DEGEMINATION AND PROSODY IN LABRADOR INUTTUT:

AN ACOUSTIC STUDY

by

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A Thesis

Submitted to the School of Graduate Studies in Partial Fulfilment of the

Requirements for the Degree of

Master of Arts

Department of Linguistics

Memorial University of Newfoundland

November 2012

St. John's Newfoundland and Labrador

ABSTRACT

In this thesis, I investigate the acoustic expression of Schneider's Law (SL), a consonant degemination rule observed in three dialects of Inuktitut (Labrador Inuttut, Quebec Inuttitut, and Northwest Territories Siglitun), the characterization of which had so far been based largely on aural-impressionistic data transcriptions. Given the expression of this rule, which conditions alternations between syllables that end with consonants versus vowels, thereby affecting rhythmic qualities of the language, I set out to perform instrumental measurements of spontaneous and elicited speech recorded in Labrador, Canada. My observations of SL from various acoustic viewpoints confirm its characterization in the scientific literature as virtually exceptionless and independent from any system of recurring metrical stress. I further demonstrate that Labrador Inuttut itself seems to be devoid of any type of metrical conditioning, in any of the phonetic correlates of stress usually considered in the literature (intensity, duration or pitch). I however note a systematic pattern of phrase-final syllable strengthening, which I show to co-vary with F0 boundary tones. The observed phenomena are consistent with descriptions of related dialects, except that the rule in Labrador Inuttut is shown to also include aspiration of phrase-final stop consonants.

Master of Arts Thesis

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Acknowledgements

Nakummik to thank. v. Nakumminiakkat. Make sure you thank her/him. NakutlakKutit. Thank you very much.

The above is a lexical entry in UKauset katitsutauppaliningit (literally, ‘a collection of words’) compiled in 1976 from a weekend gathering of Inuit Elders in Nain, Labrador on Canada’s northeast coast. It is the single most important text in the writing of this thesis and sparked my interest in the dialect of Inuktitut spoken in Labrador. A tattered copy became virtually attached to my left arm starting in 2000 when my family decided to speak only Inuktitut to our newborn daughter Anika Eta Nochasak-Pigott. The simple format, 3,000 lexical entries with definitions, examples and miniature hand-drawn illustrations, was a superb introduction to the frighteningly difficult written appearance of this polysynthetic language. The genius of the ‘word collection’ is the defined examples, extracted and edited by Rose Jeddore (Pamak) from the spontaneous speech of Inuit Elders who got together to talk about their language. My first thanks is to them, nakutlakKutit.

The next thanks goes to my best supporters and academic supervisors Dr. Doug Wharram and Dr. Yvan Rose. Without their knowledge and steadfast encouragement this important research could not have been realized. Thanks as well to Dr. Carrie Dyck for daring me to “crack Schneider’s Law,” to Dr. Paul De Decker for advice on phonetics, to Dr. Phil Branigan for taking me up the faraway tree of syntax and to Dr. Marguerite MacKenzie for all manner of support, both academic and personal. To the patient wisdom of Ruby Bishop in particular, and all the staff and students in the Linguistics Department at Memorial in general, I am forever indebted. Thanks specifically to Linguistics students Karen Hunter, Kelly Burkinshaw and Victoria Allen for their transcription work. Thanks as well to Derek Norman at Memorial’s Media Centre for use of professional recording equipment, Dr. Yvan Rose at Memorial’s Speech Sciences and Language Acquisition Laboratory for the use of their studio, and to the OKâlaKatiget Society, the Inuttut broadcaster in Nain, for loans of their studio space, video equipment and reporter Josh Pamak.

Thanks go also the ISER Foundation, Vale INCO, Nalcor, and Air Labrador for in-kind support and funding.

Nakummesuak, a huge thanks to the participants, translators and helpers with my field research in alphabetical order: William Anderson III, Joe Atsatata, Joan Dicker, Augusta Erving, Amos Fox, Doris Flowers, Edward Flowers, Bertha Holeiter, Boas Kaitok, Maria Harris, Julius Ikkusik, Lucas Ittulak, Sara Ittulak, Veruna Ittulak, Markus Kojak, Boas Jararuse, Paul Jararuse, Christine Nochasak, David Nochasak, Levi Nochasak, Phillip Abel, Phyllis Maggo, Jacko Merkuratsuk, Minnie Merkuratsuk, Hubert Paliser, Derek Pottle, Eddie Pottle, Andrew Piercey, Martin Jararuse, Kitora Tuglavina, Mary White, Brian Williams, Fran Williams, Henry Winters, Abia Zarpa and three language consultants who asked to remain anonymous.

Finally thanks to my wife Helen Toozer. Without her love and support none of the following would be possible. Diolch, i fy nghariad.

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1 Introduction

1.1 Preliminaries

This thesis is about a degemination phenomenon described in Eskimo-Aleut literature as Schneider's Law (henceforth, SL). Through instrumental measurement of Labrador Inuttut spontaneous speech, I show that SL applies exceptionlessly throughout hundreds of spoken utterances. Following an insight from Dresher & Johns (1995), who state that SL cannot be related to metrical stress, I show that SL does not co-vary with any measurable phonetic correlate of stress. Indeed, I show that SL is unrelated to any rhythmic or intonational characteristic of the system. For example, I show that lengthened phrase-final syllables co-vary with interrogative/declarative boundary tones depending on the dialogue context, without regard to the application or non-application of SL. The results are thus consistent with acoustic studies of related dialects (e.g. West Greenlandic), which also find no evidence of a metrical system of alternating stress in the language.

1.2 Thesis objectives

In this study I attempt to document the SL phenomenon in current speech samples from Labrador Inuttut language consultants. The goal is to verify proposals found in the previous scientific literature on SL, especially Dresher & Johns (1995), who argue that the rule is virtually exceptionless, refers exclusively to underlying geminates in adjacent syllables and operates independently from durational, intensity, and pitch prominence. To confirm the latter, a secondary aim of this study is to show the nature of intonation in current Labrador Inuttut speech with the expectation that the data studied here will be consistent with the accounts of intonation in West Greenlandic (Mase 1973, Rischel 1974, Nagano-Madsen 1990, 1993, 1994) and Quebec Inuttitut (Massenet 1980). The final goal of this thesis is to say something about the nature of rhythm in Labrador Inuttut, an issue that remains unresolved in the scientific literature on the Inuit languages.

1.3 The Eskimo-Aleut Language Family

The Eskimo-Aleut Language Family is a continuum of related grammars and vocabularies which includes six languages spoken on the Aleutian Islands, a dialect grouping spoken on the Chukotka Peninsula and in Southern Alaska, and a group of mutually intelligible dialects spoken across the North American Arctic from the Bering Strait in Alaska to the East coast of Greenland and Southern Labrador (Dorais, 1990). The intermediate group comprises the various dialects of Yupik, which Hayes (1995:239) describes as stress-timed with persistent left-to-right iambs, and with the context-dependant assignment of either one or two moras to CVC. The latter group is the 'Eskimo' branch of the family and includes Inupiaq in Alaska and the Northwest Territories, Inuktun and Inuktitut in Canada as well as several dialects in Greenland. Dorais (1990:2) calls the Eskimo branch the 'Inuit language' and that is how this group of related dialects will be referred to here. Dorais claims that speakers from as far away as the Bering Strait and Labrador can, with some difficulty, understand each other. Across the Inuit languages, Creider (1981) observes a continuum of Regressive Assimilation, showing that from the perspective of phonology, each dialect is slightly different in the way it deals with heterogeneous consonant clusters. Following the schematic generalization in Dorais (1990:41), the most conservative form is Western Alaskan Inupiaq in which there are eleven attested underlying environments for consonant clusters at the surface level: [mr, nr, χC, UVULARC, kC, VELARC, pC, BILABIALC, tC, ALVEOLARC, jFRICATIVE]. In the dialects of Inupiaq spoken in the North Slope region of Alaska and Northwest Territories, the number of environments drops to eight with the [χC, kC, pC, tC] distinctions assimilating into surface geminates. Inuktun has seven underlying environments for consonant cluster formation and the Western Canadian Arctic dialects of Inuktitut have five. The Baffin Island and Arctic Greenland dialects of Inuktitut have four, the same number as the remaining two dialects in Greenland. The dialect of Inuktitut in Quebec has only two environments, [rŋ, UVULARC], illustrated for example by the fact that speakers call their language, phonetically, [inuttitut]. Dresher & Johns (1995:83) show that the process of RA is complete in Labrador Inuttut, an Eastern Canadian dialect of Inuktitut where consonant clusters assimilate for manner, primary place and secondary place. The primary data collected for this thesis come from 31 Labrador Inuttut speaking language consultants. It is of primary interest as one of only three dialects in Eskimo-Aleut shown by Smith (1975:105) to have exceptionless degemination so that, moving left-to-right, the second in a pair of syllable-adjacent geminates is always reduced: CV(V)**CC**V(V)**CC**V→ CV(V)**CC**V(V)**C**V. The phenomenon was first documented by Lucien Schneider, a Catholic missionary who lived with Inuit in Quebec from the late 1930's until his return to France in 1974. Schneider (1966) describes the pattern for

Quebec Inuttitut while Dorais & Lowe (1982) show a more restricted form of SL in the Inuktun dialect of Northwest Territories Siglitun.[1]

1.3.1 Background literature on the phonology of Labrador Inuttut

The compiled works on Labrador Inuttut phonology make up a slender volume in the Inuit languages literature, a body of linguistic inquiry that begins in Greenland with a phrase book by Egede (1721) and the dictionary of Egede (1760:6-7). The latter shows that vowel length is phonemic with a series of minimal pairs. Rischel (1974:26) compares phonemic pairs from current West Greenlandic with their counterparts in Egede (1760), showing how vowel length is phonemic:

		West Greenlandic (Egede 1760)	West Greenlandic (Richel 1974)
(1)	a.	aulārpok[2]/aúlarpok ‘moves’ ‘leaves’	[aːlaːrpuq]/[aːlarpuq]
	b.	mânna/mánna ‘now’ ‘that one’	[maːnna]/[manna]

The opaque orthography used by Egede in (1) makes it difficult to interpret the accent marks used to show vowel length, but Rischel’s comparison shows that they must relate to phonemic vowel contrasts. Rischel (1974) makes another comparison from Egede

1 In Northwest Territories Siglitun the schema $CV(V)\mathbf{C}_i\,\mathbf{C}_iV(V)\mathbf{C}_i\mathbf{C}_iV(V) \rightarrow CV(V)\mathbf{C}_i\,\mathbf{C}_iV(V)\mathbf{C}_iV(V)$ properly describes the behaviour of SL. However unlike Quebec Inuttut, where SL also targets underlying consonant clusters, in Northwest Territories Siglitun the rule applies exclusively to underlying geminates. As a result the following schema is attested in that dialect: $CV(V)\mathbf{C}_i\,\mathbf{C}_iV(V)\mathbf{C}_i\mathbf{C}_jV(V) \rightarrow CV(V)\mathbf{C}_i\,\mathbf{C}_iV(V)\mathbf{C}_i\mathbf{C}_jV(V)$.

2 Egede’s use of the mid tone marker in this example and the hat marker in (1b) seems to indicate in both examples that the vowel is long.

(1760) to current West Greenlandic, showing that phonemic contrast can also be based on consonant duration:

(2) West Greenlandic (Egede 1760) West Greenlandic (Richel 1974)

a. írsilerpa/irsilérpa [issilirpa:]/[isilirpa:]
'begins to freeze' 'begins to look at him/her'

b. aggiúta/aggiutá [aɣɣi^{j}uta:]/[aɣi^{j}uta:]
'day of arrival' 'his/her file'

Rischel (1974:91) writes that the "terminology [used by Egede] reflects a transfer from Latin grammar and metrics rather than a real analysis of the Eskimo pattern, but it happened to be the crucial distinction in Eskimo as well." These phonemic contrasts are one hallmark of the Inuit languages; acoustic results shown in §5.1.1 document this phenomenon in current Labrador Inuttut speech. The literature also describes most of the Eskimo-Aleut languages in Alaska and Siberia as stress-timed and iambic. Only a handful of phonological studies have been done in the Central and Eastern Arctic, with published acoustic results only for West Greenlandic and Quebec Inuttitut. Kleinschmidt (1851) contains an aural-impressionistic account of West Greenlandic phonology. Instrumental measurement for this dialect comes from Mase & Rischel (1971), Mase (1973), Rischel (1974), Nagano-Madsen (1990, 1993, 1994), and Jacobsen (2000). The latter concludes that stress is not a relevant category, based on her measurement of words produced in carrier sentences by two language consultants. Massenet (1980) derives a similar conclusion from his acoustic analysis of Quebec Inuttitut. As there are no acoustic studies of Labrador Inuttut to follow, these accounts of West Greenlandic and Quebec Inuttitut inform the analysis of the data considered here. This thesis will not rely on Erdmann (1864) or Bourquin (1891). Both adopt Kleinschmidt's orthography and phonological account or West Greenlandic, impacting the written form of Labrador Inuttut and confusing the phonological picture of the dialect until Dresher & John's (1995) account, a work which forms the basis of the phonetic and phonological description of Labrador Inuttut in Chapter Two.

1.3.2 Thesis roadmap

In the remainder of this chapter I present the theoretical framework for this thesis. Chapter Two begins with a phonetic and phonological sketch of Labrador Inuttut, followed by a brief description and schematic representation of SL as observed in the Inuit dialects. I conclude Chapter Two with a discussion of my preliminary results, which show no evidence of syllabic trochees, moraic trochees or iambs as described in Metrical Stress Theory (MST hereafter) by Hayes (1995). In Chapter Three, I discuss in detail the background literature on SL in the Inuit languages, syllable prominence in West Greenlandic and intonation in West Greenlandic and Quebec Inuttitut. Chapter Four contains a discussion of the methodology used to design the linguistic interviews, implement the fieldwork, and analyze the results. The end of that chapter includes a detailed description of four types of data and the manner in which they were analyzed to produce the results introduced in Chapter Five. That chapter summarizes results which show that SL is virtually exceptionless, unrelated to metrical conditioning, and independent of intonation. I conclude in Chapter Six with a brief summary of the most central arguments of this thesis as well as some of their contributions for the field and related areas.

1.4 Theoretical framework

This thesis follows the model of multilinear generative phonology, assuming segments are made up of distinctive features. These largely coincide with the feature bundles proposed in Chomsky & Halle's (1968) *Sound Pattern of English*, but that linear approach is rejected here for a model where the various units comprised within phonological systems can be divided into independent components with potentially multiple associations between them. Goldsmith's (1976) autosegmental approach recognizes that features can spread across segmental or prosodic boundaries, grouping this sharing of segmental material into a geometry of interdependent features, the relations between them forming the locus of phonological patterning. This thesis adopts the skeletal tier to represent segmental duration. For syllabification, consider Kahn's (1976) *Maximum Onset Principle* (MOP), stated as follows:

(3) *Maximum Onset Principle* (MOP) (Kahn, 1976)
First make the onset as long as it legitimately can be; then form a legitimate coda.

This thesis follows Kahn's view that the context of phonological rules can often be captured by referencing duration to syllable-based generalizations. The rhythmic model accepted here is Selkirk's (1980) hierarchically organized prosodic domains, including the prosodic word, foot, syllable and mora. For the latter, this thesis follows Prince (1984) in representing intervocalic geminates as doubly-linking consonantal material to both a coda and the onset position following it across the syllable boundary. While none of the data produced by the current research contradicts the generalizations stated within MST as proposed by Hayes (1995), this thesis shows that Labrador Inuttut is not a "stress-timed" language, and therefore lies outside the MST framework. This thesis follows, instead, the syllable timing alternative proposed by Kager (1993, 1995) and "syllable-timed" theory as proposed in Abercrombie (1967), Ladefoged (1975), Roach (1982), Ramus, Nespor & Mehler. (1999) and Nespor, Shukla, & Mehler (2010). Each of the above will now be considered in more detail.

1.4.1 Autosegmental phonology

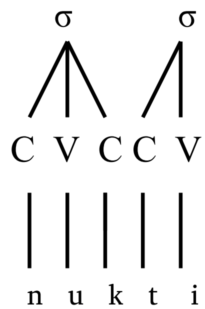
A multilinear approach to features allows a better description of assimilatory processes. As mentioned in §1.3, in the Eastern Canadian dialects of the Inuit languages, consonant clusters undergo Regressive Assimilation, so that [inuktitut] 'like the inuit' becomes [inuttitut] in Quebec Inuttitut: dorsal-coronal clusters become coronal-coronal /kt/→ /tt/. Under *SPE,* general rules would result in an inelegant description that depends on a self-contained list of place features. In an autosegmentalized representation, segmental features are organized under nodes for manner (voice, nasal, and continuant) and place, with assimilation spreading featural material from one node (the trigger) to the next (the target). Dresher & Johns (1995) use feature geometry (see §3.3.2) to account for the natural classes of sounds that participate in these assimilation processes.

1.4.2 CV tier: representing duration

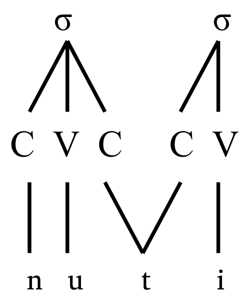
From the articulatory characteristics of segments, we turn next to the representation of their length. The skeletal tier organizes segments into an abstract sequence of time units or slots which can then have the added specification of [± syllabic], with vowels (V) being [+syllabic] and consonants [–syllabic]. I adopt the CV-Tier model argued for by Clements & Keyser (1983), so that the examples [inuktitut, inuttitut] can both be represented as VCVCCVCVC or, if we treat geminates as taking up a single slot, [inuttitut] = VCVCVCVC. The question of geminate representation is a key issue in the study of Labrador Inuttut where all geminates are underlyingly clusters of consonants and thus both the target and trigger of SL. CV-Tier theory can be of assistance in explaining geminate structure because it allows for slots with no segmental material or with segments not associated with a single syllable node. In this study, I will consider syllable-based generalizations that might help us to represent SL in Labrador Inuttut. The dichotomy between /kt/ and /tt/ as CC is thus represented in (4), where the geminate in (4b) straddles two syllables and is not limited to one syllable node:

(4) CV-Tier representation in Inuktitut.

a.



b.



Syllabification in Inuttut follows the Maximum Onset Principle, stated in (3), above. The fact that /kt/ and /tt/ are not legitimate onsets supports syllabification as V.CVC.CV.CVC, with two timing slots for geminates. Further support comes from the feature geometry posited by Dresher & Johns (1995:88), where pharyngeal geminates in Quebec Inuttitut are shown to have two root nodes. The implications for Labrador Inuttut and the data considered here are the subject of the next chapter.

2 Phonological sketch of Labrador Inuttut

2.1 Accounts of the phonemic inventory and phonological processes

The first mention of Labrador Inuttut phonology in the literature comes from published letters between Kleinschmidt & Bourquin (1881). Most of their discussion is about the orthographic representation of Labrador Inuttut versus the dialects in Greenland. Kleinschmidt's system was adopted in Labrador by Moravian Missionaries, resulting in a written form that did not match the phonetic reality of the spoken language. This led to a religious form of the dialect heard today only in church, "Moravian Inuttut," which will not be considered in this thesis. The data under investigation come from linguistic interviews, including directed oral tasks, reading, descriptions of images and spontaneous conversations with language consultants in informal settings. The first generative phonological description of Labrador Inuttut comes from Smith's (1975:101) "autonomous phonemic inventory," adapted in Smith (1977a), Dorais (1990), and Dresher & Johns (1995), as follows:

(1) Labrador Inuttut consonant inventory (adapted from Dresher & Johns 1995:82)

	Labial	Coronal	Palatal	Velar	Uvular	Glottal
voiceless stops	p	t		k	q*	
voiceless fricatives		s		x	χ	h
voiced fricatives	v/β			ɣ		
lateral approximants		ɬ, l				
nasals	m	n		ŋ	ɴ	
glides			j			

* /q/ varies with the velar /k/

This inventory is consistent with the consonants observed in the data considered here, though [β], [ɴ] and [h] are virtually absent. Also, in the context of phrase/utterance-final lengthening and pitch effects detailed in §5.2, the stops [p], [t], [k] and [q] are in complementary distribution with [pʰ], [tʰ], [kʰ] and [qʰ]. These aspirated variants arise in the rightmost segment position of a phrase or utterance, while the unaspirated stops [p], [t], [k] and [q] arise elsewhere.

All of the stops and most of the fricatives from the inventory in (1) are shown by Smith (1975) as having a phonemically long, meaning-changing, variant:

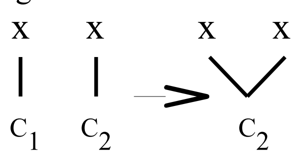
(2) Labrador Inuttut surface geminate inventory (adapted from Smith 1975:102)

pp	tt, tɬ		kk	qq
	ss		kx	qχ
ff, pv			χχ, xx	
	ɬɬ, ll			
mm	nn		ŋŋ, ɴɴ*	
		dʒ		

* /ŋŋ/ varies with the uvular /ɴɴ/

Smith’s (1975) representation of the mixed clusters [kx], [qχ], [ts], [tɬ] and [dʒ] as phonemes is not entirely correct. Dresher & Johns (1995) show that each of these clusters is in fact the phonetic realization of geminates at the phonemic level. Part of Smith’s treatment of clusters is due to the misleading orthography.[1] For example, the consonant cluster Smith writes as -kq- is, phonetically, [kx] or [qχ]. These consonant clusters arise at the surface level in the data considered here and the crucial insight from Dresher & Johns (1995) is that [kx] and [qχ] derive through affrication from the underlying phonemes /xx/ and /χχ/, respectively, and that [ts], [tɬ], and [dʒ] derive from the underlying phonemes /ss/, /ɬɬ/ and /jj/, respectively. Dresher & Johns’s (1995) further show that each of these underlying phonemes is the result of Regressive Assimilation:

(3) Regressive Assimilation in Labrador Inuttut (Dresher & Johns 1995:82)



According to Dresher & Johns’s (1995) analysis, if a voiceless stop [p], [t], [k] or [q] arises in the C_2 position of (3), it assimilates C_1 resulting in the phonemes [pp], [tt], [kk] or [qq]. A voiceless fricative [s], [χ] or [ɬ] in the C_2 position also assimilates the place of articulation of C_1 but the process results in affricates [ts], [qχ] or [tɬ] at the surface level under the rule (1995:82): “voiceless spirant geminates are affricated.” The nasals are straightforward, with Regressive Assimilation resulting in the surface forms [mm], [nn],

1 Prior to the adoption of a standardized orthography by Labrador Inuit in 1980.

[ŋŋ] and [ɴɴ]. The voiced fricatives and lateral approximants [v], [l] and [ɣ] assimilate C_1 and then devoice, realized as [ff], [ll] and [χχ/xx] under the rule (1995:83): "voiced obstruent geminates devoice." Finally, the glide [j] assimilates C_1 then affricates to [dʒ], following the above affrication rule. Dresher & Johns (1995) thus show that Regressive Assimilation applies to all underlying clusters in Labrador Inuttut. They also show that Regressive Assimilation must be followed by Affrication and Devoicing in the following rule ordering:

(4) Labrador Inuttut phonological processes (adapted from Dresher & Johns1995:83)

Underlying	/Cp/	/Cv/	/Cs/	/Cɣ/	/Cχ/	/Cj/
Regressive Assimilation	pp	vv	ss	ɣɣ	χχ	jj
(Palatal) Affrication			ts		qχ	dʒ
Devoicing		ff		χχ		
Surface	[pp]	[ff]	[ts]	[χχ]	[qχ]	[dʒ]

Dresher & Johns (1995) also refine Smith's (1977b) generalization, based on the following data, that SL simplifies geminates and heterogeneous consonant clusters:

(5) SL and 'mixed clusters'(Smith 1977b, from Dresher & Johns 1995:83)

a.	pisu(k) + kqaa + vuk	→	pisukqaavuk	's/he walks'
b.	ikqa + kqaa + vuk	→	ikqaqaavuk	's/he remembers'
c.	inu(k) + atsuk	→	inuatsuk	'loveable inuk'
d.	inni(k) + atsuk	→	inniasuk	'loveable son'

As already mentioned, the ‘mixed cluster’ that Smith writes as -kq- is phonetically [kx] or [qχ], derived from the underlying phoneme /χχ/. Smith’s -ts- is derived from the underlying phoneme /ss/. Given those assumptions, Dresher & Johns (1995) show that in Labrador Inuttut SL applies only to phonological geminates and also must follow Regressive Assimilation. The following derivations yield the proper surface forms:

(6) SL and ‘mixed clusters’: sample derivations (from Dresher & Johns 1995:84)

Underlying	/iχχa + χχaː + vuk/	/inni(k) + assuk/
Truncation[2]	—	inniassuk
SL	iχχaχaːvuk	inniassuk
Affrication	iqχaχaːvuk	—
Surface	[iqχaχaːvuk]	[inniassuk]
Smith	*ikqaqaavuk*	*inniasuk*
	‘s/he remembers first’	‘loveable inuk’

The data collected for this thesis are consistent with Dresher & Johns’s (1995) analysis of rule ordering in (6). Consider the following two examples, extracted from spontaneous speech:

2 According to Smith (1977b:8), Labrador Inuttut has two classes of suffixes. For ‘deleting suffixes’,the final consonant of a base-stem is elided as in: /inuk/ ‘person’+ /ŋa/ ‘3poss’ → [inuŋa]. For ‘adjoining suffixes’ the final consonant of a base-stem is preserved as in: /inuk/ ‘person’+ /mut/ ‘from the...’ → /inukmut/ Regressive Assimilation→ [inummut] (see §3.2.4).

(7) SL in current Labrador Inuttut data

Underlying	/iɣlu(k) + kkut/	/aχiɣɣi(k) + pvi + ssia + pvak/
Truncation	iɣlukkut	aχiɣɣipvissiapvak
Regressive Assimilation	illukkut	aχiɣɣivvissiavvak
SL	illukut	aχiɣɣivissiavak
Affrication	—	aχiɣɣivitsiavak
Devoicing	—	aχixxivitsiavak
Surface	[illukut]	[aχixxivitsiavak]
	'through the house'	'big, pretty willow ptarmigan'

Vowels do not play a significant role in this thesis, except in §5.1.3 where I show that vowel length does not co-vary with intensity prominence, pitch prominence or SL. Consider the vowel inventory in Smith (1977a:2):

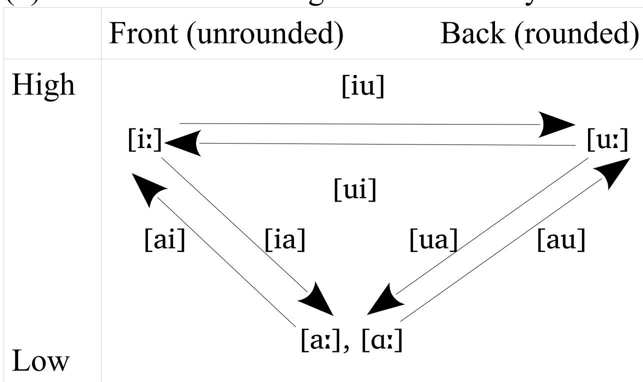
(8) Labrador Inuttut vowel inventory

	Front (unrounded)	Back (rounded)
High	[i]	[u]
Low	[a, ɑ]	

Smith's inventory is basically consistent with the short syllable peaks observed in the data considered in this thesis.[3] While I will not investigate the phonetic realizations of the allophones [a] and [ɑ], I will show that there is no evidence of widespread or systematic vowel reduction. Smith (1977a:3) describes the long vowels as follows:

3 The segment [ɑ] is virtually absent from the data considered here.

(9) Labrador Inuttut long vowel inventory



The data considered in this thesis are also consistent with this inventory. As we will see in §5.2.2, a further attestation is that of overlong vowels [aːː], [iːu] etc., which occur in environments where a vowel that is already long is lengthened at the right edge of a phrase/utterance.

2.2 Schneider's Law: A basic description

SL was first categorized in the literature as a weight rule that deletes the rightmost coda consonant in adjacent CVC syllables. SL effects are reported for only three Inuit dialects: Labrador Inuttut, Quebec Inuttitut and Northwest Territories Siglitun (Schneider 1966, Collis 1970, Rischel 1974, Smith 1975, Dorais 1976, Dorais & Lowe 1982, Fortescue 1983, Lowe 1984, Massenet 1980, 1986, Dresher & Johns 1995, 1996 and Jacobsen 2000). A straightforward demonstration of the rule comes from the following data:

(10) SL in Quebec Inuttitut (adapted from Dorais 1990:124)

a. $\mathbf{C_iC_i}V\mathbf{C_jC_j}V \rightarrow \mathbf{C_iC_i}V\mathbf{C_j}V$
illu + kkut
house.vialis
*illukkut
illukut ‘through the house’

b. $C_iV\mathbf{C_jC_j}V \rightarrow C_iV\mathbf{C_jC_j}V$
nuna + kkut
land.vialis
*nunakut
nunakkut ‘through the land’

The early literature on SL describes the environment for this rule in (10a) as a clash of two adjacent closed syllables. In (10b) then SL applies vacuously. The implication of this position is that CVC syllables are heavy. However, Dresher & Johns (1995) show that the presence of another kind of heavy syllable, CV:, has no impact on the operation of SL. For example, [illu:kut] ‘through two houses’ and [nuna:kkut] ‘through two lands’ are also grammatical. First of all, “(:)” must be added to the schematic representation of SL in (10a) $C_iC_iV(:)C_jC_jV \rightarrow C_iC_iV(:)C_jV$. And since syllable weight cannot be a factor in the rule, SL must be redefined in Labrador Inuttut, where Regressive Assimilation applies to all heterogeneous consonant clusters, as a ban on syllable-adjacent geminates.[4]

Based on his analysis of Labrador Inuttut, Smith (1977b) argues that SL applies to the first segment in C_jC_j sequences. His evidence is based on the ‘mixed cluster’ he writes as -kq-, which arises as -q- when it is the target of SL. A problem with this description arises from Dresher & John’s (1995) rule ordering, which posits -kq- as the phonological geminate /χχ/ at the point in the derivation where SL applies. The geminate /χχ/

4 And syllable-adjacent underlying geminates in Quebec Inuttitut.

therefore says nothing about which segment in a C_jC_j sequence gets deleted. Smith's insight is probably correct however given the facts in Quebec Inuttitut. In that dialect, assimilation extends only as far as primary place of articulation (Dresher & Johns 1995:84) so that heterogeneous consonant clusters involving a uvular such as [qp] are possible at the point in the derivation where SL applies. SL targets these clusters, just as it targets geminates in (10), and in those cases the first member of the cluster is deleted, e.g. [qp]→[p]. Our schematic representation in (10a) must therefore be revised again to include this possibility in Quebec Inuttitut: $C_iC_iV(:)C_jC_kV \rightarrow C_iC_iV(:)C_kV$. In Siglitun, the rule operates somewhere in between the two Eastern dialects. It is like Labrador Inuttut, in that geminate consonants are targeted by SL but unlike Quebec Inuttitut because heterogeneous consonant clusters cannot be the target of simplification (Lowe 1984): $C_iC_jV(:)C_kC_kV \rightarrow C_i\ C_jV(:)C_kV$ but $C_iC_jV(:)C_kC_lV \rightarrow C_i\ C_jV(:)C_kC_lV$.

2.3 Preliminary results

The data considered in this thesis are consistent with the phonemic inventories and phonological rules outlined in the previous sections. In addition to spontaneous speech, language consultants participated in an oral task, designed to produce two types of example words: one with syllable-adjacent underlying geminates in all word-medial consonant positions and another with syllable-adjacent underlying geminates in all word-medial consonant positions except the base-stem (for a full description of the methodology, see Chapter Four). The full phonetic results will be presented in Chapter Five, but first a brief discussion of the preliminary results.

2.3.1 SL is exceptionless

First consider the basic description of SL above and the iterative left-to-right pattern of degemination in the following two examples:

(11) SL in Labrador Inuttut data

a.	Underlying	/tuttu(k) + uː + ŋŋua + χχau + ŋŋik + tuk/
	Truncation	tuttuːŋŋuaχχauŋŋiktuk
	Regressive Assimilation	tuttuːŋŋuaχχauŋŋittuk
	SL	tuttuːŋuaχχauŋittuk
	Affrication	tuttuːŋuaqχauŋittuk
	Surface	[tuttuːŋuaqχauŋittuk]
b.	Underlying	/tutu(k) + uː + ŋŋua + χχau + ŋŋik + tuk/
	Truncation	tutuːŋŋuaχχauŋŋiktuk
	Regressive Assimilation	tutuːŋŋuaχχauŋŋittuk
	SL	tutuːŋŋuaχauŋŋituk
	Affrication	—
	Surface	[tutuːŋŋuaχauŋŋituk]

SL degeminates underlying C_jC_j without exception in (11). This is representative of the results in Chapter Five for 32 examples like the ones in (11). These examples show that SL is fully productive in the language.

2.3.2 Syllable prominence is not based on loudness, or loudness and duration

Initial analysis of lexical word examples from spontaneous speech shows that intensity peaks do not pattern systematically. The observed range of intra-word intensity variation is never more than 10 decibels (dB), this value being an extreme one, as variation in loudness between syllables is typically very small. A stringent approach to this data compilation results in the somewhat arbitrary cut-off of 1-dB as the minimum difference between syllables that contrast for intensity. On that basis, consider the following:

(12)	a.	áχìxxik	‘ptarmigan’	AB
	b.	aχìxxík		AE
	c.	àχixxík		AE
	d.	áχixxìk		BK
	e.	aχìɣɣík		HW
	f.	áχixxìk		PJ
	g.	áχiɣɣì:k		HP

Under this description of syllable prominence, peak intensity falls on either the initial or final syllable. Secondary prominence can fall on any syllable. Also, peak intensity and durational prominence do no co-vary. In a slightly longer word example peak intensity can fall on the penultimate syllable, and every other syllable except the initial:

(13)	a.	aχixxìlík	‘spruce ptarmigan’	BK
	b.	aχixxílìk		BK
	c.	aχixxílìk		JI
	d.	aχìxxílik		JM
	e.	aχíxxìlik		SI
	f.	aχixxílìk		SI

The prominent syllable in terms of intensity is most often the penultimate, a generalization that gains support from another lexical word with the same number of syllables:

(14)	a.	áχixxìvik	‘willow ptarmigan’	BH
	b.	aχìxxivík		BK
	c.	àχixxívik		EF
	d.	aχiγγìvík		HW
	e.	áχiγγìvi:k	‘is it a willow ptarmigan?’	HP
	f.	àχiγγívik		HP
	g.	àχixxívik		JI
	h.	aχìxxívik		JM
	i.	aχìxxívik		LI
	j.	àχixxívi:k		LI
	k.	aχìxxívik		PJ
	l.	àχixxívi:k		SI

As we see in (13-14), the penultimate syllable is most prominent in 12 of the 18 examples. The question is how to explain initial prominence in (14a, e), antepenultimate prominence in (13e) and final prominence in (13a) and (14b, d). Prosodic factors such as syllable shape do not resolve these apparent exceptions. The data in (12-14) come from ethnographic interviews (see full description in §4.2.2) during which language consultants were shown unlabelled photographs of Labrador flora and fauna species. In (14), for example, the photographic plate showed a willow ptarmigan in winter and summer plumage. The spontaneous response was most often a single word answer, as in (14a-c, g, h, k). These examples words have initial, penultimate and final prominence, clear evidence that peak intensity does not pattern systematically at the prosodic level of the word. The remaining example words are embedded in phrases and utterances, but peak intensity does not pattern consistently in these either. Observe penultimate prominence in (14f) where the example word arises phrase-initially and in (14j, l) where the example words are phrase-final. The initial syllable is the most prominent in (14e) where the example word arises at the end of an interrogative phrase and utterance, further evidence that peak intensity does not pattern systematically at the level of the phrase/utterance.

Another initial finding is that the long vowels in (14) do not systematically attract peak intensity. Most accounts of Labrador Inuttut, including that of Dresher & Johns (1995:89), argue that long vowels attract the most "stress." In (14e), the opposite can be true, with the short vowels in the initial and penultimate syllables attracting intensity peaks of 72 decibels and 71 decibels respectively. By comparison, the long vowel in the final syllable has a peak intensity of only 68 decibels. These contrasts are small enough to be considered insignificant. What truly matters is that the location of peak intensity is variable. These initial results in (12-14) lead to the conclusion that intensity is not a relevant correlate of syllable prominence in Labrador Inuttut (see §5.3).

2.3.3 Syllable prominence is not based on duration alone

Each vowel in Labrador Inuttut's phonemic inventory [a, i, u] has a meaning changing phonemic long form. From spontaneous speech in the data, observe the following minimal pairs:

(15)	a.	anak	'faeces'	a:nak	'paternal grandmother'
	b.	innik	'son'	i:nnik	'starfish'
	c.	inuk	'person'	inu:k	'two people'

Within the word domains in (15), phonemic short vowels always have less duration than phonemic long vowels. There is no durational overlap between long and short, consistent with Jacobsen's (2000:54) acoustic study based on a reading task in West Greenlandic. As well, there is no rhythmic constraint on long vowels, which can arise in all syllable types and positions within the word. It follows from this that phonemic vowel duration alone is not relevant to any notion of stress in Labrador Inuttut.

2.3.4 Syllable prominence is not based on pitch

The Inuit dialects and all languages in the Eskimo-Aleut Family are non-tonal. This is similar to languages like English, in which tonal contrasts are not phonemically relevant, and like Japanese, where pitch is relevant at the level of the phrase and where boundary melodies are timed with the rightmost mora of an intonational phrase (Nagano-Madsen 1994). I discuss pitch effects in Chapter Five, §5.4, where I show that SL is unaffected by a pattern of pitch effects at phrase-final/utterance-final boundaries. Neither can these effects be associated with metrical stress. In non-boundary environments, pitch is slightly falling from left-to-right. Pitch alone is therefore not a relevant correlate of stress.

2.3.5 Syllable prominence is not based on articulatory quality

None of the Eskimo-Aleut languages display a systematic pattern of vowel reduction. The Aleut and Yupik languages have a schwa segment in their phonemic vowel inventories. Dialects like Siberian Yupik, for example, have [ə], where the segment is unlike its [a i u] vowel counterparts in that it does not have a long form (Reuse 1994:18). Schwa is merged with [i] in all but one of the Inuit dialects.[5] I observe no schwa segments and no vowel reduction in the data considered in more detail in the next chapters.

2.3.6 Syllable prominence is not based on pitch and duration

The only pattern of pitch effects in my data involves phrase-final/utterance-final boundaries, a phenomenon that can include syllable rhyme lengthening, as shown in Chapter Five in §5.4. Because this covariance of pitch and duration occurs only in boundary environments, it cannot be a correlate of a metrical system of alternating stress.

2.4 Summary

Labrador Inuttut is an Inuit language where Regressive Assimilation applies to all consonants clusters, making all underlying coda consonants part of a geminate in surface forms. Initial analysis of the acoustic results from the data considered here shows that SL behaves just as it is described in the literature, especially Dresher & Johns (1995). SL is exceptionless and independent of any metrical conditioning. No recurring pattern of prominence based on the three correlates of stress can be found. With these observations in mind, I address, in the next chapter, the previous literature on the SL phenomenon.

5 At the geographic language border with Yupik, the Inuit dialect of Inupiaq on Little Diomede Island in Alaska retains schwa.

3 Background Literature on SL, "stress" and pitch

3.1 Introduction

This chapter reviews the previous descriptions and analyses of SL, keeping the preliminary results in mind and trying to establish a theoretical baseline for a fuller examination of the results in Chapter Five. One of the goals in this thesis is to provide further empirical evidence documenting the SL phenomenon. Since no acoustic studies of Labrador Inuttut are available in the previous literature, the theoretical basis for the interpretation of "stress" and pitch in this dialect primarily comes from acoustic studies of the related Inuit languages in Greenland and Quebec.

3.2 SL descriptions

Building on the basic description of SL in §2.1.2, I present in this section a chronological summary of SL descriptions in the literature. Nothing resembling the phenomenon is mentioned in the earliest literature on Labrador Inuttut. A diachronic study on the origins SL is beyond the aims of this study. However the rule, on first glance, appears to be absent from 19th Century lexicography and grammar books on Labrador Inuttut. Compare, for example, the following lexical entries from Erdmann (1864) and Bourquin (1891) to the same word in a more recent dictionary by Anderson, Kalleo & Watts (2006):

(1)		19th Century orthography	Contemporary Labrador	IPA
	a.	aksalloak 'wheel'	atsa**l**uak	[atsaluak]
	b.	Ketterdlermik 'jewelry ring'	Kititli**m**ik	[χititɬimik]

The examples in (1) suggest that SL did not apply previously, but more study is needed on the phonological assumptions of Erdmann and Bourquin, which are not described. It appears unlikely however that Bourquin would have overlooked SL if it was present in historic Labrador Inuttut, given his careful documentation of this dialect's polysynthetic morphology. One possibility is that they were influenced by the orthographic conventions of West Greenlandic, where SL is not a factor. The issue will not be resolved here.

3.2.1 SL in Quebec Inuttitut

SL gets its name from a French priest, Lucien Schneider, who spent most of his career working in the Inuit communities of Northern Quebec. Schneider (1966) described the language in a series of grammar books showing *la Loi des double consonnes* (the law of double consonants). There is no analysis of the rule, but its output is consistent with the spelling in his 1970 dictionary, one of the most comprehensive lexicographies of any Inuit language. It provides the data for the first formal description of SL as a phonological rule. Collis (1970:276-77) dubs the phenomenon "*Loi Schneider d'allitération*" (Schneider's Law of alliteration), shown in the following examples:

(2) SL description in Collis (1970): /aik + pa + šši + aq/ 'fiance'

West Greenlandic	Quebec Inuttitut
[aːppaššiaq]	[aippasaq]

According to Collis, SL is found in all the Canadian Inuit dialects east of Hudson's Bay, including Quebec Inuttitut (which includes sub-dialects on the Belcher Islands

(Qikirtamiut), the eastern shore of Hudson's Bay (Itivimiut) as well as around Ungava Bay (Tarramiutut)) and Labrador Inuttut (which includes sub-dialects spoken on the North Coast of Labrador and in Rigolet). Collis argues that SL was operative in 19th Century Labrador, based on letters between Bourquin in Labrador and Kleinschmidt in Greenland. He writes (1970:277): "*cette règle existait déjà au siècle dernier, ce qui explique pourquoi T. Bourquin n'a pu suivre les conseils orthographiques que S. Kleinschmidt lui prodiguait dans ses lettres d'août 1865 et de juin 1871*" (this rule existed in the last century, which is why T. Bourquin could not follow the orthographic advice that S. Kleinschmidt gave to him in his letters of August 1865 and June 1871). This assessment is not quite correct, as Bourquin did follow Kleinschmidt's orthographic advice in most areas, but this issue lies beyond the purposes of this thesis.

Following Collis, Rischel (1974:86) is the first to refer to SL as a rule governing the sequencing of syllables: "some Canadian dialects do not, according to the law, tolerate successions of closed syllables and hence a sequence VCCVCCV is simplified to VCCVCV."

Massenet (1986:131) shows that stating the rule in this way is too restrictive because simplification does not occur when a word's final syllable is CVC, "*si l'on adopte cette interprétation, il faudra restreindre la règle aux syllabes internes de mot, puisque à la finale on peut avoir deux syllabes fermées successives:* /sinippuq/ *'il dort'* /ippˈit/ *'toi'*" (if one adopts this interpretation, it [must] restrict the rule to word internal syllables, since at the end of a word there can be two successive closed syllables: /sinippuq/ 's/he sleeps' /ippit/ 'you'). Massenet takes instead a rule-based, generative approach in his SL description. He also make a convincing argument that in Quebec Inuttitut the phenomenon operates iteratively, from left to right. Consider the underlying consonant clusters in the following data:

(3) SL description in Massenet (1986:125)

a.	/tussiaq-puq/	→	[tutsiapuq] 's/he prays'
b.	/tussiaq-vik-mut-lu/	→	[tutsiavimmulu] 'and to church'

In (3a), the uvular is deleted while the labial is preserved at the surface level. The same happens in (3b), where the first alveolar is deleted while the second alveolar is preserved. For Massenet this is evidence that SL works from the left, targeting the first member of a heterogeneous consonant cluster. As support for this hypothesis, Massenet refers to a similar phenomenon in Labrador Inuttut described by Smith (1977) (see earlier in §2.1.2) and in Willis (1971:81), who argues the phenomenon is iterative and exceptionless: "in the Ungava dialect there cannot be a sequence of two consonant clusters (or two tense consonants). When this occurs, through affixation mainly, the first consonant of the second (fourth, sixth, etc.) cluster is deleted."

Massenet (1986) contributes to the description of SL by showing where the rule occurs relative to other phonological rules in Quebec Inuttitut, especially in relation to a phenomenon that deletes the final consonant of base-stems. He calls this phenomenon *effacement de la consonne finale du radical* (called Truncation here, following Dresher & Johns (1995)). First, Massenet demonstrates an environment where SL applies exclusively:

(4) SL alone (Massenet 1986:127)

	$C_1C_2V(:)C_3C_4$
Underlying	/illu + rru:ja:q + tuq/
Truncation	—
SL	illuru:ja:qtuq
Surface	[illuru:ja:t^{r}tuq]
	maison-ressembler.à-3s
	'it looks like a house'

Massenet argues that in the case of a base-stem that ends in a vowel, the environment for Truncation is not met, leaving SL to operate as in (4) where it targets C_3 for deletion. Massenet next illustrates environments where neither rule applies, then another where SL applies and Truncation does not, and finally two examples where Truncation applies and SL does not. Consider the following:

(5) SL and Truncation (Massenet 1986:127)

a.		$C_1V(:)C_2C_3$
	Underlying	/niuviq + vik/
	Truncation	—
	SL	—
	Surface	[niuvip^{r}p^{l}ik]
		faire.du.commerce-endroit
		‘store’

b.		$C_1C_2V(:)C_3C_4$
	Underlying	/tussiaq + vik/
	Truncation	—
	SL	tutsiavik
	Surface	[tutsiavik]
		prier-endroit
		‘church’

c.		$C_1C_2V(:)C_3C_4$
	Underlying	/niuvip^{r}p^{l}ik + liaq + puq/
	Truncation	niuvip^{r}p^{l}iliap^{r}puq
	SL	—
	Surface	[niuvip^{r}p^{l}iliap^{r}puq]
		faire.du.commerce-endroit-aller-3s
		‘s/he goes to the store’

d.		$C_1C_2V(:)C_3C_4$
	Underlying	/qalluna:q + liaq + puq/
	Truncation	qallunaliap^{r}puq
	SL	—
	Surface	[qalluna:liap^{r}puq]
		blanc-aller
		‘s/he goes to the white person’

For Massenet, the crucial distinction is between (5b), in which the suffix /-vik/ is [-Truncation] and SL applies to the underlying heterogeneous consonant cluster, and (5c), in which the suffix /-liaq-/ is [+Truncation] so that Truncation applies and SL is vacuous.

In his final case, Massenet shows environments where both rules apply, showing that Truncation must apply first:

(6) SL and truncation (Massenet 1986:128)

a.		$C_1V(:)\ C_2C_3C_4$
	Underlying	tusaq-qqaujuq
	Truncation	tusaqqaujuq
	SL	—
		[tusaqqaujuq]
		'entendre-il-vient.de/just hear it'
b.		$C_1C_2\ V(:)\ C_3C_4C_5$
	Underlying	tussiaq-qqaujuq
	Truncation	tussiaqqaujuq
	SL	tussiaqaujuq
	Surface	[tutsiaqaujuq]
		'prier-il-vient.de/s/he is just praying'
c.		$C_1V(:)C_2C_3$
	Underlying	ipa-ttauq
	Truncation	—
	SL	—
	Surface	[ipattauq]
		'veine.d'arbre-aussi/also a tree vein'
d.		$C_1C_2\ V(:)\ C_3\text{-}C_4C_5$
	Underlying	ippaq-ttauq
	Truncation	ippattauq
	SL	ippatauq
	Surface	[ippatauq]
		'restes.de.nourriture-aussi/also leftover food'

Massenet's system of ordered rules is then expanded to include Regressive Assimilation. Because Regressive Assimilation is crucial to his analysis of SL, discussion of that topic will resume in §3.3, which describes SL analyses in the scientific literature.

3.2.2 SL in the Inuit languages

Dorais (1976) calls "Schneider's Law of alliteration" a morphophonological characteristic of Quebec Inuttitut and Labrador Inuttut, describing it as an exceptionless law of elision. He shows that SL does not apply in the Inuit languages west and north of Hudson's Bay by comparing lexical words there to the same words used by Inuit in Quebec and Labrador:

(7) SL application, non-application in other Canadian Inuit languages (Dorais 1976:391)

	SE Baffin, Kinngaqmiut, Iglulingmiut		Quebec Inuttitut/Labrador Inuttut
a.	autlaqpuq	's/he goes away'	autlapuq
b.	akɣakka	'my hands'	akɣaka
c.	ijukkaqtit	's/he makes him fall'	ijukkatit
d.	utnukkut	'during the evening'	utnukut

Dorais says SL affects surface forms in Quebec and Labrador so that in (7a) the second cluster /qp/ must be simplified because it follows /tl/. Dorais differs with Collis in his diachronic assessment of SL. He argues that old Labrador texts and the memory of elderly Quebec Inuttitut language consultants show that SL is a recent innovation, coming into use sometime in the early 20th century. His main contribution relevant to the key aims of this thesis is his description of a dialectal continuum based on four variations: the voiced velar lateral approximant phoneme /L/, cluster assimilation, glottal stopping and SL. His findings are summarized in the following table:

(8) Phonological processes in four Inuktitut dialects (Dorais 1976:391)

	Iglulingmiut	SE Baffin	Kinngaqmiut	Qubec Inuttitut		Inuttut
				Itivimiut	Taqramiut	
Presence of assimilation (→)	L	→t	→s	→s	→s	L
Degree of cluster neutralization[1]	0	1	1	2	2	3
Presence (+) or absence (-) of glottal stop	-	-	-	+	-	-
Presence (+) or absence (-) of SL	-	-	-	+	+	+

Only Dorais' descriptions of the phoneme /L/ in Labrador Inuttut is problematic: it is not supported by the data here or by the subsequent literature, including Dorais (1990). The table is otherwise useful, showing how dialects with SL are at the extreme end of heterogeneous consonant cluster assimilation.

Finally, Dorais describes what he calls a 'limited form' of SL in Northwest Territories Siglitun (1986:46): "the first consonant of a cluster is elided in the same circumstances as described above, but only when the two elements of the group have the same position of articulation." Dorais provides the following examples:

1 The degree of neutralization varies from 0 in Iglulingmiut (where all four types of clusters are fully used) to 3 in Labrador (where there is only one principal type).

(9) SL in Siglitun (Dorais & Lowe 1982:131)

	Siglitun	Copper Inuit
a.	iɣluka ‘my two houses’	iɣlukka
b.	tikillijuŋ ‘may he/she arrive at it!’	tikillidɟuŋ
c.	iɣlutka ‘my (many) houses’	iɣlutka

Dorais argues that SL applies in (9a-b) because the clusters /kk/ and /dɟ/[2] have the same place of articulation, while SL has no impact on a coronal-velar cluster like /tk/ in (9c). The primary goal here is to instantiate SL empirically. Lacking Siglitun primary source data to analyze, evidence from this Inuit language will play no further role in this thesis.

3.2.3 SL in Labrador Inuttut

Smith (1975:105) writes that, in Labrador Inuttut, “two consonant clusters may not occur with only a vowel or vowel cluster between them, but must also have an intervening intervocalic simple consonant. There are no sequences of the form ...CCV(:)CC.” No analysis is given, but Smith (1975:100) “questions the confirmability” of the hypothesis in Collis (1970:276-7) that SL existed in 19th century Labrador Inuttut, pointing to the “unreliability of the orthography” and numerous counter-examples in Bourquin. Smith discounts for Labrador Inuttut the position of Rischel (1974) that SL is a rule governing the sequencing of syllables (see §3.2.1), showing that adjacent CVC syllables are possible in /imappik/ ‘sea’ and /χaittuk/ ‘band of land’.

2 Dorais describes /ɟ/ as a voiced glide in Copper Inuit, the apical fricative /r/ in other Inuit dialects.

A more comprehensive description of SL is in Smith (1977b), where he shows the behaviour of /-kkut/, the affix used in §2.1.2 to demonstrate SL in Quebec Inuttitut. Smith finds the same pattern in Labrador:

(10) SL application in Labrador Inuttut (1977b:6)

a.	/nuna + kkut/ land.vialis	→	[nunakkut]
b.	/tuttu(k) + kkut/ caribou.vialis	→	[tuttukut]

Smith (1977b) also shows more complex constructions as evidence that SL applies iteratively from left-to-right:

(11) SL application over longer sequences

a.	/nanu + ŋŋua(k) + χχaː + lluni/ bear.toy.do first.by	→	[nanuŋŋuaχaːlluni]
b.	/tuttu(k) + ŋŋua(k) + χχaː + lluni/ caribou.toy.do first.by	→	[tuttuŋuaqχaːluni]

The affixation in both examples results in three adjacent underlying geminates, but the surface output in each case is different. The source of this variation must be a contrast in the base-stems. In (11a), the base-stem has only short consonants, but in (11b) the base-stem contains an underlying geminate in the suffix-adjacent position. Smith (1977b) therefore shows that SL must apply left-to-right, since only that direction can yield the correct results in (11). The same pattern will be instantiated in the analysis here of the phonemic pair /tutuk/ versus /tuttuk/ (see methodology in §4.4.1, results in §5.1).

Smith (1977a) shows that, consistent with the results in Chapter Five, an open syllable interrupts the iterative pattern of SL, as we can see from the rule's non-application in the following example:

(12) SL blocked by the insertion of a CV syllable (1977a:82)

Underlying	/χimmi(k) + χa + ŋŋik + tuk/
	dog-have-3.s.neg
Surface	[χimmiχaŋŋituk]

Smith argues that in (12) the underlying geminate /ŋŋ/ does not degeminate because of the intervening open syllable /χa/. This position is consistent with the preliminary results and will be further substantiated by the acoustic results in §5.1.

3.2.4 Deleting versus adjoining affixes in Labrador Inuttut

One of the issues not fully explained thus far is a variation first described by Smith (1977a:8) involving two types of affixes differentiated by the way in which they adjoin base-stems with final coda consonants. One class, which he calls 'deleting affixes', is exemplified by /χa/ 'have' in (12). In that example the final stop in the base-stem /χimmi(k)/ is deleted, not because of SL, but because /χa/ is a deleting affix. The other class of affixes preserve the final coda consonant of a base-stem they adjoin, which Smith calls ‘adjoining affixes’ (Massenet (1986) describes the same phenomenon in Quebec Inuttitut as [±Truncation]). Both classes are shown in the following data:

(13) Deleting versus adjoining affixes in Labrador Inuttut Smith (1977a:8)

a.	/inuk + ŋa/	→	[inuŋa]		
	person.3poss				
b.	/inuk + mit/	→	inukmit	→	[inummit]
	person.from				

The deleting class is exemplified by /ŋa/ in (13a), while /mit/ is an example of an adjoining affix (note the preservation of the final stop is here made opaque at the surface level the by application of Regressive Assimilation to the underlying heterogeneous consonant cluster /km/). Smith (1978:116) recognizes that this alternation is not the same for all language consultants: “the Labrador dialect has been in a state of rapid change for at least the last century. The adjoining/deleting classes are presently quite variable from idiolect to idiolect.” Smith’s dictionary of affixes (1978) is the basis for most of the glosses used in this thesis, but he admits that for some cases, “insufficient or contradictory data was obtained. Individual speakers may in certain cases exhibit the class which is not given” (p. 116). This observation of variability is consistent with the findings in §5.1.4 where SL is shown to be exceptionless. At the same time, the perfect alternating pattern shown in (11), where SL applies to all syllables, is not always the case in the data considered here which show some variability at the right edge of words for the affix [ŋŋituk], [ŋittuk], or the previously unattested [ŋituk]. Crucially these variations never cause an SL violation.

3.3 SL analyses

Only two studies of SL attempt a principled explanation and theoretical solution to the phenomenon. Massenet (1986) argues for an articulatory motivation related to “tense” geminates. Dresher & Johns (1995) offer Government Theory as a plausible framework of analysis.

3.3.1 SL is not “geminate tension” in Quebec Inuttitut

Massenet (1986) shows that in Quebec Inuttitut Regressive Assimilation is not total, allowing a class of clusters that begin with a uvular [q χ ʁ N] such as /qp/ and /ʁt/. From these uvular clusters, Massenet finds phonological processes that result in pharyngealized geminates which he calls r-clusters [p^{r}p], [p^{r}pˈ], [t^{r}t], [t^{r}s], [t^{r}sˈ], [l^{r}l], [m^{r}m], [n^{r}n] and a third class of consonant clusters he calls glottalized geminates [ppˈ], [tsˈ], [kkˈ] and [qqˈ]. All other consonant clusters are surface geminates with SL degeminating each as follows: [vv →v], [pp →p], [tsˈ→ j], [ll →l], [tt→t], [kk→k], [kkˈ→ɣ], [qq→q] and [qqˈ→ʁ]. He argues that in Quebec Inuttitut both geminates and uvular clusters are tense as compared to the unassimilated clusters in other Inuit languages. According to Massenet (1986:130), the idea that geminate tension is the force behind SL follows Schneider’s (1970:XIV) insight that geminates are “*tendues*,” a term that Massenet interprets to mean articulatory tension. He argues for Tension (TEN) within the list of ordered rules already mentioned:

Truncation, Regressive Assimilation, SL, Affrication and Devoicing. Dresher & Johns (1995:85) describe Massenet's argument as articulatory, with the production of consonant clusters causing an "explosive release of air" or consonant tension. To avoid a 'tension clash' in adjacent syllables, Massenet (1986:105) proposes the following rule:

(14) SL: Law of double consonants (*La Loi des double consonnes*)
RULE: Delete a word-internal coda consonant in a syllable with a tense onset

Massenet argues for the ordering of his phonological rules as (Regressive Assimilation → Tension → SL) applied in derivational cycles, to yield the correct surface forms as follows:

(15) Rule ordering in Quebec Inuttitut (Massenet 1986:131-2)

a. /niuviq + vik + mut/ ‘to the store’

1er cycle:		niuviq
		— (*aucune règle ne s’applique*)
2ème cycle:		niuviqvik
	R. Assimilation	niuviv^{r}vik
	Tension	niuvip^{r}pˈik
	SL	niuvip^{r}pˈi
3ème cycle:		niuvip^{r}pˈimut
		—
		[niuvip^{r}pˈimut]

b. /anaʁ + ʁaj + jaŋ + ŋit + tuq/ ‘s/he didn’t return’

1er cycle:		anaʁ
		—
2ème cycle:		anaʁʁaj
	R. Assimilation	—
	Tension	anaqqˈaj
	SL	anaqqˈa
3ème cycle:		anaqqˈaja
		—
4ème cycle:		anaqqˈajaŋŋit
	R. Assimilation	—
	Tension	anaqqˈajaŋit
	SL	anaqqˈajaŋi
5ème cycle:		anaqqˈajaŋŋituq
		—
		[anaqqˈajaŋŋituq]

Tension occurs in the second cycle of (15a) where its output is a glottalized geminate, Massenet’s SL trigger environment. In the second cycle of (15b), Massenet observes the same process for the uvular stop. What he does not explain is the fourth cycle where Tension appears to delete the /ŋ/ segment. This is either a printing error or Massenet envisaged an unstated definition for tense onset in (14) that includes the nasal geminate /ŋŋ/. His stated definition of *tense consonant* is a ‘delayed burst’, which cannot apply to non-plosives. While agreeing with Massenet's account of Regressive Assimilation, I find no motivation for Tension as an articulatory phenomenon, the basis of which also makes the wrong predictions with respect to the observed facts of SL in Northwest Territories Siglitun.

3.3.2 SL is not a metrical phenomenon

Dresher & Johns (1995) is perhaps the most ambitious study of SL in the literature. The authors first use feature geometry to explain the degree of assimilation in the three dialects of Inuktitut where SL is attested, then they show how this phenomenon cannot be metrical or related to a compensatory phenomenon observed in some Inuit languages, and conclude with an overall theoretical solution based on Government Phonology. They propose:

(16) SL Description: VCCV(:)C_1C_2V → VCCV(:) C_2V
SL Rule: Delete the left root node of a place geminate when it follows a consonant cluster

As discussed in §1.3, Creider (1981) observes a typological difference in Regressive Assimilation across the Inuit languages. Dresher & Johns (1995:86) describe the situation in terms of feature geometry. In Siglitun, place is not assimilated, but voicing, nasality and continuancy are. They propose Manner as one feature node and split the Place node based on the facts of all three dialects:

(17) Continuum of Regressive Assimilation (Dresher & Johns 1995:86)

Siglitun:	Manner		
Quebec Inuttitut:	Manner	Primary Place	
Labrador Inuttut:	Manner	Primary Place	Secondary Place

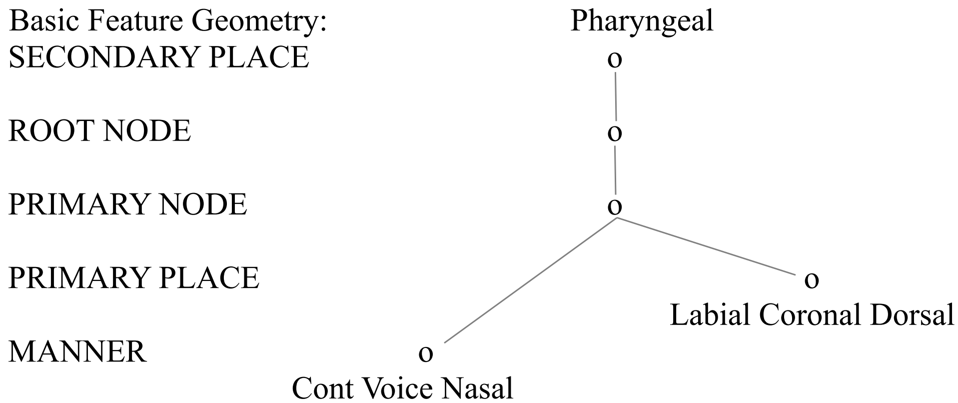
Dresher & Johns (1995) focus on the exception to place assimilation in Quebec Inuttitut, described above as ‘r-clusters.’ Massenet (1986) shows that these pharyngealized coronal or labial geminates [p^{r}p], [p^{r}p^{l}], [t^{r}t], [t^{r}s], [t^{r}s^{l}], [l^{r}l], [m^{r}m] and [n^{r}n] lose their pharyngealization when targeted by SL, shown by the following data:

(18) SL and ‘R-clusters’ in Quebec Inuttitut (Dresher & Johns 1995:87)

Underlying	/aullar + tuŋa/
SL	aullatuŋa
Surface	[aullatuŋa] (*aulla^{r}tuŋa)

Since Regressive Assimilation does not “wipe out the pharyngeal element contributed by /r/,” Dresher & Johns (1995:87) argue that the data in (18) means that all the other features must spread together. They give pharyngealization an independent status, consistent with the fact that it is a secondary articulation:

(19) Basic Feature Geometry:



From (19), Dresher & Johns (1995) can say that Regressive Assimilation in Siglitun spreads the manner node, while in Quebec Inuttitut it spreads the primary node. Consistent with this architecture is the fact that, unlike other features, pharyngealization also spreads to vowels. Finally, in Labrador Inuttut, which lacks pharyngealization, Regressive Assimilation spreads to all nodes. This is consistent with the preliminary results and the results in Chapter Five which show that Regressive Assimilation in Labrador Inuttut is total.[3]

One of the outcomes of this thesis is that SL is not a metrical rule, in line with Dresher & Johns (1995). They consider three plausible metrical solutions and then show how each one fails to explain SL. The first proposal supposes a system of strong and weak syllables from left to right, with SL applying to syllables in the weak position as follows:

3 One exception is the language consultant from the Rigolet sub-dialect, for whom many heterogeneous consonant clusters not heard in other parts of Labrador are valid. Initial results from HP, the Rigolet Inuktut consultant, show that the phenomenon affects the coronal place of articulation: [ɣl], [βl], [χt], etc. That fact that Regressive Assimilation does not spread to this primary node suggests a different feature geometry for the Rigolet dialect is needed, but this is a topic for future study.

(20) Metrical Theory One: S W syllables left-to-right, W undergo SL

a.

bear. toy. do-first.by ‘by first killing the toy bear’
1 2 3 4 1 2 3 4
/na**n**u + **ŋŋ**ua**k** + **kχ**a: + **ll**uni/ → [na**n**u**ŋŋ**ua**χ**a:**ll**uni]
S W S* W S W

b.

caribou. toy. do-first.by ‘by first killing the toy caribou’
1 2 3 4 1 2 3 4
/tu**tt**u + **ŋŋ**ua**k** + **kχ**a: + lluni/ → [tu**tt**u**ŋ**ua**qχ**a:luni]
S W S W S W

This analysis accounts for the pattern in (20b); however SL is sensitive only to the preceding syllable. As a result, in (20a), SL simplifies the underlying geminate in consonant position three, therefore weakening a syllable that is supposed to be strong. Dresher & Johns (1995) also show that reversing the strong weak pattern does not resolve the problem:

(21) Metrical Theory Two: W S syllables left-to-right, W undergo SL

a.

bear. toy. do-first.by ‘by first killing the toy bear’
1 2 3 4 1 2 3 4
/na**n**u + **ŋŋ**ua**k** + **kχ**a: + **ll**uni/ → [na**n**u**ŋŋ**ua**χ**a:**ll**uni]
W S W S W S

b.

caribou. toy. do-first.by ‘by first killing the toy caribou’
1 2 3 4 1 2 3 4
/tu**tt**u + **ŋŋ**ua**k** + **kχ**a: + **ll**uni/ → [tu**tt**u**ŋ**ua**qχ**a:**l**uni]
W S W S* W S

This account describes (21a). But in (21b), Dresher & Johns (1995) observe that SL degeminates the underlying geminate at consonant position four, thus simplifying what is supposed to be a strong syllable. They further note that any system of strong and weak syllables that one could imagine fails each time an open syllable is inserted in the relevant string. Dresher & Johns (1995:89) conclude that a metrical explanation “requires that the metrical system locates heavy syllables wherever they are.” They next consider SL as a stress-governed rule, assuming that closed syllables are stressed and that adjacent stressed syllables clash. SL would thus resolve the clash by deleting the coda of the rightmost closed syllable. The proposal is schematized in the following rhythmic grid:

(22) Metrical Theory Three: Assign stress to every closed syllable, SL context is adjacent heavy syllables

```
  *     *    *    *              *           *
  *     *    *    *             (*     *)  (*     *)
 μ μ   μ μ  μ μ  μ μ            μ μ    μ   μ μ    μ
 CVC  CVC  CVC  CVC   →         CVC   CV   CVC   CV
```

Under this system coda consonants add one mora to the overall weight of any syllable. This works as long as the vowel adds only one mora to the grid. But consider the same system for the examples in (20-21) where some syllable peaks are bimoraic:

(23) Metrical Theory Three does not work for long vowels

a.

	*		*		
(*	*)	(*	*)	(*	*)
μ	μμ	μμ	μμμ	μ	μ
CV	CVC	CVV	CVVC	CV	CV
na	nuŋ	ŋua	χa:l	lu	ni

b.

*		*			
(*	*)	(*	*)	(*	*)
μμ	μ	μμμ	μμ	μ	μ
CVC	CV	CVVC	CVV	CV	CV
tut	tu	ŋuak	χa:	lu	ni

The problem, in Dresher & Johns's (1995) view, is that long and/or complex vowels cannot be metrically weak, the situation for the third syllable, [ŋua], in (23a) and the antepenultimate syllable [χa:] in (23b). Finding no metrical solution to the problem, Dresher & Johns (1995:90) next consider a diachronic proposal from Ulving (1953). He argues that "Inuit has, or once had, a rule of consonant gradation" so that an original /k/ is weakened to /ɣ/ when it precedes main stress, as in the word [pùtuɣúq] 'big toe'. Ulving (1953) argues that /k/ is preserved and geminated when it follows main stress as in the following examples where stress shifts back a syllable in the singular versus dual forms:

(24) Consonant Gradation (Ulving 1953, adapted from Dresher & Johns 1995:90)

a.	nùkáq	→	núkkat
	'younger sibling'		'younger siblings (2)'
b.	pu:q (< *puɣuq)	→	púɣɣut
	'bag'		'bags (2)'

Rischel (1974) agrees that consonant gradation may previously have been a factor but he rejects a stress-based solution for modern day Inuit languages, especially West Greenlandic where he argues that ‘stress’ or intensity prominence is undefined. According to Rischel, phenomena like those found in (24) are related to compensatory lengthening in West Greenlandic. The rule is like SL in that it also involves geminates alternating with non-geminates but is otherwise unlike SL, being morphologically conditioned, sensitive to vowel length and non-iterative. Synchronic evidence that SL and compensatory lengthening are unrelated comes from Northwest Territories Siglitun where both rules operate independently, as shown in Dresher & Johns (1995:92):

(25) Gemination and SL in Northwest Territories Siglitun (adapted from Lowe 1985)

	a.	b.	c.
Singular	iɣaliq	quaq	upkuaq
Dual Formation	iɣallak	qujjak	upkuajjak
SL			upkujak
Affrication		qudʒak	
	iɣallak	qudʒak	upkujak
Gloss = dual of:	‘window’	‘frozen meat’	‘door’

	d.	e.	f.
Singular	iqidjralik	itiɣaq	sulukpauɣaq
Dual Formation	iqidjrallak	itikkaq	sulukpaukkaq
SL	iqidjralak		sulukpaukaq
Affrication			
	iqidjralak	itikkaq	sulukpaukaq
Gloss = dual of:	‘square’	‘foot’	‘grayling’

Dresher & Johns (1995) argue that since SL operates on the output of gradation (or compensatory lengthening) as in (25c, d, f), the rule must be independent from any gradation phenomenon.

Dresher & Johns (1995) finally consider consonant gradation in Inupiaq, spoken on the Seward Peninsula of Alaska. This Inuit language is characterized by Kaplan (1985) as having a pattern of gemination/degemination that regulates an alternating pattern of strong and weak syllables. According to Dresher & Johns (1995:92) the pattern is set in motion by the first syllable of the base-stem: "if it is closed or has a long vowel the pattern begins with strong syllable; if it is open with a short vowel the pattern starts with a weak syllable." Consider the following data:

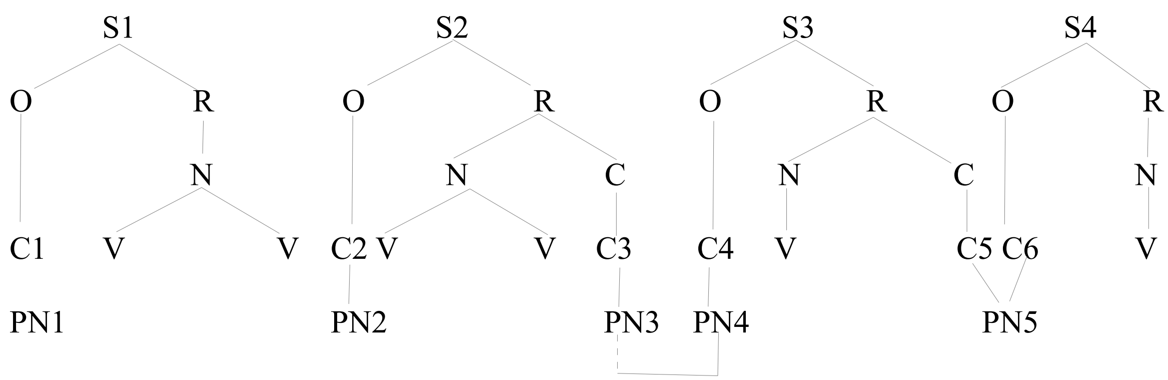
(26) Seward Peninsula Consonant Gradation (Kaplan 1985)

a.	/tuttuttuq/	→	[tuttutuq]
	caribou.kill.3s		
b.	/katittuq/	→	[katittuq]
	marry.3s		

Dresher & Johns (1995) acknowledge that the rule is iterative like SL, outputting C-CC or CC-C sequences. The similarities, however, end there. Consonant Gradation is sensitive to vowel length and functions as a rhythm rule, maintaining iambic stress. Dresher & Johns (1995:93) argue that SL cannot have a rhythmic function since it remains inactive in CVCV and $C_iC_jV(:)C_iC_jV(:)$ sequences: "it is only when a cluster is followed by a geminate that SL is brought into play." This singular generalization is fully consistent with the durational pattern observed in the primary data considered in this thesis.

Dresher & Johns (1995) conclude with a proposal whereby the source of SL lies in a government relationship between coda consonants and the following onsets (PN = place node):

(27) SL and Syllable Government



The first syllable has no coda and thus no relationship with the following syllable. But in the second syllable, Dresher & Johns (1995) argue that the coda is governed by the onset that follows it. Since a governing syllable cannot itself be governed, the motivation for SL is to eliminate that possibility by deleting C5 and thus any trans-syllable relationship between S3 and S4. While the proposal accounts for the data, the nature of government, or of the factors that ultimately drive government relations, remains undefined (Rose, Pigott & Wharram 2011).

3.4 Accounts of “stress”

The nature of syllable prominence in the Inuit languages is unclear in the literature.[4] The issue is discussed in some detail in a recent acoustic study (Jacobsen 2000), which concludes that West Greenlandic is a not a stress language. The results presented in Chapter Five suggest that this is also the case for Labrador Inuttut.

3.4.1 Early accounts of “stress” in West Greenlandic

In his orthography of West Greenlandic Egede (1760) uses long and short accents to represent phonemic length, but he leaves the nature of stress undefined. Nowhere in the Inuit languages literature is there a convincing description of the correlates of prominence. Rischel (1974:91) writes that “the category of stress has no well defined status in West Greenlandic phonology.” Unlike intonation, he says, it is difficult to make generalizations about stress patterns, though the tendency is to perceive stress on the final syllable and/or the antepenultimate. Kleinschmidt’s (1851:8) acoustic impression of West Greenlandic is that stress generally falls on the penultimate syllable, with stress called “*ton*” (accent) and defined as a “*hebung der stimme,*” which Jacobsen (2000:41) translates as a “raising of the voice.” However the acoustic manifestation of stress is left undefined. Kleinschmidt later presents an account of stress based on syllable weight: a coda consonant counts 1, a short vowel 2, and a long vowel 4. This configuration supposedly yields the correct word stress in the following phrase:

4 Except for Seward Peninsula Inupiaq which, according to Kaplan (1985), has iambic stress.

(28)Kleinschmidt: stress based on syllable weight

2 2   2 2 3   2 3   5 3   2 3   3   4

nanu   ilumut   qilammiituq   itsi^{r}ssa^{r}ppaa

Kleinschmidt argues that syllable with the highest count in (28) get the most stress, with lesser amounts of stress going to each syllable with lower counts. According to his account, each word has one main accent and one subsidiary accent falling on the initial or ultimate syllable, while long words may have several subsidiary accents. The distribution is as follows: heavy syllables always attract accent; two adjacent syllables cannot both have main accent; there cannot be more than two syllables in a row without accent; and main accent falls heaviest on the last three syllables unless they are equal in which case stress falls on the third syllable from the end. Despite the elaborate system described in Kleinschmidt, Jacobsen's (2000) study of stress correlates in modern West Greenlandic reading data shows that stress has no reliable acoustic basis. This finding is consistent with the data considered here. Despite these acoustic realities, the Inuit languages are often described in the literature as having a system of stress that is sensitive to syllable weight.

Rischel (1974:78-80) contends that the undefined 'accent' in Kleinschmidt may be pitch. His book on West Greenlandic phonology includes a chapter on phenomena related to syllabification. Addressing the representation of long segments, he shows a prominence pattern for the stress correlate of pitch: "for example the phrase final neutral intonation contour high-low-high" (p. 78). Rischel explains the timing of this HLH boundary melody in terms of morae: each short vowel in West Greenlandic can carry one tone. In other words, it has one mora; each long vowel has two morae and can thus host two tones and so on. Consider the following data:

(29) Rischel: vowel morae explain the timing of boundary melodies in West Greenlandic

a.

H L H
| | |
akivara
‘I answer him/her’

H LH
| ||
aavaa
‘s/he fetched it’

HLH
|||
ataasiq
‘one’

b.

H L H
| | |
uvaŋa
‘I’

H L H
| | |
uvaŋalu
‘and I’

H LH
| ||
uvaŋattaaq
‘I, too’

c.

H LH
| | |
akivat
‘you answered him/her’

HLH
| ||
akivaa
‘s/he answered him/her’

HLH
|| |
akivaatit
‘s/he answered you’

d.

HLH
|||
ataasiiq
‘one?’

HLH
| ||
tigu^{w}aa
‘s/he takes that’

HLH
|||
tigu^{w}aaa
‘does s/he take that?’

e.

HLH
|||
apirai
‘s/he asked them’

HLH
|||
apiraai
‘did s/he ask them?’

The data in (29) indicate that the HLH boundary melody is timed with the three rightmost morae in any phrase. Those data also indicate that the interrogative can involve a lengthening of the final syllable, which then causes the HLH boundary to shift relative to the base-stem, as in (29a) [atâːsíq] versus the question form in (29d) [atáːsĭːq]. This lengthening can also result in homogeneous overlong vowels as in (29d) and heterogeneous overlong vowels as in (29e). This thesis will not deal with the complex question of how to syllabify these sequences, but Rischel's insights on intonation will be touched upon again in §3.4.3. In this section about "stress," Rischel's contribution is to show that this prosodic phenomenon of intonational phrasing may have been incorrectly perceived by Kleinschmidt and others as word stress.

One consistency with Kleinschmidt's account throughout the literature is the position that heavy syllables always attract stress in West Greenlandic. Dresher & Johns (1995:89) write that while "the facts of stress in Inuktitut tend to be elusive, on most accounts syllables with long vowels or vowel clusters have some degree of stress: typically they have the most stress." The preliminary results here show that this is sometimes the case. But the full results in Chapter Five show that short vowels can also attract peak intensity and host pitch effects. These findings are also contrary to another system of stress proposed by Smith (1975:103-4) for Labrador Inuttut. While he acknowledges that his account is "aural impressionistic and not based on spectrographic analysis," Smith nevertheless proposes the "gross features of stress assignment at the word level" as adhering to a ternary system where the strongest [1] stress falls on syllables with a long vowel, the next strongest [2] on precluster syllables and the least stress [3] on open syllables. Consider the following data:

(30) Three degrees of stress in Inuttut (Smith 1975:103)

  2 3 3 1 3 1   3 3
nukχakasa:ligi:kχuŋa
'I am already almost finished'

Like Kleinschmidt (1851), Smith does not define stress and offers no acoustic evidence of the correlates he may be referring to. As we will see in Chapter Five, however, no one correlate or any combination of correlates could be found to match the pattern in (30). Intensity, for example appears to be entirely at the discretion of the speaker. Minimally, Smith (1975:103) contends that "subtler factors such as emphasis and emotion can be superimposed" onto his proposed system for word stress.

3.4.2 A recent account of "stress" in West Greenlandic

Jacobsen attempts to resolve the outstanding question of stress in West Greenlandic in her (2000) study of durational and pitch values for a series of words in carrier sentences read seven times by two West Greenlandic language consultants. Her focus on just two possible correlates of stress comes from Rischel (1974:96):

> ... two prosodic parameters must be studied thoroughly before it is advisable to speak of stress. One is intonation in relation to vowel morae. The other is Kleinschmidt's concept of syllable weight. Since the latter parameter is entirely deducible from the segmental structure of word forms it is no problem to represent it consistently, and hence it should be entirely possible to test empirically to what extent the subjective category of stress can be explained as a complex function of syllabification, syllable weight, and intonation. If there is a residue of unexplained rhythmicization (which there is, without doubt), we may begin to search for a significant parameter of stress'.

As mentioned above, Jacobsen (2000) finds no empirical basis for Kleinschmidt's system of stress based on syllable weight. Her working hypothesis is that, minimally, stress must include more than one acoustic parameter. Therefore the relevant parameters in her view, duration and pitch, "must covary in a systematic and consistent way." She finds no evidence of this covariance in her data and concludes that stress is not a "relevant category in the description of West Greenlandic word prosody." This finding is consistent with the detailed results presented in Chapter Five.

3.5 Accounts of pitch in the Inuit languages

The most studied phonological pattern in the Inuit languages involves intonation, introduced already for West Greenlandic in §3.4.1 as being moraically timed. I conclude this chapter with a review of the scientific literature on intonational phrases in West Greenlandic and Quebec Inuttitut, which serve as background to the analysis of pitch patterns in Chapter Five.

3.5.1 Accounts of pitch in West Greenlandic

Mase & Rischel (1971:235), Mase (1973), and Rischel (1974) examine pitch in West Greenlandic. Each concludes that the syllable is a functional category. Further, they argue that since "intonation is clearly based on a mora-counting principle, we have two units of measure in West Greenlandic: VOWEL MORA and SYLLABLE" (p. 97). Rischel also describes five terminal contours (that will not be addressed in detail here), an important one being the phrase-final boundary melody HLH. Exhaustive F0 studies of reading task data by Nagano-Madsen (1988, 1990, 1993, 1994) and Nagano-Madsen & Bredvad-Jensen (1995) reveal empirical evidence of these phenomena. Gussenhoven (2000:133) summarizes their findings, using examples from Rischel (1974), including (29d-e), which highlight the contrasting tonal patterns in declarative and interrogative phrases with the addition of a vowel mora to the final syllables of the examples in (29e). Consider the following data:

(31) Intonation in West Greenlandic: declarative versus interrogative

a.	takúʷìʲúk ‘you saw him/her’	takuʷíʲŭːk ‘did you see him?’
b.	tsigúʷăː ‘s/he takes that’	tsiguʷăːː ‘did s/he take that?’
c.	apíràí ‘s/he asked them’	apirâːí ‘did s/he ask them?’

First from a segmental perspective, Gussenhoven observes that final short vowels in declaratives are lengthened in the interrogative form, as shown in (31a). Final long vowels in declaratives become overlong in the interrogative form, as shown in (31b). Similarly, final diphthongs in declaratives also become overlong, with the first element of the diphthong being lengthened, as shown in (31c). Thus, from a mora count perspective, the final syllable in (31a) is monomoraic in the declarative and bimoraic in the interrogative, while the final syllables in (31b, c) are bimoraic in the declarative and trimoraic in the interrogative. Nagano-Madsen (1993) adds one more detail to Rischel’s (1974) account of the terminal HLH contour, decomposing that boundary melody into a word-final boundary melody of HL and a phrase or utterance-final H boundary tone. Her argument is thus that all words have an HL boundary melody, which is generally consistent with the current results, and that the H boundary tone is phrasal, falling on the final mora of a phrase or utterance and causing the HL boundary melody to shift leftwards by one mora. Finally, based on the results from two language consultants reading six paragraphs of West Greenlandic text, Nagano-Madsen & Bredvad-Jensen (1995) treat the HL previously described as a word domain boundary melody as an F0 reset or, "a pitch accent which appears in relation to a word boundary, while the phrase-final H tone can be referred to as phrase accent" (p. 152).Support for this analysis comes from the fact that in the phrase-final position they observe that the reset of L "is nearly 100% predictable that it will be followed by a phrase-final H tone which is manifested as a F0 rise." (Nagano-Madsen & Bredvad-Jensen 1995:137).

I assume, as a starting point, that the body of work on West Greenlandic is directly applicable to the related language of Labrador Inuttut studied here. It therefore stands as the theoretical model for intonation used in my analysis of F0 results in Chapter Five, where I show that boundary melodies in Labrador Inuttut also consistently pattern with various dialogue contexts.

3.5.2 A recent account of tonal and durational patterns in West Greenlandic

Building on her analysis of the prosody of West Greenlandic, Jacobsen makes three further conclusions, summarized as follows:

(1) The prosodic characteristics of words can be explained in either tonal or durational terms.
(2) The four different syllable types (of different 'weight') are distinguished in durational terms; further, there appears to be only a tripartite system of short, long and overlong [segments].
(3) There are intra-syllabic as well as inter-syllabic rhythmical adjustments. It is concluded that Greenlandic prosody does not include an autonomous stress category, either tonal or durational parameters alone will do. And although Greenlandic has distinctive quantity, there is room for considerable durational variation of segments.

(Jacobsen 2000:40)

The first point is consistent with the results of the current investigation, where, as we will see, intensity is unsystematic. The second point is also consistent with the results detailed in Chapter Five, which generally reveal four classes of syllable length and three classes of syllable peak length (no overlong consonants). Like Jacobsen's work, this thesis presents empirical evidence of distinctive quantity and also shows a limit to durational variation: phonemic long and phonemic short segments never overlap.[5] Jacobsen's (2000) study

5 This study was not designed to test for the "intra-syllabic as well as inter-syllabic rhythmical adjustments" that Jacobsen finds in her data. She describes these, respectively, as (a) shortening of long segments adjacent to other long segments, and (b) shortening of either the first or second syllable from adjacent heavy syllables, a so-called 'weight clash'. Dealing with the segmental adjustment first, Jacobsen observes:

> [...] the difference (both relative and absolute) between phonologically long /kk/ after the long vowel in atu:kkasura: and the phonologically short /k/ after the long vowel in piku:kulavuɣut happens to be smaller than the difference between the phonologically long /kk/ after the long vowel in atu:kkasura:) and phonologically long /kk/ after short vowel (in kukukkumavara).
>
> Jacobsen (2000:58)

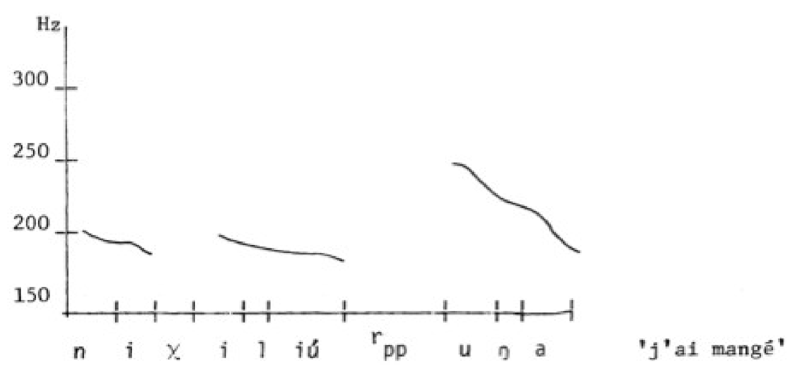
Jacobsen argues that her West Greenlandic language consultant uses this durational variation as a form of rhythmicization, with the limitation that short vowel duration must not exceed the duration of its long vowel counterpart. This phenomenon will not be explored in this thesis. The second durational phenomenon Jacobsen (2000) argues for is that adjacent super heavy syllables CV:C create a weight clash that her language consultants resolve by shortening consonants in either the first or second syllable. The environment arises in the test word [ta:ma:lla:llia:si:t], where she observes that one of her language consultants reads the first CV:C more quickly than the second CV:C, while the other language consultant does the opposite. The preliminary results here show no evidence of this phenomenon and it will not be pursued in this thesis. However, these detailed analyses of segmental duration do inform the establishment of the acoustic criteria for geminate status, crucial in Chapter Five to the instantiation of SL in the data considered here.

presents empirical evidence, consistent with the findings of Nagano-Madsen (1992:62), that geminates in West Greenlandic are twice as long as their short counterparts.

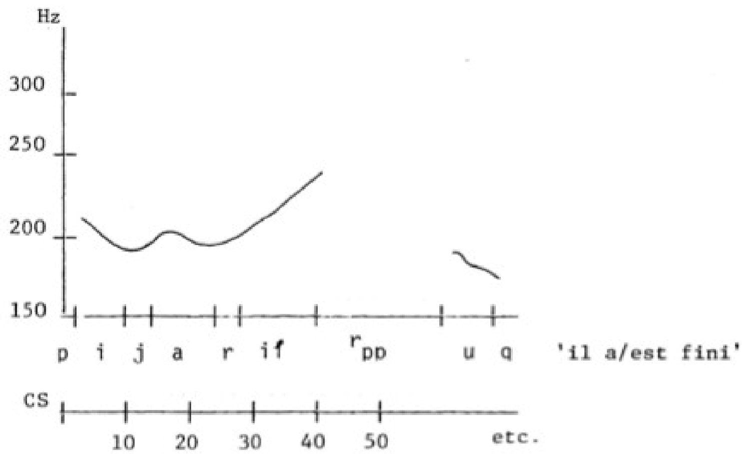
3.5.3 Pitch patterns observed in Quebec Inuttitut

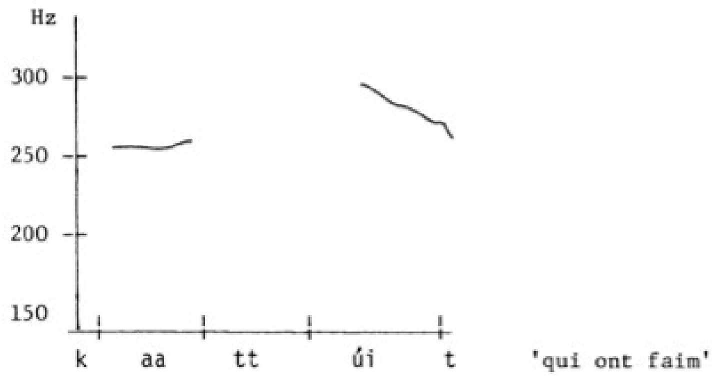
Finally the pitch effects observed in the current data are consistent with Massenet's (1980) findings in his acoustic study of spontaneous speech recorded from Inuit language consultants originally from Quebec, Canada.[6] His analysis of F0 for these Quebec Inuttitut speakers shows patterns for declarative, interrogative and imperative phrases. As regards final declarative intonation, Massenet observes high tone on the penultimate vowel, as shown in the following examples:

(32) Massenet: declarative intonational melody (1980:197-8)



6 Massenet interviewed speakers living for more than 20 years in Resolute Bay, Nunavut (now called Qausuittuq), but originally from Port Harrison, now called Inukjuak, in Quebec.

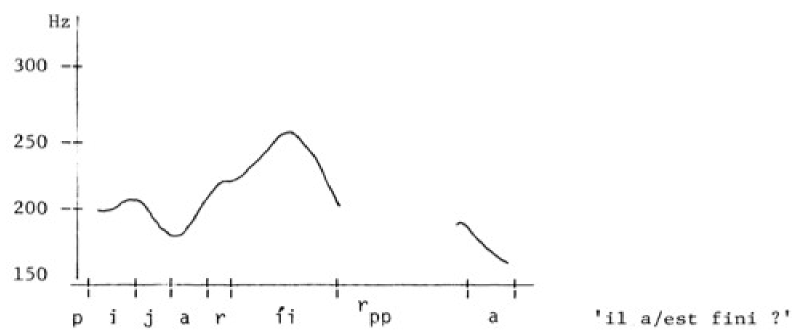


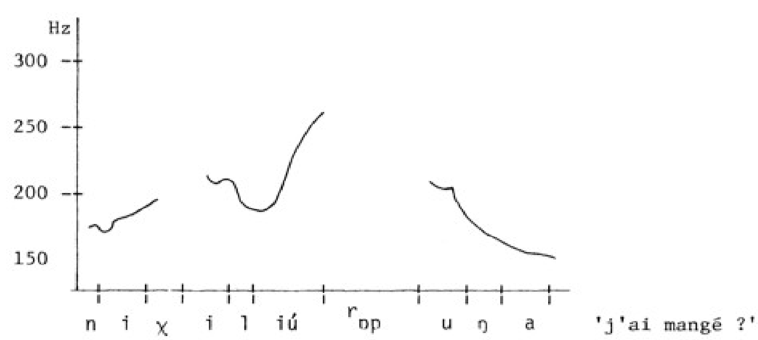


In the left and medial syllables of the first example in (32), pitch is flat or slightly falling from left-to-right across each syllable, a pattern shown in the Chapter Five results to be the unmarked pitch pattern. By contrast, at the right edge of the declarative phrases in (32), Massenet's data show high pitch on the penult consistently contrasting with low pitch on the phrase-ultimate syllable. This finding is consistent with the declarative phrase data shown in Chapter Five. Massenet's description is also consistent with arguments for an HL boundary melody associated with the final two morae of phrases in West Greenlandic, as described in Gussenhoven (2000)[7]

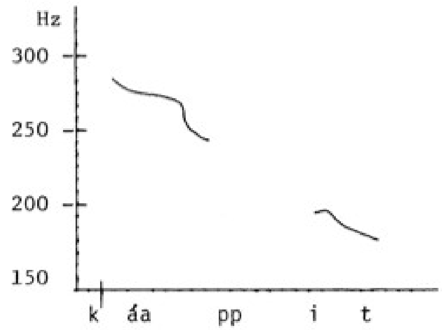
Massenet (1980:204) next describes interrogative phrases where "*l'accent musical se place sur l'anté-pénultième*" (boundary melody is placed on the antepenult). Massenet describes three different interrogative types. First, for questions where the answer is known or visible, Massenet finds no lengthening of the phrase-final syllable, as shown in the following results:

(33) Interrogative intonational melody, no lengthening (Massenet, 1980:199-200)

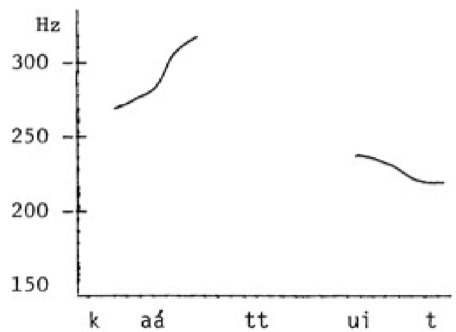




7 Nagano-Madsen & Bredvad-Jensen (1995) put forward an alternative analysis to the position that West Greenlandic words end with an HL boundary tone, arguing instead that the observed phenomenon may in fact be an F0 reset.



'as-tu faim ?'

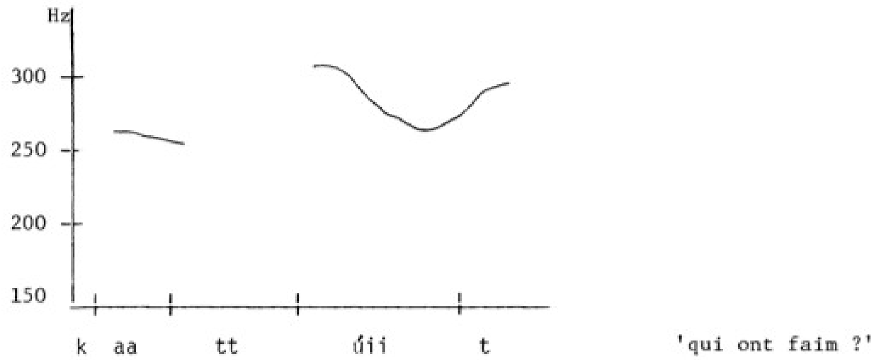


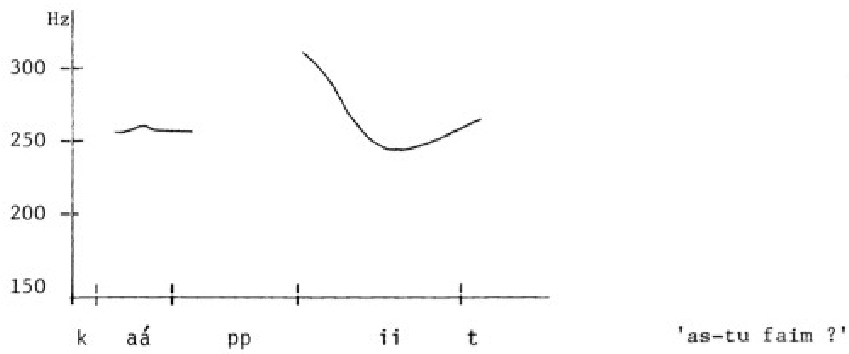
'qui ont faim ?'

Massenet observes that "*l'accent musical est placé sur la troisième voyelle la fin de la phrase*" (the boundary melody is placed on the third vowel from the end of the sentence), as shown in (33) where the H tone begins on the ante-penultimate syllable for each example.

In the second type of question, the answer is not known. Massenet (1980:200) describes lengthening for this type of interrogative phrase in a phenomenon called "*redoublement*" (reduplication) of the phrase-final vowel. In these cases the high tone is again placed on the ante-penultimate syllable, as shown by the following data:

(34) Interrogative intonational melody, with reduplication (Massenet, 1980:200-201)

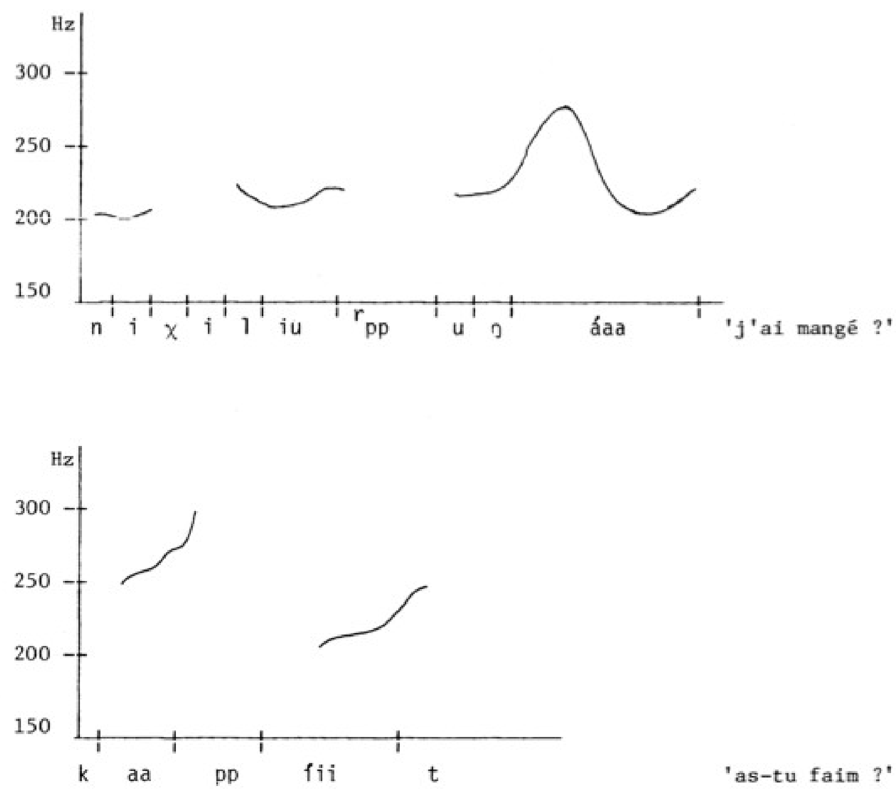




Massenet argues for a different pitch pattern in these types of questions, since, following the H tone on the antepenultimate syllable, he observes that "*après la retombée sur la voyelle suivante, on assiste à un (légère) remontée sur la dernière*" (after the decline of the following vowel, there is a (slight) rise on the last). The data in (34) are thus consistent with the descriptions of an HLH boundary melody in West Greenlandic, and with the pitch results in the data considered here.

The third type of question echoes a statement, where the questioner is looking for confirmation as a result of misunderstanding or surprise. Massenet (1980) observes "*surallongement*" (overlong) in these cases, shown by the following examples:

(35) Interrogative intonational melody, with reduplication (Massenet, 1980:200-201)



Massenet argues for the same pitch pattern as (34), except that in (35) the HLH melody falls entirely on the overlong final vowel. This description is consistent with the accounts of West Greenlandic, and, further, the same pattern is observed in the results for pitch discussed in Chapter Five.

3.6 Summary

SL is a phenomenon in which the second of two syllable adjacent geminates is degeminated. The rule is described in the literature for Quebec Inuttitut, Labrador Inuttut and Northwest Territories Siglitun, where it is shown to exclusively target underlying geminates. It is indifferent to vowel length, and works on the output of other rules like Truncation, Regressive Assimilation and Consonant Gradation. SL is not related to any metrical pattern. In regard to rhythm, studies on the Inuit languages show no evidence of metrical stress in any dialect apart from Inupiaq on the Seward Peninsula in Alaska, which Kaplan (1985) describes as iambic. Studies of the remaining dialects show that intensity prominence is unsystematic, consistent with the data considered here. Finally, SL operates independently from intonation. Among the Inuit languages, the most studied tonal system is that of West Greenlandic, where SL is not operative. In that dialect, interrogative phases are marked with boundary melodies and final syllable lengthening. Massenet (1980) describes a similar system of intonation for Quebec Inuttitut, where SL *is* operative. The rule is not affected by these tonal patterns, consistent with the results discussed here in Chapter Five.

4 Methodology

4.1 Preliminaries

The primary source data for this thesis come from field work performed in 2009 and 2010. After gaining ethical approval from Memorial University and a research permit from the Nunatsiavut Government, I conducted 19 days of field work on the North Coast of Labrador in April of 2009. This included radio interviews with the OKâlaKatiget Society to publicize the research, canvassing of potential Labrador Inuttut speaking language consultants, ethnographic interviews and continuing the preparation of my linguistic research program. Field work resumed in April of 2010 for 21 days of linguistic interviews with language consultants and travel on the land with cultural experts in and around the communities of Nain, Hopedale, Makkovik and Rigolet. In each town, local authorities were consulted and information sessions were held at community halls (attendance: Nain 17; Hopedale 15; and Rigolet 12). Information sessions were also held at three local schools, involving more than 60 students.

4.2 Participants

More than thirty people were directly involved in this study, including translators and language consultants, in addition to their spouses and other family members. For the linguistic and ethnographic interviews, examples from 22 language consultants were transcribed and segmented into a corpus organized by the software program *Phon*. From this corpus, examples were then measured with the speech analysis software program

Praat. Nine language consultants were women (AE, BH, DF, FW, JD, KT, MH, VI and SI) and 13 were men (AZ, BK, EF, HP, HW, JI, JM, LI, MK, MN, PA, PJ and TK). Language consultants ranged in age from 41 to 81 years old. Based on their answers to questions about their parents and grandparents, the language consultants were categorized as being from speech communities roughly divided as follows: Inuttut ((Hebron 9), (Okak 3), (Nain 6), (Hopedale 3)), and Inuktut (Rigolet sub-dialect 1).

4.3 Audio environment and equipment

Transportation was an issue for some of language consultants, so quiet areas were established in their homes with appropriate mixing and microphone placement to capture high-quality recordings. Alternately, interviews were done in a quiet area set up at the Atsanik Lodge, a hotel in Nain. Two interviews were done at the OKâlaKatiget Society's Broadcast Centre in Nain. Language consultants from Makkovik were interviewed in their homes. In Hopedale and Rigolet, language consultants were interviewed either in their homes or in a quiet room set up in two local hotels. All interviews were documented with the following professional equipment: Sony DV camcorder, M-Audio Microtrack 24/96 audio flash recorder and an HHL professional MD recorder. Main source audio came from a boomed Electro-voice RE-50 microphone.

4.4 Goals and methodology

The primary goal of the field work was to gather examples of SL in the speech of Labrador Inuttut speaking language consultants living in Nunatsiavut, the Inuit-governed part of Labrador. My hypothesis was that the durational pattern of SL as described in the literature would emerge from such data. Secondarily, I wanted to investigate the possibility of an iambic metrical pattern, or remnant thereof, since one of the key examples of iambic footing in Metrical Stress Theory comes from the related but more conservative Eskimo-Aleut languages of the Yupik (Hayes 1995). The ultimate goal was to compare the metrical system in Labrador Inuttut data with the occurrence of SL, with the working hypothesis that they would operate independently, as suggested by Dresher & Johns (1995).

4.4.1 Design and implementation of the linguistic interview

With help from my academic supervisors, I designed a linguistic interview to elicit the required data. A trial of that linguistic interview was done at Memorial's Speech Sciences and Language Acquisition Laboratory with a language consultant who preferred to remain anonymous. Analysis of that data offered the basis for the final revisions of my linguistic interview materials, provided in Appendix A. Each interview began with a conversational exchange intended to establish background personal information. The results for Section A of the interview process provided a series of words used by all language consultants. An important example word used in this study is [anaːnaɣa] 'my mother' which arises in multiple conjugations and phrasal positions (described in §4.4.4), making it an appropriate token for acoustic testing on the possible correlates of stress, presented in §5.3.

Sections B and C of the interview involved reading tasks. Language consultants were first asked to read from the top of the seventh page of *Labradorimi Ulinnaisigutet*, which is the introduction of a dictionary published by the Labrador Inuit Association in 2006. Next, language consultants read from a series of words, minimal pairs and lexical items with SL alternations, each embedded in carrier sentences. Since the durational pattern of SL is represented in the Labrador Standardized Spelling System (LSSS)[1], these reading tasks did not constitute a neutral test for the application of SL. None of the results for Sections B and C were thus considered in this thesis in the context of SL.

Section D is the /tutuk/ versus /tuttuk/ oral task. Language consultants were asked to make up four sentences, each with a different example word based on either [tutuk] or [tuttuk]. These words were given to the language consultants orally. They were also not allowed to see the written form given to the translator. Instead the translator was instructed to explain the meaning of the word without actually using the construction. In the case of bilingual language consultants, the meaning of the word was explained entirely in English. For example, with [tuttuːŋuaqχauŋittuk], language consultants were asked to imagine a situation in which they would use a word that means: "she wasn't pretending to be a caribou earlier today." Despite the somewhat artificial nature of the task, without exception language consultants produced all four alternations without the aid of the written form shown in Section D. The results from this task (described in §4.4.1) are crucial to the demonstration of the exceptionless nature of SL, in §5.1.

1 Adopted in 1980 by a conference of Elders held in Nain. LSSS is almost phonemic, except the long vowels [aː iː uː] are written as 'â', 'e' and 'o', respectively, while the consonants [χ] and [ɣ] are written with a small upper-case letter 'ĸ' and the lower-case letter 'g', respectively.

In Section E, consultants were asked topical questions about life in Northern Labrador. The results varied, with some language consultants giving long and detailed answers while others gave only short responses. Within these results, several words were repeated, but none specifically appropriate to a study of SL and syllable prominence. Of interest from this data set are the parts where the language consultants became emotionally engaged in what they are describing, something that occurs in particular for questions one and four. The difficulty is that the lexical items used in these responses are too varied to form tables of intra-speaker examples. As a result, there only a handful of example words from Section E in this thesis,[2] however these results do provide examples of utterances and speech samples important to the discussion of Labrador Inuttut prosody in §5.4.

4.4.2 Ethnographic interviews: purpose and methodology

I first took an interest in Labrador Inuttut in part because of the surprising realization that, even though the dialect has been 'documented' in terms of having a proper dictionary and grammar, many forms describing the natural environment, travel and hunting have not been written down. The existence of these forms is threatened because Labrador Inuttut is the mother tongue of so few Inuit under 40 years old. It is one outcome of colonization, first by German-speaking missionaries in the 18th Century to Labrador, then by English-speaking immigrants. In the 1950's the provincial government of Newfoundland started

2 Several examples of the token, /χattaχ/ 'repeatedly' from EF were extracted for this thesis, with the results discussed in §5.2.

to enforce an education strategy that saw the relocation of Labrador Inuttut speaking children away from their parents for long periods to English-only boarding schools. Nunatsiavut, the Inuit government in Northern Labrador, is now trying to revitalize their language. Following their example of holding story telling gatherings and land-based language camps, I endeavoured to include elements of the same in my linguistic study. The first field trip to Labrador in 2009 was in part reconnaissance for the linguistic interviews and an opportunity to do ethnographic research which in the end provided data crucial to this study. Background work was first done for two ethnographic studies: first I compiled a list from the Labrador Inuttut dictionaries of all the words related to sea ice; and then compiled a second list of all the species of flora and fauna named in the biology literature. The latter was correlated to a folder of photographs printed from Google Images for each species. To obtain photographs of sea ice conditions, trips were taken on snowmobile over the frozen sea around the communities. From Nain, a trip was undertaken with three Inuit guides to an [iŋiɣɣanik] 'polynya' 30 kilometres away. From Rigolet there was a trip with two Inuit guides to two open water polynyas: one on a river and a second on the sea. Finally, from Makkovik, an Inuk father and son took me by snowmobile to the [sinaː] 'sea ice edge', 15 kilometres off shore. Hundreds of sea ice features were photographed and correlated to words in the Labrador Inuttut lexicon. One feature, for example, an [allu] 'seal's breathing hole', was found near Makkovik. The resulting discussion in Labrador Inuttut about the signs left in the snow and ice by a seal was recorded. During the ethnographic interviews, these videos and photographs[3] were

3 As well as photographs of sea ice conditions in the Bering Strait (Krupnik & Weyapuk 2010).

presented systematically to each language consultant. The resulting spontaneous discussions included explanations, descriptions and stories about the sea ice, plants and animals. The results are important to this phonological study because they contain intra-speaker sequences of /-ixxi-/ from the base-stem, /aχixxik/ ‘ptarmigan’.[4] These 52 tokens are directly relevant to this study, as each contains an intervocalic geminate. My hypothesis was that if the morphology supplies an underlying geminate in the next adjacent sequence to /-ixxi-/, SL must apply. Where SL applies vacuously, any prominence pattern related to syllable weight should be visible, the subject of §5.3, in the following chapter.

4.5 Software and settings

Measurement of the relevant sequences was done with the phonetic analysis software suite *Praat,* version 5.1.19. For the analysis of pitch, the following settings were used: time step 0.1, pitch floor of 75 Hz to pitch ceiling 300 Hz for male language consultants, pitch floor of 100 Hz to pitch ceiling 600 Hz for female language consultants. Formant settings were as follows: Maximum Formant Hz 5500, Number of Formants 5, Dynamic range dB 30. Intensity settings, View Range dB 50-100, Mean Energy averaging method. Finally, the spectrogram setting was a dynamic range of dB 75.

4 Produced variably by speakers as /-iɣɣi-/, /-ixxi-/ or /-ikki-/ the result of the optional phonetic implementation rules: devoicing or continuancy.

4.5.1 Acoustic analysis

As mentioned above, one of the primary goals of this field work was to find some pattern of syllable prominence, possibly related to the iambic pattern shown for Yupik. Word examples were thus extracted from /tutuk/ versus /tuttuk/ and three sequences in the ethnographic interviews from the base stems /anaːna-/ and /aχixxi-/ and the suffix /-χattaχ-/. The tokens were first transcribed into the *Phon* software program, designed at Memorial University to facilitate the phonological analysis of data. Each example was then exported to *Praat* for measurement. Using both auditory and visual cues from the spectrogram, the three correlates of stress were considered: duration, fundamental frequency and peak syllable intensity (Fry 1958, Liberman & Prince 1977, Hayes 1995, inter alia). Values for each were then entered back into *Phon* for each segment under tiers for loudness, duration and pitch. This was then exported into the tables which appear in Appendixes C-F. A graphic representation of the three stress correlates for some of the examples was created with *Praat* as a visual aid in the description of results in Chapter Five.

4.5.2 The phonemic pair /tutuk/ 'messy hair' versus /tuttuk/ 'caribou'

The data set in Appendix C was designed to test for SL in spontaneous speech. It resulted in 32 usable examples, some discussed already in the preliminary results (see §2.2.1). There were eight language consultants involved of various ages: five women (AE-69, JD-53, BH-56, MH-41 and FW-63) and three men (PA-46, MK- 43 and TK-51). Most of these example words arise in phrase-medial positions, but a few occur phrase-finally. There is systematic lengthening of the final-syllable rhyme, a phenomenon that will be explored in §5.4 using a different data set. For the analysis of /tutuk/ versus /tuttuk/ in §5.1, which focuses on the SL durational phenomenon, this lengthening phenomenon is left aside: the duration of final-syllable coda consonants is not included in the results. This approach received support from the consideration of word edge effects in the literature on West Greenlandic. Nagano-Madsen (1992:118) observes that the /t/ in /ata:ta/ and /ata:ta:/ is longer than /t/ in /ata:ta:ta/ and /ata:tatta/. She interprets this pattern as 'prepausal lengthening'; in §5.4, using data from the ethnographic interviews, I will show that a similar lengthening phenomenon covaries in the data considered here with pitch effects, specifically boundary melodies.

4.5.3 The morpheme /χattaχ/ 'often, intermittently'

The data set in Appendix D is also discussed in Chapter Five. It involves a single language consultant (EF, 69 years old, male), combining 18 example words from both the linguistic and ethnographic interviews. This data set was compiled with the hypothesis that a prominence pattern might emerge from the way one speaker uses the morpheme /χattaχ/ 'often, intermittently', a derivational affix often found in the spontaneous data considered here. The sequence is crucial to this study because, unlike the /tutuk/ versus /tuttuk/ example, the intervocalic geminate arises between the short vowel [a], left-adjacent to both the SL trigger and target. Intensity for this data set patterns unsystematically, providing additional evidence in §5.2 for the hypothesis that SL is not governed by syllable prominence.

4.5.4 The sequence [χixxi]

The data set in Appendix E includes 52 example words extracted from the ethnographic interviews with 15 language consultants of various ages: five women (AE-69, BH-56, SI-79, VI-74 and KT-53) and ten men (EF-69, JI-73, LI-70, PJ-49, BK-53, JM-63, MN-61, HP-81, HW-72 and AZ-46). The sequence occurs within five lexical items describing related bird species, generally called 'partridge' in Labrador English. Part of the exercise was to try to better understand the Labrador Inuttut names for all flora and fauna, a subject of some confusion in the published dictionaries. Each language consultant was thus shown a photograph of the species, and, without using any assumed names, invited to make comments. Responses varied from a simple statement of the species name as they knew it, to long and detailed descriptions. As a result, word examples arise in isolation, in phrase-medial positions or in phrase-final positions. The impact this has on the observed values for all three stress correlates of the intervocalic geminate, adjacent vowels and overall word examples is the subject of §5.3.

4.5.5 The sequence [na:na]

The final data set, in Appendix F, is based on nine word examples extracted from a question in the linguistic interview where the responses included spontaneous phrases with the example word [anaːnaɣa] ‘my mother’. The resulting data table includes nine example words from seven language consultants of various ages: three women (JD-53, DF-61 and BH-56) and four men (PA-46, MK- 43, TK-51 and MN-61). The isometric nature of the CVːCV sequence makes it an ideal test for any recurring syllable prominence pattern. As with all the data discussed in Chapter Five, these example words pattern unsystematically for all three stress correlates.

5 Project data: results and analysis

5.1 SL: acoustic manifestation

In this chapter I present the results of my 2009-2010 fieldwork in four Labrador Inuit communities. As we will see, SL is exceptionless in the spontaneous speech of my consultants, consistent with other descriptions in the literature. This generalization is supported by the measurement of consonant duration in 32 example words where the base stems /tutuk/ and /tuttuk/ are morphologically concatenated with morphemes which, together, yield underlying sequences of geminates adjacent to one another across a single syllable nucleus. Nowhere in these data do syllable-adjacent geminates arise at the surface level. Instead, phonetically realized geminates can be adjoined maximally by a short consonant. These results also show inter-speaker variation in constructions involving the morphemes /-ŋŋit-/ ‘negative’ and /-tuk/ ‘3s’. Despite these unexpected results, none of the variations violate SL.

5.1.1 Fieldwork data consistent with previous descriptions of SL

In this section I discuss findings from the /tutuk/ and /tuttuk/ alternation task, described in §4.5.2 as a way to test for the prevalence of SL in spontaneous speech. Recall from Smith’s (1975:105) aural-impressionistic description, SL occurs in all cases: “there are no sequences of the form ...CC(V)VCC...”. This generalization holds for all 32 example words with the base stem /tutuk/ or /tuttuk/. Before discussing SL’s acoustic manifestation in the data, consider first the criteria used in the representation of segments as geminate. Since the /tutuk/ and /tuttuk/ alternation task involves the phonemic pair /tutuk/ ‘messy hair’ and /tuttuk/ ‘caribou’, one way to investigate geminate duration is the systematic comparison of the [t] and [tt] segments. Consider the following four examples (see Appendix C for all of the relevant data):[1]

(1) a. [tutu**ːŋŋ**ua**χ**au**ŋŋ**i**t**uk]
messy.hair-be-pretend-NEARPAST-NEG-3s
‘s/he did not pretend to be messy hair’

t	u	t	uː	ŋŋ	ˈua	χ	au	ŋŋ	i	t	u	k	
28	61	67	111	108	124	91	98	121	78	81	95	76ms	BH

b. [tu**ttuː**ŋuaχauŋituk]
caribou-be-pretend-NEARPAST-NEG-3s
‘s/he did not pretend to be a caribou’

t	u	tt	u	ŋ	ˈua	χ	au	ŋ	iː	t	u	k^h	
19	88	205	87	78	227	63	127	88	129	21	91	140	BH

c. [tutu**ːŋŋ**uania**ŋŋ**i**t**uk]
messy.hair-be-pretend-NEARFUTURE-NEG-3s
‘s/he will not pretend to be messy hair’

t	u	t	uː	ŋŋ	ˈua	n	ia	ŋŋ	iː	t	u	k^h	
29	75	52	120	114	101	63	126	111	147	13	97	125	BH

d. [tu**ttuːŋ**uania**ŋŋ**i**t**uk]
caribou-be-pretend-NEARFUTURE-NEG-3s
‘s/he will not pretend to be a caribou’

t	u	tt	uː	ŋ	ua	n	ˈia	ŋŋ	i	t	u	k	
52	67	180	146	59	128	73	128	124	99	56	43	103	BH

1 The use of apostrophes in this table and all those that follow, as in (1a) [ˈua], denotes the syllable with peak word intensity.

In (1a), the singleton [t] has a duration of 67 milliseconds (ms hereafter) while in (1b) the geminate [tt] is 205ms. The geminate is thus 3.1 times longer than its singleton counterpart. In (1c, d) the geminate is 3.5 times longer. The average difference for [t]/[tt] in Appendix C is 2.7. This is consistent with all the data considered here as well as with comparable data from acoustic studies of West Greenlandic. Mase & Rischel (1971:235) and Nagano-Madsen (1992:61) argue that long consonants are "two times" longer than short consonants. Jacobsen (2000) also finds a systematic durational difference; she argues that a long segment (where 'segment' stands for either a consonant or a vowel) is shorter when preceded by another long segment (as described in §3.5.2). Jacobsen (200:60) compares [kk] in [kuk.u**kk**.umavara] with the singleton [k] in [kuk.u**k**.ulavaːt]. On average, for Jacobsen's two West Greenlandic language consultants, the geminate is 1.5 times longer than its singleton counterpart, consistent with the data considered here. These examples support the representation of geminate consonants in the following discussion of SL.

Recall that the objective set in §4.5.2 for the /tutuk/ and /tuttuk/ alternation task was to observe the behaviour of morphemes in opposite environments: following a syllable with an SL trigger versus following a syllable where SL is not a factor. Smith (1977a, 1978) describes the morphemes selected for the current investigation as /-ŋŋua-/ 'to pretend, play x', /-χχau-/ 'near past' and /-ŋŋituk/ 'negative.3s'. According to Smith, these morphemes alternate under the influence of SL with the degeminated surface forms, [ŋua], [χau] and [ŋittuk]. Beginning with the morpheme /-ŋŋua-/, the degeminated form arises in all cases for the base stem /tuttuk/ and never for /tutuk/, as shown in the following examples, with segments represented as geminate (SL triggers) shaded in light grey and segments represented as degeminated (SL targets) shaded in dark grey:

(2) a. [tutuː**ŋŋ**ua**χ**auŋi**tt**uk]
messy.hair-be-pretend-NEARPAST-NEG-3s

t	u	t	uː	ŋŋ	ˈua	χ	au	ŋ	i	tt	u	t^h	
44	128	61	160	143	166	129	178	57	82	117	60	263ms	FW

b. [tu**tt**uː**ŋ**ua**qχ**au**ŋ**ituk]
caribou-be-pretend-NEARPAST-NEG-3s

t	u	tt	ˈuː	ŋ	ua	qχ	au	ŋ	i	t	u	k^h	
64	50	258	190	96	158	210	174	54	103	88	34	380	FW

c. [tutuː**ŋŋ**uaniaŋi**tt**uk]
messy.hair-be-pretend-NEARFUTURE-NEG-3s

t	u	t	ˈu	ŋŋ	ua	n	ia	ŋ	i	tt	uː	$χ^h$	
68	97	39	13	164	182	90	111	86	70	120	250	553	MK

d. [tu**tt**uː**ŋ**uania**ŋŋ**i**t**uk]
caribou-be-pretend-NEARFUTURE-NEG-3s

t	u	tt	ˈuː	ŋ	ua	n	ia	ŋŋ	i	t	u	k	
57	45	255	161	87	176	67	140	117	60	83	48	96	FW

In (2b, d), [ŋua] arises following the SL trigger [tt]. As we can see in (1) this pattern is, again here, exceptionless. Observe further that, on average, [ŋŋ] is 1.7 times longer than [ŋ]. Crucially, in spite of considerable inter-speaker and intra-speaker variation in the duration of phonemically long versus phonemically short segments, their respective values never overlap.[2] This is consistent with Jacobsen's (2000:42) account of West Greenlandic. This difference will be referred to as 'geminate shortening', in other words the difference between the duration of an SL trigger and an SL target. Its value will be considered for all instances of SL in the data considered here.

With the /-χχau-/ morpheme, the degeminated form [χau] arises in (2a) where it follows the SL trigger [ŋŋ]. By contrast, in (2b), where SL is not a factor, the surface form is [qχau]. This pattern holds for all the examples (listed in Appendix C), which provides further evidence that SL is exceptionless. Also, the fact that SL applies twice in the examples in (2b, d) is consistent with the claim that SL is an iterative rule. In (2b) the rule applies in consecutive adjacent syllables. In (2d), however, the pattern fails to apply as the relevant context contains a morpheme that lacks an SL trigger, the underlying /-nia(χ)-/ 'near future' (Smith 1978:77). That allows the [ŋŋituk] form to arise in the adjoining position.[3] As a result, the underlying form of (2d), prior to application of SL, is /ŋŋittuk/. Observe that the iterative pattern of SL resumes, despite the intervening non-SL trigger syllable. This finding is consistent with the position in the literature that SL is an exclusively syllable adjacent phenomenon. Finally, in (2c) the /-ŋŋit-/ and /-tuk/ morphemes do not follow the pattern in (2d), the case for a number of examples in Appendix C. This morphological variation will be discussed further in the next section.

2 At its lowest the geminate shortening ratio is 1.4 (see Appendix C (3a) and (4a)). These two examples also display the fastest speech rates. More generally, the faster the speaker's speech rate is, the lower the ratio is between geminate and degeminated segments.

3 This alternation is more complex than Smith's description, as it involves two morphemes: /-ŋŋit-/ 'negative' and /-tuk/ '3s' (Douglas Wharram, p.c., October 2010).

For our purposes here, observe that none of the variations involving these morphemes result in an SL violation, the unattested surface form *[ŋŋittuk].

In sum, SL truly is exceptionless: there are no SL violations in these 32 examples of semi-directed spontaneous speech.

5.1.2 SL holds despite variations of the 3s negative morpheme

Smith (1978) describes the morpheme /-ŋŋit-/ as a deleting suffix (see §3.2.3), in other words causing the deletion of a base stem final consonant if there is one. He describes /-tuk/ is an adjoining affix, in other words adjoining a base stem final consonant if there is one. In a footnote he describes widespread inter-speaker variability in the application of deleting versus adjoining rules. The language consultants interviewed for this thesis were asked about the [ŋŋituk]/[ŋittuk] alternation and several described confusion about the proper usage. The results also show intra-speaker variation. Consider the following:

(3) a. /tutu(k) + u + ŋŋua + χχau + ŋŋi(t) + tuk/
messy.hair-be-pretend-NEARPAST-NEG-3s

t	u	t	u	ŋŋ	ua	χ	ˈau	ŋ	i	t	u	k	
62	69	80	22	200	172	137	93	124	45	128	23	108ms	MK

b. /tuttu(k) + u + ŋŋua + χχau + ŋŋi(t) + tuk/
caribou-be-pretend-NEARPAST-NEG-3s

t	u	tt	u	ŋ	ua	χ	ˈau	ŋŋ	i	t	u	t	
36	93	139	49	65	237	103	85	143	44	109	31	60	MK

c. /tutu(k) + u + ŋŋua + nia(χ) + ŋŋi(t) + tuk/
messy.hair-be-pretend-NEARFUTURE-NEG-3s

t	u	t	ˈu	ŋŋ	ua	n	ia	ŋ	i	tt	uː	$χ^h$	
68	97	39	13	164	182	90	111	86	70	120	250	553	MK

d. /tuttu(k) + u + ŋŋua + nia(χ) + ŋŋi(t) + tuk/
caribou-be-pretend-NEARFUTURE-NEG-3s

t	u	tt	u	ŋ	ua	n	ˈia	ŋ	i	t	u	k^h	
96	39	184	68	40	191	70	131	111	62	129	29	818	MK

The examples in (3a, d) show a surface form not described in the literature: [ŋituk]. In (3b) the expected form arises, while [ŋittuk] is the surface form in (3c). As with (2c) above, it is not clear why in (3c) the underlying morpheme /-ŋŋit-/ is degeminated in the surface form. It may be that diachronic changes addressed by Smith (1978:116) are ongoing. As for the forms in (3a, d), these are two of the fastest performances of this particular word form, which suggests some ‘flattening’ of geminates in faster speech. These speculations however lie beyond the scope of my study. Lacking the data to fully understand the cause of the variation within the phonetics of this context, the important point for the current study is that none of the unexpected variations of this affix involves a violation of SL.

5.1.3 SL operates independently from vowel length

In this section, I show that, consistent with the literature, the length of the vowels adjacent to the consonants modified by SL is irrelevant to the operation of the rule. From the 32 example words in Appendix C, we can see 38 instances of degemination. In 27 of those cases, the segment in the intervening rhyme is either a long vowel [uː, iː] or a vowel sequence [ua, au]. In the other 11 cases, the segment in the intervening rhyme is a short vowel [u, i]. There is thus no evidence from these examples that vowel length makes a difference to SL, consistent with Dresher & John's (1995:81) observation that long vowels are "no impediment to the operation of SL." As discussed in §3.3.2, Dresher & Johns (1995:89) take this argument further, concluding that "just as vowels do not affect SL, they are never affected by it either. Thus there is no vowel shortening in the context of SL." Evidence in support of this position comes from the following examples. Consider the second syllable in each which, following Smith (1978), is underlyingly /tuttu+u/ 'be a caribou' or /tutu+u/ 'be messy hair':

(4) a. /tuttu(k) + u + ŋŋua + χχau + ŋŋi(t) + tuk/
caribou-be-pretend-NEARPAST-NEG-3s

t	u	tt	uː	ŋ	ˈua	χχ	au	ŋ	i	tt	u	k	
21	38	125	166	92	243	119	117	94	70	125	27	56	MH

b. /tuttu(k) + u + ŋŋua + χχau + ŋŋi(t) + tuk/
caribou-be-pretend-NEARPAST-NEG-3s

t	u	tt	u	ŋ	ˈua	qχ	au	ŋ	i	tt	u	kʰ	
47	101	140	101	88	180	120	98	45	74	191	100	153	PA

c. /tutu(k) + u + ŋŋua + χχau + ŋŋi(t) + tuk/
messy.hair-be-pretend-NEARPAST-NEG-3s

t	u	t	u	ŋŋ	ua	χ	ˈau	ŋ	i	t	u	k	
62	69	80	22	200	172	137	93	124	45	128	23	108	MK

d. /tutu(k) + u + ŋŋua + χχau + ŋŋi(t) + tuk/
messy.hair-be-pretend-NEARPAST-NEG-3s

t	u	t	uː	ŋŋ	ˈua	χ	au	ŋ	i	t	u	kʰ	
26	37	126	120	180	186	90	124	127	34	121	28	302	MH

Observe that in (4b, c) the second syllable peak is a short vowel. This is the case for 10 of the 32 examples in Appendix C, a morphological variation that may be attributable to the spontaneous nature of the oral task. For some reason, a few language consultants dropped the *-u-* 'to be' morpheme.[4] The motivation for this will not be explored here. Again, the important point is that the different vowel lengths of the second syllable in (4a, b) have no impact on the application of SL, since the underlying geminate /ŋŋ/ is degeminated in both cases. Note as well that SL has no systematic impact on the length of a syllable peak it straddles; as discussed above, the difference in vowel length in (4a, b) is morphological.

4 The results are still grammatical words, though somewhat artificial in meaning.

In (4c, d), observe that a short vowel versus a long vowel in the syllable peak preceding a SL trigger has no impact on the degemination of an SL target, in this case /χχ/. These general patterns described for (4) hold without exception for all the data considered here.

5.1.4 Summary of durational results for /tutuk/ versus /tuttuk/

The encompassing conclusion is thus that SL is exceptionless in environments where the morphology supplies syllable-adjacent underlying geminates. Generally from the data in (1-4) phonemically long consonants are 2.7 times longer than their phonemically short counterparts. In the context of SL, geminates are minimally 1.4 times longer than their degeminated counterparts. Some morphological variation was observed for the data in Appendix C involving 'negative.3s' and 'to be', but these never yielded SL violations. It can therefore be said of SL that morphology is only a relevant factor insofar as it provides syllable-adjacent underlying geminates. Finally, the presence or absence of SL has no systematic impact on vowel duration and a long vowel cannot block an SL trigger.

5.2 SL: No metrical motivation

The durational results discussed thus far are unsurprising given the description of SL in the literature. Another key point comes from Dresher & Johns (1995). They convincingly argue that SL is unrelated to any system of metrical stress, though admitting that the precise nature of the rhythmic system of the language is, at best, only partially defined (see §3.3.2). Previous research discussed in §3.5 shows that fundamental frequency, which plays a role in the intonational system of the language, has no metrical foundation. Similarly, recent research discussed in §3.4 shows that intensity prominence has no metrical basis in West Greenlandic, consistent with my preliminary results §2.2.2. In this section, I show evidence that, consistent with Dresher & John's (1995) observations (and related analysis), SL does not co-vary with a system of metrical stress based on intensity or pitch prominence.

5.2.1 SL: unrelated to syllable intensity

In addition to the references above, evidence that intensity is unsystematic (§2.2.2) and unrelated to SL comes from ethnographic and linguistic interviews with one language consultant (see §4.5.3). The following results for duration, representative of 18 word examples in Appendix D, first show that SL is active and exceptionless:

(5) a. /kattu(k) + χχi + vallia + tuinna + χatta + tu(k)/
come.together-instance.of-increasing-only-repeatedly-3s

k	a	tt	u	χ	i	v	a	ll	ia	t	ui	nn	a	χ	a	tt	a	t	u
142	99	174	70	84	84	60	51	179	138	95	101	131	71	37	33	172	64	97	61ms

b. /χaiŋŋu(k) + u + ni(χ) + ɣa + ttau + tu(k)/
polynya-be-unnoticed-HABITUAL-PASS-3s

χ	ai	ŋŋ	uː	n	i	ɣ	a	tt	au	χ	a	tt	a	t	uː^{h}
132	122	187	127	63	45	52	123	211	148	20	22	209	78	88	206

c. /χua(k) + ɣunna + niuma + χatta + tut/
freeze-be.able.to-be.expected.to-repeatedly-3p

χ	ua	ɣ	u	nn	a	ŋ	iu	m	a	χ	a	tt	a	t	u	t^{h}
186	204	41	59	180	68	93	140	93	47	53	38	210	73	84	43	147

d. /pi + χatta + tut/
do-repeatedly-3p

p	i	χ	a	tt	a	t	u	t
35	60	22	65	223	67	82	88	39

Limiting the analysis to the [χa**tt**a**t**u] sequence at right edge of each word example, note first that SL occurs, unsurprisingly, in every case. The underlying morphemes are /χattaχ/ 'often, intermittently' and /tuk/ '3s' or /tut/ '3p' (Smith, 1978:88,108). SL thus applies to the second geminate /tt/ in /χa**tt**a**χ**+**t**uk/→/χa**tt**a**χt**uk/→/χa**tt**a**tt**uk/ (through Regressive Assimilation) → [χa**tt**a**t**uk] (through SL).

The general pattern is thus a weakening of the second consonant in the context of two adjacent CVC syllables. If SL and intensity prominence were to co-vary, one would expect that the first CVC syllable in the [χa**tt**a**t**u] sequence would attract loudness in a systematic way. The fact that this does not occur is clear from the following intensity results for the word examples in (5):

(6) a. [kattuχivalliatuinnaχattatu]
'it is often just more and more (sea ice) coming together'

k	a	tt	u	χ	i	v	a	ll	ia	t	ui	nn	a	χ	a	tt	a	t	u
60.9	70.7	63.8	73.4	65.5	72.3	67.8	71.5	68.5	73.4	61.7	70.2	68.7	69.2	65.9	63	58	68.6	64.1	65.4dB

b. [χaiŋŋu:niɣattauχattatu:]
'polynyas are often unnoticed'

χ	ai	ŋŋ	u:	n	i	ɣ	a	tt	au	χ	a	tt	a	t	u:
65.4	73.6	71.2	72.8	70.8	71.6	68.8	73.6	64.5	70.4	67.9	64.9	62	69.3	59.6	66.8

c. [χuaɣunnaŋiumaχattatut]
'they are often expected to be able to freeze'

χ	ua	ɣ	u	nn	a	ŋ	iu	m	a	χ	a	tt	a	t	u	t^h
63.8	80.8	68.9	71.5	71.8	75.1	71.7	72.4	69.5	71.5	64	63.6	60.3	67.8	62	64.4	52.8

d. [piχattatut]
'they do (something) often, repeatedly'

p	i	χ	a	tt	a	t	u	t
68.2	78.3	73.9	73.8	71.5	71.4	66.9	70.4	61.4

Peak intensity falls on the second syllable in [χa**tt**a**t**u] sequence in three of the four examples in (6a-c). Only in (6d) is it possible to argue that the syllable which retains a coda after the application of SL, the [χa**t**] in [χa**tt**a**t**u], co-occurs with peak intensity in the sequence. However, the contrast between the 'strong' and 'weak' syllables is low, at less than three decibels. Further, peak word intensity in (6d) falls on the initial syllable. The best explanation for the data in (6) is that SL does not co-vary with intensity. The same can be said for all 18 words in Appendix D where peak word intensity is unsystematic and merely suggested by mostly weak intensity differences between syllables; these data also (weakly) contradict Dresher & John's (1995:89) claim "that on most accounts syllables with long vowels or vowel clusters have some degree of stress, typically they have the most stress" (see §3.3.2).[5] Finally, words like (6d) show that syllables with short vowels (and no coda) can also attract peak word intensity.

5.2.2 SL: unrelated to intonation

The intonational systems for West Greenlandic and Quebec Inuttitut are described in §3.5. Similar patterns emerge from the data considered here. Acoustic results for the base stem /aχixxik/ 'partridge (generic, ptarmigan) or rock ptarmigan (*Lagopus mutus*)' show that syllables made prominent by intensity pattern unsystematically and that fundamental frequency exhibits boundary melodies at the right edge of phrases or utterances. This last phenomenon co-occurs with lengthening of the final syllable rhyme, as described for Quebec Inuttitut (§see 3.5.2), and, in the data considered here, with final stop aspiration. Consider the following results, representative of the 52 examples in Appendix E:

5 Presumably, this claim is related to the impressionistic relationship that exists between vowel duration and relative prominence.

(7) a. [aχixxik]
‘ptarmigan’

59	52	53	56		58	51	dB	
a	χ	i	x	x	i	k˺	]$_{\omega}$	PJ
99	74	79	97	97	56	38	ms	

b. [aχiɣɣi::k^h]
‘is it really a ptarmigan (in the photograph)?’

73	72	69	64		69	52		
a	χ	i	ɣ	ɣ	î:í	k^h	]$_{IP}$]$_U$	HP
187	49	96	76	76	254	292		

c. [aχixxi::]
‘is it really a ptarmigan?’

57	57	66	60		70		
a	χ	i	x	x	î:í	]$_{IP}$]$_U$	JM
91	79	75	109	109	489		

d. [aχixxivi::n]
‘are you(1) a ptarmigan?’

66	63	69	65		70	69	63	60		
a	χ	i	x	x	i	v	í:ĭ	n	]$_{IP}$]$_U$	VI
87	74	65	81	81	89	120	512	153		

e. [aχixxivitsiavak]
‘a big, pretty brooker (willow ptarmigan, *Lagopus lagopus*)’

70	64	67	65		71	66	71	71		73	67	69	57		
a	χ	i	x	x	i	v	i	t	s	ia	v	ă:	k^h	]$_{DP}$]$_U$	SI
75	70	94	81	81	87	39	174	93	93	295	82	141	307		

In (7a), the word arises in the middle of a declarative sentence. Generally, in consideration of the data in Appendix E, it can be said that in phrase-medial environments, F0 is slightly falling from left to right. Consider the following acoustic results for (7a) and a pitch drawing of the highlighted area (the language consultant is male; accordingly, the pitch range setting was 75-300Hz; see also §4.3):

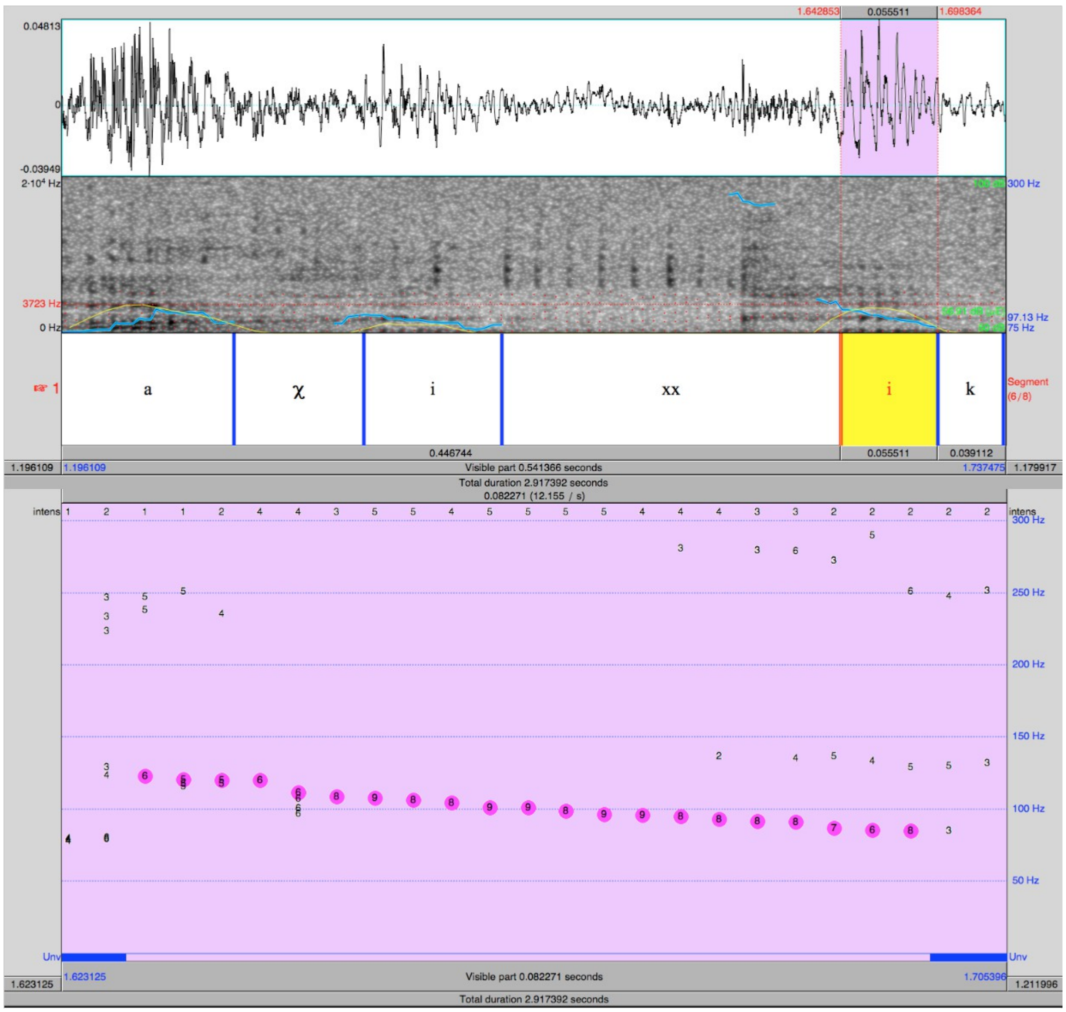


Figure 1: slightly falling tone

Observe the slightly falling tone from left to right in Figure 1. This illustrates the F0 pattern observed for phrase-medial environments throughout the recorded data. By contrast, consider (7b), where the word is located at the right edge of an interrogative phrase and utterance. The male consultant was directed to look at a photograph of the animal species in question and responds by asking if it really is a ptarmigan.[6] In (7b) the phrase-final syllable undergoes a strengthening phenomenon: the syllable rhyme is tripled in length and the coda stop is aspirated. The latter result is crucial because it shows that the SL trigger, the geminate [ɣɣ], does not apply to the final consonant [k^h] or in any way limit the lengthening caused by aspiration. This is evidence that the strengthening rule, henceforth called Final-syllable Strengthening, applies after SL. Finally in (7b), and all the example words in the data considered here that arise phrase finally, observe the exceptionless covariance of Final-syllable Strengthening and F0 boundary melody:

6 It is therefore anomalous to Massenet's (1980) description of a boundary melody and "surallongement" in environments where the questioner wants clarification of a possible misunderstanding (see §3.5.3).

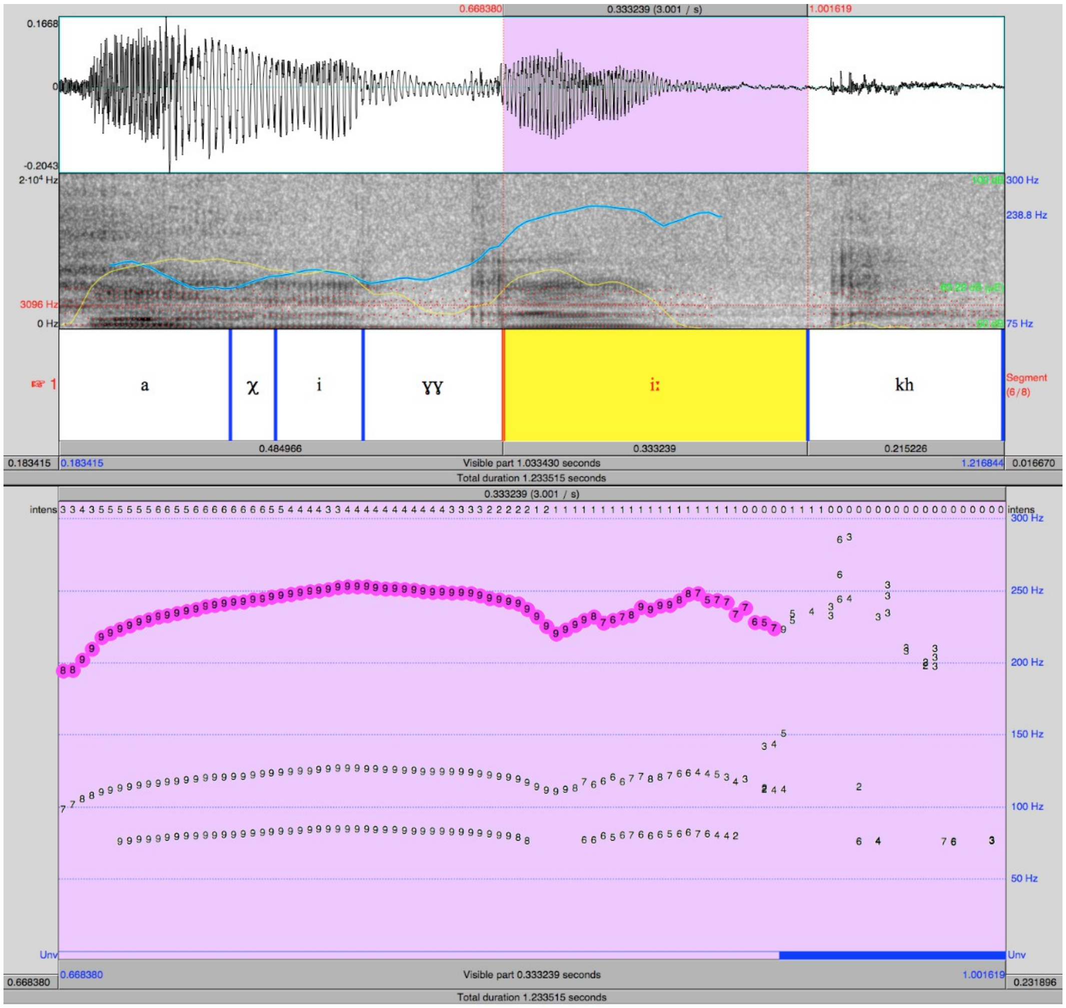


Figure 2: HLH boundary melody

The movement of F0 in Figure 2 is evidence of a HLH boundary melody, the same phenomenon described for Quebec Inuttitut (Massenet 1980:200) and West Greenlandic (Rischel 1974:97, Nagano-Madsen (1993:152), Gussenhoven (2000:133)). In (7c) the male consultant is again asking a clarification-type question. The acoustic results below show F0 movement familiar from Figure 2 co-varying with the Final-syllable

Strengthening effect of syllable rhyme lengthening (since the word in (7c) lacks a coda consonant, final stop aspiration is not a factor):

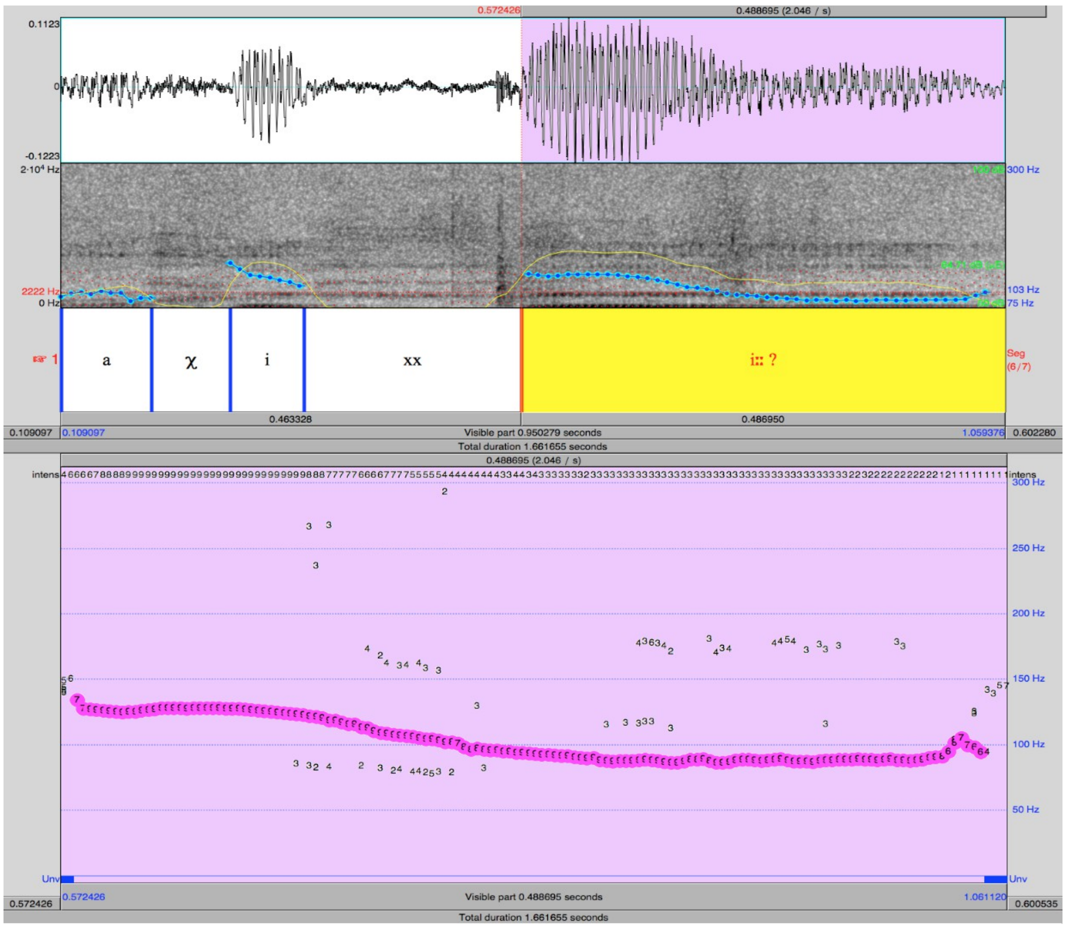


Figure 3: HLH boundary melody

Observe F0 movement in a HLH pattern. Further evidence of this phenomenon comes from (7d). The word was extracted from an animated conversation: one language consultant is imitating a bird's call and the speaker asks playfully if he is a ptarmigan [aχixxivi::n]. Smith (1977a:45) describes the suffix [vi:n] 'do/are you(1)?', so the syllable peak in this morpheme is underlyingly long. Realized in Figure 3 at 512 ms, the final syllable peak in (7d) is one of the longest segments observed in the data considered here and must therefore be the output of lengthening. Unlike (7b) and like (7c), the strengthening rule is this case is not accompanied by aspiration, because in this case the final syllable coda [n] is [+voiced]. In (7d), which comes from a female language consultant (pitch range setting is 75-600Hz, as described in §4.5), observe a HLH boundary melody:

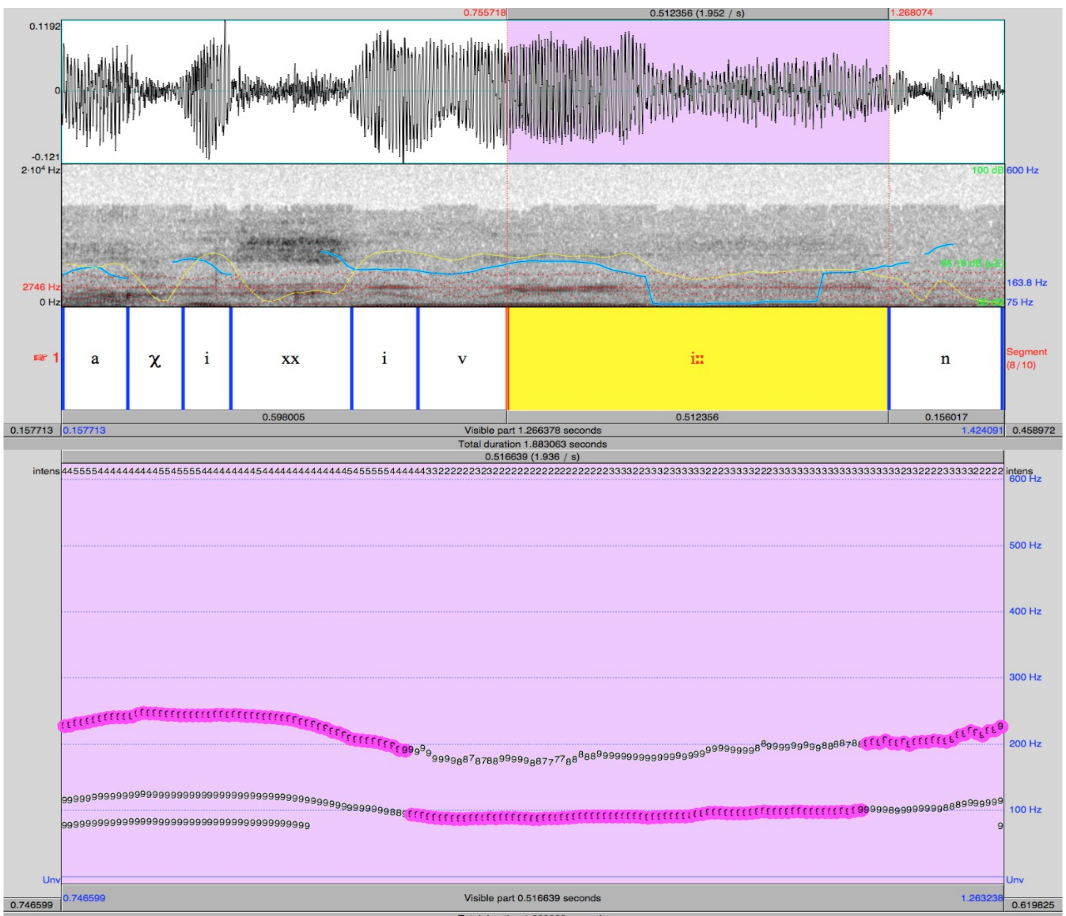


Figure 4: HLH boundary melody

The final example, (7e), also comes from a female language consultant. She is making animated comments to her husband about a photograph of the ptarmigan species in question. She expresses delight at the sight of this type of ptarmigan by stating how much she wants one. The utterance and declarative phrase ends with the word [aχixxivitsiavaːkʰ], based on the underlying /aχixxivik/ 'brooker' and the suffixes described in Smith (1978:103) as /-tsia-/ 'fine, well, good, properly *x*' and in Smith (1978:113) as /-vvak/ 'big'.The resulting derivation is realized with Final-syllable Strengthening effects: At 149 ms, the final vowel is doubled and the final coda stop is aspirated. Observe as well the following pitch pattern:

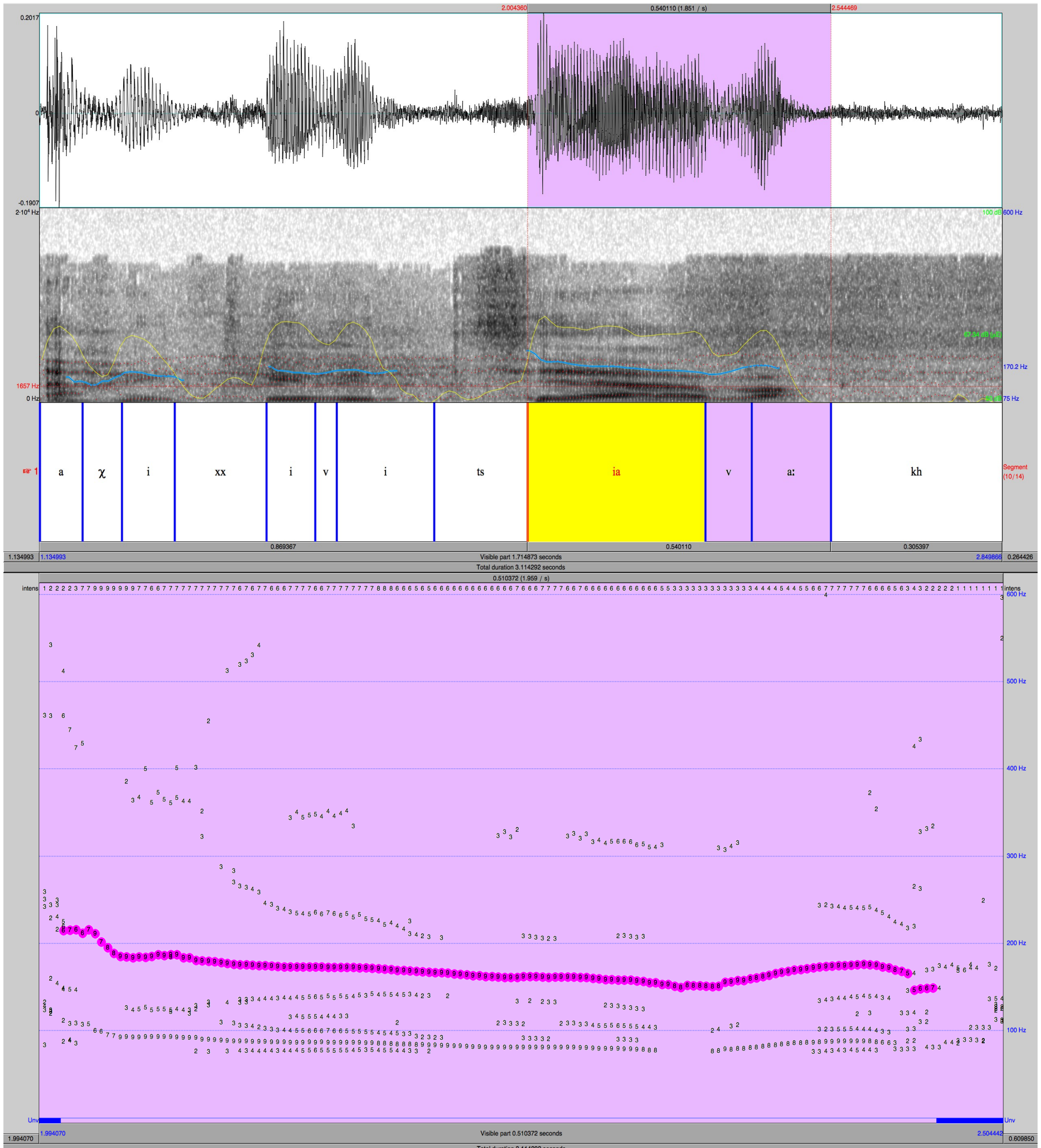


Figure 5: HL boundary melody

Observe the HL boundary melody pattern at the right side of the pitch drawing in Figure 5, thus co-occurring with the lengthened final vowel. This pattern is consistent with the description of declarative phrase intonation in West Greenlandic (Rischel 1974, Nagano-

Madsen 1993, Gussenhoven 2000), except in those studies lengthening is only described for interrogative phrases and final coda aspiration is not mentioned.

Overall, the evidence in (7) points at a rule in Labrador Inuttut that strengthens the final syllable of a phrase or utterance. The relevance of that finding to this thesis is the fact that Final-syllable Strengthening can be shown to occur independently from SL. For example, the underlying geminate /vv/ in (7e) is degeminated by SL /vv/→/[v] despite being adjacent to strengthening in the adjacent final syllable.

5.3 No evidence of metrical stress in the data

So far in this chapter, I have shown that SL is exceptionless in the examples and does not co-vary with syllables made prominent by any of the three stress correlates. I have not yet discussed the nature of syllable prominence in Labrador Inuttut, however. In this section, I will show that there is no recurring or systematic pattern of metrical prominence in the data considered here.

5.3.1 Intensity prominence does not depend on duration

The word examples considered thus far have included different vowels, coda consonants and/or Final-syllable Strengthening. To eliminate the possibility that these factors are somehow clouding the picture of syllable prominence, we must consider the results for a set of example words with no codas (and thus no SL) and only the low vowels, [a] and [aː]. Nine examples of the relevant word, [anaːnaɣa] 'my mother' were extracted from the spontaneous speech sections of the linguistic interviews as they were uttered by seven different language consultants (see §4.5.5). Underlyingly, the words come from the base-stem /ana:nak/ ‘mother’ and the deleting suffix described in Smith (1977a:31) as /-ɣa/ ‘1s.poss’. Consistent with the durational patterns described for West Greenlandic by Jacobsen (2000), on average the long vowel in the CV:CV sequence is 1.7 times longer than the following short vowel (see Appendix E for an exhaustive description of the relevant examples). Consider the following representative sample of results for duration and peak syllable intensity (with the relevant prosody, utterance, declarative phrase or word shown in brackets: ${}_{U}[{}_{DP}[{}_{\omega}[]_{\omega}]_{DP}]_{U}$):

(8) a. ${}_{U}$[tuχuma ${}_{\omega}$[**ana:naɣa**]${}_{\omega}$ asaina aŋutita:lauttuk Joshua Obed nainimiumit]${}_{U}$

'At the time of her death my mother, her husband was Joshua Obed from Nain.'

70	70	73	68	69	67	69	db	
a	n	a:	n	a	ɣ	a		BH
81	71	93	54	78	48	78	ms	

b. ${}_{U}$[${}_{\omega}$[**ana:naɣa**]${}_{\omega}$ ma:nimiu Nainimiuk -um- …ata:taɣa: United States-imiuk]${}_{U}$

'My mother is from here, from Nain, um, my father is American.'

70	72	77	72	79	75	81	
a	n	a:	n	a	ɣ	a	JD
70	56	141	53	63	34	84	

c. ${}_{U}$[${}_{DP}$[ata:tai ma:nimiuŋujuk ma:nimiuŋuqχauju:k^{h}]${}_{DP}$ ${}_{DP}$[${}_{\omega}$[**ana:naɣa:**]${}_{\omega}$]${}_{DP}$... ${}_{DP}$[nainmi -uh-]${}_{DP}$ ${}_{DP}$[nainimi: tauni nainimi -uh-]${}_{DP}$ ${}_{IP}$ [χanu:ŋ]${}_{IP}$]${}_{U}$

'Father is from here, was from here... my mother.... in Nain, uh, in Nain down... in Nain. How?'

63	65	69	67	69	70	75	
a	n	a:	n	a	ɣ	a::	PA
35	77	138	59	68	27	259	

d. ${}_{U}$[${}_{DP}$[ata:taɣalautaɣa:]${}_{DP}$ ${}_{DP}$[nuta:miuɣulauttu:]${}_{DP}$ ${}_{DP}$[${}_{\omega}$[**ana:naɣa:**]${}_{\omega}$]${}_{DP}$ ${}_{DP}$[ku:jjuamivuk panaitiluɣu:]${}_{DP}$]${}_{U}$

'My father was from Nutak, my mother she's Kuujjuaq and up there (in Northern Quebec)'

70	71	71	68	69	66	61	
a	n	a:	n	a	ɣ	a:	MK
90	63	154	82	72	61	124	

The antepenultimate syllable in [ana:naɣa] co-varies with peak intensity in (8a, d) and is an underlying long vowel. It could be wrongly argued from these facts that peak duration and intensity co-vary. That cannot be, indeed, since in (8b, c) peak intensity co-varies with the final syllable, a short vowel underlyingly. Furthermore, the degree of contrast between all the intensity peaks in (8) is rather minimal, as it never exceeds four decibels. If intensity does mark syllables as prominent, this occurs not as a systematic metrical function, but instead as a way to emphasize specific points, consistent with observations previously made by Smith (1975:104). Consider for example the acoustic results in (8b), from a female language consultant:

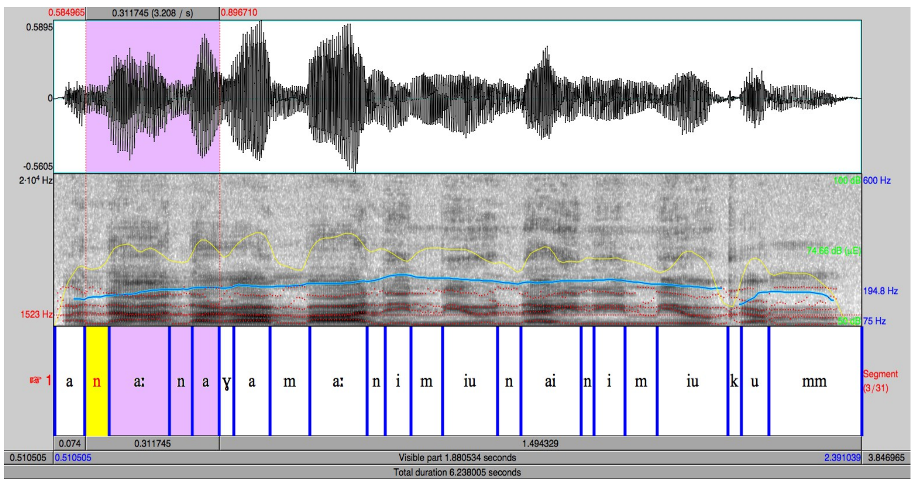


Figure 6: Intensity prominence is discretionary

In addition to attracting peak word intensity, the morpheme [ɣa] is also the loudest syllable in the utterance. If this contrast is in fact significant, it is that it functions to emphasize that the language consultant is talking about *her own* mother. No plausible arguments can be made for a system of recurring metrical prominence involving duration or intensity from the data in Figure 6. We can further observe that the intensity peaks in this representative example range between 70 and 81 decibels with no alternating pattern of prominence. Instead each syllable attracts roughly the same prominence. Based on these observations, intensity assignment must: (a) refer to the syllable (as opposed to larger constituents like the foot or the word), giving each syllable in an utterance similar peak intensity, and (b) be agnostic to vowel duration (consistent with other observations about SL in §5.1). The pattern in Figure 6 is therefore incompatible with Hayes' (1995) definition of a stress-timed language, which should be characterized by systematic intensity alternations between strong and weak syllables based on intensity prominence. The evidence in (8b) supports the claim by Rose, Pigott & Wharram (2011) that Labrador Inuttut shares characteristics with syllable-timed languages (see §5.4, and see also Rischel 1974, Nagano-Madsen 1993 and Jacobsen 2000).

5.3.2 Intensity prominence does not depend on prosodic factors

More generally, prosodic conditioning fails to offer explanations for the distribution of intensity peaks observed in (8). The example in (8a) is utterance medial, while the example in (8b) is utterance initial. There is no evidence in any of the examples considered here that position within an utterance systematically impacts the distribution of intensity peaks. In (8c, d) the words are located at the right edge of declarative phrases, where their final syllables both display Final-syllable Strengthening (as shown in §5.2). For example, we observe lengthening of the phrase-final syllable in [anaːnaɣ**aː**]. In this example, we also observe a boundary melody of a type not discussed yet. Recall the description of HL boundary melodies phrase finally in West Greenlandic in §3.5.2. Rischel (1974) and Nagano-Madsen (1993) present acoustic evidence of high-to-low boundary melodies at the right edge of declaratives. In light of their description, consider now the following acoustic results for the utterance in (8d), from a male language consultant:

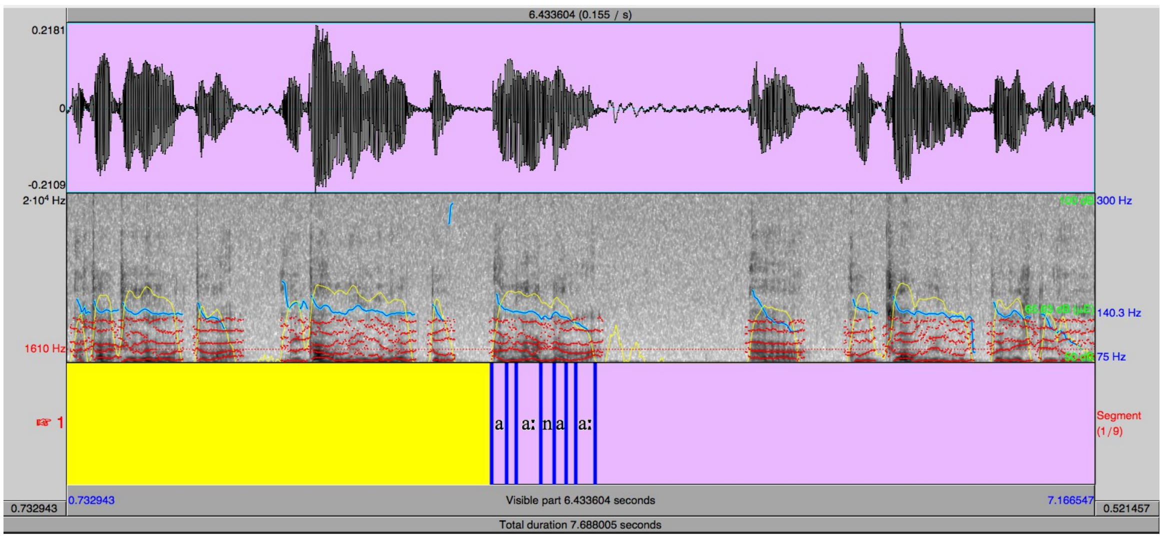


Figure 7: Evidence of a declarative phrase

The final syllable is characterized by lengthening as well as by a sharp downward movement of F0 at the right edge, consistent with the pattern seen thus far for a declarative phrase. A closer look at the acoustics of this example word shows the F0 movement more clearly:

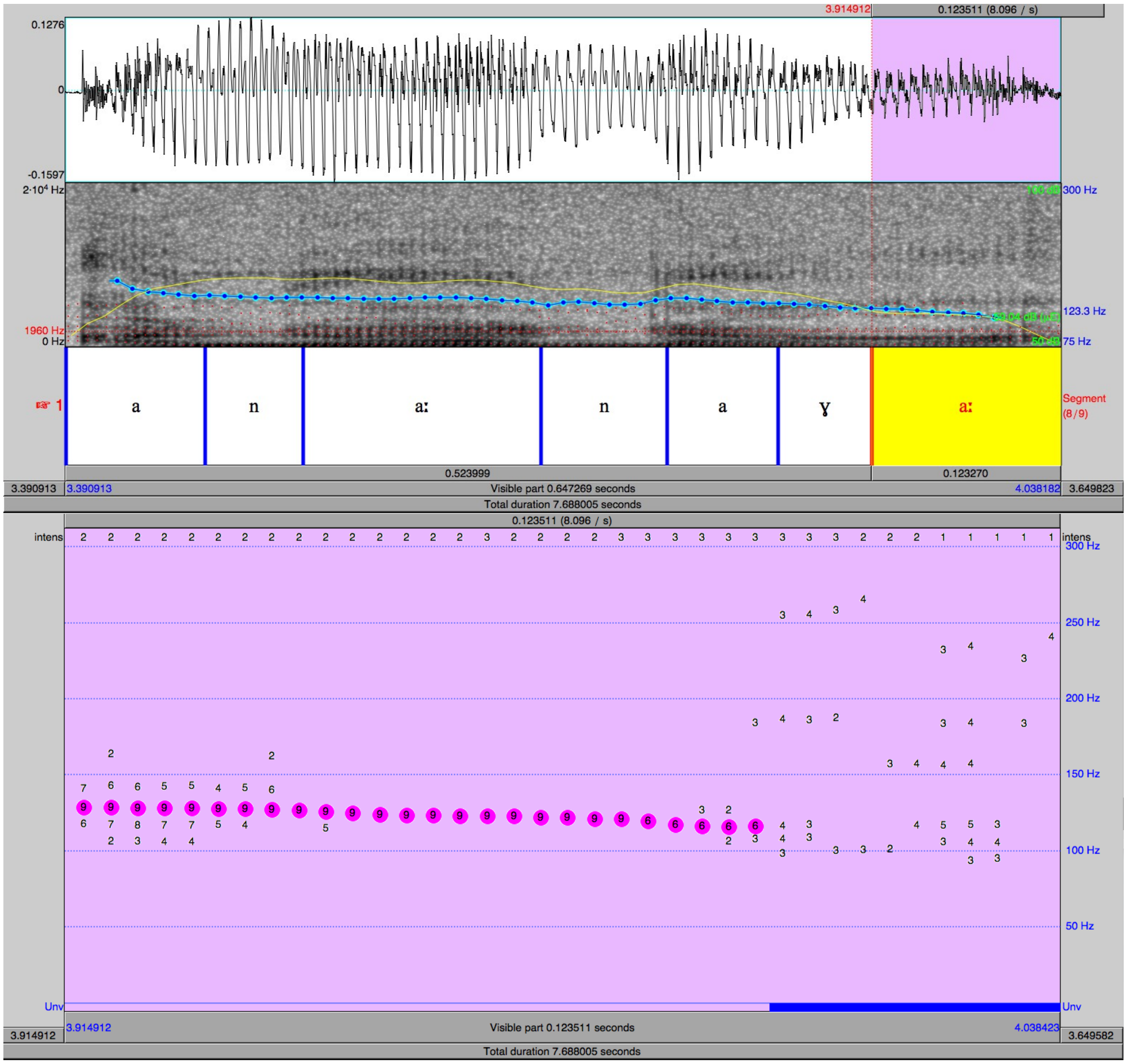


Figure 8: HL boundary tone

The sharp drop in F0 at the centre right of the pitch drawing, before the end of the vowel, is the acoustic manifestation of a HL boundary. The effect may not be best instantiated by this evidence however, given the fact that in (8d) the boundary after [anaːnaɣaː] appears to be a pause, while the language consultant recollects information about his mother. Better evidence of a HL boundary melody comes from the final word in the preceding declarative phrase about the language consultant's father, as shown in the following spectrogram:

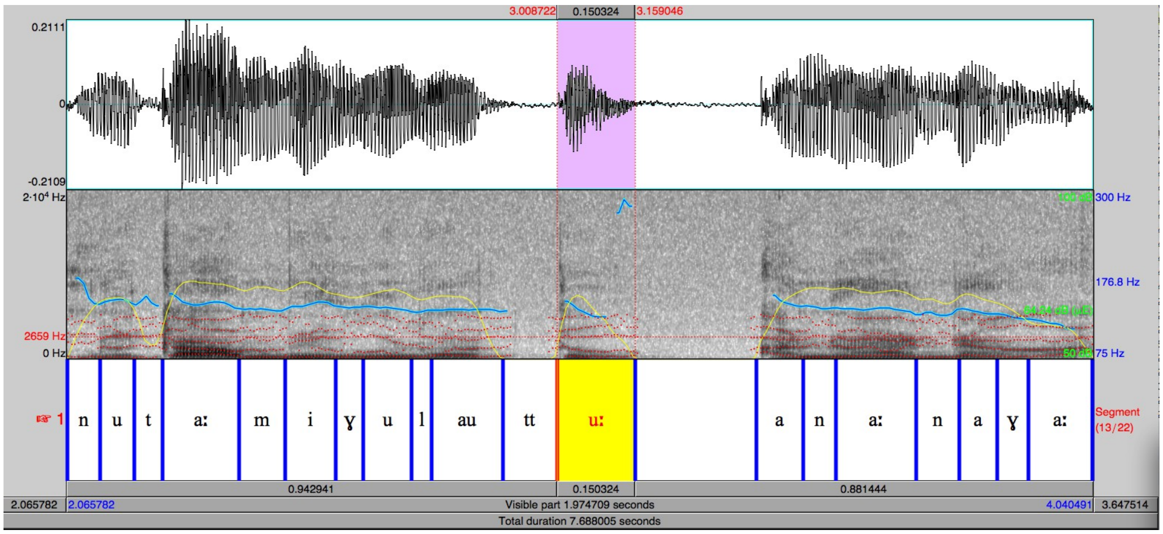


Figure 9: HL boundary tone

In line with the observations above, the most plausible interpretation for the falling movement of F0 at the centre of the pitch drawing in Figure 9 is that it instantiates a declarative phrase-final HL boundary. When this boundary melody co-occurs with vowel lengthening as in (8c, d) it acts as a cue to the end of a declarative phrase (and possibly stop aspiration as shown for example words at the right edge of interrogative phrases in §5.2). Peak intensity therefore does not systematically co-vary with Final-syllable Strengthening in both word examples, since in (8c) peak intensity falls on the final syllable while in (8d) it is antepenultimate. Overall, the data in (8) shows that intensity and pitch operate independently and that pitch effects minimally occur in syllables at the right edge of a prosodic category (word, phrase or utterance).

5.4 Evidence for syllable timing

The evidence presented thus far supports the position that the data considered here are typologically consistent with syllable-timed languages, in line with the findings of Rischel (1974), Nagano-Madsen (1993), Jacobsen (2000) and Rose, Pigott & Wharram (2011). Three durational patterns have been demonstrated: phonemic contrast and SL, both discussed in §5.1, and Final-syllable Strengthening (involving vowel lengthening, aspiration of stop codas and boundary melodies), discussed in §5.2. Aside from phrase-level intonational contours, the overarching generalization about these phenomena is that they all involve the length adjustment of a syllable rhyme. Phonemic contrasts involve a lexical difference in the length of syllable peaks, as in [anak] 'faeces' versus [aːnak] 'paternal grandmother', or a lexical difference in the length of consonants as in [anak] versus [annak] 'woman'. SL deletes coda consonants in alternating syllables. Final-syllable Strengthening lengthens the syllable peak and aspirates the syllable coda if it is an oral stop. Recall from §3.4.2 that Jacobsen (2000:64) finds syllable rhyme length adjustments in example words read in carrier sentences by two West Greenlandic language consultants. Following Rischel (1974), Nagano-Madsen (1993:66) concludes that the "syllable is the relevant articulatory unit [in West Greenlandic]." These acoustic studies demonstrate that, like the data considered here, other Inuit dialects have phonological rules that regulate syllable rhyme duration, especially when the syllables in question become extra-long because of the presence of long segments. From this perspective, SL regulates syllable rhyme duration. Final-syllable Strengthening on the other hand regulates syllable rhyme duration at the phrase level, in that case making the rightmost syllable durationally prominent relative to the other syllable rhymes in an utterance, or aspirated, or lengthened and aspirated. In the next two sections, I will show acoustic evidence that in environments where SL and Final-syllable Strengthening are not factors, syllables fall into just two length categories, short and long.

5.4.1 Syllables in example words are similar in length

The evidence in this section comes from the spontaneous speech data discussed already as the /naːna/ sequence in §4.5.5. Consider the syllable rhyme durations in the following examples:

(9) a.

$_{\omega}$[a	n	aː	n	a	ɣ	a]$_{\omega}$	425 ms	
34		98		81		58ms		TK

b.

$_{\omega}$[a	n	aː	n	a	ɣ	i]$_{\omega}$	459	
83		107		86		49		BH

c.

$_{\omega}$[a	n	aː	n	a	ɣ	a]$_{\omega}$	501	
70		141		63		84		JD

d.

$_{\omega}$[a	n	aː	n	a	ɣ	a]$_{\omega}$	503	
81		93		78		78		BH

e.

$_{\omega}$[a	n	aː	n	a	ɣ	a]$_{\omega}$	512	
77		134		63		58		DF

f.

$_{\omega}$[a	n	aː	n	a	ɣ	a]$_{\omega}$	624	
95		163		69		109		MN

g.

$_{\omega}$[a	n	aː	n	a	ɣ	aː]$_{\omega}$]$_{DP}$	646	
90		154		72		124		MK

h.

$_{\omega}$[a	n	aː	n	a	ɣ	aːː]$_{\omega}$]$_{DP}$	663	
35		138		68		259		PA

i.

$_{\omega}$[a	n	aː	n	a	ɣ	aːː]$_{\omega}$]$_{DP}$	722	
98		120		97		224		BH

Based on the physical durations in (9), three classes of syllable rhyme emerge: short, long and overlong (shown in white, light grey and dark grey respectively). *Short* includes nine

[a] syllables, with an average duration of 73 ms, nine [na] syllables, with an average duration of 75ms, and six [ɣa] syllables, with an average duration of 73ms. *Long* includes nine [naː] syllables, with an average duration of 128ms, and one [ɣaː] syllable at 124ms. *Overlong* includes two [ɣaːː] syllables, with an average duration of 242ms. These results are consistent with Massenet's (1980) analysis of short, long and overlong syllables in Quebec Inuttitut (see §3.5.3), especially since the overlong syllable rhymes in (9h, i) co-vary with interrogative phrase boundaries and Final-syllable Strengthening. Consider (9a-f), where Final-syllable Strengthening is not a factor in the word examples. Only syllable rhymes from the short and long classes remain. The long syllable rhymes all come from the lexicon as the linguistically contrastive, long form of [a]. The remaining short syllable rhymes in (9) arise in different word positions (initial, medial and final) and with different segments ([a] versus [na] versus [ɣa]), yet each is about the same length with average durations of 73, 75 and 73ms respectively. At the word level then, if phonemic contrast and Final-syllable Strengthening are not factors, each syllable rhyme is assigned short duration. The phonetic realization of *short* is shown in (9) to be between 34 and 98ms. The next section I will show evidence of short, long and overlong durational classes in phrases and utterances, as well as briefly considering the syllable rhyme duration for CVC.

5.4.2 Syllables in a phrases are similar in length

First consider the syllable rhyme durations in the following response from the linguistic interviews where the language consultant was asked where his parents are from:

(10) $_{U}$[$_{DP}$[ata:taɣalautaɣa:]$_{DP}$ $_{DP}$[nuta:miuɣulauttu:]$_{DP}$ $_{DP}$[ana:naɣa:]$_{DP}$
‘My father was from Nutak, my mother...’
$_{DP}$[ku:jjuamivuk panaitiluɣu:]$_{DP}$]$_{U}$
‘...also from up there in Kuujjuak (Quebec).’ MK

a. $_{DP}$[ata:taɣalautaɣa:]$_{DP}$

a	t	a:	t	a	ɣ	a	l	au	t	a	ɣ	a:
99		143		83		59		134		83		123

b. $_{DP}$[nuta:miuɣulauttu:]$_{DP}$

n	u	t	a:	m	iu	ɣ	u	l	au	t	u:
	69		124		127		69		139		134

c. $_{DP}$[ana:naɣa:]$_{DP}$

a	n	a:	n	a	ɣ	a:
90		154		72		124

d. $_{DP}$[ku:jjuamivuk...

k	u:	jj	ua	m	i	v	u	k
	109	139	137		70		69	38

e. ... panaitiluɣu:]$_{DP}$

p	a	n	ai	t	i	l	u	ɣ	u::
	47		108		47		46		213

The utterance must be divided into four declarative phrases based on Final-syllable Strengthening effects observed in all cases except (10d). At the right edge of that word example, there is no syllable rhyme lengthening and the final stop is unreleased. This word must therefore form a declarative phrase with the example word in (10e). The duration of syllable rhymes not affected by Final-syllable Strengthening correspond with two classes of length. *Short* includes seven syllables where [a] is at the peak ([a], [ta], [ɣa], and [pa]) with an average duration of 76 ms, two syllables where [i] is at the peak ([mi], and [ti]) with an average duration of 59ms and four syllables where [u] is at the peak ([nu], [ɣu], [lu], and [vuk]) with an average duration of 73ms. *Long* includes five syllables where [aː] is at the peak ([taː], [ɣaː], and [naː]) with an average duration of 134ms, two syllables where [uː] is at the peak ([kuːj] and [tuː]) with an average duration of 137ms[7] and four syllables with a complex vowel cluster at the peak ([lau], [miu], [jua], and [nai]) with an average duration of 129ms. The other length class, *overlong*, occurs only in Final-syllable Strengthening environments where the final syllable [ɣuːː] has a duration of 213ms.

Overall, the data in (10) suggest that each syllable class roughly corresponds to a durational range. For example short syllable rhymes, including V, CV and CVC, are all between 46ms and 107ms in (10). Long syllable rhymes meanwhile, including Vː, CVː and CVːC are between 108 and 179ms. Thus the durational ranges for short and long syllable rhymes in (10) do not overlap, a pattern that holds for most of the data considered here. Generally, then, it can be said then that in phrases, short syllables are realized within a similar durational range with no overlap into the durational range of long syllable rhymes.

The final evidence for a system of short, long and overlong syllable rhymes comes from a spontaneous speech section of the linguistic interviews.[8] One language consultant was asked to recall her memories of a tragic hunting accident in Northern Labrador in the 1970's. Consider the durational pattern in the following response:

7 Assuming that the duration of the geminate in (10d) is divided equally between coda and onset.
8 See Appendix A, Section E: Storytelling.

(11) $_{U}$[$_{DP}$[tuttuniaɣiasimatluti auŋa namukkiak]$_{DP}$ -uh-

‘While they were trying to hunt caribou going south, uh, ’

$_{DP}$[pittualummu:::]$_{DP}$ -uh- $_{DP}$[alla: piŋasut piŋasuiχu:k]$_{DP}$ $_{DP}$[ajulisimajut^{h}]$_{DP}$

‘... through deeply drifted snow, uh, so three, three of them, they died.’

$_{DP}$[nuti atautsi ilanna:ɣa matn sillit^{h}]$_{DP}$ $_{DP}$[aijai:::]$_{DP}$

‘And one my friend Martin Sillit. Oh my!’

$_{DP}$[ilu:natta:]$_{DP}$ $_{DP}$[inuit]$_{DP}$ $_{DP}$[ilu:nattik la:badr taχχanimiu attutaulauttut]$_{DP}$

‘All the people, all of us northerner Labradorians, we were all touched,’

$_{DP}$[asiujiɣatta piŋasuni:k^{h}]$_{DP}$ $_{DP}$[inu:χatittinik^{h}]$_{DP}$]$_{U}$

‘as a group by the loss of those three.’ FW

a. $_{DP}$[tuttuniaɣiasimatluti...

t	u	tt	u	n	ia	ɣ	ia	s	i	m	a	tɬ	u	t	i
	42	236	67		188		187		56		31	152	43		68

b. ... auŋa namukkiak]$_{DP}$

au	ŋ	a		n	a	m	u	kk	ia	kʰ
215		31			42		38	210	162	431

c. $_{DP}$[pittualummu:::]$_{DP}$

p	i	tt	ua	l	u	mm	u:::
	45	245	225		78	168	623

d. $_{DP}$[alla: piŋasut piŋasuiχu:k]$_{DP}$

a	ll	a:		p	i	ŋ	a	s	u	t		p	i	ŋ	a	s	ui	χ	u:	kʰ
80	182	232			56		96		109	51			85		59		135		220	172

e. $_{DP}$[ajulisimajut^{h}]$_{DP}$

a:	j	u	l	i	s	i	m	a	j	u	tʰ
153		77		67		70		84		75	359

f. $_{DP}$[nuti atautsi ilanna:ɣa...

n	u	t	i		a	t	au	ts	i		i	l	a	nn	a:	ɣ	a
	57		72		86		130	185	56		71		70	180	188		111

g. ... matn sillit^{h}]$_{DP}$

m	a	t	n		s	i	ll	i	tʰ
	69		45			68	148	77	441

h. ${}_{\text{DP}}$[aijaiːːː]${}_{\text{DP}}$ ${}_{\text{DP}}$[iluːnattaː]${}_{\text{DP}}$ ${}_{\text{DP}}$[inuit]${}_{\text{DP}}$

ai	j	aiːːː		i	l	uː	n	a	tt	aː		i	n	ui	tʰ
184		806		96		134		57	111	208		117		201	286

i. ${}_{\text{DP}}$[iluːnattik laːbadr taχχanimiu...

i	l	uː	n	a	t	i	k		l	aː	b	a	d	r		t	a	χχ	aː	n	i	m	iu
80		108		55		62	52			140		43		109			48	156	111		96		236

j. ...attutaulauttut]${}_{\text{DP}}$

a	tt	u	t	au	l	au	tt	u	tʰ
64	192	44		190		160	175	47	232

k. ${}_{\text{DP}}$[asiujiɣatta piŋasuniːkʰ]${}_{\text{DP}}$

a	s	iu	j	i	ɣ	a	tt	a		p	i	ŋ	a	s	u	n	iː	kʰ
87		164		96		54	221	98			45		75		43		135	162

l. ${}_{\text{DP}}$[inuːχatittinikʰ]${}_{\text{DP}}$

i	n	u	χ	a	t	i	tt	i	n	i	kʰ
36		100		40		39	202	78		61	388

The speech sample in (11) involves 12 declarative phrases as we can see from the pattern of Final-syllable Strengthening effects. Observe for example that the first DP, shown in (11a, b), ends with an aspirated stop. The next DP in (11c) exhibits syllable rhyme lengthening at the right edge, a pattern also shown for the first DP in (11h). Observe Final-syllable Strengthening as well in (11d), the second DP in (11h) and (11k). The remaining DPs end with aspirated stops. Given these assumptions about the prosody in (11), consider the duration for each class of syllable rhyme.

Short includes 20 syllables where [a] is at the peak ([mat], [ɣa], [na], [a], [ma], [lan], and [pa]) with an average duration of 78ms, 20 syllables where [i] is at the peak ([si], [ti], [pi], [li], [i], [sil], [tik], [ni], [ji] and [tit]) with an average duration of 76ms and 11 syllables where [u] is at the peak ([tut], [tu], [ɬu], [muk], [lu], [sut], [ju], [nu], and [su]) with an average duration of 88ms. Overall the durational range for *short* in this example is between 31 and 160ms.

Long includes five syllables where [aː] is at the rhyme ([laː], [aː], [naː], [taː] and [χaː]) with an average duration of 172ms, two syllables where [uː] is at the peak ([luː]) with an average duration of 121ms and 10 syllables with a complex vowel cluster at the peak ([ɣia], [au], [tua], [sui], [tau], [ai], [lau] and [siu]) with an average duration of 183ms. Overall the durational range for long syllable rhymes is between 111 and 236ms.

Overlong occurs exclusively environments where the Final-syllable Strengthening effect of syllable rhyme lengthening is a factor. The two overlong syllable peaks [uːːː] and [aiːːː] in (11c, h) have an average duration of 713ms. The remaining environments not discussed so far for (11) are those cases where Final-syllable Strengthening includes only an aspirated stop: [kiak^h], [χuːk^h], [jut^h], [lit^h], [nuit^h], [tut^h] and [nik^h]. In terms of duration the syllable peaks in all cases pattern either with short or long, but measurement of the syllable rhyme for each overlong example results in an average duration of 441ms. What remains unclear is whether or not the duration of an aspirated stop should be included in the measurement of syllable rhyme length, a question that will not be answered in this thesis. It is clear that aspiration plays an important prosodic role in marking phrase boundaries.

In sum, the picture that emerges from the data in (11) is that, except in environments where Final-syllable Strengthening is a factor, syllable rhymes are realized phonetically as either short or long and that these classes have similar durational ranges, though some overlapping of these ranges was observed in (11), especially for the duration of closed syllables. It may be that the phonetic reality of performing a coda consonant pushes a given syllable rhyme to the limit of its durational class. The importance here in an acoustic investigation of SL is the fact that these results show that Labrador Inuttut is unlike stress-timed languages described in MST by Hayes (1995) because syllables are not organized into alternating strong and weak patterns. In the data considered here, syllable rhymes are roughly equal in terms of duration, either short or long, except phrase finally, where they can be overlong. These facts are reminiscent of syllable-timed languages described in Abercrombie (1967), Ladefoged (1975), Roach (1982), Kager (1993, 1995), Ramus, Nespor & Mehler. (1999) and Nespor, Shukla, & Mehler (2010). This current study therefore contributes some insight into the possibility that Labrador Inuttut is syllable-timed. I recognize however that the exact nature of syllable-timing remains an unresolved question in the literature and suggest that a specific study of rhythm in Labrador Inuttut is required before any final conclusions can be made.

5.5 Summary

Overall, the results show that SL is both phonetically and phonologically exceptionless in Labrador Inuttut spontaneous speech and that geminates, the segmental units at the centre of this phenomenon, are minimally 1.4 times longer than their degeminated counterparts.

The rule is not affected by phonemic vowel length contrasts nor does it co-vary with any regular pattern involving syllable duration, intensity or pitch. The data considered here further show that MST does not describe the metrical system in Labrador Inuttut which must, therefore, be a non-stress language — and possibly syllable-timed. This position is consistent with the acoustic evidence accumulated by this study which shows remarkable similarities in the duration assigned to short and long syllables, while a third category, overlong, is needed to describe the phonetic realizations of the syllable preceding a prosodic boundary.

6 Conclusion

The current work highlights the virtually exceptionless nature of Schneider's Law, based on primary corpus data from Labrador Inuttut language consultants. Linguistic interviews were conducted in four Inuit communities with more than thirty speakers. Analysis of the resulting data shows Schneider's Law to be exceptionless in hundreds of examples. Even the unexpected inter-speaker variations described in §5.1.2 for the '3s' and 'to be' morphemes never result in a violation of this process. It can therefore be said of Schneider's Law that morphology is only relevant insofar as it provides syllable-adjacent underlying geminates, the structural manifestation that triggers application of the rule.

Schneider's Law is indeed of typological interest as a rule that applies exclusively to coda consonants, irrespective of the length of the vowels preceding these consonants: The operation behaves exactly the same in syllables with short or long vowels. The fact that the output of Schneider's Law affects only coda consonants led to its first description in the literature (Schneider 1966) as a syllable sequencing rule involving CVC, a view disputed by Dresher & Johns (1995). This thesis contributes to the debate by showing acoustic evidence from current Labrador Inuttut speech samples where syllable weight is not only independent from Schneider's Law, but also plays no systematic role in the assignment of intensity or pitch. The assignment of duration, meanwhile, is blind to the segmental makeup of the syllable since V, CV and CVC are short while V:, CV: and CV:C are long. This is the opposite of a language like Latin, where Hayes (1995:51) shows that long-voweled and closed syllables count as heavy. Labrador Inuttut is consistent with the other class of languages under Metrical Stress Theory, exemplified by St. Lawrence Island Yupik, where Hayes (1995:51) shows that the division between heavy and light is based on long-voweled versus short-voweled syllables.

However, unlike St. Lawrence Island Yupik, the data considered in this thesis clearly suggest that Labrador Inuttut is not a stress-timed language. Intensity prominence does not pattern with vowel length and is predominantly non-contrastive or unsystematic in the data considered here.[1] At the same time, pitch is shown to function as a cue to prosodic boundaries. In terms of duration, this thesis shows that phonemically long consonants are generally more than twice as long as their phonemically short counterparts. Simultaneously, the output of Schneider's Law causes geminate shortening, with geminates shown in the data considered here to be minimally one and a half times longer than their degeminated counterparts. We can also see in this thesis that this phonological operation is independent from the other durational pattern observed in Labrador Inuttut: Final-syllable Strengthening. This rule applies exclusively to the final syllable of a phrase or utterance. It is observed here to output HL or HLH boundary melodies which can covary with either short syllables or lengthened long or overlong syllables.[2] As well, there is evidence that, without exception for dozens of examples, plosive consonants arising in the coda position of phrase-final syllables are aspirated, a phenomenon not previously mentioned in the literature on Labrador Inuttut. The fact that CV:C syllables are preserved in the context of Final-syllable Strengthening, even when

1 While allowing for the possibility that intensity prominence may be used by some speakers for emphasis.
2 With overlong syllables denoting an interrogative form where the information is not known to the speaker.

preceded by a CVC or CV:C syllable, in other words a Schneider’s Law trigger, is further evidence that this process is not sensitive to syllable weight. Emphatically, Schneider’s Law effectively eliminates syllable-adjacent underlying geminates, and nothing more.

For each phonetic correlate of stress examined, prominence is either clearly irrelevant or, at best, unsystematic. Minimally, Labrador Inuttut prosodic phonology differs from that described for St. Lawrence Yupik. More generally, the unsystematic nature of the correlates of syllable prominence reported in the previous chapters makes this system incompatible with any of the stress-timed languages predicted within Metrical Stress Theory. It seems, then, that the language must be syllable-timed, implying an evolution of Labrador Inuttut to its current free or unsystematic stress system from the bounded, rhythmic stress systems found in the more conservative Yupik languages of the Eskimo-Aleut language family. Recent diachronic research suggests that Schneider’s Law , found in just three of the Inuit languages, is in fact the remnant of a lost metrical system (see Rose, Pigott & Wharram 2011).

From a formal perspective, this work provides systematic acoustic evidence in support of Schneider’s Law as it is described in the literature on theoretical phonology by Schneider (1966), Collis (1970), Rischel (1974), Smith (1975, 1977a, 1977b, 1978), Dorais (1976, 1990), Dorais & Lowe (1982), Fortescue (1983), Lowe (1984), Massenet (1986), Dresher & Johns (1995, 1996) and Jacobsen (2000). More generally, this thesis offers a contribution to the understanding of non-stress-timed languages. Among other matters, the overwhelming acoustic evidence accumulated by this study points to non-trivial similarities in the durational range of short and long syllables. In turn, these findings highlight the relative gradation in the duration of each syllable type, as well as contextual patterns —for example, the overlong duration of syllables observed at phrase and utterance boundaries. Such characteristics are also consistent with the description of syllable-timed languages in Abercrombie (1967), Ladefoged (1975), Roach (1982), Kager (1993, 1995), Ramus, Nespor & Mehler (1999) and Nespor, Shukla, & Mehler (2010). Overall, this thesis offers a stepping stone for further investigation of the prosodic typologies of languages like Labrador Inuttut which, despite showing distinctions at the level of vowel or consonant length (lexical contrasts) and having a prohibition on the occurrence of underlying geminates in adjacent syllables, fails to show any conditioning at the metrical level.

In sum, this thesis bridges phonetic and phonological lines of investigation and offers a number of benchmarks for future investigations of the syllable and higher levels of prosodic organization across languages both within the Eskimo-Aleut language family and beyond.

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APPENDIX A: Linguistic interview

A: Introductory questions

1. kinauven?
2. Katsinik jariKaven?
3. Nanemiunguven?
4. Anânait, atâtaitilu, nanemiunguvâng?
5. Nane angiKait mânna? Piujong?
6. sunauna nigikKauven ullumi?
7. PinasualautsimalaukKen puijet?
8. UKâlautiKalaulaget Kanong tuKilaukKân puijet sivullipâk.

B: Introductory reading task

Have the language consultant read Beatrice Watt's Inuttut introduction to the 2006 dictionary.

C: Phonemic pair reading task

1. Tânna aggak piujuk
2. Angutik ipiunnguangittuk ullumi
3. Angutik tutonnguangittuk ullumi
4. Maggonik anâk piujok
5. Angutik ikittonguanngituk ullumi
6. Angutik taKaunnguangittuk ullumi
7. Angutik pisiunnguangittuk ullumi
8. Angutik niliunnguangittuk ullumi
9. Tânna itivinik piujuk
10. Angutik inngitiunnguangittuk ullumi
11. Angutik tingijonnguanianngituk ullumi
12. Tânna anak piujuk
13. Angutik aggaunguajuk ullumi
14. Angutik ikketujonnguangittuk ullumi

15. Angutik aggaunguangituk ullumi
16. Angutik kiviniunnguangittuk ullumi 1
7. Angutik iginaunnguangittuk ullumi
18. Angutik imennguangittuk ullumi
19. Angutik tingijonnguangittuk ullumi
20. Angutik ijiunnguangittuk ullumi
21. Angutik alaunnguangittuk ullumi
22. Angutik ippiunguanngituk ullumi
23. Angutik tuttonguanngituk ullumi
24. Angutik KakKanguanngituk ullumi
25. Angutik pitsiunguanngituk ullumi
26. Angutik nilliunguanngituk ullumi
27. Angutik annaunguanngituk ullumi
28. Angutik mipviunguanngituk ullumi
29. Angutik aKiggiunguanngituk ullumi
30. Angutik Kimmiunguanngituk ullumi
31. Angutik itjiliunnguangittuk ullumi
32. Angutik atlaunguanngituk ullumi
33. Angutik anânnguangittuk ullumi
34. Angutik ânânnguangittuk ullumi
35. Angutik innenguanngituk ullumi
36. Angutik itennguangittuk ullumi
37. Angutik ullonguanngituk ullumi
38. Angutik ojonnguangittuk ullumi
39. Maggonik ânâk piujok
40. Tânna enniuvinik piujuk
41. Angutik anaunnguajuk ullumi
42. Angutik ojonnguanianngituk ullumi
43. Angutik anaunguanngituk ullumi
44. Tânna innik piujuk

45. Angutik aggaunguanianngituk ullumi
46. Angutik ullonguanianngituk ullumi
47. Tânna ikketujovinik piujuk
48. Angutik ujugonnguajuk ullumi
49. Angutik inniunguajuk ullumi
50. Angutik inniunguanngituk ullumi
51. Angutik anaunnguanianngituk ullumi
52. Tânna ikik piujuk
53. Angutik ullonguajuk ullumi
54. Angutik aggânguanngituk ullumi
55. Maggonik innek piujok
56. Angutik iginaunnguajuk ullumi
57. Tânna ulluk piujuk
58. Angutik ikkiunguanngituk ullumi
59. Tânna ujuguk piujuk
60. Angutik ullonguanngituk ullumi
61. Tânna aggâk piujuk
62. Angutik inniunguanianngituk ullumi
63. Angutik ikkiunguanianngituk ullumi
64. Angutik ullonguanianngituk ullumi
65. Angutik ujugonnguanianngituk ullumi
66. Angutik aggânguanianngituk ullumi
67. Tânna ânak piujuk
68. Angutik enniunguanianngituk ullumi
69. Angutik ikketujonnguanianngituk ullumi
70. Angutik ullonguanianngituk ullumi
71. Angutik ojunnguanianngituk ullumi
72. Tânna ennik piujuk
73. Angutik imiunnguanianngituk ullumi
74. Angutik ijiunnguanianngituk ullumi

75. Angutik alaunnguanianngituk ullumi
76. Angutik ippiunguanianngituk ullumi
77. Taitsumani tutunnguaKâlluni Nainimelauttuk
78. Angutik tuttonguanianngituk ullumi
79. Angutik KakKaunguanianngituk ullumi
80. Angutik pitsiunguanianngituk ullumi
81. Tânna ikketujok piujuk
82. Tânna ullok piujuk
83. Angutik ikkinguajuk ullumi
84. Tânna ojuk piujuk 85.Tânna itik piujuk
86. Angutik aggânguajuk ullumi
87. Tânna ipik piujuk 88. Tânna ikittut piujuk
89. Angutik ujugunnguangittuk ullumi
90. Angutik enniunguanngituk ullumi
91. Tânna tutuk piujuk
92. Angutik ullonguanngituk ullumi
93. Angutik ojonnguangittuk ullumi
94. Tânna taKak piujuk
95. Angutik ikketujonnguajuk ullumi
96. Tânna pisik piujuk
97. Angutik nilliunguanianngituk ullumi
98. Angutik annaunguanianngituk ullumi
99. Angutik mipviunguanianngituk ullumi
100. Angutik aKiggiunguanianngituk ullumi
101. Angutik Kimmiunguanianngituk ullumi
102. Angutik inngitinnguanianngituk ullumi
103. Angutik itjiliunnguanianngituk ullumi
104. Angutik atlaunguanianngituk ullumi
105. Taitsumani ikketujonnguaKâlluni Nainimelauttuk
106. Angutik anânnguanianngituk ullumi

107. Angutik ânânnguanianngituk ullumi
108. Angutik innenguanianngituk ullumi
109. Angutik itennguanianngituk ullumi
110. Tânna nilik piujuk
111. Angutik enniunguajuk ullumi
112. Tânna kivinik piujuk
113. Angutik ullonguajuk ullumi
114. Tânna iginak piujuk
115. Angutik ojunnguajuk ullumi
116. Tânna imik piujuk
117. Angutik ipiunnguanianngituk ullumi
118. Angutik tutonnguanianngituk ullumi
119. Angutik ikittonguanianngituk ullumi
120. Angutik ippiunguajuk ullumi
121. Maggonik itek piujok
122. Angutik taKaunnguanianngituk ullumi
123. Angutik pisiunnguanianngituk ullumi
124. Angutik niliunnguanianngituk ullumi
125. Angutik kiviniunnguanianngituk ullumi
126. Angutik iginaunnguanianngituk ullumi
127. Tânna tingijok piujuk
128. Angutik mipviunguajuk ullumi
129. Tânna ijik piujuk
130. Angutik annaunguajuk ullumi
131. Tânna alak piujuk
132. Angutik nillinguajuk ullumi
133. Angutik aggaunguakKaungittuk ullumi
134. Angutik ananngua Kaunngituk ullumi
135. Angutik inninguakKaungittuk ullumi
136. Angutik ikkinguakKaungittuk ullumi

137. Angutik ullunguakKaungittuk ullumi
138. Angutik ujugonnguaKaunngituk ullumi
139. Angutik aggânguakKaungittuk ullumi
140. Angutik enniunguakKaungittuk
141. Angutik ikketujonnguaKaunngituk ullumi
142. Taitsumani annanguakKâluni Nainimelauttuk
143. Angutik ullonguakKaungittuk ullumi
144. Angutik ojonnguaKaunngituk ullumi
145. Angutik ipiunnguaKaunngituk ullumi
146. Angutik tutonnguaKaunngituk ullumi
147. Angutik ikittonguakKaungittuk ullumi
148. Angutik taKaunnguaKaunngituk ullumi
149. Angutik pisiunnguaKaunngituk ullumi
150. Angutik niliunnguaKaunngituk ullumi
151. Taitsumani nanunnguaKâlluni Nainimelauttuk
152. Angutik kiviniunnguaKaunngituk ullumi
153. Angutik iginaunnguaKaunngituk ullumi
154. Angutik imiunnguaKaunngituk ullumi
155. Angutik tingijonnguaKaunngituk ullumi
156. Taitsumani enninguakKâluni Nainimelauttuk
157. Angutik ijiunnguaKaunngituk ullumi
158. Angutik alaunnguaKaunngituk ullumi
159. Angutik ippiunguakKaungittuk ullumi
160. Angutik tuttonguakKaungittuk ullumi
161. Angutik KakKaunguakKaungittuk ullumi
162. Angutik pitsiunguakKaungittuk ullumi
163. Angutik nilliunguakKaungittuk ullumi
164. Angutik annaunguaKaunngituk ullumi
165. Angutik mipviunguakKaungittuk ullumi
166. Angutik aKiggiunguakKaungittuk ullumi

167. Taitsumani nillinguakKâluni Nainimelauttuk
168. Angutik KimmiunguakKaungittuk ullumi
169. Angutik inngitiunnguaKaunngituk ullumi
170. Angutik itjiliunnguaKaunngituk ullumi
171. Angutik atlaunguakKaungittuk ullumi
172. Angutik anânnguaKaunngituk ullumi
173. Angutik ânânnguaKaunngituk ullumi
174. Angutik innenguakKaungittuk ullumi
175. Angutik itennguaKaunngituk ullumi
176. Angutik ullonguakKaungittuk ullumi
177. Angutik ojonnguaKaunngituk ullumi
178. Tânna ippik piujuk
179. Angutik aKiggiunguajuk ullumi
180. Angutik inngitinnguajuk ullumi
181. Tânna tuttuk piujuk
182. Angutik alaunnguajuk ullumi
183. Tânna ikkik piujuk
184. Angutik tuttonguajuk ullumi
185. Angutik ijiunnguajuk ullumi
186. Maggonik ullok piujok
187. Angutik KakKaunguajuk ullumi
188. Angutik tingijonnguajuk ullumi
189. Tânna KakKak piujuk
190. Angutik ipiunnguajuk ullumi
191. Tânna pitsik piujuk
192. Angutik tutonnguajuk ullumi
193. Tânna nillik piujuk
194. Angutik imiunnguajuk ullumi
195. Tânna annak piujuk
196. Angutik ullonguajok ullumi

197. Tânna mipvik piujuk
198. Angutik ikittonguajuk ullumi
199. Tânna aKiggik piujuk
200. Angutik taKaunnguajuk ullumi
201. Tânna Kimmik piujuk
202. Angutik pisiunnguajuk ullumi
203. Tânna inngitit piujuk
204. Angutik pitsiunguajuk ullumi
205. Maggonik ojok piujok
206. Angutik Kimmiunguajuk ullumi
207. Tânna itjilik piujuk
208. Angutik niliunnguajuk ullumi
209. Angutik itennguajuk ullumi
210. Tânna atlak piujuk
211. Angutik kiviniunnguajuk ullumi
212. Tânna ojuvinik piujuk
213. Angutik itjiliunnguajuk ullumi
214. Tânna tuttuvinik piujuk
215. Angutik atlaunguajuk ullumi
216. Tânna nillivinik piujuk
217. Angutik anânnguajuk ullumi
218. Tânna aKiggivinik piujuk
219. Angutik ânânnguajuk ullumi
220. Tânna Kimmivinik piujuk
221. Angutik innenguajuk ullumi
222. Tânna atlavinik piujuk
223. Angutik ojonnguajuk ullumi

D: tutuk/tuttuk alternation task. Through translator, ask the language consultant to use these words in a conversational sentence, without showing them the words or using the following constructions:

224. Tuttonguanianngituk

225. Tutonnguanianngituk

226. TuttonguakKaungittuk

227. TutonnguaKaunngituk

E: Story telling. Ask the following questions through translator:

1. What do you remember about the time Gus Bennett, Martin Sillit and Paul Semigak died caribou hunting in that blizzard of 1979 and what do you think happened?

2. What changes have you notice in the weather since the 1979, and what about since you were young?

3. What is different about the ice conditions? What changes have you seen?

4. What are some of the words your Grandparents used that you don't hear often today?

APPENDIX B: Ethical Approval

Certification of Informed Consent (as approved by ICEHR) July 28, 2009

ICEHR No. 2008/09-072-AR

Mr. Paul Pigott

Department of Linguistics

Memorial University of Newfoundland

Dear Mr. Pigott:

Thank you for your correspondence of April 14, 2009, addressing the issues raised by the Interdisciplinary Committee on Ethics in Human Research (ICEHR) concerning your research proposal "Inuttut ice topology".

We are happy to confirm our earlier approval of your proposal. If you intend to make changes during the course of the project which may give rise to ethical concerns, please forward a description of these changes to the ICEHR Co-ordinator, Mrs. Eleanor Butler, at ebutler@mun.ca for the Committee's consideration.

The Tri-Council Policy Statement on Ethical Conduct for Research Involving Humans (TCPS) requires that you submit an annual status report on your project to ICEHR, should the research carry on beyond March 2010. Also, to comply with the TCPS, please notify us when research on this project concludes.

We wish you success with your research.

Yours sincerely,

Lawrence F. Felt, PhD

Chair, Interdisciplinary Committee on Ethics in Human Research

LF/bl

APPENDIX C: The phonemic pair /tutuk/ 'messy hair' versus /tuttuk/ 'caribou'

Derivational ordering (see Dresher & Johns 1995:83)

Truncation = stem-final consonants are deleted before suffixation

RPA = regressive place assimilation

SL = applies after Truncation and Assimilation cycles

Affrication = voiceless spirant geminates are affricated /χχ/ → [qχ], /ss/ → [ts], /ll/ → [tl], /jj/ → [dž]

Light grey = analyzed as an underlying geminate, or SL trigger

Dark grey = analyzed as an underlying geminate targeted by SL

ms = segmental duration values averaged to the nearest 0.001 second

0.97s = measurement of the sequence /tutuːŋŋuaχauŋŋitu-/ = peak ω intensity

ʰ = phrase/utterance-final aspiration

(1)		(2)
/tutu(k) + u + ŋŋua + χχau + ŋŋi(k) + tuk/	UR	/tuttu(k) + u + ŋŋua + χχau + ŋŋi(k) + tuk/
messy hair.to be.pretend.near past.negative.3s	Gloss	caribou.to be.pretend.near past.negative.3s
tutuːŋŋuaχχauŋŋiktuk	Truncation	tuttuːŋŋuaχχauŋŋiktuk
tutuːŋŋuaχχauŋŋittuk	RPA	tuttuːŋŋuaχχauŋŋittuk
tutuːŋŋuaχauŋŋituk	SL	tuttuːŋuaχχauŋittuk
—	Affrication	tuttuːŋuaqχauŋittuk
[tutuːŋŋuaχauŋŋituk]	SR	[tuttuːŋuaqχauŋittuk]
	Position	
	Actual	

(1)

			1		2		3		4		5			
a.	t	u	t	uː	ŋŋ	ua	χ	ˈau	ŋ	i	tt	u	kʰ	
	43	18	91	126	107	126	83	109	88	42	109	43	301ms	TK
							0.97s							
b.	t	u	t	uː	ŋŋ	ˈua	χ	au	ŋŋ	i	t	u	k	
	28	61	67	111	108	124	91	98	121	78	81	95	76ms	BH
							1.07s							
c.	t	u	t	u	ŋŋ	ua	χ	ˈau	ŋ	i	t	u	k	
	62	69	80	22	200	172	137	93	124	45	128	23	108ms	MK
							1.16s							
d.	t	u	t	uː	ŋŋ	ˈua	χ	au	ŋ	i	t	u	kʰ	
	26	37	126	120	180	186	90	124	127	34	121	28	302ms	MH
							1.20s							
e.	t	u	t	uː	ŋŋ	ˈua	χ	au	ŋ	i	t	u	kʰ	
	29	49	122	163	149	191	99	137	111	31	130	32	165ms	MH
							1.27s							
f.	t	u	t	uː	ŋŋ	ˈua	χ	au	ŋ	i	tt	u	tʰ	
	44	128	61	160	143	166	129	178	57	82	117	60	263ms	FW
							1.32s							
g.	t	u	t	uː	ŋŋ	ua	χ	ˈau	ŋ	i	tt	u	kʰ	
	37	147	47	149	165	240	72	148	87	46	249	137	50ms	JD
							1.39s							
h.	t	u	t	uː	ŋŋ	ˈua	χ	au	ŋ	i	tt	u	k	
	54	122	59	138	173	168	118	153	91	52	240	88	111ms	PA
							1.45s							
C-average	40		82		**153**		102		101		**147**			
Sequence							1.23s							

(2)

			1		2		3		4		5			
a.	t	u	tt	uː	ŋ	ua	qχ	ˈau	ŋ	i	tt	u	kʰ	
	20	28	169	121	43	83	196	105	23	41	114	28	489ms	TK
							0.96s							
b.	t	u	tt	u	ŋ	ua	χ	ˈau	ŋŋ	i	t	u	t	
	36	93	139	49	65	237	103	85	143	44	109	31	60ms	MK
							1.05s							
c.	t	u	tt	uː	ŋ	ˈua	χχ	au	ŋ	i	tt	u	k	
	21	38	125	166	92	243	119	117	94	70	125	27	56ms	MH
							1.19s							
d.	t	u	tt	u	ŋ	ˈua	χ	au	ŋ	iː	t	u	kʰ	
	19	88	205	87	78	227	63	127	88	129	21	91	140ms	BH
							1.22s							
e.	t	u	tt	u	ŋ	ˈua	qχ	au	ŋ	i	tt	u	kʰ	
	47	101	140	101	88	180	120	98	45	74	191	100	153ms	PA
							1.29s							
f.	t	u	tt	ˈuː	ŋ	ua	qχ	au	ŋ	i	t	u	kʰ	
	64	50	258	190	96	158	210	174	54	103	88	34	380ms	FW
							1.44s							
g.	t	u	tt	uː	ŋ	ˈua	qχ	au	ŋ	i	t	u	kʰ	
	89	109	244	199	67	222	124	154	50	108	58	100	234ms	JD
							1.53 s							
h.	t	u	tt	ˈuː	ŋ	ua	qχ	au	ŋ	i	tt	u	kʰ	
	17	76	415	205	151	131	385	275	30	160	366	61	205	AE
							2.27s							
C-average	42		**212**		85		**165**		66		**134**			
Sequence							1.37s							

(3)		(4)
/tutu(k) + u + ŋŋua + nia(χ) + ŋŋi(k) + tuk/	UR	/tuttu(k) + u + ŋŋua + nia(χ) + ŋŋi(k) + tuk/
messy hair.to be.pretend.near future.negative.3s	Gloss	caribou.to be.pretend.near future.negative.3s
tutuːŋŋuaniaŋŋiktuk	Truncation	tuttuːŋŋuaniaŋŋiktuk
tutuːŋŋuaniaŋŋittuk	RPA	tuttuːŋŋuaniaŋŋittuk
tutuːŋŋuaniaŋŋituk	SL	tuttuːŋuaniaŋŋituk
—	Affrication	—
[tutuːŋŋuaniaŋŋituk]	SR	[tuttuːŋuaniaŋŋituk]

(3) Actual

Position			1		2		3		4		5			
a.	t	u	t	ˈuː	ŋŋ	ua	n	ia	ŋ	i	t	u	k	
	24	39	104	113	119	120	65	93	102	31	111	46	30ms	TK
						0.96s								
b.	t	u	t	uː	ŋŋ	ˈua	n	ia	ŋŋ	iː	t	u	k^h	
	29	75	52	120	114	101	63	126	111	147	13	97	125ms	BH
						1.05s								
c.	t	u	t	u	ŋŋ	ˈua	n	ia	ŋ	i	t	u	k^h	
	72	60	46	67	154	187	53	170	87	97	65	114	146ms	PA
						1.17s								
d.	t	u	t	u	ŋŋ	ˈua	n	ia	ŋ	i	t	u	k	
	26	89	113	96	171	154	90	123	117	38	120	33	368ms	MH
						1.14s								
e.	t	u	t	u	ŋŋ	ˈua	n	ia	ŋŋ	iː	t	u	k^h	
	67	80	73	34	160	178	105	149	109	136	36	52	706ms	MK
						1.19s								
f.	t	u	t	ˈu	ŋŋ	ua	n	ia	ŋ	i	tt	uː	χ^h	
	68	97	39	13	164	182	90	111	86	70	120	250	553ms	MK
						1.31s								
g.	t	u	t	uː	ŋŋ	ˈua	n	ia	ŋ	i	t	u-		
	28	40	97	113	149	170	87	139	79	86	49	104	ms	JD
							1.28s							
h.	t	u	t	ˈu	ŋŋ	ua	n	ia	ŋŋ	i	t	u	k	
	28	83	84	78	195	153	90	120	136	50	106	39	25ms	MH
						1.16s								
C-average	43		76		153		80		103		78			
Sequence						1.16s								

(4) Actual

Position			1		2		3		4		5			
a.	t	u	tt	uː	ŋ	ˈua	n	ia	ŋ	i	t	u	k^h	
	39	20	164	104	85	117	68	79	96	47	95	45	365ms	TK
						0.96s								
b.	t	u	tt	u	ŋ	ua	n	ˈia	ŋ	i	t	u	k^h	
	96	39	184	68	40	191	70	131	111	62	129	29	818ms	MK
						1.15s								
c.	t	u	tt	uː	ŋ	ua	n	ˈia	ŋŋ	i	t	u	k	
	52	67	180	146	59	128	73	128	124	99	56	43	103ms	BH
						1.15s								
d.	t	u	tt	u	ŋ	ˈua	n	ia	ŋ	i	t	u	x	
	27	93	127	68	64	184	73	123	115	50	115	63	173ms	PA
						1.15s								
e.	t	u	tt	ˈuː	ŋ	ua	n	ia	ŋŋ	i	t	u	k	
	57	45	255	161	87	176	67	140	117	60	83	48	96ms	FW
						1.30s								
f.	t	u	tt	uː	ŋ	ˈua	n	ia	ŋ	i	t	u	k	
	34	117	173	138	115	183	87	147	84	61	83	56	154ms	JD
						1.34s								
g.	t	u	tt	uː	ŋ	ua	n	ˈia	ŋ	i	t	u	k^h	
	36	39	280	151	147	173	96	158	118	51	129	32	279ms	MH
						1.41s								
h.	t	u	tt	ˈuː	ŋ	ua	n	ia	ŋŋ	i	t	u	k	
	68	70	291	198	122	199	73	158	179	39	84	51	93ms	FW
						1.53 s								
C-average	51		207		90		76		118		97			
Sequence						1.25s								

Appendix D: The morpheme /χattaχ/ 'often, intermittently'

(5)a.	k	a	tt	u	χ	i	v	a	ll	ia	t	ui	nn	a	χ	a	tt	a	t	u
	142	99	174	70	84	84	60	51	179	138	95	101	131	71	37	33	172	64	97	61
																	0.31s			

b.	s	i	v	u	ll	iu	χ	a	tt	a	m	a
	87	66	77	49	182	149	65	30	171	63	69	37
									0.33s			

c.	χ	ai	ŋŋ	uː	n	i	ɣ	a	tt	au	χ	a	tt	a	t	uː^h
	132	122	187	127	63	45	52	123	211	148	20	22	209	78	88	206
													0.33s			

d.	a	tj	i	ɣ	i	ts	ia	χ	a	tt	a	ŋ	i	t	uː	k
	150	147	109	49	96	241	137	30	44	210	57	89	72	81	190	38
										0.34s						

e.	s	aː	tt	au	χ	a	tt	a	t	uː
	77	128	207	158	28	48	192	102	64	166
							0.37s			

f.	p	i	j	au	χ	a	tt	a	t	uː
	47	68	101	132	49	40	206	84	55	154
							0.37s			

g.	s	i	k	ua	χ	a	tt	a	t	uː
	166	52	153	174	42	54	190	83	67	276
							0.37s			

h.	χ	ua	ɣ	u	nn	a	ŋ	iu	m	a	χ	a	tt	a	t	u	t^h
	186	204	41	59	180	68	93	140	93	47	53	38	210	73	84	43	147
													0.37s				

i.	p	i	χ	a	tt	a	t	u	t
	35	60	22	65	223	67	82	88	39
					0.38s				

j. i mm au i l ua n i χ a tt a t uː

113 152 187 57 91 158 70 136 66 53 181 79 71 295

0.38s

k. χ a nn i t au s i m a j uː j aː χ a tt a t uːʰ

177 73 206 94 97 162 84 49 95 80 67 209 53 155 43 52 206 90 70 704

0.39s

l. χ i n ua ŋ u n i ɣ aː χ a tt a t a v u t

166 69 174 162 60 91 64 65 46 150 48 32 207 104 100 68 70

0.39s

m. χ i n ua l i χ a tt a m a

220 88 102 240 55 74 60 67 217 55 93 105

0.40s

n. a tj iː χ a tt a ŋ i tt a ŋ a

140 192 201 84 53 230 63 76 42 100 75 81 167

0.43s

o. u χ a tt a ŋ a

140 77 86 226 75 107 33

0.46s

p. t i n i χ a tt a s u n iː

86 79 85 72 75 58 227 110 74 64 172 201

0.47s

q. u l i χ a tt a tɬ u n

183 109 67 102 62 210 102 74 97 172

0.48s

r. χ u pp a χ a tt a t uː ɣ a l ua

97 100 210 90 170 96 209 84 85 199 24 65 55 305

0.56s

60 52 205 80 80

0.40s

For each example word the decibel value boxed in double lines attains peak word intensity. Decibel value boxed valued in a single line attains peak intensity for the [χatta] sequence.

(6)a.

χ	a	nn	i	t	au	s	i	m	a	j	uː	j	aː	χ	a	tt	a	t	uː^{h}
62.6	$\boxed{72.3}$	67.3	68.5	63.9	71.1	60	64.1	63.8	66.9	64.5	69.4	66.6	71.1	63.9	62.2	59.5	$\boxed{63.9}$	57.8	63.5

58.8

b.

p	i	j	au	χ	a	tt	a	t	uː
58.8	66.1	68	$\boxed{68}$	63.7	63.1	60.5	$\boxed{64.8}$	54.6	60.9

59.5

c.

s	i	k	ua	χ	a	tt	a	t	uː
64.7	67.4	63.5	$\boxed{73.6}$	65.6	64	60.4	$\boxed{66}$	58.9	65

60.9

d.

χ	ua	ɣ	u	nn	a	ŋ	iu	m	a	χ	a	tt	a	t	u	t^{h}
63.8	$\boxed{80.8}$	68.9	71.5	71.8	75.1	71.7	72.4	69.5	71.5	64	63.6	60.3	$\boxed{67.8}$	62	64.4	52.8

61.1

e.

t	i	n	i	χ	a	tt	a	s	u	n	iː
59.4	$\boxed{72}$	70.2	70.2	64.5	65.7	58.7	$\boxed{67.8}$	56.3	65.3	65.6	65.7

61.4

f.

u	χ	a	tt	a	ŋ	a
67.9	58.7	$\boxed{68.7}$	61.6	68.5	65.8	$\boxed{68.7}$

61.8

g.

i	mm	au	i	l	ua	n	i	χ	a	tt	a	t	uː
65.2	64.5	$\boxed{72}$	66.9	65.4	$\boxed{71.6}$	65.5	71.2	68.4	63.5	64.7	$\boxed{68.8}$	63.8	54.9

62.1

h.

k	a	tt	u	χ	i	v	a	ll	ia	t	ui	nn	a	χ	a	tt	a	t	u
60.9	70.7	63.8	$\boxed{73.4}$	65.5	72.3	67.8	71.5	68.5	73.4	61.7	70.2	68.7	69.2	65.9	63	58	$\boxed{68.6}$	64.1	65.4

62.7

i.

χ	ai	ŋŋ	uː	n	i	ɣ	a	tt	au	χ	a	tt	a	t	uː^{h}
65.4	$\boxed{73.6}$	71.2	72.8	70.8	71.6	68.8	73.6	64.5	70.4	67.9	64.9	62	$\boxed{69.3}$	59.6	66.8

63

j.

s	aː	tt	au	χ	a	tt	a	t	uː
61.3	71.5	63.7	71.9	64.8	62.6	64.3	70.9	58.1	67.2

63.1

k.

u	l	i	χ	a	tt	a	tɬ	u	n
76.1	70.1	71.6	63.5	68.1	60.5	69.6	63.1	65.6	64.2

63.2

l.

χ	i	n	ua	l	i	χ	a	tt	a	m	a
64.5	72.3	69.1	73.2	66.6	69.6	65.7	67.7	64.2	64.5	65.3	68.2

63.2

m.

a	tj	i	ɣ	i	ts	ia	χ	a	tt	a	ŋ	i	t	uː	k
71	57.9	73.2	67.5	71.1	67	72.2	63.8	63.5	60.2	70.8	70.9	71.4	61.7	70	71

63.4

n.

a	tj	iː	χ	a	tt	a	ŋ	i	tt	a	ŋ	a
70	67.2	74.9	65.8	68.4	61.6	70.5	71.5	70.1	67.1	70.1	68.8	69

64.2

o.

χ	i	n	ua	ŋ	u	n	i	ɣ	aː	χ	a	tt	a	t	a	v	u	t
67.6	73	73.4	77.8	73.1	73.8	71.8	72.8	70.4	76	70	68.1	63.9	70.2	66.6	73.4	69.5		

64.7

p.

χ	u	pp	a	χ	a	tt	a	t	uː	-ɣ	a	l	ua
58.5	71.3	68	73.6	64.4	73.1	65.7	70.8	66.6	73.7	69.2	74.5	66.3	72.2

65.4

q.

s	i	v	u	ll	iu	χ	a	tt	a	m	a
59.9	69.5	65.5	70.1	69.5	74.7	68.7	67.7	61.9	72.1	69.6	71

65.9

r.

p	i	χ	a	tt	a	t	u	t
68.2	78.3	73.9	73.8	71.5	71.4	66.9	70.4	61.4

68.6

Avg.	65.7	66.2	62.2	68.7	63.4

APPENDIX E: The sequence /χixxi/

For all the tables in the ptarmigan corpus, peak intensity is shown above each segment in decibels with the peak word intensity value boxed in double lines and secondary word intensity boxed in a single line. For duration, values are beneath each segment in milliseconds with peak word duration boxed in double lines and secondary durational prominence boxed in a single line. The examples are ordered from the shortest [χixxi] sequence in seconds.

The boundary tones H and L are marked with the unmarked case being a pitch line slightly falling from left to right. Prosodic boundaries are marked, as needed for my analysis.

$]_{\omega}$ = word boundary

$]_{IP}$ = interrogative phrase-final boundary

$]_{DP}$ = declarative phrase-final boundary

$]_{U}$ = utterance-final boundary

7a.

71	61	63	56		65	dB		
a	χ	i	x	x	i	$]_{\omega}$		BH
104	25	90	57	57	117	ms		
			0.35s					

b.

62	61	61	59		75			
a	χ	i	x	x	i	$]_{\omega}$		BH
72	14	56	91	91	116			
			0.36s					

c.

62	61	61	59		75			
a	χ	i	ɣ	ɣ	i	$]_{\omega}$		BH
14	5	37	116	116	99			
			0.37s					

d.

57	57	66	60		70			
a	χ	i	x	x	îːí	$]_{IP}]_{U}$		JM
91	79	75	109	109	489			
			0.86s					

e.

59	52	53	56		58	51		
a	χ	i	x	x	i	k˺	$]_{\omega}$	PJ
99	74	79	97	97	56	38		
			0.40s					

f.

56	58	63	60		64	56		
a	χ	i	x	x	íː	k^h	$]_{U}$	AE
64	70	66	114	114	128	224		
			0.49s					

g.

67	62	66	62		71	57		
a	χ	iː	x	x	íː	k^h	$]_{U}$	AE
96	112	140	63	63	124	423		
			0.50s					

h.

75	68	64	65		69	70		
a	χ	í	ɣ	ɣ	ìː	k^h	$]_{DP}$	HW
111	81	93	61	61	214	118		
			0.51s					

i.

73	72	69	64		69	52		
a	χ	i	ɣ	ɣ	îːí	k^h	$]_{IP}]_{U}$	HP
187	49	96	76	76	254	292		
			0.55s					

j.

54	46	48	44		43	36		
a	χ	í	x	x	ìː	k^h	$]_{DP}$	AZ
83	36	67	91	91	260	342		
			0.55s					

k.

75	68	64	65		69	70		
a	χ	í	x	x	ìː	k^h	$]_{DP}$	BK
75	120	58	96	96	224	343		
			0.59s					

	71	61	63	56		65	dB	
8a.	a	χ	i	x	x	i	$]_{\omega}$	BH
	104	25	90	57	57	117	ms	
	104		172		174			

	62	61	61	59		75		
b.	a	χ	i	x	x	i	$]_{\omega}$	BH
	72	14	56	91	91	116		
	72		161		207			

	62	61	61	59		75		
c.	a	χ	i	ɣ	ɣ	i	$]_{\omega}$	BH
	14	5	37	116	116	99		
	14		158		215			

	57	57	66	60		70		
d.	a	χ	i	x	x	îːí	$]_{IP}]_{U}$	JM
	91	79	75	109	109	489		
	91		263		598			

	59	52	53	56		58	51		
e.	a	χ	i	x	x	i	k˺	$]_{\omega}$	PJ
	99	74	79	97	97	56	38		
	99		250			191			

	56	58	63	60		64	56		
f.	a	χ	i	x	x	íː	kʰ	$]_{U}$	AE
	64	70	66	114	114	128	224		
	64		250			466			

	67	62	66	62		71	57		
g.	a	χ	i	x	x	íː	kʰ	$]_{U}$	AE
	96	112	140	63	63	124	423		
	96		315			610			

	75	68	64	65		69	70		
h.	a	χ	í	ɣ	ɣ	ìː	kʰ	$]_{DP}$	HW
	111	81	93	61	61	214	118		
	111		235			393			

	73	72	69	64		69	52		
i.	á	χ	ì	ɣ	ɣ	îːí	kʰ	$]_{IP}]_{U}$	HP
	187	49	96	76	76	254	292		
	187		221			622			

	54	46	48	44		43	36		
j.	a	χ	í	x	x	ìː	kʰ	$]_{DP}$	AZ
	83	36	67	91	91	260	342		
	83		194			693			

	75	68	64	65		69	70		
k.	a	χ	í	x	x	ìː	kʰ	$]_{DP}$	BK
	75	120	58	96	96	224	343		
	75		274			663			

9a.														
53	49	43	44		53	48	45	46	49	52		44	34	
a	χ	i	x	x	i	l	i	t	á	n	n	àː	kʰ	]$_{DP}$ AZ
82	44	116	64	64	63	66	107	140	39	91	91	153	377	
82	224			127		173		270			621			
	0.35s													

b.									
71	63	64	62		71	69	71	54	
a	χ	i	x	x	i	l	îːí	kʰ	]$_{IP}$ BK
78	93	50	66	66	80	57	126	350	
78	209			146		533			
	0.36s								

c.														
69	68	70	69		75	71	74	72	79	74		74	67	
a	χ	i	x	x	i	l	i	t	á	n	n	àː	kʰ	]$_{DP}$ EF
195	86	73	67	67	81	39	60	120	86	108	108	125	458	
195	226			148		99		314			691			
	0.37s													

d.									
69	63	66	66		71	67	70	62	
a	χ	i	x	x	i	l	i	k˺	]$_{\omega}$ SI
146	62	59	104	104	62	86	76	72	
146	225			166		234			
	0.39s								

e.									
73	71	73	66		75	71	74	62	
a	χ	i	x	x	i	l	i	k˺	]$_{\omega}$ BK
76	100	73	95	95	53	61	69	59	
76	268			148		189			
	0.41s								

f.									
66	58	68	65		71	64	62	52	
a	χ	i	x	x	i	l	îː	kʰ	]$_{DP}$ JM
113	73	70	92	92	94	95	241	238	
113	235			186		574			
	0.42s								

g.									
59	52	54	54		65	61	62	59	
a	χ	i	x	x	i	l	îːí	kʰ	]$_{DP}$]$_{U}$ JI
73	103	47	100	100	96	59	297	254	
73	250			196		610			
	0.45s								

h.									
62	59	69	61		74	68	67	70	
a	χ	i	x	x	i	l	i	m	]$_{\omega}$ JM
85	92	74	103	103	97	104	31	244	
85	269			200		379			
	0.47s								

i.									
69	63	66	66		70	67	70	62	
a	χ	i	x	x	i	l	i	k˺	]$_{\omega}$ SI
118	75	107	135	135	88	76	66	99	
118	317			223		241			
	0.54s								

10a.

69	68	68	64		72	68	68	62	dB		
a	χ	i	ɣ	ɣ	i	v	i	k˺	$]_{\omega}$	HP	
115	23	76	71	71	102	50	61	65	ms		
115	170			173		176					
			0.34s								

b.

71	68	70	66		75	64	68	65		
a	χ	i	x	x	i	v	i	k˺	$]_{\omega}$	LI
176	32	85	69	69	104	60	63	77		
176	186			173		200				
			0.36s							

c.

66	60	67	61		67.7	66	68.4	60		
a	χ	i	ɣ	ɣ	i	v	i	k˺	$]_{\omega}$	HW
94	90	100	63	63	77	63	91	56		
94	253			140		210				
			0.39s							

d.

71	63	63	65		73	66	67	54		
a	χ	i	x	x	í	v	ĭ	kʰ	$]_{DP}]_{U}$	LI
290	18	87	82	82	115	85	155	149		
290	187			197		389				
			0.39s							

e.

66	57	59	56		68	65	62	61		
a	χ	i	x	x	í	v	ìː	kʰ	$]_{DP}$	JI
96	100	51	95	95	78	88	311	269		
	246			173		668				
			0.42s							

f.

72	71	68	64		71	68	68	46		
a	χ	i	ɣ	ɣ	i	v	îːí	ɣ˺	$]_{IP}]_{U}$	HP
157	47	91	90	90	116	50	171	143		
157	228			206		364				
			0.44s							

g.

71	66	68	65		77	74	71	61		
a	χ	i	x	x	í	v	ìː	kʰ	$]_{DP}$	EF
135	41	64	99	99	140	66	247	313		
135	204			239		626				
			0.45s							

h.

61	60	64	59		66	61	60	55		
a	χ	i	x	x	í	v	ìː	kʰ	$]_{DP}$	PJ
73	102	103	95	95	67	97	233	196		
73	300			162		526				
			0.46s							

i.

60	61	67	58		72	66	65	54		
a	χ	i	x	x	í	v	ĭː	kʰ	$]_{DP}]_{U}$	JM
118	86	96	92	92	109	106	223	536		
118	274			201		865				
			0.47s							

j.

75.8	59	69	56		75.5	67	70	52		
a	χ	i	x	x	í	v	ĭː	kʰ	$]_{DP}]_{U}$	BH
150	45	122	87	87	118	71	174	230		
150	254			205		475				
			0.48s							

k.

72	65	72	64		73	66	69	66		
a	χ	i	x	x	í	v	ĭː	kʰ	$]_{DP}]_{U}$	SI
87	86	57	122	122	101	55	260	311		
87	265			223		626				
			0.49s							

l.

71	65	76	70		75	74	78	64		
a	χ	i	x	x	í	v	ĭː	kʰ	$]_{DP}]_{U}$	BK
83	90	157	79	79	93	59	291	253		
83	326			172		603				
			0.49s							

11a.	a	χ	i	x	x	i	n	iu	t	î:í	kʰ		
	75	75	73	69		67	71	72	64	69	55	dB	
	a	χ	i	x	x	i	n	iu	t	î:í	kʰ	$]_{IP}]_{U}$	BH
	72	44	78	62	62	39	97	194	27	360	141	ms	
	72		184		101		291			528			
			0.29s										

b.	a	χ	i	x	x	i	n	iû	t	í:	kʰ		
	65	56	63	60		64	63	62	56	58	54		
	a	χ	i	x	x	i	n	iû	t	í:	kʰ	$]_{DP}]_{U}$	KT
	155	60	68	62	62	55	93	131	77	187	270		
	155		190		117		224			534			
			0.31s										

c.	a	ɣ	i	x	x	i	n	iu	t	î:í	kʰ		
	71.77	69	70	62		71	73	71.71	66	69	58		
	a	ɣ	i	x	x	i	n	iu	t	î:í	kʰ	$]_{DP}]_{U}$	EF
	126	46	90	69	69	70	96	199	35	132	297		
	126		205		139		295			464			
			0.34s										

d.	a	χ	i	x	x	i	n	iu	t	î:í	kʰ		
	59	56	65	62		70	70	75	65	67	63		
	a	χ	i	x	x	i	n	iu	t	î:í	kʰ	$]_{DP}]_{U}$	HW
	81	67	78	67	67	74	91	152	69	175	156		
	81		212		141		243			400			
			0.35s										

e.	a	χ	i	x	x	i	n	iu	t	i	k	u	l	u		
	70	66	69.8	65		69	69	73	64	68	67	69.8	66	67		
	a	χ	i	x	x	i	n	iu	t	i	k	u	l	u	$]_{\omega}$	SI
	87	78	81	77	77	38	77	180	45	45	95	55	52	92		
	87		236		115		257		90		150		144			
			0.35s													

f.	a	χ	i	x	x	i	n	íu	t	î:	kʰ		
	65	60	64	60		68	68	69	63	61	65		
	a	χ	i	x	x	i	n	íu	t	î:	kʰ	$]_{DP}]_{U}$	KT
	115	47	86	77	77	65	89	188	65	135	412		
	115		210		142		277			612			
			0.35s										

g.	a	χ	i	x	x	i	n	iu	ɣ	u		
	77	66	71	65		74	69	73	66	72		
	a	χ	i	x	x	i	n	iu	ɣ	u	$]_{\omega}$	BH
	100	82	76	68	68	84	42	122	14	84		
	100		226		152		164		98			
			0.38s									

h.	a	χ	i	x	x	i	n	iu	t	ĭ:	kʰ		
	56	53	53	54		61	60	60	54	56	47		
	a	χ	i	x	x	i	n	iu	t	ĭ:	kʰ	$]_{U}$	PJ
	96	107	42	72	72	101	31	190	50	195	163		
	96		221		173		221			408			
			0.39s										

i.	a	χ	i	x	x	i	n	iu	t	i	k		
	61.9	56	62	58		61	60	61.8	57	58	56		
	a	χ	i	x	x	i	n	iu	t	i	k	$]_{\omega}$	JI
	98	83	84	73	73	87	47	176	54	100	48		
	98		240		160		223			202			
			0.40s										

j.	a	χ	i	x	x	i	n	iu	t	i	$_{C}$[ŋ	â:í		
	71	67	68	72		72	69	75	69	71	73	74		
	a	χ	i	x	x	i	n	iu	t	i	$_{C}$[ŋ	â:í	$]_{C}]_{IP}]_{U}$	BH
	101	57	67	109	109	83	54	171	50	59	78	516		
	101		233		137		225		109		594			
			0.43											

k.	a	χ	i	x	x	i	n	íŭ	t	i::	kʰ		
	70	56	68	67		71.7	71	72.2	60	68	64		
	a	χ	i	x	x	i	n	íŭ	t	i::	kʰ	$]_{IP}]_{U}$	SI
	143	95	95	159	159	89	126	403	110	463	539		
	143		349		248		529			1112			
			0.60s										

	70	66	67	58	$\boxed{72}$	69	$\boxed{75}$	70	71.8	49	dB	
12a.	a	χ	i	ɣ	i	t	ui	n	a	k̚	$]_{\omega}$	LI
	156	100	87	70	128	51	109	145	96	64	ms	
	156	187		198		160		305				
		0.33s										

	64	61	65	64		66	70	$\boxed{71}$	65	$\boxed{67}$		66	$\boxed{71.7}$	68	$\boxed{71.8}$	62		
b.	a	χ	i	x	x	i	n	iu	t	i	$_{C}[$ ɣ	l	uː	n	iː	t̚	$]_{c}]_{\omega}$	SI
	115	54	83	61	61	67	45	142	80	40	93	93	146	82	126	108		
	115	198			128		187		213			239		316				
		0.33s																

	$\boxed{68.3}$	62	65	56		$\boxed{67.8}$	60	67.5	59	$\boxed{68}$			
c.	a	χ	i	x	x	i	l	i	$_{C}[$ l	u	$]_{c}]_{\omega}$	BH	
	82	87	72	64	64	75	68	87	82	65			
	82	223			139		155		147				
		0.36s											

d.	68	67	67	63		$\boxed{70.6}$	68	$\boxed{71.2}$	67		63	63	65	56	63	66		67	65	
	a	χ	i	ɣ	ɣ	i	l	iu	l	l	u	ŋ	iː	t	u	ɣ	l	i	ɣ̚	$]_{\omega}$
	139	50	81	79	79	74	74	146	86	86	42	57	118	53	57	83	83	88	98	
	139	210			153		306			128		175		193			269			
		0.36s																		

e.	66	63	69	65		$\boxed{70}$	69	$\boxed{63}$	60		
	a	χ	i	x	x	i	v	íːĭ	n	$]_{IP}]_{U}$	VI
	87	74	65	81	81	89	120	512	153		
	87	$\boxed{220}$			170		$\boxed{785}$				
		0.39s									

	70	64	67	65		$\boxed{71}$	66	71		71	$\boxed{73}$	67	69	57		
f.	a	χ	i	x	x	i	v	i	t	s	íà	v	áː	kʰ	$]_{DP}]_{U}$	SI
	75	70	94	81	81	87	39	174	93	93	295	82	141	307		
	75	245			168		306			$\boxed{388}$		$\boxed{530}$				
		0.41s														

	68	57	69	64		68	71	$\boxed{72}$	67	$\boxed{70}$		
g.	a	χ	i	x	x	i	ɣ	u	n	a	$]_{\omega}$	SI
	141	70	99	168	84	93	86	87	33	75		
	141	337			177		173		108			
		0.43s										

h.	70	65	$\boxed{71}$	67		70.8	68	$\boxed{73}$	68	70.6		
	aː	χ	i	x	x	i	χ	i	v	a	$]_{\omega}$	SI
	147	92	98	77	77	104	55	116	35	95		
	147	267			181		171		130			
		0.45s										

i.	71.5	68	71.7	60		71.4	69	$\boxed{72.6}$	71.9	$\boxed{72.5}$	70	71		
	a	χ	i	x	x	i	l	i	ŋ	u	n	a	$]_{\omega}$	SI
	108	84	116	100	100	97	87	64	107	96	102	91		
	108	300			197		151		203		193			
		0.50s												

	71	66	72.4	62		$\boxed{72.5}$	72	$\boxed{73}$		71	70		
j.	aː	χ	iː	x	x	i	ŋ	ú	n	n	ăːː	$]_{DP}]_{U}$	SI
	162	160	144	124	124	121	145	78	116	116	663		
	162	428			245		339			$\boxed{779}$			
		0.67s											

	69	70	$\boxed{71.77}$	61		71	69	71.71	72	$\boxed{74}$	57		
k.	a	χ	i	x	x	i	χ	uː	t	i	k	$]_{\omega}$	SI
	153	137	147	161	161	116	137	195	107	116	143		
	153	445			277		332		366				
		0.72s											

APPENDIX F: The sequence /na:na/

(13)a.

65	70	71.8	71	72.2	68	74	dB	
a	n	aː	n	a	ɣ	a	$]_{\omega}$	TK
34	67	98	49	81	38	58	ms	

0.30s

0.43s

b.

75	75	77	75	76	69	72		
a	n	aː	n	a	ɣ	i	$]_{\omega}$	BH
83	57	107	47	86	30	49		

0.30s

0.46s

c.

70.2	70	73	68	69.7	67	69		
a	n	aː	n	a	ɣ	a	$]_{\omega}$	BH
81	71	93	54	78	48	78		

0.30s

0.56s

d.

70	72	77	72	79	75	81		
a	n	aː	n	a	ɣ	a	$]_{\omega}$	JD
70	56	141	53	63	34	84		

0.31s

0.50s

e.

66.7	68	66.6	63	64	64	66.8		
a	n	aː	n	a	ɣ	a	$]_{\omega}$	DF
77	81	134	61	63	38	58		

0.34s

0.51s

f.

63	65	69	67	69.1	70	75		
a	n	aː	n	a	ɣ	aː	$]_{DP}$	PA
35	77	138	59	68	27	259		

0.34s

0.66s

g.

73	75	77.1	76	76.4	73	73		
a	n	aː	n	a	ɣ	aː	$]_{stutter}$	BH
98	51	120	75	97	57	224		

0.34s

0.74s

h.

70	71	71	68	69	66	61		
a	n	aː	n	a	ɣ	aː	$]_{DP}$	MK
90	63	154	82	72	61	124		

0.37s

0.65s

i.

69.5	72	71	71	69.8	68	69.2		
a	n	aː	n	a	ɣ	a	$]_{\omega}$	MN
95	84	163	63	69	41	109		

0.38s

0.62s