JournalLing is based in Montreal, which is situated on the traditional unceded territory of the Kanien’kehá:ka, a place which has long served as a site of meeting and exchange amongst nations. JournalLing recognizes and respects the Kanien’kehá:ka as the traditional custodians of the lands and waters on which our journal operates.

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Foreword

Linguistics, like language, is an ever-growing field of study that is constantly shifting, adapting, and evolving. However, even as the tools and methods used by linguists continue to change, the curiosity driving them remains constant. We are therefore proud to present this year's edition of *JournalLing*, which captures the curiosity and hard work of talented authors from our active undergraduate linguistics community, spanning across various subfields.

The release of the 2025-2026 edition of *JournalLing* is bittersweet. It marks the end of a chapter filled with back-and-forth emails, team meetings, and impromptu OJS troubleshooting sessions, among others. I (Minji) am sincerely grateful to have been given the opportunity to lead this year's publication alongside Katelyn, my co-Editor-in-Chief. From excitedly meeting to discuss before the start of the academic year to copyediting together, we were quite the duo! I could not have asked for a better co-Editor-in-Chief. I also thank Jackson, our VP Journals, for consistently offering his support and sharing his knowledge about the website and publication process. If Katelyn and I made such a great duo, it was in part thanks to your invaluable contributions. As well, we would like to extend our gratitude to the rest of our team: our editors, Alexander, Beatrix, Georgia, Giuliana, Liliana, and Jordan, as well as Rhea, for graphic design. Each of you contributed significantly to this publication, and your hours of hard work did not go unnoticed. Lastly, a special mention goes to the McGill Libraries team, especially Jennifer Innes, for going above and beyond to guide us with publication. This has been an excellent year working with an incredible group of people, and I am excited to watch *JournalLing* continue to grow and to offer a space for upcoming linguists for years to come.

The journal has connected me to linguistics more than I ever could have imagined. I (Katelyn) began working with the journal last year as a Lead Editor to become more involved with my peers and their work. I loved sitting in class listening to different research topics and jumped at the opportunity to be involved with turning those projects into published articles. I am beyond grateful that I was allowed the opportunity to lead our wonderful team this year as a co-Editor-in-Chief. My time working with JournalLing has been the best learning curve I could have asked for and I am excited to share the final project with the McGill Linguistics community. I think our journal is one of the best ways to stay connected with research outside our own subfields and to gain insight into what our peers are working on. I am happy to have shared my time with Minji, who perfectly balanced out our position by bringing a sense of calm and composure to every tight deadline and late night. To Jackson our VP Journals, without your knowledge of journal logistics and back-end functions, specifically in building our website from the ground up, this could not have been completed. To our team, it has been a pleasure to work alongside you and watch everyone grow over the course of the year. I have no doubt that each individual will go on to do amazing things, and I can't wait to support you from the sidelines. I am proud to say that my four years at McGill have culminated in this year's edition and hope you see all the love and passion that was poured into it.

We would both like to give a special thanks to all of our graduating team members: Jackson, Alexander, and Jordan, as well as graduating authors. Thank you for spending your last semesters working with us, putting up with our deadlines and last-minute meeting changes, and listening to our bad dad-joke ice breaker questions. This year has truly been the most fun because of all of you. The time spent working with the journal has been incredibly impactful for the both of us and has become one of the highlights of our time at McGill. We hope you sit back, relax, and enjoy reading the 2025-2026 edition of JournalLing!

Katelyn Lamoureux and Minji Jeong
Co-Editors-in-Chief of JournalLing
March 2026

Clipped Loanword Blends in Japanese

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Abstract

Word-blending is a common and productive process that forms new words by combining components of multiple source words. Different from compounding, blending is defined by the shortening of one or more of the constituent words. This paper conducts a typological analysis of Japanese Clipped Loanword Blend (CLB), a process of word blending involving loanwords. By drawing on existing blendword literature and by investigating the semantics of lexical data, this paper establishes three descriptive categories of Japanese CLBs based on semantic meaning and pragmatic usage: true compounds, true blends, and complex clipped loanwords. Empirical investigation suggests that many blend-word data fall between these categories, possibly due to shifts in meaning and/or usage.

1 Introduction

Do you feel like watching an episode of a *dramedy* after a long day at work? Ever need to rely on your phone to *scanlate* while travelling in Tokyo? You might find such terms a mix of foreign and old-fashioned. However, the word-formation method of *blending* is a highly productive and common process, creating frequently used and nearly lexicalized words such as *brunch* and *motel*. Word blending is analogous to compounding; however, blendwords' structures might not be as overt as those of compounds. In Japanese, word-blending is an extremely productive and common word-formation strategy that applies to both native words and loanwords. Although conjunctions alongside the shortening of native morphemes are usually morphological processes, this is not always the case for loanword-blending.

In this paper, we will examine the phenomenon of **Clipped Loanword Blends** (CLB henceforth) in Japanese and attempt to formalize a theoretical account of their formation. CLBs are blends of one or two shortened loanwords, whose shortening is intuitively motivated by the circumvention of the epenthetic repair of loanwords, which would create sequences that are long and cumbersome to pronounce. The phonological aspect of CLBs has been well documented in the current literature, yet few linguists have examined their morphological structure. Section 2 will review existing literature on general blending theories, Japanese loan words and compounds; Section 3 examines the lexical data of Japanese

CLBs and provides three categories of blend words according to their semantic meaning in relation to the source morphemes; Section 4 concludes this paper by discussing the three categories and proposes directions for future studies.

2 Literature Review

2.1 Blend Words & Compounds

The categorization of blending as a type of word formation has been much disputed. Blending has been hypothesized to be a type of compounding, a type of shortening, or unrelated to either. We will work with the following definition: **blends are lexical items formed by merging two or more words in a way in which only part of their material is preserved, where the merging does not exclusively involve the simple concatenation of existing morphemes.**

Beliaeva (2014) hypothesizes a set of rules that indicate which words can be blended. We notice that an essential feature that distinguishes blend words from, for example, compounds, is that part of the word material, which is orthographic and/or phonological, is lost. We will designate the original words from which we form the blend 'source words'. In blend words, we most commonly find some similarity between the source words. Furthermore, the locus of the similarity is most often the locus of the switch point, on which either side is a segment from different sources. The overlap between words can be fully phonological, such as in *fauxbia (**faux** + pho**bia**)*, in which the overlap of *faux* and *pho* in the source words is not graphical. The overlap can also be graphical and have little phonological overlap. Furthermore, the overlap is not limited to solely one switch point; in *parentnoia (**parent** + **para**noia)*, the blend takes the fully overlapping (orthographically and phonologically) segment *par* of either source word, and takes the ultimate syllable of the latter source word, while replacing the second /a/ of *paranoia* with /ent/ of the first source word.

The words that can be blended are not just determined by their formal properties; as we can note relevant semantic properties as well. J. Algeo (1977:56) distinguishes two semantic categories of blend. The first category is **syntagmatic blends,** which are "the combination(s) of two forms that occur sequentially in the speech chain". The classic blend example, *motel* (motor + hotel), is presumably an instance of this; a motel was originally called a motor hotel, which eventually became a blend. The second category that Algeo distinguishes is **associative blends**. These are "linked in the word-maker's mind and thence in his language" (Algeo 1977:57). This is, for example, *pleurire (pleurer + rire)* in French, meaning *to cry and laugh (cry + laugh)*. The source words have clear semantic relations, as both are displays of emotion, and the blend describes a real phenomenon – laughing to the point of tears. Although this semantic distinction is disputed, we will attempt to account for it.

We can now examine the factors that influence how the source words are blended. A first element of prevalence is the order of the words in the blend, conditioned by the semantic properties of the resulting blend and by the source words themselves. The importance of word order in determining the resulting blend is especially apparent in syntagmatic blends, as syntagmatic blends are the result of sequential, and therefore often ordered, words in speech. The order of the source words is likely to be determined by the position of the semantic head, often on the right in English, according to the Right-Hand Head Rule; *floordrobe (floor + wardrobe)* is a type of wardrobe, not a type of floor. We also commonly find that the shorter word, should the sources be of different lengths, and that the more frequently used source word appears first. The more prototypical often appears first when the blend is formed from two words of the same lexical category, for example, in *spork (spoon + fork)*, where spoons have been longer and more widely used than forks. There can also be pragmatic influences, such as the temporal order of meals in *brunch (breakfast + lunch)*.

The parts of words that become part of the blend vary; source words can be found in their entirety, or can become clipped in a blend, which are the word parts we call splinters.
Furthermore, splinters can eventually acquire morphemic status should they become productive. In English, we can observe this phenomenon with the morpheme *-aholic*, which originated from the morphologically complex word alcoholic, with the root alcohol and the suffix *-ic*. The bound morpheme *-aholic*, which we now use productively, was, at its origin, a splinter of *alcoholic*. Considering this, we now call words such as *workaholic* or *shopaholic* affixations rather than blends. As we will see in Japanese, the clipping of loanwords into new morphemes is a very productive process.

We can observe around a dozen very common structures in blends. First, blends in which the source words do not overlap at the switch point: *tigon (**tig**er + li**on**)*. We find blends where the source words do not overlap, and where the first word is entirely present: *blogebrity (**blog** + cel**ebrity**)*. Blends such as these would require that the first source have fewer segments than the second. Another is where the source words do not overlap, and the second word is entirely present: *incredidrunk (**incredi**bly + **drunk**)*. For blends with overlap, as seen before, we have formations in which the source words overlap and are both clipped, such as *motel (**m(ot)**or + h**(ot)el**)*. We have blends with overlap where the first word is entirely present: *mockbuster (**mock** + bl**(ock)buster**)*, and where overlap with the second word is entirely present: *jumbrella (**j(umb)**o + **umbrella**)*. Finally, we find blends in which the source words overlap, and in which they are both entirely present: *alcoholiday (**alcohol** + **holiday**)*. I would assume that this formation is rarer, as it requires that the final segment of the first word be the same as the first segment of the second.

While these seven blend formations account for most blends, others are attested as well. Among them, cryptoblends (Renner 2015) are blends in which "the first splinter retains no other phonological and graphical material than the segment overlapping with the second source word" (Belieava 2019:9). She gives the example *ostalgie ((**ost**)en + n(**ost**)algie)* in German. However, this blend could be analyzed as source-word boundary: #ostalgie (#(ost)en + n(ost)algie), which would fit within the framework of the blends we know how to account for, as an overlap between two splinters. Another attested form is infixed blends, in which a fragment from the middle of one source word is replaced by the other source word or its splinter. This gives us *prowebstinate (**pro**cra**stinate** + **web**)*. As manifested in this last example, infixed blends do not obligatorily include any phonological or orthographic overlap, although attested. We also find infixed blends with source words intercalated in the blend, resulting in words such as *skarfolóno (**s(ka)l(óno)** + **(ka)rf(óno)**)* in Greek, in which it seems that *karf* is inserted at the point of overlap, and that a second point of overlap *óno* is present. Blend words must observe formal regularity. They must obey phonotactics; among these, the stress pattern must be conserved from source to blend. The switch points should also be placed at major phonological joints, such as syllable boundaries or boundaries of syllable elements (commonly between the onset and rhyme).

A relevant formation, especially in Japanese, is clipping compounds. These are items formed by the concatenation of the initial segments of sources, commonly splinters, for example, digicam (*digital* + *camera*) instead of **digimera*. Beliaeva does not consider such formations to be blends, as they do not meet a defining blend constraint: not "have [...] been formed by concatenation of morphs"; she considers them to be neighbouring morphological categories (Beliaeva 2014:2). The formation of blend words, as said, has been disputed, especially regarding it as a subtype of compounding and/or word shortening. In her 2014 paper, Beliaeva concludes that blending is neither an instance of nor a process of blend formation, and that blend formation is far more complex.

Clipping compounds, or complex clipping, have an AC formation (AB + CD = AC); the **beginnings of the source words are conserved**, and they differ from the blends we have seen henceforth. The source words are often **difficult to deconstruct** without prior knowledge. Their formation seems to be the opposite of that of blends: in **clipping, a frequent co-occurrence establishes a semantic link between source words that gives rise to their merging**, whereas blending is a "formation of new notions in the process of conceptual integration" in which the merging gives rise to a semantic link (Beliaeva 2014). The origins of blending and complex clipping are therefore different, as AC formation implies a semantic link between sources before their merging, like syntagmatic blends.

Here, a question arises about the difference between complex clipping and syntagmatic blends – which have been analyzed as blends – for example, why did *digital camera* become a clipped compound

and *motor hotel* become a blend? Considering that they are both phrases that commonly arise in speech, what factors result in their different creative formations? We will propose the following: as Beliaeva describes blending as a type of "creative word formation," and a motor hotel is not a hotel for motors, but rather a hotel for motorists, the meanings of blend words are not strictly compositional. Alternatively, a digital camera has no idiosyncrasies. This is a possible reason for the difference in formation.

Complex clippings seem to be contractions of **existing compounds**. Their formation relies on source word merging followed by shortening of some kind, and the merging and shortening of words coincide in blends such that enough material from the source words appears in the blend. Beliaeva does state that there are marginal cases in which these principles do not seem to stand: "the ultimate boundary between them is impossible to draw."

2.2 Japanese Loanwords and *Wasei-Eigo*

Loaning is a widespread phenomenon, and loanwords in Japanese have been researched extensively from multiple perspectives (see Hoffer 1990, Schmidt 2009, Hatanaka & Pannell 2016, among others). Mark Irwin offers arguably the most comprehensive account in his 2011 book, *Loanwords in Japanese.* Irwin pointed out that Japanese borrows words from other languages extensively due to language contact, and its lexicon can thus be divided into three major strata: Native (*yamato*), borrowing from ancient Chinese (Sino-Japanese), and foreign words from other languages (Irwin 2011). Irwin also classified a separate stratum for mimetic words. However, they will not be included in our discussion.

The foreign stratum is termed as *gairaigo* or *yogo,* meaning 'western words', which refers to loanwords from specifically European languages. While strictly speaking, loanwords from Chinese and Korean are also foreign, the stratum of words borrowed from outside the Sinosphere receives special treatment. Below, Irwin provides his definition:

> A *gairaigo* is a foreign word which has undergone adaptation to Japanese phonology, has been borrowed into Japanese after the mid-16th century and whose meaning is, or has been, intelligible to the general speech community. (Irwin 2011:10)

Due to the strict phonotactics in Japanese, *gairaigo* almost always undergoes phonological reparations such as epenthesis. This could greatly lengthen the input word, so it is consequently shortened for more convenient use. For example, 'convenience store' becomes *konbiniensu-sutoa,* which is subsequently clipped as *konbini*. Although this slightly differs from the CLBs, since it is purely elliptical

and does not contain roots from two source words, it is an example of Japanese speakers using clipping to shorten loanwords rather than using the full form.

In addition to nouns, verbs and adjectives are also frequently borrowed into Japanese. Source verbs can be preserved or truncated, and a verbal inflectional suffix is attached; the verb is then subjected to regular Japanese inflectional rules. For example, 'to sign' is borrowed as *saiɴ* and verbalized by inflection *-suru* as *saiɴ-suru*; 'panic' is borrowed as *panikku* and verbalized with another inflection *-ru* and becomes *panikkuru.* 'Sabotage' is borrowed as *sabotaaju,* clipped into verbal root *sabo-* and *-ru* verbal inflection attaches to make *saboru.* On the other hand, if the original word already ends with *-ru*, it can be adapted directly, such as 'Google' > *guuguru* > *guugu-ru* (Irwin 2011:137-138).

Adjectives, on the other hand, are categorized into two different classes. Some of them are directly adopted as an adjectival noun and used in conjunction with a copular particle *na,* for instance 'best' > *besuto* > *besuto na* (noun), whereas some other words become native-like adjectives after truncation and attachment of adjectival suffix. Such is the case with 'grotesque' > *gurotesku* > *guro-i* and 'erotic' > *eročikku* > *ero-i.* Lastly, adjectival nouns and true adjectives are inflected differently in adverbial forms (e.g. *besuto ni* vs. *guro-ku*). Such variation shows that truncated loaned adjectives have a special status, supporting the view that clipping is a morphological process rather than a purely phonological one.

Notably, whereas *gairaigo* loanwords are the direct adaptations of foreign words, some of them do not make sense or even seem bizarre when they are re-adapted into English: they seem to have no source. These words are "expressions that are coined in Japan from English words" (Hatanaka & Pannell, 2016:15), termed *wasei eigo*, literally meaning 'Japanese-made English'. Unlike direct loanwords, they often undergo semantic shifts and/or narrowing. For example, the loan of 'mansion' - *manshon,* does not refer to a mansion; instead, it means 'apartment complex'. *Wasei eigo* derivation can also occur during compound formation, creating novel compounds with no English counterparts. For example, *romansu gure* 'romance grey' refers to a 'middle-aged lover', *wan patan* 'one pattern' refers to something redundant or boring, etc. They could be subjected to clipping as well: *eko guzzu* 'ecological goods' refer to recyclable items. The creative formation of new words that semantically differ from their English origins is parallel to Believa's claim that blend word formation is creative: the meaning of *wasei eigo* compounds is very often non-compositional.

2.3 Japanese Compounds and Clipping

Compounding is a remarkably productive word-formation process. Japanese compound word formation can be categorized into NN, NV, VN and VV compounds (Lensun et al. 2023). Japanese compounds mostly obey the syntactic property of right-headedness, but Sino-Japanese ones could reflect Chinese syntax when the original word is left-headed (Kageyama 2011). However, there is debate over how to analyze compounds in Japanese, an isolate language. Li (2019) analyzed nominal compounding from a Distributed Morphology perspective, while Kageyama (2011) argued that it is incompatible with DM and instead supports the Modular Morphology model. Kageyama suggested that Japanese compounding was pervasive "in both lexical and syntactic domains"; a lexical compound and a syntactic phrase are easily distinguished by whether or not they have inflections. For example, *huru-hon* 'used book' is a compound, while *huru-i hon* 'old-INFL book' is an NP containing an AdjP adjunct (Kageyama 2011:512). Nevertheless, despite their different approaches, both Kageyama and Li agree that compounds are often lexicalized and become single words in the lexicon.

Li (2019) further categorizes NN compounds based on the semantic relation between the two noun elements: N_1 could either be "a modifier…, an object… or an instrument of N_2" (Li 2019:2). His analysis of N_{OBJ} - $N_{TRANS.conj}$ compounds demonstrates similarities between them and English deverbal compounds. For example, *gohan-dukuri* 'rice-making' is formed by adding 'rice' and the conjunctive form of 'to make', and the elements are not semantically related because other transitive verbs could easily replace the deverbal head productively (e.g. 'rice-eating', 'rice-selling', etc.). Such evidence supports his claim that Japanese compound formation is syntactic and that semantic interpretation occurs after merger. This is consistent with the observation that the semantic meanings of non-lexicalized loanword compounds are compositional as well.

Ito & Mester (1996) examined Sino-Japanese compounds in depth. They pointed out that Sino-Japanese stems are maximally bimoraic, are typically CVCV, and that neutralization is commonly applied to the second consonant's consonantal feature. These are all carryover effects from rigid Chinese phonotactics. Such a phonological constraint also seems to apply to CLBs, as almost all of them have maximally bimoraic roots, and if there are rare exceptions, their roots do not surpass two syllables. Importantly, they suggest that "Sino-Japanese stems are subject to syllabic closure" (Ito & Mester 1996:22), as codas of stem 1 do not re-syllabify as the onset of stem 2 if stem 2 starts with a vowel. On the other hand, this non-cyclicity is less visible in CLBs, perhaps because most of the loanword elements begin with a consonant.

In his 2018 paper, Daniel argued that clipping is a morphology-motivated process rather than a purely phonological or arbitrary one. He defines clipping as "a process which creates new lexemes by shortening expressions" (Daniel 2018:16). This is supported by the fact that the clipping of long, complex compounds cannot be predicted by phonology, but by syntax and semantics, because the preserved element is usually more crucial for the deduction of the original meaning. The status of being semantically significant is determined by the morphological component of the grammar. Daniel's conclusion provides further evidence supporting the suspicion that CLBs are motivated not only by phonology but also by morphology and semantic preservation, which govern the clipping and blending of loanwords.

3 Clipped Loanword Blends (CLBs) in Japanese

After examining the literature on Japanese compounds and loanwords, we realize that there is no structural account for loanword compounds, which are frequently shortened by clipping. Daniel (2018:20) declared that clipped loanwords "do not show the complex morphological structure as seen in native expressions", yet such a claim is ungrounded. The authors of this paper speculate that CLBs may be complex compounds, just as native expressions, and, by comparing them with native/Sino-Japanese compound theory, we find that the same phonological operation can yield structurally diverse forms. A CLB can be descriptively defined as a compound word that consists of one or two elements, which are shortened loanwords. A closer examination of the examples of blend words shows that the CLB could consist of either compound clipping or blended words.

Given the prevalence of semantics in determining blend words, we investigate the morphological properties of CLBs by analyzing their meanings and how standard theories of blend words and compounds apply to them. After closely examining the morphological-semantic interface of CLB data, we propose **three** major categories of CLBs: (1) true compounds formed with morphemes produced by clipping, (2) true blend words, and (3) complex clipping. Additionally, data show that the boundary between these categories can be blurred, especially under the influence of lexicalization.

3.1 True Compound Formed with Clipped Morphemes

As Daniel (2018) argued, clipping can produce productive lexemes and morphemes, but contrary to his claim, this process is not limited to native Japanese words. The clipping process can produce productive, native-like morphemes that can stand alone when suffixed, and the compound words that they constitute are structurally identical to regular compounds. For example, as Irwin (2011) has demonstrated, loanword adjectives can be clipped and combined with adjectival suffixes to become native-like

adjectives, such as 'grotesque' → *guro-i* and 'erotic' → *ero-i.* In this instance, the two adjectival roots combine to form the blendword *eroguro*, which is an adjectival noun (jisho, n.d.). It can be used as an adjective in conjunction with a copular particle *na* or a noun suffix *-kei* 'genre' as in *eroguro kei* 'erotic-grotesque genre'. Another example is *-kon,* the clipped form of *konpulekkusu* 'complex'. It is extremely productive in forming words such as *rori-kon* 'lolita complex', *šhisu-kon* 'sister complex' and *faza-kon* 'father complex'. Such productivity is contrasted with the homophony produced by clipping other compounds, as demonstrated by Irwin's (2011) data below, which show that homophonic lexemes can have different morphological statuses as their meanings vary: some are productive morphemes, some are not productive, and their significance is contingent on the surrounding morphological context.

Radio + control	***raji****(o)* + ***kon****(torooru)*	*rajikon*	'Radio controlled'
Family + computer	***fami****(rii)* + ***kon****(pyuutaa)*	*famikon*	'family computer'
System + component	***šisu****(temu)* + ***kon****(poonento)*	*šisukon*	'system component'
Summer + concert	***sama****(a)* + ***kon****(saato)*	*samakon*	'summer concert'

Table 1: Examples of CLBs with the morphemes of the same phonological form *-kon*

Interestingly, according to internet search results, the word *šisukon* seems more commonly perceived as 'sister complex' than 'system component' (or the brand 'Syscom'), showing that the productive morpheme is semantically more competitive.

Most importantly, the true compounds' meanings are strictly compositional: the compound's meaning does not deviate from the sum of its parts, which individually have their meanings. This contrasts with blends, where semantic narrowing and shifts can occur, and with complex clipping, where meaning is processed in the source-language compound, and individual parts cannot retain their respective meanings once divided.

WORD	SOURCE WORDS	SEMANTIC	LANGUAGE OF ORIGIN
Eroguro (nansensu)	ero(tic) + gro(tesque)	An artistic movement featuring "erotic grotesque nonsense" that emerged in Japan in the early 20th century	English
nōto-pasokon	*note* + *pasokon*	laptop	English
rorikon	*Loli(ta)* + *com(plex)*	sexual attraction to fictional and real underage girls	English

Table 2: Examples of true compounds

3.2 (True) Blends

Alongside true compounds, another form of creative formation involving loanwords is **true blends**. These are multi-morphemic words that are entirely or partially made up of loanwords. Many *wasei eigo* examples fall under this category. However, unlike true compounds like *eroguro*, they are distinguished by non-compositionality: their meanings usually shift or narrow, but their formation is not entirely arbitrary, as the elements are semantically associated to a limited extent. For example, *karaoke* is a blend of *kara-* 'empty' and *Ōkesutora* 'orchestra'. It does not literally mean 'an empty orchestra'; instead, its meaning has shifted and is idiosyncratic. This property aligns with Beliaeva's definition of blend word formation as being creative, and the fact that the frequency of *karaoke* occurring far surpasses that of *oke* as in 'orchestra' (jisho, n.d.) alone signifies that the clipping most likely happened after the blend has formed, and *Ōkesutora* > *oke* clipping was not a morpheme production process, unlike examples like *-kon.*

Another example that falls under this category is *depachika,* literally composed of *depato* 'department store' and the native noun *chika* 'underground'. It is classified as a blend word for two reasons. First, *chika*'s head status is different from its native usage, when it usually occupies the non-head position, such as *chika-tetsu* 'subway', *chika-sui* 'underground water' and *chika-šitsu* 'basement'. It could be considered an example of syntagmatic formation (Alegeo 1977), where consecutive elements in a phrase get combined, as in the derivation hypothesized in (1):

(1) **Depā~~to no~~** **chika~~-kai~~**
department.store-MOD underground-level

Secondly, *depachika* refers specifically to the food court that is usually situated on the underground level of a mall (Wiktionary contributors, n.d.). This is a classic example of semantic

narrowing without compromising endocentricity, as the right-hand head determines that this blend refers to a type of underground space rather than a department store. Below are the data we analyzed as blend words.

WORD	SOURCE WORDS	SEMANTIC	LANGUAGE OF ORIGIN
bīdama	*vi(dro)* + dama	marbles	Portuguese + Japanese
depachika	depa(rtment store) + *chika*	Food courts located in the basement of Japanese department stores	English + Japanese
hote-toru	hote(l) + Tur(kish bath)	sexual services provided in a hotel room	English
pansuto	pan(ty) + sto(cking)	pantyhose	English
anison	ani(me) + son(g)	An anime song, most often the theme	English
erogu	ero(tic) + (blo)g	erotic blog, adult-oriented blog	English
karaoke	kara + *orche(stra)*	karaoke	Japanese + English
pokemon	*pocke(t)* + *mon(ster)*	Pokémon	English
taoru ketto	*Towel* + *(blan)ket*	a type of blanket made of a material similar to a beach or bath towel	English
tonkatsu	*Ton* + *cut(let)*	pork cutlet	Japanese + English
woshuretto	*wash+(toi)let*	a toilet with a built-in bidet	English
rabuho	*Love ho(tel)*	Love hotel	English
eneo	*ene(my)* + *otto(husband)*	Enemy husband: a husband who torments his wife	English + Japanese
enetopia	*Ener(gy)* + *(u)topia*	Green housing development	English

Table 3: Examples of blend words

3.3 Complex Clipping

While Beliaeva seems to rely on the formal structure of clippings – deletion of end segments and concatenation of initial segments – to identify them, we will not be employing this formal structure to classify clipping compounds. Although the AC clipping pattern is accurate for complex clippings, it cannot be a reliable identifying factor, because many true blends, which differ in other ways from complex-clipped words, share the AB + CD = AC clipping pattern.

However, since the surface form is motivated by morphology, we do not need to posit that Japanese morphology motivates an AC form in the same way that English morphology does. We can still identify some formal properties that allow us to account for the data we have. We can characterize the category of Complex Clipping by the shortening of constituent words in the source. Furthermore, across all our data, the words that meet all the requirements of this category are derived from two foreign words. We will take a first example: we find *eakon*, which was derived from the English phrase 'air conditioner' (***ai****r* + ***con****ditioner).* In contrast with blend words and true compounds, these words strictly correspond to the source English compound, and the intended meaning cannot be deduced if they are separated: even though *ea* is the loanword of 'air', *ea* + *kon* cannot derive the compound 'air conditioner'; the multimorphemic counterpart is instead a Sino-Japanese word *kūchō sōchi* 'air-conditioning appliance'.

To identify clipped compounds, we will rely mostly on their semantic features. This includes the origin of the word formation: a syntagmatic combination of both source words that previously occurred in the source language. This implies, and runs in parallel with, the same-language origin of the source words, with the additional need for them to form a common phrase in this language. The structure of these words is monomorphemic; the structure of the compound is opaque. This suggests that, due to a semantic association in the source language, the words are concatenated before being borrowed into Japanese. The phrase, therefore, acts as a unit in Japanese; the source words are unable to be semantically separated. This is further supported by the fact that these words keep the semantic meaning of the phrase from which they originate.

WORD	SOURCE WORDS	SEMANTIC	LANGUAGE OF ORIGIN
mobo	mo(dern) bo(y)	(1920s slang) young men adopting western styles and behaviours	English
moga	mo(dern) gi(rl)	(1920s slang) young women adopting western styles and behaviours, flapper	English
eakon	air con(ditioning)	air conditioning or air conditioner	English
pasokon	*perso(nal) com(puter)*	PC	English
puroresu	*pro(fessional) wrest(ling)*	professional wrestling	English
rimokon	*remo(te) con(trol)*	remote control	English
sefure	*se(x) + frie(nd)*	casual sexual partner	English
tereka	*tele(phone) ca(rd)*	A prepaid card for using public telephones	English
wāpuro	*wor(d) + pro(cessor)*	word processor	English
yan egu	*youn(g) ex(ecutive)*	young executive	English
dejikame	*digi(tal) came(ra)*	Digital camera	English
sekuhara	*sex(ual) hara(ssment)*	Sexual harassment	English
hansuto	*Hun(ger) + st(rike)*	*Hunger strike*	English
sekohan	*Seco(nd) + hand*	*secondhand*	English

Table 4: Examples of loanwords undergone complex clipping

3.4 Further Analysis

Nevertheless, the three categories we have identified above still struggle to account for all the data. There are some words, such as *famikon (**fami**ly + **com**puter)* and *ensuto (**en**gine + **stop**)*, that seem to fall somewhere between blends and clipping compounds. The composing morphemes of these examples share surface properties with complex clippings; they present two points regarding the deletion of word-final segments, both sourced from non-native words in the same language. However, they behave semantically like blends: they are not derived from common English phrases and have idiosyncratic meanings. For example, *famikon* could mean 'family computer', but, according to a native speaker, it is more commonly associated with a model or series of Nintendo gaming consoles.

In the data we collected from native speakers, some words appear formally as blends but are monomorphemic. This poses a problem if we want to integrate these into the blend category, where we

specifically state morphological complexity as a requirement for words to be defined as blends. *Karupisu (**cal**cium + sar**pis**)*, a popular yogurt-flavoured soft drink, is derived from the English word *calcium* and the Sanskrit word *sarpis* for 'good taste'. Like blends, the derived meaning is idiosyncratic and creative. In the same fashion as clipping compounds, there is deletion of a segment from both source words; however, as seen here, not just the final segments of the sources. This word is also monomorphemic to native speakers, possibly a result of its lexicalized usage.

WORD	SOURCE WORDS	SEMANTIC	LANGUAGE OF ORIGIN
afu-reko	af(ter) + recor(ding)	postrecording, dubbing	English
ensuto	en(gine) sto(p)	stall (as in an automobile engine)	English
famikon	fami(ly) com(puter)	The Nintendo Entertainment System. Also, a catch-all term by the older generation for any gaming console.	English
jīpan	jea(ns) + pan(ts)	jeans	English
karupisu	*cal(cium) + (sar)pis*	Calpis (a brand of soft drink that uses milk as a key ingredient)	English + Sanskrit
sumaho	*sma(rt) + (p)ho(ne)*	smartphone	English
mopaato	*mo(tor) + (a)part(ment)*	Apartment with a garage	English
resuteru	*Rest + (ho)tel*	Short-stay hotel	English

Table 5: Blend words that cannot be categorized

4 Conclusion

In tandem with Beliaeva's proposition, the line between compound clipping and blend words is extremely hard to draw. Under the influence of compound rules, phonotactics and the extensiveness of borrowing, the term CLB is no more than a descriptive umbrella term. Blending could be considered a subtype of word merging, whereas compounding is instead concatenative. Many theories offer potential explanations, but they are difficult to test due to differently ordered sequences of concatenation, merging, loaning, and shortening. Furthermore, lexicalization seems to occur in real time, and greatly affects how blends, compounds, and complex clipped loanwords are interpreted. In conclusion, Japanese CLBs could be either true compounds, complex-clipped loanwords, or true blends, depending on the interface between their semantic and morphological structures. To rigorously test their morphological status and structure, future research could collect additional native-speaker judgements and analyze actual usage in spontaneous speech corpora.

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Deconstructing Queer Speech; The Features and Nature of "Gay-Sounding Speech"

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Abstract

One of the fundamental observations of sociolinguistics is that separate social classes and groups form individual speech patterns. Taking this fact into account for queer communities, this article explores the features of speech associated with a so-called "gay-sounding speech", specifically in the realm of phonetics and acoustics, and the place of this speech in relation to the wider 2SLGBTQIA+ community. Through a survey of the research literature, it considers different kinds of acoustic variation to investigate the widespread idea that "gay-sounding speech" is characterized by a feminization of speech, a view deemed controversial. The article provides evidence both for and against this claim.

1 Introduction

The field of sociolinguistics posits the existence of certain linguistics subsets, or sociolects, which emerge from within social groups when their members have prolonged exposure to each other, and especially if they are cut off from speech associated with dominant social norms. Milroy and Milroy (1978) study the idea of Dense-Multiplex social networks, characterized by prolonged and constant exposure of the speakers in a network to one another, versus Loose-Simplex ones, determining that the former reinforces linguistic trends which diverge from the norm. In many nations around the world, queer identities have been, across history, forced into reclusion and hiding by the reigning heteronormative social norms. This led to the formation of a tightly knit (potentially dense) subculture, one which would also be expected to follow covert prestige rather than attempt to appeal to the dominant social norms so antagonistic to them. As a result of these factors (and a variety of others that could be considered), we may expect to observe a speech associated with these 2SLGBTQIA+ cultures.

Furthermore, many people of all sexual orientations and identities have some ability to identify speech they consider to be associated with queer people, notably with gay men. This ability has been confirmed many times, such as by Gaudio (1994) and by Linville (1998), the latter of which observed that

people could identify sexual orientation nearly four out of five times (79.6%) (Linville 1998:41). This leads to the question: What constitutes this "gay" or "queer" speech? What features does this speech possess which allow for identification, if any? This article will investigate this question, looking at one of the answers that is most often hypothesized: speech feminization in gay men. This article will first establish some background information on the topic. Subsequently, it will consider evidence for the feminization view, followed by evidence to the contrary. Lastly, it will reconcile both positions, proposing an analysis of the data and of the field.

First, we must establish that there are a number of levels of speech in which features denoting "gay" or "2SLGBTQIA+" speech may appear; among these, we can look at elements of acoustics, phonetics, lexical, prosody, and more (e.g., while less attested in the literature, one could observe for syntactical elements of "gay-sounding speech"). Despite this variety, the phonetic and acoustics elements appear as most common in the literature and will therefore be developed at greater lengths in what follows.

Before proceeding further, we can establish that the lexical features are the most straightforward and most definitive markers of "gay" speech. There is a history of observing a "gay argot", a dialect associated with queer subcultures, one that has been characterized by many linguists, including Doyle (1982). We can conclude that a marker of the identification of gay and queer peoples in everyday speech will naturally be the usage of the lexicon(s) associated with queer culture; though not with certainty, as many terms of this lexicon do eventually get absorbed into mainstream (heterosexual) culture (Kulick 2000). Nevertheless, we can investigate Zeve's work which characterizes the queer lexicon as one defined by reclaiming pejorative language, as well as the metaphorical redefinition of words (he supplies "closet" as a prime example of this, one that even extended itself to a redefinition of the word "out", which equally takes on a new meaning) (Zeve 1993:4). However, while this is an element of any analysis of "gay-sounding speech", it is an element beyond the acoustic quality of such speech, often considered to be its defining characteristic.

We therefore consider the perhaps more elusive question of what has often been characterized as "gay voice", a mostly phonetic or acoustic measure of queer speech. While there is some disagreement, the most repeated hypothesis suggests that what denotes this form of speech in gay men is a higher pitch. This aligns with pre-existing linguistic analysis of the speech of gay men, where it has been suggested that gay male speech is associated with lower-class femininity (Barrett 1998:145); or further, that the language of gay men is an imitation of women's speech (Lakoff 1990), a claim which was met with much controversy, explored below.

2 Preliminary Remarks on "Queer Speech"

Before continuing, we must also consider that while this "gay-sounding speech" is heavily associated with gay men, the 2SLGBTQIA+ community is one which has historically been, and remains, strongly connected. If there is a social explanation to this "gay" speech, as the one offered by Suire (2020:2575) which posits these features may emerge as a marker of in-group identity, we must consider the influence of other queer individuals rather than focusing only on gay men. Indeed, we question whether this "gay" speech is monolithic across queer communities or if it is in fact distinct; we may not expect homosexual men to necessarily speak like any other member of the broader queer community, although this remains a possibility. To do so, we can consider work done to determine whether transgender individuals' voices are also identified as this "gay speech". Notably, Hancock et al. (2014) observed the listener judgments of 14 listeners in Washington D.C., who listened to the speech of 44 speakers who had been recorded discussing a painting. The researchers observed gender as opposed to perceived gender, and the influence of intonation on gender perception. They find that the speech of transgender women is not interpreted as belonging to men most of the time, with nine out of fourteen being designated as one of the non-male categories (ranging from ambiguous to female).

Not surprisingly, the feminization of speech is much more strongly attested amongst transgender women speakers; notably, this does not seem to contribute to "gay sounding speech" or "queer-sounding speech" (which have been historically associated with gay men) as transgender women are likely to be identified correctly as women, or to be identified as not belonging to the category of "men" (Hancock 2013:205). However, it may be hypothesized that, as some transgender women may first come out as gay before recognizing their identities, the feminization of speech in transgender women (and other transgender peoples) may have had a historical effect on what is considered gay speech (beyond the simple fact that both communities have historically shared many 2SLGBTQIA+ spaces).

Another remark is necessary before continuing. Because "gay-sounding speech" is widely attested cross-linguistically and has been found to share features cross-linguistically, the research considered in this paper is not restricted exclusively to English speakers.

3 For the "Feminization" Hypothesis

One frequent claim is that "gay-sounding speech" in men is associated with speech feminization, which can be characterized by a general shift towards the speech of women, such as a higher pitch. A variety of research supports this claim: we can, for instance, observe the conclusions of Suire et al. (2020) or of Gaudio (1994).

Indeed, Suire and colleagues (2020) observed several linguistic factors in heterosexual and homosexual native French-speaking men and women (180 men and 150 women). The researchers recorded the participants repeat a story they had been made to hear. Then, they analyzed this data for fundamental frequency and frequency variation, breathiness, and jitter. They also tested the testosterone of each participant to observe whether this would have some correlated effect with sexual orientation and speech, though this did not prove to be the case. The study found that sexual orientation did show a significant effect on mean F0-SD (variation in F0) and HNR (breathiness). While the speech of the homosexual participants was significantly different from that of heterosexual women, the mean of these participants was shifted towards the values of women in certain variables (both F0-SD and HNR). They conclude a difference of 10.65% in overall speech acoustics of gay men as compared to heterosexual men. These differences represent a significant, though slight, shift toward the speech of heterosexual women. They also found that F0 observes no significant difference between homosexual and heterosexual men. Finally, they observe pitch variation, with greater pitch variation among gay men. Their findings indeed suggest that such variation would be used by listeners to identify sexual orientation. As such, they analyze these features overall as a feminization of speech in homosexual men.

While this supports the feminization hypothesis in production, research has also shown that feminization is perceptually associated with queer identities. Gaudio (1994) studied native speakers of Standard American English, specifically four gay men and four “nongay” men of ages 21 to 31, who were asked to read two short passages into a microphone, followed by an interview. 13 participants played the role of the listeners to obtain listener judgements. They observed for pitch, F0 for pitch variation and fluctuation, and for the listener's judgement pertaining to the gay, effeminate, emotional, and ordinary nature of the speech. They concluded that there was an undeniable accuracy in assessments of sexual orientation in the listener judgements, mainly in the recorded passages. Additionally, the speech of gay men was deemed by the listeners to be higher on the effeminate scale, and those who judged gay men as having effeminate speech usually identified the speakers as being gay. When it came to pitch range (based on F0 values), this feature seemed to not be correlated with the answers provided by listeners. However, intonational variability does seem to play a role in assessment, though its exact role remains ambiguous, and Gaudio concludes that this element, on its own, may not be enough to justify identification of homosexual speech. As such, while the actual pitch was not conclusive, listeners associated effeminate speech in men to be associated with an 2SLGBTQ+ identity.

To conclude, research demonstrates that feminization of speech is associated, both perceptually and in production, with queer identities and may form the basis of “gay-sounding speech”.

4 Against the "Feminization" Hypothesis

While studies surveyed above support feminization, other research contradicts or nuances the feminization hypothesis. Indeed, many researchers find this explanation to be insufficient. Here, we focus on Baeck et al. (2011), Vanpoucke et al. (2018), and Linville (1998).

First, many articles conclude slight feminization, but not one strong enough to account for the perceptual effects of "gay-sounding speech". Baeck and colleagues (2011) recorded speech samples to observe pitch amongst 30 homosexual men aged 18-59, 56 heterosexual men aged 18-60, and 54 heterosexual women aged 17-59, all being inhabitants of Flanders, in Belgium. Analyzing these, they observed higher fundamental frequency in the speech of homosexual men than in that of heterosexual men, though only slightly. The more notable difference was a much higher frequency variation in the speech of homosexual men. However, they could not confirm their initial hypothesis, according to which "gay-sounding speech" is a product of feminization, since the homosexual men in the study still fell within the general range for men despite a mean still somewhat above that of heterosexual men.

This is similar to the findings of Vanpoucke et al. (2018) who observed feminization not through pitch but nasality. The research observed nasality in 30 self-identified homosexual men, 35 heterosexual men, and 34 heterosexual women, from Northern Belgium. The nasality of speech was observed both instrumentally (through the calculation using the Nasality Severity Index) and perceptually (rated by the researchers), during the reading of certain texts. The study found higher nasality among homosexual men in the vowels /a/, /i/, and /u/ when these were tested individually, approaching the nasality of the heterosexual women (while /m/ was the same for all three groups). No such correlation was observed in the tasks involving longer texts; as such, the researchers preliminarily assumed nasality plays no role in identification of sexual orientation. However, they noted that in single sounds, the conclusions seemed different, as there was an observed trend. Ultimately, the difference was deemed irrelevant due to a large amount of variation among the homosexual speakers.

Lastly, Linville (1998) ruled out feminization, observing no such effect in its data. This study observed nine men aged 24 to 43 years old (five identifying as gay and four as straight), who were speakers of Standard American English. Each speaker was asked to read a monologue. The study observed duration of /s/, average /s/ peak frequency, speech formants, modal speaking frequency and speech rate. Perceptual tests were then performed by 25 young adult females. The study suggests that the idea of "feminization" as the primary feature of gay speech is incorrect, as this was not attested in its findings. It also notes that the perception of formants one to three (F1, F2, & F3) were irrelevant in determining sexual orientation. Modal speaking F0 was also not predictive of perceived or actual sexual

orientation. Indeed, the study finds duration and frequency of /s/ to be the most predictive, showing correlation. Also, one gay speaker was consistently identified as being straight, indicating that the community of gay men is not homogeneous. The tongue placement of /s/ is concluded to be the most related to gay speech.

In conclusion, the idea of "feminization" is not fully accepted by researchers in this field; quite the contrary, many sociolinguists believe this effect to be too weak to account for "gay-sounding speech" or outright incorrect.

5 Reconciling the Positions

There is conflicting data as to the feminization of speech as a leading factor of "gay-sounding speech". In fact, we initially seem to expect gay men to have speech that mirrors or approaches that of heterosexual women in many aspects — this is attested as the starting point for or referenced in nearly all the studies mentioned (Suire 2020; Baeck et al. 2011; Vanpoucke et al. 2018; Linville 1998; Gaudio 1994). However, as shown, there are some conflicting conclusions about the feminization of speech in gay men. Some studies found no element of this feminization of speech (Linville 1998:45), others found this trend only in an inconclusive sense (Vanpoucke et al. 2018:1447; Baeck et al. 2011:213), and still others found it to be correlated with sexual orientation (Suire 2020:2581). So, what can be said conclusively about "feminization" in this field?

First, it seems that the "feminization" observed in Suire (2020) is well attested, including by Gaudio (1994). Further, if this element is cast in doubt in both the studies of Vanpoucke (2018) and Baeck (2011), it is not because the mean showed no feminization, but because the variation observed among the gay respondents was too great (both studies could not conclude feminization due to a large amount of interpersonal variation amongst queer respondents). This is interesting as there is also much variation, linguistic or otherwise, within the gay community; while the means generally demonstrated some feminization, most studies found some homosexual speakers whose features of speech were more strongly correlated with the norms for men, or beyond that. For instance, Linville (1998) observed for most respondents very accurate recognition of sexual orientation, but found one gay man was consistently labelled straight (Linville 1998:41).

As a result, the most straightforward conclusion on the feminization of speech in homosexual men is that this feature does exist but that there is a wide range of different speech features among this group. It seems as though there are a number of gay men who demonstrate more feminization and that this has become one element socially associated with this gay-sounding speech, often described as being stereotypically "effeminate" (Gaudio 1994:31). We could be tempted to conclude that "gay speech" is a

collection of acoustic factors, including namely fundamental frequency and breathiness (Suire 2020:2583; Baeck et al. 2011:213), which displays a shift towards the means of these factors in heterosexual women. However, while these factors have contributed to the idea of what gay speech is, particularly to what a cisgender, heterosexual individual may use to identify someone as being gay or queer, this is only representative of a subset of a subset of the queer community, which is to say a minority of gay men.

This precursory conclusion remains incomplete; as observed by Linville (1998), other elements are also associated with "gay-sounding speech" separate from feminization, suggesting that this feature forms an incomplete explanation. Indeed, Linville believes the feminization of speech theory to be a flawed view of "gay-sounding speech", concordant with the limitations of viewing feminization as the primary feature of this speech established above. She suggests an alternative solution, focused on the production of /s/. Linville concludes that both the duration and frequency of /s/ was strongly correlated with sexual orientation and used by listeners to assess the sexual orientations of the research subjects.

It can also be noted that each of Suire (2020), Gaudio (1994), and Baeck et al. (2011), in their observations of pitch, reached conflicting conclusions as to the pitch of homosexual men. Suire and Gaudio (2020; 1994) observed pitch to be correlated with sexual orientation, while Baeck did not. However, all three concluded that the speech of gay men, more so than of heterosexual men, displays an important role of variance in pitch and intonation, which is to say that they demonstrated a wider net of values of pitch. Pitch variance was also used by listeners to assess sexual orientation in speech, as seen in Gaudio (1994:54). As these studies find a consensus despite differing in other conclusions and while observing different populations, this is a strong indication that pitch variance is an important feature defining "gay-sounding speech".

The discussion surrounding "gay-sounding speech" is diverse, with many hypotheses about its nature. We can conclude first and foremost that the idea of "gay-sounding speech" is not monolithic; it appears to be composed of a few distinct features, not all of which are attested at once within all speakers labelled as having gay speech. It seems that the (seemingly controversial) idea of feminization of speech (higher pitch as well as F0 and jitter nearer to that of heterosexual women), which has been theorized at length, is indeed attested, but only in a subset of gay speakers and of speakers labelled as gay by listeners regardless of sexual orientation. This is naturally correlated with the widespread stereotype that this gay speech is "effeminate". This makes feminization alone a poor explanation of "gay-sounding speech", as it explains too little of the accuracy observed in studies like Gaudio (1994), where listeners could correctly assess sexual orientation with much accuracy, and too few of homosexual speakers seem to pattern with this particular feminized speech (as observed by Baeck et al. 2011:213). Many other elements are necessary to form a complete theory of "gay-sounding speech". These include the characteristics of /s/

(and the associated position of the tongue during its production) observed by Linville (1998) as well as the greater variation in pitch in “gay-sounding speech” observed by Suire (2020), Gaudio (1994), and Baeck et al. (2011).

6 Conclusion

We can conclude that feminization is not sufficient to characterize or account for “gay-sounding speech”, a view which emerges from a range of studies arguing both for or against the importance of “feminization” but is especially found in Vanpoucke et al. (2018) and Linville (1998). However, this is not to say that there is no feminization: for many 2SLGBTQ+ people, especially a subset of gay men, this phenomenon is consistently observed (Suire et al. 2020; Gaudio 1994). Regardless, it is not sufficient to explain what is perceived as “gay-sounding speech”, especially as a variety of other factors, such as pitch variation or the features of /s/ may play equal or greater roles in characterizing the speech of gay men. We conclude that feminization is present in this “gay-sounding speech”, as spoken by gay men, but is not its defining characteristic.

Due to the fundamental association of the “gay-sounding speech” and gay men, which are the subset of the queer community most associated with such speech (Gaudio 1994), this analysis is mostly limited to that group. The exclusion of trans women is explained above, but the speech of trans men, lesbians, and many other subsets of the queer community could not be addressed, despite a strong co-existence of these with gay communities and by extension the speech emerging from a broader 2SLGBTQIA+ community. Further research should analyze the relations between the speech of these communities, as it may be possible that their historical proximity has led to some convergent factors (as well as the fact that queer peoples were at length perceived as similar or homogeneous, leading to stereotypes of gay and queer speech possibly emerging as amalgamations of the attested speech of actual communities). Such further research may also inform future research carried out to investigate the speech of gay men, of which the defining characteristic, shown not to be feminization, remains unidentified (further studies could in this way investigate pitch variation or sibilant production, which have been proposed as hypotheses).

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Three Puzzles from Camsá Morphology

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Abstract

Camsá (also spelled Kamsá, Kamentšá, and Camentšá), is a language isolate spoken in Colombia at a transition point between the Amazon lowlands and Andean highlands (O'Brien 2018:2). It is endangered and understudied, with an elderly speech community and no more than 10 published linguistic works (O'Brien 2018:23), with O'Brien (2018) representing the first reference grammar. Camsá has also been described as morphologically complex (O'Brien 2018:27). These qualities: genetically isolated, typologically transitional, understudied, and morphologically complex, all make further analysis of Camsá a potentially valuable contribution to our understanding of morphology. In this paper, we explore three puzzles present throughout the language. First, we explore an alternation in the forms of adjectives triggered by linear positioning with respect to their head nouns, and argue it represents an alternation between true noun-adjective structure building and noun-adjective compounding. Second, we describe a process within the verb that seems akin to noun incorporation or noun-verb compounding. Finally, we revisit a decomposition of the agreement system, arguing that the *o* vowel present in several prefixes is a separable morpheme; and suggest that, moreover, this morpheme is sensitive to the presence of an incorporated noun.

1 Introduction

Camsá (also spelled Kamsá, Kamentšá, and Camentšá), is an endangered language isolate spoken in Colombia by around 500 people[1] (O'Brien 2018:18).[2] The core speech communities are located in the

[1] The first version of this paper was written as a final assignment for the LING 440: Morphology course in the Winter 2025 semester at McGill University. Thank you to Martina Martinović for teaching the class and providing guidance and review on this paper. Thank you also to Chase Boles and Ina Zeng for discussion on some of the morphological puzzles.

[2] There is no official orthography for the language (O'Brien 2018:49). We use the orthography that is used in large publications such as the Bible (*Bëngbe Bëtsa Cabëngaftaca Entsoyebuambna - El Nuevo Testamento en el idióma camsá* 2009) and the dictionary (Juajibioy 2018). This orthography aligns with the IPA except for the following graph:[IPA] pairs: ë:[1], š:[ù], tš:[tù], ch:[Ù], ÿ:[^{n}Ã], sh:[S], ñ:[ñ], y:[j], j:[x], ng:[^{N}g], ll:[L], c:[k]. Of the sources we reviewed, only O'Brien (2018) writes /wV/ sequences; other sources render this sequence as uV. We render every /uV/ and /wV/ sequence as <uV>. As the distribution of /w/ is limited to pre-vocalic position (O'Brien 2018:39), this should not cause ambiguity. For a full description of different orthographies in use in various works, see (O'Brien 2018:49).

Sibundoy valley, which has been described as a transition from the lowlands to the highlands (O'Brien 2018:2); or correspondingly, from the Amazon to the Andes (O'Brien 2021): reflecting this, Camsá has been described as displaying a mix of typologically Amazonian and Andean features (O'Brien 2018; O'Brien 2021). Being both a language isolate and located at a typological and geographical transition, the language provides much potential insight into the structure of South American languages and language in general.

The potential value in studying Camsá also stems from its understudied nature. No more than 10 linguistics works have been published on the language (O'Brien 2018:23), with O'Brien (2018) representing the first reference grammar, only published in 2018. Juajibioy (2018), a dictionary for the language, was also only published in 2018. As a result, any careful look at the structure of the language is likely to reveal phenomena of relevance to general linguistics.

A final relevant quality of the language is that Camsá is described as morphologically complex, with extensive TAM and agreement morphology on verbs, and case and class marking on nouns (O'Brien 2018:27). This makes it especially relevant for studying morphology. In short, Camsá is genetically isolated, typologically transitional, understudied, and morphologically complex. Each of these qualities make it particularly worth exploring, especially in the context of the study of the morphology

In this paper, we explore three puzzles present within the language. First, we explore an alternation in the forms of adjectives triggered by linear positioning with respect to their head nouns. Second, we describe a process within the verb that seems akin to noun incorporation. Finally, we revisit a decomposition of the agreement system, with a focus on the *o* vowel present in several prefixes.

The sections are organized as follows. Section 2 introduces the relevant background on the language, focusing on nominal and verbal morphology. Section 3 examines the first puzzle, alternations in adjectives, and argues that they are caused by alternations between an adjunction and a compounding structure. Section 4 describes the second puzzle, which concerns a process that appears like noun incorporation, and provide preliminary evidence for this analysis. Section 5 analyzes several parts of the agreement system, concluding that the *o* vowel spread throughout the agreement is a separate morpheme which tracks noun incorporation. Section 6 concludes.

2 Language Background

2.1 Nominal Morphology

Camsá nominal morphology is primarily expressed through suffixing (in contrast to the verbal domain which is characterized by primarily prefixing processes). However, there are some circumfixal class markers, such as those that appear on the adjectives 'red' and 'blue' in example (2).[3]

Camsá nouns are distributed among 10 noun classes, including one class with null markings, but not including one putative class (the 'human class') which does not trigger adjectival class agreement (O'Brien 2018:64). Class markers, when present, are obligatory on the noun and on the adjective (if the adjective follows the noun). Nouns and adjectives can also be marked for things other than noun class, such as case in example (1). Determiners and pronouns are not typically class marked, at least not when the noun is overt. As a result, there are instances of class-marked adjectives modifying a non-class-marked determiner, as in (2).

(1) sënjatbonja šešon uasnaniya uasnaniya
s-n-j-atbonja šešon ua-snani-ya ua-buangani-ya-c
1SG.SUBJ-EVI-VBLZ-cover baby CLF-blanket-CLF CLF-red-CLF-INST
'I covered the baby with the red blanket' (O'Brien 2018:155)

(2) cem yentšiya indeuamën uabchendujua i inÿa uabuanganjua
cem yentš-iya i-nd-euamën ua-bchendu-jua i inÿa ua-buangan-jua
DEM cloth-CLF 3SG-HAB-be CLF-blue-CLF and other CLF-red-CLF
'The cloth is blue and the other is red' (O'Brien 2018:62)

O'Brien (2018:54) provides 2 structures for nouns. For nouns with a class marker, the structure is root + class + (dim) + (number) + (case). For those without class marking, the other affixes are similarly ordered.

[3] Glossing abbreviations follow Leipzig convention, with the following labels: FUT=future; GEN=genitive; EVI=evidential; PROG=progressive; VBLZ=verbalizer; HAB=habitual; LOC=locative; DIM=diminutive; CL=classifier; INST=instrumental; TOP=topic; COND=conditional; IRR=irrealis; NEG=negation; DET=determiner; BEN=benefactive; PST=past; ALL=allative; SUBJ=subject; DEM=demonstrative; TH=thematic (vowel); INF=infinitive; OBJ=object; du=dual; SUB=subordinator; O=*o* agreement vowel; Q=question; PART=particle; IMP=imperative. Glosses with X>Y indicate transitive agreement with an agent X and a patient Y.

2.2 Verbal Morphology

Camsá also exhibits complex verbal morphology. Verbs can be marked for tense, aspect, mood, evidentiality, subject agreement for person and number, object agreement for person, and negation (O'Brien 2018:87). Other qualities may be marked, though the complexity of the verb obscures any other certain claims of morpheme identity.

Verbs in their citation form minimally contain 3-4 morphemes, depending on their analysis. Example (3) shows the verb meaning "to see them".

(3) janÿan
j-a-nÿe-an
VBLZ-TH-see.them-INF
'To see them.' (Juajibioy 2018:20)

O'Brien (2018:128) refers to the first morpheme as a "verbalizer", and we do so, as well. Its function is unclear, also appearing in inflected verbs, though it is not mandatory. O'Brien (2018:128) mentions it may simply be deleted in more inflected verbs for phonological reasons; we put aside its analysis in this paper.

O'Brien (2018:87) mentions verb roots can start with *a*, *o*, or *u* (/w/), including them in the root within morpheme breakdowns. We gloss these as separate prefixes for two reasons. First, taking these to be separate morphemes simplifies our analysis of noun incorporation in Section 4. Second, Juajibioy (2018:15) provides compelling breakdowns suggesting these morphemes should in fact be separated out. We gloss these as th, for "thematic", by analogy with the thematic vowels of Indo-European and inspired by their labeling in Juajibioy (2018) as "functional vowels".[4] Their actual function is unclear. Pairs such as those in (4) and (5) suggest some sort of classificatory function, but this is beyond the scope of this analysis.

(4) jajájuan
j-a-jajuá-n
VBLZ-TH-lay.something-INF
'To lay something on something' (Juajibioy 2018:106)

[4] Spanish *La Vocal Funcional*

(5) juajájuan
j-ua-jajuá-n
VBLZ-TH-lay.something-INF
‘To lay something complex on something‘ (Juajibioy 2018:106)

The third morpheme is the root. Other derivation morphology such as reflexives may occur between the verbalizer and the theme. The last morpheme present in citation forms is the suffix called infinitive, thus glossed as inf: its distribution seems to match that of non-finite verbs. In its place, a benefactive suffix can also appear (O’Brien 2018:120).

Other verbal morphology is prefixing. Example (6) shows a highly inflected verb, marking subject and object, evidentiality, and aspect. The morpheme glossed as o is included in analyses like that of O’Brien (2018) as part of the agreement prefixes: we argue for its separation in Section 5. However, as its function is not yet entirely clear, we gloss it neutrally.

(6) s̈contsonÿa
s̈-c-o-n-ts-o-nÿa
1SG.OBJ-2SG-O-EVI-PROG-TH-look.at
‘You are looking at me.’ (O’Brien 2018:109)

Prefixes that may appear more peripherally than agreement include irrealis marking, and possibly tense (O’Brien 2018).

3 Puzzle 1: Adjective Morphology Alternations

Adjectives interact so significantly with nouns that O’Brien (2018:150) defines the open class of adjectives as ”words that can agree with nouns in class, number and sometimes evaluatives and/or case”. Case marking is exemplified in example (1), plural marking is exemplified in example (7), and evaluative marking in example (8), in which the adjective /baš̈e/ ‘small’ has a diminutive suffix to agree with the noun it modifies.

(7) unga s̈loftsëng buanganang
unga s̈loftsë-ëng buangan-ang
three bird-PL red-PL
‘The three birds (are) red’ (O’Brien 2018:151)

(8) ceše̱tem baše̱tem ijemën
ceše-tem baše-tem i-j-emën
dog-DIM small-DIM 3SG-VBLZ-be
'The little dog was small' (O'Brien 2018:121)

The analysis in O'Brien (2018:151) claims that adjectives ending in /o/ or /a/ lose their final vowel when they precede the noun. It is also claimed that the stressed vowel /á/ is not dropped, although an example of such an adjective is used to demonstrate the process (example (12); O'Brien 2018:151). In example (9), the absence of the adjective-final vowel changes the meaning of the sentence, suggesting analysis of the vowel as a morpheme separate from the adjective.

(9) a. atš chanjacuenta atše̱be enutá botaman cuento
atš s-ch-a-n-j-acuenta atš-be enutá botamana cuento
1SG 1SG.SUBJ-FUT-?-EVI-VBLZ-tell 1SG-GEN friend beautiful story
'I'm going to tell my friend a beautiful story' (O'Brien 2018:197)

b. atš chanjacuenta atše̱be enutá botamana cuento
atš s-ch-a-n-j-acuenta atš-be enutá botamana cuento
1SG 1SG.SUBJ-FUT-?-EVI-VBLZ-tell 1SG-GEN friend beautiful story
'I'm going to tell my beautiful friend a story' (O'Brien 2018:197)

What are the exceptions one would encounter trying to apply the rule "adjectives lose their final vowel pre-nominally" to the Camsá data? Any satisfactory analysis must account for all of the following exceptions:

- There are some adjectives that appear never to end in vowels, even post-nominally. Some adjectives optionally end in vowels post-nominally, such as *botaman(a)* in example (10).
- Some adjectives appear always to end in vowels, even pre-nominally, such as the adjective *yemba* in example (11).
- Some adjectives which do lose their final vowels pre-nominally (like the adjective meaning 'black'; see example (12)), appear to retain the final vowel when there are additional suffixes on the adjective (example (13)).[5]

[5] The word for "black" in 13 is written as *ftsengwu* in O'Brien (2018): to adopt it to the orthography, we have removed the <w> — it is unclear what this phonologically represents, given that /wu/ is not an allowable glide-vowel sequence (39 O'Brien 2018).

(10) atsbe enuta **botamán** tsaba intsoyejua
atsë-be enuta **botamán** tsaba i-n-ts-oyejua
1SG-GEN friend **beautiful** good 3SG-EVI-PROG-happy
'My beautiful friend is happy' (O'Brien 2018:157)

(11) chca jtsopasanan porce choyna caba **yemba** jente camoyenaca
chca j-ts-opasanan porce choy=na caba **yemba** jente ca-mo-oyena-ca
like.this VBLZ-PROG-happen because there=TOP still **infidel** people INTS?-3PL-live-DISC
'This happens because the unfaithful (non-christian) people still live there.' (O'Brien 2018:164)

(12) **ftseng** uakná / uakná **ftsengá**
ftseng uakná / uakná **ftsengá**
black cow / cow **black**
'black cow' (O'Brien 2018:57)

(13) uabouan **ftsengu**ëjna canÿe shembioy tshangan yerufja bejtseyautsayse
wabowan **ftsengu**-ëj=na canÿe shem-bi-oy tshangan yerufja be-j-ts-eyautsay-se
horrible **black**-EVAL=TOP one woman-ANI-ALL heated rod-EVAL DU-VBLZ-PROG-put.in-SUB
'A horrible black man was putting a heated rod into (the mouth of) a woman' (O'Brien 2018:83)

With these data in mind, there is an outstanding question to address: how can we formalize this alternation? We consider three analyses: phonology (which we determine to be inadequate), allomorphy of the adjectival root (which is perhaps too adequate), and the possibility that the absence of the adjectival suffix /-a/ is indicative of the adjective forming part of an AdjN compound.

3.1 Analysis 1: A Phonological Process

There is significant evidence against a phonological process explaining the alternation. In this analysis, adjectives that can ever end in a vowel are always generated with that vowel, and a phonological rule removes this vowel when the adjective is immediately pre-nominal: $V \rightarrow \emptyset / \underline{\ }]_{adj}N$. Attempting to apply this model to the data reproduces many of the exceptions above, which are analytically fatal under the assumption that phonology is exception-less. It is allowable under this model that some adjectives never end in vowels; they are simply not stored or generated with one. What is far less allowable are: adjectives ending in a vowel post-nominally but only optionally (see (2), (10), and (7)); immediately pre-nominal adjectives whose final vowel is not deleted by a phonological process (see (11)).

Initially, data points such as example (13), in which intervening suffixes between the adjective and the noun seem to prevent the application of this rule, seem relatively unproblematic. However, if we posit that suffixes block the application of this rule (which is necessary to account for (13)), we expect that blocking to apply across-the-board. Thus, we can no longer explain adjectives that fail to end in vowels pre-nominally, even though the final vowel should have been spared by the intervening content, as in example (13)[6].

(14) chëngna ndoñ bëtsëtsanga monjobemas
chëngna ndoñ bëts-ëts-anga mo-n-j-obemas
3PL-TOP NEG big-?-PL 3PL-EVI-VBLZ-become
'They didn't get big' (O'Brien 2018:226)

Finally, the references to syntactic categories makes '_]$_{adj}$N' a sketchy triggering context for a phonological rule, again suggesting that this is not an adequate model.

3.2 Analysis 2: Root Allomorphy

Instead of the adjective roots always generating with (or without) a final vowel, the phonological form that is inserted could alternate. This could be formalized as a vocabulary insertion rule, or rather a similar vocabulary insertion rule for each adjective. /botaman/ 'beautiful' is an adjective that always surfaces without a final vowel pre-nominally and sometimes ends in an /a/ post-nominally. Perhaps this pattern could be captured with the following vocabulary insertion rule, which accounts for the optionality of a post-nominal adjective-final vowel by encoding the optionality into the vocabulary insertion rule:

$$\left\{ \begin{array}{l} \text{botaman / \_ N} \\ \text{botaman(a) / elsewhere} \end{array} \right\}$$

The apparent exception in example (13), where 'black' surfaces as /ftsengwu/ pre-nominally, is potentially less problematic under this model ('potentially' because we do not have a full tree structure for the sentence). This is because the addition of evaluative and topic suffixes between the adjective and the noun may move the noun out of the immediate context that would be visible (so to speak) to the

[6] /bets(á)/ 'big' is an adjective that alternates - sometimes ending in /á/ and sometimes not. Thus, one can't account for example (13) by saying that the underlying adjective is not stored with a vowel and would thus never be generated with one.

vocabulary insertion rule. As with phonology, this corresponds to a problem with pre-nominal adjectives with suffixes that do not end in vowels (even though they could), such as (13).

Some exceptions (like the form 'yemba' in (11)) and forms that do not alternate (e.g., always end in a consonant) can be analyzed as special cases: adjectives that have only one vocabulary insertion rule - only an elsewhere form.

{ yemba / elsewhere }

Although the root allomorphy approach is more effective than the phonological rule approach, it is also limited in important ways that we would like to resolve. Firstly, too much information has to be specified for each adjective root, which potentially obscures patterns that operate across many roots. Secondly, the use of an optional final vowel and '_ N' as a vocabulary insertion context would probably require extensions to the theory.

3.3 Analysis 3: Separate Morpheme

Positing a suffix which attaches to adjectives and whose phonological form is a singleton vowel could explain the alternation in two ways: (1) the morpheme is absent on some adjectives and present on others (i.e., there is a structural difference between pre-nominal and post-nominal adjectives which has a morphological exponent), or (2) the morpheme is present on all adjectives but surfaces as /−∅/ on some.

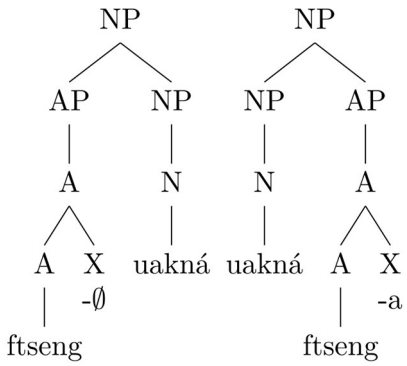

Figure 1: Trees for 'black cow': ftseng uakná on left, uakná ftsenga on right

Let's first imagine scenario (2) to see why it is sub-optimal. Figure 1 shows the trees for the noun phrases in example (12). Both trees include a suffix (provisionally labeled X) which surfaces as ∅ on the left (pre-nominally) and as /a/ on the right (post-nominally). However, this pattern seems impossible to formalize using the theory developed in class. The right-or-left location of the NP node, relative to the AP

node, should not be able to determine the phonological form of a suffix 2 layers down the tree. Not only is this relative location, this right-or-left-ness, not in the theory, but it is remote from the suffix, which is internal to the adjective (and thus to the adjective phrase).

Finally, we turn towards the hypothesis that there is some structural, morpho-syntactic difference between pre-nominal and post-nominal adjectives that is marked by a singleton vowel suffix (which appears to vary depending on the root). The structural differences we think are most likely to account for the pattern are the differences between phrasal structures and compound. The /-a/ suffix, then, is analyzed through the lens of Distributed Morphology (Halle and Marantz 1993) as an adjective categorizing head, *a*. In the cases when the adjective follows the noun, it is presumably serving as a nominal adjunct. In that position, the adjectival root is generated, as is the adjective classifying head, which optionally surfaces as a vowel (this needs to be optional to account for post-nominal forms that do not end in vowels, like (10)). In the cases where the adjective appears to lose its vowel pre-nominally, this is the result of the adjectival root forming a compound with the noun. This compound would represent the direct merger of two roots, which are then classified as a noun, thus explaining the lack of /-a/, the adjective-classifying suffix.

For roots that do not alternate and consistently end in vowels even pre-nominally, like <yemba> in (11), the root is stored and always generated with a final vowel. The adjective-classifying suffix would not surface on an adjective that ends with a vowel because of the restrictions on hiatus (i.e., /aa/ is an illicit sequence; O'Brien 2018). Those adjectives that never end in vowels pose the largest analytical problem; in this case, we are forced to posit a null categorizing adjectival head.

To us, this analysis seems like a promising avenue to account for the variation, yet there remains a significant amount of work before the contours of this process are more fully mapped out into a formal model that generates testable predictions. Particularly, relatively thorough syntactic fieldwork would likely be required to identify what types of constituents could be incorporated into the noun or used in compounds and whether these differences in type can explain the presence of the adjective-classifying suffix on some pre-nominal adjectives but not others. Additionally, further investigation would be needed to determine the productivity of this process, which clearly does not produce alternation in the form of *all* adjectives. If we could find some *natural class* of adjectives for which the alternation is present (preferably exclusively), that would be ideal; as long as it has to be specified adjective-by-adjective which ones are subject to the addition of this category-determining suffix, there are few reasons to prefer it to analysis 2 using root allomorphy.

3.4 Provisional Conclusions

We presented data from Camsá adjectives which clearly indicate a pattern waiting for adequate explanation and then proposed three possible explanations for that pattern. Our first explanation, phonology, failed to function as an explanation in any meaningful sense, but its failure as an explanatory tool pointed to the exceptional cases that any better model would have to explain. Root allomorphy fully accounts for the data but once again fails to explain it. The 'explanation' is constructed with data already in hand, and no prediction is made for new data other than that we will be able to sort the adjective into one of a few categories and assign it the corresponding set of vocabulary insertion rules. The final explanation seeks to analyze the alternating vowel as an adjective-classifying suffix, absent on those pre-nominal adjectives which are generated in compounds. This crucially makes a prediction. Rather than having free word order where adjectives can generate before or after the noun, adjectives generate after the noun unless they are in compounds. Correspondingly, it should be possible to have coordinated adjectives (e.g., 'yellow and smooth') post-nominally but not pre-nominally because the coordination could not target bare roots.

4 Puzzle 2: Nouns Incorporation

Camsá exhibits several sets of verbs with shared semantic and morphological characteristics, as in (15)-(18).

(15) juashecjabián
j-ua-shecjabia-n
VBLZ-TH-wash.feet-INF
'To wash feet' (Juajibioy 2018:197)

(16) juashecjatsán
j-ua-shecjatsá-n
VBLZ-TH-lay.underfoot-INF
'To lay something under one's foot' (Juajibioy 2018:198)

(17) juashecuastán
j-ua-shecuastá-n
VBLZ-TH-follow.someone-INF
'To follow someone (lit. to follow behind another's feet)' (Juajibioy 2018:198)

(18) juashecyenán
j-ua-shecyená-n
VBLZ-TH-place.foot-INF
‘To place one’s foot on another’s foot‘ (Juajibioy 2018:198)

These verbs all involve feet in some manner. Correspondingly, the verb roots all share the string *-shec-*. Crucially, this string is also found in the noun ”foot”, decomposed in (19). The relevant suffix, *-cuatsï*, is mentioned by O’Brien (2018:64) as potentially being a frozen classifier suffix, as it does not participate in concord.

(19) shecuatsï
shec-cuatsï
foot-clf?
‘Foot‘ (Juajibioy2018:255)

This suggests that the verb roots in (15)-(18) are complex: the root for ”foot” is actually present within a larger stem. These are re-analyzed in (20)-(23).

(20) juashecjabián
j-ua-shec-jabia-n
VBLZ-TH-foot-wash-INF
‘To wash feet‘ (Juajibioy 2018:198)

(21) juashecjatsán
j-ua-shec-jatsá-n
VBLZ-TH-foot-spread.on.floor-INF
‘To lay something under one’s foot‘ (Juajibioy 2018:198)

(22) juashecuastán
j-ua-shec-uastá-n
VBLZ-TH-follow-INF
‘To follow someone (lit. to follow behind another’s feet)‘(Juajibioy 2018:198)

(23) juashecyenán
j-ua-shec-yená-n
VBLZ-TH-foot-support.foot-INF
‘To place one’s foot on another’s foot‘ (Juajibioy 2018:198)

Furthermore, the relevant verbs are all attested in their independent forms: *jajabián* ”wash”, *jajatsán* ”spread on the floor”, *juastán* ”follow”, *joyenán* ”support the soles of your feet”. Thus, there is

clear motivation to decompose these verbs into sequences of noun roots followed by verb roots. This also motivates our decomposition of theme vowels: the noun roots appear between the theme vowels and the verb root. Cursory inspection suggests the noun root conditions the form of the theme vowel, but what this means theoretically is beyond the scope of our analysis.

This process seems akin to noun-verb compounding or possibly noun incorporation. Abstracting away from discussions about the exact theoretical nature of noun incorporation, we distinguish between these two possibilities. In the case of noun-verb compounding, the roots should combine directly, and thus we expect (i) potentially idiosyncratic meanings and (ii) no sensitivity to argument structure. On the other hand, if this is some sort of incorporation, where a reduced nominal is merging in argument position with the verb, we expect this process to be sensitive to argument structure. We argue for the latter option: data from alternations suggests incorporated nouns (a) can saturate arguments and (b) target the same argument position within a given verb.

Given that this phenomenon does not seem to be mentioned in previous analysis, one might wonder if the process is actually productive. This is difficult to answer based on the data present alone, as verbal morphology is not always easily decomposable, but we argue that this process occurs widely enough to merit synchronic analysis.

The scope of incorporation is also worth mentioning. While the easiest examples of incorporations seem to involve inalienably possessed nouns like body parts, other examples exist. Example (24) shows an example where ”bed” has been incorporated into the verb meaning ”put something on something”. The corresponding verb and noun are shown in (25) and (26), respectively.

(24) jajutsnájuan
j-a-jutsn-jájua-n
VBLZ-TH-bed-place.on-INF
‘To place something on bed.‘ (Juajibioy 2018:112)

(25) jajájuan
j-a-jájua-n
VBLZ-TH-place.on-INF
‘To place something on something.‘ (Juajibioy 2018:106)

(26) jutsnëshá

jutsn-shá

bed-CLF

‘Bed‘ (Juajibioy 2018:206)

Example (27) shows ”attic” being incorporated into the same verb, with the independent noun in (28).

(27) jatsëmiájuan

j-a-tsëmio-ájua-n

VBLZ-TH-attic-place.on-INF

‘To put something on the attic space.‘ (Juajibioy 2018:130)

(28) tsëmioc

tsëmio-c

attic-CLF?

‘Attic‘ (Juajibioy 2018:274)

Notably, the verb *jajájwan* seems to be ditransitive, as indicated by the translation in (25).[7] Moreover, in the incorporating variants in (24) and (27), the incorporated noun has saturated one of the thematic roles: crucially, it is occupying the *same role* in each example: that of the goal/location. While this is odd, as an incorporated noun might be expected to saturate a theme, the semantics of the translation might not reflect the true argument structure of the language. As such, we predict that, given the language’s nature as a primary object language (O’Brien 2018:28, in the terminology of Dryer 1986), verbs like *jajájuan* will exhibit object agreement with the argument that is translated as the theme instead of the goal.

Two more examples bear mentioning. Example (29) shows ”foundation/base” incorporated into an unknown verb, with the independent noun in (30). Example (31) shows ”drop” (shown in (32)) incorporated into what seems to be the same verb: the meaning seems associated with things landing on

[7] Juajibioy (2018:106) lists it as a transitive verb, but in general does not seem to distinguish transitives from ditransitives [7]The incorporated and free form of ”drop” have metathesized *ts* with respect to each other, which we put aside.

the ground.[8] This shows the difficulty in identifying incorporation with existing data, as some of the relevant verbs are not attested independently.[9]

(29) Canÿe yebna ndayiñe chaotsé́cuatjonama tojapormacá
canÿe yebna ndayiñe ch-ao-tsé́cua-tjona-ma t-o-j-a-porma=cá
one house ? FUT-COND?-base-land?-BEN PST-O-VBLZ-TH-make=TOP
'The foundation he [God] has laid is solid.' (1 Corinthians 3:10)

(30) tsëscuá
tsëscuá
foundation/base
'Base' (Juajibioy 2018:275)

(31) jabuastëtjonán
j-a-buast-tjona-n
VBLZ-TH-drop-land-INF
'Drops of liquid fall' (Juajibioy 2018:100)

(32) buatsëndón
buats-ndón
drop-?
'Drop' (Juajibioy 2018:330)

One other prediction of noun incorporation as opposed to compounding is that incorporated nouns will have more structure than just a root. Phrased within the theory of Distributed Morphology (Halle and Marantz 1993), we expect incorporated nouns to minimally consist of a root and a categorizing head *n*. Incorporated nouns do appear without case and classifier marking, however case is associated with a relatively high projection (Bittner and Hale 1996); and given that adjectives also express class marking (O'Brien 2018:150), this too must be located above the categorizing heads. However, there are still no good candidates in the language for an overt instantiation of *n*, so for now we are forced to posit null heads in this position.

[8] The incorporated and free form of "drop" have metathesized ts with respect to each other, which we put aside.

[9] For organization, excerpts from the Camsá Bible are cited as bookchapter:verse. We sometimes omit broader parts of the verse. The relevant citation is *Bëngbe Bëtsa Cabëngaftaca Entsoyebuambna - El Nuevo Testamento en el idióma camsá* (2009).

One final example of the difficulty in decomposing incorporation and the structure of nominals is this. Examples (33) and (34) show two verbs that seem to have incorporated the root *-buch-*.[10] This root clearly seems to correspond to ”eye”.

(33) jabuchjuinÿinÿán
j-a-**buch**-juinÿinÿá-n
VBLZ-TH-eye?-burn-INF
‘To burn the eyes‘ (Juajibioy 2018:100)

(34) jabuchanenán
j-a-**buch**-anená-n
VBLZ-TH-eye?-move-INF
‘To shake one’s eyelids‘ (Juajibioy 2018:100)

However, as seen in (35) and (36), neither listed free form for ”eye” corresponds to this root. Example (37) also displays what appears to be a true noun-noun compound: the root *buch* reappears here. Also of note is that the class marker *-ch* is associated by Juajibioy (2018:12) with flexible and flat things. Thus, ”skin” is clearly the head of the compound in (37), further suggesting that *buch* represents a bare root.

(35) fs̈nëbe
fs̈në-be
eye-CLF
‘Eye‘ (Juajibioy 2018:345)

(36) bominÿ
bominÿ
eye
‘Eye‘ (Juajibioy 2018:345)

(37) buchbobach
buch-boba-ch
eye?-skin-CLF
‘Eyelid‘ (Juajibioy 2018:60)

The assumption that (37) represents root-root compounding is problematic for the incorporation account, since the bare root corresponds to the incorporated noun: we are forced to posit a null *n*. We leave the resolution of these conflicting data to future work.

5 Puzzle 3: Decomposing Agreement

Camsá verbs exhibit polypersonal agreement: they may mark one or two arguments with agreement prefixes. O’Brien (2018:106) offers some tentative decompositions of these prefixes into

[10] We omit the standalone verbs for brevity, but they are attested in Juajibioy (2018).

separate agreement and/or number prefixes. We put aside this deeper analysis for now and examine the surface appearance of the agreement prefixes.

5.1 1st Person Subject Tense Variance

Example (38) shows that the first person subject prefix is *së-*. Example (39) demonstrates that the form of the future prefix is *ch-*.[11] When these are combined, as in (40), the surface form of the prefix is *ch*: that is, the 1st person agreement prefix has disappeared.

(38) Muënts sëntsotebem.
muënts s-n-ts-o-tebem.
here 1SG.SUBJ-EVI-PROG-TH-sit
'I am sitting here.' (O'Brien 2018:91)

(39) cochantsareparan
c-o-ch-an-ts-a-reparan
2SG-O-FUT-?-PROG-TH-run.fast
'You will run fast' (O'Brien 2018:93)

(40) Chanjuabuá.
Ø-ch-an-j-u-abuá
1SG-FUT-?-VBLZ-TH-cook
'I will cook.' (O'Brien 2018:92)

We analyze this disappearance as being phonological. Evidence for this comes from the 1st person plural agreement prefix. As shown in (41), it has the form *bsë-* (or *fsë-*, subject to variation). Example (42) shows this prefix in combination with the future marker: the surface form of the prefix is *f-*.

(41) Bsëndanmën bëts tabanoc.
bs-nd-a-nmën bëts taban-oc
1PL-HAB-TH-be big village-LOC
'We are/were in a big town.' (O'Brien 2018:96)

(42) As, ¿ndayá bënga **f**chjóyëngacñe ca?
As ndayá bënga fs-ch-j-ó-yëngacñe ca
Thus what 1PL 1PL-FUT-VBLZ-TH-take Q
'What then will there be for us? ' (Matthew 19:27)

This shows that the process responsible for deleting the first person *së-* also deletes the same sequence in the same context for the prefix *bsë-*. In other words, the deletion is sensitive to phonology

[11] O'Brien (2018:123) describes the form of the future as *chan-*. However, as in this example, O'Brien frequently glosses future forms as just *ch*. Furthermore, the author tentatively suggests *chan-* can be further decomposed. As a result, we will be glossing *ch-* as the future morpheme for consistency.

and operates over phonological strings, not morphemes. This suggests the disappearance of 1st singular person agreement in the future is a result of phonology, and not something like tense-conditioned allomorphy.

We analyse this process as following. First, we posit that the underlying form of the 1st singular and plural agreement prefixes are /s/ and /bs/ (or /fs/). Second, in the case that the sequence /s-tS/ arises, the /s/ deletes. This is easily motivated phonologically as a deletion process in response to an illicit sequence of segments. /stS/ does seem to be an illicit sequence in Camsä: only one instance of the sequence can be found in our data, shown in (43). Notably, the *s-* prefix is no longer initial, suggesting that it may avoid deletion in the case that it syllabifies as a coda.

(43) atš cada te natjḗmbana ainánaca ndoñe ceschbatsmëna
atš cada te natjḗmbana ainá=na=ca ndoñe ce-**s**-ch-batsmëna
1SG each day quietly heart=TOP=PART? NEG IRR-1SG-FUT-?
'Each day I am burdened down' (2 Corinthians 11:28)

(44) also shows an instance of the 1sg person subject prefix appearing word-initially without ë.

(44) Bëngbe Bëtsá entsonÿá atše ndegombre stsichámuama.
bëng-be bëtsá e-n-tsonÿá atše ndegombre s-ts-i-chámua-ma
1PL-GEN father 3SG?-EVI?-? 1SG true 1SG.SUBJ-PROG-TH-say-BEN
'God is my witness.' (2 Corinthians 1:23)

Assuming that this instance of *ts* is a true affricate and thus a single segment (O'Brien 2018:44), we take this example as showing that epenthesis only occurs in particular sequences of 3 consonants. Sequences of 3 consonants are permissible (O'Brien 2018:45), so the nature of the segments must have to do with the epenthesis. We leave formulating this process precisely to future work.

5.2 Agreement with 3rd Person Arguments

In (38), the verb marks agreement with the 1st person singular subject of the clause with the prefix *s-*. Examples (45) and (46) show that the same prefix is used in a transitive sentence with a 1st person singular agent and a 3rd person singular patient.

(45) Cadaté atš sënduabuán uameshnen.
cadaté atš s-nd-u-abuán uameshnen
everyday 1SG 1SG.SUBJ-HAB-TH-cook mote
'Every day, I cook moté (hominy soup).' (O'Brien 2018:91)

(46) Tonjapasais atš sënjanguango tsjan
tonjapasaibs atš **s**-n-j-a-nguango tsjan
yesterday 1SG 1SG.SUBJ-EVI-VBLZ-TH-seek guinea.pig
'Yesterday I looked for the guinea pig.' (O'Brien 2018:108)

These examples show two things. First, Camsá agreement seems to exhibit nominative-accusative alignment: the sole argument of an intransitive patterns with the more agentive argument of a transitive. Second, third person themes are not agreed with. This is not a question of animacy: (47) shows that 3rd person animate patients are not agreed with.

(47) Tonjapasaibs sënjachemb atsb̈e enuta
tonjapasaibs s-n-j-a-chemb ats-̈be enuta
yesterday 1SG-EVI-VBLZ=TH-call 1SG-GEN friend
'Yesterday I called my friend.' (O'Brien 2018:109)

In the case of a 3rd person agent and a 1st person patient, the agreement prefix is *s̈-*, as shown in (48). However, this prefix also surfaces in (49), where there the 1st person is the sole argument of the verb.

(48) ch basatem atš s̈onjapega base ndëtš̈bemac
ch basa-tem atš s̈-o-n-j-a-pega base ndëtš̈-be-ma=c
DET small-DIM 1SG 1SG.OBJ-O-EVI-VBLZ-TH-hit small rock-CL-DIM=INST
'The boy hit me with the small rock.' (O'Brien 2018:110)

(49) s̈ojtsebubua kausna ndoñ chiyatobená jtan
s̈-o-j-tsebubua kaus=na ndoñ chiy-at-o-bená j-tan
1SG.OBJ-O-VBLZ-be.drunk because=TOP NEG COND-IRR-TH-be.able VBLZ-go.again
'Because I was drunk I couldn't return.' (O'Brien 2018:111)

	AGENT		
PATIENT	**1**	**2**	**3**
None	*s-*	*co-*	*i-,to-*
1	N/A	*s̈co-*	*s̈o-*
2	*cbo-*	N/A	*co-*
3	*s-*	*co-*	*i,to-,tbo-*

Table 1: Basic Agreement Paradigm for Singular Arguments

O'Brien (2018:111) describes the class of intransitive verbs taking objective markers as having experiencer subjects. This suggests the agreement markers actually display a Split-S alignment; however, these verbs are relatively infrequent, and so will not be addressed due to lack of data. The relevant result from this data is that 3rd person agents are also invisible to agreement in transitive contexts, since the 3>1 prefixes are used in certain intransitive contexts with patient-like 1st person arguments. As a result, we take *s̈-* to represent a 1st person object, and not a 3>1 transitive configuration.

5.3 The *o* Vowel in Agreement and Transitive Breakdowns

As visible from some of the examples in previous sections, several agreement markers end with an *o*. O'Brien (2018:105) summarizes this as follows: *"All of the prefixes that encode subject and object end in o-, so this could perhaps be analyzable as something to do with transitivity, but it also appears in intransitive verbs"*. Table 1 summarizes the combinations of singular arguments.[12] However, there are several instances of these prefixes, transitive or intransitive, occuring without o. Examples (50) and (51) show the 2nd person singular suffix surfacing as *c-* instead of *co-*:

(50) Cektseboše bënga fchayá chë bacna shácuana jetsejashtsëtsama ca?
ce-**c**-tseboše bënga fs-ch-ay-á chë bacna shácuana j-etse-jashtsëtsa-ma ca
IRR-2SG-wish 1PL 1PL-FUT-?-go DET bad grass VBLZ-?-uproot-BEN Q
'Do you want us to go out and pull up the weeds? ' (Matthew 13:28)

(51) Céctsetatsëmbo, ntsamo tconjayanama chë fariseunga ndoñe tsabá
cé-**c**-tsetatsëmbo ntsamo t-c-o-n-j-ayana-ma chë farise-unga ndoñe tsabá
IRR-2SG-know how PST-2SG-O EVI-VBLZ-say-BEN DET Pharisee-PL NEG good
chenatëuénana ca?
ch-e-n-at-ëu-énana ca
FUT?-?-EVI-NEG-word?-hit.hard Q
'Do you know you insulted the Pharisees by what you said? ' (Matthew 15:12)

Example (52) shows that the agreement prefix for 1st person subject and 2nd person object, which normally surfaces as *cbo-*, can appear as *cb-*.

[12] 3rd person arguments seem to be subject to tense variance (O'Brien 2018:94). However, as 3rd person arguments seem invisible to transitive agreement, accounting for their exact distribution is difficult, and we put it aside.

(52) aca condétatsëmbo bueta uata cbetsajabuáchanama, nÿets
aca c-o-nd-ét-atsembo bueta uata **cb**-e-ts-a-j-abuáchana-ma nÿets
here 2SG-O-EVI-?-offer.gift how.many year 1SG>2SG-?-PROG-?-VBLZ-go.to.someone-BEN total
tempo cbetseyeunanama
tempo **cb** e-tseyeunana-ma
time 1SG>2SG-?-follow.orders-BEN
'For years I have worked for you like a slave and have always obeyed you.' (Luke 15:29)

The identity of the *e* vowel that follows in this example is unclear. However, the shared sequence is still *cb-*.

O'Brien (2018:106) identifies a form of the 3rd person subject to 3rd person object as *bo-*. In (53), the prefix occurs as *bë-*. The vowel matches the distribution and quality as the epenthetic vowel identified in a previous section, so we will analyze this morpheme as just *b-*. However, this example is unusual because this verb is intransitive (Juajibioy 2018:127), and there do not seem to be two arguments.

(53) Ntseco orscana tbënjatëcja ca?
ntseco orscana t-**b**-n-j-atëcja ca
when since PST-3SG?-EVI VBLZ-make.sensation.disappear Q
'Since when is he better? ' (John 4:52)

In (54), the prefix marking 2nd person subject and 1st person object, usually identified as *ës̈co-*, surfaces as *ës̈c-*.

(54) Ndocna te s̈catjuashecjabiá ca!
ndocna te **s̈-c**-at-j-ua-shec-jabiá ca
no.one day 1SG.OBJ-2SG-NEG-VBLZ-TH-foot-wash Q
'You will never wash my feet! ' (John 13:8)

Note that the *o* has not disappeared to resolve hiatus: in the sequence /oa/, the *o* seems to surface as a glide, as in the form in (55).

(55) canÿe ndëts̈bé chábioye buanjats̈taye
canÿe ndëts̈bé chá-bioye b-o-a-n-j-ats̈taye
one rock 3SG-ALL DU-O-EVI-VBLZ-give
'You give him a rock' (O'Brien 2018:233)

In (56), the prefix for 3rd person subject and 1st person object surfaces as *s̈-*.

(56) cha bënga s̈nétsayaunanama
cha bënga **s̈**-n-étsay-aunana-ma
3SG 1PL 1SG.OBJ-EVI say?-hear-BEN
'He will hear us.' (1 John 5:14)

However, even though all the prefixes labelled as ending with *o* can appear without it, it is not the case that those labelled as appearing without *o* can appear with it. The 1st person agreement prefixes *s-* and *fs*do not appear with *o* in the data. Thus, it is likely that this vowel is relevant to the agreement paradigm in some way, and is not something like another TAME marker. We present a tentative explanation of its nature in the following section.

With the o vowel separable from the prefixes, decomposing the transitive prefixes becomes simpler. We update the paradigm from Table 1 in Table 2. The visible components are listed in Table 3[13]. Further analysis is required to fully account for the order of prefixes, idiosyncracies such as 1sg>2 *cb-*, and the full distribution of number marking. We leave this to future work.

	AGENT		
PATIENT	**1**	**2**	**3**
None	*s-*	*c-*	*i-,Ø-*
1	N/A	*s̈c-*	*s̈-*
2	*cb-*	N/A	*c-*
3	*s-*	*c-*	*i-, -,b-*

Table 2: Updated Agreement Paradigm for Singular Arguments

MEANING	**FORM**
1sg.subj	*s-*
1sg.obj	*s̈-*
2sg	*c-*
3sg	*i-*

Table 3: Visible Transitive Components

5.4 Towards an Analysis of the *o* Vowel

Having established the independence of the *o* from the agreement prefixes, it remains to explain exactly its function. The paucity of forms lacking *o* makes a complete analysis beyond the reach of this

[13] O'Brien (2018:106) identifies essentially these same morphemes as well, but does not account for the lack of o in some cases.

paper. However, we present the following sketch: the absence of o within the agreement prefixes appears to be correlated with the presence of an incorporated noun.[14]

The clearest example are as follows. In (57), repeated from (54), ”foot” has been incorporated into ”wash”. In (58), ”eye” has been incorporated into ”wash”. However, in this analysis, ”eye” has also been incorporated into the word *s̈onjabuchanëtjo*, with an unclear verb. This verb complex appears with o, weakening this analysis. Verifying this exception is complicated by the fact that (i) the verb is unattested and (ii) the incorporated noun is ”eye”, which, as discussed in Section 4, incorporates suppletively.

(57) Ndocna te s̈catjuashecjabiá kca!
ndocna te s̈-c-at-j-ua-**shec**-jabiá ca
no.one day 1SG.OBJ-2SG-NEG-VBLZ-TH-foot-wash Q
‘You will never wash my feet! ‘ (John 13:8)

(58) Y cha tojanéjua: Chë boyabása, Jesús ca uabainá, ngüiche yebuáyeca
y cha t-o-j-anéjua chë boyabása Jesús ca uabainá ngüiche y-ebuáyeca
and 3SG PST-O-VBLZ-answer? DET man Jesus PART called mud 3SG-?
tonjábema, s̈onjabuchanëtjo y s̈onjauyana:
t-o-n-j-ábema s̈-o-n-j-a-**buch**-anëtjo y s̈-o-n-j-auyana
PST-O-EVI-VBLZ-make 1SG.OBJ-O-EVI-VBLZ-TH-eye?-apply? and 1SG.OBJ-?-EVI-VBLZ-tell
“Motsa y Siloé uafjajónayiñe metsobúchjabebiye ca”. Chcasna, atsë
m-o-ts-a y Siloé uafjajónay-i-iñ-e m-e-ts-o-**búch**-jabebiye ca chca-s=na atsë
IMP-O-PROG-go and Siloam lake-CL-ILL-? IMP-?-PROG-TH-eye?-wash PART thus-?=TOP 1SG
sënjá, ënjetsobúchjabebiye y cachora s̈ontsabinÿna
s-n-j-á ë-n-j-etso-**búch**-jabebiye y cach=ora s̈-o-n-ts-a-binÿna
1SG.SUBJ-EVI-VBLZ-go ?-EVI-VBLZ?-eye?-wash and same=moment 1SG.OBJ-O-EVI-PROG-TH-see
ca.
ca
PART
‘He answered, “Someone named Jesus made some mud and smeared it on my eyes. He told me to go and wash it off in Siloam Pool. When I did, I could see.‘ (John 9:11)

This exemplifies the difficulty with testing this hypothesis, and something which was mentioned in Section 4: the component pieces of the stem are not always transparent. The previous example showed unknown verbs: there are also instances of unknown nouns. The pairs in (59) and (60), as well as (61) and (62), show two similar verbs. The only difference in the stem in each case is the addition of the string -*yeu*in incorporating position.

[14] Thank you to Ina Zeng for noticing this pattern.

(59) jua**yeu**enatjëmbán
j-ua-yeuenatjëmbá-n
VBLZ-TH-disappear.sound-INF
‘To disappear a voice or sound‘ (Juajibioy 2018:201)

(60) juenatjm̈bán
j-u-enatjëmbá-n
VBLZ-TH-disappear-INF
‘To disappear‘ (Juajibioy 2018:203)

(61) joyeunayán
j-o-yeunayá-n
VBLZ-TH-obey-INF
‘To obey‘ (Juajibioy 2018:167)

(62) jenayán
j-e-nayá-n
VBLZ-TH-tie-INF
‘To tie‘ (Juajibioy 2018:137)

Examining the meanings also reveals a pattern: (59) and (60) share the action of disappearing, modulo the concept of a sound or voice. If we take *-yeu-* as ”voice” incorporating, then the meaning of ”obey” can derived idiomatically as ”tie voices”. With this analysis, we can re-examine the form in (52) that does not contain o, shown in (63).

(63) aca condétatsembo bueta uata cbetsajabuáchanama, nÿets
aca c-o-nd-ét-atsembo bueta uata cb-e-ts-a-j-abuáchana-ma nÿets
here 2SG-O-EVI-?-offer.gift how.many year 1SG>2SG-?-PROG-?-VBLZ-go.to.someone-BEN total
tempo cbetseyeunanama
tempo cb-e-ts-e-**yeu-nana**-ma
time 1SG>2SG-?-PROG-TH-voice-tie-BEN
‘For years I have worked for you like a slave and have always obeyed you.‘ (Luke 15:29)

Thus, the predictions about the distribution of this vowel seem to uncover new nouns. However, it also shows the difficulty in testing this hypothesis. Verb stems can be relatively opaque, and incorporating nouns quite small. However, this also suggests another indicator for the lack of o: verb complexity. The other noun without o in (63) is translated as ”go to someone” by Juajibioy (2018:99). Semantically, this seems to be a more complicated action, as such it also might be a complex verb stem.

To summarize, the vowel *o* that is normally grouped with the agreement prefixes appears to be separable. Moreover, at a first approximation, its absence correlates with the presence of an incorporated noun. Much more analysis is required to confirm this pattern as true, false, or due to a deeper cause.

6 Conclusion

Our exploration of Camsá morphology has resulted in possible solutions to some puzzles, starting points for new exploration, and some further questions of how to analyze its structure. Focusing on a select three puzzles, we came to the following conclusions. First, alternation between the form of adjectives in pre-nominal and post-nominal position reflects an alternation between a syntactic structure and a adjective-noun compound. Second, there is a process of noun incorporation at work within the verbal morphology. Third, the agreement prefixes further decompose into agreement and a vowel *o*, which tracks the presence of incorporated nouns. However, all three of these conclusions require further testing and analysis. As such, we have included some predictions from these analyses in an aim to ease future work. Overall, there are many avenues by which further research into Camsá can further understanding of the language and languages in general.

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Appendix A: Leftover Examples

This section contains examples that were glossed in the process of analyzing the data and testing predictions, but were not used in the final presentation. Given the scarcity of parsed data in this language, we have opted to collect these leftovers in this appendix.

(64) Atše jëtschuayama bayënga chešmënjanëbaye y chë soyënga chešmënjanátsëmbona,
atše j-ëtschuaya-ma bay-ënga chešmënjanëbaye y chë soy-ënga chešmënjanátsëmbona
1SG VBLZ-offer.tribute-BEN animal-PL ? and DET thing-PL ?
chë canta bnét́sana uata entšanga ndoyena luarentše tsëngaftanga šmonj§eftsemna ora?
chë canta bnét́sana uata entša-nga ndoyena luarentše tsëngaftanga šmo-n-j-§eftsem-na ora
DET four ten year person-PL where land 2PL 2PL-EVI-VBLZ-work?-INF when
'You didn't offer sacrifices and offerings to me during those 40 years in the desert.' (Acts 7:42)

(65) Chentšna, Jesús chabe uatsjéndayëngaftaca tojanoluaré mar béjaye tsachoye
chentša=na Jesús cha-be uatsjéndayë-ng-aftaca t-o-j-an-oluaré mar béjaye tsachoye
there=TOP Jesus 3SG-GEN student-PL-COM PST-3SG?-VBLZ-?-go.leave lake water valley?
'Jesus led his disciples down to the shore of the lake.' (Mark 3:7)

(66) Mënté šmiyatšatá cada te šnetsëjaboto tandëše.
mënté š-m-iy-atš-atá cada te š-netsëja-boto tandëše
today 1SG.O-IMP-?-gift-provision every day 1SG.O-?-be.short bread
'Give us our food for today.' (Matthew 6:11)

(67) y cha nÿetsca soy-ënga š-n-etsatšatnaye
y cha nÿetsca soy-ënga š-n-e-ts-atša-tnaye
and 3SG all thing-SC 1SG.O-EVI-?-PROG-gift-give
'He gives everything else to all people.' (Acts 17:25)

(68) Chë tempo, unga uata y tsét́ntsañe nÿetšá ndoñe tonjanafté y bëts shëntsana
chë tempo unga uata y tsét́ntsa-ñe nÿetšá ndoñe t-o-n-j-an-afté y bëts shëntsana
DET time three year and half-? all NEG PST-?-EVI-VBLZ-?-rain and great hunger
chë luariñe yojtsebinÿna.
chë luar-iñe y-o-j-tsebinÿna
DET land-ill 3SG?-?-VBLZ-illuminate
'there was no rain for three and a half years, and people everywhere were starving' (Luke 4:25)

(69) atsë cbochanjábiama Bëngbe Bëtsabiama entsang anguayata
atsë **cbo**-chan-j-ábiama Bëngbe Bëtsabiama entsa-ang anguayata
1SG 1SG>2SG-FUT-VBLZ-weave? our father person-PL ?
'I will make you fishers of men (I will make you find those for God?)' (Matthew 4:19)

Nominal and Verbal Behavior in Pulaar Infinitives

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Abstract

This study explores the nominal and verbal behavior of infinitive clauses in the Futa Tooro dialect of Pulaar. Pulaar infinitives have the distribution of nouns, in that they can appear in both the subject and object position of verbs and can be possessed by possessive constructions. These infinitives also vary in that sometimes they behave as full nominals that select for adjectival modifiers, and sometimes behave partially verbally, selecting for adverbial modifiers. As noted by Ba (2017), it appears that this variation correlates to whether the infinitive takes a determiner that agrees with the infinitive head in noun class. When there is a determiner agreeing with the infinitive head in noun class, the infinitive behaves fully nominally, however when this determiner is not present, the infinitive behaves partially verbally. Using the ideas laid out by Kratzer (1994) and expanded upon by Harley (2009), we show that this variance in nominal and verbal behavior can be explained by which point in the derivation the nominalizing infinitive head attaches. Harley identifies the verbalizing v^o head to be inside of the agent introducing vP layer. If the infinitive head attaches below vP, the infinitive is never verbal at any point in the derivation and behaves fully nominally. If the infinitive head attaches above vP, however, the infinitive behaves partially verbally, as it is a verb at some point in the derivation.

1 Introduction

In this paper, we will investigate and propose an analysis of the nominal status of infinitive clauses in Pulaar. Pulaar belongs to the Atlantic branch of the Niger-Congo language family, and exists on a dialect continuum extending from Senegal to Cameroon and Sudan (Ba 2017). Pulaar is known by many other names across Africa, including Pulaar, Fula, Fulani, and Fulfulde. The variety known as Pulaar is spoken primarily in Senegal, Mauritania, the Gambia, and western Mali, alongside Sereer and Wolof.

Pulaar infinitive clauses exhibit several nominal properties, including the ability to occupy the internal and external argument positions of verbs, the ability to be modified by adjective-like stative verbs (as Pulaar does not have adjectives in the traditional sense), and the ability to appear in possessive

constructions. These infinitive constructions therefore do not seem to be infinitives in the traditional sense, but instead appear to behave as nominalized VP constituents. Nominalization refers to 'a general process by which non-nominal elements become grammatical nominals (Genetti et al. 2008). A grammatical nominal is a constituent that has the properties of a noun and behaves in the same way as a noun. Therefore, nominalization is a process by which a non-noun constituent acquires the properties and behavior of a noun. Nominalization is traditionally thought to exist in two forms: derivational and clausal. Derivational nominalization is a process by which a lexical root is made to function as a lexical noun, often adding additional meaning. Clausal nominalization is a syntactic process which allows a clause to function as a noun. These two processes differ in the domains to which they apply (root vs. clause) as well as the syntactic category that they result in (N vs. NP) (Genetti et al. 2008). Examples of both processes in English are given below, using the English verb swim.

(1) Derivational Nominalization: -er
'She was a talented swimmer'

(2) Clausal Nominalization: -ing
'Swimming in the river is my favourite thing to do'

Nominalization is a very productive process in Pulaar, which can be achieved using various nominalization strategies. These processes include deverbal nominalization, which can incorporate the internal argument (object) of the verb, as well as clausal nominalization processes that nominalize entire CP constituents. Infinitive clauses seem to exhibit a number of the same properties as these nominalized constituents, though they are not relative clauses themselves.

While descriptions of infinitive clause nominalization are present in the literature (Ba 2017), there do not appear to be any analyses of how infinitive verbs acquire their nominal properties. This is the gap that we intend to fill. In this paper, we will argue that the infinitive suffix is a nominalizing head that can attach at various positions in the syntactic tree, resulting in variable levels of constituency being incorporated into the nominalized constituent. We will argue that the infinitive head can attach both above and below the subject-introducing vP layer, optionally including or excluding the external argument of the verb. We will do so by utilizing a parallel analysis of English gerunds originally proposed by Kratzer (1994) and elaborated on by Harley (2009) using the framework of distributed morphology.

Data for this paper was collected by working with a speaker of the Futa Tooro variety of Pulaar. We would like to issue a special thanks to Abuu Njom for kindly providing us with judgments and insights about both his language and culture as a whole, as well as for being a pleasure to work with.

2 Review of Previous Literature

2.1 Ba 2017: Nominal and Verbal Properties of Pulaar Infinitives

Ba (2017) provides an overview of nominalization processes in the Toore dialect of Pulaar. Ba includes infinitive constructions as one of these nominalizations, claiming that the infinitive verb acts as a head noun that can take a genitive marker. Ba claims that when the infinitive occurs in genitive nominals (possessives), it can have nominal as well as verbal properties depending on whether the determiner is related to the infinitive or the internal argument (object) of the verb (Ba 2017). Ba uses adjectival and adverbial statives as evidence of these nominal and verbal properties. When the infinitive is modified by an adjectival stative, it is said to behave fully nominally. When the infinitive verb is modified by an adverbial, it is said to be partially verbal, since adverbs modify verbs. These infinitives are not fully verbal, however, since they have the nominal properties of being taken as the subject or object of another verb.

Ba claims that when the determiner at the end of the infinitive clause agrees in noun class with the infinitive marker, infinitives exhibit fully nominal properties as they can be modified by adjectival statives and not adverbials. In these contexts, Ba claims, the infinitive is a fully nominalized form of the verb phrase. This can be observed in examples 3 and 4 below. In 3, we see agreement between the infinitive marker *-go* and the determiner *ngo*. The nominalized infinitive is modified by the adjectival stative *yaawngo*, which agrees in noun class as well. In 4, we see that this clause can not be modified by the adverbial stative *ko yaawi*.

(3) [windu-go am deftare **yaaw-ngo** ngo] bettu-m Musaa
write-INF my book quick CL.the surprise-PERF Musaa

'My quick writing (of) a book surprised Musaa.'

(4) *[windu-go am deftare ngo **ko yaawi**] bettu-m Musaa
write-INF my book CL.the Rel quick surprise-PERF Musaa
Int: 'My quickly writing (of) a book surprised Musaa.'

Source: Toore, (Ba 2017)

Ba further claims that when the determiner inside the infinitive agrees in noun class with the object argument instead, the infinitive behaves as a verb and can be modified only by adverbial phrases. This is observable in 5 and 6. We see that the determiner *ngo* is absent, and we see a determiner *nde* agreeing in class with *deftare*. In 5, the infinitive clause is modified by the adverbial stative *ko yaawi*. 6 shows that adjectival modification is now ungrammatical.

(5) [windu-go maako deftare nde **ko yaawi**] bettu-at Musaa
write-INF his book CL.the Rel quick surprise-IMPERF Musaa
'His writing the book quickly will surprise Musaa.'

(6) * [windu-go maako deftare nde **yaaw-ngo**] bettu-at Musaa
write-INF his book CL.the quick surprise-IMPERF Musaa
Int: 'His quickly writing the book will surprise Musaa.'

Source: Toore, (Ba 2017)

Ba finds that past tense morphology can be included in the infinitival construction as well. This can occur when the infinitive behaves verbally, but not when it is fully nominal. Note the agreement between the object *deftare* and the determiner *nde* in 7, and between the infinitive *-go* and the determiner *ngo* in 8.

(7) [windu-**noo**-go maako deftare nde] bettu-at-no Musaa
write-PAST-INF his book CL.the surprise-IMPERF-PAST Musaa
'His writing the book would surprise Musaa.'

(8) * [windu-**noo**-go maako deftare ngo] bettu-at-no Musaa
write-PAST-INF his book CL.the surprise-IMPERF-PAST Musaa
Int: 'His writing the book would surprise Musaa.'

Source: Toore, (Ba 2017)

Ba observes as well that infinitive clauses with verbal properties can include a subject argument. Ba claims that this subject can go in the preverbal position, but must be a strong pronoun. This then appears to be some sort of focus fronting.

(9) [**deeɓe** yaa-go ekool] won-aa ko wakt-id-tee
3PL.STR go-INF school be-NEG PRO discuss-ASC-IMPERF
'Them going to school is not a matter for discussion.'

(10) * [**ɓe** yaa-go ekool] won-aa ko wakt-id-tee
3PL go-INF school be-NEG PRO discuss-ASC-IMPERF
Int: 'Them going to school is not a matter for discussion.'

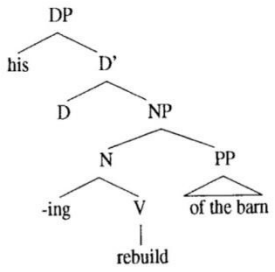
Source: Toore, (Ba 2017)

To summarize, Ba describes that when infinitive clauses take a determiner agreeing in noun class with the infinitive marker, the clauses behave fully nominally and can be modified only by adjectival statives. When there is only a determiner agreeing with the object, however, the infinitive clause behaves partially verbally; it has the distribution of a noun, but is modified by adverbial statives. Additionally, Ba shows that when tense and subject information are incorporated in the nominalization, the infinitive clause behaves only partially verbally.

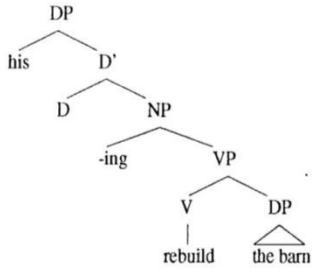
2.2 Kratzer 1994: The Structure of English Gerunds

Kratzer (1994) provides some insight into a similar phenomenon occurring within English gerunds. Gerunds are formed by attaching the suffix *-ing* to verbs. Gerunds, like Pulaar infinitives, exhibit a range of verbal and nominal properties, with some gerunds appearing fully nominal and some partially verbal. Kratzer attributes this variance in nominal and verbal properties to the level in the derivation at which the nominalizing *-ing* head attaches: V, VP, or VoiceP. She identifies VoiceP to be the level at which the external argument, i.e. the subject, is introduced. The structure of the three types of gerunds are shown below: of_{ing}, $poss_{ing}$, acc_{ing}. In each of the gerund syntactic structures, we see the nominalizing head being attached at different levels of the tree.

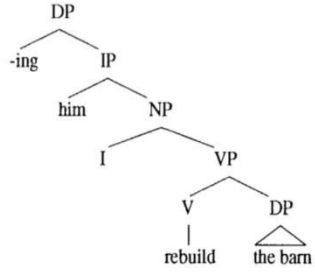
a. *of*$_{ing}$: His rebuilding of the barn took five months.



b. poss$_{ing}$: We remember his rebuilding the barn.



c. acc$_{ing}$: We remember him rebuilding the barn.



Source: Kratzer (1994)

These ideas given by Kratzer will help us diagnose the differences in behavior seen in Pulaar infinitives.

3 Data: Genitive Infinitive Nominals in Futa Tooro

We will now turn to our findings and describe how the phenomena detailed in Ba (2017) appear in the Futa Tooro dialect of Pulaar. The Futa Tooro dialect spoken by our consultant and the Toore dialect described by Ba (2017) differ primarily in the phonological form of grammatical elements, including

tense and aspect morphology and the form and noun class of the infinitive head. The difference between the infinitive heads in each dialect can be seen in both its phonological form and in agreement with determiners and adjectival statives.

Ba (2017) attributes the alternation between nominal and verbal behavior to whether the clause final determiner agrees in noun class with the infinitive head or object argument. We disagree with this claim, as agreement between a determiner and a noun would be the result of that noun being selected by the determiner. Therefore, the noun phrase selected by the determiner would need to be taken as compliment by the determiner within its own DP. Since the object argument would be low in the tree, within vP, and the nominalizing head would be high, above the clause being nominalized, it does not seem plausible that the form of a single determiner alternates between the two agreement relationships. This claim also does not take into account the possibility of both the object NP and the nominalized clause occurring with a determiner. Therefore, we expect that we can instead attribute this alternation to the presence or absence of either determiner and expect that we will also be able to have both or neither determiner in the same infinitive clause. We will return to this as we explain our findings.

In the Futa Tooro dialect of Pulaar, the infinitive head takes the form *-de*, as opposed to *-go* in Toore. Adjectives that agree with this head take the class suffix *-nde*, and a determiner of the form *nde*. To distinguish agreement with the object, we have chosen to use the noun *mogo* as the object to the verb, which agrees with the determiner *ŋgo*. Agreement with the noun serves to show that the determiner is selecting that noun. Noun class agreement relationships are indicated by co-indexation in the gloss when relevant.

We will now turn to our findings. We found that in the genitive infinitive clauses that Ba (2017) describes, we see fully nominal behavior when there is a determiner that agrees with the infinitive head. We can see that this is nominal by the presence of an adjectival stative. This is true regardless of the presence of a determiner that agrees with the object.

(11) windu-dɛ am mɔgɔ jaaw-ndɛ **ndɛ** bɛtt-ii Musaa
write-INF.CL$_i$ 1SG.GEN play.CL$_j$ quick-CL$_i$ DEF.CL$_i$ surprise-PFV Musaa
'My quick writing (of) the play surprised Musaa.'

(12) windu-dɛ am mɔgɔ **ŋgɔ** jaaw-ndɛ **ndɛ** bɛtt-ii Musaa
write-INF.CL$_i$ 1SG.GEN play.CL$_j$ DEF.CL$_j$ quick-CL$_i$ DEF.CL$_i$ surprise-PFV Musaa
'My quick writing (of) the play surprised Musaa.'

We do not see this nominal behavior when the determiner that agrees with the infinitive head is not present.

(13) * windu-dɛ am məgɔ ŋgɔ jaaw-ndɛ bɛtt-ii Musaa
write-INF. CL_i 1SG.GEN play.CL_j DEF.CL_j quick-CL surprise-PFV Musaa
Int: 'My quick writing (of) the play surprised Musaa.'

Instead, when the determiner that agrees with the infinitive head is not present, the infinitive head behaves verbally, and we see an adverbial stative being used. The adverbial can appear in multiple positions.

(14) windu-dɛ am məgɔ ŋgɔ kɔ jaaw-i bɛtt-ii Musaa
write-INF.CL_i 1SG.GEN play.CL_j DEF.CL_j COP quick-PFV surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'

(15) windu-dɛ am kɔ jaaw-i məgɔ ŋgɔ bɛtt-ii Musaa
write-INF.CL_i 1SG.GEN COP quick-PFV play.CL_j DEF.CL_j surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'

If we introduce the determiner that agrees with the infinitive head back in, adverbial agreement becomes ungrammatical. This is true for both positions of the adverbial.

(16) *windu-dɛ am kɔ jaaw-i məgɔ ŋgɔ ndɛ bɛtt-ii Musaa
write-INF.CL_i 1SG.GEN COP quick-PFV play.CL_j DEF.CL_j DEF.CL_i surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'

(17) *windu-dɛ am məgɔ ŋgɔ ndɛ kɔ jaaw-i bɛtt-ii Musaa
write-INF.CL_i 1SG.GEN play.CL_j DEF.CL_j DEF.CL_i COP quick-PFV surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'

None of these constructions can include higher adverbs such as possibly/probably. This indicates that they are nominalized below the CP layer, and thus are not relative clauses.

(18) *windu-dɛ am ina waaw-i məgɔ ŋgɔ jaaw-ndɛ ndɛ bɛtt-ii
write-INF.CL_I 1SG.GEN STAT possible-PFV play.CL_j DEF.CL_J quick-CL_i DEF.CL_i surprise-PFV
Musaa
Musaa
Int: 'My possible quick writing of the play surprised Musaa.'

(19) *windu-dɛ am ina waaw-i kɔ jaaw-i mɔgɔ ŋgɔ ndɛ
write-INF.CL$_i$ 1SG.GEN STAT possible-PFV COP quick-PFV play.CL$_j$ DEF.CL$_j$ DEF.CL$_i$
bɛtt-ii Muusa
surprise-PFV Muusa
Int: 'My possibly quickly writing the play surprised Musaa.'

To summarize, we found that contrary to Ba's (2017) findings, it appears it is the presence or absence of a determiner agreeing with the infinitive head that determines whether an infinitive clause behaves fully nominal or partially verbal. If the determiner agreeing with the infinitive head is present, then the infinitive clause behaves fully nominally and is modified by adjectival statives. If this determiner is not present, however, the infinitive behaves partially verbally, and is modified by adverbial statives. This data will be the subject of our analysis. Further data for which we will not provide an analysis will be discussed later in section 5.

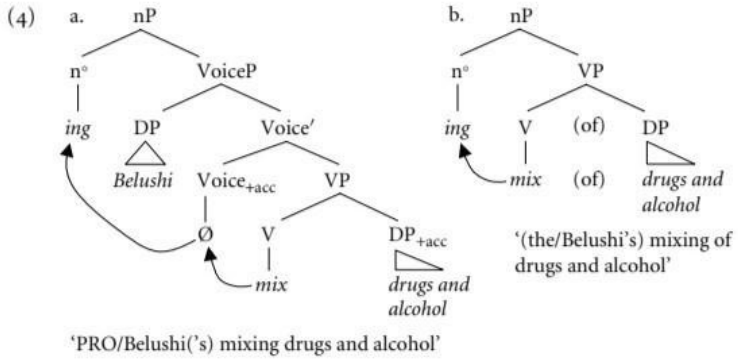
4 Analysis

4.1 Theoretical Background: Harley (2009)

Harley (2009) further discusses the analysis of the nominal and verbal properties of English gerunds described in Kratzer (1994). Harley's analysis utilizes the framework of Distributed Morphology (Halle and Marantz 1993) and shows that the difference in nominal and verbal properties between acc$_{ing}$ and of$_{ing}$ gerunds can be described as a difference in where the nominalizing *-ing* attaches in the derivation.

Distributed Morphology, henceforth referred to as DM, is a syntax-based approach to word formation in which morphological derivation is accomplished in the syntax alongside regular syntactic derivation. Morphemes in DM are independent elements that occupy terminal nodes within the syntactic derivation of the word. Each terminal node is fully specified for featural content and receives a pronunciation after the syntax has finished building the tree (Harley 2009). There are two broad classes of terminal nodes in DM: roots, also known as l-morphemes, and grammatical elements, known as f-morphemes. Roots are acategorical, acquiring their category by merging with a category defining f-morpheme in the syntax (Harley 2009). These f-morphemes can have an overt pronunciation, as is the case of morphemes like the English verbalizer *-ify*, or they can be null and receive their pronunciation from the verb that moves into them. Category-defining f-morphemes are labeled with the lower-case version of the lexical category that they correspond to: v◦, for verbalizers, n◦, for nominalizers, and a◦, for adjectivalizers (Harley 2009).

Harley uses the proposal by Kratzer (1994) to explain why gerunds of the acc_{ing} class appear to be broadly verbal, while gerunds of the of_{ing} class appear broadly nominal. Harley's analysis focuses on the assignment of accusative case, though a similar contrast in nominal/verbal behavior can be observed in the selection of statives in Pulaar. Harley explains that the assumption underlying this approach is that the accusative case, as well as the agent theta-role, is associated with the voice head in Kratzer's proposal. She gives the following example.



Source: (Harley 2009)

In example a., the nominal head is attached above VoiceP, resulting in an acc_{ing} structure. In example b., the nominal head is attached below VoiceP and above VP, excluding the external argument and resulting in an of_{ing} structure. As a. includes the external argument, it is able to bear case and thus behaves more verbally, while in b., no case is marked and it thus appears nominal.

Harley draws a parallel between Kratzer's external argument introducing VoiceP and Chomsky's agent introducing vP shell. Further, she claims that distributed morphologists ((Harley 1995), (Marantz 1997)) have identified the v◦ head to be within the vP shell. Thus, the lower 'VP' head would no longer be a VP, but instead it would be projecting an acategorical root rather than a proper verb. It is once the lower root moves to the upper v◦ head via head movement that the result becomes a true verb.

To Harley, this is then why we obtain verbal and nominal behavior. If VoiceP is the same as DM's verbalizing vP, then this accounts for the verbal properties of acc_{ing} gerunds, including their ability to take adverbial modification. The v◦ head within vP creates a genuine verb within the structure. The absence of vP in of_{ing} structures, on the other hand, means that at no point in the derivation is there a genuine verb present, which accounts for fully nominal characteristics such as allowing adjectival modification and permitting determiners. The root in of_{ing} structures is never fully verbal.

With the basics of Harley's analysis established, we can then return to our data. Recall that the difference between nominal and verbal behavior seems to be the presence of a determiner that agrees in class with the infinitive head, as shown in examples 12 and 14 and repeated below.

(20) windu-dɛ am mɔgɔ ŋgɔ jaaw-ndɛ ndɛ bɛtt-ii Musaa
write-INF 1SG.GEN play DEF quick DEF surprise-PFV Musaa
'My quick writing (of) the play surprised Musaa.'

(21) windu-dɛ am mɔgɔ ŋgɔ kɔ jaaw-i bɛtt-ii Musaa
write-INF 1SG.GEN play DEF COP quick-PFV surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'

To use Harley's analysis to explain this data, we need to show that the vP layer, and thus the verbalizer v◦, is present in 21 but absent in 20. Before we can do this, we must take a look at how possessives work in Pulaar.

4.2 Possessive Constructions in Pulaar

Ba (2017) describes that genitive nouns, or possessive noun constructions, consist of a DP and a possessor or modifier that is either a pronoun or another DP. The possessed noun is followed by the possessor noun or genitive pronoun, which is then followed by a determiner agreeing in class with the possessed noun. These possessive constructions are notable as they include both a genitive pronoun (or DP) and a determiner, whereas cross-linguistically, most languages have one or the other. The head noun occurs before the possessive pronoun, and the rest of the NP follows. Examples of possessive constructions given by Ba (2017) are given below.

(22) oto Musaa mo
car Musaa DET
'Musaa's car.'

(23) oto maako mo
car 3SG.GEN DET
'His car.'

(24) defte am jawi maw-ɗe ɗe
book.PL 1SG five big-CL DET.PL
'My five big books.'

(25) *defte jawi maw-ɗe am ɗe
book.PL five big-CL 1SG DET.PL
Int: ‘My five big books.’

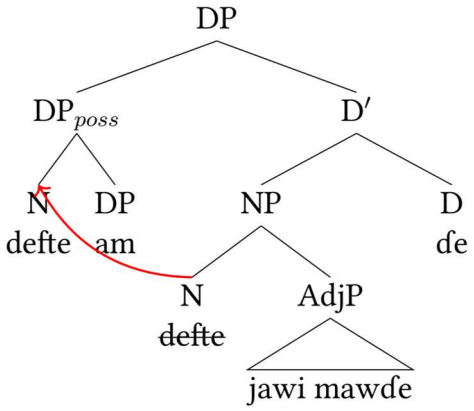
Simple possessives can also occur without the determiner, employing only the pronoun. It is currently unclear whether the determiner is required for complex NPs.

(26) ndɛɛ-dɔ kɔ dɛftɛrɛ am
DEM-LOC COP book 1SG.POSS
‘This is my book.’

Source: Futa Tooro, Ada and Jasmine, McGill University, Individual Elicitation, Oct. 7, 2025

No syntactic analysis of these possessive constructions currently exists in the literature. Because of this, we will need to make assumptions about the structure of these possessive constructions. We would expect that the possessive functional head will be above the NP layer, thus the genitive pronoun and determiner will be higher in the syntactic tree than the possessed noun, or in our case the infinitive clause. Given that we see the head noun appear to the left of the genitive pronoun, and the rest of the NP between the genitive pronoun and determiner, it seems that the head noun moves up to some position on the left edge of the genitive pronoun. We will then use the following rough structure for possessive DPs in Pulaar, based on the structure proposed by Ghomeshi and Ritter (1996) with modifications made for word order and a position added for the head noun at the left edge. The specifics are not relevant for the present analysis; what is important is that the possessive consists of a determiner and genitive pronoun, and that they exist above the NP layer.

(27) defte am jawi maw-ɗe ɗe
book.pl 1SG five big-CL DET.PL
‘My five big books.’



Additionally, we know that the possessive pronoun is a pronominal DP element and not a D functional head since it can be used outside of possessive constructions and has the distribution of a pronoun. These pronouns appear to be used in prepositional phrases, as they are used as the second element in coordination with strong pronouns (Ba 2013), following prepositions, and in the object position of *aadɛ* verbs following a linking element.

(28) miin he maako ɲjaa-du-noo
1SG.STR LK 3SG.GEN go-ASS-PST
'It's me and him that went together.'
Source: Toore, (Ba 2013)

(29) (ko) dow maako teg-mi deftare nde
(COP) on 3SG.GEN put-1SG book DET
'It's on him that I put the book.'
Source: Toore, (Ba 2013)

(30) cukal-ɛl ŋgɛl maɓɓ-ii-ma ʔɛ makkɔ
child-CL DET hug-PFV-ma LK 3SG.GEN
'The child hugged him/her.'
Source: Futa Tooro, Sama'a and Emma, McGill University, Individual Elicitation, Oct. 9 2025

4.3 Nominal and Verbal Behavior of Infinitives

Let us now return to our data. We have established that possessive constructions consist of a genitive pronoun and a determiner, and that genitive pronouns can occur in other contexts aside from possessive constructions. Thus, as it has both a genitive pronoun and a determiner agreeing with the head noun, 20 looks like one of the possessive constructions that we have observed, while 21 does not, since it

does not have a determiner agreeing in class with the head noun. Examples 20 and 21 are repeated below.

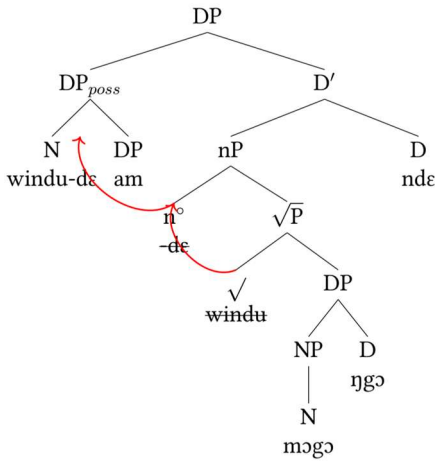
(31) windu-dɛ am mɔgɔ ŋgɔ jaaw-ndɛ ndɛ bɛtt-ii Musaa
write-INF 1SG.GEN play DEF quick DEF surprise-PFV Musaa
'My quick writing (of) the play surprised Musaa.'

(32) windu-dɛ am mɔgɔ ŋgɔ kɔ jaaw-i bɛtt-ii Musaa
write-INF 1SG.GEN play DEF COP quick-PFV surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'

We have also theorized that infinitives in Pulaar, like English gerunds, will behave nominally when the infinitive head attaches below the subject introducing vP, and will behave verbally when the infinitive head attaches above vP. We then propose the following.

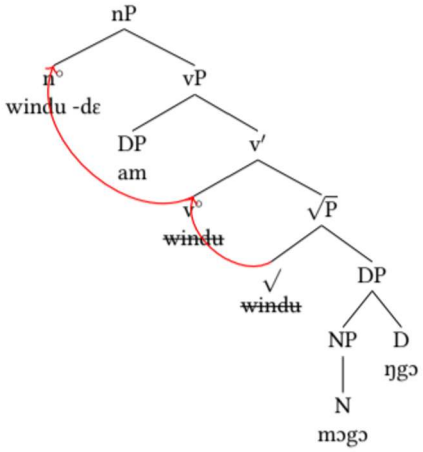
In fully nominal infinitive clauses such as 20, the infinitive head attaches before the tree merges with the subject introducing vP. This means that the verbalizer v◦ is never introduced into the derivation, explaining why we see fully nominal behavior, as the nominalizing infinitive head contains the first category features introduced into the derivation. The genitive pronoun and determiner are then introduced into the derivation above the infinitive head to form the possessive. The root moves into the nominalizing infinitive head, and then further moves above into the possessive construction. A derivational tree is given below, with adjectivals omitted for clarity.

(33) windu-dɛ am mɔgɔ ŋgɔ jaaw-ndɛ ndɛ bɛtt-ii Musaa
write-INF 1SG.GEN play DEF quick DEF surprise-PFV Musaa
'My quick writing (of) the play surprised Musaa.'



In partially verbal constructions like 21, we propose that the nominalizing infinitive head attaches just above the subject introducing vP. This means that the verbalizer v◦ is present in the derivation below the nominalizing infinitive head, and this explains the partially verbal behavior. The genitive pronoun occupies the external argument position at spec vP. The root moves from its position in √P to v◦, and then into the nominalizing infinitive head. A derivational tree is given below, with adverbials omitted for clarity.

(34) windu-dɛ am mɔgɔ ŋgɔ kɔ jaaw-i bɛtt-ii Musaa
write-INF 1SG.GEN play DEF COP quick-PFV surprise-PFV Musaa
'My writing the play quickly surprised Musaa.'



To summarize, we propose that the difference between fully nominal and partially verbal behavior in Pulaar infinitives is equivalent to the difference in behavior observed in English gerunds. As originally proposed by Kratzer (1994) and expanded upon by Harley (2009), Pulaar infinitives behave fully nominally when the nominalizing infinitive head attaches below the agent introducing vP. When the infinitive head attaches above vP, and thus the external argument is introduced, the infinitive behaves partially verbally because the verbalizing v◦ is present within the vP layer. This explains why the examples given by Ba (2017) that include grammatical information such as tense are only possible when the infinitive behaves nominally: This grammatical information is located above vP in the derivational tree.

4.4 Why is the External Argument Genitive?

With all of this established, we are left with one final question: why is the external argument present in the verbal infinitive shown in 21 a genitive pronoun? To this we do not have an exact answer, however we would like to draw attention to a likely possibility.

As we observed in section 4.2, the so-called genitive pronouns appear in prepositional phrases as well. This shows that they are not purely used in possessives but are a pronoun that appear to be inflected for case.

Harley (2009) describes that in English gerunds, we also see a difference in the form of the external argument when the nominalizing *-ing* attaches above vP, including the external argument in the nominalization. This can be seen in the following examples.

(35) 'I wrote the play.'

(36) 'Me writing the play surprised Musaa.'

(37) * 'I writing the play surprised Musaa.'

Harley (2009) attributes this alternation to a difference in the assignment of case inside gerunds. While she provides a full analysis of this for English, we do not have sufficient information to give a proper account of the assignment of case in Pulaar, and thus the specifics of this alternation are left to future research. It is worth noting, however, that this alternation in case is yet another parallel between Pulaar infinitives and English gerunds.

5 Further Evidence: Infinitive Nominalization at Other Constituency Levels

We would now like to return to the data collected during research for this paper, and present some other examples of infinitive nominalizations in Pulaar at different levels in the derivational tree. First, we have observed a separate nominalizing head that behaves the same as fully nominal infinitives. Alongside a nominalizing suffix, this strategy triggers mutation of the initial consonant of the root. There appears to be a variety of these suffixes that differ in noun class, and each verb seems to select for a unique noun class. These nominalizations behave as our analysis expects that they would, as they do not incorporate the external argument and behave fully nominally.

(38) ʃakku-ru pɔm ndu ina tɔɔw-nɔ
chew-NOM apple DEF STAT loud-PST
'The chewing of an apple was loud.'

(39) mbɔdɔ jiɗ-i ɲɟim-ri ndii
1SG like-PFV sing-NOM DEF
'I like the singing.'

Returning to infinitives, we found an alternate form of subject-incorporating infinitive where the subject clitic appears in its standard form. These behave verbally and can not have a determiner agree with the infinitive head, though this is to be expected due to felicity constraints. These constructions could be relative clauses of some kind.

(40) mah-dɛ-mbɔ gallɛ ɔɔ waɗ-ii hitaandɛ
build-INF-3SG house DEF do-PFV year
'Him building the house took a year.'

(41) * mah-dɛ-mbɔ gallɛ ɔɔ ndɛ waɗ-ii hitaandɛ
build-INF-3SG house DEF DEF do-PFV year
Int: 'The him building the house took a year.'

(42) mah-dɛ-mbɔ gallɛ ɔɔ kɔ jaaw-i ina sohl-i ŋgaalu
build-INF-3SG house DEF COP quick-PFV STAT need-PFV money
'Him building the house quickly needs money.'

Finally, as did Ba (2017), we found that nominalizations can include tense as well. Our data on these are not comprehensive enough to make any claims, but it appears that these function verbally and appear similarly to the last example, but with tense included. These could be relative clauses as well.

(43) windu-nɔɔ-dɛ-mi mɔgɔ ŋgɔ kɔ jaaw-i bɛtt-ii Musaa
write-PST-INF-1SG play DEF COP quick-PFV surprise-PFV Musaa
'Me quickly writing/having quickly written the play surprised Musaa.'

Interestingly, the subject pronouns in these constructions seem to be interchangeable with their genitive counterparts.

(44) windu-nɔɔ-dɛ-am mɔgɔ ŋgɔ kɔ jaaw-i bɛtt-ii Musaa
write-PST-INF-1SG play DEF COP quick-PFV surprise-PFV Musaa
'Me quickly writing/having quickly written the play surprised Musaa.'

5 Conclusion

In this paper, we have shown that the Pulaar infinitive suffix is a nominalizing functional head. Infinitive clauses will display varying degrees of nominal and verbal behaviors depending on what level in the derivation the infinitive head attaches at. If the infinitive head attaches below the subject-introducing vP, then the infinitive clause will display fully nominal behavior. If the infinitive head attaches above vP, then the infinitive clause will display partially verbal behavior and incorporate the external argument of the verb. This variance in behavior is analogous to the same process in English gerunds.

This paper has raised as many questions as it has provided answers. The most demanding question that remains, it seems, is the status of possessive DPs in Pulaar. This would be a great topic for future research. Along the same line, another topic that could benefit from more research is the status of Pulaar's so called genitive pronominals. Thus far, they seem to be pronouns inflected for case, though this would require research into Pulaar's case system as a whole, to claim with any certainty. Finally, the exact mechanics of Pulaar's infinitive nominals at higher constituency levels such as those introduced in section 5 would be a fascinating topic to investigate as well.

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Mandarin Rhotacization: A Sociolinguistic Study of Young Urban Speakers in Beijing and Other Regions of China

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Abstract

Rhotacization (*erhua*) is a salient phonological feature of Beijing Mandarin and a well-known marker of regional identity in China, especially among male speakers. However, the distribution of this feature among younger Mandarin speakers, notably in large cities, somewhat differs from the distribution described in previous studies . This study investigates the effects of region and gender on *erhua* usage among urban Mandarin speakers born in the 2000s, recruiting participants from Beijing and other major Chinese cities, evenly divided by gender. Through a quantitative comparison across groups and styles in performing reading tasks, the results show a robust regional effect: Beijing speakers use *erhua* at significantly higher rates than non-Beijing speakers. Beijing speakers also display substantially greater individual variation, likely reflecting the city's sociolinguistic heterogeneity. In contrast, no statistically significant gender difference was found. However, descriptive patterns suggest that Beijing men may reduce rhotacization more sharply in formal contexts than women, indicating possible gendered style shifting. These findings highlight the continued importance of regional background in shaping *erhua* usage while suggesting a potential weakening of traditional gender-based differences among younger urban speakers.

1 Introduction

Rhotacization in Mandarin, often known as *erhua*, is a phonetic and phonological phenomenon in which certain syllables become r-colored, typically transcribed as [ɚ] or [˞]. While *erhua* occurs in many Mandarin dialects, it is particularly prominent in Beijing Mandarin, which serves as the foundation for Modern Standard Chinese. However, the distinction between the standard language and the Beijing dialect is somewhat arbitrary and has long been a topic of debate; certain features of Beijing Mandarin, including *erhua*, are generally not considered part of Modern Standard Chinese (Chen 1999: 37).

Even within Beijing Mandarin, *erhua* exhibits a high degree of free variation. Many words commonly occur in their rhotacized form, yet their unrhotacized counterparts are also acceptable and frequently observed (Chen 1999: 39):

- *huā* [xwa] or *huār* [xwaɚ] 'flower'
- *pén* [pʰən] or *pénr* [pʰɚ] 'basin'

The acceptability of *erhua* in Beijing Mandarin varies on a gradient scale. Unlike r-coloring in English, whose distribution is mainly phonological, *erhua* in Mandarin is closely associated to the specific lexicon. Depending on the specific word, rhotacization can either be obligatory, optional, or forbidden (Zhao 2017: 207). This variation provides ground for lexical contrasts, where rhotacization differentiates meanings between words (Chen 1999, 39):

- *huǒxīng* [xwoɛɪŋ] 'Mars' vs. *huǒxīngr* [xwoɛɪɚ̃] 'spark'
- *xìn* [ɛɪn] 'letter' vs. *xìnr* [ɛɪɚ] 'message'

Such distinctions are generally lost in Modern Standard Chinese, where all the words above would be pronounced without rhotacization.

The sociolinguistic status of *erhua* in China remains complex. It is a salient feature of Beijing Mandarin and a strong marker of local identity, yet it is also perceived as a stereotype of Beijing speech, as it is avoided in formal speech and attracts overt social commentary by Beijing and non-Beijing speakers (Zhao 2017: 51). A 2005 study on Chinese professionals in Beijing found that female employees in foreign companies used significantly less rhotacization than their male colleagues, whereas this difference was not observed among professionals in state-owned companies (Zhang 2005: 447). Another study on university students in Beijing revealed that men and students with low aspirations used 15% more *erhua* than women and students with high aspirations (Zhao 2017, 212-214). Beyond the capital, research on young men from Zhengzhou, Henan, indicated that extroverts tend to use more rhotacization, as it is associated with masculinity (Pankhurst 2012: 38).

This study focuses on a specific speech community: urban Mandarin speakers in China, particularly young adults born in the 2000s. This population generally has a native or near-native proficiency in Standard Mandarin through mass media, education, and language assimilation policies. In major urban centers such as Beijing and Shanghai, mass migration in recent decades may have also influenced local language patterns, reducing regional features and encouraging a shift toward Standard Mandarin (Zhang 2018: 74-75).

In our research, we are looking at the performance of male and female speakers from Beijing and other cities. Based on previous research, we hypothesize that *erhua* usage will vary based on both region

and gender: (1) speakers from Beijing will use *erhua* more frequently than speakers from other cities, and (2) male speakers will use *erhua* more frequently than female speakers.

2 Methodology

Our research included speech samples from two groups: 20 speakers from Beijing and 20 speakers from other Chinese cities. Each group was evenly divided into 10 male and 10 female speakers. Non-Beijing participants were carefully selected to ensure a balanced representation of China's major Chinese-speaking regions. To recruit participants, we contacted friends and acquaintances to participate in the research and asked a few of them to reach out to their own friends for participation. Most of this outreach occurred on social media, with some interactions taking place in person. We chose not to upload our survey online to maintain better control over participant backgrounds. Our participants were mainly university students, and all had completed at least high school. Most of the participants belonged to the middle class, but this was not a strict classification and is not a major focus of this study.

To qualify for participation, individuals had to meet the following criteria:

1. Fluency in Standard Mandarin. This applied to all members of the target speech community; we did not encounter anyone who did not meet this criterion.
2. Born in the 2000s. Since we were looking for adult participants, only individuals born between 2000 and 2006 were eligible. We successfully recruited a range of participants born between 2002 and 2006.
3. Have lived in a single city for most of their first 18 years. Participants were not required to have remained in the same city throughout their youth, but they had to be able to identify one city that best represented their background. We also used this information to select participants by region, as shown in Table 1.

Region	Northeast	Central N	East	Central S	Southwest	South
Male	1	2	2	1	2	2
Female	1	2	2	1	2	2

Table 1: Non-Beijing participants by specific region

Each participant received a survey to verify their demographic background (gender, year of birth, and city) and completed two tasks. Task 1 consisted of a short Chinese passage that we composed, which

contained 55 words that could potentially undergo rhotacization. Participants were asked to record themselves reading the passage in a natural, conversational tone. Task 2 featured a list of 50 words that could be rhotacized, and participants were also asked to read and record it. The two tasks featured the same syllable targets, most of which belonged to the same word in both tasks. However, a few words in Task 2 were deliberately made different from their Task 1 counterparts to avoid excessive repetition (e.g. 公园 in Task 1 vs. 动物园 in Task 2). Certain words appeared multiple times in the passage (hence 55 targets rather than 50), allowing us to cover the rhotacization of the same word across different linguistic environments.

We collected information on gender (male/female) and region (city name) through demographic questions in the survey. To analyze *erhua* usage, we listened to the audio recordings and coded each possible instance of *erhua*: a score of 1 was assigned for presence and 0 for absence. While most cases could be identified impressionistically, some utterances were difficult to decipher due to fast speech. In such cases, we turned to secondary phonetic evidence:

- Coda deletion (e.g., *hái* [xai] vs. *háir* [xaɚ]; *jìng* [tɕɪŋ] vs. *jìngr* [tɕjɚ]). The absence of [i] and [ŋ] is sufficient to indicate *erhua*.
- Blocking of raising (e.g., *diǎn* [tjɛn] vs. *diǎnr* [tjaɚ]; *yuán* [ɥɛn] vs. *yuánr* [ɥaɚ]). The vowel /a/ in rhymes /jan/ and /ɥan/ rise to /ɛ/. However, *erhua* causes deletion of the coda /n/, destroying this rhyme and thus blocking raising.

If the target syllable was strongly reduced, it was marked as absent (0). If a participant misread a word, such as through substituting it with a synonym or skipping part of the phrase, the word was excluded from the data. However, if a participant avoided rhotacization by adding suffixes (e.g. *xiǎohái vs. xiǎoháizi*, *lǎotóu vs. lǎotóuzi*), this was not considered as a misreading but rather a morphological strategy to produce natural speech without *erhua*. In such cases, the *erhua* of the word was also marked as absent.

Once all data was encoded, we calculated each participant's individual frequency of *erhua* usage for both tasks.

3 Results

Region	Beijing		Non-Beijing	
style	reading style	word list	reading style	word list
average (%)	54.55	45.2	13.88	14.2
standard deviation	24.14	30.99	13.93	13.78

Table 2: Regional variation in *erhua* frequency

Gender	Male		Female	
style	reading style	word list	reading style	word list
average (%)	31.24	29.98	37.18	27.02
standard deviation	24	27.98	35.4	28.36

Table 3: Gender variation in *erhua* frequency

Region/Gender	Beijing		Non-Beijing	
	reading style	word list	reading style	word list
Male avg. (%)	49.27	35	13.21	13
Female avg. (%)	59.82	55.4	14.55	15.4
Male std. dev.	30.01	34.18	16.56	14.7
Female std. dev.	16.36	24.05	11.59	13.47

Table 4: Detailed variation in *erhua* frequency based on both region and gender

4 Discussion

We begin by examining the first variable: region. As shown in Table 2, speakers from Beijing exhibit an average *erhua* frequency of 54.55% in the reading style and 54.2% in the word list. In contrast, speakers from other cities show a markedly lower average frequency of 13.88% in the reading style and 14.2% in the word list. A *t*-test on the reading style results yields a p-value of 0.000000152, significantly smaller than any conventional significance level. This data strongly supports the conclusion that Beijing speakers use *erhua* at a significantly higher frequency than non-Beijing speakers. This finding aligns with the known distribution of *erhua* in China, where its usage is most prominent in Beijing and less frequent in other regions.

Furthermore, the usage of *erhua* differs in non-Beijing areas. After sorting non-Beijing participants by specific regions in Table 5, we observe a skewed distribution where the erhua frequencies from northern China (Northeast, Central North) is higher than their southern counterparts:

Region	Northeast	Central N	East	Central S	Southwest	South
reading style	36.95	27.27	7.27	13.64	6.36	3.18
word list	47	22.5	7	5	9.5	6

Table 5 : *Erhua* frequency by specific region

While the limited sample size prevents us from drawing definitive conclusions about broader regional variation, this north-south divide in *erhua* usage is worth further investigation. A possible account for this result is the influence of local Chinese varieties of each region. As a linguistic feature, *erhua* is exhibited in most northern dialects and a few southern dialects, specifically the southwest and Wu-speaking regions in eastern China (Cao 2008, Map 052). However, from our results, speakers from the east and the southwest have a low frequency of using *erhua*. A possible explanation lies in the the quality of *erhua* of these regions: *erhua* in northern Chinese varieties is commonly realized as rhotacization, similar to *erhua* in Beijing. In comparison, *erhua* surfaces as a rhotic or lateral suffix in the southwest and takes the form of a nasal coda in Wu Chinese (Cao 2008, Map 052). Such realizations are considerably more different from the *erhua* in Beijing Mandarin, and therefore might not be adopted by southern speakers when speaking standard Mandarin.

The variability in *erhua* usage also differs between the two groups. Among Beijing speakers, the standard deviation is 24.14% in the reading style and 30.99% in the word list, whereas for non-Beijing speakers, it is 13.93% and 13.78% respectively, as shown in Table 2. An F-test on the reading style data produces a p-value of 0.0209, which is below the significance level of 0.05, confirming that Beijing speakers exhibit more significant variation in *erhua* usage than non-Beijing speakers.

A key factor contributing to this variation may be that non-Beijing speakers tend to use very little *erhua* overall, with their average frequency being only around 14%. Nonetheless, since they come from diverse regions across China, one might expect more variation among them than among Beijing speakers, who represent a single city. Interestingly, we observed the opposite trend: *erhua* variation is greater among Beijing speakers, likely due to the city's sociolinguistic complexity. As a major metropolis, Beijing has absorbed migrants from across China, leading to linguistic diversity within its speech community. While the children of migrants in Beijing generally assimilate to the local dialect, variation still remains, particularly in highly variable features such as *erhua* (Dong 2009: 118; Zhang 2018: 64-68). Therefore, this variation could be explained by the variation in regional backgrounds of Beijing speakers. To confirm this explanation, however, further research should collect information on family background, such as the place of origin of the speakers' parents.

The second variable under investigation is gender. In Table 3, male participants exhibit an average *erhua* frequency of 31.24% in the reading style and 24% in the word list, while female participants show higher averages of 37.18% and 35.4%, respectively. However, *t*-tests indicate no statistically significant difference between the two groups.

Several factors might explain this result. First, the sample size may be insufficient to detect a gender-based difference. Previous studies have shown that gender differences in speech are not always evident and sometimes involve only a small margin, such as the 15% difference in Zhao's (2017: 213) study on university students. A larger sample might be necessary to confirm any potential differences. Another possibility is that gender-based variation in *erhua* usage is diminishing within our target speech community. Research on other features of Beijing Mandarin, such as neutral tone, classifier omission, and the intensifier *te*, suggests that long-term promotion of Standard Mandarin and the lack of prescriptive differences between Beijing Mandarin and Standard Mandarin may be contributing to the gradual loss of gender-based speech differences (Zhao 2022, 141).

Interestingly, rather than supporting the expectation that men use more *erhua*, our data actually suggests the opposite: women may have higher *erhua* usage than men. While the difference is not statistically significant, female participants consistently exhibit higher *erhua* frequency in both tasks. A possible explanation is style shifting; that is, men might be reducing their *erhua* usage more consciously in the two tasks.

Comparing the change from reading style to word lists, male participants reduced their *erhua* frequency by 7.24%, whereas female participants only reduced theirs by 1.78%. This effect is even more significant among Beijing speakers: based on data in Table 4, Beijing men reduced their *erhua* usage by 14.27%, while Beijing women reduced theirs by only 4.42%.

As suggested by previous studies, *erhua* is perceived as a stereotype of Beijing speech, which might have a stronger effect on men since it is also associated with masculinity. This perception may lead Beijing men to reduce their rhotacization in formal contexts such as reading passages and word lists, where they might perceive it as less appropriate. However, the degree of style shifting likely varies between individuals. Indeed, male Beijing participants exhibit greater variability in *erhua* usage than their female counterparts: in reading style, the standard deviation is 30.01% for men and 16.36% for women; in word lists, variability increases for both groups, with 34.18% for men and 24.05% for women (Table 4).

This suggests that some male speakers significantly reduce their *erhua* usage in formal contexts while others do not, leading to greater overall variation. In contrast, female participants exhibit more consistent behavior across tasks. However, to confirm this style-shifting hypothesis, future research would need data from casual and careful speech contexts to better capture potential changes in *erhua* across different speech styles.

Overall, style shifting is not highly significant. Across all participants, the average *erhua* frequency is 34.21% in reading style and 29.7% in word lists. However, as suggested previously, this does not imply that all participants maintain a consistent level of *erhua* usage between the two tasks.

Shift type	Sharp decrease	Mild decrease	Consistent	Increase
Range	-15% & lower	-15% ~ -5%	-5% ~ +5%	+5% & higher
Participants	6	7	20	7

Table 6 : Shift in *erhua* frequency between styles

This relates back to individual variation in style shifting: speakers exhibit different motivations and tendencies when adjusting their *erhua* frequency. Some reduce it in more formal contexts, others reinforce it, and some remain largely consistent across tasks.

5 Conclusion

This study examined *erhua* usage among young urban Mandarin speakers, focusing on region and gender. The results confirm that Beijing speakers use *erhua* significantly more than non-Beijing speakers. Beijing speakers also showed greater individual variation, likely due to the city's linguistic diversity. Non-Beijing speakers, on the other hand, had less variation but still exhibited regional differences. Gender differences were not statistically significant. Nonetheless, it appears that Beijing men have a stronger tendency to reduce *erhua* in formal contexts. Style shifting was minimal overall and varied by individual. These findings suggest that regional identity remains a key factor in *erhua* usage, while gender differences may be decreasing due to changing social norms. Future research should further explore other speech styles, namely casual speech and careful speech. Regional backgrounds of speakers could be investigated to study *erhua* variation in Beijing, while larger samples should be collected to study gender-based differences.

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Appendix A

Task 1. Characters with emphasis marks represent specific syllable targets.

过了这么多年，我终于回了一趟老家。在老家的最后几天，我给很久没联系的浩文发了微信，和他约在小区旁边的公园见面。从公园大门进去之后，我找了个长椅坐下。道路两边的树木开了很多花，长椅上全是落下来的花瓣。不远处的几个小孩在一起玩跳绳。

浩文过了一会才过来。他穿了一件灰色的 T 恤，还戴着眼镜，跟以前的他看起来有点不一样。我不免回想起小时候，我们在学校后院一起玩的那段时光。

我上前招呼他过来。“哎呀，这都多少年没见了。”他热情地说，“你要是早点告诉我，我肯定找时间去餐馆请你吃饭了。”

我们一起散步，欣赏着草地上的兰花，随意地聊天。浩文的人缘很好，和很多人都还在联系，不管什么样的事他都知道。“丽丽在区里当了官，真是佩服；彭哥呢，好像是在一家互联网公司上班。”他说，“我记得他高考没考好，比一本线低了好几分，差点就去复读了，没想到这家伙现在混得有模有样的。”

浩文又提到了其他几个人，但我和他们一点也不熟，搞不清楚人名，所以听得有些走神。我用脚踢了踢路上的几块石头，没想到鞋带突然松了，只好狼狈地蹲下来系鞋带。

我本来以为浩文要带我在公园里面走几圈，结果他带我到外面的人行道上。“既然这次没法请你吃饭，等会我就请你喝个饮料吧。”

“你可别这么客气，我自己买就行了。”我告诉他，接着向街上望去。学生时代在这里卖烤肠的路边摊不见了，我们一路走到最近的小卖部。浩文从冷柜里拿出一根冰棍，问我要不要。我摆了摆手，然后打开冰箱，原本想拿一罐汽水，但最后还是拿了一瓶橙汁。我抢在浩文前面，把自己的饮料递给收银台的老头，告诉他：“分开付。”

后来，浩文带着我在街上逛，到了傍晚才各自回家。进了家门之后，我发现之前桌子上摆的一盘瓜子、花生、杏仁已经不见了，厨房里飘来饭菜的香味。我去厨房帮我妈干活，她递给我几个小碗，让我去盛米饭。吃饭的时候，我给她讲了今天和浩文聊的一些事，她听了之后沉默了片刻，然后说：“看来我真的是老了，怎么之前总感觉，你们还是小孩呢？”

Appendix B

Task 2. Characters with emphasis marks represent specific syllable targets.

1 旁边	11 上班	21 老头	31 大件行李	41 呼啦圈
2 动物园	12 差点	22 陶瓷盘	32 有点累	42 等一会
3 马路边	13 一点盐	23 杏仁	33 游玩	43 地摊
4 花瓣	14 走神	24 干活	34 餐馆	44 木棍
5 玩游戏	15 鞋带	25 琐事	35 人缘	45 汽水
6 休息一会	16 没法	26 公园	36 贪官	46 果汁
7 眼镜	17 香肠	27 开门	37 打分	47 大门
8 电影院	18 萝卜根	28 茉莉花	38 人模狗样	48 瓜子
9 聊天	19 易拉罐	29 小孩	39 人名	49 香味
10 坏事	20 酒瓶.	30 跳绳	40 石块	50 饭碗

Linguistic Change in a Bilingual Context: Influence of Spanish in Catalan Sound Changes in Progress

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Abstract

This paper investigates the degree to which language contact may influence Catalan sound change in the absence of language shift by examining variables with potential contact-induced variants in the context of the highly bilingual Catalan-Spanish urban center of Barcelona that has undergone a recent reversal of language shift. The study identifies four variables, three which have been previously described in the literature as potential contact-induced linguistic changes, and one which is recognized as unaffiliated with language contact. These involve the potential merger of /ʎ/ and /j/, the affrication of /ʃ/, the devoicing of /ʒ/ and /z/, as well as the deletion of pre-consonantal /r/, in an attempt to determine whether these former changes, if they are present, are due to language internal or external factors, and whether their social distribution differs significantly from the latter change unaffiliated with language contact. Additionally, the study analyzes the factors of language attitude and use among bilingual speakers and whether these correlate with particular linguistic variants to determine whether linguistic changes observed are due to language contact. The sociolinguistic patterns of the merger, affrication, and devoicing suggest these are, at least partially, language contact-induced changes from below, while that of /r/ deletion affirms its status as a stable sociolinguistic variable. Language attitude is found to have no correlation with the variables studied, while language use is found to be highly predictive only of /z/ devoicing.

1 Introduction

The effect of language contact on linguistic change has been well-attested (Heath 1984; Thomason 2006). Situations of language contact seem to provide a fairly straightforward answer to the "actuation problem" of linguistic change (Labov 1972), which asks why certain linguistic changes occur in a particular language at a particular time, as they provide the social context conducive to the development of linguistic variation through the introduction of a non-native variant that competes with a native one (Ravindranath 2008). However, many authors have stressed that the co-occurrence of language

contact and linguistic change, even when seemingly converging in structure, does not necessitate that such changes are contact induced (Poplack, Zentz, & Dion 2012).

Mooney and Hawkey (2019), in their study on Catalan and Occitan speakers in France, attempt to disambiguate between language-internal and language-external sources of change in the merger of the phonemes /ʎ/ and /j/. They observe that a shift from [ʎ] to [j] is a common sound change seen in many other Romance languages (e.g. French and standard varieties of Peninsular Spanish) due to the low functional load of the /ʎ/-/j/ contrast. On the other hand, prolonged contact with the higher prestige French language, where these are no longer contrastive phonemes, may have triggered the merger in Occitan and Catalan, which are in an increasing state of obsolescence vis-à-vis French in the regions they are spoken in France. The study finds a change in apparent time of /ʎ/ from [ʎ] to [j], a merger that, for Catalan, is nearing completion for younger speakers. The authors argue that whereas in Occitan this change is solely due to language contact with French, in Catalan, both language external and internal factors drive the change.

Across the border in Catalonia, the sociolinguistic picture of Catalan is quite different. Whereas the authors describe Catalan as an "obsolescent" language of France with very few fluent native children or widespread presence in the education system, in the Spanish autonomous community of Catalonia, Castilian Spanish and Catalan are on much more equal footing. Barcelona, the main urban cosmopolitan center of Catalonia, is Spain's "biggest and most salient bilingual city" (Boix-Fuster 2015, 147). It is characterized by a highly fluid and unstable "seesawing bilingualism" in which it is unclear which of the two languages historically spoken in the city, Castilian Spanish, or Catalan, has greater prestige (Miller & Miller 1996). This is due, in part, to the fact that in Catalonia, economic and political power has long been separated, where Catalan is associated with the economic elite and Spanish with the politically dominant group. Due to the large influx of primarily lower-class Spanish-speaking immigrants to the city within the last half century, the social distribution of Catalan and Spanish in Barcelona can be characterized as "sandwich-shaped," in which Spanish is the dominant language in both the highest and lowest social class groups, while Catalan predominates in middle-class sectors (154).

Similar to the sociolinguistic context in France, Spanish and Catalan present a case of extended language contact. However, whereas the centralizing language planning of the French state has led to the steady decline of Catalan in the country, the historical context in Spain is more complex, with the status of Catalan vis-à-vis Castilian Spanish undergoing multiple periods of suppression and subsequent revitalization. Once the language of the empire of the Crown of Aragón, Catalan slowly lost ground to Castilian Spanish as a literary and institutional language following the integration of Catalonia into the Castile-Aragon dynastic union (Miller & Miller 1996). In the mid-19th century, the language was revived

during a period known as the *Renaixença* (Renaissance) that saw Barcelona emerge as a modern industrial economic force, where the language was mobilized as the base for a broader Catalan national political movement (Etherington 2010). This increased proliferation of the Catalan language continued into the early 20th century where it was followed by a brief bout of repressive language policies following the centralist coup of 1923 and the successive restoration of the language's official status (equally as brief) in 1931 during Spain's Second Republic.

The mid-20th century bore another radical shift in language policy in Catalonia, marked by the end of the Spanish Civil War and the Spanish dictator, Francisco Franco's, ascendance to power. During his reign, from 1936 until his death in 1975, Catalan was heavily suppressed as a public language—along with traditional emblems of Catalan cultural identity, including Catalan customs, music, and dances—in the name of promoting Franco's nationalist ideal of a unified country under one culture, religion, and language (Seoane 2009). The situation of Catalan vis-à-vis Spanish during this time was characteristic of diglossia (Woolard & Gahng 1990), in which Spanish constituted the only permissible language of government, education, and mass media, whereas Catalan was relegated to the private sphere of the home.

Catalonia has undergone yet another rapid shift in language policy and language dynamics within the last half century following the restoration of democratic government in the country and the conferral of a measure of self-government in Catalonia, which granted Catalan official status for the first time in 40 years. Catalonia's current governing body, the Generalitat, explicitly announced the goal of language normalization as part of its language policies: a process in which Catalan "gradually recovers the formal functions it had lost" and "works its way into those social sectors, within its own territory, where it was not spoken before" (Miller & Miller 1996, 123). Catalan is now compulsory across all levels of public education in the region and is the language of government and mass media.

Thus, in many ways, Catalonia is an anomaly within the Catalan-speaking community. Despite "cultural and linguistic domination by the Castilian center," it has emerged with a thriving industrial powerhouse of an urban center that has enabled the revival and standardization of the language (Boix-Fuster 2015, 148). As in French, many varieties of Spanish, including that spoken in Catalonia, have merged the /ʎ/ and /j/ phonemes in favor of /j/, in the widely documented process known as yeísmo (Canales 2011). An investigation into the state of the /ʎ/-/j/ merger in Catalonia, in which, similar to France, we find extended language contact with a Romance language that has lost the contrast, but a striking *lack* of language shift, could provide an insight into the social factors at play in this phonological phenomenon. Along with the familiar social variables of age, gender, and social class, probing into the factors of language attitude and use, as well as whether these correlate with particular linguistic variants,

could help determine whether the linguistic change observed is indeed due to language contact. Due to the diverging development of the /ʎ/ phoneme in Spanish and Catalan, the only cognates in which this phoneme was present historically, in both, is limited to intervocalic position, as in "cat" : 'bellesa' [bəʎeza] and Sp. 'belleza' [bejeθa] *beauty* (Zampaulo 2019). Thus, if the merger were contact induced, it would be favored in intervocalic position where the influence of the Spanish [j] variant strengthened the change.

Previous research on the state of these phonemes in the Catalan spoken in Spain indicates that this contrast remains stable in the language or has only just begun to merge. Rost (2016) compares the perceptual abilities of Spanish and Catalan speakers and finds that this contrast was much more robust for Catalan speakers, where the sounds remain distinct phonemes, though there are small urban centers where this merger is surfacing. Canales (2011) finds that in the related Valencian variety, the two phonemes remain distinct, while in Spanish, the merger is nearing completion among bilingual Valencian Spanish speakers in Gandía. Pons i Griera (1992), however, suggests that for the particular variant spoken in Barcelona, a merger of the two phonemes has been in progress for some time and has developed sociolinguistic variation along class lines, though she does not clarify the nature of this distribution.

She identifies several other phenomena of sociolinguistic interest: word-initial affrication of the voiceless fricative /ʃ/ and devoicing of the voiced fricatives /ʒ/ and /z/, particularly as these are changes that converge with the phonemic inventory of Castilian Spanish, which lacks phonemic /ʃ/ and /z/. Analyzing the social correlations of the devoicing of /ʒ/ and whether they pattern with the other changes in progress could help determine whether these changes are being driven by language-internal or external factors. The devoicing of /ʒ/ could be an indirect consequence of contact-induced change through speakers' attempts to level imbalance in their phonemic feature inventory, if /z/ devoicing was the initial change, or an indication that this change is due to unrelated language-internal factors. By contrast, Mas i Miralles and Montoya i Abad (2004), in their general overview of the current sociolinguistic variation in Catalan, identify the deletion of pre-consonantal /r/ as another sociolinguistic variable of interest, though crucially variation identified in previous research as unaffiliated with the influence of language. Evaluation of whether there are differences in the social factors that govern the variation in /r/ deletion compared to those of the other variables identified could help determine whether the latter are truly due to language contact.

Figure 1: Area of Study

This paper investigates the degree to which language contact may influence sound change in the absence of language shift by examining variables with potential contact-induced variants in the context of the highly bilingual Catalan-Spanish urban center of Barcelona that has undergone a recent reversal of language shift. It analyzes the potential merger of /ʎ/ and /j/, the affrication of /ʃ/, and the devoicing of /ʒ/ and /z/, as well as the deletion of pre-consonantal /r/, in an attempt to determine whether these former changes, if they are present, are due to language internal or external factors, and whether their social distribution differs significantly from the latter change unaffiliated with language contact.

I predict that if the sound changes in progress are driven by language-contact with Spanish, this will be reflected in socioeconomic status and region, with higher class urban speakers with more connections to the Spanish-speaking world further advanced in these changes than lower class rural speakers, as well as language use and attitude, with greater Spanish usage and feelings of Spanish language solidarity correlated with further advancement in these changes. Similarly, if these sound changes are contact induced, they should be favored in words with Spanish cognates, where phonemic correspondence with the Spanish variant strengthens the change.

2 Methods

Participants for this research project were recruited using snowball sampling, in which additional participants are recruited through referral from initial participants, thus leading to a sampling bias that overrepresents the social networks of relatively few individuals. The resulting demographic distribution of participants skews strongly older and female. In particular, younger male speakers were underrepresented, with only two participants in this category, as compared to the relatively more even distribution across other categories, as observed in Figure 2.

Participants	Male	Female	Total
Older: 40-82	12	17	29
Younger: 18-30	2	11	13
Total	14	28	42

Figure 2: Sample Size of Catalan speakers by Age and Gender

To gauge the potential effects of style shifting on each variable, while still maintaining a uniform set of data to draw from, I designed a word list, representing a more formal style. The list contained 3-4 instances of each variable of interest, along with a reading passage, representing a more casual style, that contained 4-7 instances of each variable, in a range of relevant linguistic environments. Participants were asked to record themselves reading the passage and word list and given the option to send these recordings through WhatsApp or email, though the majority of recordings were received through WhatsApp.

The (z), (ʃ), (ʒ), and (r) variables were all recorded impressionistically, using the presence of the voicing bar and slope of F3 on Praat, correlated with voicing and rhoticity, respectively, as guidelines in case of any transcriptional ambiguity. The /ʎ/ and /j/ variables, which are much more challenging to discriminate auditorily, were instead analyzed acoustically on Praat. The minimal and maximal F2 value of each variable were measured, as well as the duration of the entire gesture, following the method developed by Crowley and Palaiologou (2024), as the lateral variant tends to be longer in duration and have a flatter F2 slope. In order to avoid directly comparing the formant values across genders, which would lead to spurious differences due to physical differences in vocal tract size, I subtracted the mean F2 slope for /ʎ/ from that of /j/ and compared this difference in F2 slope across speakers. Group means of /ʎ/ and /j/ were statistically analyzed using two tailed t-tests while the distribution of all other variables among groups were statistically analyzed through chi-squared tests.

The word list and reading passage were accompanied by a questionnaire, delivered in Catalan, that asked for participants' demographic information: year of birth, gender, education level, parents' jobs, as well as what region they grew up in and whether they still lived there. There was minimal variation in education level, with 34 of the 42 participants having a college education or above. Thus, socioeconomic status was primarily based on participants' responses about their parents' job, in which there was greater variation. This led to a classification of 10 upper middle class, 17 lower middle class, 13 upper working

class and 1 lower working-class participants (one participant did not respond to this question). Additionally, while most speakers came from the Barcelona province, which essentially covers the area where the Central Catalan dialect is spoken—with 26 directly from the Barcelona metropolitan area—7 participants came from other major cities in Catalonia, where dialect differences may have played a role in the variation observed.

Along with this demographic information, a number of questions were aimed to assess participants' bilingual experience in Catalan and Spanish. Participants were asked for their native language—for which "Catalan," "Spanish," or "both" were presented as options—as well as their second language (L2) and at what age they began speaking their L2. These variables were coded with whatever response put forth for native language pertaining to their L1, and their L2 split into early L2, if learned before the end of primary school, and late L2, if learned later than primary school.

Additionally, language use and attitude in both Catalan and Spanish were assessed, in line with recent research that asserts that language *use* provides a more accurate measure of L2 proficiency than subjective self-evaluations (Hernández-Rivera et al. 2024). To assess language use, participants were asked how often they spoke each language daily on a 5-point scale: ranging from *almost never* to *almost always*, as well as who they spoke each language to: family, friends, work colleagues, neighbors, and strangers, with each group contributing one point to the participant's total language use score. Participants' responses for each question were combined, yielding a language use score out of 10 for each language. To assess language attitudes, participants were asked to answer *yes* or *no* to a series of statements on whether they felt comfortable speaking each language, whether they enjoyed speaking it, as well as whether they would linguistically accommodate to an interlocutor that felt more comfortable in one or the other language. A *yes* response to every question indicated a perfectly neutral or balanced language attitude to both languages, while any *no* responses indicated a preference for the other language. Thus, *no* responses for the Spanish statements counted towards stronger Catalan solidarity and vice-versa along one 6-point scale from strong Catalan solidarity (score of 3) to strong Spanish solidarity (score of -3).

3 Results & Analysis

Figure 3 displays and compares the social variables with statistically significant differences across group means by style to identify the degree of style-shifting (L: list and P: passage) for each variable. Since a broader comparison of gender across all speakers would have too great a confound of age, analysis of gender differences was restricted to older speakers, who had a more even gender distribution. Thus, all references to gender differences in the data tables and graphs refer to comparisons

across speakers aged 40 and over. In the table for certain variables, *Sp* use refers to total Spanish use which was found to be marginally significant ($p<0.01$), while *Cat-Sp* use refers to the use of Spanish relative to Catalan.

Variables	List	Passage	Style-Shifting
/ʃ/ affrication	Age: p= .344 O: 14% Y: 23%	Age: p= **.007** O: 32% Y: 54%	**p< .001** L: 18% P: 39%
	Gender: p= .555 F: 18% M: 13%	Gender: p= .723 F: 34% M: 29%	
	Sp Use: p= .091 H: 25% L: 13%	Sp Use: p= .087 H: 47% L: 34%	
/ʒ/ affrication	Age: p = .792 O: 7% Y: 6%	Age: p = .741 O: 41% Y: 40%	**p< .001** L: 7% P: 41%
	Gender: p = .793 F: 7% M: 6%	Gender: p = 0.201 F: 45% M: 36%	
/ʒ/ devoicing	Age: p = **.041** O: 13% Y: 4%	Age: p = **.046** O: 5% Y: 0%	**p = 0.002** L: 10% P: 3%
	Gender: p = .212 F: 12% M: 15%	Gender: p = **.015** F: 8% M: 0%	
/z/ devoicing	Cat-Sp Use: p = .212 H: 21% L: 13%	Cat-Sp Use: p = **.005** H: 6% L: 18%	**p = .018** L: 17% P: 11%
/j/ - /ʎ/ F2 Slope	Age: p = **.031** O: 2.8 Y: 1.7	Age: p = **.021** O: 2.6 Y: 1.1	p = .276 L: 2.5 P: 2.1
	Gender: p = **.007** F: 3.4 M: 2.0	Gender: p = .231 F: 2.9 M: 2.2	

/r/ deletion	Age: p = .877 O: 22% Y: 23% Cat-Sp Use: p = .866 H: 22% L: 23%	Age: p = .100 O: 25% Y: 37% Cat-Sp Use: p = **.008** H: 23% L: 45%	p = .147 L: 22% P: 29%

*Significance at $p < 0.05$

Figure 3: Group Means and Statistical Significance of Social Factors on Linguistic Variables

The social factors of age, gender, and style proved to have the strongest correlation with the variables, with at least one of these factors statistically significant in some capacity for each variable. All other factors, including socioeconomic status, region, native language, and language attitude, were found to not be substantial. For /ʃ/ affrication, there were significant differences across age groups in the more casual reading passage style (p-value of 0.007), with younger speakers affricating more than older speakers. This was a trend observed in the word list style, though not statistically significant. This pattern is indicative of a change in progress towards affrication. This variable also exhibited the most dramatic style-shifting, with speakers affricating significantly more in the casual reading passage than the more formal word list (p-value of less than 0.001). While gender did not have a statistically significant effect on this variable, female speakers tended to have higher rates of affrication than male speakers.

Intriguingly, the only other variable that exhibited such a high degree of style-shifting was one I hadn't originally planned to examine but was produced organically by my speakers: /ʒ/ affrication. Speakers affricated /ʒ/ significantly more in the casual reading passage than the formal word list, with a p-value of less than 0.001. This variable is clearly value-laden for speakers, who seem to correct their speech towards the non-affricated variant in more formal settings, yet strikingly, it is the only variable that doesn't correlate significantly with any of the social factors. Rate of production of the affricated variant is nearly identical across age and gender in the word list style, while female speakers have only a slight non-significant lead in the reading passage style. This is not in line with the prediction by Bell (1984) that stylistic variation presupposes social variation, in which markers exhibit both social and stylistic distinctions while indicators exhibit only a social difference.

The devoicing of /ʒ/, by contrast, correlated significantly with the most number of social factors. In both speaking styles, younger speakers devoiced this variable significantly less than older speakers. In the reading passage style, female speakers devoiced this variable significantly more than male speakers (p-value of 0.015). These results are driven by the fact that the only instances of devoicing in the reading passage style are by older female speakers. The distribution across age and gender for this variable indicates, somewhat unexpectedly, that female speakers and younger speakers do not align in their variant

preference, while in terms of style-shifting, all speakers devoiced significantly less in the reading passage than the word list (p-value of 0.002). This suggests that the devoicing of /ʒ/ was once a change from above, in which the devoiced variant carried social prestige, hence the further advancement of female speakers and greater frequency in the more formal register, which has since lost its social valuation and is receding among younger speakers.

The devoicing of /z/ shows a similar style-shifting trend to /ʒ/ in which speakers devoice significantly less in the more casual reading passage than the formal word list (p-value of 0.018). Yet unlike the devoicing of /ʒ/, and similar to the affrication of /ʒ/, this variable shows no other significant correlation with the social factors of age and gender. It does, however, display a meaningful correlation with Catalan vs. Spanish language use, which will be explored further below.

The /ʎ/-/j/ merger, in contrast to some of the other variables examined, displays several significant correlations with social factors yet does not display a significant degree of style shifting. This pattern suggests that this variation is still below conscious awareness at the level of an indicator. In both speaking styles, the difference in the F2 slope of /ʎ/ and /j/ is significantly different across age groups, with a much smaller difference among younger speakers than older speakers. The convergence of the F2 /ʎ/-/j/ slopes for younger speakers is indicative of a change in progress towards a phonemic merger. Figure 4 shows a breakdown of this merger by age, with the older group further split into 40-60-year-old middle-aged speakers and those 60 years old and older. The graph measures the percentage of speakers with an unequivocally complete merger. Speakers with a difference in /j/-/ʎ/ slope of less than 1.0 were counted as having a categorical merger of the phonemes.

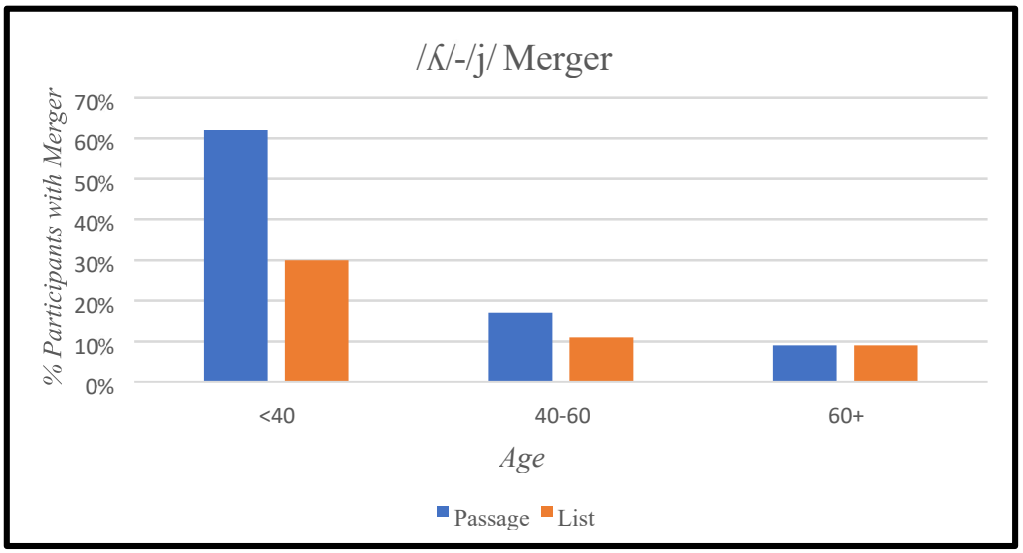

Figure 4: /ʎ/-/j/ Merger by Age Across Styles

The graph demonstrates a correlation not only between age and phonemic merger, as previously observed, but also between age and degree of style-shifting. Indeed, as age decreases, the degree of style-shifting increases. In the oldest speakers, the percentage of participants with a full merger is identical in both speaking styles; style-shifting begins to play an incipient role for middle-aged speakers, while for the youngest speakers, this shoots up to a 32% difference in styles. This more detailed examination of the interaction of social and stylistic factors for this variable shows the clear progression of this variable towards the status of a marker for younger speakers, in which it reaches conscious awareness and begins to respond to changes in formality. As the previous graph confirms, this merger has all the characteristics of a change in progress. Yet, strikingly, whereas women tended to lead changes in progress in Labov (1990), the women in my sample tended to preserve a greater contrast between the two phonemes than the men, with this difference statistically significant at a p-value of 0.07 in the word list. Figure 5 further examines the distribution of the merger by gender.

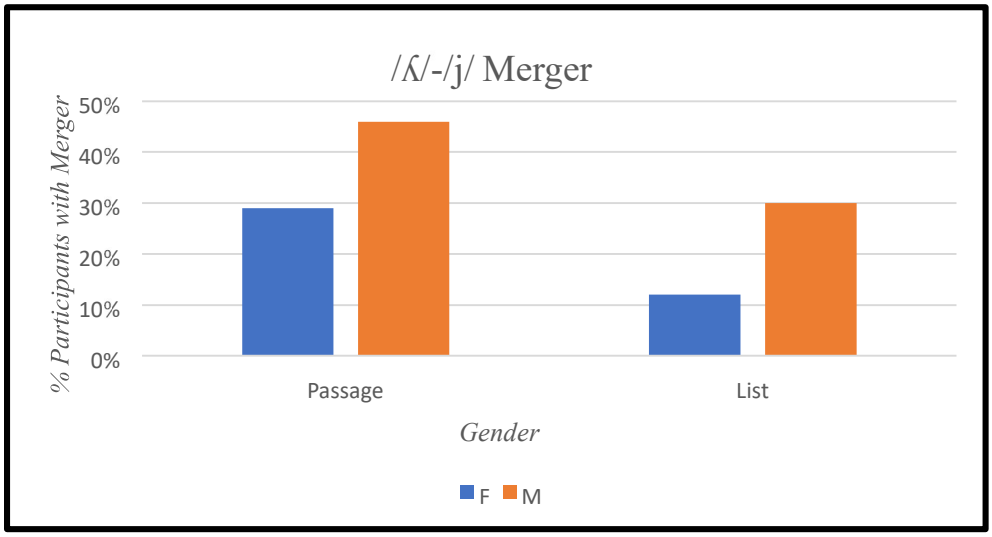

Figure 5: /ʎ/-/j/ Merger by Gender Across Styles

This graph shows that men are further advanced in this merger than women in both speaking styles, with a 17% difference across genders in the reading passage and an 18% difference in the word list. Both men and women appear to style shift to relatively the same degree, with the percentage of both female and male participants with a complete merger increasing in the reading passage style. Thus, all speakers, regardless of gender, recognize a negative value attached to the merged [j] variant of /ʎ/ and shift away from the innovative variant in formal contexts, but female speakers respond more strongly to this social stigmatization and produce less of the merged variant in either context than male speakers. The fact that this gender difference is only statistically significant in the formal word list style indicates that female speakers are more responsive to this change in formality than male speakers. Put together, these

facts suggest that, contrary to what Figure 3 and 4 might indicate, this variable has reached the status of a marker even for older speakers, where this gender difference is exhibited, and is now confronting the effects of change from above towards a more prestigious non-merged form.

Finally, and perhaps most surprisingly, for pre-consonantal /r/ deletion, this study found neither statistical significance of the effect of the social factors of age and gender on the variation exhibited, nor significant stylistic variation. However, the variable was significantly correlated with Catalan vs. Spanish language use (p-value of 0.008), with lower dominance of Catalan language use over Spanish (more balanced language use) associated with higher rates of /r/ deletion. This phenomenon cannot be due to convergence with Castilian Spanish as this variety of Spanish does not delete /r/ pre-consonantally. Thus, it is likely that its correlation with lower dominance of Catalan language use over Spanish is signaling something else altogether. Though not statistically significant, speakers tended to decrease their rate of /r/ deletion in the more formal register, indicating that /r/ articulation is the standard form. Thus, balanced Catalan-Spanish language use could indicate lower attachment to the language standard, compared to Catalan-dominant language use, reflected in greater deviation from this norm. Though gender was not statistically significant, age was on the cusp of being marginally significant for the reading passage style (p-value of 0.100), with younger speakers deleting /r/ at a greater rate than older speakers. This indicates that pre-consonantal /r/ deletion is an incipient change that hasn't yet acquired all its social connotations.

Pre-consonantal /r/ deletion is not the only variable that exhibited significant correlations with language use. As previously mentioned, /z/ devoicing does not show significant correlation with the social factors of age and gender. However, lower dominance of Catalan language use over Spanish correlated with greater devoicing in the reading passage style. While it may appear from the similar correlation of these two variables, in regard to language use, that this correlation has a similar underlying motivation, their style-shifting behavior reveals a divergence. In contrast to /r/ deletion, /z/ devoicing had a significant effect of style on the variation observed. Furthermore, for this variable, speakers tended to devoice more in the formal register, indicating that the devoiced variant is the more prestigious form, whereas for the /r/ variable, the variant associated with balanced Catalan-Spanish language use demonstrated the opposite connection with prestige, where the tendency was to reduce deletion in the more formal style. When further analyzing the linguistic environments of /z/ devoicing, we find that the word "casa" (En: *house*), which was the only form in the study with a direct Spanish cognate, had the highest rate of devoicing in the reading passage style, making it likely that this devoicing is a result of convergence with Spanish.

Similarly, /ʃ/ affrication had marginally significant effects of Spanish language use on the variation observed in both speaking styles, with greater total use associated with greater rates of

affrication. When examining the linguistic environments of this variable, we find that the affricated variant appears overwhelmingly more when in word-initial position compared to word-medially, and it never appears word-finally. Word-initially, the affricated variant is slightly more frequent in forms with a direct cognate to Spanish, such as in the word “xocolate” (En: chocolate), itself a Nahuatl borrowing that was adapted differently in the corresponding languages, than in Catalan only words such as “xarranca” (En: hopscotch).

Though not statistically significant, the /ʎ/-/j/ merger was more advanced in intervocalic position in both styles compared to word-initial and final position. This is exactly the position in which the correspondent phoneme to Catalan /ʎ/ is Spanish /j/. Thus, the fact that the /ʎ/-/j/ merger is favored in this position suggests this change is, if not contact-induced, contact-accelerated.

4 Discussion

The variables examined in this paper show a wide array of sociolinguistic patterns that position them as either stable variation or variables at different stages of sound change and with varying influences of language contact. Pre-consonantal /r/ deletion is an incipient change from below, as suggested by its age distribution and lack of style shifting, whose correlation with language use is likely unaffiliated with language contact but rather may signal lack of pressure to conform to language standards. The affrication of /ʒ/ is another variable unaffiliated with language contact that emerged unexpectedly from this study as a stable sociolinguistic variable, as suggested by its strong degree of style shifting yet comparative lack of variation by age.

The remaining variables all exhibited signs of at least partial influence from language contact, in line with the assumptions put forth by previous research. The affrication of /ʃ/ represents a change from below, as suggested by its age distribution, that is further advanced than /r/ deletion and now exhibits stylistic variation. The marginally significant correlation of Spanish language use with greater rate of affrication along with this variant being favored by greater correspondence to a Spanish cognate suggests the change is contact induced.

This pattern can be contrasted to that observed in the devoicing of /ʒ/ and /z/, which show an opposing direction of style shifting in which the variant associated with language contact is used more in the formal register. This indicates its status as the prestigious variant. The devoicing of /z/ represents a contact-induced change, as suggested by its correlation with language use and the favorable conditions for devoicing presented by Spanish cognates, that has stagnated or is becoming stable sociolinguistic variation, as noted by its lack of correlation with other social factors. Meanwhile, the devoicing of /ʒ/ represents an old change in progress from above that is receding, as suggested by age and gender

distribution. Since the devoicing of /ʒ/ and /z/ show the same social evaluation of their variants, it's plausible that /ʒ/ devoicing developed as an extension of contact-induced devoicing of /z/. The patterns of these two variables are likely the effect of a recent reversal of language shift that has led Spanish to lose any of the prestige it may have carried when these sound changes were in progress.

The merger of /ʎ/ and /j/ represents a change from below that is most advanced, as it has now reached the level of social awareness that yields correction from above. While Mooney and Hawkey (2019) did not find a significant effect of gender on the merger of /ʎ/ and /j/, my study finds that women are less advanced in this change than men in formal registers, indicating that women, which tend to respond more to changes in formality than men, are responding to the social stigmatization of this merged variant through a greater correction of their speech in formal styles. Additionally, my study found that only 62% of the youngest speakers in my sample had this categorical merger while for Mooney and Hawkey (2019), this was over 90% for younger speakers. The degree of advancement of this merger in Barcelona thus more closely corresponds to the 60% merger for older speakers of Mooney and Hawkey's study, indicating that this change is still a generation behind for speakers of Barcelonan Catalan.

Contrary to my hypothesis, language attitude had no statistical correlation with any variable in any style and thus was not predictive of any differences in production. Language use, on the other hand, was found to correlate with several variables, including one that is unlikely to be the result of language contact. This indicates that correlation with language use does not imply contact-induced change but instead signals the need for further probing into the language-internal facts about the distribution of each variant to determine whether the change is truly influenced by language contact. Thus, one social factor was underpredictive, and the other overpredictive, suggesting that these may not be the best markers of the influence of language contact.

Language use is a useful social factor to consider for sociolinguistic variation in a bilingual context. In fact, for one of the variables under study, /z/ devoicing, it was found to be the only social factor significantly correlated with variation. However, this social factor requires careful consideration of its interaction with other aspects of the variation observed to understand exactly what is being conveyed, as it could signal external influence or simply a lack of adherence to linguistic standards depending on the variable.

5 Conclusion

This study set out to find whether changes in progress identified by previous research on the Catalan spoken in Barcelona were due to language contact with Spanish or are advancing purely through

language-internal processes of change to examine to what degree language contact can influence sound change in the absence of language shift. The variables of /r/ deletion, /ʒ/ and /ʃ/ affrication, /ʒ/ and /z/ devoicing, and the merger of /ʎ/ and /j/ were analyzed and found to have varying sociolinguistic patterns that generally affirmed the influence of language contact on these changes as well as the stable variation of /r/ deletion and /ʒ/ affrication unassociated with language contact. Intriguingly, the active sound changes with the contact-induced variant in advancement were all changes from below, with any instances of a contact-induced change from above receding from the community. This demonstrates the powerful effect of language shift reversal in changing the social valorization attached to linguistic variables.

Due to the limitations of the sample size of the current study, results showed several marginally significant correlations between social factors and linguistic variables suggesting a more strongly significant difference in a larger sample. A natural extension of this study would thus be to analyze the same variables with a larger sample size, in particular, a sample with a more even distribution of gender across age groups, for more robust findings. As the study found no correlation with social class, which was unexpected given previous research, it would benefit from the more direct sampling of Barcelona neighborhoods as a correlate for socioeconomic status as these are still socially, and somewhat linguistically, segregated. Additionally, the study found several variables that displayed style shifting but seemingly no other stylistic variation. A more Eckertian approach to these variables that anchors social factors to local categories and communities of practice (Eckert 2007) may reveal social variation that has gone undetected here.

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Figure 1: Barcelona *provincia*, Spain. *Encyclopædia Britannica*. https://www.britannica.com/place/Barcelona-province-Spain

An Acoustic Analysis of Stress in the Na-Dene Languages of Ahtna and Dena'ina

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Abstract

This study measures and analyzes the acoustic factors that contribute to the assignment of stress in non-tonal Na-Dene languages. Ahtna and Dena'ina are examined, and each language is represented by three archival audio recordings taken from the Alaskan Native Language Archive (ANLA). This paper studies the duration, intensity, and pitch of the vowel /a/ in stressed and unstressed environments. Through Praat and statistical analysis, a significant correlation is found between stress and duration where the token /a/ was longer in stressed environments compared to its unstressed counterparts. Pitch and intensity show no significant correlation to stress. This suggests that duration is the primary acoustic cue of stress placement in toneless Na-Dene languages.

1. Introduction

1.1 Stress in Linguistics

Stress, referring to the relative prominence of a syllable in a word, is a central concept in the study of phonology. The most prominent syllable of a word is labeled to have *primary stress*. Stress is crucial to language as it is required for lexical contrast and emphasis, which are essential for overall intelligibility. The main theory behind stress is the binary relationship between strong and weak syllables, coined by Liberman and Prince (1977) as Metrical Theory of Stress. They presented a new theory (at the time) where they proposed that stress patterns are in hierarchical structures instead of cyclic rules, which thus indicates that stress levels are not arbitrary (Liberman and Prince, 1997). Metrical Theory allows linguists to predict stress levels in a language which is now known as metrical stress.

It is important to note that metrical stress is different from lexical stress. Lexical stress is the degree of emphasis of the syllables of a word spoken in isolation, where the location of primary stress can differentiate segmentally equivalent words (Mousikou et al, 2024). Research has shown that lexical stress is typically cued cross linguistically with some combination of three factors: duration, volume, and pitch. For example, some languages may only use duration to denote stress while others use a combination of pitch and volume. Another area that complicates stress and stress assignment is the existence of tone in a language. Tone can greatly contribute to a language's stress assignment since tone can carry prosodic load, and thus, might change the location for phonetic cues for stress (Kidder, 2008). As de Lacy (2002) explains in his research, tone is the manifestation of pitch on the syllable and can override pitch-based (and potentially duration and volume based) stress cues. The overlap of tone and phonetic cues of stress can make it complicated for linguists to identify the effects of duration, volume, and pitch on stress for languages with rich tonal inventories.

1.2 Stress in Na-Dene

As stress occurs cross-linguistically, it is realized in many forms and cued differently depending on the language. Na-Dene languages also undergo stress computation by the speaker; however, not much work has gone into what causes stress to be detected by the listener. This research will focus on stress specifically in the Na-Dene language family. The Na-Dene language family is made up of around fifty distinct languages that are spoken across Alaska, the Yukon, the North West Territories, British Columbia, Alberta, and all the way down the west coast to California. Navajo and its related languages are also included in the Na-Dene language family and are currently located in Southern America mainly in Texas, New Mexico, and Arizona (Dryer & Martin, 2013).

1.2.1 Phonological Approach to Na-Dene Stress

Previous work that has been done into Na-Dene stress patterns has primarily focused on tonal languages in the family such as Tahltan, Tetsǫ́ t’ıné, and Tanana. Before delving into the research that has been conducted on stress and tonal Na-Dene languages, it is important to discuss the work of Leer (1999) on *tonogenesis* in the Na-Dene family. In his paper, Leer discusses the tone contrast between tonal Na-Dene languages to Proto-Na-Dene which has been theorized to be toneless (Krauss, 1964). Leer argues that phonemic tone developed in Na-Dene languages through the process of tonogenesis and through the conditioning of word-final glottal stops. Leer noticed that in Na-Dene languages that developed tone, the glottal stop at the end of the stem played an essential role in triggering the tonal distinctions. He explains how from a toneless Proto language, contrasting high and low tones appeared

in Na-Dene languages depending on how the language applied the glottal features to the preceding vowel in the stem. As discussed in section 1.1, the presence of tone in a language can contribute to the assignment of stress in a language.

Alderete and Bob (2002) built off earlier work that was conducted by Cook (1972) on stress in Tahltan. Both papers confirmed that stress typically appears on the stem syllable and is conditioned by the weight of the syllable (long vowel or moraic coda). Cook initiated this inquiry by comparing stress, pitch, and vocalic quality, and found that these three factors were not randomly distributed but were in fact predictable. Alderete and Bob sought to refine this by analyzing a corpus of data in Tahtlan utilizing Metrical Stress Theory. They replicated Cook's finding that stress was predictable, and in fact, almost always fell on the stem syllable and was affected by the weight of the syllable. Furthermore, they supported Leer (1999) and briefly discussed the functional load of tone and how that affects stress assignment.

1.2.2 Acoustic Approach to Na-Dene Stress

Adding to the phonological approach, there have been studies that have applied phonetic methods to theories of phonological stress patterns to identify how stress is acoustically realized. As discussed in section 1.1, acoustic analysis of duration, pitch, and intensity can be used to discuss the perception of lexical stress (Mousikou et al, 2024). Tuttle (2000) conducted an acoustic analysis of vowel duration, fundamental frequency, and amplitude of stress between two lower Tanana dialects: tonal Minto and toneless Salcha. They noted that there was a difference in the acoustic features that assign stress between the tonal dialect and the toneless dialect. For Minto, pitch is dominant in signaling stress, while in Salcha, stress is marked by intensity and duration. They make the important note that since Salcha has no native speakers left, the use of instrumental measures impacts the validity of judgements made about the phonology of Salcha. Another acoustic study of Na-Dene by Jaker and Howson (2022) investigated the interaction of stress, the four-way tone system, and contrastive vowel length in Tetsǫ́t'ıné. This study explored how stress manifests according to the Functional Load Hypothesis and the Iambic-Trochaic Law. The Functional Load Hypothesis states that languages avoid using a single phonetic feature like duration to mark multiple contrasts, such as both tone and stress (Berinstein 1979). The Iambic Trochaic Law states that in languages with predictable iambic stress, it is usually duration that marks stress (Hayes, 1995). Jaker and Howson showed that in Tetsǫ́t'ıné, duration was the most prevalent cue for primary stress. This finding goes against the Functional Load Hypothesis as duration can be used to mark stress even in a tonal language.

1.3 Literature Gap

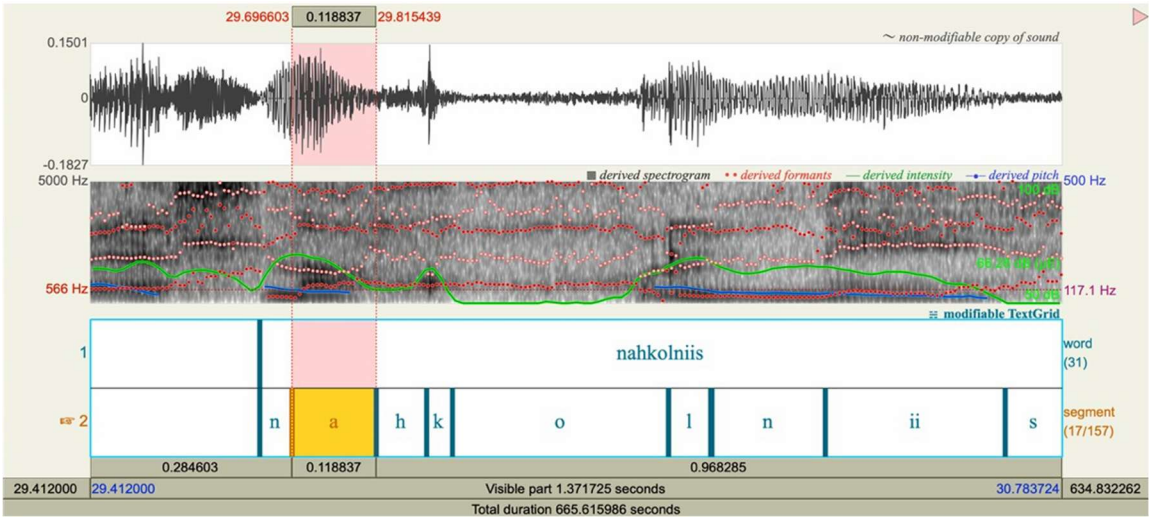
The literature contained in section 1.2 covers the vast majority of research that exists that focuses on stress assignment in Na-Dene languages. This is a deeply understudied area of linguistics, especially due to the historical silencing and underrepresentation of Indigenous languages. Within the literature that does exist around stress in Na-Dene, there have been no studies that focus on only toneless Na-Dene languages and how stress is phonetically realized in these languages. The lack of phonetic tone in toneless Na-Dene languages allows for a clearer look at how vowel length, intensity, and pitch affect stress assignment. While stress is not consistently marked in Na-Dene orthography, the work done by Shanks (2023) on syllable structure and moraic theory in Southern Tutchone points to a weight-based system in Na-Dene languages. Thus, this paper will aim to build on these insights by using an acoustic analysis to determine which features indicate weighted stress in toneless Na-Dene languages.

2. Methodology

2.1 Overview of Project

This project seeks to answer the question of how stress is realized in non-tonal Na-Dene languages. Specifically, how does duration, volume, and pitch vary in stressed versus unstressed environments in non-tonal Na-Dene languages? These questions will be explored through analyzing audio recordings of people speaking non-tonal Na-Dene languages. The recordings have been taken from the Alaskan Native Language Archive (ALNA) and manually matched up with transcriptions, also found on the ALNA. Most of these recordings are from the 1990s or earlier and as a result are not of high quality, nor do they have matching transcriptions. Subsequently, only the recordings that are intelligible and have a transcription on the ALNA will be presented here. The amount of data is limited due to the difficult nature of this matching process. Once the recordings and transcriptions were located, they were taken into Praat, and the transcription was manually aligned to the audio. The audio was then analyzed to see if the difference between stressed and unstressed environments results in a significant difference in duration, volume, and/or pitch. In analyzing the data, it was important to consider the possibility that multiple factors could contribute to the phonetic realization of stress in toneless Na-Dene languages, or that another factor that was not measured in this project could be the main contributing factor.

Figure 1: Example of Praat Analysis Showing Duration (s), Volume (dB), and Pitch (Hz)



To control this experiment, I selected a specific segment that occurs in both stressed and unstressed environments, and I recorded the duration in seconds, the volume in decibels, and the pitch in hertz for each environment. The values were taken directly from Praat where the duration is highlighted in red (0.118837 seconds in Figure 1), the volume is the green line (66.28 dB in Figure 1), and the pitch is the blue line (566 Hz in Figure 1). To collect the value for each of these lines, it is necessary to select the point on the spectrogram that one wishes to investigate. To remain consistent, I always selected the highest value for both volume and pitch. The specific environment that was selected was the /a/ vowel as it occurs in both selected languages of Ahtna and Dena'ina, and it occurs in both stressed and unstressed positions in both languages. For each recording, three words where /a/ is stressed and three words where /a/ is unstressed were selected for analysis.

2.2 Languages

The two languages chosen for this project were Ahtna and Dena'ina. Both languages are a part of the Na-Dene family and are traditionally and currently located in Alaska. The two languages of Ahtna and Dena'ina are closely related as they are both quite conservative; that is, they appear to preserve features from their theoretical ancestor parent language, Proto-Na-Dene. One of these features shared between these two languages is tonelessness, whereas most other Na-Dene languages are tonal. As discussed in section 1.2 regarding Leer (1999), tonogenesis is believed to have occurred in many Na-Dene languages from the toneless parent Proto-Na-Dene. Both Ahtna and Dena'ina did not undergo tonogenesis and thus still resemble the Proto language. It is because of their toneless nature that these

two languages were selected to analyze how stress is realized in the absence of tone in the Na-Dene family.

2.2.1 Ahtna

The Ahtna live in the 'Headwaters Country' in Alaska that consists of complex mountain passes and is a crucial resource of salmon and other game (Kari, 1986). The Ahtna language is spoken in and around Copper River and consists of four dialects: Upper, Central, Lower, and Western Ahtna, with all but Lower Ahtna still being spoken today. The language is classified as nearly extinct on the World Atlas of Language Structure (WALS) and Glottalog (Campbell et al, 2022). Ahtna, like its other Na-Dene languages, has complex phonetics and phonology with a large consonant inventory, including plain, aspirated, and ejective plosives and affricates. Ahtna also has a large vowel inventory with contrastive long and short vowels. The full consonant and vowel charts for Ahtna can be seen in Tables 1 and 2. The recordings taken from ANLA are specifically of speakers of the Upper Ahtna dialect. Most of the information regarding the language is sourced from James Kari's 1990 grammar of Ahtna; however, the transcription of the stories is from Kari's earlier work titled *Tatl'ahwt'aenn Nenn' (The Headwaters People's Country): Narratives of the Upper Ahtna Athabaskans* (Kari, 1986).

Table 1: Ahtna Consonant Inventory (Kari 1990)

		Labial	Alveolar	Lateral	Velar	Uvular	Glottal
Nasals		m	n		ŋ		
Plosives/ Affricates	Plain	p	t ts	tɬ	k	q	ʔ
	Aspirated	p^h	t^h ts^h	$tɬ^h$	k^h	q^h	
	Ejective		t' ts '	tɬ'	k'	q'	
Fricatives		v	s z	ɬ	x ɣ	χ ʁ	h
Approximant		h^w		l			

Table 2: Ahtna Vowel Inventory (Kari 1990)

	Front		Back	
	Short	Long	Short	Long
High	ɪ	iː	ʊ	uː
Mid	ɛ		ɔ	oː
Low	ɐ	æ		ɑː

2.2.2 Dena'ina

The Dena'ina language sometimes referred to as Tanaina, is spoken in Cook Inlet in Alaska and consists of four dialects: Upper Inlet, Outer Inlet (sometimes called the *Kenai* dialect), Iliamna, and Inland (Boraas, 2009). The recordings taken from ALNA are all of Peter Kalifornsky who speaks the Kenai dialect. Like Ahtna, Dena'ina is also classified as nearly extinct by Glottalog, the Kenai dialect being the most endangered. In 2009, there were only around 10 speakers of the dialect, including Peter Kalifornsky. (Campbell et al, 2022; Boraas, 2009). In line with the Na-Dene family, Dena'ina has a rich consonant system with plain, aspirated, and ejective stops and affricates, as seen in Table 3. The vowel inventory for Dena'ina is not as complex as Ahtna as it does not have contrastive vowel length and only has four vowels as seen in Table 4. The grammatical and morphological information for Dena'ina is sourced from Boraas' (2009) grammar of Kenai Dena'ina titled *An Introduction into Dena'ina grammar: the Kenai (Outer Inlet) Dialect*. The transcriptions and recordings all come from Peter Kalifornsky's award winning book titled *K'tl'egh'i Suku* (Remaining Stories) where he wrote traditional Dena'ina stories which were translated with the help of Kari.

Table 3: Dena'ina Consonant Inventory (Boraas, 2009)

		Labial	Alveolar	Lateral	Palatal	Velar	Uvular	Glottal
Nasals		m	n			ŋ		
Plosives/ Affricates	Plain	p	t ts	tɬ	tʃ	k	q	ʔ
	Aspirated	p^h	t^h ts^h	$tɬ^h$	$tʃ_h$	k^h	q^h	
	Ejective		t' ts'	tɬ'	tʃ"	k'	q'	
Fricatives		f v	s z	ɬ	ʃ ʒ	x ɣ	χ ʁ	h
Approximant				l	j	w		

Table 4: Dena'ina Vowel Inventory (Boraas, 2009)

	Front	Central	Back
High	i		u
Mid		ə	
Low		a	

2.3 Data Selection

When performing data analysis, it is important to restrict the bounds of the inquiry to ensure accurate results. The first restriction was selecting the /a/ as the segment of interest in stressed and

unstressed environments, as mentioned in section 2.1. Another crucial restriction concerns the amount of data collected. For each language it was important to have three different recordings to provide enough data and to ensure that the results do not occur due to random error. For the audio clip being analyzed, it must contain only the selected word and have a matching transcription to locate /a/. Furthermore, the sound cannot be produced in isolation as stress is often affected by the preceding and following segments, as discussed in section 1.1. Additionally, since I am not a speaker of Ahtna or Dena'ina, I do not have native intuitions on the phonology of these languages, and thus consulted with other listeners to more accurately determine where the primary stress of the word was. To avoid bias about where the primary stress is in the word based on the spectrogram, I would gather the opinions of non-linguists and from people not looking at the spectrogram. The last criteria I imposed on this research project is that the word must be polysyllabic. This is important to get the unstressed /a/ environments, it assumes that another vowel in the word is stressed and thus cannot be monosyllabic. As well, most of the research conducted on Na-Dene languages has specifically been done with monosyllabic or disyllabic words (e.g., Krauss (1964); Leer (1979)). As a result, not much work has been done on stress in polysyllabic words in Na-Dene, so I believe that it was especially significant to pursue here.

3 Results

For each of the statistical analyses performed below, an alpha value of 0.05 (confidence interval of 95%) was assumed. For Figure 2-6, each of the columns of duration, volume, and pitch of Tables 5-10 were compared in group with an independent samples t-test. This test compared the variance between stressed ('yes') and unstressed ('no') values in each column. The results of the one-sided and two-sided t-tests are shown in the significance column of the figures. The independent t-test calculates the significance for equal variance assumed and for equal variances not assumed, and for this project I will only be looking at the equal variances not assumed values. Furthermore, since I am looking for an increase in one of duration, volume, or pitch from unstressed to stressed syllables, I will be looking at the one-tailed tests. Thus, the hypotheses for this project are made with the two-group t-test structure of a null hypothesis and an alternative hypothesis. The hypotheses are as follows:

$$H_0 = \mu_{stressed} \leq \mu_{unstressed}$$

$$H_a = \mu_{stressed} > \mu_{unstressed}$$

3.1 Ahtna Results

Three stories were able to be matched to the transcriptions from *Tatl'ahwt'aenn Nenn' (The Headwaters People's Country): Narratives of the Upper Ahtna Athabaskans* by James Kari.The three

chapters that were matched was “Chapter 4: Dae’ Ts’atk’aats (How We Were Trained)” which corresponds to ANLC5030B, “Chapter 8: Tsaał K’aas C’eghaan T’ił’aen’de (When ‘He Trains the Chinook Wind’ Made War)” (ANLC5030A), and “Chapter 17: C’uka Ts’ul’aen’i gha Nen’ Ta’stedeł dze’ (How We Went Hunting Out in the Country)” (AT973K2010). Because each of these stories is spoken by a different person, I will not compare the pitch and volume across samples, since the sex of the speaker can affect these factors (Chen et al, 2010). Thus, duration was compared both across samples and within-sample, while pitch and volume were only compared for each story.

Table 5: Huston Sanford Reading “Chapter 4: Dae’ Ts’atk’aats (How We Were Trained)”

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
neniłdaagga'en	yes	0.187966	64.46	403.9
nicdalzes	yes	0.087683	66.09	538.9
nek'ehwtedax	yes	0.118368	66.95	640.2
nahwnedełi'eł	no	0.160754	68.93	606.4
nakakolniis	no	0.094798	62.33	505.2
nadaexi'en	no	0.155596	64.99	572.7

Figure 2: One-Tailed and Two-Tailed T-Test for Huston Sanford’s Ahtna Data

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
LENGTH	Equal variances assumed	.419	.553	-.157	4	.442	.883	-.0057103	.0364504	-.1069128	.0954921
	Equal variances not assumed			-.157	3.618	.442	.884	-.0057103	.0364504	-.1112671	.0998464
LOUDNESS	Equal variances assumed	1.945	.236	.203	4	.424	.849	.41667	2.05150	-5.27921	6.11255
	Equal variances not assumed			.203	2.568	.427	.854	.41667	2.05150	-6.77916	7.61249
PITCH	Equal variances assumed	1.385	.304	-.452	4	.337	.674	-33.76667	74.63160	-240.97720	173.44387
	Equal variances not assumed			-.452	2.730	.342	.684	-33.76667	74.63160	-285.14992	217.61658

Table 5 shows the data collected for Huston Sanford reading Chapter 4 and for each highlighted vowel (/a/) in the chart's word column. By looking at the significance values in the unequal variance and one-sided t-test rows and columns in Figure 2, length (duration), loudness (volume), and pitch are not significant. This is because when these p-values are compared to the alpha value of 0.05, they are not lower than the alpha, and the null hypothesis is not rejected. Since none of this data is significant, no conclusions can be drawn from only looking at Huston Sanford's data.

Table 6: Katie John Reading "Chapter 8: Tsaał K'aas C'eghaan T'ił'aen'de (When 'He Trains the Chinook Wind' Made War)"

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
stanad**aa**s	yes	0.265884	64.40	851.3
ts'ilgh**a**n	yes	0.126750	63.59	783.4
sk'etl'**aa**ze'	yes	0.225314	66.39	953.2
n**a**hwogholnigi	no	0.111882	63.11	817.4
st**a**nadaas	no	0.083615	62.37	919.3
stan**a**daas	no	0.179850	62.51	885.3
st**a**natkaes	no	0.090535	59.56	817.4

Figure 3: One-Tailed and Two-Tailed T-Test for Katie John's Ahtna Data

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
LENGTH	Equal variances assumed	1.051	.352	2.070	5	.047	.093	.0895122	.0432452	-.0216532	.2006775
	Equal variances not assumed			1.913	3.124	.074	.148	.0895122	.0467881	-.0560926	.2351169
LOUDNESS	Equal variances assumed	.029	.870	2.489	5	.028	.055	2.90583	1.16754	-.09542	5.90709
	Equal variances not assumed			2.530	4.697	.028	.056	2.90583	1.14878	-.10537	5.91703
PITCH	Equal variances assumed	.648	.457	.054	5	.479	.959	2.78333	51.11472	-128.61124	134.17790
	Equal variances not assumed			.050	3.063	.482	.963	2.78333	55.53031	-171.90149	177.46815

Table 6 shows the data collected for Katie John reading Chapter 8, and the data collected is for each of the highlighted vowels (/a/) in the word column of the chart. The procedure was the same as mentioned for Figure 2, so the significance can be found in the significance column of Figure 3. Unlike Huston Sanford's data, volume is significant for the one-sided t-test with unequal variances. The value is 0.028, which is less than the alpha of 0.05, making this data significant at the 95% confidence interval. With a p = 0.028, a t = 2.489, and a mean difference of 2.91 dB, I can reject the null hypothesis and conclude that stressed syllables are louder than unstressed syllables in Katie John's speech. The significance values for length duration and pitch show no significant variance between stressed and unstressed syllables in Figure 3, thus the null hypothesis cannot be rejected, and no conclusion can be drawn.

Table 7: Adam Sanford Reading "Chapter 17: C'uka Ts'ul'aen'i gha Nen' Ta'stedeł dze' (How We Went Hunting Out in the Country)"

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
sesy**aa**ne'yaen	yes	0.138925	79.04	1210
n**a**daeggi	yes	0.168357	74.92	769.4
ts'egh**aa**x	yes	0.186860	80.60	735.5
k**a**ts'enaes	no	0.129134	77.50	701.6
n**a**xaelts'eldeli'el	no	0.079288	82.94	735.5
n**a**ts'idaetl	no	0.142137	80.94	803.2

Figure 4: One-Tailed and Two-Tailed T-Test for Adam Sanford's Ahtna Data

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
						Significance				95% Confidence Interval of the Difference
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
LENGTH	Equal variances assumed	.615	.477	2.019	4	.057	.114	.0478610	.0236996	-.0179396	.1136616
	Equal variances not assumed			2.019	3.657	.060	.120	.0478610	.0236996	-.0204483	.1161703
LOUDNESS	Equal variances assumed	.039	.853	-.979	4	.192	.383	-2.27333	2.32257	-8.72181	4.17514
	Equal variances not assumed			-.979	3.984	.192	.383	-2.27333	2.32257	-8.73234	4.18567
PITCH	Equal variances assumed	9.589	.036	1.016	4	.184	.367	158.20000	155.72106	-274.15098	590.55098
	Equal variances not assumed			1.016	2.153	.205	.410	158.20000	155.72106	-468.31159	784.71159

Table 7 shows the data collected for Adam Sanford reading Chapter 17, and the data collected is for each of the highlighted vowels (/a/) in the word column of the chart. The independent sample test for length (duration), loudness (volume), and pitch for this data is shown in Figure 4. By looking at the significance values for the unequal variances row, no p-values are below the threshold of 0.05, and thus this data is not significant. Therefore, the null hypothesis cannot be rejected, and I cannot make any conclusions regarding the effect of duration, volume, or pitch on Adam Sanford's syllable stress.

Figure 5: One-Tailed and Two-Tailed T-Test for All Ahtna Duration Data

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
						Significance				95% Confidence Interval of the Difference
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
LENGTH	Equal variances assumed	1.425	.249	2.090	17	.026	.052	.0445863	.0213297	-.0004153	.0895880
	Equal variances not assumed			2.042	13.371	.031	.061	.0445863	.0218340	-.0024505	.0916231

As mentioned at the beginning of the analysis of the Ahtna data, only the length of the vowel /a/ can be compared across the data since volume and pitch are dependent on the speaker and their sex and vocal cord length (Chen et al, 2010). Within each individual's speech, the length of the vowel did not prove to be significant. However, comparing the results across the samples yields a value of $p = 0.031$, $t = 2.042$, and a mean difference of 0.446 for the one-tailed t-test with unequal variances. Since this p-value of 0.031 is smaller than the alpha of 0.05, I can conclude that these results are significant at the 95% confidence level. As such, I am able to draw the conclusion that stressed syllables are longer than unstressed syllables in Ahtna.

3.2 Dena'ina Results

I was able to match three transcriptions to three separate recordings of Peter Kalifornsky reading Kenai Dena'ina. Two of the transcriptions came from Kalifornsky's book *K'tl'egh'i Sukdu*, specifically "K'uch' Qinseshi Suduk II (Supernatural Story II)" (the beginning of ANLC1318B) and "Unhshcheyakda Sukt'a (My Great Great-Grandfather's Story)" (21:31 of the same recording). The

other transcription is the “Naq’eltanich’ Bahdach’nelneshi (The Lord's Prayer)”, which was found in *Kalifornsky Songs and Stories* (identifier TI 972 Kl, K1972b) and corresponds to 35:00 in ANLC1378. I have separated the three stories into different tables with the data collected depending on the story. Since all the stories are by the same speaker, I can analyze duration, volume, and pitch across the samples as seen in Figure 6.

Table 8: Peter Kalifornsky Reading K’uch’ Qinseshi Suduk II (Supernatural Story II)

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
Den**a**'ina	yes	0.155632	69.56	904.9
y**a**hghuhdnil'ih	yes	0.116030	71.16	1074
ghet**a**zhchedi	yes	0.233743	74.81	1142
k'qestl**a**gh	yes	0.241510	66.35	873.1
q'**a**ghnudnul'ih	no	0.078957	63.96	769.4
q**a**qyedenish	no	0.130473	74.68	1210
q**a**hdełtl'it'h	no	0.088307	71.77	1040

Table 9: Peter Kalifornsky Reading Unhshcheyakda Sukt’a (My Great Great-Grandfather's Story)

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
nach'**a**nildush	yes	0.114609	74.51	972.7
Naq**a**n'ijut	yes	0.110655	73.14	871.0

Qadanalchen	yes	0.095204	70.72	701.6
q'anqeydul'uk	no	0.107701	72.15	972.7
taqiynin'un	no	0.080313	74.44	938.8
Qadanalchen	no	0.081144	71.53	803.2
Qadanalchen	no	0.074466	75.57	873.1

Table 10: Peter Kalifornsky Reading Naq’eltanich’ Bahdach’nelneshi (The Lord's Prayer)

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
yuyanq'	yes	0.192437	77.46	701.6
ch'adlkidi	yes	0.135499	83.47	904.9
qtułahqech'	yes	0.100123	73.34	701.6
Natukda	no	0.153106	85.64	837.1
taqech't'htunił	no	0.072236	73.73	667.7
nak'uch'inłkit	no	0.120439	79.38	938.8

Figure 6: One-Tailed and Two-Tailed T-Tests for Dena'ina Data

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
LOUDNESS	Equal variances assumed	.051	.823	-.361	18	.361	.722	-.83300	2.30920	-5.68444	4.01844
	Equal variances not assumed			-.361	17.461	.361	.723	-.83300	2.30920	-5.69519	4.02919
LENGTH	Equal variances assumed	5.220	.035	2.622	18	.009	.017	.0508300	.0193878	.0100978	.0915622
	Equal variances not assumed			2.622	13.368	.010	.021	.0508300	.0193878	.0090620	.0925980
PITCH	Equal variances assumed	.000	1.000	-.298	18	.385	.769	-20.34000	68.33780	-163.91239	123.23239
	Equal variances not assumed			-.298	17.999	.385	.769	-20.34000	68.33780	-163.91281	123.23281

From Figure 6, the p-value for length for the one-tailed and unequal variance is p = 0.010, which is less than the alpha value of 0.05. This means the value is significant, and the null hypothesis can be rejected to support the alternative hypothesis. Since t = 2.622 which is a positive value, the positive correlation of the alternative hypothesis is accepted, thus I conclude that the vowel /a/ is longer in stressed syllables than in unstressed syllables. The p-values for pitch and loudness are not significant at the alpha value of 0.05, thus no conclusions can be drawn from that data. These results mirror the results that were seen in Ahtna.

4 Discussion

In the following section, I discuss the results provided in section 3 and situate them within the broader literature. This section will address the individual results from both Ahtna and Dena'ina before comparing them to each other. The implications of this research for the Na-Dene language family and suggestions for further research will also be discussed.

4.1 Ahtna Conclusions

From the comparison of duration, volume, and pitch in Ahtna, only duration proved to be statistically significant. This led me to conclude that the duration of the vowel /a/ is longer in stressed syllables than unstressed syllables. It is important to note that some of the values included for duration are for long vowels, since Ahtna has both the long vowel [æ] and the short vowel [ɐ]. For all the words that were taken into consideration for Ahtna, the long vowels only appeared in the stressed position, which does support the hypothesis that longer duration is what phonetically indicates stressed syllables, and sometimes, that arises as long vowels in Ahtna. However, I also want to point out that not every long vowel is stressed in Ahtna. For example, with "Nakakolniis" in Table 5, the long vowel of [iː] does not attract the primary stress which is actually realized on the /o/. For all three speakers of Ahtna that were collected in section 3, pitch did not show significant difference between the stressed and unstressed. This

is surprising, since I had expected pitch to be involved in stress determination since other Na-Dene languages have prosodic pitch (tone), which can play a role in stress assignment. If Ahtna and Dena'ina, the more conservative languages of the Na-Dene family, had pitch influenced the assignment of stress, this research could phonetically support Leer (1999) and the theory of tonogenesis. However, pitch did not come into play, so this project makes no claims about tonogenesis and the assignment of stress in Na-Dene.

Lastly, with volume in the Ahtna data, only Katie John's speech was significant at the 0.05 level for having a difference between stressed and unstressed syllables. Since this pattern did not show up in any other Ahtna speech, it could be a unique characteristic of Katie John's speech. Alternatively, this pattern could be indicative of the role volume plays in the perception of stress in Ahtna. In order to further understand this pattern, I investigated the difference in volume between the vowel /a/ in three different positions of a polysyllabic word. Given the limited data, only the word "Stanadaas" was able to be researched in this study, as seen in Table 11 below. The word "Stanadaas" allows me to investigate the vowel /a/ in three separate environments: two unstressed and one stressed. There is not enough data to run a robust statistical analysis on the data in Table 11, but by visual analysis, the volume of the stressed /a/ is roughly 2 dB higher than that of the unstressed /a/. More data needs to be collected to draw conclusions on whether this finding is significant, but regardless, it is interesting that only Katie John's speech showed this pattern.

Table 11: Analysis of the Ahtna Word Stanadaas

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
stanad**aa**s	yes	0.265884	64.40	851.3
st**a**nadaas	no	0.083615	62.37	919.3
stan**a**daas	no	0.179850	62.51	885.3

4.2 Dena'ina Conclusions

From the comparison of duration, volume, and pitch for Dena'ina, like Ahtna, only duration proved to be statistically significant. Similarly to Ahtna, I was able to conclude that the duration of the

vowel /a/ is longer in stressed syllables than unstressed syllables in Dena'ina. Unlike Ahtna, Dena'ina does not have contrastive vowel length and thus does not have the long vowel /aa/. The lack of the moraic long vowel syllable in Dena'ina helps emphasize the significance of duration affecting the location of stress since a long-short vowel contrast cannot be the cause of this significant observation. As such, the data from Dena'ina is crucial to the understanding of phonetic realization of stress in Na-Dene, as this finding does not result from the existence of long vowels or from tone, but purely from the duration of /a/. On the other hand, pitch and volume did not show any significant effects on stress in Dena'ina. Similar to what was discussed in 4.1, it was surprising that pitch did not play a role in Dena'ina, since tone later developed in other Na-Dene languages (Leer, 1999).

In terms of the volume data for Dena'ina, there was no significant variance between the stressed and unstressed environments across the data collected from Peter Kalifornsky's speech. Due to the pattern found in Katie John's Ahtna speech, I investigated whether there was a similar pattern in Dena'ina by looking at the word "Qadanalchen". This word was chosen as it allowed me to investigate the vowel /a/ in three separate environments: two unstressed and one stressed. Since only one word was investigated, there is not enough data for significant analysis, but the volume information can be observed visually. The stressed /a/ vowel in "Qadanalchen" is quieter by around 2-5 dB compared to the unstressed /a/ vowel. This observation would not support the idea that volume increases on the stressed syllable in a polysyllabic word in Dena'ina. Interestingly, by visual observation, I noticed that the first syllable is typically the loudest in Dena'ina. However, I did not collect data on this specifically.

Table 12: Analysis of the Dena'ina Word Qadanalchen

Word	Stressed	Duration (s)	Volume (dB)	Pitch (Hz)
Qadan**a**lchen	yes	0.095204	70.72	701.6
Qad**a**nalchen	no	0.081144	71.53	803.2
Q**a**danalchen	no	0.074466	75.57	873.1

4.3 Implications for Na-Dene Languages

The results discussed above correspond with the literature discussed in section 1.1.2, especially with the study conducted by Jaker and Howson (2022). Even in tonal Na-Dene languages like Tetsǫ́t'ıné, duration was found to be the cue for the location of primary stress. It is interesting to see that both toneless Na-Dene languages of Ahtna and Dena'ina share these results. This would suggest that, fundamentally, duration is the cue used in Na-Dene languages to indicate stress.

While this cannot be concluded with certainty, it can be posited to be likely since both toneless and tonal Na-Dene languages exhibit duration-induced stress assignment. According to both grammars for Ahtna and Dena'ina, stress is predictable in both languages and typically falls stem-initially (Kari, 1990; Boraas, 2009). Neither language has been classified as iambic or trochaic, however, following the Iambic-Trochaic Law stated in Hayes (1995), it is possible to identify the foot pattern of these languages. Jaker and Howson (2022) found that Tetsǫ́t'ıné is dependent on heavy moraic syllables (long vowels or moraic codas), and they concluded that it was iambic due to its heavy foot-initial stress.

My research found that stress is cued with vowel duration in Ahtna and Dena'ina, and both are known to have stem-initial stress (Kari, 1990; Boraas, 2009). Therefore, it could be the case that these two languages are also iambic, as was found for Tetsǫ́ t'ıné (Jaker & Howson, 2022). However, despite finding that duration plays a significant role in the phonetic realization of stress, it may not be the sole determinant of stress in the Na-Dene family. This specifically relates to the volume pattern found in Katie John's Ahtna speech, where the stressed syllable appears to be louder than the other syllables. Since vowels of the same quality must be compared and there is a lack of data, nothing conclusive can be drawn, however, this observation aligns with lexical stress cues cross-linguistically (Mousikou et al, 2024). As well, it was noted that not all long vowels are stressed, which suggests that Ahtna (and potentially Dena'ina by association) are not entirely governed by duration. It could be the case that stress is also influenced by additional prosodic features (like volume mentioned above). This aligns with Metrical Stress Theory, which allows for stressed heavy syllables but does not require all heavy syllables to be stressed (Hayes, 1995). Thus, while duration was found to be a key acoustic cue in stress assignment in Ahtna and Dena'ina, it must also be understood in conjunction with the specific phonological systems of the languages.

4.4 Further Research and Limitations

This study lends itself many avenues for further research. One area that I wish to investigate further is the potential effect of volume on the assignment of stress. Since there was some significant

data in Ahtna with Katie John's speech, it would be interesting to gather more data and see if this result is an isolated case or is part of a larger pattern. Building on this, I would investigate the volume of the vowel /a/ in different positions within one word, as seen in Table 11. This would allow for the comparison between stressed and unstressed /a/ in a word to see if stressed syllables are significantly louder than unstressed syllables in Ahtna. It would also be interesting to extend this research to Dena'ina. However, I expect that Dena'ina would show a different pattern, based off the data and analysis of Table 12 in section 4.2.

Additionally, further investigation into stress in polysyllabic words should be done. This research was one of the first to look at polysyllabic words specifically and due to this, the foot assignment of syllables has not been studied in depth. I would like to expand on this research to see if conclusions can be drawn regarding whether Ahtna and Dena'ina form iambic or trochaic feet like Jaker and Howson (2022) did for Tetsǫ́ t'ıné. The final area of further research I will mention is connecting this study to the information known about Proto-Na-Dene. We currently know that Proto-Na-Dene would have been toneless and thus Ahtna and Dena'ina are the two Na-Dene languages that closely resemble it due to their conservative nature. It would be interesting to see if this research could provide insight into how stress would have been cued in Proto-Na-Dene. Since Proto-Na Dene is purely theoretical and cannot be spoken, researching the current spoken languages that most resemble it is the only way to obtain information regarding stress in the Proto language.

I would also like to address the many factors that limited the study. Firstly, I am a white non Indigenous researcher who does not speak any Na-Dene language. Not being able to speak or understand the languages I was investigating could have affected my judgement regarding the place of stress within the words, along with the process of lining up the transcription with the audio file. Another limitation is the lack of data collected for this research. Due to poorly managed archives, there was a lot of difficulty finding audio-transcription matches thus only three recordings for each language were analyzed. While this was enough data to pull significant results, with more time and manpower, much more data could be collected for further research. The last limitation is the degree of error that comes with using Praat to get the values for duration, volume, and pitch. All these values are dependent on the researcher, as to obtain the value, you must click on the point you wish to investigate, and as such, different researchers will have different methods. As mentioned in section 2.1, I always selected the highest value for volume and pitch with the goal of mitigating as much error as possible. For further research, a more accurate tool could be utilized to collect these values.

5 Conclusion

The goal of this paper was to investigate whether duration (s), volume (dB), and/or pitch (Hz) cued the phonetic realization of stress in toneless Na-Dene languages. This research focused on data collected from the Alaskan Native Language Archive (ANLA) for the Ahtna and Dena'ina languages, specifically looking at /a/ in both languages. After analyzing three different recordings for each language, I was able to conclude that duration played a significant role in the phonetic realization of stress in both Ahtna and Dena'ina. Since the data was significant for a one-tailed t test, I was able to reject my null hypothesis and conclude that the vowel /a/ is longer in stressed syllables compared to unstressed. These findings are instrumental to future work that could be conducted into stress and Na-Dene languages, as it is a historically understudied field.

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Tonal Opposition in Northern and Southern Tutchone

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Abstract

This paper examines tonal opposition in two closely related Athabaskan languages, Northern and Southern Tutchone, both spoken in the Yukon Territory and Alaska. Despite their shared linguistic roots, these languages exhibit contrasting tonal systems: Northern Tutchone uses high tone as the marked category, while Southern Tutchone favours low tone. The study investigates whether this tonal divergence originated from a common ancestral development or arose independently through different phonetic inputs. Drawing on comparative phonological analysis, this research explores various hypotheses regarding tonogenesis, including shared origin with diverging outcomes, asymmetric derivation, and independent development. The paper further discusses broader patterns of tonal opposition within the Athabaskan language family and explores similar cases in other language families, suggesting that tonogenesis can lead to the development of divergent tonal systems even in closely related languages. The findings highlight the complex processes involved in the emergence of tone as a contrastive feature, contributing to our understanding of historical phonology and tonogenesis in North American Indigenous Languages.

1 Preliminary Remarks

This paper examines tonal opposition in two closely related Athabaskan languages, Northern Tutchone and Southern Tutchone. Primarily spoken in Alaska and the Yukon Territory, these are two severely endangered languages. Due to the limited availability of comprehensive grammar for either language, particularly in terms of tonal descriptions, this analysis relies on a comparative approach. It primarily draws on lexical data from publicly available dictionaries provided by the Yukon Native Language Center and phonetic reconstructions and theoretical analyses from broader Na-Dene literature. Throughout this paper, the following conventions are used: high tone is marked with an acute accent (e.g., é, k'éʔ), whereas low tone is marked with a grave accent (e.g., è, k'à), which is consistent with standard Tutchone orthography. Glottal stops are represented by the IPA symbol [ʔ]. Marked tone in this paper is referring to the less common or more phonologically complex tonal category in a given language, often carrying additional linguistic significance or emerging from specific historical developments (Hyman 2010). Examples from other Athabaskan languages, such as Tanacross, Dogrib, and Slavey, are cited in

their original transcriptions where available. The proto-language forms and reconstructions are based on sources including Leer (1999), Kingston (2005), and Hargus & Rice (2005).

The scope of this analysis is limited to lexical and morphological tone opposition in Tutchone and comparative data from select Athabaskan and non-Athabaskan languages where tonal opposition or markedness reversal is attested. While the exact mechanisms of tonogenesis and tonal divergence between Northern and Southern Tutchone remain unclear, several hypotheses have been proposed, each grounded in diverging patterns of glottalization, phonation, and diachronic sound change.

Unless otherwise stated, the phonological analysis in this study assumes a diachronic perspective, focused on the emergence and evolution of tone as a contrastive feature among these languages.

2 Introduction

2.1 The Athabaskan Languages

The Athabaskan–Eyak–Tlingit (AET) family, a subgroup of the Na-Dene language family, comprises a group of Indigenous languages spoken across North America. These languages share a number of typological properties, including complex templatic verbal morphology and broadly comparable segmental inventories. The Northern Athabaskan languages are distributed across northern North America, extending from the interior of Alaska to Hudson Bay, and from the Arctic Circle south to the Canada–United States border (McDonough 2008).

The AET family is generally estimated to include approximately 47 languages, although the precise number varies depending on classificatory criteria and dialect–language distinctions. Figure 1 presents an extended family tree of AET based on Goddard (1996). Subsequent work (e.g. Leer 2008) supports the inclusion of Eyak within this grouping and the exclusion of Haida, in contrast to Sapir's (1915) earlier proposal concerning their genetic affiliation.

Within Na-Dene, Athabaskan and Eyak form a particularly close subgroup (Athabaskan–Eyak), with Tlingit constituting a coordinate branch. In this paper, AET refers to the Athabaskan–Eyak–Tlingit family as a whole. The spelling *Athabaskan* is adopted throughout for consistency, though alternative spellings have been used historically.

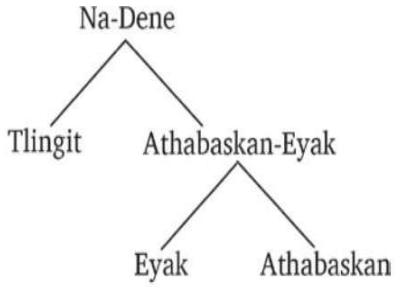

Figure 1: Na-Dene language family, based on Goddard (1996)

2.2 Northern and Southern Tutchone

Northern Tutchone and Southern Tutchone are two closely related languages which belong to the Athabaskan branch of the Na-Dene language family. They are traditionally spoken in the Yukon Territory of northwestern Canada, with some historical presence in adjacent areas of Alaska. Today, both languages are considered severely endangered, with some estimates placing the number of native or fluent speakers in the low hundreds, many of whom are elderly (Krauss 1996). The Tutchone people self-identify as part of the Dene cultural group, and their language reflects a history of oral tradition, kinship terms, and ecological knowledge. Northern Tutchone is spoken in communities such as Pelly Crossing and Mayo, and Southern Tutchone is spoken in places like Haines Junction, Burwash Landing, and Whitehorse (Yukon Native Language Centre nd).

Linguistically, both languages exhibit typical Athabaskan characteristics: complex verb morphology, templatic verb structure (although this is itself controversial), and a historically toneless proto-language. Despite these shared features, the two languages differ sharply in their tonal systems. In Northern Tutchone, high tone is the main marked tonal category, while in Southern Tutchone, low tone is marked. This leads to cases of direct tonal opposition across cognate vocabulary (Krauss 2005; Yukon Native Language Centre nd). This tonal distribution is shown in Figure 2 below, based on Krauss (1974).

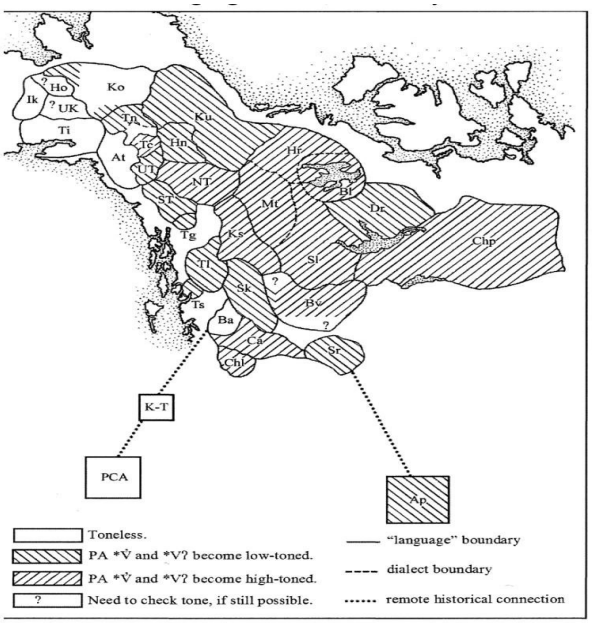

Figure 2: The Tonal Distribution Map of Northern Indigenous Languages (Krauss 1974).

According to Michael Krauss's influential language mapping work, both languages are classified as severely endangered in Alaska and the Yukon. Krauss emphasized not only the geographic spread of Athabaskan languages but also their precarious status. His map-based documentation provides a useful visual of the shrinking linguistic landscape in which Tutchone exists. The language family relationship is genealogically established, with Tutchone being a formalized member of the Northern Athabaskan subgroup. However, unlike many other Northern Athabaskan languages, Northern and Southern Tutchone present an intriguing case of tonogenesis, leading to divergent tone-marking systems. This contrast leads to the central puzzle discussed in this paper; why two closely related varieties, sharing much of their phonological and genealogical profile, have developed opposite marked tonal categories through tonogenesis.

2.3 Research Goals and Hypotheses

As mentioned above, this analysis seeks to understand the relationship between Northern and Southern Tutchone and answer the questions of how and why tonal opposition emerged between these two languages. Therefore, the overarching goal is to determine whether tonal divergence between N/S Tutchone can be traced to a shared historical development that later split, or whether the two tonal systems developed independently due to different phonetic inputs.

Due to the lack of available data, I rely on systems of related Athabaskan languages such as Slavey, Dogrib, Doig and Halfway (Dane-z̲ aa). This approach also allows me to evaluate whether the Northern–

Southern Tutchone tonal contrast is an isolated development or part of a wider Na-Dene pattern of tonogenesis and changing tonal markedness (Tuttle 2003). Therefore, to guide this inquiry, the following hypotheses are proposed:

i. Shared origin, diverging outcomes: Tone developed in Proto-Tutchone from glottal or laryngeal features but later split into high vs. low tone alignments in Northern and Southern Tutchone.

ii. Asymmetric derivation: One variety (likely Northern Tutchone) developed marked tone from glottal features first, and the other reanalyzed tone oppositely, either through dialectal diffusion or structural rebalancing.

iii. Independent tonogeneses: Northern and Southern Tutchone each developed tone independently from different glottal or phonatory cues, possibly due to local geographic or sociolinguistic factors.

In addition to these hypotheses, I pose a secondary question that investigates whether tone opposition is a recurring phenomenon elsewhere in the family and outside of it. If tonal opposition proves to be a systematic pattern, this could suggest broader implications for our understanding of tonogenesis and historical phonology in this region. These hypotheses will be explored through comparative phonological analysis, previous historical reconstructions, and the examination of phonetic environments. As of now, the answer to this question in the broader Na-Dene literature remains unclear; however, speculating about all three hypotheses is a worthy investigation.

3 Defining Tonogenesis

3.1 Broad Definitions of Tonogenesis

Tonogenesis refers to the process by which tonal contrasts- specifically, the pitch of a syllable that can alter meaning- arise from earlier non-tonal contrasts (Michaud 2020). Essentially, this means that phonological representations of tone in language allow for distinctions between two utterances. Historically, tone has been detected using the comparative method, but it can also be classified as a feature that is ongoing in a language. Thus, it is important to examine tone through both synchronic and diachronic studies.

Comparative-historical methods of detecting tonogenesis allow us to deduce the original conditioning environments that resulted in the tonal contrasts present in today's language use. While synchronic studies help us understand how the phonetic qualities of a vowel (such as height, aspiration, phonation type, etc.) affect its fundamental frequency (f0), which can lead to reanalyses of the underlying phonological contrasts; the realization of a high tone versus a low tone (Michaud 2020). There are

numerous contrasts in a language that exhibit tonogenetic variation, such as aspirated versus unaspirated consonants, glottalized versus plain, voiced versus voiceless, etc. This signifies a significant diversity of evolutionary paths to the development of tone systems, some of which will be discussed in the sections below for Northern and Southern Tutchone.

To illustrate the process of tonogenesis, I will use a well-documented scenario found in many East Asian languages: the loss of final laryngeal consonants. Drawing on data and examples from Michaud (2020), the case of Vietnamese offers a classic example. In earlier stages of Vietnamese, syllables could end in glottal consonants such as /ʔ/ and /h/. These consonants had phonetic effects on voice, such as a creaky or breathy quality, that influenced the pitch of the syllable. Over time, as these final contrasts were lost in Vietnamese, the pitch contours they conditioned were reinterpreted as lexical tones, resulting in the development of three contrastive tones.

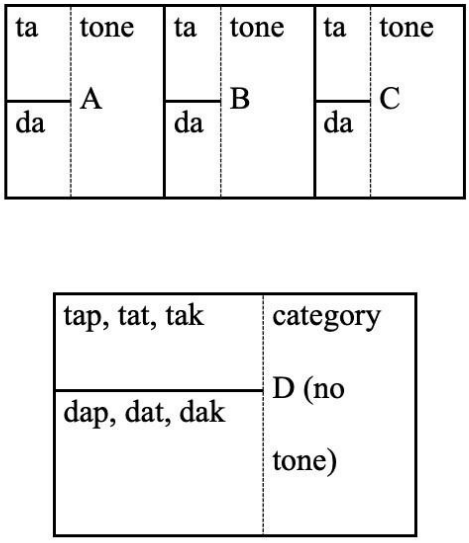

Figure 3: Tone systems before the two-way split: three tones, no distinctive tone on obstruent-final syllables (Michaud 2020).

This tonal system further evolved when initial voicing distinctions in onsets, which originally marked the contrast between voiced and voiceless consonants, began to wear down. These cues weakened, and the pitch differences associated with them were reanalyzed as additional tones, which eventually gave rise to the six-tone system in modern Vietnamese.

name	description	IPA	tone numbers	example
ngang 'level'	mid level	˧	44	*ma* 'ghost'
sắc 'sharp'	high rising	˧˥	24	*má* 'cheek, mother (southern)'
huyền 'hanging'	low falling (often breathy)	˨˩	32	*mà* 'but'
hỏi 'asking'	mid dipping	˧˩˧	312	*mả* 'tomb, grave'
ngã 'broken'	medial glottal constriction, ends on high pitch	˧ˀ˥	325	*mã* 'code'
nặng 'heavy'	glottal constriction cuts short the syllable	˨ˀ	22	*mạ* 'rice seedling'

Figure 4: The 6-tone system of modern Vietnamese (Michaud 2020).

3.2 Tonogenesis in Athabaskan

While Vietnamese is a well-documented and relevant example of tonogenesis, I will now turn to discussions of Tonogenesis in Athabaskan languages. In many Athabaskan languages, it is attested that syllables contrast in terms of high and low tones. The historical source for these tones is likely an earlier contrast between two different syllable structures, with and without final glottalization. A pre-tonal situation is still attested in several Dene languages, providing evidence that Proto-Athabaskan was underlyingly toneless. As Michaud (2020) notes, this phonological environment, final-syllable glottalization, would typically be expected to give rise to a high tone.

This is indeed attested in the Dene languages. However, it is not exhibited in all of them. The reverse interaction, where glottal constriction is reflected in low tone, is also attested. This then presents itself as "high-marked" and "low-marked" tone languages in Dene (Kingston 2005). This is illustrated in the table below, where we see the non-tonal Proto-Athabaskan and the resulting languages that are high, low, or non-tonal.

Proto-Athabaskan		High Marked		Low Marked		Non-tonal	
		Beaver	Slave	Tsek'ene	Sarcee	U. Kuskokwim	Ahtna
*qʷə̀n'	*'fire'*	[kʰwʌ́n]	[kʰǒʔ]	[kʰwə̀n]	[kʰṵ̀:ʔ]	[kʰwən']	[kʰon']
*ča'	*'beaver'*	[t͡sʰáʔ]	[t͡sʰáʔ]	[t͡sʰàʔ]	[t͡sʰàʔ]	-[t͡sʰoʔ]	[t͡sʰaʔ]
*-wət'	*'belly'*	-[pʌ́t]	-[mpéʔ]	-[pə̀t]	-[mìʔ]	-[mit']	-[peʔt]

Figure 5: Proto-Athabaskan historical reconstruction (Miller 2013).

In his 1999 study, Leer provided a foundational account of Athabaskan tonogenesis, demonstrating how a contrastive tone could have emerged out of a toneless Proto-Athabaskan system.

Through systematic comparisons of cognate forms and phonetic environments across daughter languages, Leer identified several laryngeal features, like glottalization, voicing, and aspiration, as key triggers in Athabaskan tonogenesis. He argues that many of the lexical tone distinctions visible in contemporary Athabaskan languages originated not as independent innovations but as phonologized pitch effects. These phonologized pitch effects were initially predictable from surrounding segmental features. For example, syllables ending in glottalized or constricted codas tended to produce a higher pitch, while those with voiced segments were associated with a lower pitch. Over time, as these segmental cues were lost or weakened, the pitch effects they conditioned became phonemic, resulting in contrastive tone systems (Leer 1999).

As Kingston (2005) clarifies, Leer's proposition does not suggest that tone developed directly from glottalic consonants themselves. Rather, glottalic consonants introduced a distinct voice quality, which Leer termed "constriction" on the preceding vowel. It was this non-modal phonation, and not the consonant directly, that served as the phonetic precursor to marked tone. Kingston notes that even in Proto-Athabaskan, some stem nuclei were already contrasted for constriction, such as between /*Vʔ/ and /*VV/. Over time, stems with final glottalic consonants merged tonogenetically with those whose vowels were inherently constricted, creating a pathway toward marked tone. This analysis situates Athabaskan tonogenesis within a broader pattern comparable to the example provided above on Vietnamese, where segmental loss or weakening leads to the emergence of pitch-based contrasts (Kingston 2005).

Leer's model serves as a comparative backdrop for the current study, suggesting that tonogenesis can proceed in divergent ways even within a singular language family, depending on the local phonological and, perhaps, geographic context.

Tongass Tlingit	**Eyak**	**Pre-PA**
V (short)	V (short)	V (short)
V̀ (fading)	Vh (aspirated)	–
V^{ʔ} (glottalized)	Vʔ (short glottalized)	V^{ʔ} (glottalized)
V· (lengthened)	V· (long)	V· (long)
–	V·ʔ (long glottalized)	–

Figure 6: Comparative reconstruction (Leer, Jeff 1999).

4 The Case of Northern and Southern Tutchone

Among the Athabaskan languages, as mentioned above, Northern and Southern Tutchone present a particularly interesting case of tonal divergence within the same language family. While both languages descended from the same ancestral language, Proto-Athabaskan, and remain largely mutually intelligible among speakers, they exhibit a striking and systematic opposition in lexical tone markings: words that bear a high tone in Northern Tutchone often correspond to low tone cognates in Southern Tutchone, and vice versa.

This phenomenon is not merely a matter of phonetic variation or dialectal pitch preference, but rather, I argue, a consistent, contrastive pattern that affects a wide range of lexical items. As the examples below demonstrate, this reversal is repeated across numerous lexical items, specifically in the noun class, and is borrowed from the Yukon Native Language Centre's dictionaries for both languages. Additional examples are provided in Appendix A. What makes this pattern particularly noteworthy is the toneless ancestor from which both languages originated. This seems to suggest a pattern that developed in several ways, either tone developed independently in each language, or a single process of tonogenesis led to divergent outcomes. Either possibility raises significant questions about the mechanism of tonogenesis and the potential influence of geographic factors in shaping tonal systems.

(1)

a. Northern Tutchone:

tsé

'beaver'

b. Southern Tutchone:

tsà

'beaver'

(2)

a. Northern Tutchone:

té

'father'

b. Southern Tutchone:

tà

'father'

4.1 Historical Evidence for Sound Change and Plausible Explanations

As of 2025, the answer for the diverging outcomes of Northern and Southern Tutchone remains outstanding. While we see the familial resemblance of the limited data set above, which is repeated for several lexical items in their dictionaries, we cannot confirm the exact cause of the tonal opposition exhibited. We can, however, discuss the possibilities related to the hypotheses posed in the sections above.

Given that Proto-Athabaskan is reconstructed as toneless (Leer 1999), the tonal patterns in Tutchone must be the result of post-Proto sound changes, which likely involved glottalization, phonation, and pitch effects that later became phonemic. One plausible explanation is that both Northern and Southern Tutchone underwent tonogenesis under the same phonetic environments, particularly glottalic codas or voice contrast differences, but diverged in how those features were phonologized. For example, final glottal stops or laryngealized sonorants may have triggered a creaky voice, which resulted in pitch lowering in one language (in this case, it would be Southern Tutchone), while in Northern Tutchone, the same features would have been associated with a pitch raising resulting in a higher tone. As discussed below, this kind of split would be reminiscent of tonal flips observed in other Na-Dene languages, such as Dogrib or Slavey, where the same phonetic triggers yield opposite tonal reflexes, but some differences remain (Rice 2014; Saxon 2000).

As Kinston (2005) notes, glottalic consonants often do not directly result in tone but instead induce constriction on vowels, which then become pitch cues. In this view, tonal opposition may reflect a contrast in how vowel constriction was resolved phonetically instead of a contrast in segmental content. This hypothesis would phonetically resolve vowel constriction as a high tone in Northern Tutchone or a low pitch in Southern Tutchone. In view of Dene facts, Matisoff (2003) surmises that there may be two kinds of glottal stop: strong glottal constriction is associated with tension and perceptual high pitch, whereas a lapse into creaky voice is associated with relaxation, and thus, lower pitch. This implies that both Northern and Southern Tutchone developed independently during the process of tonogenesis through parallel but phonetically distinct processes.

Perhaps one of the most compelling hypotheses is that beyond phonetic conditioning, the divergence among the languages may also reflect language contact or dialectal diffusion. As suggested in Kingston (2005), geographical separation has been correlated with tonal differentiation in other Athabaskan languages. It is possible that environmental or communicative pressures favoured tonal contrast in opposite directions across dialect boundaries. The answer most likely lies in the retention of the contrast in stem-final sonorants as well as between glottalic and non-glottalic vowels in these languages down to the present day. However, Leer (1999) suggests that the high-marked languages in

Athabaskan form a tightly compact group. This could lead to speculation that this grouping represents the spread of innovation, meaning that the low-marked system is older, and that the high-marked system evolved from a low-marked system and then spread geographically. This is worth noting, as it is still speculation at this stage, much like the other hypotheses regarding these diverging outcomes.

4.2 Some Important Distinctions

While tonal opposition observed between Northern and Southern Tutchone does mirror other tonal opposition across the Athabaskan languages, it is important to distinguish such phenomena from what Jaker (2011) described as prosodic reversal in Tłı̨chǫ Yatiì (Dogrib). In Tłı̨chǫ, Jaker argues for the Prosodic Reversal Hypothesis, which claims that the conjunct prefix follows an iambic (weak-strong) stress pattern, with feet constructed from left to right, whereas the disjunct prefixes are trochaic, with feet constructed from right to left. As a result, certain grammatical and discourse contexts can lead to intonational reanalysis of pitch accent placement, such that the expected high tone or stressed syllable shifts to a different position within the phrase. He argues that this process is not a result of tonogenesis, but of prosodic restructuring, which is driven by syntactic, pragmatic, or morphological factors. This is occurring in a language that already has tonal features.

In contrast, the tonal opposition observed in Tutchone involves lexical tone that is contrastive at the word level and appears to be the result of historical sound changes, particularly involving glottalization and phonation. Unlike prosodic reversal, which is necessarily context-dependent and variable, Tutchone's tonal patterns are systematic and predictable across lexical items, which suggests a fundamentally phonologized tone system, although the root cause is unclear. Both phenomena (the prosodic reversal that Jaker describes and Tutchone's tonal opposition) involve changes due to pitch. However, I argue that they differ in both origin and structure. Tłı̨chǫ's prosodic reversal reflects synchronic rules for intonation, whereas it can be argued that Tutchone's tonal opposition reflects a diachronic process of phonological development. This distinction is crucial in situating the case of N/S Tutchone within the framework of tonogenesis.

5 Comparison from Within the Family

Due to the lack of data availability in these languages, exploring other low- or high-tonal opposition cases in closely related languages within the family is worthwhile.

While the tonal opposition in Northern and Southern Tutchone is striking, I argue that it is not an isolated event in the Na-Dene language family. Several other pairs of closely related languages exhibit what appear to be mirror tonal systems, in which cognates bear opposite tonal markings. Although these

cases may not involve the same mechanisms as Northern and Southern Tutchone, they provide evidence that tonal divergence may be a recurrent outcome of phonologized pitch contrasts in environments shaped by the hypotheses above.

5.1 Tłı̨chǫ (Dogrib) and Slavey

A relatively well-documented case of what appears to be tonal opposition comes from the Tłı̨chǫ (Dogrib) and Slavey languages, both of which are part of the northern Athabaskan subgroup. Saxon (2000) argues that the Proto-Athabaskan complementizer *Guʔ has two functions: an adverbial complementizer for subordinate temporal clauses and an adverb suffix, which are the most basic and perhaps most ancient uses. *Guʔ has reflexes in both languages, but it has opposing tonal outcomes. In Dogrib, the form has evolved to become a lengthened vowel bearing a marked low tone, whereas in Slavey, the reflex has become ‘gú’ with a marked high tone (Saxon 2000). This is shown in the examples below. This type of tonal reversal on a shared morpheme provides evidence for divergent tonal paths from a common source: Proto-Athabaskan. As Saxon notes in her work, these differences cannot be explained by segmental phonology alone, suggesting that a deeper cause is at play, likely due to a reorganization of phonological tone assignment between the two languages.

(3) **Slave**

Ts'ǫ́danı	hehlı̨	gú	ʔabá	lanı̨we.
child	*1sS.be*	*GU*	*father*	*3S.pf.die*
'My dad died when I was a child'				(Rice 1989:1256)

Figure 7: The function of * Guʔ in Slavey.

In Figure 8, we see that *Guʔ in Slavey functions as a complementizer, with a high-marked tone, and is presented as gú.

Saxon (2000) argues that Dogrib has a morpheme that is cognate with the form in Slavey. It has functions expected to be discovered through comparative studies, but its form in modern Dogrib is quite distinct from that of Slavey. It appears as a suffix and lacks a consonant, taking the shape of a low tone copy of the final vowel of the word to which it is affixed, as shown below.

(9) Paul eyı dǫ goaʔɻ̨ ekò […]
that person 3pO.3S.pf.see-GU then

Nǫ̀htsɻ ts'ǫ̀ masì dı.
God to thank you 3S.imp.say
'When Paul saw those people […] he said thanks to God'
'At the sight of these men Paul thanked God …'
(LS glosses; LS translation; NIV translation)
(Dogrib Translation Committee: Acts 28:15)

Figure 8: Modern Dogrib and the *Guʔ complementizer

However, Saxon also argues that this form is a result of language change, with its original form being/gù/ with a low tone. Emile Petitot, in the 1860s and '70s, published transcriptions of a small number of stories, together with word-by-word glosses and free translations. According to Saxon, these translations provide evidence that the morpheme at that time had the shape /gu/. Although Petitot did not analyze tone, Saxon analyzes it as a low tone in her retranscription. Due to the nature of the complementizer, it is not the same pattern as N/S Tutchone, as it is not reflected in the core lexical items, but it does suggest concrete changes in the tonogenetic process.

(11) Ejitta ttsékhé khittcha ttsen déya
Ezhıt'à ts'èke kıch'à ts'ę̀ dèya
therefore woman 3p-from to 3S.pf.leave

la, étségu, tchon kota xhé, …
là, etse gù, chǫ goda xè, ...
Evid 3S.cry-GU 3S.pregnant with

Figure 9: Proposed Original Form of *Guʔ

5.2 Doig and Halfway

While Doig and Halfway are two dialects of Dane-z aa (Beaver), they exhibit a similar phenomenon to Northern and Southern Tutchone, as well as Dogrib and Slavey. According to Miller's 2021 dissertation, these varieties exhibit what she describes as mirror tonal systems. However, it is important to note that detailed lexical comparisons remain limited in publicly available data. Miller, supervised by Hargus, suggests that despite shared ancestry and geographical proximity, the two dialects have systematically opposite tone assignments for a range of vocabulary items, shown in the glossed examples below, which were embedded in carrier phrases in the actual study. Additional examples are found in Appendix B. In her research with the speakers of both dialects, she posed the question of

distinguishing features between the two dialects. Speaker commentary confirmed to her that tone was the most salient feature. According to speakers, Doig speakers were considered "low-talkers," presumably due to the prevalence of a low-marked tone, and Halfway speakers were described as being "high talkers," which means that their most prevalent, unmarked tone is high (Miller 2021). She suggests that these mirror systems may have arisen due to different phonological interpretations of glottalic and phonatory cues, which are possibly influenced by dialect contact phenomena. This suggests a process that could be very similar to that of Northern and Southern Tutchone, perhaps exhibiting a repeatable pattern.

(3)

Doig:

tʰás

'arrow'

Halfway:

tʰàs

'arrow'

(4)

Doig:

mɛ̃ɬ́

'snare'

Halfway:

mɪɬ̀

'snare'

5.3 Summary So Far

At this stage, we have seen that there are at least three examples of mirrored (oppositional) tones within the Northern Athabaskan group of AET: N/S Tutchone, Doig/Halfway, and Dogrib/Slave, while distinguishing these processes from the one described in Jaker (2011). This pattern is shown in the table below. This suggests a repeatable pattern in the Athabaskan languages. It is not random and appears to affect core lexical items in the languages, which suggests that they have arisen from shared historical conditions followed by divergent phonological developments.

Language A	Form A: High Tone	Gloss	Language B	Form B: Low Tone
Northern Tutchone	Tsé	beaver	Southern Tutchone	Tsà
Northern Tutchone	Té	father	Southern Tutchone	tà
Northern Tutchone	Kwán	matches	Southern Tutchone	kwèn
Northern Tutchone	k'é?	arrow	Southern Tutchone	k'à
Northern Tutchone	dek'ána	boy	Southern Tutchone	dak'àna
Doig	t^hás	arrow	Halfway	t^hàs
Doig	mɛ̃ɬ́	snare	Halfway	mɨɬ̀
Doig	$\widehat{ts}^h$á?	beaver	Halfway	$\widehat{ts}^h$à?
Doig	júú	these	Halfway	jùù
Dogrib	gú (high tone)	complementizer	Slavey	gù (low tone)

Table 1: Summary of the Na-Dene language family tonal opposition pattern.

6 Outside of the Family

6.1. Zulu and Ndebele

Expanding beyond the Athabaskan family, I will now turn to language families from different regions of the world to examine whether similar patterns of tonal divergence emerge in cross-linguistic systems.

Ndebele and Zulu are genetically closely related Nguni languages spoken in Botswana, Zimbabwe, and South Africa, excluding populations in the diaspora. Northern Ndebele is often considered a dialect of the Zulu language. They share a high degree of lexical similarity, although they still retain some differences due to historical influences and language contact. The two languages share over 85% of their lexicon, with enough similarity that it is postulated (although still unconfirmed) that they both derive from a Proto-Zulu parent language spoken in Zululand before 1822 (Rycroft 1980). Much like the Athabaskan language family, there is a lack of reliable linguistic evidence from this period, which hinders the use of reliable comparative methods and reconstruction.

Rycroft (1980) notes that Ndebele has undergone significant changes in tone assignment. This is likely due to the Ndebele, who asserted their independence in 1822 and broke away from the Zulu, rather than the other way around. Thus, Ndebele has changed, while Zulu has (largely) not. Ndebele systematically favours an initial high tone in nouns, which is contrary to most other Nguni languages,

including Zulu, which typically assign either a high or no tone in that position, as shown in Figure 12. Moreover, Ndebele appears to favor avoiding phrase-final H tones (often realized as final H deletion), with the result that the tonal system becomes restructured. As Rycroft explains,

"This presents certain classificatory problems if one attempts to deal with Ndebele tone-patterns synchronically, without considering their Zulu counterparts." (Rycroft 1980).

This underscores a key insight: tonal systems may not only diverge in the phonetic realizations of lexical items, but also in how marked tone is assigned. This creates mirror-like patterns across dialects and closely related languages. Just as in the Athabaskan examples explained above, languages with shared genetic ancestry can have pitch distinctions that move in opposite directions.

ZULU	NDEBELE	
abántu	*ábántu*	(people)
abántwana	*ábántwana*	(children)
abantwányana	*ábántwányana*	(small children)

Figure 10: Ndebele nouns have initial high tones where their Zulu cognates have low tones (Rycroft 1980).

6.2 Evidence in East-Asian Languages

As a comparative baseline for the Athabaskan case, I next consider evidence from a different region of the world. The Kammu dialects of the Mon-Khmer language, spoken in Laos and Thailand, offer a striking example of diverging tonogenesis from shared genetic origins. Some dialects of this language have developed a tonal contrast which corresponds to a contrast between voiced and voiceless initial consonants in other dialects. Thus, Kammu is a language in which the process of acquiring tones is still ongoing (Svantesson 2003). Eastern Kammu is non-tonal and has retained original voicing contrasts.

In Northern and Western Kammu, syllables with original voicing contrasts have developed high and low tones, respectively. In Northern Kammu, a high-low tone contrast has replaced the voiceless-voiced contrast. In Western Kammu, voiced stops have become aspirated voiceless, which contrast both segmentally and tonally with original unaspirated voiceless stops, which are retained as such in all dialects. The original aspirates did not change, and gave rise to a high tone in Northern and Western Kammu. Thus, Northern Kammu words have a tone contrast if they begin with a sonorant or a voiceless unaspirated stop. In contrast, words with an aspirated stop always have a high tone. For Western Kammu, words beginning with sonorants or aspirated stops have contrasting tones, but those with a voiceless

unaspirated stop always have a high tone. The situation is illustrated by the words in (13) (Svantesson 2006).

(1) *Words illustrating Kammu tonogenesis*

Eastern	*Northern*	*Western*	
taaŋ	táaŋ	táaŋ	'pack'
daaŋ	tàaŋ	tʰàaŋ	'lizard'
tʰaaŋ	tʰáaŋ	tʰáaŋ	'to clear'
r̥aaŋ	ráaŋ	ráaŋ	'tooth'
raaŋ	ràaŋ	ràaŋ	'flower'

Figure 11: Tonogeneis in Kammu (Svantesson 2006).

While this is not exactly the case of Northern and Southern Tutchone, it is a good representation of how cognate forms can carry opposing tonal values depending on the dialect. In both cases, tonogenesis proceeds from common phonetic triggers, likely changes in glottalization or voicing contrasts, but the final phonologization has diverged. This suggests that marked tone is flexible, not only in Athabaskan but also in languages outside the family.

7 Discussion

The phenomenon in Northern and Southern Tutchone challenges conventional models of tonogenesis, which assume a uniform mapping from phonetic triggers to consistent and predictable outcomes. However, we note that in Athabaskan languages, as well as in languages outside the family, we find that identical (or nearly identical) historical pressures on tonogenesis have led to divergent tonal realizations. This is represented in Northern and Southern Tutchone, Dogrib, Slavey, Halfway, and Doig within the family. Considering both factors within the languages and the cross-linguistic aspects, this opposition does not appear to be an accident. It suggests a deeper phonological restructuring, where tone is assigned differently during the process of phonologization.

The broader comparison with languages from outside the Athabaskan family strengthens this interpretation. The Kammu dialects and tonal variation in Nguni languages demonstrate that tonal opposition can and does appear independently in other language families, from similar sources. This cross-linguistic parallel supports the assumption that tonogenesis is sensitive to interpretation and reorganization, rather than being a singular, bound process. A table summarizing all the exhibited cross-linguistic data, organized by marked tone, can be found in Appendix C.

However, this analysis remains preliminary in several aspects. The historical phonology of Tutchone is not fully reconstructed and cannot be at the present time. Existing descriptions of either language are often fragmentary. The hypotheses proposed, particularly regarding the role of glottalic consonants and constriction, require further phonetic documentation or experimental phonology to validate these claims. While it is an interesting hypothesis and entirely theoretically plausible, it is unclear to what extent language contact or geographical diffusion have influenced the divergent tonal developments across dialect boundaries. A remaining factor has been unmentioned so far: Northern and Southern Tutchone remain mutually intelligible to speakers. Thus, tone is not the distinguishing, or most salient feature between these languages.

Future research in this field should aim to collect comparative lexical and acoustic data from remaining Northern and Southern Tutchone speakers, conduct studies on phonation types, particularly regarding glottalized vowels and final segments, and examine the sociolinguistic dynamics that may have driven divergence.

8 Conclusion

This paper has explored the phenomenon of tonal opposition in Northern and Southern Tutchone, situating it within the context of tonogenesis and oppositional patterns across Athabaskan and other language families. Through preliminary comparative analysis, it becomes clear that tonal opposition between the two Tutchones is not an isolated event, but part of a repeatable pattern. These examples demonstrate that tonogenesis is not a linear process, but instead may be impacted by several factors, some of which remain unclear. Ultimately, the case of Northern and Southern Tutchone contributes to a body of evidence that mirror tonal systems are not only plausible, but a recurrent outcome of tonogenesis. It highlights the importance of looking beyond individual languages to identify cross-linguistic patterns and reinforces the idea that shared genealogy can lead to different phonological outcomes.

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Appendix A: Glossed Examples in Northern and Southern Tutchone

(5)

Northern Tutchone:

Kwán

'matches'

Southern Tutchone:

kwèn

'matches'

(6)

Northern Tutchone:

k'ɛ́ʔ

'arrow'

Southern Tutchone:

k'à

'arrow'

(7)

Northern Tutchone:

dek'ána

'boy'

Southern Tutchone:

dak'àna

'boy'

Appendix B: Glossed example of tonal opposition in Doig/Halfway

(8)

Doig:

t͡sʰáʔ

beaver

Halfway:

t͡sʰàʔ

beaver

(9)

Doig:

júú

these

Halfway:

jùù

these

Appendix C: Summary organized by marked tone

High-Tone Language	Form (High Tone)	Low-Tone Language	Form (Low Tone)	Gloss
None	Tsé	Northern Tutchone	Tsà	beaver
None	Té	Northern Tutchone	tà	father
None	Kwán	Northern Tutchone	kwèn	matches
Northern Tutchone	k'é?	Southern Tutchone	k'à	arrow
None	dek'ána	Northern Tutchone	dak'àna	boy
None	t^hás	Doig	t^hàs	arrow
Doig	mɛ̃ɬ́	Halfway	mɪ̀ɬ	snare
None	t͡s^{h}á?	Doig	t͡s^{h}à?	beaver
None	júú	Doig	jùù	these
None	gù (low tone)	Dogrib	gú (high tone)	complementizer
Zulu	umúntu	Ndebele	úmuntu	person
None	ikhómu	Zulu	íkhomu	cow
None	ba (voiced)	Eastern Kammu	bá (tone)	father
None	pa (voiceless)	Eastern Kammu	pà (tone)	father