ON THE ACQUISITION OF SEGMENTS AND SYLLABLE TYPES:

A CASE STUDY OF A FIRST-LANGUAGE LEARNER OF NORTHERN EAST CREE

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Comprehensive Paper II

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March 15, 2010 (revised version)

1. Introduction

This paper is a case study of A1, a young girl learning Northern East Cree (NE Cree), examining how she acquires syllable structure and consonants over a 19-month period. The data come from a larger project, the Chisasibi Child Language Acquisition Study (CCLAS), a longitudinal study of first language acquisition in the Cree community of Chisasibi, Quebec. (CCLAS will be discussed in greater detail in §3.)

Although case studies have been conducted on the acquisition of segments and syllable types in many languages, including Dutch (Fikkert 1994; Levelt 1994; Levelt et al. 1999, 2000), Spanish (Lee 1989, Núñez Cedeño 2007), English (Pater 1997), Portuguese (Freitas 1997), Brazilian Portuguese (Gomes 2006) and Quebec French (Rose 2000), they have yet to be discussed within the context of polysynthetic languages, though acquisition of morphosyntactic elements has been studied in languages such as Inuktitut (Fortescue 1984/1985; Swift 2001, 2003) and Huichol (Gomez Lopez 1998).

1.1 Outline

§2 contains a description of Cree, situating NE Cree within the greater Cree-Montagnais-Naskapi dialect continuum. This section also describes the phonemic

inventory of NE Cree. Methodology is documented in §3, including a description of CCLAS, data preparation and coding. §4 discusses A1's acquisition of syllable types and consonants. Finally, there is a discussion of these findings (§5).

2. Cree

NE Cree is part of the Cree-Montagnais-Naskapi (CMN) dialect continuum (MacKenzie 1980), which is a member of the Central Algonquian language family. Varieties in the CMN dialect complex, shown in Figure 1, can be divided into two groups—Western Cree and Eastern Cree—based on phonological criteria (Rhodes and Todd 1981).

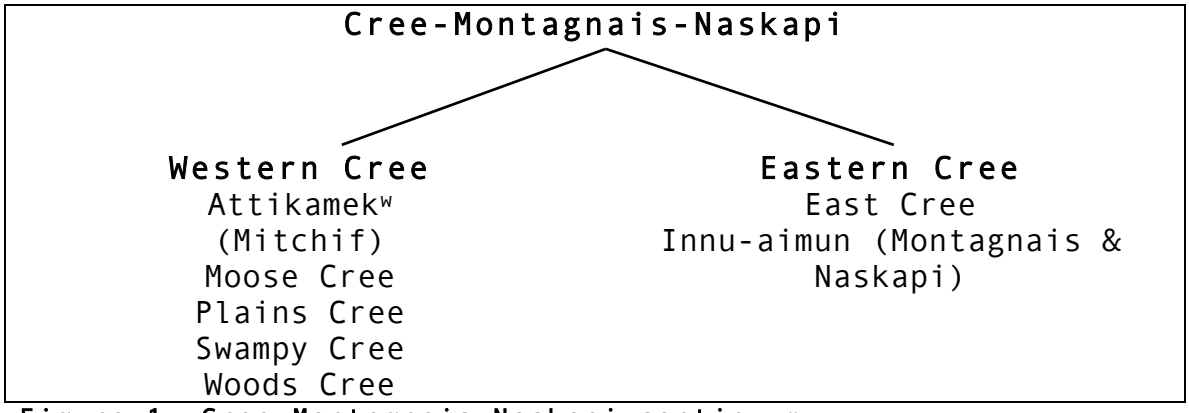


Figure 1. Cree-Montagnais-Naskapi continuum.

The varieties classified as Eastern Cree are also known as the *palatalized* dialects because they have /tʃ/ as their reflex for Proto-Algonquian **k* before front vowels; western dialects are also known as *non-palatalized* because velar stops in these varieties do not undergo this process

(Michelson 1939; Pentland 1979; MacKenzie 1980, 1986; Rhodes and Todd 1981). The term *Innu-aimun* is sometimes applied to Montagnais and Labrador Naskapi (but not Quebec Naskapi), though they remain distinct varieties (e.g., MacKenzie 1991, Brittain 1996, Branigan and MacKenzie 1999, Hasler 2002, Bannister 2004, Oxford 2008).

East Cree, the variety relevant to this paper, is a palatalized dialect of Cree spoken by approximately 13,000 people in northern Quebec east of James Bay (MacKenzie and Junker 2004). This paper focuses on NE Cree, a subdialect spoken in three communities: Whapmagoostui, Chisasibi (formerly Fort George) and Wemindji (Swain 2008). The child in this study is from Chisasibi, a community home to approximately 3,800 Cree (Cree Nation of Chisasibi 2006).

2.1 The phonemic inventory of NE Cree

The phonemic inventory of NE Cree is illustrated in (1) and (2), in roman orthography.[1] Consonants are listed in (1); obstruent voicing is non-contrastive in NE Cree, as in other subdialects of Cree.

(1) Consonants (Dyck et al. 2006, Wood 2006, Swain 2008)[2]

[1] Cree orthography is typically syllabic; this paper employs the less commonly used roman system. This is possible because Cree orthography is largely phonemic (Burnaby and Anthony 1979), thus allowing the use of orthography rather than phonetic symbols.

[2] Following Dyck et al. (2006) and Swain (2008), [w] and [y] are listed in the consonant inventory even though they are allophones of /u/ and /i/.

p	t	ch [tʃ]	k, kw [kʷ]
	s	sh [ʃ]	h
m	n		
w	y		

Onsets in Cree consist of a single segment or a "consonant followed by *w*" (Wolfart 1996: 431); other research on NE Cree (Dyck et al. 2006, Wood 2006, Swain 2008) also lists *kw* as a singleton onset.[3]

The vowels and diphthongs of NE Cree are shown in (2).

(2) <u>Vowels and diphthongs</u> (Dyck et al. 2006, Swain 2008)

Vowels	*Long*		*Short*
	î [i:]	û [u:]	i/a [ə][4]
	u [ə]		
	â [a:][5]		

[3] The status of *kw* will not be discussed further since it does not appear in the data examined for this paper.
[4] PA **i* and **a* are merged in NE Cree.
[5] PA **â* [a:] and **e* [e:] are also merged in NE Cree.

Diphthongs (long)	wâ	[(w)ɑ:]
	wâw	[ɑw]
	âw	[aw]
	ay	[ay]
	iw	[i:w]
	uy	[uy]

NE Cree has both long and short vowels. Short vowels can be elided, resulting in ‘secondary’ consonant clusters.

Like other Cree dialects (Wolfart 1996), NE Cree has a (C)V(C) template (Dyck et al. 2006, 2008). The onset of a NE Cree syllable can contain a single consonant and the coda can only contain *s, sh* or *h*. Thus, concatenation of two CVC syllables results in word-internal clusters where the first consonant in the cluster can be one of the coda segments /s, ʃ, h/ and the second may be any consonant in the NE Cree inventory, as listed in (1).

Algonquian languages with syncope, such as NE Cree, have what Wolfart (1996) labels *secondary clusters*, a term that simply refers to clusters which arise from syncope of short vowels. Secondary clusters can consist of any onset consonant followed by any onset consonant. Examples are provided after the discussion of accent and syncope.

NE Cree also permits an extra, word-final onset appendix (Dyck et al. 2006). The word-final consonants in (3a-c) in particular are onsets, not codas, since coda consonants are restricted to fricatives.

(3) Word-final onsets

a. a.ti.**m** ‘dog’
b. chaa.ki.**t** ‘long coat, jacket’
c. uu.**t** ‘canoe’
d. nis.**k** ‘Canada goose’
e. a.misk.**kw** ‘beaver’
f. wî.chish.**kw** ‘muskrat’ (Dyck et al. 2008: 19)

NE Cree words can thus end with a single onset consonant, or a coda consonant followed by an onset consonant.

Finally, this paper assumes the domain of syllabification in NE Cree is larger than the word; resyllabification occurs when a word-initial vowel is preceded by a word-final consonant (…C# #V…). This is relevant to the discussion on data preparation (§3.1).

2.2 Accent and syncope

NE Cree is quantity-sensitive at the level of the nucleus. Short vowels are light and long vowels are heavy; codas do not contribute to weight in NE Cree (Dyck et al. 2006). Historically-long vowels (*î* [i:], *û* [u:] and *â* [a:]) are tense, optionally long and not subject to syncope while historically-short vowels (*i/a* [] and *u* []) are lax and are subject to syncope (Dyck et al. 2006).

Stress assignment is also affected by syllable weight in NE Cree. Stress generally falls on the penultimate syllable if it is heavy (4); otherwise, the antepenultimate syllable receives stress ((4); Dyck et al. 2006).

(4) Quantity-sensitivity (Dyck et al. 2006: 4)[6]

a. □î.ti.ni.m ‘hold like so’
b. ni.□pâ.wi.n ‘bed’
c. □wa.pu.shu.ch ‘rabbits’
d. a.□wâ.shish ‘child’

Syncope optionally deletes short vowels (*i/a* [□] and *u* [□]) in metrically weak positions in NE Cree; metrically strong short vowels and long vowels (*î* [i:], *û* [u:] and *â* [a:]) are not unaffected (Dyck et al. 2006, 2008). The environment for syncope is illustrated in the following example sets. In (5), the first short vowel [□] in the first syllable of both words is not elided because it is in a stressed syllable. In contrast, in (6), the vowels in the underlined syllables (bolded in the transcriptions) can be deleted since they are unstressed.

(5) Metrically strong short vowels (no syncope) (Dyck et al. 2008: 4)

a. ni.maas [□n□.mæs] ‘fish’
b. nis.ku.t [□n□s.k□.t] ‘my nose’

(6) Metrically weak short vowels (syncope) (Dyck et al. 2008: 4-6)

a. nísh.tu.shaa.p [□n□□.**t□** .□æ.p^{h}] ‘thirty’
b. áa.mih.kwaa.n [□æ.**m**^{h}.g□.n] ‘spoon’
c. saa.ki.híi.ki.n [sæ.**k**.□hi.g□.n]

[6] Examples (4, 5, 6) have been syllabified slightly differently from the source material. Dyck et al. (2008) do not place the word-final consonants in their own syllables; in this paper, they have been syllabified as a word-final onset to be consistent with the arguments presented in §2.1. This change does not affect stress assignment since these syllables are extrametrical.

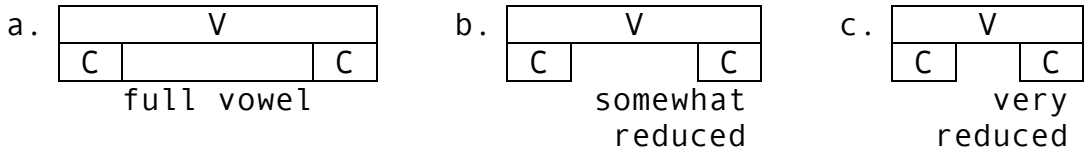
‘lake’

The location at which syncope may apply can be predicted under a metrical analysis if NE Cree is analysed as iambic (Dyck et al. 2008). Dyck et al. (2008) also note that syncope can result in a devoiced vowel, as in (6a), a shortened devoiced element [^{h}], as in (6b), or the deletion of the vocalic element, as in (6c). When the vocalic element is deleted, the resulting surface structure contains a syllable that consists of a single consonant and an empty vowel. In sum, syncope affects unstressed short vowels. It occurs in a wide variety of contexts in NE Cree and can result in a devoiced element or complete vowel deletion.

2.3 C syllables

This paper assumes that elided syllables such as those shown in (6) consist of a single consonant and an empty vowel. This assumption is based on the concept that syncope can be viewed as syllable shortening (Coleman 2001). Coleman (2001) argues that results from compression of unstressed syllables in rapid speech. The vowel in particular which is compressed since consonants typically have a shorter duration than vowels (ibid: 33). In rapid speech, the syllable can become so short that the consonant gestures overlap the vowel gesture, and vowel is no longer audible, as illustrated in (7).

(7) Syllable shortening (Coleman 2001: 33)



I assume that the word-final onsets in (3) and the elided syllables in (6) have a common syllable structure (a single consonant and an empty vowel nucleus). This structure will henceforth be referred to as a C syllable, defined below.

(8) C syllable

A C syllable is a syllable consisting of an onset consonant, followed by a phonetically empty nucleus.

2.4 Summary

NE Cree is a quantity-sensitive Algonquian language with a (C)V(C) syllable template. Pre-syncope, this results in word-medial consonant clusters of maximally two consonants, with restrictions on coda constituents. At this stage, word-medial and word-final clusters consist of two consonants. Post-syncope, there are fewer restrictions on surface forms, resulting in new combinations of consonant clusters in all word positions. Word-final consonants are classified as onsets since any consonant can appear in this position (recall that coda consonants are restricted to fricatives). Word-final onsets, like syncopated CV syllables, are classified as C syllables in this paper.

The next section describes the project's methodology,

as well as the data and how they were prepared (§3.1) and coded (§3.2).

3. Methodology

The data for this study are drawn from the corpus collected as part of the Chisasibi Child Language Acquisition Study (CCLAS), a longitudinal study of first language acquisition in the Cree community of Chisasibi, Quebec. In this study, six Cree-speaking children were recorded over a 30-month period (2004-2007), resulting in approximately 120 video-recordings (Brittain et al. 2007). Children were grouped into two cohorts: the three children in Cohort A were video-recorded between the ages of 20 and 50 months while the three in Cohort B were between the ages of 44 and 74 months when they participated in this study (Brittain et al. 2007).

In this paper, the data from one child (codenamed A1) have been examined; A1 is part of the first cohort. Two sessions, one recorded when A1 was age 2;1.12 (henceforth Session 1) and another recorded at age 3;8.24 (henceforth Session 2), were analysed in order to track A1's acquisition of syllable types over a 19-month period. As there is no standard benchmark for acquisition in the field (Rose, p.c., September 3, 2009), a phoneme or syllable type is arbitrarily considered to be acquired in this study when A1

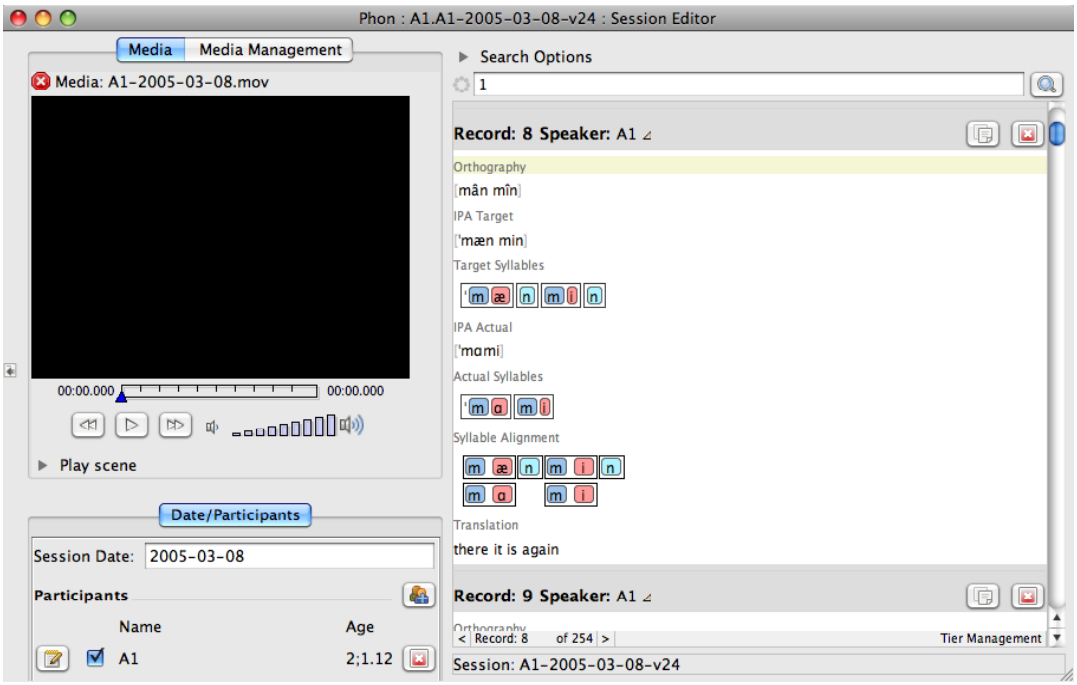
can produce it correctly 80% of the time.

3.1 Data preparation

All of the video-recordings were analysed in Phon software (Rose et al. 2006, 2007) a "software program designed to support every step involved in the management, analysis and sharing of large corpora of phonological data" (Rose et al. 2006: 489). The recordings were then segmented and transcribed using a double-blind process (Chisasibi Child Language Acquisition Study 2007). These transcripts were validated by a third transcriber and then translated by a native Cree speaker who had participated in A1's recording sessions. (None of these tasks were performed by the author of this paper.)

In Phon, information is presented to the user in tiers. There are six tiers that are relevant to the current study: (1) Orthography, (2) IPA Target, (3) Target Syllables, (4) IPA Actual, (5) Actual Syllables and (6) Syllable Alignment. They can be seen in (9).

(9) Phon interface



The Orthography tier contains the orthography of the target form, with morpheme boundaries reflected. The IPA Target tier contains the transcription of the form the native Cree speaker thinks the child is producing while the IPA Actual tier has the transcription of the child's utterance. The Target Syllables and Actual Syllables tiers show segments grouped by syllable; Phon automatically labels each segment according to its position in the syllable (Rose et al. 2006). (The algorithm that performs this task is not specific to NE Cree.) The Target Syllables and Actual Syllables tiers are paired for comparison in the Syllable Alignment tier. This task is also performed automatically; another algorithm aligns the target and actual forms on a segment-by-segment and syllable-by-syllable basis (ibid).

Manual adjustment is possible in all of these tiers.

Phon labels segments as pne of eight options: left appendix, onset, nucleus, coda, right appendix, onset of an empty-headed syllable (OEHS), ambisyllabic, or unknown. In this analysis, segments were coded as ‘onset,’ ‘nucleus’ or ‘coda’ if they were one of these basic syllable constituents. ‘OEHS’ was applied to onsets of syllables with an elided vowel, to reflect the elided or null nucleus. Intervocalic segments were coded as ‘ambisyllabic’ if they could be analysed as members of adjacent syllables. This is not in keeping with the traditional definition of ambisyllabicity since ambisyllabicity is typically stress-dependent. ‘Ambisyllabic’ is used here for segments that are ambiguously syllabified. More details on this are provided below.

‘Left appendix’ and ‘right appendix’ were not used in this analysis; recall from §2.1 that extra word-final consonants pattern like an onset. For this reason, they have been coded as ‘OEHS’.

To ensure that segments were coded according to NE Cree syllable structure and that utterances were consistently represented, each record was double-checked by the author. Where necessary, as explained later, segments were recoded manually. Some changes were also made to the transcriptions

in the IPA Target and the IPA Actual tiers by the author. For example, two-segment transcriptions of [ts, dz, tʃ, dʒ] were changed to single-segment transcriptions [ʦ, ʣ, ʧ, ʤ], to better reflect the phonemic inventory as described in (1). This decision has consequences for deaffrication, onset structure and syllable alignment. For example, if [ʧ] is transcribed as two segments instead of one, it might suggest that NE Cree allows complex onsets, or that the [t] should be considered an OEHS. In contrast, if coded as one segment, it is possible to look for deaffrication.

A small number of miscellaneous adjustments were also made, reflecting the author's judgments of the recordings. For example, if the Orthography Tier recorded the word *mommy* once, and the IPA Actual Tier had the word transcribed twice, I listened to the recording and amended the discrepancies between tiers.

Changes were also made to the Target Syllables and Actual Syllables tiers, as described in the following paragraphs. Intervocalic [w] and [j] were coded as 'ambisyllabic,' i.e. ambiguously syllabified, under the assumption that it could not be determined whether the glide in a sequence such as [ija] was in the nucleus or the following onset. Glides were coded as ambiguously syllabified in the following contexts: VGV (word-medial

intervocalic glide, exemplified in (10a)) and VG# #V (word-final glide followed by a vowel-initial word, in (10b)). In the latter sequence, glides are coded as ambiguously syllabified due to resyllabification (described in §2.1).

(10) Examples of glides coded as ambiguously syllabified[7]

a.	*kiyâh nîyi ituhtâu*	[gij**a** ni it daw]	'yes, I will go'	(3;8.24-32T)
b.	*nîyi û*	[n**ij o**]	'me (this is mine)'	(2;1.12-27T)

In sequences of V# #GV (word-initial glide preceded by a vowel-final word), glides were not considered ambiguously syllabified, because the environment for resyllabification was not met. An example of a glide [w] that was not coded as 'ambisyllabic' is bolded in (11).

(11) Example of glides not coded as ambiguously syllabified

îhî nipîu	[n he **w**ibijo]	'yes, again it's wet'	(3;8.24-23A)

Other word-final consonants were coded as 'ambisyllabic' (ambiguously syllabified) when followed by a vowel-initial word, under the assumption that segments were resyllabified across word boundaries, as in (12). (The domain of syllabification is larger than the word.)

[7] The information in parentheses at the end of each example indicates A1's age and the record number in the recording session. 'T' at the end signifies that the example is from the target form; 'A' signifies that it is from A1's actual productions.

(12) Examples of word-final consonants coded as ambiguously syllabified

a.	*mîn û*	[mi**n** o]	'again this'	(2;1.12-10T)
b.	*tân âhtiyin â*	[daj di**n**]	'how are you doing? right'	(2;1.12-112T)

All word-final consonants except for / s, , h/ were coded as onsets of empty-headed syllables (OEHS) when phrase-final (13a), or when followed by a consonant-initial word (13b). In contrast, word-final / s, , h/ were labelled as codas because they also occur in word-medial coda position.

(13) Examples of word-final consonants coded as OEHS

a.	*nishtu*	[n**t**]	'three'	(3;8.24-121A)
b.	*mitâhtu* *mitâhtu*	[mdæ**t**] mdæ**t**]	'ten, ten'	(3;8.24-131T)

These consonants must be coded as onsets, specifically onsets of empty-headed syllables, because only /s, , h/ can appear in codas in core syllables, as mentioned in §2.1. Finally, the first consonant in a cluster was coded as an OEHS if it was *not* /s, , h/ since only /s, , h/ can appear in codas in core syllables. An example of this can be seen in (14). Relevant segments are bolded.

(14) Example of coding the first segment of a consonant clusters as an OEHS

	pâyikushtâu	[baj**k**taw]	'nine'	(3;8.24-

182TA)

In this example, the [k] has been coded as ‘OEHS’ while the [□] remains in coda position under the assumption that [k□] represents an elided syllable /ku□/.

In cases where syncope has occurred more than once in a word, it is possible to have two C syllables in a row, as illustrated in (15). As Phon does not permit two OEHS segments in a row, it was necessary to add a null nucleus [ø] to the IPA transcription, to enable the author to code two adjacent instances of onsets of empty-headed syllables.

(15) Example of an OEHS sequence

Awân	[w□n□ad□**tøk□**]	‘who	did (3;8.24-
kâihtutihk		that?	16T)

In this example, [tø] is the first OEHS, and [k^{h}] is the second.

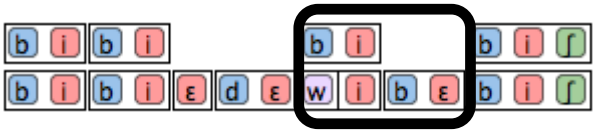
Segments in the Syllable Alignment Tier, the tier in which Phon aligns the transcriptions of the target and actual forms, were also sometimes adjusted by the author. Realignment was typically the result of: judgements about how segments in the child’s utterances should be aligned with the target words; avoidance of aligning A1’s meaningless utterances with anything, as in record 80 from Session 1, exemplified in (16); or the creation of a better match, as in record 52 of Session 1, shown in (17).

(Labelling a sound ‘meaningless’ means that either (a) no one, including the Cree speaker, could understand what A1 was attempting to say, or (b) A1 was producing syllables without any apparent communicative intent.) In (16), the target morphemes are *pîpî* ‘baby’ and the diminutive suffix –*ish*.

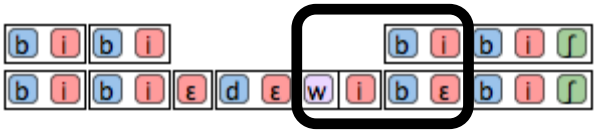
(16) <u>Example of the realignment of the Syllable Alignment tier to avoid aligning nonsensical utterances with target forms</u>

ORTHOGRAPHY	TARGET	ACTUAL		
Pîpî pîpîsh	[□bibi □bibi□]	[bi□bi b□bi□]	□d□wi	‘baby little baby’

Automatically generated alignment:



Manually realigned tier:



In this example, Phon had aligned the first syllable of the target form of [bibi□] with A1’s [wi] rather than with [b□]. However, transcribers and other analysts, including the Cree speaker, decided that [□d□wi] was not meaningful; for this reason, I realigned the target syllable [bi] with the first syllable of A1’s word [b□bi□].

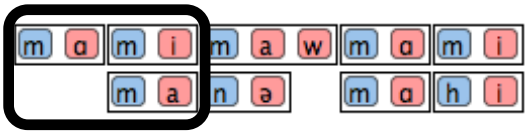
Another example of manual realignment is shown in (17). The top line is the target form; the lower line is A1’s

actual production.

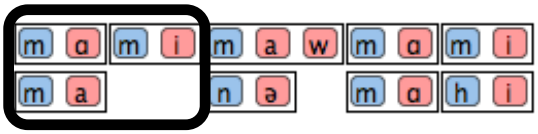
(17) Example of the realignment of the Syllable Alignment tier to create a better match

ORTHOGRAPHY	TARGET	ACTUAL
Mommy mâu Mommy	[□m□mi □m□mi]	□maw	[man□□m□hi]

Automatically generated alignment:



Manually realigned tier:



In this example, Phon had aligned A1's first syllable [ma] with the target syllable [mi]. This was manually changed to reflect a better match between tiers. In many cases, I based such realignments on the assumption that word-edge syllables are more perceptually salient, and therefore more likely to be reproduced by A1.

3.2 Coding

For every utterance, each segment in both the target forms and the child's productions was compared based on its position in the syllable (onset, nucleus, coda, OEHS, or ambiguously syllabified), place of articulation (labial, coronal, dorsal, or laryngeal) and manner of articulation

(plosive, affricates, fricatives, nasals, or glides). /w/ has been grouped with the labials.

4. Results

This section is structured as follows. First, the two recording sessions are summarized in §4.1. Next, the results for the various syllable types are discussed. Results for consonants follow in §4.3.

4.1 Summary of the recording sessions

The two sessions analysed in this paper contain both Cree and English utterances, or as well as some in which both languages are used (in examples of codeswitching). As Swain (2008) notes, although A1 is not being raised in a bilingual environment, she is familiar with some English words, primarily due to exposure to English-language television programs such as *Dora the Explorer*. However, since it is not possible to determine whether A1 is learning one phonology (NE Cree) or two (NE Cree and English), recordings that contain English words have not been analysed, except for the words *mommy* and *daddy* (and variants) since these high-frequency words contain only phonemes used in NE Cree; furthermore, studies have shown that "highly familiar" words such as these, and names for other family members, are recognized as early as six months (Bortfeld et al. 2005: 301), suggesting that they might be

acquired earlier as well. (Names that included only phonemes present in NE Cree in their target forms were also analysed as part of the data set.) Similarly, 60 records were excluded from analysis because they contained incomplete tiers, because the Cree speaker could not ascertain the target form, or because A1 was singing, not speaking.

In Session 1, made when A1 was 2;1.12, there were 173 utterances: 119 in Cree, 47 in English and seven containing codeswitching. The English and codeswitching utterances comprise 31.2% of the session; these records have been excluded from this analysis. In Session 2, made at age 3;8.24, A1 produces a total of 331 utterances: 270 in Cree, 26 in English and 35 with codeswitching. Records excluded from the analysis of this session, which comprise 36.5% of the utterances present in the recording, include the English and codeswitching records, as well as 60 of the Cree utterances, which were deemed unanalysable for the reasons mentioned at the end of the previous paragraph.

4.2 The acquisition of NE Cree syllables

The following syllable types will be discussed: CV syllables in §4.2.1, CVC syllables in §4.2.2, V syllables in §4.2.3 and C syllables in §4.2.4. §4.2.5 looks at data that does not fit into these categories. The results are then summarized in §4.2.6. When examples are given in this

section, they reflect the IPA transcription of the **target** form unless otherwise noted.

4.2.1. CV syllables

CV syllables are the most frequently occurring syllable type in the data set, accounting for the majority of the syllable data (84.0% of Session 1 and 74.2% of Session 2). A1 has acquired this syllable type by age 2;1.12, as the data in (18) show.

(18) Production of CV syllables in Session 1

Attempted:	288	
Target-like:	252	(87.5%)
Deleted:	14	(4.9%)
Other syllable type:	22	(7.6%)[8]
C:	1	(0.3%)
V:	21	(7.3%)

Production of CV syllables in Session 2

Attempted:	544	
Target-like:	480	(88.2%)
Deleted:	33	(6.1%)
Other syllable type:	31	(5.7%)
C:	7	(1.3%)
V:	24	(4.4%)

[8] The percentages listed in the breakdown of "Other syllable types" reflect their percentage of the number of attempts, in this case the single C syllable is 0.3% of the 288 attempted CV syllables. This is also true in the next section for the data on "Substituted" phones.

At age 3;8.24, A1 produces target-like syllables at a near-identical rate as in Session 1; however, she substitutes other syllable types less and deletes more in Session 2.

4.2.2. CVC syllables

CVC syllables account for a very small percentage (1.2%) of the syllables found in Session 1. In Session 2, they are more frequent but still comprise only a small part of the data (4.6%). The results for this type of syllable are outlined in (19).

(19) Production of CVC syllables in Session 1

Attempted:	4	
Target-like:	3	(75.0%)
Deleted:	0	(0.0%)
Other syllable type:	1	(25.0%)
V:	1	(25.0%)

Production of CVC syllables in Session 2

Attempted:	34	
Target-like:	29	(85.3%)
Deleted:	0	(0.0%)
Other syllable type:	5	(14.7%)
CV:	5	(14.7%)

Given that there are only four instances of CVC syllables in Session 1, it is not possible to draw any firm conclusions about A1's acquisition of this syllable type at age 2;1.12, though they suggest that she is on her way to acquiring CVC syllables. In Session 2, there are more occurrences of this syllable type; the results show that A1 has mastered this syllable type, producing target-like syllables 85.3% of the time. When she does not produce a CVC syllable, she substitutes a less marked syllable type, the CV syllable. This suggests that A1 has not acquired syllabic subconstituents (such as the rhyme), or that CVC is a single unit. (Coda consonants are discussed in greater depth in §4.3.3.)

4.2.3. V syllables

Syllables consisting of a single vowel or diphthong are rare in the data set. They account for only 6.7% of the syllables in the target forms in Session 1, and 3.7% of Session 2. The data are shown in (20).

(20) Production of V syllables in Session 1

Attempted:	23

```
Target-like:          10    (43.5%)
Deleted:        0     (0.0%)
Other syllable type:13    (56.5%)
           CV:        13    (56.5%)
```

Production of V syllables in Session 2

Attempted: 27

Target-like:	11	(40.7%)
Deleted:	6	(22.2%)
Other syllable type:	10	(37.0%)
CV:	10	(37.0%)

In Session 1, A1 has not mastered V syllables, sometimes producing them correctly, other times producing less marked CV syllables in their place. This appears to be the default syllable template for A1. Of the ten target-like CV syllables, five of them were word-initial and three of them were single-syllable words. In Session 2, A1 shows a similar distribution, although she is now also deleting target V syllables instead of only substituting them. As with Session 1, six of the ten substitutions (for CV syllables) in Session 2 occur word-initially, suggesting that word-initial V syllables may be more challenging to acquire. This could be due to word-segmentation issues; with so little data, it is not possible to determine.

4.2.4. C syllables

Syllables consisting of a single consonant—the result of syncope—appear infrequently in Session 1 but are more common in Session 2, as illustrated in (21).

(21) Production of C syllables in Session 1

Attempted: 28

Target-like:	4	(14.3%)
Deleted:	18	(64.3%)
Other syllable type:	6	(21.4%)
CV:	6	(21.4%)

Production of C syllables in Session 2

Attempted: 115

Target-like:	65	(56.5%)
Deleted:	45	(39.1%)
Other syllable type:	5	(4.3%)
CV:	5	(4.3%)

As (21) shows, at age 2;1.12, A1 overwhelmingly deletes (64.3% of occurrences) when the target form contains a C syllable. In Session 2, A1 is much more successful with this syllable type, producing target-like syllables in over half of her attempts. She still favours deletion, though she uses this strategy less often when she is older.

In Session 2, there are also instances of syllables consisting of two consonants, as the result of syncope. Most are found in four words. The sequence [k□] is present in the target forms of: *pâyikushtâu* [baj**k□**□taw, baj**k□**daw] ‘nine’, found six times in the session data; the root *kusht-* [**k□**t] ‘be scared’, found four times in utterances such as *chikushtâu* [□□**k□**□taw] ‘you scared?’ (3;8.24-71T); and *achihkush* [□□□u**k□**] ‘star’, found twice. There was also one instance of the sequence [ks] for the root *kischih-* [**ks**□i] ‘be capable/know how to’ in *tâpâ nikischihun nîyi* [da□ba □n□ks□□ni] ‘I can't do it/I don't know how to do it’ (3;8.24-117T).

A1 successfully produces a CC syllable (such as [k□] for /ku□/) for only six of the 13 target words (46.2%) in which this sequence is found. These six target-like productions occur in her six productions of the word *pâyikushtâu* 'nine'. This suggests that A1 has acquired the word but not this syllable type. For the two instances of *achihkush* [□□□uk□] 'star', listed in (22), she produces an affricate instead of the /k□/ sequence. This suggests that she may be interpreting the /k□/ sequence as an affricate, or that the /k/ is assimilating to the place of articulation of /□/.

(22) Alignment of target and actual forms for *achihkuch* 'star' (Session 2)

a. [□□□uk□] realized as [□□□□] (3;8.24-238)

b. [□□□uk□] realized as [□□□□□] (3;8.24-239)

For these two records, it is possible that [t] and [□] might be better regarded as separate phonemes, rather than an affricate since, as §4.3.1.1 will show, A1 sometimes produces [t] for /k/ in onset position (though not for /k/ as an OEHS (cf. §4.3.2.1)).

In the five examples, the CC syllable is found in the verb complex.[9] In the verb complex, A1 combines the first two syllables of the target form (the person prefix *ni-* and the first syllable of the verb stem, i.e. /ks/ or /k□/), into a CVC syllable, i.e. the underlined segments in a <u>CV</u>.<u>CC</u> sequence are realized as CVC syllables. This sequence is word-initial in all five instances. This is detailed below in (23). As in (22), the target forms in (23) are listed in the top tier and A1's actual production is the bottom tier.

(23) <u>A1's productions of CV.CC sequences as CVC syllables in Session 2</u>

	Orthography, IPA transcriptions and alignment	Record
a.	*chikushtâu* 'you scared?'	71
	T: dʒ ʊ k ʃ t a w	
	A: d ɪ ʃ d o	
b.	*tâpâ nikischihun* 'I can't do it/I don't know how to do it'	117
	T: d a b a n ɪ k s tʃ ʊ n i	
	A: n ɪ ʃ dʒ a n i	
c.	*shâsh nimui nikushtâu pwâchikî* 'not anymore scared of the boogieman'	300
	T: ʃ ɛ ʃ n ə mʷ i n ʊ k ʃ t a w b ʊ dʒ ə g i	
	A: dʒ ɛ ʃ n i m i d ɪ ʃ d a b ʌ dʒ ə g i	
d.	*mâu nîyi mîn nikushtân û* 'this is mine I'm scared of it again'	352
	T: m a w n i m i n ʊ k ʃ t ə n o	
	m a m e ɪ n ə m ɛ n ɛ ʃ d ɪ n ʊ	

[9] Algonquian verbs are morphologically complex, carrying both derivational and inflectional morphology.

A:

e. *mâmî nikushtân û* ‘I'm scared of it’ 353

T: m a m i n ʊ k ʃ t ə n o

A: m a m i d a n ɛ s t a n

In all of the above records, A1 deletes [k] to preserve [ʃ], a canonical or primary coda type in NE Cree. This suggests that she has some knowledge of phonotactics, as will be discussed in §4.3, or that /ʃ/ is perceptually salient (strident), or easier to produce than /k/ in codas.

4.2.5. Other syllable data

In Session 2, A1 has some variation that seems systematic but does not fit into the above categories. This section will discuss this data.

One pattern observed in the data is the sequence <u>CV</u>.<u>CV</u> becoming a CV syllable, taking the consonant from the first syllable and vowel from the second syllable (underlined). Examples of this are listed in (24).

(24) <u>Examples of CV.CV → CV</u>

	ORTHOGRAPHY, IPA TRANSCRIPTIONS AND ALIGNMENT	RECORD
a.	*chiwâpihtân â nîyi akwâtisîu* ‘see I am the best’	87
	T: dʒ o h a n n a n i ə k ʌ ʦ i j o w	
	A: dʒ a n a n i k a kʰ	
b.	*pwâchikî* ‘boo□eyman’	310
	T: b ʌ dʒ ə g i	
	A: w ʊ dʒ i	

In total, there are 18 instances of this pattern. (Note that the target form of *chiwâpihtân* [□ohan] is a reduced form.)

In addition to the CV.CC → CVC syllables, there are also instances of A1 producing the sequence CV.CVC as a CVC syllable, created from the underlined constituents. These records are shown in (25).

(25) CV.CVC → CVC

	Orthography, IPA transcriptions and alignment	Record
a.	*chikushtâu* 'are you scared?'	69
	T: dʒ i k ə ʃʰ t a w	
	A: ∅ ∅ ɛ s d o	
b.	*niyâyu nikutwâshch* 'five six'	173
	T: n i j aj g ə d ɑ ʃ ʧ	
	A: n i ∅ g ∅ ɑ ʃ	
c.	*nikutwâshch* 'six'	224
	T: n ə g ə d ɑ ʃ ʧ	
	A: n i g ∅ ɑ ʃ	

Since there are not many examples of this sequence, it is not possible to determine any pattern. However, similar data has been seen in English, in which the word *banana* was produced as [bænə] (Pater 1997).

A1 occasionally epenthesizes segments or syllables in her utterances in both sessions. (Content is considered epenthetic if there is no corresponding form to A1's productions in the Orthography or IPA Target fields.) She

most commonly epenthesizes word-initially but meaningless syllables can also be found in other positions.

When A1 adds a V syllable, it is word- and utterance-initial in all but three instances; for Session 1, this occurs in 7 out of 10 instances and, for Session 2, in 13 out of 14 instances. Examples of epenthesized V syllables are given below.

(26) Examples of V syllable epenthesis

	Orthography	Target	Actual	Record
a.	*mommy*	[m□.mi]	[□ ma.□me]	2;1.12-17
b.	*nâu*	[□naw]	[□.□naw]	3;8.24-171

This is different from the #V → #CV repair mentioned in §4.2.3; in the #V → #CV repair, A1 is replacing a syllable type she has yet to acquire with one she has already acquired whereas, in cases like those in (26), the extra syllable does not have corresponding form in the target word, nor does it carry any meaning.

CV syllables are sometimes added as well, as in (27). In Session 1, this occurs 15 times.

(27) Examples of CV syllable epenthesis

	Orthography	Target	Actual	Record
a.	*chipiha*	[□□.□ba]	[**n**□.d□.□b□]	2;1.12-95
b.	*mâutâh nîyi*	[maw.□da	[□ma.d□.ni.**ja**]	3;8.24-

□ni] 249

Six of these were word-and utterance-initial, five were word-medial and four were word- and utterance-final. Similarly, in Session 2, A1 added CV syllables three times before the target form, once word-medially and six times after the target form.

C syllables are epenthesized less frequently. In Session 1, A1 adds a C syllable word-finally twice and word-medially once. In Session 2, she adds this syllable type 12 times – twice at the start of the word (and utterance), five times word-medially and five times word- and utterance-finally. Examples of epenthesized C syllables are shown in (28).

(28) Examples of C syllable epenthesis

	Orthography	Target	Actual	Record
a.	*mommy*	[m□.mi]	[□m□.mi.**n**]	2;1.12-194
b.	*mâutâh*	[□maw.d□]	[□næ.**n**.da]	3;8.24-5

When found word-medially these syllables are typically found preceding a consonant with the same place of articulation, as in (31b).

4.2.6. Summary

The data from these two sessions show that A1 has acquired only two of the syllable types discussed in this

paper: CV and CVC syllables. She is still in the process of mastering the others (C and V syllables), with varying rates of success. Given that CV syllables are the least marked syllable type (Zec 2007) and that CV syllables are acquired first in other languages (Ohala 1995, Levelt et al. 2000), A1's earlier acquisition of this type of syllable is expected. Other studies (e.g., Demuth 1995, Levelt et al. 2000, Gnanadesikan 2004) have shown that that CV syllables are acquired before CVC syllables so A1's stages of acquisition of syllable types appears to be in keeping with observations made for other languages.

If a purely frequency-based approach were being used, A1 should have acquired C syllables before CVC structures; however, the data show that A1 acquired CVC syllables before C syllables. This suggests that C syllables, which are the result of syncope and are highly phonologically marked, are more challenging to learn, despite their frequency (Rose 2000). Finally, A1 is somewhat more successful at producing target-like C syllables (cf. §4.2.4) than V syllables (cf. §4.2.3); however, she is not close to acquiring either syllable type at age 3;8.24.

In the next section, A1's acquisition of NE Cree consonants is discussed.

4.3 The acquisition of NE Cree consonants

All of the consonants in the phonemic inventory except for /k^{w}/ are present in the target forms.

4.3.1. The acquisition of NE Cree onsets

The results discussed in this section are only for consonants coded as onsets. Those coded as onsets of empty-headed syllables (OEHS) will be discussed in the following section since, as §4.2 illustrated, they are found in syllables that A1 is in the process of acquiring.

4.3.1.1 Plosives

Plosives are the second most frequently occurring natural class in the sessions examined, accounting for approximately one-third of the consonants found in target forms (32.7% of Session 1 and 32.5% of Session 2). Given that frequently occurring phones may develop early (Bernhardt and Stemberger 1998), A1 was expected to show higher percentages of target-like productions of /p, t, k/. Results for /p/ are outlined in (29).

(29) Production of /p/ in Session 1

Attempted: 17

Target-like: 11 (64.7%)
Deleted: 0 (0.0%)
Substituted: 6 (35.3%)
Other labials: [w][10] 1 (5.9%)

[10] Recall that /w/ is being grouped with labials in this paper even though it has both labial and dorsal qualities but (§3.2).

Other plosives: [t] 4 (23.5%)
[k] 1 (5.9%)

Production of /p/ in Session 2

Attempted: 40

Target-like: 33 (82.5%)
Deleted: 4 (10.0%)
Substituted: 3 (7.5%)
Other labials: [w] 3 (7.5%)

In Session 1, A1 produces target-like sounds for /p/ at an above-chance rate in the first session (64.7%). When she does not produce a target-like consonant, A1 consistently substitutes, producing another plosive [t, k] 29.4% of the time or another labial [w] in 5.9% of her attempts. These substitutions look like long-distance assimilation, e.g., A1 produces the target *tâpâ ihtâu* [d□b□ □daw] ‘she’s not there (nobody’s there)’ as [d□□d□ du] (2;1.12-117); however, long-distance assimilation is not common in the data set.

In Session 2, A1 has mastered onset /p/, successfully producing target-like sounds in 82.5% of her attempts. Unlike Session 1, though, A1 is now sometimes deleting /p/. This occurs twice word-initially and twice word-medially; there does not appear to be a pattern for this strategy.

For /t/, A1 demonstrates near-mastery in both sessions, uttering target-like productions just over three-quarters of

the time. There is, in fact, little change between the two sessions.

(30) Production of /t/ in Session 1

Attempted:	51		
Target-like:	40	(78.4%)	
Deleted:	2	(3.9%)	
Substituted:	9	(17.6%)[11]	
Other coronals:	[□]	3	(5.9%)
	[s]	1	(2.0%)
	[j]	1	(2.0%)
Other plosives:	[p]	1	(2.0%)
Other obstruents:	[h]	2	(3.9%)
Other:	[w]	1	(2.0%)

Production of /t/ in Session 2

Attempted:	112		
Target-like:	88	(78.6%)	
Deleted:	5	(4.5%)	
Substituted:	19	(17.0%)	
Other coronals:	[□]	2	(1.8%)
	[s]	1	(0.9%)
	[n]	2	(1.8%)
	[l]	1	(0.9%)
	[□]	2	(1.8%)
	[j]	1	(0.9%)
Other plosives:	[p]	2	(1.8%)

[11] Due to rounding, the percentage listed next to “Substituted” is not always the same as the sum of the percentages listed for the segments substituted.

		[k]	7	(6.3%)
Other:		[w]	1	(0.9%)

As (30) shows, A1 rarely deletes, instead substituting an array of segments. She displays the most amount of variation in her substitutions for this consonant; she substitutes other coronals in 8.0% of her attempts and other plosives in another 8.0% of them.

Results for /k/ are shown in (31).

(31) Production of /k/ in Session 1

Attempted:	28			
Target-like:	20	(71.4%)		
Deleted:	3	(10.7%)		
Substituted:	5	(17.9%)		
Other plosives:		[t]	3	(10.7%)
Other:		[n]	1	(3.6%)
		[w]	1	(3.6%)

Production of /k/ in Session 2

Attempted:	49			
Target-like:	34	(69.4%)		
Deleted:	6	(12.2%)		
Substituted:	9	(18.4%)		
Other plosives:		[p]	2	(4.1%)
		[t]	3	(6.1%)
Other obstruents:		[s]	1	(2.0%)
Other:		[j]	3	(6.1%)

In Session 1, A1 appears to be close to mastering this segment in onset position but the results may be skewed due to one word—*kûhkûm* [□□kum] ‘grandmother’—occurring nine

times. In Session 2, A1 uses a greater variety of words with /k/ in onset position, although the name *Cammie* accounts for five of her target-like productions. Her rates of target-like, deleted and substituted productions are quite similar in both sessions, as they were for /t/.

Given the 80% benchmark, A1 has acquired one NE Cree plosive (/p/) and is on the cusp of acquiring the other two. These data are summarized in Figure 2. The results for /t/ and /k/ are consistent across sessions but those for /p/ show significant change.

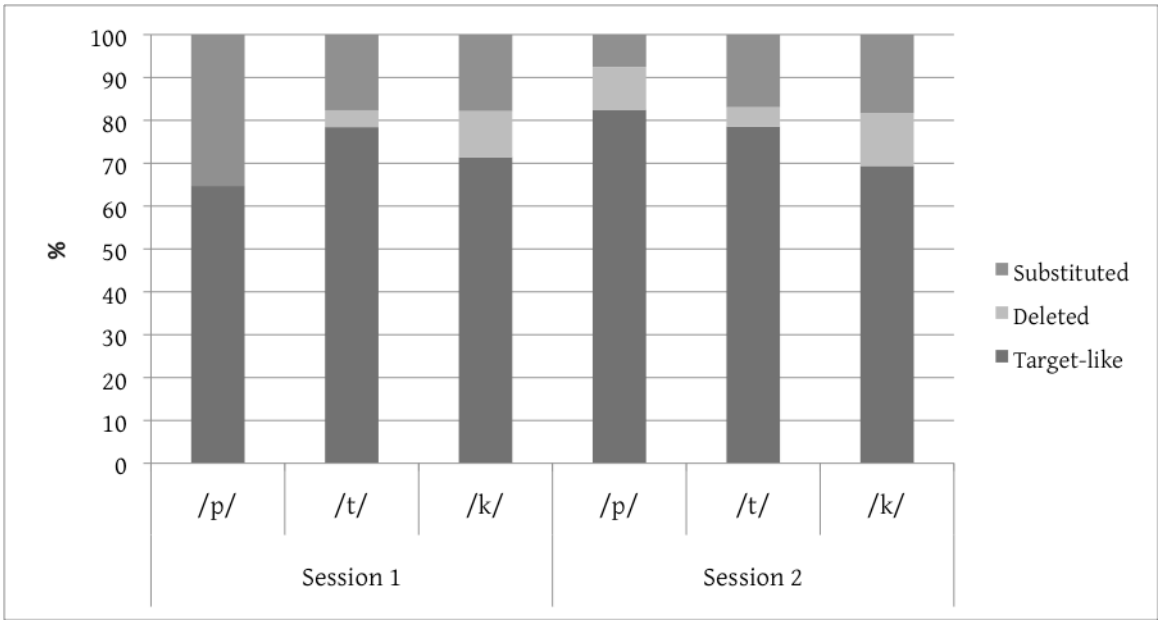


Figure 2. A1's acquisition of plosives in onset position.

4.3.1.2 Affricates

As illustrated in §2.1, there is only one affricate in NE Cree: /□/. A1's productions of this phoneme are displayed in (32).

(32) Production of /□/ in Session 1

Attempted: 15

Target-like:	4	(26.7%)		
Deleted:	2	(13.3%)		
Substituted:	9	(60.0%)		
Other coronals:	[t]	7	(46.7%)	
	[l]	1	(0.7%)	
Other obstruents:	[p]	1	(0.7%)	

Production of /□/ in Session 2

Attempted: 62

Target-like:	48	(77.4%)		
Deleted:	5	(8.1%)		
Substituted:	9	(14.5%)		
Other coronals:	[t]	3	(4.8%)	
	[s]	1	(1.6%)	
	[l]	1	(1.6%)	
	[n]	1	(1.6%)	
Other obstruents:	[k]	2	(3.2%)	
	[h]	1	(1.6%)	

In Session 1, A1 has not mastered this segment. She primarily substitutes other coronals, particularly [t] (46.7%). This deaffrication (to [t]) suggests that, at age 2;1.12, A1 has not yet acquired the [±anterior] (henceforth [±ant]) distinction. (This will also be discussed in the following section.) In Session 2, at age 3.8.24, she has nearly acquired this segment, though she still shows some

deaffrication, at a much lower rate (6.5% of her attempts). Affricates may be harder to acquire since they are complex, i.e. two-part gestures. Other studies have shown that substituting plosives for affricates is the most frequent pattern, followed by the substitution of fricatives for affricates (Bernhardt and Stemberger 1998). An example of A1's substitution is illustrated below.

(33) Example of A1's substitutions for /□/

Mommy chîyi û Mommy T: [□m□mi □i□jo □m□mi] A: [m□mi di□ m□mi]

'mommy this is you mommy' (2;1.12-51)

4.3.1.3 Fricatives

NE Cree contains three fricatives: /s, □, h/. Fricatives do not occur that frequently in the data set. In Session 1, there are only two instances of fricatives in onset position and, in Session 2, there are 48.

/s/ did not appear at all in the target forms in Session 1; in Session 2, A1 attempts this segment only five times.

(34) Production of /s/ in Session 2

Attempted: 5

Target-like: 3 (60.0%)
Deleted: 0 (0.0%)
Substituted: 2 (40.0%)
Other coronals: [□] 1 (20.0%)
Other obstruents: [f] 1 (20.0%)

As (34) illustrates, A1 is fairly successful at producing this segment in Session 2. (There does not appear to be a systematic explanation for the two substitutions that occurred.)

Like /s/, /ʃ/ does not appear frequently in this data set. In Session 1, it is present only once, so no conclusions can be drawn.

(35) Production of /ʃ/ in Session 1

Attempted: 1

Target-like: 0 (0.0%)
Deleted: 1 (100.0%)
Substituted: 0 (0.0%)

Production of /ʃ/ in Session 2

Attempted: 9

Target-like: 6 (66.7%)
Deleted: 0 (0.0%)
Substituted: 3 (33.3%)
Other coronal fricatives: [s] 2 (22.2%)
Other coronals: [ɹ] 1 (11.1%)

In Session 2, /ʃ/ is still infrequent; this session likely provides a more plausible assessment of A1's abilities, indicating that she is on her way to mastery. It is worth noting that her substitutions—all other coronals—are very similar to /ʃ/. Her two substitutions of [s] for /ʃ/ suggest that A1 has not acquired the [±ant] distinction, the only feature that distinguishes /s/ from /ʃ/. This distinction is

learned later in the acquisition process (Smit et al. 1990, Dinnsen 1992, Bernhardt and Stemberger 1998).

The laryngeal fricative /h/ was not expected to occur very often in onset position since it is found mainly in codas in the NE Cree lexicon (available at http://eastcree.org and on the *Cree Conversation CD and Manual* (Blacksmith et al. 2008)); its frequency in this study is likely a by-product of the low number of target forms containing /h/ in the data set.

Like /□/, /h/ appears only once in the target forms in Session 1 but is more frequent in Session 2, as illustrated in (36).

(36) Production of /h/ in Session 1

Attempted: 1

Target-like: 0 (0.0%)
Deleted: 1 (100.0%)
Substituted: 0 (0.0%)

Production of /h/ in Session 2

Attempted: 34

Target-like: 11 (32.3%)
Deleted: 20 (58.8%)
Substituted: 3 (8.8%)
Other laryngeals: [□] 1 (2.9%)
Other: [w] 1 (2.9%)
[n] 1 (2.9%)

When A1 is age 3;8.24, she demonstrates little mastery of this segment. However, the reduced form of the word *chiwâpihtân* [□a□h□n] ‘you (sg.) see’ occurs 20 times in

Session 2; /h/ is consistently deleted in this word, accounting for all of the deleted attempts. (This word is subject to a significant amount of deletion (M. MacKenzie, p.c., December 12, 2009). For this reason, I have analysed it as a reduced form of the word that appears in context.) In contrast, A1's target-like productions of [h] are restricted to one word, with variable target forms and orthography—*îhî / nîhî* [□□h□□, n□□h□] 'yes'—suggesting that her success might be restricted to a single, frequently occurring word.

On the whole, it appears that A1 has not acquired any fricative in onset position, although she demonstrates some success with all three, particularly /□/, which she possibly does not distinguish from /s/. The results are summarized in Figure 3.

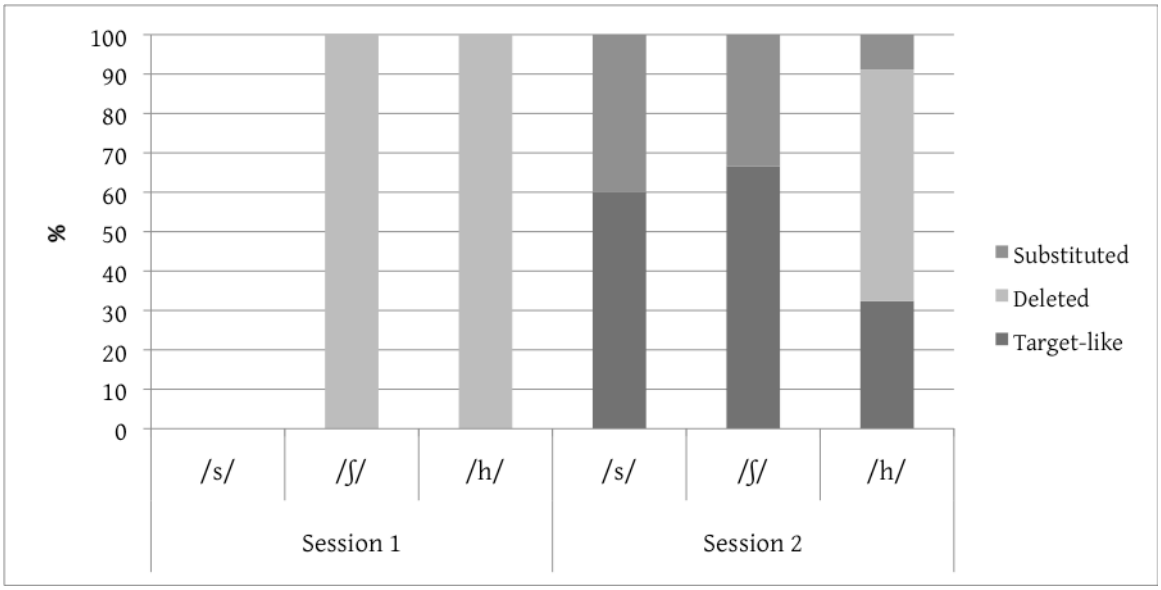


Figure 3. A1's acquisition of fricatives in onset position.

4.3.1.4 Nasals

Nasals are the most frequently occurring natural class in onset position in the data set. The results for /m/ and /n/, shown in (37) and (38) respectively, show that A1 is well on her way to acquiring nasals at age 2;1.12.

(37) Production of /m/ in Session 1

Attempted: 131

Target-like: 89 (67.9%)
Deleted: 22 (16.8%)
Substituted: 20 (15.3%)

Other labials:	[p]	6	(4.6%)
	[w]	2	(1.5%)
Other nasals:	[n]	4	(3.1%)
Other sonorants:	[j]	1	(0.8%)
	[□]	1	(0.8%)
Other:	[t]	5	(3.8%)
	[h]	1	(0.8%)

Production of /m/ in Session 2

Attempted: 133

Target-like: 91 (68.4%)
Deleted: 11 (8.3%)
Substituted: 31 (23.3%)

Other labials:	[p]	8	(6.0%)
	[w]	8	(6.0%)
	[f]	1	(0.8%)
Other nasals:	[n]	7	(5.3%)
	[□]	1	(0.8%)
Other sonorants:	[j]	1	(0.8%)
Other:	[t]	3	(2.3%)

[h] 1 (0.8%)
[□] 1 (0.8%)

In Session 1, A1 uses deletion and substitution at near equal rates. Her deletions are typically word-initial (20/22) and are found primarily in the first syllable of the word *mommy* (8/22); the other deleted segments happen across a variety of words. A1's substitutions do not appear to be systematic, although denasalization (/m/ → [p] or [t]) accounts for 11 of the 20 substitutions.

There is little change between sessions for A1's percentages of target-like productions of /m/. There are, however, differences in her rates of deletion and substitution: A1 deletes less and substitutes more in Session 2. In these substitutions, she is producing segments that share features with /m/ more frequently than she did at age 2;1.12—A1 substitutes a similar segment at a rate of 80.6% at age 3;8.24, compared with 60.0% in Session 1. This suggests that A1 is becoming better at producing this consonant, especially since most of the substitutions have the same place (17/31) or manner (8/31) of articulation as /m/.

As (38) shows, A1 has not acquired /n/ in Session 1 but she has mastered this phoneme in onset position by Session 2.

(38) Production of /n/ in Session 1

Attempted: 35

Target-like:	24	(68.6%)		
Deleted:	2	(5.7%)		
Substituted:	9	(25.7%)		
Other coronals:		[t]	2	(5.7%)
		[□]	1	(2.9%)
		[□]	1	(2.9%)
Other nasals:		[m]	3	(8.6%)
Other sonorants:		[w]	1	(2.9%)
Other:		[p]	1	(2.9%)

Production of /n/ in Session 2

Attempted: 124

Target-like:	100	(80.6%)		
Deleted:	12	(9.7%)		
Substituted:	12	(9.7%)		
Other coronals:		[t]	1	(0.8%)
		[□]	1	(0.8%)
		[j]	1	(0.8%)
Other nasals:		[m]	4	(3.2%)
Other sonorants:		[w]	2	(1.5%)
Other:		[p]	1	(0.8%)
		[f]	1	(0.8%)
		[□]	1	(0.8%)

In Session 1, A1 deletes infrequently and substitutes a variety of segments for /n/. Her substitutions in this session tend to share either place (4/9) or manner (3/9) of articulation with the target segment. In Session 2, she has passed the benchmark for acquisition, producing [n] in 81.5% of her attempts; interestingly, she also deletes and substitutes at equal rates at this age.

Overall, A1 shows two different rates of acquisition. For /m/, she displays almost no change in the percentage of target-like productions (at just under 70%) whereas, for

/n/, she demonstrates mastery by age 3;8.24. These results are summarized in Figure 4.

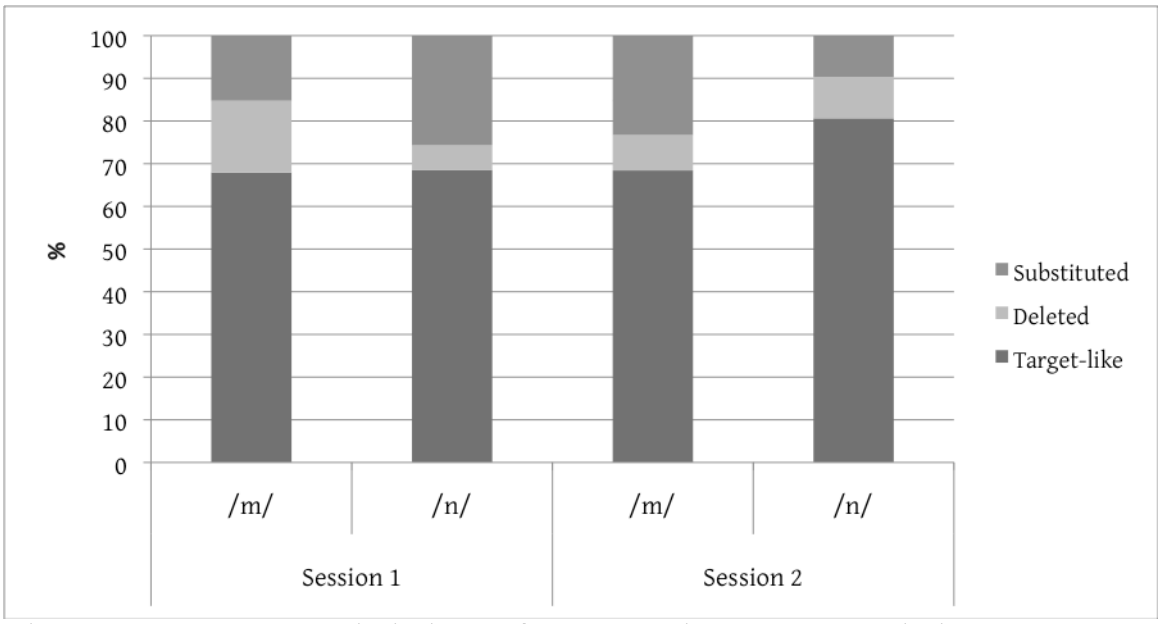


Figure 4. A1's acquisition of nasals in onset position.

4.3.1.5 Glides

In this study, glides coded as both 'onset' and 'ambiguously syllabified' in Phon have been counted as onsets. Recall from §3.1 that intervocalic glides were coded as ambiguously syllabified only in the following contexts: VGV (word-medial intervocalic glide, exemplified in (13a) and VG# #V (word-final glide followed by a vowel-initial word, in (13b). This example set is repeated on the following page.

(13) <u>Examples of glides coded as ambiguously syllabified</u>

a. *kiyâh nîyi* [gija ni 'yes, I will (3;8.24-

	ituhtâu	□it□daw]	go'	32T)
b.	*nîyi û*	[n**ij □o**]	'me (this is mine)'	(2;1.12-27T)

Including the ambiguously syllabified glides as onsets increases the number of attempts that A1 makes at glides in onset position, as well as the numbers in the three headings of the results (target-like, deleted and substituted) but does not alter the list of substituted consonants; A1 uses the same set of substitutes whether the glides have been coded as onsets or as ambiguously syllabified.

The results for /w/ are shown in (39). In Session 1, A1 makes only six attempts at this onset. Four of these six attempts were coded as ambiguously syllabified; A1 produced a target-like segment for only one of these four occurrences.

(39) <u>Production of /w/ in Session 1</u>

Attempted: 6

Target-like:	2	(33.3%)	
Deleted:	2	(33.3%)	
Substituted:	2	(33.3%)	
Other labials:	[m]	1	(16.7%)
Other:	[□]	1	(16.7%)

<u>Production of /w/ in Session 2</u>

Attempted: 17

Target-like:	10	(58.8%)	
Deleted:	5	(29.4%)	
Substituted:	2	(11.8%)	
Other glides:	[j]	1	(5.9%)
Other:	[t]	1	(5.9%)

In Session 1, there are too few instances of [w] in the target forms to make strong generalizations but the data suggest that A1 has not yet mastered this segment. As (39) shows, even at the later age, A1 has yet to acquire this consonant in onset position, though she seems to be progressing in that direction. The two substitutions in Session 2 occurred in words where [w] was coded as ambiguously syllabified; in both cases, A1 maintains place of articulation ([m]).

Session 2 yields a higher percentage of target-like productions, though A1 is still far below the benchmark for acquisition. In this session, 11 of the 17 attempts were coded as ambiguously syllabified; A1 produced a target-like segment six of the 11 times. Again, both instances of substitution occurred for segments coded as ambiguously syllabified.

For /j/, shown in (40), there is a similar pattern. There are few occurrences of the segment in the target forms in Session 1, eight of which have been coded as ambiguously syllabified.

(40) Production of /j/ in Session 1

Attempted: 9

Target-like: 4 (44.4%)
Deleted: 2 (22.2%)
Substituted: 3 (33.3%)
Other coronals:[t] 1 (11.1%)

	[l]	1	(11.1%)
Other:	[p]	1	(11.1%)

Production of /j/ in Session 2

Attempted: 33

Target-like:		24	(72.7%)
Deleted:		7	(21.2%)
Substituted:		2	(6.0%)
Other coronals:	[n]	1	(3.0%)
Other:	[k]	1	(3.0%)

A1 is more successful at producing target-like segments in Session 2, nearing the benchmark for acquisition. There are similar rates of deletion in both sessions but less substitution in Session 2.

By age 3;8.24, A1 has yet to master either glide in NE Cree. Glides, along with stops and nasals, are thought to develop earlier than fricatives and affricates (Gildersleeve-Neumann et al. 2000) and so A1 might be expected to acquire this class earlier in the process; however, she has not. For both /w/ and /j/, substitutions occur only with ambiguously syllabified segments, suggesting that A1 can differentiate between these and regular onsets. The data on glides are summarized in Figure 5.

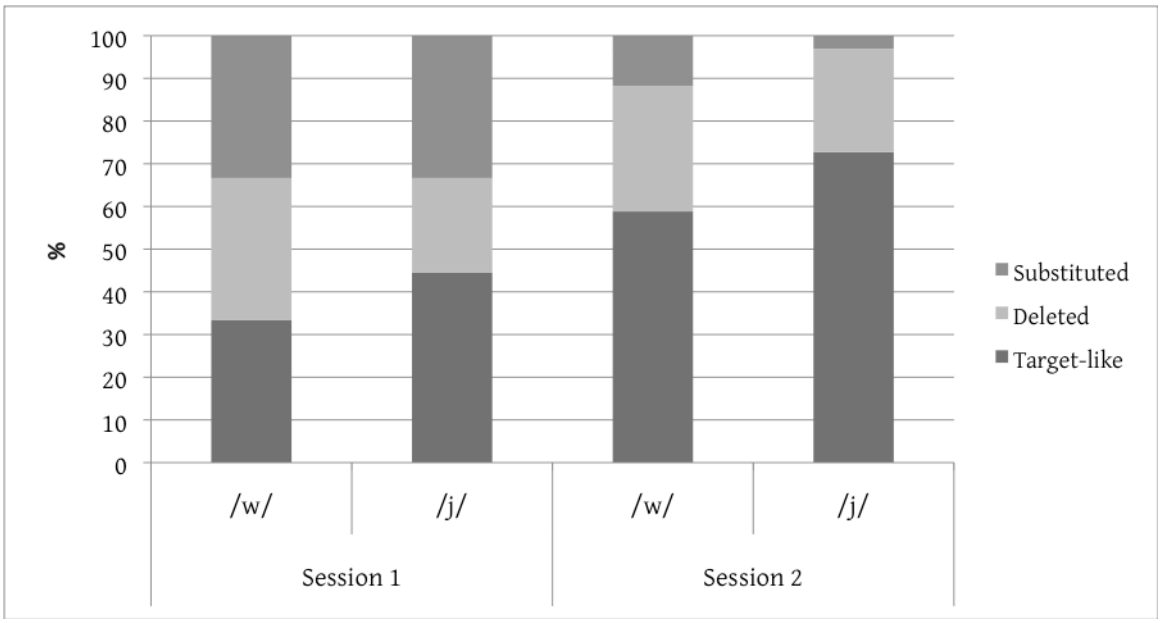


Figure 5. A1's acquisition of glides in onset position.

4.3.1.6 Summary

The data show that A1 is still in the process of acquiring consonants in onset position. She has acquired only two consonants—/p, n/—by age 3;8.24, producing them in over 80% of her attempts. She is nearing mastery of four other onset consonants, producing target-like segments for /t, k, □, j/ in over 70% of her attempts.

The data are summarized in Figure 6, which shows A1's acquisition of onset consonants by manner of articulation.

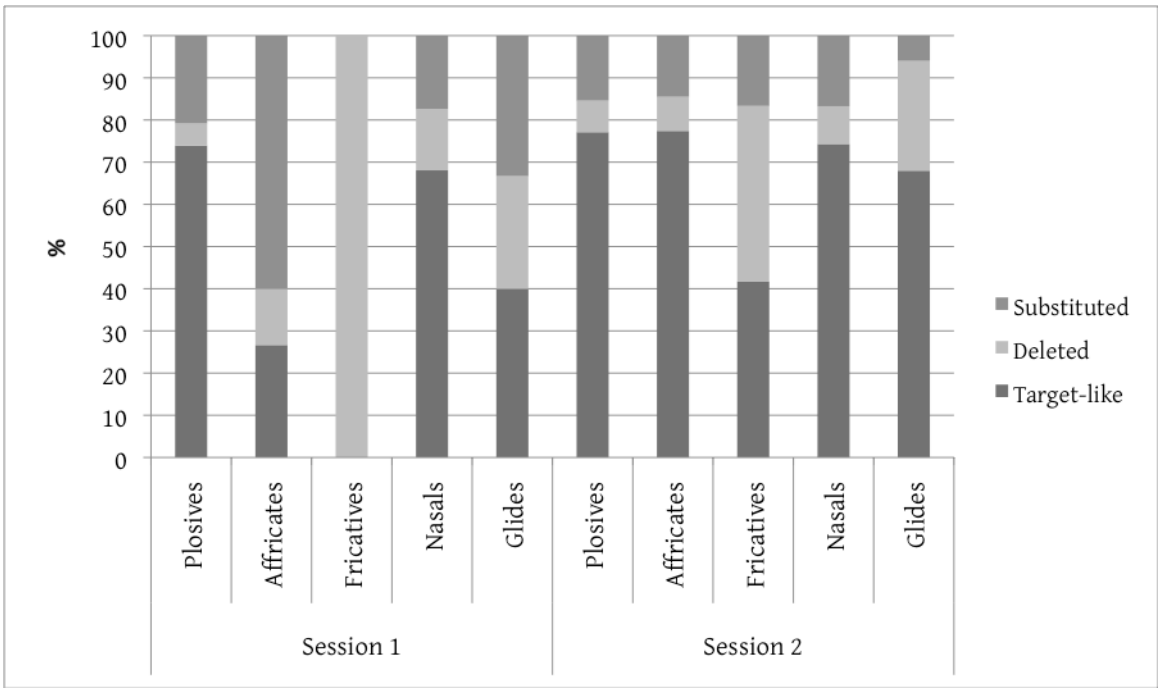


Figure 6. A1's acquisition of onsets by manner of articulation.

Figure 6 illustrates that although A1 has acquired certain consonants in onset position by age 3;8.24, and is nearing mastery of others, she has yet to utter target-like segments in any natural class at a rate of over 80%. She is nearing this benchmark with plosives (77.1% target-like), affricates (77.4% target-like) and nasals (74.3%), and is not far behind with glides (68.0%), but appears to still have difficulty with fricatives (41.7% target-like). Fricatives are also the natural class that A1 tends to delete the most, in both sessions, which suggests that this is the most challenging natural class for her to acquire; fricatives are acquired later than other classes of sounds (Salus and Salus 1974; Gildersleeve-Neumann et al. 2000).

Combining A1's target-like productions with her attempts where she substituted a segment with similar values, e.g., the same place or manner of articulation, provides a more positive assessment of A1's abilities. When A1's target-like productions are combined with her substitutions that share manner of articulation with the target, it favourably affects all of the natural classes except for the affricates, illustrated in Figure 7. When these two groups are combined, the data suggest that A1 has acquired manner of articulation for plosives.

Figure 7. A1's acquisition of onsets by manner of articulation (grouping substitutions of segments the same manner of articulation with the target-like productions).

The following chart shows A1's progress in the acquisition of NE Cree onsets with consonants grouped as obstruents and sonorants.

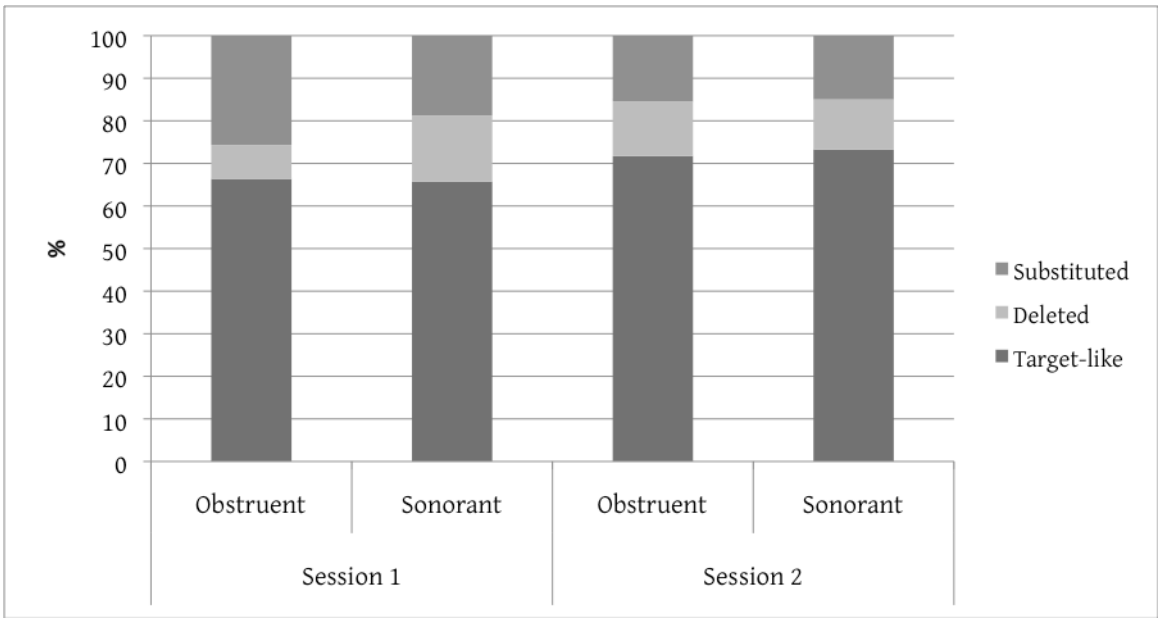


Figure 8. A1's acquisition of onsets (obstruents vs. sonorants).

Using such broad categories of phonemes reinforces that A1 is producing more target-like segments in Session 2, with a small increase in percentages for both sonorants and obstruents.

Once again, combining A1's target-like productions with substitutions of similar consonants provides a more positive description of A1's abilities, shown in Figure 9.

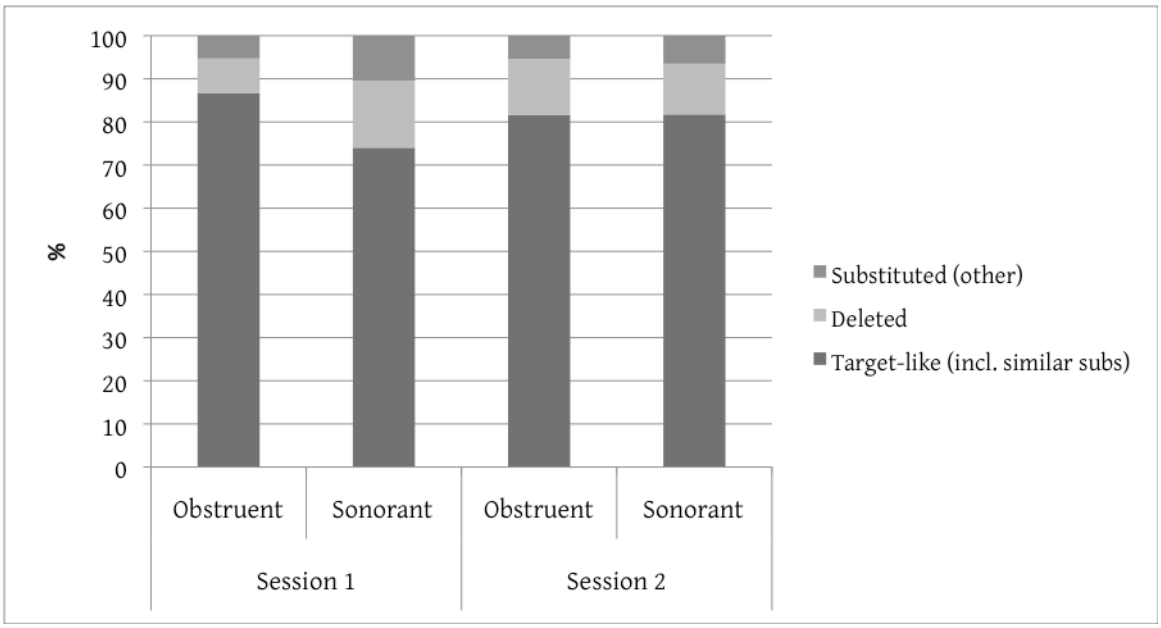


Figure 9. A1's acquisition of onsets (obstruents vs. sonorants, grouping substitutions of segments in the same class with the target-like productions).

As this chart demonstrates, when these categories are combined, it suggests that A1 has acquired the distinction between obstruents and sonorants by age 3;8.24.

When the data are examined in terms of place of articulation, a similar picture emerges, shown in Figure 10. In this chart, coronals are divided according to the [±ant] contrast since the target NE Cree consonants make this distinction.

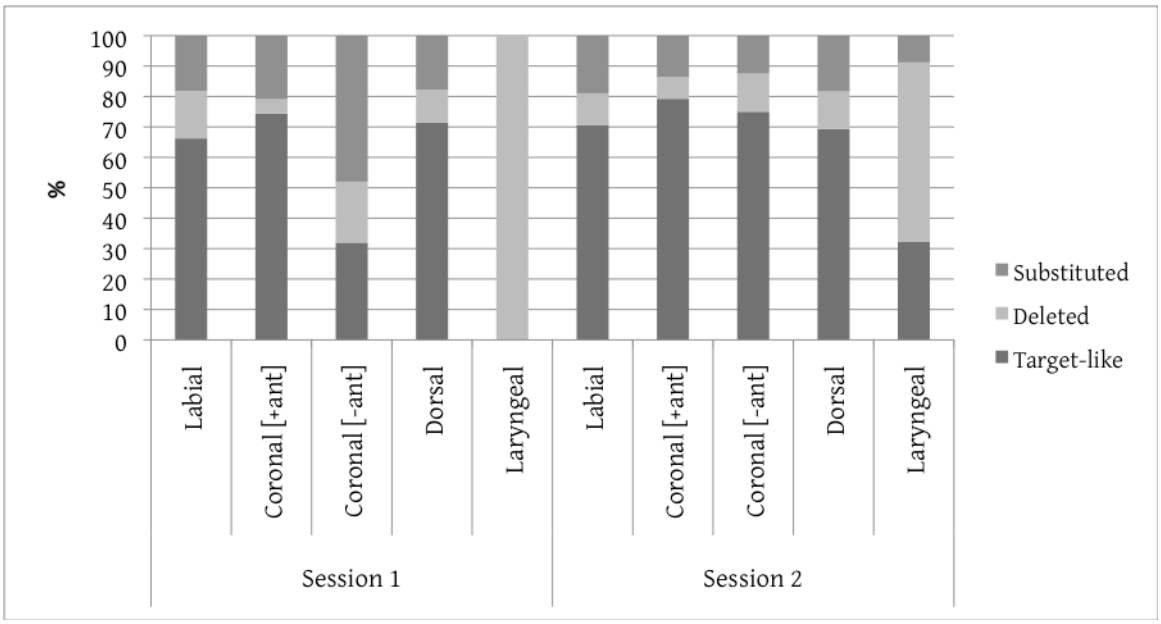


Figure 10. A1's acquisition of onsets by place of articulation.

As Figure 10 shows, A1 is nearing mastery of both groups of coronals (78.9% for those that are [+ant] and 71.4% for those that are [-ant]), as well as labials (70.5%). The dorsal and laryngeal categories are each represented by a single consonant—/k/ and /h/, respectively; however, A1 has yet to acquire either of these phonemes.

When A1's target-like productions are combined with the substituted segments that share the target's place of articulation, illustrated in Figure 11, changes are only visible for labials and coronals that are [±ant]; the other three categories remain the same as they were in Figure 10.

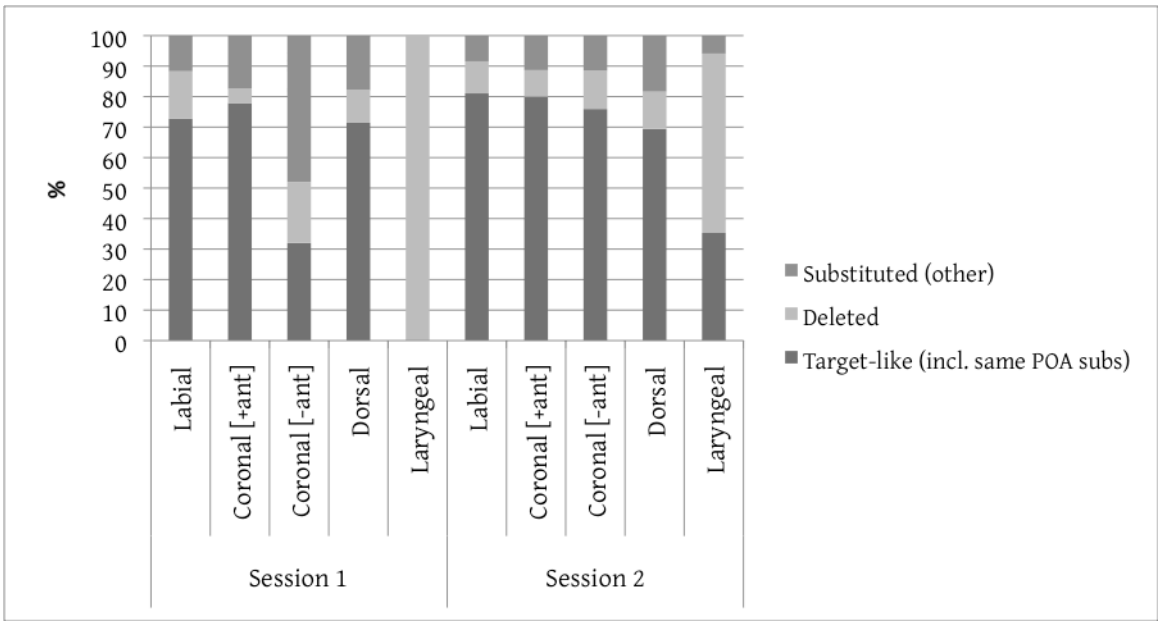


Figure 11. A1's acquisition of onsets by place of articulation (grouping substitutions of segments with the same place of articulation with the target-like productions).

As a result of these adjustments, it appears that A1 has acquired the place of articulation for NE Cree [+ant] coronals by age 2;1.12 and labials by age 3;8.24.

4.3.2. The acquisition of NE Cree onsets of empty-headed syllables

Onsets of empty-headed syllables (OEHS), or onsets of syllables with elided vowels (and word-final Cs), occur much less frequently than the onsets of syllables with an overt nucleus. As such, the data will be discussed primarily in terms of raw numbers, rather than percentages, although percentages are available in all examples. Only plosives, affricates and nasals appear as onsets of empty-headed syllables in the target forms of the sessions analysed; consequently, fricatives and glides are not discussed in this section. (Fricatives do not appear as onsets of empty-

headed syllables, presumably because there are few instances of sV, □V or hV sequences in the data. Glides are not found in this position, likely because they are part of a diphthong when followed by a consonant. The three natural classes that can occur in this position are all [-continuant] but this may be a by-product of the data, not the explanation.)

4.3.2.1 Plosives

Plosives occur infrequently as onsets of empty-headed syllables in this data set. For /p/, for example, there are no target forms with this consonant as an OEHS in Session 1. In Session 2, there are only four instances. Results are shown only for the latter session in (41).

(41) Production of /p/ as OEHS in Session 2

Attempted: 4

Target-like: 1 (25.0%)
Deleted: 0 (0.0%)
Substituted: 3 (75.0%)
Other plosives: [t] 3 (75.0%)

The single target-like production is found word-medially; the three substitutions are word-final. At first glance, it appears that A1 is consistently substituting a different plosive for [p] but these three instances all contain the same target form *apih* [□p□] 'sit', which A1 produces as [□j□t□aw □t □j□jaw □t] (3;8.24-333) and [□j□□aw j□t]

(3;8.24-334), so it is possible that this is a lexical effect.

The coronal plosive /t/ is the only one to occur with frequency in OEHS syllables. It is found three times as an OEHS in the target forms of Session 1 but is more common in Session 2, illustrated in (42).

(42) Production of /t/ as OEHS in Session 1

Attempted:	3	
Target-like:	1	(33.3%)
Deleted:	2	(66.7%)
Substituted:	0	(0.0%)

Production of /t/ as OEHS in Session 2

Attempted: 39

Target-like: 26 (66.7 %)
Deleted: 10 (25.6%)
Substituted: 3 (7.7%)
Other coronals:[□] 3 (7.7%)

A1's three attempts at OEHS /t/ in Session 1 are all word-final; all but four of the attempts in Session 2 are word-final as well. Three of the word-medial attempts resulted in target-like productions; the other resulted in a deletion. Of the 35 word-final attempts at this segment, 65.7% were target-like, 25.7% were deleted and 8.6% were substituted.

Although it appears that A1 is fairly successful at producing [t] as an OEHS in Session 2, she is often repeating the same words. Specifically, A1 attempts *mitâhtu* [m□dæt□, midat□] 'ten' 14 times, *nishtu* [n□□t, n□□t□] 'three' 11 times and the (typically-reduced) verbal root *ihtut* [d□t, d□t□, dut□] 'do' seven times, accounting for 32 of the 39 occurrences of this segment as an OEHS. This suggests that the information in (42) may not accurately represent A1's abilities at this stage of development, or that she is learning to produce OEHS C-syllables on a word-by-word basis.

Like /p/, the final NE Cree plosive /k/ was not found in the target data for Session 1; however, as (43) shows,

/k/ appears as an OEHS more frequently in Session 2, both word-medially and word-finally.

(43) Production of /k/ as OEHS in Session 2

Attempted:	24		
Target-like:	15	(62.5%)	
Deleted:	7	(29.2%)	
Substituted:	2	(8.3%)	
Other:	[□]	2	(8.3%)

15 of the 24 instances of /k/ as an OEHS were found word-medially, 13 of these in the [k□] or [ks] syllables discussed in §4.2.4. In these attempts, /k/ was deleted six times, substituted twice and produced in a target-like manner seven times. Of the nine word-final segments, eight of these attempts were target-like; the remaining attempt resulted in a deletion. This suggests that A1 is more successful with /k/ as a word-final OEHS.

It is worth noting that most of the deletions occur word-medially in longer utterances. The two instances of OEHS [□] in the actual forms appear in the same word—target *achihkush* [□.□□u.k□] 'star' produced as either [□□□□] (3;8.24-238) or [□□□□□] (3;8.24-239)—suggesting that the presence of [□] in the actual forms might be word-specific. Also, as with other plosives in OEHS position, [k] appears in the same words repeatedly in this session: *pâyikw* [bajk, bajk□] 'one' appears seven times, *pâyikushtâu* [bajk□taw, bajk□daw] 'nine' six times and the root *kusht-* [k□t] 'be

scared’ four times (in utterances such as *chikushtâu* [□□k□□taw] ‘you scared?’ (3;8.24-71T)).

Overall, it seems that A1 has become more aware of plosives as onsets of empty-headed syllables but it is not possible to determine whether she has acquired them in this position, or is producing them only in specific words, due to the small sample size. However, when word position is taken into account, it appears that A1 is closer to acquiring plosives that are word-final onsets of empty-headed syllables than those that are word-medial. She produces target-like utterances in 66.7% of her word-final attempts and 50.0% of her word-medial ones. It remains to be seen if A1 is acquiring final OEHS position or if this is lexical learning.

4.3.2.2 Affricates

Like /p/ and /k/, the affricate /□/ does not appear as an OEHS in Session 1 although it is present in the target forms of Session 2. Results for this session are shown in (44).

(44) Production of /□/ as OEHS in Session 2

Attempted: 13

Target-like: 0 (0.0%)
Deleted: 12 (92.3%)
Substituted: 1
Other coronals:[t] 1 (7.7%)

All attempts are found in word-final position; the 12 instances of deletion occur when /□/ is preceded by /□/. For example, A1 produces the target word *nîshwâshch* [ni□□□□□] 'nine' as [ni□□□□] (3;8.24-125) and *kutwâshch* [□□□d□□□] 'six' as [□n□□□□] (3;8.24-156). It is possible that deletion occurs because of the articulatorily complex sequence [□□]. For the single substitution, A1 produced [t]; deaffrication was also found with /□/ in onset position (§4.3.1.2).

4.3.2.3 Nasals

Both NE Cree nasals appear as onsets of empty-headed syllables. The results for /m/ are shown in (45).

(45) Production of /m/ as OEHS in Session 1

Attempted:	9	
Target-like:	0	(0.0%)
Deleted:	9	(100.0%)
Substituted:	0	(0.0%)

Production of /m/ as OEHS in Session 2

Attempted: 3

Target-like: 1 (33.3%)
Deleted: 1 (33.3%)
Substituted: 1
Other nasals: [n] 1 (33.3%)

A1 did not produce [m] in empty-headed syllables at age 2;1.12, categorically deleting these segments. These occurrences were all of the same word—*kûhkûm* [g□kum] 'grandmother'—so it is impossible to say whether A1 has yet to acquire this segment in this syllable position, or this word. In Session 2, A1 still displays difficulty with /m/ as an OEHS. A1 begins to produce [m] as an OEHS but is only successful in one of her three attempts; all three instances of /m/ as on OEHS are both word- and utterance-final.

For /n/, a different pattern emerges. When A1 is age 2;1.12, she produces target-like segments or deletes equally. In this session, all of the deletions are found word-finally; the target-like productions are evenly divided between word-medial (3/7) and word-final (4/7) positions. The three target-like word-medial productions were all found in the same word – *mânitâh* [□mænd□] 'like that', which produces as either [□n□□d□] (2;1.12-82) or as [□n□d□] (twice in 2;1.12-145) – so this may be a lexical effect. (Note that A1's production of this word as [□n□□d□] shows no syncope

in the syllable in question; syncope is optional in NE Cree.)

(46) Production of /n/ as OEHS in Session 1

Attempted:	13	
Target-like:	7	(53.8%)
Deleted:	6	(46.2%)
Substituted:	0	(0.0%)

Production of /n/ as OEHS in Session 2

Attempted: 48

Target-like:	23	(47.9%)		
Deleted:	20	(41.7%)		
Substituted:	5	(10.4%)		
Other coronals:		[t]	3	(6.3%)
Other nasals:		[m]	1	(2.1%)
Other:		[p]	1	(2.1%)

The results for Session 2 show a similar distribution of rates, although A1 occasionally substitutes other segments for /n/, typically those that share place or manner of articulation with the target consonant. All of these substitutions occurred for word-final onsets of empty-headed syllables. This suggests A1 is making progress with the acquisition of word-final OEHS since her percentage of target-like productions is nearly identical to Session 1. When A1's attempts are analysed according to position in the word, the data show that she was more successful at producing OEHS /n/ word-medially: she produces target-like segments in 53.8% of the word-final attempts and in 77.8% of the word-medial ones.

4.3.2.4 Summary

A1 has yet to acquire any particular consonant as an OEHS. Only six phonemes appear as onsets of empty-headed syllables in this data set: /p, t, k, □, m, n/. Figure 12 shows the data grouped according to place of articulation.

Note that the results for plosives for Session 1 are only for /t/ since the other two were not found in OEHS position in Session 1.

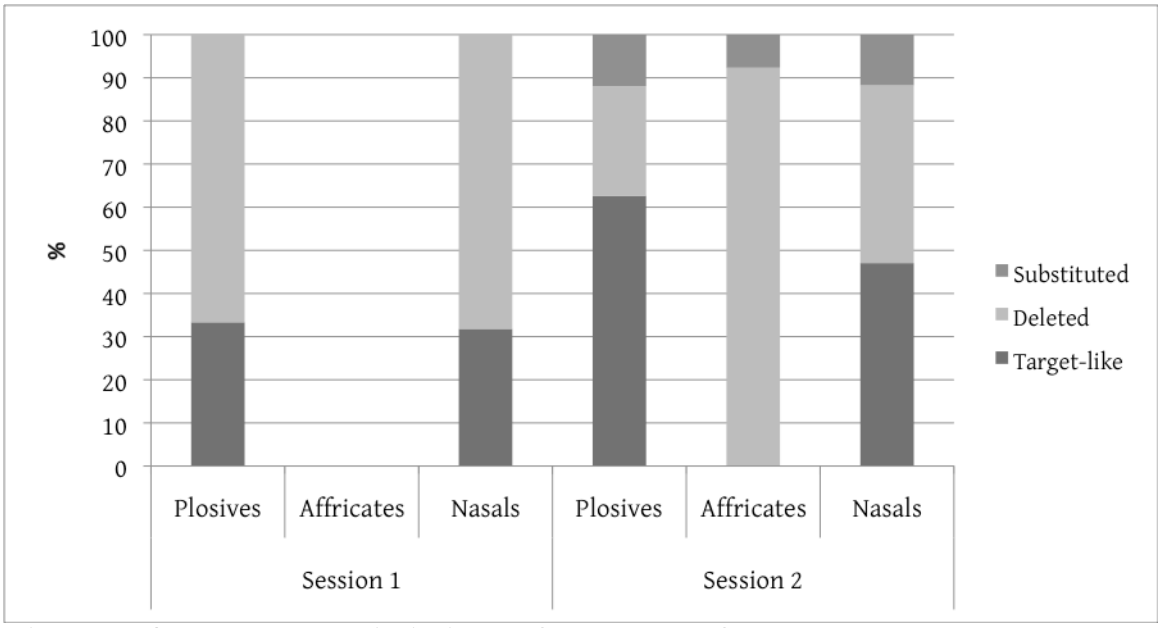


Figure 12. A1's acquisition of onsets of empty-headed syllables by manner of articulation.

The chart illustrates that A1 has yet to master onsets of empty-headed syllables; it also suggests that she will acquire plosives in the position first since she produces target-like utterance 61.5% of the time at age 3;8.24. OEHS plosives are heavily aspirated (Power 2009), while OEHS nasals are not; this increased saliency may make it easier to acquire plosives in this environment.

In Figure 13, the data are grouped as obstruents and sonorants. A1 shows near identical progress in these two classes of sounds.

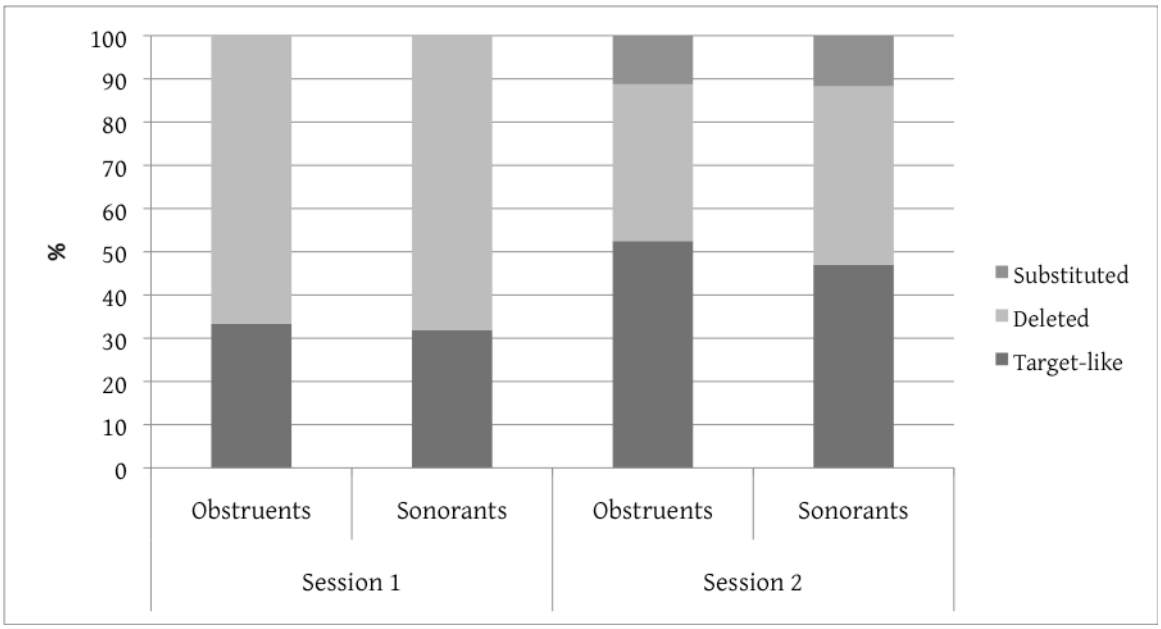


Figure 13. A1's acquisition of onsets of empty-headed syllables (obstruents vs. sonorants).

Specifically, A1's rates of target-like productions increase by the same amount, and she also begins to substitute, with near equal percentages, at age 3;8.24.

In Figure 14, these findings are grouped according to manner of articulation. Only the relevant categories are included.

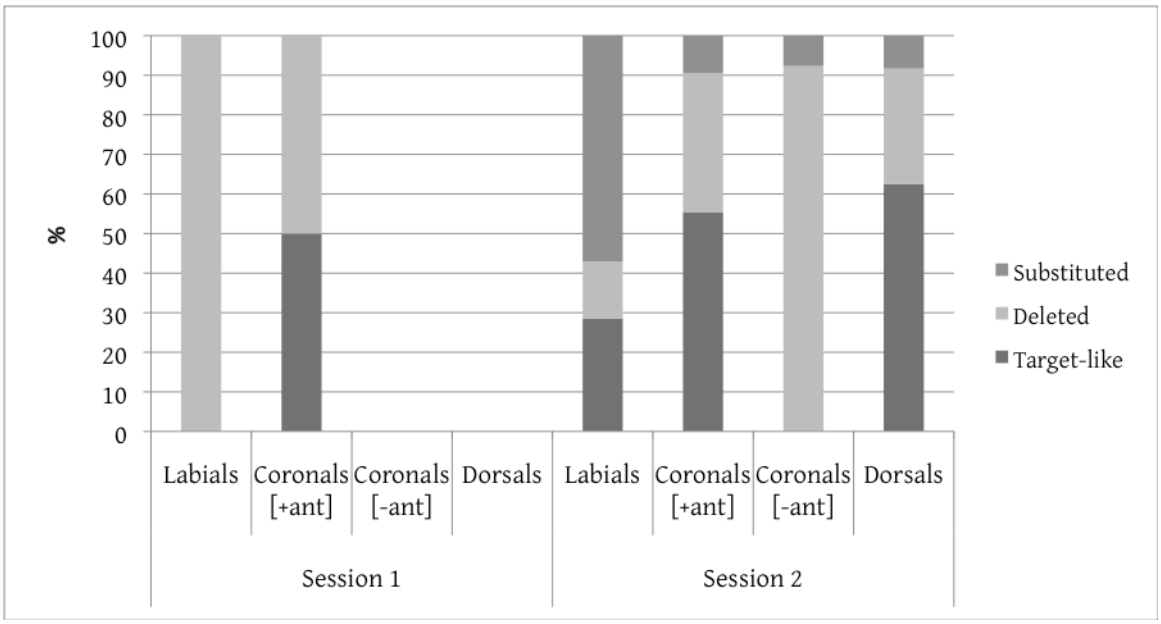


Figure 14. A1's acquisition of NE Cree onsets of empty-headed syllables by place of articulation.

As this chart shows, A1 is most successful with dorsals (/k/) and least successful with labials (/p, m/); her ability to produce target-like coronals is the same at both ages.

When the OEHS data are examined in terms of word position, in Figure 15, they show that A1 is making significant progress in her acquisition of these segments.

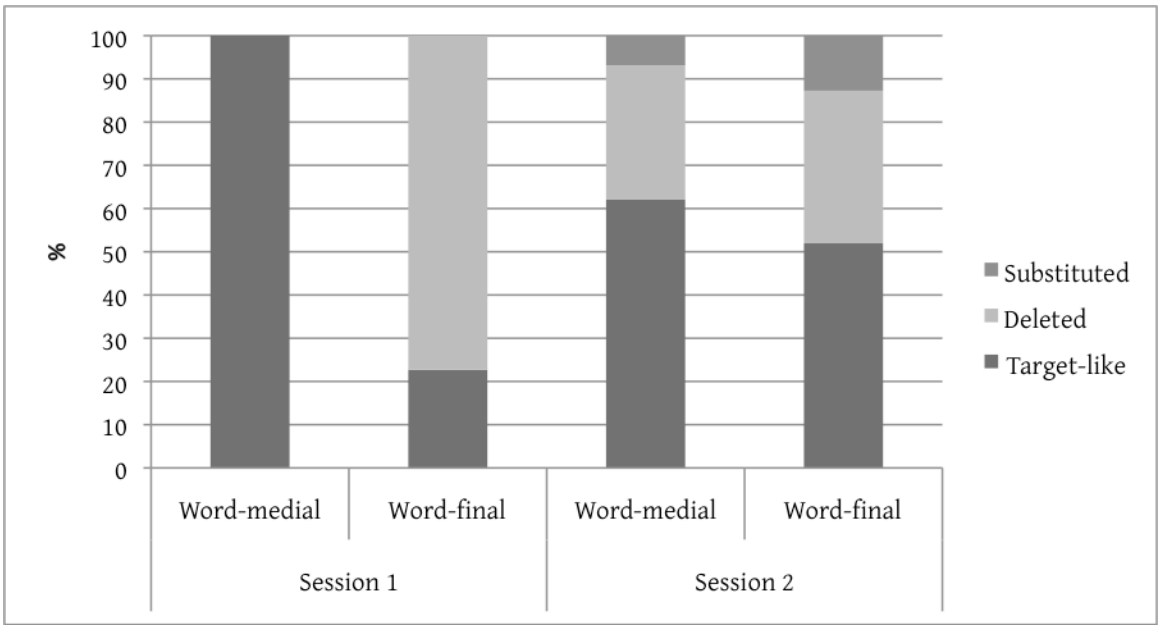


Figure 15. A1's acquisition of onsets of empty-headed syllables by word position.

Recall that there were only three instances of word-medial OEHS consonants in Session 1, and that they all occurred in the same word - *mânitâh* [□mænd□] 'like that' (cf. §4.3.2.3). This means that the 100.0% target-like result for word-medial consonants in OEHS position for Session 1 in Figure 15 is probably not an accurate representation of A1's abilities at age 2;1.12. However, this chart shows that A1 has made significant progress with word-final onsets of empty-headed syllables between sessions.

An examination of A1's target-like productions in terms of manner of articulation and word position shows that A1 is more successful with plosives word-finally and with nasals word-medially.

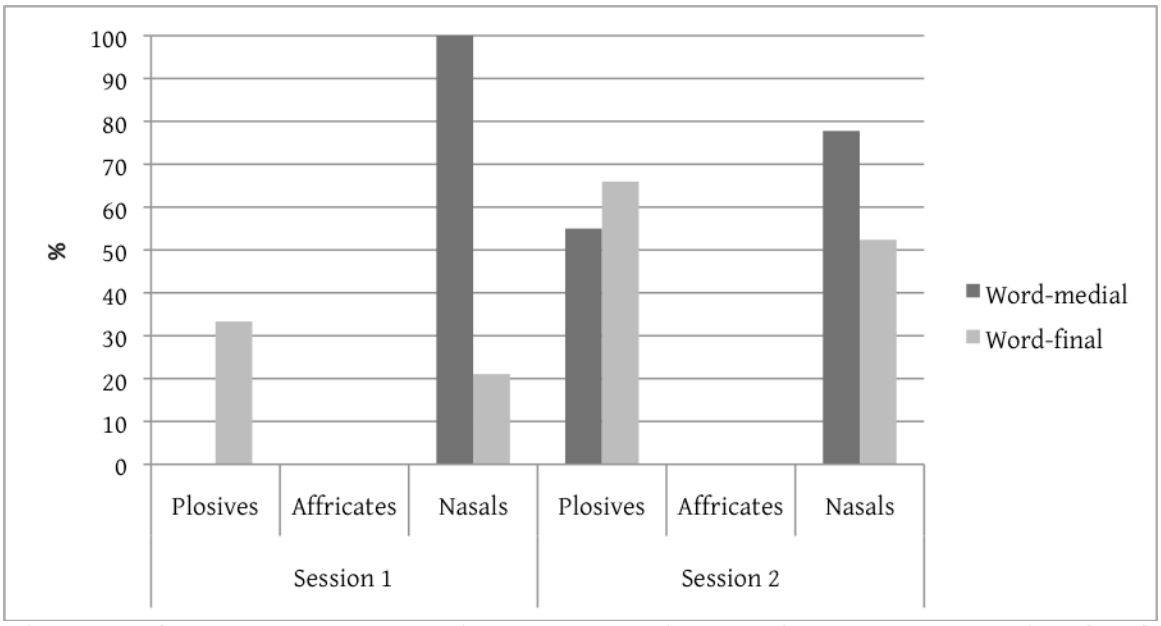


Figure 16. A1's target-like productions of consonants in OEHS position by manner of articulation and word position.

In sum, A1 appears to be recognising segments as onsets of empty-headed syllables and is becoming increasingly more accurate with her productions of these consonants in this type of syllable. However, she has yet to acquire any segments in this syllable position by Session 2. When word position is considered, it becomes clear that A1 is slightly more successful at producing target-like onsets of empty-headed syllables word-medially; in Session 2, she produces target-like segments word-medially in 62.1% of her attempts, compared to 52.0% for her word-final attempts. The plosives go against this general trend; A1 is more successful with word-final segments in this natural class (66.0% target-like word-finally vs. 55.0% word-medially). It is also possible that A1's target-like productions are a result of lexical

learning; more data are required to determine what strategy she is employing.

4.3.3. The acquisition of NE Cree codas

As discussed in §2.1, only fricatives can occur in canonical coda position in NE Cree. As such, this section is confined to the three fricatives found in the phonemic inventory of the language: /s, □, h/.

The alveolar fricative /s/ is not present in coda position in Session 1 and appears only twice in Session 2:

(47) Production of /s/ as coda in Session 2

Attempted:	2	
Target-like:	1	(50.0%)
Deleted:	0	(0.0%)
Substituted:	1	(50.0%)
Other:	[□] 1	(50.0%)

A1's target-like production is found in a word-initial syllable, in which she produces the Target form of *iskuluyan nîyi* [**s**k□□l□jæn] 'when I go to school' as [**s**koloni] (3;8.24-101). Since there are so few instances of /s/ in coda position in the data set, no strong conclusions can be drawn; however, it is possible that being word-initial makes the coda [s] in this utterance more perceptually prominent to A1. (In addition, /s/ is prominent (strident) on its own.)

The results for the postalveolar fricative /ʃ/ are shown in (48). A1 demonstrates the most success for this coda consonant.

(48) Production of /ʃ/ as coda in Session 1

Attempted:	4	
Target-like:	3	(75.0%)
Deleted:	1	(25.0%)
Substituted:	0	(0.0%)

Production of /□/ as coda in Session 2

Attempted: 51

Target-like: 41 (80.4%)
Deleted: 4 (7.8%)
Substituted: 6 (11.8%)
Other: coronal fricatives: [s] 3 (5.9%)
[h] 1 (2.0%)
Other coronals: [t] 1 (2.0%)
[□] 1 (2.0%)

As the above data illustrate, /□/ appears only four times in Session 1 and is correctly produced three of these times. All three of these productions occur in the diminutive suffix *-ish*, suggesting that A1 may have acquired this morpheme, rather than this segment in coda position.

In Session 2, however, A1 demonstrates that she has acquired this segment in this position, producing in just over 80.0% of the time. /□/ occurs quite frequently in coda position in NE Cree numbers. The numbers that appear in this session are: *nîshu* [□ni□] 'two', *nishtu* [□n□□t□] 'three', *nikutwâshch* [n□□□□d□□□, □□□d□□□] 'six', *nîshwâshch* [ni□□□□□, ni□□□□] 'seven' and *pâyikushtâu* [□bajk□taw, bajk□□daw] 'nine', listed here in their target forms. These numbers account for 34 of the 51 attempts at this coda /□/ (with 31 target-like productions). When she does not produce a target-like segment, A1 deletes or substitutes another coronal with near equal frequency.

When word position is considered, it becomes clear that A1 is more successful with /□/ when it is found as a word-medial coda, producing a target-like segment in 91.7% (33/36) of her attempts. Word-finally, A1 has a target-like production 64.3% of the time (9 out of 14 attempts).

Coda /h/ is not found in Session 1 and appears only sporadically in Session 2. NE Cree has a tendency to delete coda [h], with compensatory lengthening of the vowel (http://www.usc.mun.ca/~cdyck/eastcree.htm/hsounds.htm, accessed Jan. 19, 2010); few examples were expected. The results for Session 2, in (49), show that A1 deletes the coda /h/ when present in the target form. All three attempts are found in word-final position.

(49) Production of /h/ as coda in Session 2

Attempted:	3	
Target-like:	0	(0.0%)
Deleted:	3	(100.0%)
Substituted:	0	(0.0%)

In the records containing the three times that [h] appears as a coda, A1 accurately produces nearly all of the other segments. Since [h] occurs so infrequently in the data, it is not possible to determine why deletion occurs but it seems likely that this is because A1 has yet to acquire coda consonants.

Since coda consonants are more marked than onset consonants, children tend to acquire these later (e.g., Demuth 1995, Gnanadesikan 2004). This, combined with the fact that coda consonants occur much less frequently than onset consonants in the data set, make it unsurprising that A1 has acquired only one of the three NE Cree coda consonants by age 3;8.24.

4.3.4. Summary: A1's acquisition of NE Cree consonants

Overall, A1 shows progress in her acquisition of NE Cree consonants over a 19-month span, from age 2;1.12 to age 3;8.24. This information is summarized in the charts on the following page, which show the percentages and total N for each consonant in each position. Figure 17 shows the results for Session 1. At this stage, A1 has not acquired any consonants, though she is approaching the acquisition benchmark (80.0%) with plosives and nasals in onset position, and coda /□/.

	Onset				OEHS				Coda			
	N	Tar.	Del.	Sub.	N	Tar.	Del.	Sub.	N	Tar.	Del.	Sub.
/p/	17	64.7	0.0	35.3	0	-	-	-				
/t/	51	78.4	3.9	17.6	3	3.33	66.7	0				
/k/	28	71.4	10.7	17.9	0	-	-	-				
/□/	15	26.7	13.3	60.0	0	-	-	-				
/s/	0	-	-	-					0	-	-	-

/□/	1	0.0	100.0	0.0					4	75.0	25.0	0.0
/h/	1	0.0	100.0	0.0					0	-	-	-
/m/	13	67.9	16.8	15.3	9	0	100.0	0.0				
/n/	35	68.6	5.7	25.7	11	45.5	54.5	0				
/w/	6	33.3	33.3	33.3								
/j/	9	44.4	22.2	33.3								

Figure 17. Summary of A1's consonants at age 2;1.12.

Figure 18 summarizes the results from Session 2. Bolded numbers indicate that A1 has achieved or surpassed the benchmark of acquisition.

	Onset				OEHS				Coda			
	N	Tar.	Del.	Sub.	N	Tar.	Del.	Sub.	N	Tar.	Del.	Sub.
/p/	**40**	**82.5**	**10.0**	**7.5**	4	25.0	0	75.0				
/t/	112	78.6	4.5	17.0	39	61.5	25.6	7.7				
/k/	49	69.4	12.2	18.4	24	62.5	29.2	8.3				
/□/	62	77.4	8.1	14.5	13	0.0	92.3	7.7				
/s/	5	60.0	0.0	40.0					2	50.0	0.0	50.0
/□/	9	66.7	0.0	33.3					**51**	**80.4**	**7.8**	**11.8**
/h/	34	32.4	58.8	8.8					3	0.0	100.0	0.0
/m/	13	67.7	8.3	15.8	3	33.3	33.3	33.3				
/n/	**124**	**80.6**	**9.7**	**9.7**	47	4.7	42.6	10.6				
/w/	17	58.8	29.4	11.8								
/j/	33	72.7	24.2	3.0								

Figure 18. Summary of A1's consonants at age 3;8.24.

At this stage, A1 has acquired /p/ and /n/ in onset position, as well as /□/ in codas. Interestingly, A1 has target-like productions of /□/ more frequently in coda position than in onset (where she has target-like productions 66.7% of the time in this session). This may be attributed to the phonotactic distribution of /□/.

5. Discussion

Looking at these two sessions reveals that A1 is making progress in her acquisition of NE Cree. The syllable data show that A1 has acquired CV syllables, the most common syllable type in the data by Session 1, producing target-like syllables in 87.5% of her attempts at the form. Since the CV syllable is unmarked and, consequently acquired first in many languages, this indicates that A1's acquisition of NE Cree follows universal norms. By Session 2, she has acquired CVC syllables but has yet to master the other two syllable types in NE Cree. The results for C syllables are quite interesting because A1 shows a great deal of improvement between sessions, with her rate of target-like productions going from 14.3% to 56.5%. Although C syllables occur more frequently in the data than CVC syllables, A1 has not mastered this syllable type, likely because they are phonologically marked. Finally, she produces target-like V syllables approximately 40% of the time in both sessions.

A1's acquisition of consonants also progresses between sessions. In Session 1, recorded when she was 2;1.12, A1 has not passed the benchmark of acquisition for any of the NE Cree consonants, in any of the syllable positions considered. By Session 2, recorded at age 3;8.24, A1 has acquired three segments: /p/ and /n/ in onset position, and coda /□/. An examination of her acquisition of natural classes at this stage in her development reveals that A1 has nearly acquired plosives (77.1% target-like), affricates (77.4% target-like) and nasals (74.3%) as onsets, and is approaching competence with glides (68.0%). She continues to have difficulty with fricatives (41.7% target-like) in this position, the natural class that A1 tends to delete the most in both sessions. Adopting a more liberal interpretation of her productions, in which similar substitutions are grouped with target-like productions, suggests that she may have acquired manner of articulation for onset plosives, as well as the distinction between obstruents and sonorants in this position.

The data on onsets of empty-headed syllables show that A1 has yet to acquire this position. She demonstrates differing levels of acquisition based on word position: A1 produces more target-like consonants word-medially than word-finally. When the data are grouped according to their

natural classes, however, they show that this is true for nasals in Session 2; plosives show the opposite result.

A1 demonstrates some success with coda consonants, namely /□/. This may be due to the fact that fricatives are acquired later than other natural classes, or to the fact that onsets are typically acquired earlier than codas. The other two NE Cree fricatives do not appear frequently in coda position in the data set.

Overall, A1 is acquiring the consonants and syllable types of NE Cree. From the two sessions examined, it is not possible to determine when she will acquire the full consonant inventory and all of the syllable types, but there is nothing in the data that indicates that this will not happen.

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