point, as Kaye (1973) records that in the left hand column, the stem-initial vowel does not completely disappear, but the [n] in [dng] obligatorily deletes (though lexical exceptions to this rule are cited), yielding [d<sup>o</sup>g]. Meanwhile, Bloomfield (1957) does not record deletion of the medial [n] in the entry for this word, but elsewhere indicates that such deletion may be one of three possible outcomes: [dəng], [dng] and [dg].

<sup>10</sup>The standard view among Algonquianists is that syncope in Old Odawa was triggered by an influx of Potawatomi speakers to Odawa territories. Potawatomi had developed syncope a short time before Odawa. Hockett (1948:5) indicates that Potawatomi also restructured along the lines presented here.

“*never silent*” (Baraga 1878b:4, emphasis original). The first documentation of reduction and syncope comes in a 1912 text collected by Sapir, though the fact that the some words like *miw* and *niw* ‘that (obviative)’ occasionally appear in both syncopated and unsyncopated forms indicates that syncope had yet to become fully productive (Richard Rhodes, p.c.).

Bloomfield encountered the reduction/syncope system at its zenith in 1938 from a speaker who must have been significantly younger than his 1941 speaker.<sup>11</sup> In 1938, Old Odawa syncope was a gradient process, as unstressed vowels were “rapidly spoken and often whispered or entirely omitted” (Bloomfield 1957:5).<sup>12</sup> This observation is echoed by Kaye (1973) and Piggott (1980), in their description of data collected with speakers born in the early 20th century. The late arrival of syncope in Old Odawa and its apparent lack of categoricity leads us to state that it arose through the gradual extension of a phonetic reduction process to an extreme, rather than being a stable phonological process that had been transmitted between generations. This characterization of Old Odawa syncope will be important when we consider the wholesale loss of metrically conditioned syncope alternations in speakers born during or after the mid-1930s.

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<sup>11</sup>Our assumption that Bloomfield’s 1941 speaker, (Angeline Williams) was much older than the 1938 speaker (Andrew Medler) rests on the short life expectancy of the time. Williams was 73 years old, a very advanced age for that time and ethnic group. Medler was therefore statistically quite likely to have been younger than Williams. Furthermore, individuals who were children in the 1940s and 1950s have childhood memories of Medler. If our assumption that he was much younger than Williams is false, he would have lived to a remarkable age for the period.

<sup>12</sup>It is not currently known what the relative frequencies of the variants were in 1938, but recordings of what was presumably Old Odawa made in 1947 by Jane Willets may shed light on this question.

## 1.2 Old Odawa Hiatus Resolution

Old Odawa repaired vowel-vowel strings that crossed the prefix-stem boundary by epenthesis [d] between the vowels. This is formalized as a rule of hiatus resolution in (13).<sup>13</sup>

(13) Hiatus Resolution

$$\emptyset \rightarrow d / V \_ \_ V$$

Hence, /nɪ-a:dɪso:kɑ:n/ surfaced as n[d]-a:dso:kɑ:n ‘my sacred story’. The occurrence of epenthesis despite syncope removing the potential for a vowel-vowel sequence on the surface illustrates that [d]-epenthesis must be ordered before syncope in a rule-based framework. This is illustrated in (14).

(14) ‘my sacred story’  
/nɪ-a:dɪso:kɑ:n/ UR  
nɪ[d]a:dɪso:kɑ:n Hiatus Resolution  
(nɪ'dɑ:)(dɪ'so:)('kɑ:n) Stress  
(n\_ 'dɑ:)(d\_ 'so:)('kɑ:n) Syncope  
[nda:dso:kɑ:n] SR

Switching the order of stress-syncope and hiatus resolution would produce the incorrect \*n-a:dso:kɑ:n, as (15) shows.

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<sup>13</sup>The epenthesis of [d] only resolved vowel hiatus that spanned the prefix-stem boundary. In other environments [ʔ] was epenthesis or one of the vowels deleted. These aspects of the phonology do not concern this discussion, making (13) an adequate representation for present purposes. Rule (60) in Piggott (1980) is the more precise articulation of this process.

(15)	‘my sacred story’		
	/nɪ-a:dɪsɔ:kɑ:n/	UR	
	(nɪ'a:)(dɪ'sɔ:)('kɑ:n)	Stress	
	(n_ 'a:)(d_ 'sɔ:)('kɑ:n)	Syncope	
	—	Hiatus Resolution	
	*[nɑ:dso:kɑ:n]	SR	

### 1.3 Old Odawa Apocope

In addition to syncope, Old Odawa had an apocope process that targeted word-final short vowels in inflected verbs.<sup>14</sup> Simplifying slightly, the rule is formalized in (16).

(16) Apocope

$$V \rightarrow \emptyset / \_ ]_{v+person}$$

Apocope is illustrated in (17), where the form on the left undergoes apocope while the form on the right does not because of the presence of a consonantal suffix.

(17)	‘I am dry’	‘that he is dry’	
	/nɪ-ba:sʊ/	/ba:sʊ-d/	UR
	nɪba:s_	—	Apocope
	(nɪ'ba:s)	('ba:)('sʊd)	Stress
	(n_ 'ba:s)	—	Syncope
	[nba:s]	[ba:sʊd]	SR

The syllables moved into word-final position by apocope must have been stressed, because the mapping from underlying /gɪ-ma:be:wɪzɪ/ to [g[d]-ma:be:wɪz]

<sup>14</sup>The rule appears to have been restructured some time before Old Odawa. Historically the process non-iteratively removed word-final short vowels and glides (Piggott 1980). However, the only convincing alternations in the modern language are found in the deletion of vowels in inflected verbs.

‘you are shaped so’ shows that they did not delete. In a rule-based framework, this is handled by apocope applying prior to the stress rules. This first derivational path is illustrated in (18).

- (18) ‘you are shaped so’
- |                           |                   |
|---------------------------|-------------------|
| gi-ma:be:wɪzɪ/            | UR                |
| gi[d]ma:be:wɪzɪ           | Hiatus Resolution |
| gidma:be:wɪz_             | Apocope           |
| (gɪ'dɪ)('na:)('be:)('wɪz) | Stress            |
| (g_ 'dɪ('na:)('be:)('wɪz) | Syncope           |
| [gdma:be:wɪz]             | SR                |

Reversing the order of stress-syncope and apocope would make the predicted surface form be \*[g[d]-ma:be:wz], as shown by (19).

- (19) ‘you are shaped so’
- |                              |                   |
|------------------------------|-------------------|
| /gi-ma:be:wɪzɪ/              | UR                |
| gi[d]ma:be:wɪzɪ              | Hiatus Resolution |
| (gɪ'dɪ)('na:)('be:)(wɪ'zɪ)   | Stress            |
| (g_ 'dɪ)('na:)('be:)(w_ 'zɪ) | Syncope           |
| (g'dɪ)('na:)('be:)(wz_)      | Apocope           |
| *[gdma:be:wz]                | SR                |

Apocope was widespread in the Old Odawa lexicon, targeting the forms in the right-hand column in (20), among others.<sup>15</sup>

- (20)
- | Suffixed      | Unsuffixed   |                 |
|---------------|--------------|-----------------|
| na:da:sʊ-d    | n-na:da:s    | get things      |
| ne:we:bɪ-d    | n-ne:we:b    | rest            |
| ni:ga:nbɪzʊ-d | n-ni:ga:nbɪz | drive ahead     |
| a:bdɪzɪ-d     | n[d]-a:bdɪz  | be useful       |
| n-wi:kbm-gʊ-n | n-wi:kbm-ɪg  | tie me up       |
| g-wi:kbm-nɪ-m | g-wi:kbm-m   | tie you (pl) up |

<sup>15</sup>Our examples are restricted to showing [ʊ] and [ɪ] deleting because no verb stems ended in [ʌ] underlyingly.

## 1.4 [ʊ] Lengthening

A rather unusual rule lengthened stem-initial [ʊ] after a prefix, which we formalize in (21) with the name [ʊ] lengthening. This is a well-documented idiosyncrasy of all Ojibwe dialects (Bloomfield 1957, Piggott 1980, Nichols and Nyholm 1995). The [ʊ] must be truly stem initial, not just in the first syllable. For instance, the [ʊ] in Old Odawa /gʊʃkʊm/ does not lengthen in *n-gʊʃkm-a:* ‘I startle him’.

(21) [ʊ] Lengthening

$$\text{ʊ} \rightarrow \text{o:} / \text{ ]}_{\text{prefix}} \text{ \_\_\_}$$

In the non-syncoating ancestor Old Odawa this rule created alternations between, for example, *ʊpwa:gʌn* ‘pipe’ and *ni[d]-o:pwa:gʌn* ‘my pipe’. With the advent of syncope, Old Odawa surface forms came to have an alternation between zero and [o:], as (22) illustrates.

(22)	‘my pipe’	‘pipe’	
	/ni-ʊpwa:gʌn/	/ʊpwa:gʌn/	UR
	niʊ:pwa:gʌn	—	[ʊ] Lengthening
	ni[d]o:pwa:gʌn	—	Hiatus Resolution
	(ni'do:)('pwa:)('gʌn)	(ʊ'pwa:)('gʌn)	Stress
	(n_ 'do:)('pwa:)('gʌn)	(_ 'pwa:)('gʌn)	Syncope
	[ndo:pwa:gʌn]	[pwa:gʌn]	SR

## 2 Evidence for Restructuring in New Odawa

Each generation of a speech community RECAPITULATES or RESTRUCTURES their language. A recapitulated language maintains the phonology of the parental language, while a restructured language differs from the parental language. New

Odawa deviates from Old Odawa in two major respects. First, New Odawa no longer attests the Old Odawa stress-conditioned stem alternations at the left edge of the word. Second, the person prefix system has undergone a radical change, with multiple innovative allomorphs for each prefix. Crucially, no analysis where New Odawa recapitulates Old Odawa can account for these facts parsimoniously.

## 2.1 Loss of Stem Alternations

New Odawa fails to show many of the Old Odawa syncope alternations at the left edge of the stem. Recall that Old Odawa stems that began with a CV syllable like /dΛgʊʃm/ ‘arrive’ alternated drastically. As seen in (23), when the word was not prefixed, it surfaced as [dgʊʃm] ‘he arrives’.

- (23) ‘he arrives’  
 /dΛgʊʃm/ UR  
 (dΛ'gʊ)(ʃm) Stress  
 (d\_ 'gʊ)(ʃm) Syncope  
 [dgʊʃm] SR

The addition of a prefix shifted the footing, permitting different vowels to surface in [n-dΛgʃm] ‘I arrive’, as illustrated by (24).

- (24) ‘I arrive’  
 /nɪ-dΛgʊʃm/ UR  
 (nɪ'dΛ)(gʊʃm) Stress  
 (n\_ 'dΛ)(g\_ 'ʃm) Syncope  
 [ndΛgʃm] SR

In New Odawa, prefixation no longer triggers the realization of a completely different set of vowels. Instead, the Old Odawa unprefixed form is used through-

out the paradigm, ensuring that. Thus, the New Odawa word for ‘he arrives’ is [dgʊʃm], while the main New Odawa correlate of Old Odawa [n-dʌgʃm] is [ndʌ-dgʊʃm]. A caveat must be added, because section 3 shows that New Odawa grammar does generate some vowel-zero alternations, though crucially they are not stress-driven.

A second restructured feature of New Odawa is that the regular prefixation strategy has changed in New Odawa away from simple *n*- prefixation to using innovative prefixes *ndʌ*- or *ndo*:- interchangeably (Rhodes 1985a; 1985b). We will explain the origin of these innovative prefixes in section 2.2, and the grammar that governs them in section 3.3.

The loss of metrically conditioned syncope alternations at the left edge of the word is exceptionless in New Odawa. For example, consider the words cited in (8), repeated in (25).

(25)	Old Unprefixed	Old Prefixed	
	nsɪdpw-a:-d	n-nɪsdʊpw-a:	recognize its (an) taste
	mzmʔɪgʌn	n-mʌznʌʔgʌn	paper
	dgʊnge:	n-dʌgnɪge:	mix things
	bzʊge:ʃm	n-bɪzge:ʃm	stumble
	znʌgto:	n-zʌngɪto:	struggle
	gtɪgmɪngɪbn-a:-d	n-gʊtɡʊmnʌgbɪn-a:	roll him

Compare these forms with their New Odawa correlates. In every case, the unprefixed form is the same as the Old Odawa unprefixed form, and this stem allomorph is used throughout the paradigm.

(26)	New Unprefixed	New Prefixed I	New Prefixed II	
	nsɪdpw-a:-d	ndʌ-nsɪdpw-a:	ndo:-nsɪdpw-a:	recognize its (an) taste
	mzɪmʔɪgʌn	ndʌ-mzɪmʔɪgʌn	ndo:-mzɪmʔɪgʌn	paper
	dgʊŋge:	ndʌ-dgʊŋge:	ndo:-dgʊŋge:	mix things
	bzʊge:ʃɪn	ndʌ-bzʊge:ʃɪn	ndo:-bzʊge:ʃɪn	stumble
	znʌgto:	ndʌ-znʌgto:	ndo:-znʌgto:	struggle
	gtɪgmɪŋɪbn-a:-d	ndʌ-gtɪgmɪŋɪbn-a:	ndo:-gtɪgmɪŋɪbn-a:	roll him

The loss of Old Odawa stem alternations in New Odawa is paralleled by the restructuring of prefixes, which we take up in the next section.

## 2.2 Prefix Restructuring

The New Odawa prefix allomorphs *ndʌ-*, *ndo:-* and *ndɪ-* are unlikely to have been created *ex nihilo*, but rather arose through RECUTTING, a diachronic shift in the placement of a morpheme boundary (Chantraine 1945; Lynch 2001; Diertani 2011). A well-known example of recutting is the re-analysis in English where word-initial [n] was shifted to the indefinite determiner in cases like *a nadder* becoming *an adder*.

Old Odawa stems that began with a short vowel followed by a heavy syllable (VCVV stems) were particularly vulnerable to recutting in New Odawa, as their initial vowel only appeared when the stem was prefixed. Example (27) shows the Old Odawa derivation that provided some of the data for the prefix allomorph *ndʌ-*.

(27)	‘I hang’	‘he hangs’	
	/ni-Λgo:d̥ʒim/	/Λgo:d̥ʒim/	UR
	ni[d]Λgo:d̥ʒim	—	Hiatus Resolution
	(ni'dΛ)(ˈgo:)(ˈd̥ʒim)	(Λ'go:)(ˈd̥ʒim)	Stress
	(n_ 'dΛ)(ˈgo:)(ˈd̥ʒim)	(_ 'go:)(ˈd̥ʒim)	Syncope
	[ndΛgo:d̥ʒim]	[go:d̥ʒim]	SR

Because the stress algorithm “restarted” the iambic secondary stress pattern after a long vowel, the person prefix was only able to affect the footing of the stem-initial vowel in /Λgo:d̥ʒim/. This means that when the form had no person prefix, as in *go:d̥ʒim* ‘someone hangs’, the stem initial vowel was unstressed, and hence not realized. But when a person prefix was attached, like in *ndΛgo:d̥ʒim*, the stem initial vowel was stressed, which allowed it to surface.

From the perspective of a language learner, the segmentation of *n-* given the forms *ndΛgo:d̥ʒim* ‘I hang’ and *go:d̥ʒim* ‘someone hangs’ leaves [dΛ] with no morphemic parse. In contrast, a historically incorrect parse of the prefix as *ndΛ-* would be tempting, since it leaves no unexplained material, as schematized in (28).

(28)	ndΛ	⎧	go:d̥ʒim	‘he hangs’
		⎩	go:d̥ʒim	‘I hang’

With this segmentation, the formerly stem-initial vowel has become part of the prefix, and the stem is now consonant-initial. This process can be repeated for stems that began with other short vowels. The derivations of the Old Odawa stem /ma:bΛd̥ʒito:/ ‘use something so’ in (29) demonstrate how *ndi-* arose. First, consider the derivation that generated the surface forms *na:bd̥ʒito:-d* ‘that he uses it so’ and *ndi-na:bd̥ʒito:-n* ‘I use it so’ :

(29)	‘I use it so’	‘that he uses it so’	
	/ni-ma:bΛdʒito:-n/	/ma:bΛdʒito:-d/	UR
	ni[d]ma:bΛdʒito:n	—	Hiatus Resolution
	(ni'dɪ)(na:)(bΛ'dʒɪ)('to:n)	(ɪ'na:)(bΛ'dʒɪ)('to:d)	Stress
	(n_dɪ)(na:)(b_dʒɪ)('to:n)	(_'na:)(b_dʒɪ)('to:d)	Syncope
	[ndma:bdʒito:n]	[na:bdʒito:d]	SR

Aligning the shared material at the left edges of the words provides a prefix *ndɪ-* ‘I’ and a stem *na:bdʒito:n* ‘use something so’:

(30)		na:bdʒito:d	‘that he uses it so’
	ndɪ	na:bdʒito:n	‘I use it so’

Words like the Old Odawa word /ʊdʒe:pɪzɪ/ ‘be lively’ created *ndo:-*. We first provide the Old Odawa derivations in (31). Recall from section 1.4 that [ʊ] lengthened after a prefix.

(31)	‘I am lively’	‘that he is lively’	
	/ni-ʊdʒe:pɪzɪ/	/ʊdʒe:pɪzɪ-d/	UR
	niʊ:dʒe:pɪzɪ	—	[ʊ] Lengthening
	ni[d]ʊ:dʒe:pɪzɪ	—	Hiatus Resolution
	nido:dʒe:pɪz_	—	Apocope
	(ni'd'o:)(dʒe:)(pɪz)	(ʊ'dʒe:)(pɪ'zɪd)	Stress
	(n_d'o:)(dʒe:)(pɪz)	(_'dʒe:)(p_'zɪd)	Syncope
	[ndo:dʒe:pɪz]	[dʒe:pɪzɪd]	SR

String alignment between the two surface forms favors a prefix *ndo:-* ‘I’ and a stem *dʒe:pɪzɪ* ‘be lively’.

(32)		dʒe:pɪzɪd	‘that he is lively’
	ndo:	dʒe:pɪz	‘I am lively’

Learners had evidence for simpler prefixes as well. The prefix allomorph *n-* was segmentable off of words like /ga:skΛnʊzʊ/ ‘whisper, whose derivations we

show in (33).<sup>16</sup>

(33)	‘I whisper’	‘that he whispers’	
	/ni-ga:skʌnʊzʊ/	/ga:skʌnʊzʊ-d/	UR
	ni-ga:skʌnʊz_	—	Apocope
	(ni'ga:s)(kʌ'nʊz)	('ga:s)(kʌ'nʊ)('zʊd)	Stress
	(n_'ga:s)(k_'nʊz)	('ga:s)(k_'nʊ)('zʊd)	Syncope
	[nga:sknʊz]	[ga:sknʊzʊd]	SR

String alignment of [nga:sknʊz] ‘I whisper’ and [ga:sknʊzʊd] ‘that he whispers’ by New Odawa learners allows the segmentation of *n-*.

(34)		ga:sknʊzʊd	‘that he whispers’	
	n		ga:sknʊz	‘I whisper’

Finally, the allomorph *nd-* would be pulled off of Old Odawa words that began with long vowels, like *nd-a:da:gne:fɪm* ‘I am snow-bound’.

(35)	‘I am snow-bound’	‘he is snow-bound’	
	/ni-a:da:gʊne:fɪm/	/a:da:gʊne:fɪm/	UR
	ni[d]a:da:gʊne:fɪm	—	Hiatus Resolution
	(ni'da:)('da:)(gʊ'ne:)('fɪm)	('a:)('da:)(gʊ'ne:)('fɪm)	Stress
	(n_'da:)(_'da:)(g_'ne:)(_'fɪm)	('a:)(_'da:)(g_'ne:)(_'fɪm)	Syncope
	[nda:da:gne:fɪm]	[a:da:gne:fɪm]	SR

The segmentation would be performed mechanically by string-alignment between [nda:da:gne:fɪm] ‘I am snow-bound’ and [a:da:gne:fɪm] ‘he is snow-bound’.

(36)		a:da:gne:fɪm	‘he is snow-bound’	
	nd		a:da:gne:fɪm	‘I am snow-bound’

In sum, Old Odawa surface forms provided evidence for five prefix allomorphs for the first person, of these *ndʌ-* and *ndo:-* emerged as defaults.<sup>17</sup> Hence, in addition to the forms listed in (25), innovative prefixes appear on the words in (37),

<sup>16</sup>Recutting did not occur to the suffix *-d*, due to constraints on space we will not discuss this.

<sup>17</sup>Second person prefixes regularized in the same way, though third person inflection in verbs is typically null.

where we suppress *ndo:-* for brevity. Crucially, these innovative default prefixes appear on practically all stems. The data collected for this study indicate that default prefixes even occur on vowel-initial words, despite the fact that they always took *nd-* in Old Odawa. The grammar of prefixes in New Odawa and new documentation of their behavior is presented in section 3.3.

(37)	Old Unprefixed	Old Prefixed	New Default Prefixed	
	ga:sknʊzʊ-d	n-ga:sknʊz	ndΛ-ga:sknʊz	whisper
	na:bdʒiɾo:-d	n[d]-ma:bdʒiɾo:-n	ndΛ-na:bdʒiɾo:-n	use it so
	a:bnΛmw-a:-d	n[d]-a:bnΛmw-a:	ndΛ-a:bnΛmw-a:	untie him
	a:bdwe:we:bzʊ-d	n[d]-a:bdwe:we:biz	ndΛ-a:bdwe:we:biz	make noise

The remaining prefix allomorphs are still in use to a limited degree. The allomorph *nd-* sporadically appears on vowel-initial stems, bringing about words like *nd-a:bdwe:we:biz* ‘I make noise while moving’. Likewise, *n-* sporadically appears on stems that begin with a vowel, a singleton consonant, or a rising onset, as seen in *n-a:bdiz* ‘I am useful’, *n-ko:dʒi:fiw* ‘I have lice’, *n-fkwa:ta:* ‘I die’ (these cannot be historical relic forms, since none of these words took this allomorph in Old Odawa). Finally, the use of *ndi-* varies between speakers, some use it as a markedly less frequent alternative to *ndΛ-* and *ndo:-*, as *ndi-bi:mfkʊfka:* ‘I spin’ demonstrates, while others don’t use it at all.

Where Old Odawa surface forms had lexically specific prefix allomorphs, the default New Odawa prefix system attaches *ndΛ-* and *ndo:-* to all lexical items. This is a significant restructuring of the prefix allomorph inventory. To deny that the language has radically changed its inventory would require proliferating word-initial vowels on all stems and arbitrarily forcing them to surface as [Λ] or [o:], but

not [ɪ] for the majority of speakers. Such an approach is not only suspect, it obtains only modest success, as historically hiatus avoiding allomorphs are predicted to become obligatory. This is disconfirmed by the attestation of *n-* as a secondary pattern that occurs even outside of its historical domain. A more accurate analysis states that prefixes in New Odawa have been recut, and they attach to a base that corresponds at the left edge to the Old Odawa unprefixes stem allomorph.

### **2.3 The Time Course of Restructuring**

Recall from section 1.1.1 that Old Odawa syncope was the final stage of a gradual phonetic weakening in unstressed vowels. Reduction became severe and outright deletion became frequent around the time of Bloomfield's 1938 fieldwork.

The approximate beginning of restructuring was identified in Piggott's 1974 dissertation (published as Piggott 1980), where affixation in speakers in their mid-thirties and younger is noted to be considerably different from that of their elders (Piggott 1980:2). Rhodes (1985a,b) identifies the prefix restructuring discussed above as the crucial shift in affixation. Given that most of the fieldwork for Piggott's dissertation was carried out in 1968-1970, the earliest that these New Odawa speakers could have been born is 1932. Crucially, the early childhood of these speakers coincides with the zenith of syncope documented by Bloomfield's 1938 fieldwork. Thus, as soon as children attempted to learn the phonetic loss of underlying vowels as part of the pattern of phonological alternations in their language, restructuring occurred.

Rhodes also identifies the loss of metrically conditioned syncope alternations

as part of New Odawa, but this was not mentioned by Piggott. There is little reason to suspect that this omission is evidence of Old Odawa alternations continuing into Piggott's New Odawa data, since Rhodes began fieldwork in 1972 and worked in many communities, including Manitoulin Island, Ontario (where Piggott collected much of his data). With both linguists likely having interviewed similar speakers, the simultaneous loss of stem alternations and change in prefixation strategies noted by Rhodes were probably features of Piggott's data as well.

### 3 New Odawa Grammar

Despite the overwhelming leveling attested in New Odawa, the language nevertheless has vowel-zero alternations in the form of apocope and an innovative syncope process. Crucially, these need not be generated by a serial stress-before-syncope grammar. In place of the stress-before-syncope grammar necessary to recapitulate Old Odawa, New Odawa developed a system of syncope insensitive to odd-even position, but instead regulated by phonotactics. Optimality Theory is an ideally suited framework for these phenomena, which are transparent. Stratal OT (Kiparsky 2000, Ito and Mester 2001; 2003, *inter alia*) is utilized here to obtain effects of morphology on syncope and apocope.<sup>18</sup> Finally, the prefix grammar

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<sup>18</sup>The use of stratal OT does allow limited serialism into the grammar. This may not be necessary, as analyses cast in Output-Output correspondence are frequently a non-serial equivalent of stratal OT. If it turns out that stratal OT is required, the core claims of this paper will hold so long as strata are forbidden from being set up to create the Old Odawa stress-before-syncope system. Such a constraint is latent in stratal OT's architecture, since strata correspond to morphological operations. Because Old Odawa syncope applied in both affixed and unaffixed forms, it was independent of morphology and thus was not amenable to a recapitulative analysis in stratal OT.

of New Odawa obeys markedness principles that are easily codified in OT.

Section 3.1 will provide a discussion of syncope in New Odawa. Section 3.2 will cover New Odawa apocope. Section 3.3 motivates a grammar that governs prefix selection.

### **3.1 New Odawa Syncope**

New Odawa deletes short vowels in the two sided open syllable syncope environment, meaning that vowel deletion removes short vowels whenever it will not violate constraints on consonant clusters. The phonotactic constraints on deletion vary according to the type of morphology involved, which is what prompts us to divide the grammar into derivational and inflectional strata. Syncope conditioned by derivational morphology is forbidden from making tri-consonantal strings, even if they are syllabifiable. By contrast, syncope in the inflectional domain creates any cluster so long as it is syllabifiable. The derivational and inflectional strata are described in section 3.1.1 and 3.1.6 respectively.

#### **3.1.1 Derivational Stratum Phenomena**

In the derivational stratum, syncope deletes vowels so long as complex codas or strings of three consonants are not created. In addition, occasionally the markedness pressure against short vowels brings together strings of three consonants, in which case the cluster may be simplified.

Although Odawa, like all Algonquian languages, has very few words that share no sound-meaning relation with other words, many of the patterns are not produc-

tive, and may not have been so for a very long time. In considering the syncope accompanied by derivational morphology, we limit ourselves to considering productive applications of the morphology, focusing largely on the alternations observed in or conditioned by the morphemes *-idɪzʊ* ‘reflexive’, *-wɪm* ‘abstract nominal’ and *-fki* ‘negative characteristic’.

In the simplest cases, a single vowel that would appear in the two sided open syllable environment fails to surface. This is especially clear in words like *nɪfnɑ:bɛ:m-wɪm* ‘Odawa language’, which does not attest the underlying [ʊ] seen in the verb *nɪfnɑ:bɛ:mʊ-d* ‘that he speaks Odawa’. This same pattern is observed in the complex nominals below from the Rhodes dictionary.<sup>19</sup>

(38)	Verb	Derived Nominal	Root Gloss
	gɪnda:sʊ-d	gɪnda:s-wɪm	count/read
	mi:ga:di-d	mi:ga:d-wɪm	fight each other
	ngʌmʊ-d	ngʌm-wɪm	sing
	ni:mɪ-d	ni:m-wɪm	dance

The examples below were not taken from the Rhodes dictionary, but come from field work conducted in 2011. When two vowels are underlyingly in the two sided open syllable environment either one deletes, but not both. For instance, the last two vowels in *-idɪzʊ* are in the two sided open syllable environment underlyingly in (39). In the field work carried out for this study, both words attested free variation in the deletion site.<sup>20</sup> To ensure that the table fits on the page, we elide

<sup>19</sup>The Rhodes dictionary lists *a:ʒda:di-wɪm* ‘mutual revenge’ and *ggwe:dʒkʌna:di-wɪm* ‘contest’. These words will have to be treated as exceptions. However, section 3.1.9 discusses some exceptions listed in the Rhodes dictionary that did not behave exceptionally in the field work for this study. It is possible that *a:ʒda:di-wɪm* ‘mutual revenge’ and *ggwe:dʒkʌna:di-wɪm* ‘contest’ are likewise not exceptions.

<sup>20</sup>The underlying form /da:ngɪ/ differs from /da:ngɪm/, which might be expected if the Rhodes

the root in the surface forms.

(39)	Underlying	Surface 1	Surface 2	
	da:ngn-ɪdɪzʊ-wɪn	...-ɪdzʊ-wɪn	...-ɪdɪz-wɪn	self-feeling-ness
	da:ngdʒi:bn-ɪdɪzʊ-wɪn	...-ɪdzʊ-wɪn	...-ɪdɪz-wɪn	self-brushing-ness

Other words were not recorded as having multiple variants, but nonetheless illustrate that deletion sites are not consistent when two vowels are in the two sided open syllable syncope environment. Among them are [wi:kɪn-ɪd.zʊ-wɪn] ‘self eggging on-ness’, [bi:skʊnje:-dɪz-wɪn] ‘self clothing-ness’ and [de:pta:-d.zʊ-wɪn] ‘self-hearing-ness from afar’.<sup>21</sup>

Furthermore, when three vowels in adjacent syllables are in the two sided open syllable environment, the first and the third delete, as shown by the mapping from /bi:dʒma:m-ɪdɪzʊ-wɪn/ to [bi:dʒma:n-dɪz-wɪn] ‘self-smelling-ness’. A variant of this word is [bi:dʒma:n-zʊ-wɪn] ‘self-smelling-ness’.

Deletion was not recorded when the resulting consonant cluster contains three consonants, even when the resulting cluster would be an unmarked complex onset in New Odawa.<sup>22</sup> For instance, strident-voiceless stop-[w] clusters are possible onsets in New Odawa (see section 3.1.6), but deletion fails to occur in *ga:we:-fki-*

dictionary is consulted. The speaker the verb was elicited from never gave any utterance that would have indicated that [ɪ] was present.

<sup>21</sup>The consistent deletion of the first [ɪ] in the last two words is presumably due to a dispreference against vowel hiatus.

<sup>22</sup>The Rhodes dictionary lists three words that appear to be exceptions to this generalization. They are *gɔdʒ-fki-d* ‘that he is naturally shy’, *gtɪn-fki-d* ‘that he is naturally lazy’ and *mi:gaz-fki-d* ‘that he is naturally pugnacious’ (from underlying /gɔdʒɪ-fki/, /gtɪnɪ-fki/ and /mi:gazʊ-fki/, respectively). If these words are part of New Odawa and not listed from Old Odawa, they will have to be treated as exceptions. However, there is a good chance that if syncope has applied in New Odawa, the voiced coronal obstruents in *gɔdʒ-fki-d* and *mi:gaz-fki-d* would delete before the strident [ʃ] (Valentine 2001, also see section 3.1.4). These words at least would then cease to be exceptional.

*wɪn* ‘natural jealousy’. This pattern occurs in all of the nominalizations of verbs derived with *-fki* ‘negative characteristic’ that I have encountered, shown in (40). None of the bases of these verbs end in short vowels, making the tri-consonantal sequences below the result of morpheme concatenation.

(40)	Word	Root Gloss
	zɑ:mɔ:n-fki-wɪn	talk too loud
	ʒo:wbi:-fki-wɪn	be mildly drunk
	zɑ:kʌm-fki-wɪn	go to the bathroom
	zha:we:n-fki-wɪn	be envious
	zʊsdʌm-fki-wɪn	cough

Avoiding tri-consonantal sequences not only causes some vowels to not delete, but it determines which vowel will delete. The verbs /je:kga:bʌwɪ/ ‘tire from standing’ and /ze:gɪzɪ/ ‘be scared’ both have two vowels in the two sided open syllable environment at the right edge of the word, as shown by their inflected forms in (41), taken from the Rhodes dictionary.

(41)	Prefixed	Suffixed	
	ndʌ-ze:gɪz	ze:gɪzɪ-d	be scared
	ndʌ-je:kga:bʌw	je:kga:bwɪ-d	tire from standing

These surface forms come from the application of apocope (discussed in section 3.2) in the left-hand column and syncope in the right-hand column. The application of both of these processes is outlined in rule form in (42).

(42)	I am scared	that he is scared	
	/ndʌ-ze:gɪzɪ/	/ze:gɪzɪ-d/	UR
	ndʌ-ze:gɪz_	—	Apocope
	—	ze:g_ɪzɪ-d	Two-Sided Syncope
	[ndʌ-ze:gɪz]	[ze:gɪzɪ-d]	SR

When *-fki* is applied to these verbs, only the first vowel deletes, producing [je:kga:bwɪ-fkɪ-d] ‘that he naturally tires from standing’ and [ze:gzi-fkɪ-d] ‘that he naturally is scared’. The second vowel cannot delete, since that would bring about a string of three consonants in the unattested \*[je:kga:bɔw-fkɪ-d] ‘that he naturally tires from standing’ and \*[ze:giz-fkɪ-d].

Finally, some consonants were observed to delete in the field work for this study with concomitant vowel deletion. For instance, underlying /za:mkɔmgɪzɪ-fkɪ-wɪn/ loses [zɪ] in the mapping to [za:mkɔmgɪ-fkɪ-wɪn] ‘natural overactivity’. Likewise, /bi:d̥ɜma:m-idɪzɔ-wɪn/ from above is optionally truncated to [bi:d̥ɜma:n-zɔ-wɪn]. An even more impressive case of consonant deletion arises with the mapping from /no:ndɔw-idɪzɔ-wɪn/ to [no:n-dɪz-wɪn] ‘self hearing-ness’. We won’t have much to say about these consonant deletions, since the amount of evidence we can bring to bear on the conditions for consonant deletion is sparse.

### 3.1.2 Derivational Stratum Analysis

The core phenomenon of vowel deletion necessitates a grammar that syncopates short vowels, unless a triple-consonant cluster is created. The analysis here is Optimality theoretic, and relies on four constraints, listed below.

- (43) a. \*V: assign one violation mark for every short vowel.<sup>23</sup>  
 b. \*CCC: assign one violation mark for every string of three consonants.

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<sup>23</sup>Gouskova (2003) presents arguments that \*V and other constraints from the \*STRUC family should be excluded from CON. Deletion under that theory is held to be driven by satisfaction of constraints that do not specifically penalize the existence of structure. However, it is not clear what is optimized by deletion in Odawa besides a “nihilistic” dispreference against short vowels. Hence, we will not utilize Gouskova’s approach.

- c. \*COMPLEXCODA (abbreviated as \*COMPCODA): assign one violation mark for every segment after the first in a coda.
- d. MAX-V: assign one violation mark for every short vowel in the input that has no output correspondent.

To protect long vowels from deleting we assume that a fifth constraint, MAX-V, which prohibits the deletion of long vowels, is high-ranking. We will not show this constraint in tableaux.

The simple case of a single vowel deleting, as seen in the mapping from /ze:gɪzɪ-fkɪ/ to [ze:gɪfki] ‘he is naturally scared’, can be generated with the ranking \*CCC, \*COMPCODA >> \*V >> MAX-V, as (44) shows.

(44)

	ze:gɪzɪ-fkɪ	*CCC	*COMPCODA	*V	MAX-V
a.	ze:g.zɪfki			**	*
b.	ze:gɪzɪfki			***!	
c.	ze:g.zɪfk		*!	*	**
d.	ze:gɪz.fkɪ	*!		**	**

In words with two short vowels in the two sided open syllable environment like /da:ngn-ɪdɪzɔ-wɪn/, free variation between [da:ngn-ɪd.zɔ-wɪn] and [da:ngn-ɪdɪz-wɪn] is observed. We must modify our theoretical framework slightly to allow this free variation. In keeping with the use of OT in the analysis of New Odawa, the analysis uses Stochastic OT (Boersma 1997, Boersma and Hayes 2001), though Maximum Entropy (Goldwater and Johnson 2003) or Noisy Harmonic Grammar (Boersma and Pater to appear) are also feasible architectures.<sup>24</sup>

<sup>24</sup>Without additional constraints, a partial order grammar (Anttila 1997) is unable to match the frequencies of variants.

The winning candidates *da:ngn-id.zʊ-wm* and *da:ngn-idiz-wm* tie on the four constraints at the top of our grammar, but they differ in whether a coda or a complex onset been created (consonant-glide sequences are unmarked onsets in New Odawa). In (45), we add \*COMPLEXONSET and \*CODA as dominated but freely ranked constraints to break the tie between them.<sup>25</sup>

(45)	da:ngn-idzʊ-wm	*CCC	*V	MAX-V	*COMPONS	*CODA
a.	da:ngnɪd.zʊwm	*	***	*		**(!)
b.	da:ngnɪ.dɪ.zwm	*	***	*	*(!)	*
c.	da:ngnɪdɪzʊwm	*	****!			*
d.	da:ngnɪd.zwm	**!	**	**	*	**

Our grammar also correctly deletes the first and third vowels when three adjacent short vowels are in the two sided open syllable environment. For instance, the vowels of the reflexive morpheme *-idzʊ* are all in the two sided open syllable environment in */bi:dʒma:m-idzʊ-wm/* ‘self smelling-ness’. In the surface form of this word, the first and last vowels of the reflexive morpheme delete, producing *[bi:dʒma:n-diz-wm]*. The winning candidate has undergone nasal place assimilation of an unproblematic sort; the analysis of this will not be discussed. A preliminary tableau in (46) illustrates how our grammar deletes the relevant vowels.

<sup>25</sup>The addition of \*COMPLEXONSET and \*CODA may not be the correct way to derive variable deletion sites, as it is the fact that the consonants in the morphology are obstruents and a glide that allows this to work. If the consonants were all obstruents, the tie situation would re-arise. Allowing some constraints to be completely de-activated would allow a true tie to not be a skepticism-inducing claim.

(46)

	$bi:d\hat{z}ma:m-idiz\upsilon-wim$	*CCC	*V	MAX-V
a. $\text{[ɛ]}$	$bi:d\hat{z}ma:ndizwim$		**	**
b.	$bi:d\hat{z}ma:m\acute{id}iz\upsilonwim$		***!*	
c.	$bi:d\hat{z}ma:ndz\upsilonwim$	*!	**	

However, in addition to  $bi:d\hat{z}ma:n-diz-wim$ , another variant,  $bi:d\hat{z}ma:n-z\upsilon-wim$ , is also attested. This can be modeled with faithfulness constraints protecting voiced obstruents ranked low enough to permit their optional deletion. With consonant deletion available, it becomes very difficult to predict the full range of variants a New Odawa word might have. Just the word under consideration,  $/bi:d\hat{z}ma:m-idiz\upsilon-wim/$ , could also have surface forms  $[bi:d\hat{z}ma:m-iz-wim]$ ,  $[bi:d\hat{z}ma:n-di-wim]$  or even  $[bi:d\hat{z}ma:n-wim]$ , which were not encountered in the fieldwork conducted for this study. The precise conditions for consonant deletion are not fully understood, which prompts us to leave this question for a study that tracks the patterns of consonant deletion more explicitly.

Tableau (47) illustrates how  $bi:d\hat{z}ma:n-diz-wim$ , and  $bi:d\hat{z}ma:n-z\upsilon-wim$  surface from  $/bi:d\hat{z}ma:m-idiz\upsilon-wim/$ . We give MAX-D, a constraint which penalizes the deletion of voiced coronal obstruents, a variable ranking with \*COMPLEX in the tableau to allow the tie between the winning candidates to be broken.

(47)

	bi:d̥zma:m-ɪdɪzɔ-wɪm	*CCC	*V	MAX-V	*COMPONS	MAX-D
a.	bi:d̥zma:ndɪ.zwɪm		**	**	*(!)	
b.	bi:d̥zma:nzɔwɪm		**	**		*(!)
c.	bi:d̥zma:mɪdɪzɔwɪm		***!*			
d.	bi:d̥zma:nd.zɔwɪm	*!	**	**	*	

### 3.1.3 Empirical Necessity of \*CCC

Because our grammar uses \*CCC, it correctly blocks deletion in a word like *ʒo:wbi:-fki-wɪm* ‘natural mild drunkenness’. The grammar must block the underlying string [i:fkiwɪm] from shortening to [i:fkwɪm]. While \*COMPLEXONSET would prefer the faithful candidate over the deletion candidate, it was seen in (47) that \*COMPLEXONSET is low ranked. However, \*CCC is sufficient to block deletion here, and can be ranked over \*V, as shown in (48).

(48)

	ʒo:wbi:-fki-wɪm	*CCC	*V	MAX-V	*COMPONS
a.	ʒo:wbi:.fkiwɪm		*		*
b.	ʒo:wbi:.fkwɪm	*!		*	**

\*CCC is also needed to ensure that /je:kga:bɔwɪ-fki-d/ only surfaces as *je:kga:bwɪ-fki-d* ‘that he habitually tires from standing’ and not *\*je:kga:bɔw-fki-d*. Failing to include \*CCC would mean that the variable ranking between \*COMPLEX and \*CODA would produce free variation. Tableau (49) illustrates the mapping.<sup>26</sup>

<sup>26</sup>This pattern presumably applies at least to all of the words that end in the non-productive suffix *-ga:bɔwɪ* ‘stand’, like /gbi-ga:bɔwɪ/ ‘block an opening by standing’ and /ni:ga:n-ga:bɔwɪ/ ‘stand first in line’, though I have not checked them.

(49)	je:kga:bΛwɪ-fkɪ-d	*CCC	*V	MAX-V	*CODA	*COMPONS
a.	je:k.ga:bwɪ.fkɪd		**	*	*	**
b.	je:k.ga:bΛwɪ.fkɪd		***!		*	
c.	je:k.ga:bΛw.fkɪd	*!	**	*	**	*

### 3.1.4 Consonant (Non)-Deletion

We briefly mentioned the deletion of some voiced (traditionally lenis) obstruents in the analysis of /bi:dʒma:m-ɪdɪzʊ-wɪn/ surfacing optionally as [bi:dʒma:n-zʊ-wɪn] ‘self-smelling-ness’. Deletion of a consonant in that context is not well understood. In contrast, the deletion of voiced obstruents before voiceless consonants is fairly well documented (Valentine 2001). This process accounts for the alternations in (50).

(50)	Faithful	Deleted	
	gi:zɪs	gi:s-ɔ:n	moon
	ndΛ-nɪʒɪf	nɪʒɪ-d	be good
	mɔ̃ʒɪkwɛ:ʒɛ:nʒɪf	mɔ̃ʒɪkwɛ:ʒɛ:nʒ-Λg	naughty girl

The examples in (50) above do not involve derivational morphology, but the deletion of voiced coronal obstruents extends to the derivational stratum as well. For instance, underlying /za:mkΛmgɪzɪ-fkɪ-wɪn/ surfaces as [za:mkΛmgɪ-fkɪ-wɪn] ‘habitual overactivity’. This process can be modelled by ranking \*V over MAX-D, which penalizes the deletion of voiced coronal consonants. We illustrate this in tableau (51).

(51)

	za:mkʌmgɪzi-fki-wɪn	*CCC	*V	MAX-V	MAX-D
a.	☞ za:mkʌmgɪfkiwɪn		****	*	*
b.	za:mkʌmgɪzi-fkiwɪn		*****!		
c.	za:mkʌmgɪz-fkiwɪn	*!	****	*	
d.	za:mkʌmgzi-fkiwɪn	*!	****	*	*
e.	za:mkʌmgfkiwɪn	*!*	***	**	*

As noted in section 3.1.2, the deletion of consonants opens up many additional opportunities for deletion, potentially allowing candidates like *za:mkɪfkiwɪn* or *za:* to surface. The way the grammar is currently constructed precludes such deletions for this word, since the massively truncated candidates involve the deletion of nasals and fortis consonants, while only the faithfulness constraint protecting lenis coronals is low-ranking here. However, the overall problem posed by consonant deletion is valid, but is left until a more complete understanding of the process can be attained.

Tableau (51) shows that the existence of consonant clusters on either side of the underlying [ɪzi] string means that deleting a vowel requires the removal of a consonant. In contrast, the word */ze:gɪzi-fki-wɪn/*, which does not have a cluster on either side of the string [ɪzi], surfaces as [ze:gɪzi-fki-wɪn]. We show this in (52).<sup>27</sup>

<sup>27</sup>To avoid the generation of unattested *ze:gr-fki-wɪn* we must assume that \*CODA is not variably ranked with MAX-D. We assume *ze:-fki-wɪn* is ruled out by faithfulness constraints forbidding the removal of velar features.

(52)

	ze:gɪzɪ-fki-wɪn	*CCC	*V	MAX-V	MAX-D
a.	ze:gɪzɪfkiwɪn		***	*	
b.	ze:gɪzɪfkiwɪn		****!		
c.	ze:gɪzɪfkiwɪn	*!	***	*	
d.	ze:gɪfkiwɪn		***	*	*!
e.	ze:gɪfkiwɪn	*!	**	**	*

### 3.1.5 Local Summary

When a short vowel is embedded in derivational morphology, it will delete so long as a complex coda or a string of three consonants is not created. Importantly, this grammar need not make any reference to stress derivationally preceding deletion, rather the deletion is analyzable non-serially.

An analysis of these deletions that recapitulates the Old Odawa grammar is impossible, not least because metrically conditioned syncope will never allow variable deletion sites like those attested for *da:nɡn-ɪd(ɪ)z(ʊ)-wɪn* ‘self-feelingness’. As noted, questions still remain regarding consonant deletion and whether or not apparent exceptions listed in the Rhodes dictionary are exceptional in New Odawa.

### 3.1.6 Inflectional Stratum Phenomena

In the inflectional stratum, short vowel deletion is constrained solely by the legality of the resulting consonant cluster. Short vowels may delete and leave behind simple or complex codas. The complex codas created by syncope must be drawn

from the legal word-final clusters of Old Odawa (see section 0.1). Meanwhile, complex onsets include consonant-glide and strident-stop-glide sequences. Finally, syncope cannot create word-final clusters. These processes are very regular at the right edge of the word, but are optional at the left edge.

The need for two separate strata is underscored by the fact that identical strings are treated differently depending on the type of morphology that the string is composed of. When the morphology is derivational, \*CCC is active, which prohibits deletion in *ga:we:fkɪ-wɪn* ‘habitual jealousy’. However, when inflectional morphology is present, a trilateral consonant sequence can be created, as in *ga:we:fk-wɪg* ‘they are habitually jealous’.<sup>28</sup>

In the simplest case, a vowel deletes between singleton consonants, as illustrated in (53).<sup>29</sup>

(53)	Singular	Plural	
	a:nɫk	a:n.k-ɫg	brown thrasher
	wa:gɔf	wa:g.ɸ-ɫg	fox
	pwa:gɫɪ	pwa:g.n-ɫg	pipe
	nme:gɔs	nme:g.s-ɫg	brown trout
	tibdo:wɫɪ	tibdo:w.n-ɫɪ	wheel
	ndɫ-wi:bɪd	ndɫ-wi:b.d-ɫɪ	my tooth
	wa:gka:gɫɪ	wa:gka:g.n-ɫɪ	rainbow

Syncope also creates complex codas, as shown by the mapping from /a:ɓzɪŋɔfɪ-

<sup>28</sup>In the event that vowels that do not delete in the derivational stratum are not later deleted in the inflectional stratum, some form of the strict cycle condition proposed in Mascaró (1976) would be necessary. Other approaches to ensuring that deletion only occurs when the environment is created, like comparative markedness (McCarthy 2003) could work to obtain such facts as well.

<sup>29</sup>The morphology on nouns varies according to the animacy of the referent, where -ɫg indicates ‘animate plural’ and -ɫɪ ‘inanimate plural’. The word for ‘pipe’ *pwa:gɫɪ* is part of a large set of nouns that are idiosyncratically classified as animate.

d/ to [a:bzɪŋg.fɪ-d] ‘that he wakes up rested’. More examples are listed in (54).<sup>30</sup>

(54)	Underlying	Surface	
	a:ndʌbɪ-d	a:nd.bɪ-d	change seats
	nɪspʌbɪ-d	nɪsp.bɪ-d	sit so high
	we:ndɪzɪ-d	we:nd.zɪ-d	be easy
	nɪnɪŋgʌdʒɪ-d	nɪnɪŋg.dʒɪ-d	shiver from cold
	mo:ʃkʌmʊ-d	mo:ʃk.mʊ-d	surface/appear
	gwi:ʃkʊfɪ-d	gwi:ʃk.fɪ-d	whistle

Syncopé also creates complex onsets, as shown by the alternation between *bʌgʌʃk* ‘cutweed’ and *bʌg.fk-o:n* ‘cutweeds’. Other examples include the alternation between *ga:we:ʃkɪ-d* ‘that he is naturally jealous’ and *ga:we:ʃk-wʌg* ‘they are naturally jealous’.<sup>31</sup> The Rhodes dictionary lists other words that form complex onsets when syncopé applies, some of which we show in (55).

(55)	Singular	Plural	
	nɪmɪ	nɪ.n-wʌg	man
	wa:wɑ:te:sɪ	wa:wɑ:te:s-wʌg	firefly
	pɪtʃɪ	pɪ.tʃ-wʌg	robin
	zɑ:dʌj	zɑ:dʃ-wʌg	poplar
	pʌkwe:ʃʌʃk	pʌkwe:ʃ.fk-o:n	cattail

Deletion is blocked when any other cluster would result. For instance, no alternation is observed between *dʒɪ:gdʌbgʌn* ‘broom’ and *dʒɪ:gdʌbgʌn-ʌn* ‘brooms’, where the vowel that does not delete is underlined. Many other words attest this blocking effect, among them *mɪ:ga:dʌwɪn-ʌn* ‘wars’, *mɪ:zɪmɪn-ʌn* ‘acorns’, *bdʌknɪgʊ-d* ‘that he has a nightmare’ and *ʃɪdɑ:kpɪzʊ-d* ‘that he is fastened’.

<sup>30</sup>The Rhodes dictionary lists a total of eighteen words that allow the creation of complex codas through syncopé.

<sup>31</sup>Recall that in the derived nominal of this and other verbs of negative characteristic, the final vowel surfaced faithfully, as in *ga:we:ʃkɪ-wɪn* ‘natural jealousy’.

Syncope is also blocked when it would create otherwise legal nasal-voiced obstruent or strident-voiceless stop clusters at the right edge of the word. Hence, even though New Odawa has words like *ndΛ-nΛgΛsk* ‘my palate’, or *ndΛ-wa:ba:nz* ‘I am white’, the vowels that separate [s\_k] in *nta:de:bwe:s\_k* ‘he is a good liar’, or [n\_z] in *ndΛ-nd̥z̥mΛz* ‘fight for a reason’ surface faithfully.

Finally, in contrast to the obligatory syncope found at the right edge of the word, syncope is optional at the left edge. New Odawa words whose initial syllables are open and light like /ɜɪda:ba:n/ ‘to drag someone’ freely vary when prefixed between alternants like [ndΛ-ɜɪda:ba:n-a:] and [ndΛ-ɜda:ba:n-a:] ‘I drag him’. As expected, complex onsets can also be created here, as shown by the free variation between [ndΛ-nɪfkwe:m-a:] ‘I bother him by talking’ and [ndΛ-n.fkwe:m-a:].<sup>32</sup> Since naturalistic production data is not currently available, it is difficult to give a complete account of the relative frequency of the variants. We note that in a small corpus of 25 elicited stems with prefixes, 21 were recorded as having an acceptable deletion variant (see section 3.3 below).<sup>33</sup> Furthermore, deletion variants were judged to be as acceptable as a faithful variant roughly a quarter of the time.

### 3.1.7 Inflectional Stratum Analysis

To model this pattern of deletion, the phonotactic constraints regulating it must enforce a ban on word-final clusters and cluster well-formedness conditions. This

<sup>32</sup>The Old Odawa predecessors of these words were underlyingly /ɪɜɪda:ba:n/ and /ɔnɪfkwe:m/.

<sup>33</sup>Of the four stems that failed to show deletion, one of them, /gɔnda:gna:pne:/ ‘get a sore throat’, would have had an unsyllabifiable intervocalic [gnd] sequence if deletion occurred, as in \*[ndΛ-gnda:gna:pne:]. The failure of the other three stems to show deletion can’t be due to phonotactic constraints. We might explain this as optional deletion simply failing to apply.

analysis will use \*CC# and an umbrella constraint LEGALMARGIN, defined below.

- (56) a. \*CC#: Assign one violation mark for a word-final consonant cluster.  
 b. LEGALMARGIN (abbreviated as LEGMAR): assign one violation mark for every complex coda that is not composed of [sp, st, sk, ʃp, ʃt, ʃk] or [mb, nd, nz, nʒ, nɟ̃, ng], and every complex onset that is not composed of consonant-glide or [sp, st, sk, ʃp, ʃt, ʃk] (+ w, j).

The core ranking for the grammar is LEGALMARGIN, \*CC# >> \*V >> MAX-V. Because New Odawa has underlying clusters that violate LEGALMARGIN, as seen in *dgʊʃm* ‘he comes’, or *wa:bnda:ng* ‘he sees it’, this constraint is not undominated in the language as a whole. While these clusters are being simplified in many speakers’ grammars, in order to account for the cases that are not simplified, it is assumed without further argument that MAX-C is high ranked.

Tableau (57) illustrates that this ranking correctly generates the mapping from /a:nʌk-ʌg/ to [a:nk-ʌg] ‘brown thrashers’, where vowel deletion occurs between singleton consonants.

(57)

	a:nʌk-ʌg	LEGMAR	*CC#	*V	MAX-V
a.	☞ a:n.kʌg			*	*
b.	a:nʌ.kʌg			**!	
c.	a:nʌkʌg	*(!)	*(!)	*	*

This grammar is able to generate vowel deletion that creates complex codas so long as they are compliant with sonority sequencing. The mapping from

/gwi:fkʊfɪ-d/ to [gwi:fk.fɪ-d] ‘that he whistles’ is successful in (58).<sup>34</sup> Note that this results in the creation of a trilateral consonant sequence, which was not possible in the derivational stratum.

(58)

	gwi:fkʊfɪ-d	LEGMAR	*CC#	*V	MAX-V	*COMPCODA	*CCC
a.	gwi:fk.fɪd			*	*	*	*
b.	gwi:fkʊfɪd			**!			
c.	gwi:fkʊfd	*(!)	*(!)	*	*	*	

Furthermore, our grammar captures instances of syncope that lengthens complex onsets. For instance, the underlying [ɪ] in /ga:weɪ-fkɪ-wʌg/ deletes in the surface form [ga:weɪ-fk-wʌg] ‘they are habitually jealous’. Tableau (59) illustrates this mapping.

(59)

	ga:weɪ-fkɪ-wʌg	LEGMAR	CC#	*V	MAX-V	*COMPONS
a.	ga:weɪ.fkwʌg			*	*	**
b.	ga:weɪ.fkɪ.wʌg			**!	*	
c.	ga:weɪ.fkɪwg	*(!)	*(!)	*	*	*

The crucial ranking argument for LEGALMARGIN over \*V in our grammar comes from word-internal cluster avoidance. For instance, syncope cannot occur in  $\widehat{d}zi:gdʌbgʌn-ʌn$  because deletion of the penultimate vowel in the word would create an illegal [bgn] cluster. We illustrate the blocking effect in tableau (60).

<sup>34</sup>The form of /gwi:fkʊfɪ/ when it appears in a matrix clause with a third person subject is [gwi:fkfɪ]. To ensure that the penultimate vowel deletes and the final vowel does not, these words must be subject to an Output-Output correspondence constraint forbidding the appearance of vowels that do not appear in the embedded clause version of the word. A similar issue arises with how to stop the deletion of the stem final vowel in *nmi* ‘man’ (\**nm*).

(60)

	$\widehat{d}ʒi:gd\Delta bg\Delta n-\Delta n$	LEGMAR	*V	MAX-V
a.	$\text{☞} \widehat{d}ʒi:g.d\Delta b.g\Delta n\Delta n$		***	
b.	$\widehat{d}ʒi:g.d\Delta b.gn\Delta n$	*!	**	*

Finally, the grammar correctly stops syncope when it would create a word-final cluster, even if it would be a legal coda. For instance, the vowel that separates [s\_k] in *nd $\Delta$ -nta:de:bwe:sik* ‘I am a good liar’, surfaces faithfully, as shown by (61).

(61)

	<i>nd<math>\Delta</math>-nta:de:bwe:sik</i>	*CC#	*V	MAX-V
a.	$\text{☞} nd\Delta nta:de:bwe:sik$		*	
b.	<i>nd<math>\Delta</math>nta:de:bwe:sk</i>	*!		*

### 3.1.8 Optional Deletion at the Left Edge

While two sided open syllable syncope is obligatory at the right edge of the word, it is optional at the left edge. Deletion at the left edge is less common than faithful realizations. To generate this, positional faithfulness like  $MAX-V_{\text{stem-initial-syll}}$  can be ranked slightly above \*V, permitting \*V to occasionally dominate  $MAX-V_{\text{stem-initial-syll}}$  if rankings are perturbed as in Stochastic OT. This constraint is defined below.<sup>35</sup>

- (62) a.  $MAX-V_{\text{stem-initial syll}}$  (abbreviated as  $MAX-V_s$ ): assign one violation mark if the first vowel in the stem in the input has no output correspondent.

Tableau (63) illustrates how the free-ranking of  $MAX-V_s$  with \*V enforces optional deletion between *nd $\Delta$ -k $\Delta$ wa:te:ʃin* and *nd $\Delta$ -kwa:te:ʃin* ‘I cast a shadow’.

<sup>35</sup>This constraint was not relevant in the derivational stratum because to my knowledge all derivational morphology that could condition syncope is suffixal.

(63)	ndΛ-kΛwa:te:fɪn	MAX-V <sub>s</sub>	*V	MAX-V
a.	ndΛkΛwa:te:fɪn		***(!)	
b.	ndΛkwa:te:fɪn	*(!)	**	*

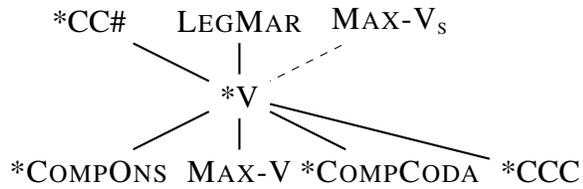
Importantly, deletion was independent of the acceptability of the Old Odawa prefixed form of the word. That is, the Old Odawa underlying representation for ‘cook so’ was /nɪ-mize:kwe:/, which led to the prefixed form [n-[d]mize:kwe:], as shown in (64).

(64)	‘I cook so’	
	/nɪ-mize:kwe:/	UR
	nɪ[d]mize:kwe:	Hiatus Resolution
	(nɪ'dɪ)(nɪ'ze:)('kwe:)	Stress
	(n_ 'dɪ)(n_ 'ze:)('kwe:)	Syncope
	[ndmize:kwe:]	SR

When the Old Odawa form (modulo the prefix boundary shift) *ndmize:kwe:* ‘I cook so’ was elicited from a New Odawa speaker, the form was judged to be unacceptable. However, *ndo:-nze:kwe:* and *ndΛ-nze:kwe:* were judged as acceptable. Though the entire paradigm of the word has not been searched for memorized Old Odawa forms, the conclusion that deletion is a productive grammatical process and not memorization of Old Odawa forms seems plausible.

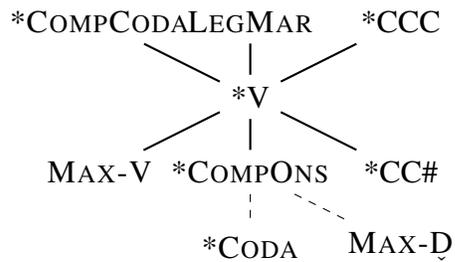
The constraint rankings motivated thus far for the inflectional stratum are summarized in the Hasse diagram in (65). In section 3.2 this will be articulated further.

(65) Hasse diagram of inflectional stratum rankings



For comparison, consider the ranking of the constraints used in the derivational stratum. They are summarized in (66).<sup>36</sup>

(66) Hasse diagram of derivational stratum rankings



### 3.1.9 Exceptions to Syncope?

Rhodes (1985b) and Valentine (2001) state that in some cases, consonant cluster simplifications counterfeed syncope in New Odawa. For instance, (67) shows that Old Odawa syncope set up a [ds] cluster in all surface forms of /me:ɖɑsɪn/ ‘miss him’.

<sup>36</sup>Some non-crucial constraints are only shown in one Hasse diagram. For instance, **\*CODA** and **MAX-D** are not included in the inflectional stratum Hasse diagram. **MAX-V<sub>s</sub>** is not included in the derivational stratum Hasse diagram because productive derivational prefixes are not parsed into a prosodic word with the root, and thus are predicted to not condition deletion.

(67)	‘I miss him’	‘that he misses him’	
	/ni-me:dʌsim-a:/	/me:dʌsim-a:-d/	UR
	(ni'me:)(dʌ'si)('na:)	('me:)(dʌ'si)('na:d)	Stress
	(n_ 'me:)(d_ 'si)('na:)	('me:)(d_ 'si)('na:d)	Syncope
	[nme:dsma:]	[me:dsma:d]	SR

Rhodes reports that [d] frequently deletes before [s] in New Odawa, giving rise to the dictionary entry *me:sm-a:-d* ‘that he misses him’.<sup>37</sup> The deletion of [d] places the [ɪ] in the two sided open syllable environment, but for this particular word, the dictionary indicates that the [ɪ] never deletes (though the related form *me:smʌn-g* ‘that he misses it’ does attest two sided open syllable syncope in the prefixed form *n-me:sn-a:n* ‘I miss it’).

For at least some speakers of New Odawa, two sided open syllable syncope has spread to this word. In 2011 recordings of a speaker of New Odawa born in 1938 were made. In these recordings, ‘he misses him’ was invariably pronounced *me:sn-a:*, as indicated in figure (3). While there is a gap between the offset of the [s] and the onset of voicing in [n], the duration of this stretch is at best a very short vowel (33 milliseconds) without clear formant structure. This gap is better analyzed as partial voicing assimilation of the [n] to the preceding [s].

For comparison, consider New Odawa *gsma:* ‘it is cold’ (from Old Odawa /gɪsma:/). In this word the [ɪ] is not in the two sided open syllable environment and would therefore not be expected to delete. Figure (4) is a spectrogram of a recording of this word from the session where *me:sn-a:* was collected. It shows what a full vowel between the [s] and the [n] looks like, having much longer

<sup>37</sup>The Rhodes dictionary also gives the New Eastern Ojibwe form *me:dsim-a:-d*, indicating that the [ds] sequence was not simplified in that dialect. Even in New Odawa the deletion is not universal, as the dictionary also lists *mskʊdsʌn-g* ‘that he paints it red’ as an Odawa word.

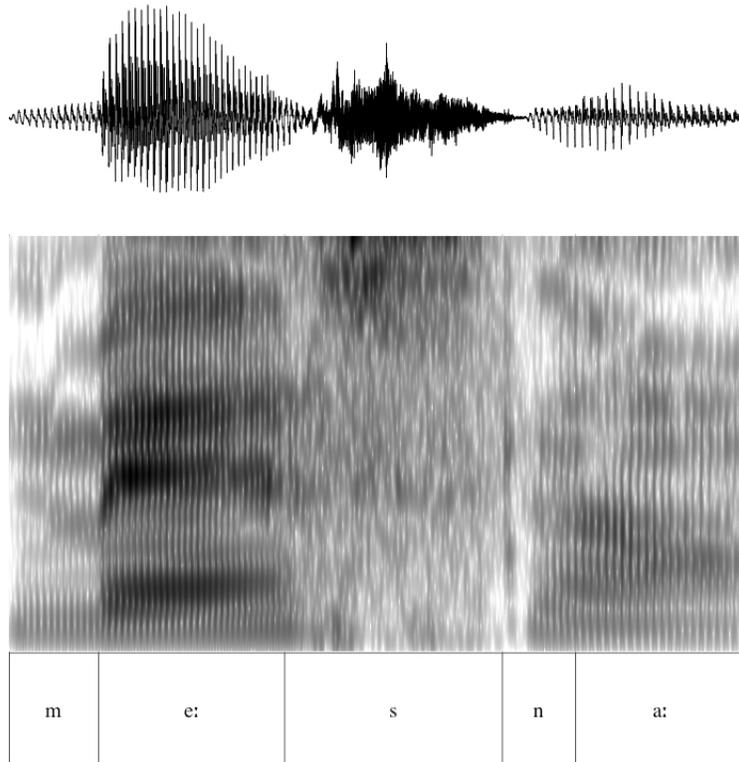


Figure (3): Absence of [d] or [ɹ] in New Odawa [me:sn-a:], from Old Odawa [me:dsn-a:].

duration (81 milliseconds), clear formant structure and voicing. Whatever the analysis of the stretch between [s] and the voiced portion of [n] in New Odawa *me:sna:* is, it must be seen as qualitatively different from the gap between [s] and [n] in New Odawa *gsma:*.

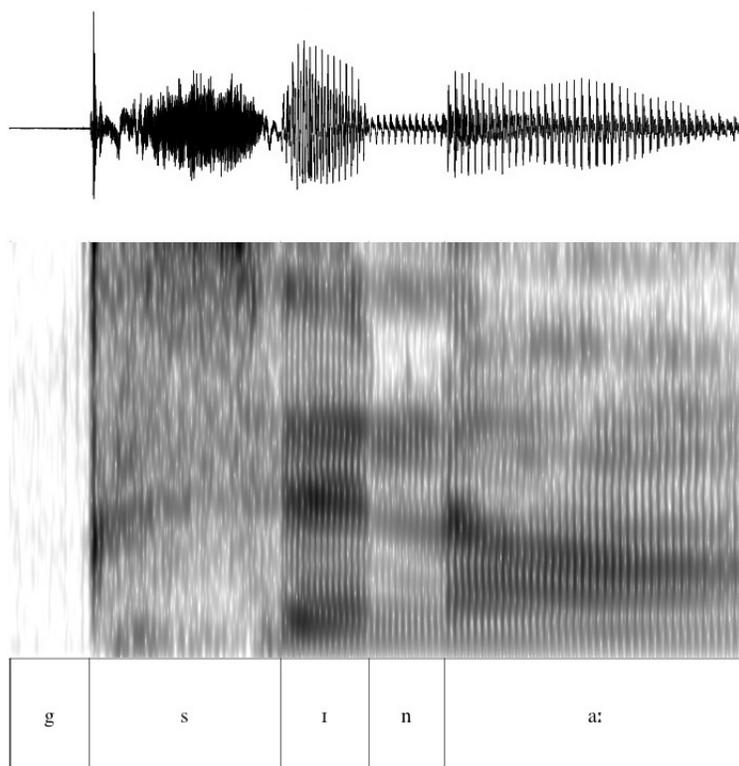


Figure (4): Presence of [ɪ] in New Odawa [gsma:], from Old Odawa [gsma:].

Several other cases where cluster simplification fed deletion were observed during the fieldwork for this study. For instance, the Old Odawa word for ‘drum’ was underlyingly /de:we:ʔɪgʌn/. Example (68) shows that in Old Odawa the [ɪ] in this word was always placed in a weak metrical position and deleted since it immediately followed a long vowel. Hence, the Old Odawa surface form of this

word was [de:we:ʔgʌn]. The plural form [de:we:ʔgʌnʌn] shows that the stem attested no allomorphy in the plural.

(68)	‘drum’	‘drum-pl’	
	/de:we:ʔɪgʌn/	/de:we:ʔɪgʌn-ʌn/	UR
	(‘de:)(‘we:)(ʔɪgʌn)	(‘de:)(‘we:)(ʔɪgʌ)(‘nʌn)	Stress
	(‘de:)(‘we:)(ʔ_’gʌn)	(‘de:)(‘we:)(ʔ_’gʌ)(‘nʌn)	Syncope
	[de:we:ʔgʌn:]	[de:we:ʔgʌnʌn]	SR

Old Odawa clusters with glottal stops have typically been simplified in New Odawa. Hence, the modern pronunciation of ‘drum’ is [de:we:gʌn]. The Rhodes dictionary does not represent the word this way, instead giving the historical [de:we:ʔgʌn]. However, figure (5), from the same recording session as the previous figures, shows that at least some New Odawa speakers do not have a glottal stop in [de:we:gʌn]. The loss of the glottal stop means that the final stem vowel is placed in the two sided open syllable environment when an affix is added to the word, as in /de:we:gʌn-ʌn/ ‘drums’. The vowel subsequently deletes, producing [de:we:gnʌn].

The phenomenon of cluster simplification feeding two sided open syllable syncope is attested by other speakers as well. For instance, Old Odawa [ʒɪbi:ʔmʌw] ‘write for him!’ lost the glottal stop in New Odawa, producing ʒɪbi:mʌw ‘write for him!’. When suffixed, ʒɪbi:mw-a: ‘he writes for him’ shows that the [ʌ] deletes in the two sided open syllable syncope environment. The speaker who provided this data point contributed to the Rhodes dictionary, while the speaker who provided the spectrograms above is her sister. The discrepancy between the Rhodes dictionary and these data cannot be a case of disagreement between sources, but

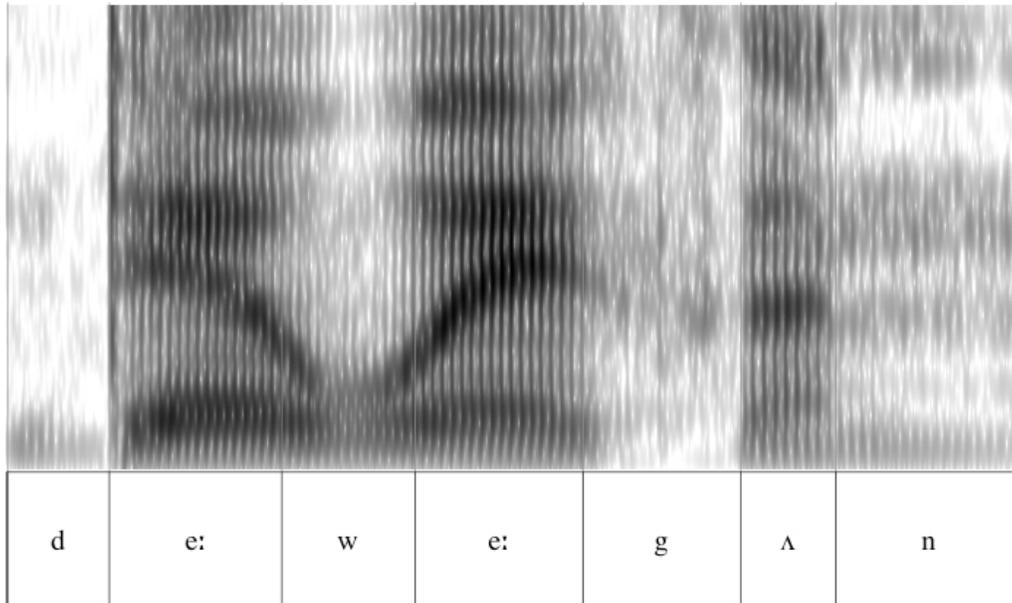


Figure (5): Absence of [ʔ] in New Odawa [de:we:gʌn], from Old Odawa [de:we:ʔgʌn].

is most likely the result of exceptions becoming unexceptional over time.

One of the more striking instances of two sided open syllable syncope is found in the New Odawa form *mo:nfkwe:* ‘he digs for herbs’.<sup>38</sup> In Old Odawa, this word had the underlying form /mo:nʌʔʌfkikʷe:/. Due to the presence of long vowels at each edge of the word, it never alternated in the syncope stage, as we see in (69).

<sup>38</sup>The [n] in [mo:nfkwe:] optionally deletes. Also, we will assume that what we see as restructuring is not the result of confusion with what the Baraga dictionary lists as pre-Old Odawa *mo:nʌfkwe:* ‘go weeding’, which is absent from all other documentary sources checked.

(69)	‘I dig for herbs’	‘that he digs for herbs’	
	/ni-mo:nʌʔʌʃkiwi:/	/mo:nʌʔʌʃkiwi:-d/	UR
	(ni'mo:)(nʌ'ʔʌ)(ʃki'ki)(we:)	('mo:)(nʌ'ʔʌ)(ʃki'ki)(we:-d)	Stress
	(n_ 'mo:)(n_ 'ʔʌ)(ʃk_ 'ki)(we:)	('mo:)(n_ 'ʔʌ)(ʃk_ 'ki)(we:-d)	Syncope
	[nmo:nʔʌʃkwi:]	[mo:nʔʌʃkwi:d]	SR

From the Old Odawa form [mo:nʔʌʃkwi:-d] ‘that he digs for herbs’, New Odawa simplified the [nʔ] and [ʃkk] clusters to [n] and [ʃk], creating the representation /mo:nʌʃkiwi:-d/, where both the [ʌ] and the [i] separate consonants that are syllabifiable as a sequence. As our grammar predicts, neither vowel appears in New Odawa, as we illustrate in tableau (70).<sup>39</sup>

(70)	mo:nʌʃkiwi:-d	*V	MAX-V
a.	mo:n.ʃkwi:-d		**
b.	mo:nʌʃkiwi:-d	*!*	

The extension of syncope to new contexts confirms that it is productive in New Odawa. Additional confirmation of the productivity of syncope comes from its application in a wug test (Berko 1958). The data on this point are thin because data from one speaker were discarded because the speaker found the task highly taxing. However, another speaker succeeded in remembering all the segments in two forms, [dɛ:tʒɪsɪk] and [ko:tʃpa:kʊd], and gave [dɛ:tʒɪsko:n] and [ko:tʃpa:kdo:n], as their respective plurals. The plural forms lack a vowel that otherwise would be in a two sided open syllable environment, confirming that there is an active deletion process in the language.<sup>40</sup>

<sup>39</sup>Some speakers do recall the Old Odawa pronunciation and try to approximate it, producing *mo:nʌʃkwi:* ‘he goes digging for herbs’. This was observed to provoke passionate disagreements between members of the community.

<sup>40</sup>The plural morphology was expected to be consistently [-ʌn] or [-ʌg] on nonce words, as these are usually taken to be the default allomorphs of the plural form. For the two speakers consulted,

This is not to say that syncope is exceptionless or that cluster simplification is completely regular, as there are morphological and lexical exceptions to both processes. One of the more interesting lexical exceptions to cluster simplification involves the continued use of what can only be a memorized form from Old Odawa. Old Odawa /ʊde:ʔimm/ ‘strawberry’ had a glottal stop-consonant cluster in its surface forms, as illustrated by the derivation in (71).

(71)	‘Strawberry-pl’	‘Strawberry’	
	/ʊde:ʔimm-ʌn/	/ʊde:ʔimm/	UR
	(ʊ'de:)(ʔɪ'mɪ)(n'ʌn)	(ʊ'de:)(ʔɪ'mm)	Stress
	(_ 'de:)(ʔ_ 'mɪ)(n'ʌn)	(_ 'de:)(ʔ_ 'mm)	Syncope
	[de:ʔmmʌn]	[de:ʔmin]	SR

Like Old Odawa [de:we:ʔgʌn] ‘drum’ from above, which lost its glottal stop-consonant cluster in New Odawa, the singular form of ‘strawberry’ is now *de:mm*. However, instead of the plural being [de:mn-ʌn] ‘strawberries’, for at least one speaker the plural form ‘strawberries’ is [de:ʔmm-ʌn]. The plural has idiosyncratically maintained the glottal stop from Old Odawa. To handle this, a full model of New Odawa will likely incorporate idiosyncratic lexical listing along the lines proposed by Zuraw (2000) and Hayes and Londe (2006).

Furthermore, some words that do not normally pluralize in New Odawa resist alternating in the plural. The word *ʃo:gʌn* ‘butter’ is one such word. If asked to make a plural form of such words, which places the [ʌ] in the two sided open syllable environment, none of the speakers consulted for this study syncopated but instead said *ʃo:gʌn-ʌn* ‘butters’ (in the sense of many types of butter). Notably, not all mass nouns failed to syncopate. One speaker treated *mmɪdʒi:mm* ‘pea’ as a the default allomorphs were a minority in the forms produced. It is not clear why this happened.

mass noun that could not take plural inflection. When pressed, the consultant volunteered *mnid̥zi:mn-Λg* ‘peas’, a plural form with the stem-final vowel missing, as expected. This discrepancy could simply be the result of speakers being unwilling to alternate in wug-test-like conditions.

Finally, third person plural forms often maintain a stem-final short vowel, despite it separating consonants in an otherwise syllabifiable sequence. It is possible that this is caused by output-output correspondence between third person forms, which in other members of the paradigm also have stem-final vowels. Thus, we see *wa:ba:nzʊ-wΛg* ‘they are alive’, even though intervocalic [nzw] is syllabifiable in the language.<sup>41</sup> Some other third person forms of this verb are *wa:ba:nzʊ* ‘he is alive’, and *wa:ba:nzʊ-d* ‘that he is alive’. The continued presence of the stem-final short vowel is not completely general, since deletion is observed in cases like /*ga:we:ʃki-wΛg*/ surfacing as [ga:we:ʃk-wΛg] ‘they are jealous’, from (59).

The vowel that appears in *wa:ba:nzʊ-wΛg* ‘they are alive’ is most likely underlying because the third person plural forms of other verbs maintain underlying quality distinctions. Thus, words like /*a:bdwe:we:bizʊ-wΛg*/ ‘they make noise as they move’, surface as [a:bdwe:we:bzʊ-wΛg], even though [zw] is an acceptable onset. The F2 value of the [zw] transition in *a:bdwe:we:bz-wΛg* ‘they make noise as they move’ is low, around 1200 hertz at its highest point, reflecting that the underlying representation contains a back vowel in this position. This is shown in

<sup>41</sup>Importantly, in Old Odawa, (*wa:*)(*ba:n*)(*zʊ-wΛg*) would have surfaced as (*wa:*)(*ba:n*)(*z-wΛg*). This rules out the possibility that the persistence of stem-final vowels is an inherited feature of Old Odawa. The other examples below (*a:bdwe:webzʊ-wΛg* ‘they make noise as they move’ and *bma:dziwΛg* ‘they are alive’) would have maintained their stem-final vowel in Old Odawa.

figure (6).

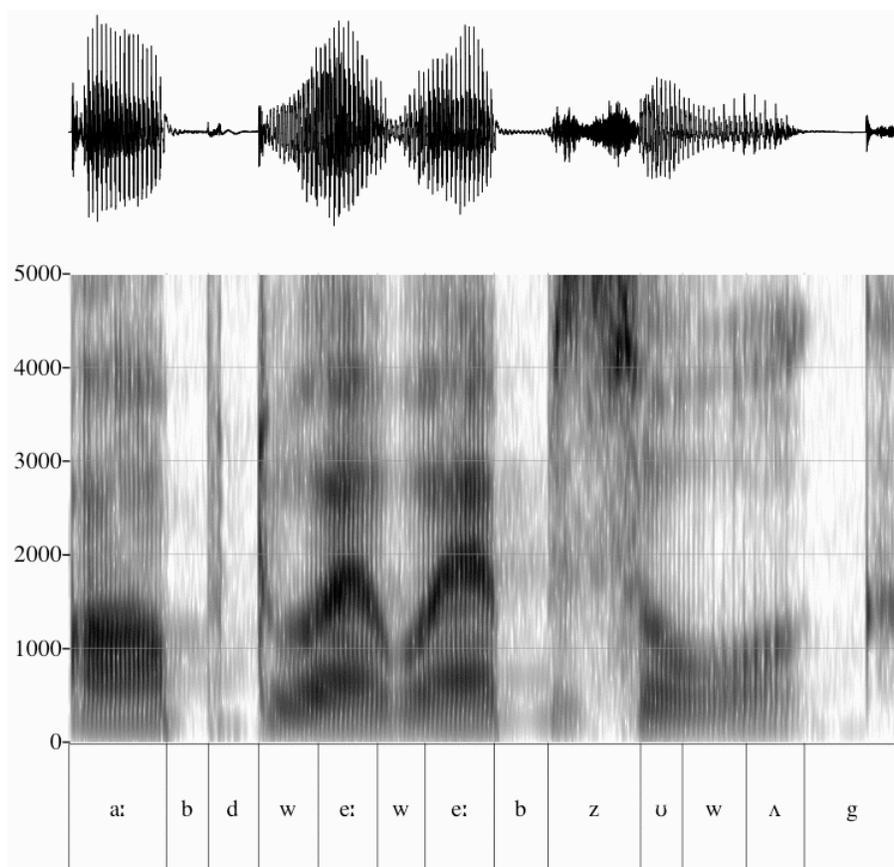


Figure (6): Low F2 between [z] and [w] confirms underlying [ʊ].

Meanwhile, F2 in the [zw] transition in *bma:dz-wΛg* ‘they are alive’ peaks around 1800 hertz, reflecting the underlying [ɪ] from /bma:dɪzɪ-wΛg/. This is shown in figure (7).

These points indicate that the full behavior of the language is not fully understood. However, the conclusion that two sided open syllable syncope is productive seems unavoidable.

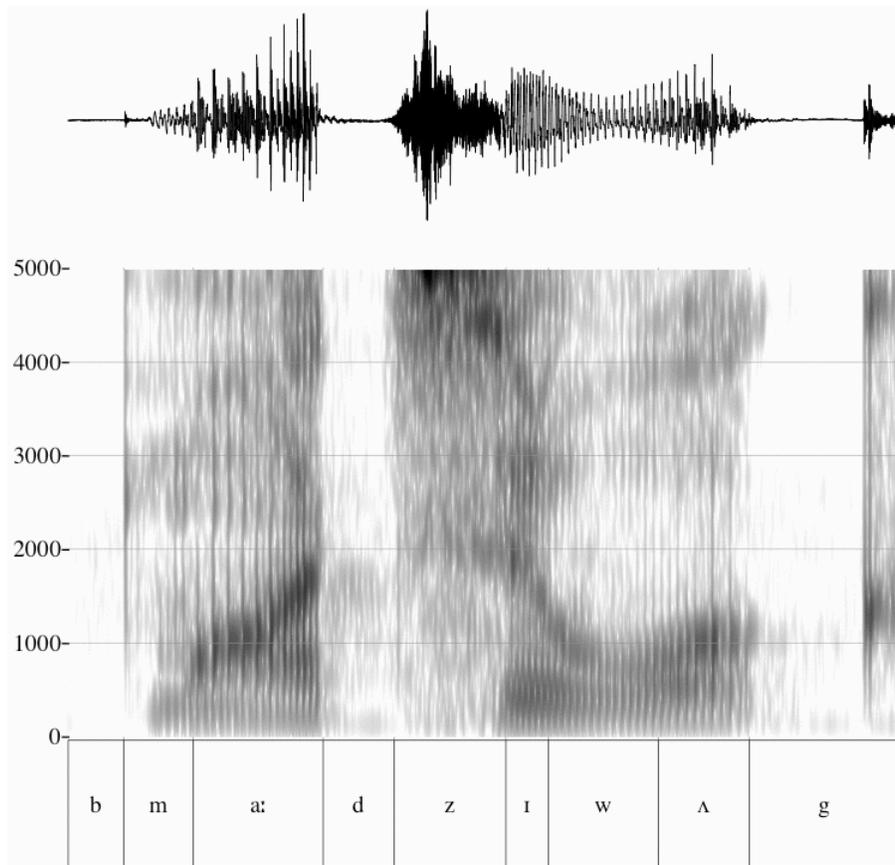


Figure (7): High F2 between [z] and [w] confirms underlying [ɪ].

### 3.2 Apocope

Like Old Odawa apocope, New Odawa apocope deletes word-final short vowels in inflected verbs. The alternation between [a:bna:bi] ‘he looks back’ and [ndΛ-a:bna:b] ‘I look back’ show that apocope is unable to apply to uninflected forms, while inflected forms do not have final vowels.<sup>42</sup> Despite the restriction of apocope to a particular morphological environment in this analysis, it is a general process in the language, as the alternations in (72) attest.

(72)	3 <sup>rd</sup> Matrix	1 <sup>st</sup> Matrix	
	ke:nda:su	ndΛ-ke:nda:s	be smart
	kumʊ	ndΛ-kum	be out on the water
	zkizʊ	ndΛ-zkiz	burn
	znagkΛmgizi	ndΛ-znagkΛmgiz	be uncooperative
	bgΛʃknΛni	ndΛ-bgΛʃknΛn	be rotten
	dΛki:mi	ndΛ-dΛki:m	own land

Apocope also can create complex codas, as shown in the alternation between *ga:we:ʃki* ‘he is characteristically jealous’ and *ndΛ-ga:we:ʃk* ‘I am characteristically jealous’. Not many verbs have the correct underlying form to bring this alternation about, making this alternation be limited to the verbs that end in one of the three derivational suffixes: *-endi* ‘be absent’, *-anzʊ* ‘be colored’ and *-ʃki* ‘negative characteristic’. Some of these words are listed in (73).

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<sup>42</sup>Some suffixes like *-mi* ‘first person plural’ recently lost a coda [n] and also do not undergo apocope. This detail will not be reflected in our analysis, but it would be quite easy to add more morphological restrictions to the constraint.

(73)	3 <sup>rd</sup> Matrix	1 <sup>st</sup> Matrix	
	nde:ndɪ	ndΛ-nde:nd	be absent
	mda:sgʊne:ndɪ	ndΛ-mda:sgʊne:nd	be absent for ten days
	mškwa:nzʊ	ndΛ-mškwa:nz	be red
	za:wa:nzʊ	ndΛ-za:wa:nz	be orange
	nbe:fkɪ	ndΛ-nbe:fk	be a sleepy-head
	gʒa:we:ndʒge:fkɪ	ndΛ-gʒa:we:ndʒge:fk	be envious

To generate the deletion of word final short vowels even if a word-final cluster results, \*V# (defined below), a constraint that penalizes word-final short vowels, must outrank \*CC#, MAX-V, \*CODA and \*COMPLEXCODA. Because the ranking \*CC# >> \*V >> MAX-V, \*COMPLEXCODA has already been established in section 3.1.6, ranking arguments for the constraints under \*CC# will not be repeated. \*V# is restricted to applying to inflected verbs in accordance with the discussion in section 1.3.

- (74) \*V#: assign one violation mark for every word-final short vowel in an inflected verb.

The ranking outlined above guarantees deletion of word-final short vowels like that seen in the mapping from /ndΛ-a:bna:bi/ to [ndΛ-a:bna:b] ‘I look back. Tableau (75) illustrates this.

(75)	ndΛ-a:bna:bi	*V#	MAX-V	*CODA
a.	ndΛa:bna:b		*	*
b.	ndΛa:bna:bi	*!		

With the ranking of \*V# over \*CC#, the grammar permits apocope to create word final consonant clusters. This is illustrated by the mapping from /ndΛ-

ga:we:fkɪ/ to [ndʌ-ga:we:fk] in (76).<sup>43</sup>

(76)

	ndʌ-ga:we:fkɪ	*V#	*CC#	MAX-V	*COMPCODA
a.	ndʌga:we:fk		*	*	*
b.	ndʌga:we:fkɪ	*!			

The model proposed here correctly predicts that only the final vowel will delete in a word like /ndʌ-wi:dge:ma:gʌnɪ/ ‘I get married’, which maps to [ndʌ-wi:dge:ma:gʌn]. This word has both a vowel in the two sided open syllable environment and a vowel in word-final position.<sup>44</sup> Tableau (77) illustrates that our grammar captures this. In order to ensure that our grammar will generate only legal word-final clusters, LEGMAR is ranked over \*V# even though they don’t conflict for any words in the language.

(77)

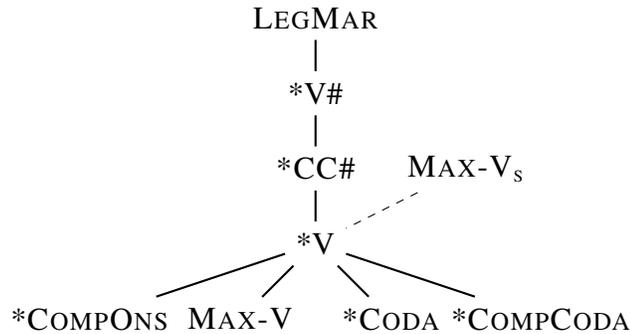
	ndʌ-wi:dge:ma:gʌnɪ	LEGMAR	*V#	*CC#	*V	MAX-V
a.	ndʌwi:dge:ma:gʌn				**	*
b.	ndʌwi:dge:ma:gʌnɪ		*!		***	
c.	ndʌwi:dge:ma:gʌnɪ		*!		**	*
d.	ndʌwi:dge:ma:gʌn	*!		*	*	**

The final constraint rankings for the inflectional stratum are summarized in the Hasse diagram in (78). Variable ranking is indicated with a dashed line.

<sup>43</sup>One of the speakers consulted for this study may have developed paradigmatic gaps in cases where apocope would create a word-final cluster.

<sup>44</sup>This stem is analyzable as being built from *wi:d-ge:-m* ‘live with someone’ (literally ‘together-actor.focus-animate.object’). The productivity of these morphemes is questionable, as the actor-focus suffix *-ige:* is often highly lexicalized and the suffix *-m* generally only appears with *wi:d* ‘together’. The next morpheme is the non-productive nominalizing suffix *-a:gʌn*, yielding *wi:dge:m-a:gʌn* ‘spouse’. Finally, the denominal verb forming suffix *-ɪ* makes *wi:d-ge:-m-a:gʌn-ɪ* ‘I am/become a spouse’.

(78) Hasse diagram of inflectional stratum rankings



### 3.3 Prefix Grammar

To establish the distribution of prefixes and check whether prefixation conditioned stem allomorphy in New Odawa, a survey was carried out in 2011 with a speaker born in 1942. The survey checked all five New Odawa prefix allomorphs (*ndΛ-*, *ndo:-*, *ndɪ-*, *nd-* and *n-*) both on stems that alternated in Old Odawa, and stems that did not alternate.<sup>45</sup> For instance, stems that did not alternate in Old Odawa included stems that that began with a long vowel, like *a:dfm* ‘he is stranded’. Thus, the speaker evaluated *ndo:-a:dfm*, *ndΛ-a:dfm*, *ndɪ-a:dfm*, *n-a:dfm* and *nd-a:dfm*.

This was repeated for other stems that did not alternate. Such stems began with a consonant in Old Odawa, or historically began with short vowels. Such stems were *ga:we:fkɪ* ‘he is naturally jealous’, *ʊdʒe:pɪzɪ* ‘he is lively’, *ma:kɪzʊ* ‘he burns so’, and *Λgo:dʒɪm* ‘he hangs’. Due to restructuring, these words now begin with consonants in New Odawa, as in *dʒe:pɪzɪ* ‘he is lively’, *na:kzʊ* ‘he burns so’, and

<sup>45</sup>The second person series *gdΛ-*, *gdo:-*, *gdɪ-*, *gd-*, and *g-* was checked as well; it behaved identically to the first person series.

*go:dʒim* ‘he hangs’.

Additionally, lexical items that had stem internal alternations in Old Odawa, like *mididv* ‘he is big’ and *mize:kwe:* ‘he cooks so’ were surveyed. The New Odawa forms of these words are *mididv* ‘he is big’ and *nize:kwe:* ‘he cooks so’. These stems were also surveyed with alternations conditioned by prefixation. Hence, deletion from the citation form was checked with *ndΛ/ndɪ/ndo:-n\_ze:kwe:* ‘I cook so’, and apparent epenthesis was tested in *n-m[Λ/ɪ/ʊ]did* ‘I am big’.

In virtually every case, the speaker judged both *ndΛ-* and *ndo:-* to be the most acceptable prefix allomorphs (one was preferred over the other apparently at random). These allomorphs were even rated high when they brought about vowel hiatus, as in *ndΛ-/ndo:-a:dʃim* ‘I am stranded’.<sup>46</sup> The allomorph *ndɪ-* was judged to be acceptable only sporadically. Likewise, *nd-* and *n-* were occasionally judged to be acceptable, but only in limited environments, *nd-* only appears before vowels (*nd-a:dʃim* ‘I am stranded’), while *n-* appears before vowels, simple onsets and rising clusters. Thus, *n-* was judged acceptable on *n-a:bdɪz* ‘I am useful’, *n-ko:dʒi:fɪw* ‘I have lice’, *n-fkwa:ta:* ‘I die’, while it was never judged to be acceptable on words that begin with a falling cluster like *n-mdid* ‘I am big’. In Old Odawa, the prefixed forms for these words were *n[d]-a:bdɪz* ‘I am useful’, *n[d]-Λko:dʒi:fɪw* ‘I have lice’, *n[d]-ɪfkwa:ta:* ‘I die’.

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<sup>46</sup>This is especially noteworthy because it indicates that the impulse to regularization over-rode the exceptionless generalization that the *nd-* allomorph applied to words that began with long vowels in Old Odawa. The Rhodes dictionary lists only *nd-* as the prefix for words that begin with long vowels. It is not clear if across-the-board application of *ndΛ-* and *ndo:-* is a recent development in New Odawa, since the Rhodes dictionary privileges conservative forms in some areas.

Recall from section 3.1.8 that syncope was slightly dispreferred at the left edge of the stem. Epenthetic cases were very rarely judged to be acceptable and usually did not have the historically correct vowel quality. The overwhelming dispreference against epenthesis indicates that it is not a feature of the grammar.

### 3.3.1 Likely Factors in Regularization

Several factors may have led to *ndΛ-* and *ndo:-* becoming default allomorphs in New Odawa. First, unlike *nd-* and *n-*, *ndΛ-* and *ndo:-* end in vowels, and thus avoid consonant clusters when placed on consonant-initial stems. For instance, no consonant cluster in *ndΛ-dgʊfm* ‘I come’ is more marked than what would be found in *\*n-dgʊfm* or *\*nd-dgʊfm*. Furthermore, *ndΛ-* and *ndo:-* permit syllable boundaries to clearly align with morpheme boundaries, thus *ndΛ-wi:kbma:* ‘I tie him up’ has syllable-morpheme boundary alignment, but *nd-wi:kbma:* or *n-wi:kbma:* do not.

The allomorphs *ndΛ-* and *ndo:-* were probably chosen as default allomorphs over *ndɪ-* because they were more frequent than *ndɪ-* on Odawa reserves at the time of restructuring. Support for this conjecture comes from the large number of Potawatomi speakers in the Odawa speech communities around the time of restructuring. Potawatomi is very closely related to Odawa, but had merged [ɪ] and [Λ] to [Λ] prior to developing metrically conditioned syncope (Hockett 1948).<sup>47</sup> Potawatomi speakers therefore had a systematic absence of *ndɪ-* in their speech,

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<sup>47</sup>The consensus view is that Potawatomi developed syncope prior to Odawa (Rhodes 1985a, Valentine 1995). By the time of Hockett’s 1937-1938 field work, Potawatomi was beginning to restructure as well, though it appears that only the *ndo:-* allomorph was regularized (Hockett 1948:5).

making *ndΛ-* and *ndo:-* be highly frequent.

### 3.3.2 Modeling Prefixes

A phonological grammar of New Odawa prefixes must capture the default status of *ndΛ-* and *ndo:-*, while still allowing the sporadic attachment of *ndɪ-*, *nd-* and *n-*, modulo phonotactic restrictions. To attain this, allomorph selection will be governed by the ranking of allomorph-specific constraints (Kager 1996, Russell 1995, Hammond 1995).<sup>48</sup> Five allomorph constraints are required, defined below.

- (79)
- a. 1=*ndΛ-*: Assign one violation mark if the realization of the first person feature is not *ndΛ-*.
  - b. 1=*ndo:-*: Assign one violation mark if the realization of the first person feature is not *ndo:-*.
  - c. 1=*ndɪ-*: Assign one violation mark if the realization of the first person feature is not *ndɪ-*.
  - d. 1=*nd-*: Assign one violation mark if the realization of the first person feature is not *nd-*.
  - e. 1=*n-*: Assign one violation mark if the realization of the first person feature is not *n-*.

Whichever allomorph-specific constraint is top-ranked decides the choice of allomorph. Because each allomorph surfaces some of the time, the constraints must be freely rankable (or have similar weights, if the chosen implementation is

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<sup>48</sup>Bonet, Lloret, and Mascaró (2007) propose that selection of non-default allomorphs in phonologically conditioned environments is determined by hierarchies stipulated in the lexicon. In such a system, a constraint that penalizes the selection of allomorphs from low in the hierarchy interacts with phonotactic constraints. Because that theory always assigns violation marks to non-default allomorphs, the sporadic use of less productive prefixes in Odawa would require the theory to be modified to allow stochastic perturbation of the lexical hierarchy, or a theory like Maximum Entropy that allows harmonically bounded candidates to win must be employed. Either option is potentially valid, but rather than enact such a system, we utilize the already established theory of Kager and others.

noisy Harmonic Grammar or Maximum Entropy). Because *nd* $\Delta$ - and *ndo*- are the most common variants, the constraints that prefer them must be top-ranked most frequently. If variable constraint ranking is stochastic (Boersma 1997, Boersma and Hayes 2001), this result can be achieved by giving 1=*nd* $\Delta$ - and 1=*ndo*- equal ranks, but be slightly higher than the remaining constraints. This is represented in (80) for the stem *a:dfm* ‘get marooned’. In the tableau, constraints with essentially identical rankings are separated by dashed lines, but constraints that are ranked less closely together are separated with a jagged line. Potentially fatal violations are not indicated in (80), since all permutations are possible under this variable ranking.<sup>49</sup>

(80)

	1= <i>a:dfm</i>	1= <i>nd</i> $\Delta$ -	1= <i>ndo</i> -	1= <i>ndr</i> -	1= <i>n</i> -	1= <i>nd</i> -
a. $\text{nd}\Delta\text{a:dfm}$			*	*	*	*
b. $\text{ndo:a:dfm}$		*		*	*	*
c. $\text{ndia:dfm}$		*	*		*	*
d. $\text{na:dfm}$		*	*	*		*
e. $\text{nda:dfm}$		*	*	*	*	

The other core phenomenon is that *nd*- never appears before consonant-initial stems, and *n*- never appears before falling onsets. We assume that candidates violating these generalizations are disqualified by high-ranking phonotactic constraints, and will not include them in tableaux.

Tableau (81) illustrates the variation in prefix forms for words that begin with singleton onsets like *go:dʒm* ‘hang’.

<sup>49</sup>Other markedness constraints that might decide between allomorphs, like \*V, are assumed to be dominated by the allomorph-specific constraints for simplicity.

(81)

	1-go:dʒim	1=ndΛ-	1=ndo:-	1=ndɪ-	1=n-
a.	ndΛgo:dʒim		*	*	*
b.	ndo:go:dʒim	*		*	*
c.	ndɪgo:dʒim	*	*		*
d.	ngo:dʒim	*	*	*	

When the word begins with a falling onset in New Odawa, the phonotactic effects ensure that only three prefixes can arise, as (82) shows for *nda:ʔa:gmΛʔa:n* ‘stir something’.

(82)

	1-nda:ʔa:gmΛʔa:n	1=ndΛ-	1=ndo:-	1=ndɪ-
a.	ndΛnda:ʔa:gmΛʔa:n		*	*
b.	ndo:nda:ʔa:gmΛʔa:n	*		*
c.	ndɪnda:ʔa:gmΛʔa:n	*	*	

This concludes the description of New Odawa phonology. Even though New Odawa lost many of the alternations present in Old Odawa, it innovated a grammar that maintains Old Odawa apocope and uses a restructured syncope process. Finally, the chaotic allomorphy of Old Odawa affixation has been regularized to a large degree.

## 4 Theoretical Implications of Restructuring

Languages restructure when learners are forced to an analysis that differs from the historically correct analysis (Kiparsky 1973b). Section 2.3 argues that the shift to New Odawa was begun by speakers who were children at the time that

Old Odawa developed metrically conditioned syncope. Given this timecourse, the conclusion that the innovation of metrically conditioned syncope in Old Odawa was the trigger for restructuring seems inescapable. To be clear, as argued in section 1.1.1, Old Odawa innovated syncope as a post-lexical or phonetic rule. Tasked with learning this low-level process as part of the core phonology of their language, children instead restructured the language.

The challenge of Old Odawa for learners lay in the opaque nature of the grammar.<sup>50</sup> The stress rules built iambic feet, but the alternating stress pattern was destroyed by the deletion of unstressed vowels. In this system two counterposed, independent processes were at work in an opaque ordering.

Our goal is to make the most modest theoretical move that can explain the failure to acquire Old Odawa grammar. Various models within the framework of OT make predictions about the learnability of opacity. For instance, classical OT does not represent the mapping from underlying forms to surface forms with ordered independent processes. Rather, ranked constraints evaluate a set of surface forms in parallel. There are thus no intermediate representations that can express a generalization that is later hidden. This means that classical OT can only capture counter-feeding on focus opacity, which it models with faithfulness constraints blocking large disparities between underlying and surface forms (McCarthy 1999). Classical OT cannot represent other types of opacity, thus it predicts that all other opacity will be restructured. Such a move seems to be too drastic.

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<sup>50</sup>Old Odawa syncope resists classification in standard typologies of opacity (Kiparsky 1971; 1973a, Bakovic 2007). However, the informal characterization of opacity as consisting of non-surface true generalizations clearly applies.

The restructuring of opaque phonology in Odawa is insufficient cause to propose that nearly all opacity is restructured.

A better option is to utilize a version of OT that allows more opacity to be expressed. This involves utilizing a version of parallel OT that has been augmented with more analytic options. The many reasonable augmentations that might be proposed include local faithfulness conjunction (Moreton and Smolensky 2002), lexical levels (Bermúdez-Otero 2006a), or Output-Output constraints (Benua 1997). Such additions to the theory allow opaque phenomena like chain shifts, environment opacity, cyclic effects, or counter-bleeding to be captured. Crucially, opaque orderings that do not correlate with morphological levels cannot be represented.

What should be avoided are models that utilize phonological derivations (McCarthy 2008). These models have no difficulty representing a step-by-step progression exactly like the stress-before-syncope progression characteristic of Old Odawa. Indeed, metrically conditioned syncope is portrayed as a virtue of the model. However, because children could not acquire Old Odawa syncope, phonological theory should not employ such a powerful tool for the analysis of opacity.

#### **4.1 Concrete Lexical Theory**

A competing explanation for Odawa restructuring comes from the constraint on lexical representations proposed by Albright (2002, 2010). This model maintains that underlying forms may only contain segments from a single surface form of a paradigm. Old Odawa syncope brought about a situation where no single member

of a paradigm had all the underlying vowels realized. Children would therefore need to consult more than one member of a paradigm in order to build the correct underlying form. This is schematized in (83).

(83)	m	Λ	k	I	z	ɪ	n	New UR	
	m		k	I	z	ɪ	n	Old SR 1	
	n-	m	Λ	k		z	ɪ	n	Old SR 2

If lexical representations are constrained to only contain segments from a single surface form, then some vowels will be lost. As was established earlier, Old Odawa leveled the lexicon off of unprefixated forms, so vowels that only appeared in prefixed forms were generally lost (leading to the underlying representation /mkɪzɪm/ ‘shoe’). However, approximately 400 words in the Rhodes dictionary have underlying forms that were constructed off of at least two Old Odawa surface forms. This can be seen in the New Odawa alternation between  $\widehat{d}_3e:pɪzɪ-d$  ‘that he is lively’ and  $nd\Lambda-\widehat{d}_3e:pɪz$  ‘I am lively’, which supports the underlying form / $\widehat{d}_3e:pɪzɪ$ /.<sup>51</sup> Due to the interaction of syncope and apocope in Old Odawa, the penultimate vowel could only have come from a prefixed form and the final vowel could only have come from an unprefixated form, as schematized in (84).

(84)	$\widehat{d}_3$	e:	p	I	z	I	New Odawa UR
	$\widehat{d}_3$	e:	p		z	I	d Old Odawa SR
	ndo:	$\widehat{d}_3$	e:	p	I	z	Old Odawa SR

The contribution of Old Odawa prefixed forms to New Odawa underlying forms appears to be limited to the penultimate vowel. As the examples in (85)

<sup>51</sup>The New Odawa surface forms are derived by the application of two-sided open syllable syncope in  $\widehat{d}_3e:pɪzɪ-d$  ‘that he is lively’ and apocope in  $nd\Lambda-\widehat{d}_3e:pɪz$  ‘I am lively’.

show, the vowels in the penultimate syllable differ in quality from each other, which rules out an epenthetic account of their presence. What is most noteworthy is that the vowels all correspond to the Old Odawa vowels. It therefore appears that abstract lexical representations can be constructed by children, ruling out an explanation of Odawa restructuring that is based in a concretist view of lexical representations.<sup>52</sup>

(85)	Unsuffixed	Suffixed	
	ndΛ-bi:ndge:bIZ	bi:ndge:bzʊ-d	zip inside
	ndΛ-bkʊdΛb	bkʊdbɪ-d	perch
	ndΛ-ndʒmΛz	ndʒmzʊ-d	dispute

## 4.2 Syncope at Large

A consequence of abandoning serial grammars is that other cases of metrically conditioned syncope are predicted to either be restructured, or have a different analysis. Restructuring seems to have struck many of the languages listed in McCarthy (2008) as having metrically conditioned syncope. That is, unstressed vowel deletion is a feature of reconstructed languages like Indo-European and Slavic, but not the daughter languages.<sup>53</sup>

McCarthy also lists the following individual stages of attested languages as having metrically conditioned syncope: Old Babylonian, Old Assyrian, Old Irish,

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<sup>52</sup>An explanation of the leveling pattern in New Odawa is most likely possible by setting unprefixing forms as privileged output targets and permitting lexical entries to be no more complex than is necessary to generate the unprefixing forms given the non-serial grammar defended in this document. This move amounts to no more than the combination of the OT concept of lexicon optimization with the notion of a privileged surface form (Bermúdez-Otero 2003; 2006b).

<sup>53</sup>The *jers* of Slavic phonology are the synchronic residue of syncope.

Archaic Latin and Classical Mandaic.<sup>54</sup> McCarthy also cites Potawatomi, a very close relative of Odawa, as a case of metrically conditioned syncope. However, Hockett (1948) encountered restructuring in progress, as the unprefixal allomorphs of stems appeared after an apparently recut prefix *ndor-*, just as in New Odawa.<sup>55</sup> The restriction of metrically conditioned syncope to specific stages of languages supports the diagnosis of metrically conditioned syncope as unstable.

Some of the cases of metrically conditioned syncope cited by McCarthy are not frozen in time. They are Hindi, Macushi Carib, South Eastern Tepehuan, Afar, Tundra Nenets and Aguaruna. It is beyond the scope of this discussion to analyze these languages, but we can quickly note the following. First, the metrical structure of Hindi is famous for being poorly understood (Ohala 1986, Hayes 1995). This makes it difficult to establish that metrically conditioned syncope is at work. Second, following Kager (1997), vowel deletion in Macushi Carib was a gradient, post-lexical process fairly recently. Under the theory advanced here, restructuring may be imminent. For the remaining four languages, the author's knowledge is insufficient to make definitive statements. However, the theory advanced here predicts that if vowel deletion is a stable process, it must be given a non-serial analysis.

As an example of a potential re-analysis, ostensibly stable cases of metrically conditioned syncope may be analyzed as the result of the interplay between

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<sup>54</sup>The synopsis of Archaic Latin in Blumenfeld (2006) states that syncope was sporadic and only general tendencies about syncope can be discerned. Archaic Latin may therefore not even have developed true metrically conditioned syncope.

<sup>55</sup>Tonkawa is another language that had metrically conditioned syncope, but it is no longer spoken.

phonology and morphology. For instance, McCarthy cites the Aguaruna examples reproduced in (86). In order to explain the alternations in suffixes and at the right edge of the stem, the forms are analyzed as being due to iambic metrically conditioned syncope. In this language, unfooted/word final vowels delete and word-initial syllables never syncope.

(86)	Underlying	Stress	Syncope
	tʃaŋkina	(tʃaŋ'ki)na	(tʃaŋ'kin)
	tʃaŋkina-na	(tʃaŋ'ki)('nana)	(tʃaŋ'ki)('nan)
	tʃaŋkina-ŋumi-na	(tʃaŋ'ki)(na'ŋu)('mina)	(tʃaŋ'kin)('ŋu)('min)
	tʃaŋkina-ŋumi-na-ki	(tʃaŋ'ki)(na'ŋu)(mi'na)ki	(tʃaŋ'kin)('ŋum)('nak)
	Glosses: 'basket', 'basket-acc', 'basket-pos-acc', 'basket-pos-acc-foc'		

While the alternations are certainly compatible with metrically conditioned syncope, note that they conform in large part to the New Odawa pattern of general immunity to deletion at the left edge of the word, but regular deletion at the right edge. Furthermore, the bulk of the alternations analyzed in McCarthy (2008) occur in cases with multiple short, stacked suffixes, raising the possibility that the alternations could be the result of two sided open syllable syncope applied cyclically or constrained through Output-Output correspondence. Thus, even if the patterns in Aguaruna ultimately prove to be amenable only to the analysis proposed in McCarthy (2008), further data demonstrating the productivity of metrically conditioned syncope would be desired.

To see how Aguaruna syncope might be cast as cyclic two sided open syllable syncope plus apocope, consider the generation of [tʃaŋkin-ŋum-na-k] 'only your basket (acc)'.<sup>56</sup> The first step is to build *tʃaŋkina-ŋumi*, to which two sided open

<sup>56</sup>Lexical listing of entire allomorphs that are deployed in specific morpho-lexical environments

syllable syncope applies, producing *tʃaŋkin-ŋumi*.<sup>57</sup> Subsequently the word gains another affix in *tʃaŋkin-ŋumi-na*, prompting the deletion of [i] to make *tʃaŋkin-ŋum-na*. Finally, the focus morpheme would be added, making *tʃaŋkin-ŋum-na-ki*. With the word “finishing” its path through the morphology of Aguaruna, the ban against word-final vowels would apply, creating [tʃaŋkin-ŋum-na-k] ‘only your basket (acc)’.

New Odawa arose when Old Odawa crossed into a metrically conditioned syncope system. From Old Odawa, it developed an inventory of novel prefixes that are applied throughout the lexicon with little relation to their historical origin. The lexicon now does not attest the Old Odawa alternations at the left edge of the word, having only optional deletion of vowels in the stem-initial syllable. Finally, the grammar no longer deletes vowels after the application of a stress rule, but deletes vowels in the two sided open syllable environment.

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is another option that must be considered in a full analysis.

<sup>57</sup>Two sided open syllable syncope would be equally well served by deleting [u], as in the unattested *tʃaŋkina-ŋmi*. The failure to alternate in deletion sites could be caused by the fact that we are dealing with inflected forms, which are often prone to maintaining relics of non-productive phonology (cf. the vestige of closed syllable shortening in English *keep* vs *kept*, or the Odawa third person plurals discussed in section 3.1.9). Note that deletion sites do in fact vary for some affixes in Aguaruna, as seen in *utʃinaʃkam* ~ *utʃintʃakam* ‘also to the child’ (McCarthy 2008:522).

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