Paraguayan Guarani progressive nasalization as phonologically conditioned suppletive allomorphy

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Abstract Although Paraguayan Guarani shows extensive leftward and rightward nasalization processes, progressive nasalization in Guarani is less productive and morpheme-specific (Estigarribia 2020; Russell 2021; 2025). This paper presents the first formal analysis of Paraguayan Guarani progressive nasalization as phonologically conditioned suppletive allomorphy (Carstairs 1988), wherein the different patterns of progressive nasalization that different suffixes display are analyzed as differences in the lexical specification of their allomorphs. I bring in original fieldwork data collected in Coronel Oviedo, Paraguay to show that, although progressive nasalization in Guarani is morpheme-specific, suffix progressive nasalization is still productive and phonologically optimizing. I also use this data to show that progressive nasalization targeting roots is not a case of this phonologically conditioned allomorphy since root nasalization in Guarani is lexicalized, and to show that the attested variation in progressive nasalization affecting suffixes is dialectal as opposed to fully explained by a lack of productivity of the pattern. This paper ultimately provides insight into the specific factors that play a role in Guarani nasalization and its variable application across morphemes, constructions, and varieties of the language.

Keywords: phonologically conditioned allomorphy; nasalization; nasal harmony; Paraguayan Guarani; variation

1 Introduction

Most Tupi-Guarani languages show extensive nasalization processes, with some of these languages showing leftward and rightward nasal spreading simultaneously (Lapierre & Michael 2018). For example, in Paraguayan Guarani, both prefixes and suffixes nasalize in different ways in the environment of roots with nasal segments. Example (1a) shows that the suffix initial consonant is a voiceless stop, but (1b) shows that, when attached to a nasal root (bolded), the initial consonant of the suffix alternates to a nasal-oral contour stop (boxed). And, preceding segments in roots and prefixes nasalize given leftward nasalization, triggering the alternation of the nasal-oral stop in the prefix to a full nasal consonant (boxed).

(1) a. $\boxed{\text{nd}}$e-jagu**a**-$\boxed{\text{k}}$uéra
[n^{d}e-ʤaɰ^{w}a-ˈk^{w}eɾa]
2SG-dog-PL
'your dogs'

b. $\boxed{\text{n}}$e-mit**ã**-$\boxed{\text{ng}}$uéra
[$\overleftarrow{\text{nẽ-mĩtã}}$-ˈŋ^{gw}eɾa]
2SG-child-PL
'your children'

Although regressive (leftward) nasalization in Guarani is productive and exceptionless, progressive nasalization is morpheme-specific (Estigarribia 2021; Russell 2021; 2025). As in the examples in (1) above, some suffixes show the alternation of only the initial stop consonant of the suffix to a nasal-oral contour stop in the environment of nasal roots. But, as shown in (2) below, other suffixes fully nasalize and the initial consonant of the suffix is a full nasal consonant. Finally, other suffixes fail to nasalize altogether in the environment of nasal roots, as shown in (3) below.

(2) a. o-karu-$\boxed{\text{peve}}$ (with **u** bold in o-kar**u**)
[o-karu-ˈpeʋe]
3-eat-until
‘until he ate’

b. o-kosi**na**-$\boxed{\text{meve}}$
$\overleftarrow{\text{õ-kõsĩnã}}$-$\overleftarrow{\text{ˈmẽʋẽ}}$
3-cook-until
‘until he cooked’

(3) a. o-kar**u**-$\boxed{\text{ta}}$
[o-kaˈɾu-ta]
3-eat-FUT
‘he will eat’

b. o-kosi**na**-$\boxed{\text{ta}}$
[$\overleftarrow{\text{õ-kõsĩˈnã}}$-ta]
3-cook-FUT
‘he will cook’

Given the morpheme-specific nature of progressive nasalization in Guarani, the pattern is often dismissed as idiosyncratic and unproductive, therefore remaining understudied compared to Guarani’s more robust system of regressive nasalization, which has benefited from descriptive and analytical work for decades (Gregores & Suárez 1967; Lunt 1973; Rivas 1975; Beckman 1998; Walker 1998; Kaiser 2008; Estigarribia 2020; Cabrera 2025). However, this paper argues that progressive nasalization in Guarani suffixes, although morpheme-specific, is still productive and phonologically conditioned for many speakers of Paraguayan Guarani: many speakers show consistent progressive harmony alternations in suffixes, where suffixes consistently nasalize in their lexically-specific manner in the environment of nasal roots.

To this end, this paper presents the first formal analysis of Guarani progressive nasalization under constraint-based theories of phonology (Prince & Smolensky 1993). I analyze the pattern as a case of phonologically conditioned suppletive allomorphy (Carstairs 1988), as proposed in previous literature to be the case for Guarani progressive nasalization (Estigarribia 2020; Russell 2021; 2025). The specific analysis proposed in this paper installs the attested differences across suffixes under progressive nasalization as differences in the lexical specification of the suffix allomorphs (Tranel 1990). These differences in lexical specification fully account for the three different patterns of progressive nasalization in Guarani, attested in the examples in (1), (2), and (3) above. This analysis also predicts that the suffix alternations under progressive nasalization occur consistently for these suffixes in the environment of oral versus nasal roots.

Furthermore, this paper provides original fieldwork data on root nasalization in Guarani, which shows a similar pattern to the kind of suffix nasalization observed in example (1) above. This data shows that forms with root progressive nasalization, although similar to suffix nasalization and analyzable as phonologically conditioned allomorphy, are lexicalized remnants of a previously productive pattern of progressive nasalization in Tupi-Guarani languages (Estigarribia 2021). So, I argue that root nasalization should not be analyzed under the proposed analysis of progressive nasalization that accounts for the phonologically optimizing allomorphy of suffixes since such analysis predicts a vastly more productive pattern of root nasalization.

Finally, I also present original data on dialectal variation in progressive nasalization across speakers from different cities in Paraguay. This dialectal variation shows that the lack of consistent progressive nasalization attested in Guarani (Estigarribia 2020; Russell 2025) is not a property of all individual speakers of Guarani. Specifically, speakers from Coronel Oviedo, Paraguay show consistent and (semi-)productive progressive nasalization, while speakers from Asunción and Concepción show optional and variable progressive nasalization. And, this data on variation in progressive nasalization ultimately reinforces the fact that root and suffix progressive nasalization are different: the variation and optionality in progressive nasalization is limited to suffixes and is not attested in root nasalization. Ultimately, the morpheme-specific nature of the pattern, its phonological conditioning to suffixes but not roots, and its variation across speakers are all synchronic evidence of the fact that progressive nasalization in Tupi-Guarani languages was historically a productive process that has diminished in productivity on the way to modern-day Guarani (Mello 2000; Estigarribia 2021).

This paper is structured as follows. Section 2 provides the necessary background on Paraguayan Guarani and gives an overview of regressive nasalization. Next, in Section 3 I present the data on the morpheme-specific pattern of progressive nasalization in Guarani suffixes, most of which has been described in previous works (Dietrich 2018; Estigarribia 2020; Russell 2021; 2023b; 2025) and confirmed with my language consultants. Section 4 presents the analysis of suffix progressive nasalization as phonologically conditioned suppletive allomorphy. Section 5 describes the pattern of root nasalization in the environment of preceding nasal elements, arguing that root nasalization is not a case of phonologically conditioned allomorphy since it fails to show the same productivity that suffixes show in the ennvironment of nasal roots. Section 6 presents new data on the dialectal variation in suffix alternations attested among the language consultants whose data is described in this paper. Finally, Section 7 discusses two main issues concerning Guarani progressive nasalization and its analysis: the nature of the mechanism that accounts for this long-distance agreement between roots and suffixes and its place in the overall system of nasalization in Guarani, and alternative analyses that formalize the phonologically conditioned allomorphy in different ways. Section 8 concludes.

2 Background

Paraguayan Guarani (Tupian, Tupi-Guarani) is a language spoken by 5 to 6 million people in Paraguay and neighboring areas of Argentina and Brazil. The language is learned as a first language for many, with around 80% of the population speaking Guarani at home (Estigarribia 2020). The language shows extensive contact and language mixing with Paraguayan Spanish, with mixed Guarani-Spanish varieties such as Jopará and Guarañol, spoken by many bilingual Spanish-Guarani speakers, emerging from such contact. Paraguayan Guarani, including its nasalization system, has been described for decades (Gregores & Suárez 1967; Lunt 1973; Rivas 1975; Estigarribia 2020; Russell 2023b), and has significantly contributed to phonological theory and typology (Piggott 1992; 2003; Beckman 1998; Walker 1998; 1999a; b; 2000; 2014; Kaiser 2008; Lapierre & Michael 2018; Dabkowski 2022a; b; Estigarribia 2021; Russell 2021; 2022; 2023a; 2025; Dabkowski & Russell 2025; Cabrera 2025) and linguistic theory and typology in general (Monserrat & Facó Soares 1983; Jensen 1990; 1998; 1999; Velázquez-Castillo 1991; 2002; Rose 2015; Tonhauser 2011a; b; 2006; 2007; 2020; Tonhauser & Colijn

2010; Clopper & Tonhauser 2013; Shain & Tonhauser 2010; Zubizarreta & Pancheva 2017a; b; Pancheva & Zubizarreta 2019; Zubizarreta 2022; Jun & Zubizarreta 2022; Jun et al. 2023; Johnson 2024; 2025).

Unless otherwise specified, all Paraguayan Guarani language data in this paper were collected in consultation with eight native speakers of the language through structured elicitation. The eight language consultants are either bilingual Guarani-Spanish speakers, or speak Spanish as a second language. The data from six speakers were collected in-situ fieldwork in Coronel Oviedo, Paraguay, which is a mid-size town in south-central Paraguay with a population of around 50,000. These speakers were 24 to 70 years old. The data for the remaining two speakers were collected remotely via *Zoom*. These two speakers are from the cities of Asunción and Concepción. Asunción is the capital city of Paraguay located along the south-eastern border of the country, and Concepción is a city in north-central Paraguay. Both speakers are bilingual Guarani-Spanish speakers and speak English as a second language. They currently live in the United States.

2.1 Basic phonology

The consonant and vowel inventories of Guarani are given in Tables 1 and 2 below. The orthographic transcription of the phones is given in italics if it differs from their IPA transcription. Notice that Guarani lacks plain voiced stops and instead has nasal-oral contour stops (*mb*, *nd*, *ng*), often referred to as “prenasalized” stops in previous literature. The language has six contrastive vowel qualities where both oral and nasal versions of these vowels contrast, rendering a total of 12 phonemic vowels.

p	t			k	ʔ *’*
m^{b} *mb*	n^{d} *nd*			ŋ^{g} *ng*	
m	n		ɲ *ñ*	ŋ *g̃*	
			ʤ *j*		
	s	ʃ *ch*			
ʋ *v*	ɾ *r*			ɰ *g*	

Table 1: Guarani consonant inventory.

i, ĩ	ɨ, ɨ̃ *y, ỹ*	u, ũ
e, ẽ		o, õ
	a, ã	

Table 2: Guarani vowel inventory.

All syllables in Guarani are of type (C)V, where high vowels [i, ɨ, u] may diphthongize before or after the nucleic vowel. Nasal-oral stops are possible onsets and may occur word-initially, and these resyllabify in word-medial position (Kaiser 2008). Stress in Guarani is predominantly final, both in monomorphemes and in morphologically complex words, and only a few morphemes have penultimate or antepenultimate stress. Suffixes in Guarani are lexically stressed or unstressed in an unpredictable manner. In morphologically complex words, stress shifts to the rightmost lexically stressed syllable. Stress is not marked in the orthography (with an accute accent) when it occurs word-finally. In the examples below, *-se* DES is a lexically stressed suffix since it attracts primary stress from the root, while *-ta* FUT is a lexically unstressed suffix.

(4) a. a-karú-ta
[a-kaˈɾu-ta]
1SG-eat-FUT
'I will eat'

b. a-karu-se
[a-kaɾu-ˈse]
1SG-eat-DES
'I want to eat'

c. a-karu-sé-ta
[a-kaɾu-ˈse-ta]
1SG-eat-DES-FUT
'I will want to eat'

2.2 Nasality and regressive nasalization

Regressive (leftward) nasalization in Guarani has been described for decades (Gregores & Suárez 1967; Lunt 1973; Rivas 1974; 1975; Humbert & Piggott 1997; Beckman 1998; Walker 1998; Crowhurst 1998), and benefits from more recent and ongoing descriptive and analytical work (Lapierre & Michael 2018; Estigarribia 2020; 2021; Russell 2022; 2023b; 2025; Cabrera 2025). The data and generalizations in this section are described and analyzed in these previous works and have been confirmed with my language consultants.

Two types of segments trigger regressive nasalization in Guarani: phonemic nasal vowels and nasal-oral stops. As shown in (5a-5b) and (6a-6b) below, nasality spreads leftwards from rightmost nasal vowels, resulting in the nasalization of all preceding voiced segments (Cabrera 2025). Unlike phonemic nasal vowels, nasal-oral stops trigger regressive nasalization in any position in the word, but they nasalize preceding segments in the same way as phonemic nasal vowel triggers (5c, 6c).

(5) a. avati
[aʋaˈti]
'corn'

b. morot**ĩ**
[$\overleftarrow{\text{mõɾ̃õtĩ}}$]
'white'

c. pana**mbi**
[$\overleftarrow{\text{pãnãˈm}}^{b}$i]
'butterfly'

(6) a. ka'u
[kaˈʔu]
'drunkedness'

b. ñati'**ũ**
[$\overleftarrow{\text{ɲãtĩˈʔũ}}$]
'mosquito'

c. mo**mbe**'u
[$\overleftarrow{\text{mõm}}^{b}$eˈʔu]
'to tell'

Voiceless segments in regressive nasalization are transparent: they fail to nasalize in nasal spans and they don't block nasality from spreading onto preceding segments. For example, in (5b) and (6b) above, nasal spread does not affect the voiceless stops [t] or [ʔ] but nasal spread continues onto segments to their left.

In addition to nasalizing all voiced segments, regressive nasalization induces various consonant alternations. Nasal-oral stops and full nasal consonants are in complementary distribution, where nasal-oral stops occur before oral vowels and full nasal consonants occur before nasal vowels. So, given that the leftward spread of nasality nasalizes preceding vowels, nasal-oral stops appear in oral spans and their full nasal counterparts appear in nasal spans. A similar distribution is also found between the palatal affricate *j* [ʤ] and the palatal nasal *ñ* [ɲ], where *j* occurs in oral spans and *ñ* occurs in nasal spans. These alternations are reflected in the orthography of the language (boxed). The examples in (7) and (8) below show these segment alternations in prefixes in the environment of oral versus nasal roots. These alternations occur equally in the context of nasal-oral stop triggers (7b) and phonemic nasal vowel triggers (8b).

(7) a. $\boxed{\text{nd}}$e-sy
[n$^{\text{d}}$e-ˈsɨ]
2SG
‘your mother’

b. $\boxed{\text{n}}$e-me**mb**y
[$\overleftarrow{\text{nẽ-mẽˈm}}{}^{\text{b}}$ɨ]
2SG-daughter.of.woman
‘your daughter’

(8) a. $\boxed{\text{j}}$a-ha
[ʤa-ˈha]
1PL.IN-go
‘let’s go!’

b. $\boxed{\text{ñ}}$a-g̃uah**ẽ**
[$\overleftarrow{\text{ɲã-ŋ}^{\tilde{\text{w}}}\text{ãhẽ}}$]
1PL.IN-arrive
‘we arrived’

As shown in (9) below, these segment alternations stack and may occur at a long distance from the trigger, as long as the segments are within the morphological word. Again, nasal vowel triggers (9b) and nasal-oral stop triggers (9c) induce the same nasalization pattern on preceding segments.

(9) a. $\boxed{\text{ñ}}$a**nd**e $\boxed{\text{nd}}$a-$\boxed{\text{j}}$a-$\boxed{\text{j}}$o-h-ayhú-i
[$\overleftarrow{\text{ɲãˈ}}n^{\text{d}}$e n$^{\text{d}}$a-ʤa-ʤo-ha$^{\text{i}}$ˈhu-$^{\text{i}}$]
1PL.IN NEG-1PL.IN-REC-love-NEG
‘we don’t love each other’

b. $\boxed{\text{ñ}}$a**nd**e $\boxed{\text{n}}$a-$\boxed{\text{ñ}}$a-$\boxed{\text{ñ}}$o-he**no**-i
[$\overleftarrow{\text{ɲãˈ}}n^{\text{d}}$e $\overleftarrow{\text{nã-ɲã-ɲõ-hẽˈnõ-}}{}^{\text{ĩ}}$]
1PL.IN NEG-1PL.IN-REC-call-NEG
‘we don’t call each other’

c. $\boxed{\text{ñ}}$a**nd**e $\boxed{\text{n}}$a-$\boxed{\text{ñ}}$a-$\boxed{\text{ñ}}$o-he**ndú**-i
[$\overleftarrow{\text{ɲãˈ}}n^{\text{d}}$e $\overleftarrow{\text{nã-ɲã-ɲõ-hẽˈn}}{}^{\text{d}}$u-$^{\text{i}}$]
1PL.IN NEG-1PL.IN-REC-listen-NEG
‘we don’t listen to each other’

Following previous works, I assume that Guarani nasal-oral stops are underlying nasal consonants that post-oralize when followed by an oral vowel (Piggott 1992; Cardoso 2009; Lapierre & Michael 2018; Estigarribia 2021; Russell 2022; 2025; Cabrera 2025).[1] In this paper I analyze the alternation of underlying nasal consonants to nasal-oral stops in oral spans as simple interaction between two constraints: *NV and *CONTOUR (Stanton 2017). The *NV markedness constraint rules out sequences of a nasal consonant followed by an oral vowel, and *CONTOUR rules out contour segments, which include nasal-oral stops. A higher-ranked faithfulness constraint IDENT[VOICE] protects the nasal consonant from changing input nasality to avoid a violation of *NV.[2]

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[1] Other literature argues that Guarani nasal-oral stops are underlying voiced oral stops that prenasalize after nasal vowels (Gregores & Suárez 1967; Lunt 1973), and others assume they are complex segments with nasal and oral subsegments (Kaiser 2008; Thomas 2014).

[2] Given regressive nasalization, the faithfulness constraint violated by the nasalization of the vowel must be lower-ranked than *NV, since vowels may freely nasalize in the environment of phonemic nasal vowels and nasal-oral stop triggers, hence avoiding violations of *NV. A candidate such as [mã] is not included in the tableau in (10), but see the tableau in (20) for the analysis of regressive nasalization.

(10)

/ma/	Ident[voice]	*NV	*Contour
a. ma		*!	
b. pa	*!		
☞ c. m^{b}a			*

The table below summarizes the segment alternations induced by regressive nasalization. Their orthographic representation is given in parenthesis.

oral spans	m^{b} (mb)	n^{d} (nd)	ŋ^{g} (ng)	ʤ (j)	ɾ (r)	ʋ (v)	ɰ (g)
nasal spans	m	n	ŋ (g̃)	ɲ (ñ)	ɾ̃	ʋ̃	ɰ̃ (g̃)

Table 3: Segment alternations induced by regressive nasalization. Adapted from Russell (2022).

The oral/nasal contrast for vowels in Guarani was previously thought to lie at stressed syllables (Gregores & Suárez 1967; Sportiche 1977; Vergnaud & Halle 1978; Trigo 1993; Flemming 1994; Beckman 1998; Walker 1998; 1999b; 2000; Kaiser 2008; Dietrich 2018; Russell 2022; Dabkowski & Russell 2025). But, more recent work on regressive nasalization shows that the oral/nasal contrast in vowels instead lies at the right edges of words (Cabrera 2025). Although stress is overwhelmingly final in Guarani, and so stressed syllables and the right edges of words often overlap, a few monomorphemes with non-final stress disentangle the distribution of the oral/nasal contrast and stress. The examples in (11) below show that the oral/nasal contrast in vowels is specified at the right edges of words since the entire word is nasalized, including segments to the right of lexically stressed syllables, which most notably include full nasal consonants as opposed to the expected nasal-oral stops (boxed). Recall that Guarani does not show bidirectional nasalization: nasal-oral stops trigger only leftward nasal spread, leaving any segments to their right fully oral (6c).[3]

(11)	a. mára$\boxed{\text{m}}$o	b. mé$\boxed{\text{n}}$a	c. mamó$\boxed{\text{n}}$e	d. hikó$\boxed{\text{n}}$i
	$\overleftarrow{\text{[ˈmãɾ̃ãmõ]}}$	$\overleftarrow{\text{[ˈmẽnã]}}$	$\overleftarrow{\text{[mãˈmõnẽ]}}$	$\overleftarrow{\text{[hĩˈkõnĩ]}}$
	‘never’	‘husband’	‘papaya’	FREQ

Finally, morphologically complex forms with suffixes and/or multiple roots show that regressive nasalization is sensitive to prosodic or morphological structure (Dabkowski & Russell 2025; Cabrera 2025). For example, in forms with an oral root followed by a nasal root, the nasality of the second nasal root does not spread onto the first root. This can be seen in Guarani compounds (12) and in forms with noun incorporation (13) and reduplication (14).

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[3] An alternative analysis is that stressed nasal vowels trigger bidirectional nasal spread, and nasal-oral stops (underlying nasal consonants) trigger only leftward nasalization. See Cabrera (2025) for more.

(12) a. avati-mir**ĩ**
[aʋati-$\overleftarrow{\text{mĩˈɾĩ}}$]
corn-small
‘wheat’

b. Ava-ñe’**ẽ**
[aʋa-$\overleftarrow{\text{ɲẽˈʔẽ}}$]
man-word
‘Guarani (lang.)’

c. py’a-por**ã**
[pɨʔa-$\overleftarrow{\text{põˈɾã}}$]
heart-pretty
‘kindness’

(13) a. o-$\boxed{\text{j}}$e-py’a-$\boxed{\text{m}}$o**ng**eta
[o-ʤe-pɨʔa-$\overleftarrow{\text{mõŋ}}^{g}$eˈta]
3-AGD-chest-converse
‘he thought to himself’

b. *o-$\boxed{\text{ñ}}$e-pyʔa-mo**ng**eta
[$\overleftarrow{\text{õ-ɲẽ-pɨ̃ʔã-mõŋ}}^{g}$eˈta]

(14) a. o-$\boxed{\textbf{mb}}$ota-**mb**ota
[$\overleftarrow{\text{õ-m}}^{b}$ota-m^{b}oˈta]
3-knock-knock
‘he knocked and knocked’

b. *o-$\boxed{\text{m}}$ota-**mb**ota
[$\overleftarrow{\text{õ-mõtã-m}}^{b}$oˈta]

Interestingly, Guarani suffixes also show this phonological independence, where nasal suffixes trigger only suffix-internal nasalization and fail to nasalize segments in preceding suffixes and roots (Cabrera 2025). The examples in (15-16) show that nasal suffixes fail to nasalize preceding oral roots, and (17-18) show that they fail to nasalize preceding suffixes. The bisyllabic suffixes in (15b), (16b), and (17b) more clearly show that there is still suffix-internal nasalization since the non-final segments of the suffix are nasalized. Note that this occurs even when the nasal suffix triggers are lexically stressed ((a) examples in (15-18)) or unstressed ((b) examples in (15-18)), and also when the suffixes that immediately precede the nasal suffix are lexically stressed (17a, 18a) or unstressed (17b, 18b).[4]

(15) a. o-$\boxed{\text{j}}$ehu-r**õ**
[o-ʤehu-$\overleftarrow{\text{ˈɾõ}}$]
3-happen-if
‘if it happens’

b. $\boxed{\text{nd}}$-a-ikatu-$\boxed{\text{m}}$o’**ã**-i
[n^{d}a-^{i}katu-$\overleftarrow{\text{mõˈʔã}}$-$^{\tilde{\imath}}$]
NEG-1SG-able-NEG.FUT-NEG
‘I won’t be able to’

(16) a. e-$\boxed{\text{j}}$u-**na**
[e-ˈʤu-$\overleftarrow{\text{nã}}$]
IMP-come-REQ
‘please come!’

b. che-r-e$\boxed{\text{nd}}$ú-ra**mo**
[$\overleftarrow{\text{ʃẽ-ɾ̃-ẽˈn}}^{d}$u-$\overleftarrow{\text{ɾ̃ãmõ}}$]
1SG-1/2POSS-listen-if
‘if you hear me’

(17) a. a-mba’e-porandu-se-**mi**
[$\overleftarrow{\text{ã-m}}^{b}$aʔe-$\overleftarrow{\text{põɾ̃ãn}}^{d}$u-se-$\overleftarrow{\text{ˈmĩ}}$]
1SG-thing-ask-DES-DIM
‘I want to ask a little something’

b. che-sy-pe-g̃uar**ã**
[ʃe-sɨ-pe-$\overleftarrow{\text{ɣ̃}^{\tilde{w}}\text{ãˈɾã}}$]
1SG-mother-DOM-for
‘for my mother’

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[4] Suffixes *-se* DES and *-mba* TOT are lexically stressed since they attract stress from the root. For example, (17a) without suffix *-mi* DIM shows final stress on suffix *-se*, and (18a) already shows that *-mba* attracts stress from the root. And, suffixes *-pe* DOM and *-ke* FRC are lexically unstressed since they fail to attract stress from the root, as in (17b) and (18b) above.

(18) a. o-ñe’**ẽ**-$\boxed{\text{mb}}$á-**ma**
[$\overleftarrow{\text{õ-ɲẽʔẽ}}$-ˈm$^{\text{b}}$a-$\overleftarrow{\text{mã}}$]
3-talk-TOT-INCIP
‘he started to finish talking’

b. e-h-endú-ke-**na**
[$\overleftarrow{\text{ẽ-hẽ}}$ˈn$^{\text{d}}$u-ke-$\overleftarrow{\text{nã}}$]
IMP-3POSS-listen-FRC-REQ
‘please, do listen’

Table 4 below summarizes the distribution of regressive nasalization across various morphological boundaries. Notice that, unlike prefixes, suffixes are incohesive with the regressive nasalization pattern attested between roots and prefixes since there is no nasal spread onto segments outside a nasal suffix.

	Ṽ trigger	**N$^{\text{D}}$ trigger**
prefix-prefix	harmony	harmony
prefix-root	harmony	harmony
root-root	no harmony	no harmony
root-suffix	no harmony	no harmony
suffix-suffix	no harmony	no harmony

Table 4: Regressive nasalization across different kinds of morpheme boundaries. N$^{\text{D}}$ represents a nasal-oral stop. Adapted from Cabrera (2025).

Given the observed phonological independence of roots and suffixes, Cabrera (2025) argues that suffixes form their own prosodic or morphological units, and that the mechanism of regressive nasalization is limited to the domain of these prosodic units. Cabrera (2025) presents two possible prosodic structures that fully capture the system of regressive nasalization in Guarani, shown in (19) below. In the prosodic structure in (19a), Guarani suffixes (and second roots) form their own prosodic words, while in the structure in (19b), suffixes are not prosodic words themselves, but rather they recursively adjoin to larger prosodic words.

(19) Two possible prosodic structures for Guarani (Cabrera 2025).

a. Suffixes form their own prosodic words
$[\ \overleftarrow{P_1 - P_2 - R_1}\ ]_\omega - [\ \overleftarrow{R_2}\ ]_\omega - [\ \overleftarrow{S_1}\ ]_\omega - [\ \overleftarrow{S_2}\ ]_\omega - [\ \overleftarrow{S_3}\ ]_\omega \ldots$

b. Suffixes recursively adjoin to prosodic words
$[[[[[\ \overleftarrow{P_1 - P_2 - R_1}\ ]_\omega - \overleftarrow{R_2}\ ]_\omega - \overleftarrow{S_1}\ ]_\omega - \overleftarrow{S_2}\ ]_\omega - \overleftarrow{S_3}\ ]_\omega \ldots$

Since all suffixes either form their own prosodic constituents (19a) or are adjoined recursively to larger and larger prosodic words (19b), they fail to nasalize preceding segments that are within other prosodic words. In other words, the domain of regressive nasalization in Guarani is limited to the prosodic word and so nasal spread fail to cross onto the right edge of the preceding prosodic word. Guarani prefixes show a different pattern because they are in the same prosodic word as the (first) root, and so regressive nasalization triggered by the (first) root or prefixes target preceding prefixes. Roots are in different prosodic words since the second root fails to nasalize the first, as observed in Guarani compounds, reduplication, and noun incorporation (12-14). Crucially, all suffixes, regardless of lexical stress, form their own prosodic words since they show the same behavior in regressive nasalization.[5,6]

The tableau below, adopted from Cabrera (2025), shows how non-final oral suffixes are protected from regressive nasalization triggered by nasal suffixes to their right. The tableau analyzes the form in (17b) above which has an oral suffix followed by a nasal suffix. The highly-ranked IDENT-RIGHT[NAS] constraint is what limits the domain of regressive nasalization (formalized by ALIGN-L[NAS] below) to individual suffixes: IDENT-RIGHT[NAS], defined to protect the right edges of prosodic words from changes in input nasality, also protects the nasality of non-final suffixes and roots since these are at the right edges of their own prosodic words. So, this constraint is violated by candidates that regressively nasalize segments in preceding suffixes and roots, and so Candidate (c) is immediately ruled out. So, even under demands from regressive nasalization by ALIGN-L[NAS] suffixes preserve their phonemic oral/nasal contrast given the ranking of IDENT-RIGHT[NAS] over ALIGN-L[NAS].[7]

(20)

/[[[ʃe-sɨ]$_{\omega}$-pe]$_{\omega}$-ɰʷaɾã]$_{\omega}$ /	IDENT-R[NAS]	ALIGN-L[NAS]	IDENT[NAS]
a. ʃe-sɨ-pe-ɰʷaɾã		****!**	
☞ b. ʃe-sɨ-pe-ɰ̃ʷ̃ãɾ̃ã		***	***
c. ʃe-sɨ-pẽ-ɰ̃ʷ̃ãɾ̃ã	*!	**	****

3 Guarani progressive nasalization: the facts

Guarani's progressive nasalization system is strikingly different from regressive nasalization: its triggers, targets, locality, productivity, and interaction with the language's morphological/prosodic structure all differ substantially (Russell 2021; 2022; 2023b; 2025; Cabrera 2025). So, even though Guarani shows "regressive" and "progressive" nasalization, they are characteristically different systems, and so nasalization in Guarani is not bidirectional. Table 5 below summarizes the main differences between regressive and progressive nasalization in Guarani that will become apparent in this section. The data and generalizations in this section have already been described in previous works (Estigarribia 2020; Russell 2021) and were confirmed with my language consultants.

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[5] The fact that suffixes form their own prosodic units, while prefixes are prosodically bound to the prosodic domain of roots, is further evidenced by the distribution of lexical stress in Guarani: suffixes are lexically stressed or unstressed, while prefixes are never stressed.

[6] The prosodic structures in (19) proposed by Cabrera (2025) are against those proposed in Dabkowski (2022a; b); Russell (2023a), and Dabkowski & Russell (2025). Given Guarani's relatively flexible suffix order and reduplication patterns, this literature argues that Guarani's lexically stressed suffixes form their own prosodic words, while lexically unstressed suffixes remain unprosodified. This prosodic structure fails to account for the full pattern of regressive nasalization: the pattern is crucially not tied to stress, as observed in roots with non-final stress (11) as well as the pattern of nasality and nasalization in suffixes (15-18) where lexically stressed and unstressed suffixes show the same behavior in nasalization. See Cabrera (2025) for more on Guarani prosodic structure and regressive nasalization.

[7] ALIGN-L[NAS] in the tableau below assigns violations to every voiced segment that is between the left edge of the input word and a nasal segment (input nasal consonant or nasal vowel). This is to predict the fact that voiceless segments are transparent in regressive nasalization. See Walker (1998); Piggott (1992; 2003) for other analyses of neutral segments in nasalization. The particular mechanism behind the transparency of voiceless stops in regressive nasalization is outside the scope of this paper.

	regressive	**progressive**
triggers	rightmost nasal vowels, nasal-oral stops	root nasal vowels
targets	voiced segments	initial voiceless stops, or full morphemes
locality	local	non-local
productivity	productive	morpheme specific
prosodic / morphological structure	sensitive	insensitive

Table 5: Comparing regressive and progressive nasalization. Adapted from Russell (2021) and Cabrera (2025).

As briefly discussed in the Introduction, only a handful of Guarani stop-initial suffixes alternate in the environment of oral versus nasal roots. The examples in (21) below show that the initial consonant of the suffix nasalizes in the environment of nasal roots, but in (22) and (23) the suffixes remain as so across contructions with oral or nasal roots: in (22) the future suffix *-ta* remains fully oral even when preceded by a nasal root, and in (23) the completive suffix *-ma* [-mã] remains fully nasal even when preceded by an oral root.

(21) a. jagu**a**-$\boxed{\text{k}}$uéra
[ʤaɰʷa-ˈkʷeɾa]
dog-PL
'dogs'

b. mit**ã**-$\boxed{\text{ng}}$uéra
[$\overleftarrow{\text{mĩtã}}$-ˈŋᵍʷeɾa]
child-PL
'children'

(22) a. a-jerok**y**-$\boxed{\text{ta}}$
[a-ʤeɾoˈkɨ-ta]
1SG-dance-FUT
'I will dance'

b. ai-pytyv**õ**-$\boxed{\text{ta}}$
[$\overleftarrow{\text{ãĩ-pɨ̃tɨ̃ˈʋ̃õ}}$-ta]
1SG-help-FUT
'I will help'

(23) a. a-jerok**y**-$\boxed{\text{ma}}$
[a-ʤeɾoˈkɨ–$\overleftarrow{\text{mã}}$]
1SG-dance-CMPL
'I finished dancing'

b. ai-pytyv**õ**-$\boxed{\text{ma}}$
[$\overleftarrow{\text{ãĩ-pɨ̃tɨ̃ˈʋ̃õ}}$-$\overleftarrow{\text{mã}}$]
1SG-help-CMPL
'I finished helping'

We also briefly saw in the Introduction that, among the suffixes that alterate under progressive nasalization, they are affected differently in a lexically specific manner. Some suffixes only show the alternation of their initial stop consonant to a nasal-oral stop in the environment of a nasal root (in (24) below as well as (21) above), while other suffixes show full nasalization (25, 26). The initial full nasal consonant of the suffixes in (25) and (26) is explained by the complementary distribution between nasal oral stops and full nasal consonants in regressive nasalization: nasal-oral stops appear before oral vowels and nasal consonants appear before nasal vowels.

(24) a. a-kar**u**-$\boxed{\text{p}}$a
[o-kaɾu-ˈpa]
3-eat-TOT
‘he ate (completely)’

b. o-ñe’**ẽ**-$\boxed{\text{mb}}$a
[$\overleftarrow{\text{õ-ñẽʔẽ}}$-ˈm^{b}a]
3-talk-TOT
‘he talked (completely)’

(25) a. che-s**y**-$\boxed{\text{pe}}$
[ʃe-ˈsɨ-pe]
1SG-mother-DOM
‘my mother’

b. che-mit**ã**-$\boxed{\text{me}}$
[$\overleftarrow{\text{ʃẽ-mĩˈtã}}$-$\overleftarrow{\text{mẽ}}$]
1SG-child-DOM
‘my child’

(26) a. a-ha-$\boxed{\text{peve}}$
[a-ha-ˈpeʋe]
1SG-go-until
‘until I left’

b. a-g̃uah**ẽ**-$\boxed{\text{meve}}$
[$\overleftarrow{\text{ã-ũɰ̃}^{w}\text{ãhẽ-}}$$\overleftarrow{\text{ˈmẽʋ̃ẽ}}$]
1SG-arrive-until
‘until I arrived’

Furthermore, progressive nasalization is triggered only by phonemic nasal vowels, which, as discussed in the previous section, are the rightmost nasal vowels of roots and suffixes. The example below shows that nasal-oral stops, even when at the onset of rightmost syllables, fail to condition progressive harmony alternations on following suffixes.

(27) panamb**i**-$\boxed{\text{k}}$uéra, *panamb**i**-$\boxed{\text{ng}}$uéra
[$\overleftarrow{\text{pãnãm}}$^{b}i-ˈk^{w}eɾa]
butterfly-PL
‘butterflies’

Interestingly, progressive harmony alternations in suffixes may stack and occur at a long distance. In the examples in (28) below, all alternating suffixes show their respective progressive harmony alternations in the environment of the nasal root, even when these suffix are at a long distance from the root. And, these alternations occur across intervening oral segments. Specifically, the suffixes in (28) below alternate across the intervening suffix *-se* DES, a phonemically oral suffix unaffected by progressive nasalization, and across the phonemic oral vowels in suffixes *-pa/-mba* TOT and *-pota/-mbota* INCIP. Also note that, although these alternations occur at a long distance, the basic facts of regressive nasalization still hold: the nasal-initial and fully nasal suffixes fail to nasalize segments outside the suffix. This exasmple also shows that unlike regressive nasalization, progressive nasalization is insensitive to the fact that suffixes seem to form their own prosodic word units, since all alternating suffixes are affected by the nasality of the root.

(28) a. o-kar**u**-se-$\boxed{\text{p}}$a-$\boxed{\text{p}}$ota-$\boxed{\text{peve}}$
[o-kaɾu-se-pa-poˈta-peve]
3-eat-DES-TOT-INCIP-until
‘until he is about wanting to finish eating’

b. o-ñe’**ẽ**-se-$\boxed{\text{mb}}$a-$\boxed{\text{mb}}$ota-$\boxed{\text{meve}}$
[$\overleftarrow{\text{õ-ñẽʔẽ}}$-se-mᵇa-mᵇoˈta-mẽʋ̃ẽ]
3-talk-DES-TOT-INCIP-until
‘until he is about wanting to finish talking’

All progressive harmony examples so far (especially (28) above) show that it is the root’s phonemic nasal vowel that conditions progressive harmony alternations. However, some exceptions to this generalization are attested in Estigarribia (2020) and Godoy et al. (2022), some of which are shown in (29) and (30) below. In these examples, the roots are phonemically oral, but the final suffixes still alternate, and so their alternation may have only been triggered by the nasal suffixes that immediately precede them. However, going forward, I will assume that it is only roots that trigger progressive harmony alternations at a long distance, as opposed to the immediately preceding nasal suffix, because it is possible these forms are lexicalized. I return to this issue in Section 7 of this paper.

(29) a. che-r-oga-$\boxed{\text{k}}$ue
[ʃe-ɾ-oɰa-ˈkʷe]
1SG-N3POSS-house-POST
‘my former house’[8]

b. che-r-oga-r**ã**-$\boxed{\text{ng}}$ue
[ʃe-ɾ-oɰa-ɾ̃ã-ˈŋᶢʷe]
1SG-N3POSS-house-DEST-POST
‘my former future house’

(30) a. añete-há-$\boxed{\text{pe}}$
[ãɲete-ˈha-pe]
true-NMLZ-ADV
‘truly’[9]

b. apy-re-’ỹ-$\boxed{\text{me}}$
[apɨ-ɾe-ˈʔɨ̃-mẽ]
end-POST-PRV-ADV
‘perpetually’

c. joja-’ỹ-$\boxed{\text{me}}$
[ʤoʤa-ˈʔɨ̃-mẽ]
fair-PRV-ADV
‘unfairly’

Table 6 below shows a comprehensive list of all stop-initial morphemes in Guarani, organized by the behavior they display in the environment of oral versus nasal roots. These were gathered from previous literature (Estigarribia 2020; 2021; Russell 2021; 2025) as well as from my own fieldwork. Roots also seem to show progressive harmony alternations wherein the initial stop of a root alternates to a nasal-oral stop in nasal environment (like *-kuéra/-nguéra* PL). Root alternations show a different pattern of productivity compared to suffixes, so these will be discussed in Section 4 of this paper. This table also notes the kind of morphological boundary that was transcribed in Estigarribia (2020) for these morphemes, where these are variably transcribed as suffixes (-), clitics (=) or even as their own words (#).[10]

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[8] The examples in (29) are from Estigarribia (2020) and were not confirmed with my language consultants.

[9] The examples in (30) are from Godoy et al. (2022) are were not confirmed with my language consultants.

[10] I refer to all these morphemes as “suffixes” in this paper for various reasons. First, all these morphemes show the same phonological behavior regarding regressive nasalization: all these morphemes equally show morpheme-internal nasalization only. They also show the same behavior regarding stress: all of these morphemes are within the stress window, meaning that, if they are lexically stressed and the final morpheme

Type A	-ˈpa	-ˈm^{b}a	TOT	
undergoing (T ∼ N^{D})	-poˈta	-m^{b}oˈta	INCIP	
	-ˈpɨ	-ˈm^{b}ɨ	NMLZ.PASS	
	-ˈtɨ	-ˈn^{d}ɨ	COLL	
	-ˈk^{w}e	-ˈŋ^{gw}e	NMLZ.ABS;POST[a]	
	=ˈk^{w}eɾa	=ˈŋ^{gw}eɾa	PL	
	#ɰoˈt$^{(ɨ)}$o	#ŋ^{gɰ}oˈt$^{(ɨ)}$o	‘towards’	
	(and roots, see Section XX)			
Type B	=pe	=mẽ	LOC;DOM;ADV	
undergoing (full nas.)	=/#ˈpeʋe	=/#ˈmẽʋ̃ẽ	‘until’	
Type C	-ta	FUT	=pa	Q
non-undergoing	-ke	FRC	-mã	CMPL
	-nã	REQ	-nẽ	DUB
	-mõˈʔã	NEG.FUT	-ˈmĩ	PLEA;DIM;HAB
	=m^{b}o	UNCRTN	-ŋ^{g}aˈʔu	DES
	=n^{d}i	‘with’		
	(and roots, see Section XX)			

Table 6: Guarani stop-initial suffixes by progressive nasalization type. T represents a voiceless stops and N^{D} a nasal-oral stop. The type of boundary is transcribed according to Estigarribia (2020).

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[a] Russell (2021) assumes this suffix is a Type B suffix, where the nasal allomorph undergoes full nasalization to [ŋ^{w}ẽ] as opposed to [ŋ^{gw}e]. The language consultants produced a clear nasal-oral stop and oral vowel in my fieldwork, and other sources orthographically transcribe this suffix as *-ngue* rather than as *-g̃ue*.

Crucially, the distribution of these suffixes shows truly idiosyncratic and lexically specific behavior in progressive nasalization, where their distribution cannot be fully explained by other phonological or morphological properties. First, lexical stress doesn't fully account for the behavior of these suffixes under progressive nasalization: although all Type A suffixes (including roots) are lexically stressed, Type B and Type C suffixes show a combination of lexically stressed and unstressed suffixes. Second, the type of boundary reported for each morpheme by Estigarribia (2020) also fails to account for the distribution: all types of suffixes include a mix of suffix boundaries and clitic boundaries at the very least. Finally, Russell (2021) argues that the distribution of Type A and Type B suffixes could be explained by diachronic factors, where Type A suffixes were historically stand-alone roots and Type B suffixes are historically reconstructed as affixal morphemes in Proto-Tupi-Guarani (Jensen 1998). Although this may account for the

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in a construction, only the final syllable is pitch accented (see (Jun & Zubizarreta 2022; Jun et al. 2023) for more on Guarani intonation). And, previous works that transcribe these morphemes as clitics or as their own words (primarily Estigarribia (2020)) fail to provide evidence or diagnostics for the difference between suffixes and clitics. What is crucial to this paper is that all these morphemes show the same prosodic and phonological behavior (albeit showing different types of progressive nasalization).

distribution of Type A vs. Type B suffixes, this fails to account for the distribution of undergoing (Types A and B) vs. non-undergoing (Type C) suffixes.

Note that Table 6 is not an exhaustive list of Guarani suffixes. For example, Guarani also has suffixes with an initial glottal stop that fail to alternate under progressive nasalization, as well as suffixes that are sonorant-initial or vowel-initial that also remain unaffected under progressive nasalization. As with Type C suffixes, these are contrastively oral or nasal and remain as so regardless of the orality or nasality of the root. Table 6 above is also missing two suffixes that show similar alternations to Type A suffixes but that are in free variation according to Estigarribia (2020). These are the veridical emphatic suffix *-(ni)ko/-(ni)ngo* VRD.EMPH, and the attentuative suffix *vy/-ngy* [-ˈʋɨ/-ˈŋᶢɨ] ATTN. For these suffixes, the oral allomorphs (*-(ni)ko*, *-vy*) may appear with nasal roots, and the nasal allomorphs (*-(ni)ngo*, *-ngy*) may appear with oral roots, and so they do not follow the robust pattern of progressive nasalization attested in the suffixes in Table 6.

4 The analysis

Given that Guarani progressive nasalization is morpheme-specific, it is often described as a case of phonologically conditioned suppletive allomorphy (Estigarribia 2021; Russell 2021; 2025). I now provide the first formal analysis of Guarani progressive nasalization as phonologically conditioned suppletive allomorphy (Carstairs 1988). Under the proposed analysis, the suffixes that alterate have different listed allomorphs with different underlying representations, and the choice of the suffix allomorph is determined by the phonology. In the proposed constraint-based analysis of the pattern, the phonological grammar's markedness and faithfulness constraints select the UR allomorph that results in the least marked output (Tranel 1990; Mester 1994; Kager 1996; Mascaró 2007; Paster 2006; Wolf 2008), and so allomorph selection is phonologically optimizing.

The first main component of this analysis is that the three types of morphemes differ in their lexical specification, and these differences in lexical specification predict the three different types of suffixes described in the previous section. Table 7 below shows the suffix lexical specifications I assume in this paper for the three suffix types.

morpheme type	**example**	**listed allomorph schema**
Type A	-pa ∼ -mᵇa TOT	{ TV, NV } NV → **Nᴰ V**
Type B	-pe ∼ -mẽ LOC;DOM;ADV	{ TV, NṼ }
Type C	-ta FUT	{ TV }
	-mã CMPL	{ NṼ }

Table 7: Morphemes differ in lexical specification in three ways. T indicates a voiceless stop, N a full nasal consonant, and N^D a nasal-oral stop

Here, both types of alternating suffixes (Types A and B) have two listed allomorphs each. For both types of suffixes, one of their listed allomorphs is fully oral (with an initial voiceless stop and oral vowel), while the other has an initial full nasal consonant. The phonemic nasality of this nasal-initial allomorph is different across Type A and Type B suffixes, thus predicting their differential behavior under progressive nasalization. For the suffixes that alternate to an initial nasal-oral stop (Type A), the nasal-initial allomorph has a phonemic oral vowel. Given this phonemic oral vowel, the initial nasal consonant post-oralizes via the regular phonotactics of the language. On the other hand, the suffixes that undergo full nasalization in the environment of nasal roots (Type B) are specified with a phonemic nasal vowel in their nasal allomorph. Since there’s no need for post-oralization in the environment of a nasal vowel, the initial full nasal consonant surfaces faithfully. These lexical specifications across both types of alternating suffixes also apply to the bisyllabic suffixes under both types. The Type A bisyllabic suffixes are fully oral and only differ in the nasality of the initial segment. So, for example, the underlying forms of the allomorphs for *-kuéra/-nguéra* PL are {/kueɾa/, /ŋueɾa/}. For the Type B bisyllabic suffix *-peve/-meve* ‘until’, the nasal allomorph has a phonemic (rightmost) nasal vowel that triggers regressive nasalization onto the preceding syllable (/meʋ**ẽ**/ → [$\overleftarrow{\text{mẽʋ̃ẽ}}$]).[11] So, as with the monosyllabic suffix *-pe/-me* LOC;DOM;ADV, its initial full nasal consonant surfaces as such. Lastly, the Type C non-undergoing suffixes, oral or nasal alike, have only one listed allomorph, and so the phonology has no allomorphs to choose from. These non-undergoing suffixes are contrastively oral/nasal and they follow the general pattern of regressive nasalization described in Section 2.

The second central component of the analysis is that the allomorphy is phonologically conditioned: oral roots select for oral suffix allomorphs, and nasal roots select for nasal(-initial) suffix allomorphs. I define the progressive nasalization constraint that controls allomorphy selection in (31) below.

(31) *[… [α NAS]]$_{\text{ROOT}}$ … [$_{\omega}$ [−α NAS, −CONT] …] (PROGHARM)

Assign a violation to every non-local sequence of a rightmost [α NAS] segment of the root and a leftmost [-α NAS, -CONTINUANT] segment in a prosodic word to its right.

In other words, this PROGHARM markedness constraint rules out forms in which the rightmost vowel of the root disagrees in orality/nasality with the initial stop of any prosodic word to its right. So, this constraint builds a non-local correspondence relation between the phonemic vowel of the root (which is the rightmost vowel of the leftmost prosodic word) and the initial segment of morphemes (or, prosodic words) to their right, where the corresponding segments must agree in nasality. The diagram in (33) below visualizes the general mechanism of the PROGHARM constraint, using (32) as an example.[12]

(32) o-ñe’ẽ-se-$\boxed{\text{mb}}$a-$\boxed{\text{mb}}$ota-$\boxed{\text{meve}}$

[$\overleftarrow{\text{õ-ñẽʔẽ}}$-se-m^{b}a-m^{b}oˈta-mẽʋ̃ẽ]

3-talk-DES-TOT-INCIP-until

‘until he is about wanting to finish talking’

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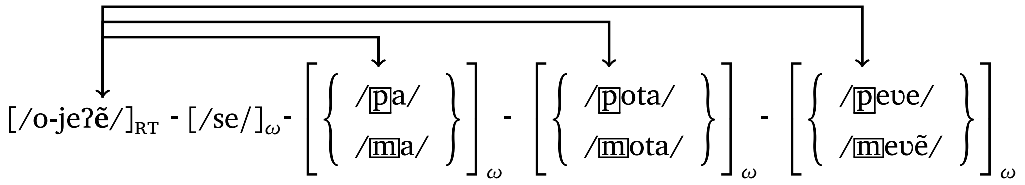
[11] Recall that suffixes, regardless of lexical stress, retain the oral/nasal contrast in their rightmost vowels and they trigger regressive nasalization up to the suffix boundary (Cabrera 2025).

[12] Note in (33) that there is no correspondence or dependency between the phonemic nasal vowel of the root with the suffix *-se* DES since PROGHARM-C only requires correspondence in nasality between roots and initial [-continuant] segments in suffixes, and *-se* has a [+continuant] segments suffix-initially.

(33)



Crucially, PROGHARM encodes the various important characteristics of Guarani progressive nasalization discussed in the previous section. First, it is the phonemic orality or nasality of the root, determined by its rightmost segment, that conditions the alternation among the suffixes to their right. Recall that phonemically oral suffixes, as well as oral segments in alternating suffixes, may appear between the phonemic vowel of the root and other alternating suffixes, and these oral segments fail to block progressive nasalization. And, nasal-oral stops, or underlying full nasal consonants, fail to trigger progressive nasalization. Second, the initial segments of the suffixes are the "targets" of the PROGHARM correspondence in nasality. This is because in Type A alternating suffixes the only nasal segment in the suffix is the initial nasal consonant (which surfaces as a nasal-oral stop), and so there are no other segments in these suffixes that may be targets of the correspondence in nasality between the root and following suffixes.[13,14] Additionally, this constraint operates at a long distance and establishes multiple correspondence relations simultaneously: intervening oral segments can occur between the root and alternating suffixes, and suffix alternations stack. Lastly, this constraint is symmetric in its correspondence in nasality: it must be violated by forms with nasal-initial suffixes in the environment of an oral root as well as by forms with oral-initial suffixes in the environment of a nasal root. See Section 6 for more discussion on the nature and mechanism of this constraint as well as its analysis under theories of harmony systems.

Having established the lexical specification of suffix allomorphs and the mechanism of Guarani progressive nasalization, we can now analyze the different types of suffixes. The tableau in (35) below analyzes a form with a phonemic nasal root followed by a Type A suffix, namely one that alternates to an initial nasal-oral stop in the environment of a nasal root. Candidate (a) fatally violates PROGHARM since the initial segment of the suffix is oral while the rightmost segment of the root is nasal. The selection of the oral allomorph of the suffix cannot be rescued by altering the nasality of the phonemic vowel of the root given the higher-ranked IDENT-R[NAS], which, as discussed in Section 2, protects the phonemic nasality of roots and suffixes equally since these are their own prosodic words. Candidate (c) selects the nasal-initial allomorph, but the general *NV phonotactic constraint rules it out since it contains a sequence of a nasal consonant followed by an oral vowel. Finally, Candidate (d) is the most optimal candidate since the nasal allomorph is most optimal under PROGHARM, it follows the general phonotactic restrictions of full

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[13] For Type B suffixes, we can alternatively assume a correspondence relation between the phonemic nasality of the suffix (its rightmost vowel) and the phonemic nasality of the root. But the PROGHARM constraint as it stands predicts the alternation in phonemic nasality of Type B suffixes given that the URs of the oral versus nasal allomorphs of Type B suffixes differ in phonemic nasality as well as in the nasality of their initial segment. Section 7 of this paper returns to this issue.

[14] The PROGHARM constraint as defined in (31) above would fail to predict the alternation of *-gotyo/-ngotyo* 'towards' in the environment of oral versus nasal roots, since the initial segment of this suffix is [+continuant] and the constraint only rules out suffixes with initial [−continuant] segments in forms with nasal roots. We can alternatively assume that PROGHARM builds a correspondence relation between any initial segment of the suffix regardless of its value for the [continuant] feature, and the analysis would still make the right predictions since any [+continuant]-initial suffix just has one listed allomorph. Or, we can assume that, the velar approximant [ɰ] is underlyingly a voiced oral stop given its phonological behavior in progressive nasalization. However, Guarani lacks oral voiced stops at any place of articulation.

nasal consonants of the language, and its selection violates no faithfulness constraints. Note that in this analysis there is no real “alternation” in the orality/nasality of the initial segment of the suffix, and so candidates with either oral- or nasal-initial segments fail to violate any faithfulness constraints in nasality as long as the candidate has no other ones.

(34) o-ñe’ẽ-mba, *-pa
[õ-ɲẽʔẽ-ˈm^{b}a]
3-talk-tot

(35)

/$\tilde{V}_{RT}$ - { TV, NV }/	*NV	Ident-R[nas]	ProgHarm	*Contour
a. Ṽ - TV			*!	
b. V - TV		*!		
c. Ṽ - NV	*!			
☞ d. Ṽ - N^{D}V				*

Similarly, oral roots select for oral-initial suffix allomorphs. The tableau in (37) below analyzes a form with an input oral root followed by a Type A alternating suffix such as that in (36). Here, the selection of the oral allomorph is most optimal since both the root’s rightmost vowel and the initial segment of the suffix are oral, therefore Candidate (a) wins. All other candidates lose to Candidate (a) since they either violate ProgHarm by selecting the nasal-initial allomorph in the presence of an oral root (Candidates (b) and (c)), or they violate high-ranking faithfulness by altering the orality/nasality of the root’s rightmost vowel (Candidate (d)).

(36) o-karu-pa, *-mba
[o-kaɾu-ˈpa]
3-eat-tot

(37)

/V_{RT} - { TV, NV }/	*NV	Ident-R[nas]	ProgHarm	*Contour
☞ a. V - TV				
b. V - NV	*!		*	
c. V - N^{D}V			*!	*
d. Ṽ - N^{D}V		*!		*

Next, suffixes with full nasalization are similarly selected given the demands of ProgHarm. The tableau in (39) below analyzes a form such as (38), which has a phonemic nasal vowel in the root followed by a Type B suffix that shows full nasalization in constructions with a nasal root. Recall that the nasal allomorph of Type B suffixes has a phonemic nasal vowel, and this is what predicts the differential behavior of Type A and Type B suffixes under progressive nasalization. As in the tableau in (35) above with Type A suffixes, Candidate (a) fatally violates ProgHarm since the root and the initial segment of the suffix disagree in nasality, and Candidate (b) fatally violates high-ranking faithfulness. Candidate (c) is the winner since the selection of the nasal-initial allomorph satisfies ProgHarm.

Candidate (d) is ruled out by *CONTOUR since it contains an unnecessary nasal-oral stop: nasal-oral stops only surface before an oral vowel. Notice that candidates with either a phonemic oral or nasal vowel in the suffix don't violate IDENT-R[NAS] since their nasality or orality is faithfully mapped from the selected input UR.

(38) kosi**na**-$\boxed{\text{me}}$, *-$\boxed{\text{pe}}$
[kõsĩˈnã-mẽ]
kitchen-LOC

(39)

/Ṽ$_{RT}$ - { TV, NṼ }/	*NV	IDENT-R[NAS]	PROGHARM	*CONTOUR
a. Ṽ - TV			*!	
b. V - TV		*!		
☞ c. Ṽ - NṼ				
d. Ṽ - N^{D}Ṽ				*!

Next, the non-alternating Type C suffixes violate PROGHARM in constructions where their nasality disagrees with the phonemic nasality of the root, but they are still predicted as optimal. The tableaus in (41) and (42) below analyze forms in which the orality/nasality of the root disagrees with the orality/nasality of the initial segment of the suffix, such as in the examples in (40). Type C suffixes show that an additional faithfulness constraint is in order, specifically one that rules out the alternation in nasality of the initial consonant of the suffix to satisfy PROGHARM. We can simply assume a general IDENT[VOICE] constraint that rules out featural changes in voicing, hence ruling out the mapping of a voiceless stop to a nasal consonant (or nasal-oral stop).[15] Note that, although not included in the previous tableaus, this faithfulness constraint is not violated by Type A and Type B suffixes since their initial consonant is selected via the allomorphs as opposed to alternated via featural changes. So, in both tableaus below, the optimal candidates violate PROGHARM, but these are still the more optimal candidates compared to candidates that avoid violations of PROGHARM via alternations of root nasality or alternations in nasality to the initial segment of the suffixes.

(40) a. ai-pytyv**õ**-ta, *-nda, *-na
[ã$^{\tilde{\imath}}$-pɨ̃tɨ̃ˈʊ̃õ-ta]
1SG-help-FUT

b. a-jerok**ý**-ma, *-pa
[a-ʤeɾoˈkɨ-mã]
1SG-dance-CMPL

(41)

/Ṽ$_{RT}$ - { TV }/	*NV	ID-R[NAS]	ID[VOI]	PROGHARM	*CNTR
☞ a. Ṽ - TV				*	
b. Ṽ - N^{D}V			*!		*
c. V - TV		*!			

---

[15] There are many ways we can formalize this constraint. We could alternatively assume a faithfulness constraint in nasality that rules out changes in nasality for voiceless segments specifically, compatible with their transparency in regressive asalization. This constraint should only apply to [−voice] segments since initial voiced segments may nasalize via regressive nasalization (such as suffix [-ɾ̃ãmõ] 'if' in example (16b)).

(42)

/V$_{RT}$ - { NṼ }/	*NV	ID-R[NAS]	ID[VOI]	PROGHARM	*CNTR
☞ a. V - NṼ				*	
b. V - TṼ			*!		
c. Ṽ - NṼ		*!			

This analysis also predicts that progressive harmony alternations stack among alternating suffixes given accumulating violations of PROGHARM. The tableau in (44) below analyzes a form with a nasal root and multiple alternating suffixes such as (43). In (44), Candidates (a) and (b) are immediately ruled out given their variable violations of PROGHARM, and Candidate (c) is ruled out given its unfaithful realization of the phonemic nasality of the root.

(43) mitã-$\boxed{\text{ng}}$uéra-$\boxed{\text{me}}$ *-$\boxed{\text{k}}$uéra-$\boxed{\text{pe}}$
[mĩtã-ˈŋ^{gw}eɾa-mẽ]
child-PL-DOM

(44)

/Ṽ$_{RT}$ - { TV, NV } - { TV, NṼ }/	*NV	ID-R[NAS]	PROGHARM	*CNTR
a. Ṽ - TV - TV			**!	
b. Ṽ - TV - NṼ			*!	
c. V - TV - TV		*!		
☞ d. V - N^{D}V - NṼ				*

Finally, this analysis also predicts that alternating suffixes (Types A or B) will in fact alternate even in the environment of non-alternating Type C suffixes. The tableau below analyzes a form with an alternating suffix followed by two non-alternating suffixes (in this case, oral followed by nasal, as in (45) below). Candidate (b) is the winner in this analysis since it incurs the least number of violations of PROGHARM, and it violates no other higher-ranking constraints. Candidate (a) has two violations of PROGHARM since the oral allomorph was selected for the first suffix. So, the analysis predicts that any alternating suffix must agree with the nasality of the root even when the form must optimally violate PROGHARM given the presence of non-alternating suffixes. In other words, even when PROGHARM is a violable constraint and is optimally violated by forms with non-undergoing suffixes, the phonological grammar prefers candidates with the least violations of PROGHARM when such violations can be avoided via allomorphy selection.

(45) o-ñe’ẽ-$\boxed{\text{mb}}$á-ta-ma
[õ-ɲẽʔẽ-ˈm^{b}a-ta-mã]
3-talk-TOT-FUT-CMPL

(46)

	/Ṽ$_{RT}$ - { TV, NV } - { TV } - { NṼ }/	*NV	Id-R[N]	ProgHarm	*Cntr
	a. Ṽ - TV - TV - NṼ			**!	
☞	b. Ṽ - N^{D}V - TV - NṼ			*	*
	c. Ṽ - N^{D}V - N^{D}V - NṼ		*!		**

Taking stock, the proposed analysis formalizes the differential behavior of suffixes in the environment of nasal roots as differences in the lexical specification of their allomorphs. Specifically, the alternating suffixes (Types A and B) have two listed UR suffix allomorphs, while Type C suffixes have one listed allomorph that is phonemically oral or nasal and remains so regardless of the nasality of the root. The difference between Type A and Type B suffixes is formalized as a difference in the phonemic vowel of the nasal-initial allomorph of the suffix, which predicts the phonemic nasality or orality of the allomorphs as well as which consonant (nasal-oral stop or nasal consonant) surfaces as the initial consonant of the suffix in the environment of nasal roots. The analysis also predicts that non-alternating Type C suffixes are optimal even when their single allomorph disagrees with the nasality of the root. And, the analysis predicts the stacking effect of alternating suffixes via accumulating violations of ProgHarm as well as forms with various alternating and non-alternating suffixes.

5 Root nasalization and exceptional causatives

Sections 3 and 4 of this paper described and analyzed Guarani progressive nasalization in suffixes. However, verbal and nominal roots, not just suffixes, also show lexically-specific alternations in the environment of preceding nasal segments. In all progressive nasalization targeting roots, the root-initial voiceless stops always alternate to initial nasal-oral stops. The general pattern of root nasalization is primarily described in Estigarribia (2020; 2021) and Russell (2021), but in this Section I provide new fieldwork data showing that root nasalization is not as productive as suffix nasalization under progressive harmony.

Type A-style root alternations are mostly attested in Guarani compounds and in some causative constructions. In the compounds in (47, 48), the initial stop consonant of the second root alternates to a nasal-oral stop when preceded by a phonemic nasal root. As with suffix alternations under progressive nasalization, root alternations are also lexically specific: other roots, such as those in (49, 50, 51) below, fail to alternate even when the first root is nasal. In general, compounding in Guarani is not an entirely productive process, even for compounds that involve no progressive harmony alternations.

(47) a. ñande-katu
[ɲãn^{d}e-kaˈtu]
1PL.IN-able
‘we’re smart’

b. akã-ngatu
[ãkã-ŋ^{g}aˈtu]
head-ability
‘memory’

(48) a. je-ka’u
[ʤe-kaˈʔu]
AGD-drunk
‘drunk’

b. akã-nga’u
[ãkã-ŋ^{g}aˈʔu]
head-drunk
‘dizzy (from drunkenness)’

(49) akã-$\boxed{\text{k}}$angue
[ãkã-kãˈŋ^{gw}e]
head-skull
'skull'

(50) akã-$\boxed{\text{k}}$y'o
[ãkã-kɨˈʔo]
head-louse
'head lice'

(51) akã-$\boxed{\text{p}}$yta
[ãkã-pɨˈta]
head-certain
'prudent'

These lexically-specific root alternations are also attested in some of Guarani's causative constructions. In the examples in (52) and (53) below, the causative prefix surfaces as its fully nasal allomorph *-mo* [-mõ], and the initial voiceless stops of the verb roots alternate to nasal-oral stops in the presence of the causative prefix. See Appendix A for a full list of roots that undergo progressive nasalization in causative constructions and in compounds.

(52) a. o-$\boxed{\text{p}}$áy
[o-ˈpa^{i}]
3-wake.up
'he woke up'

b. o-**mo**-$\boxed{\text{mb}}$áy Diego-pe
[õ-mõ-ˈm^{b}a^{i}]
3-CAUS-wake.up Diego-DOM
'he woke up Diego'

(53) a. che-$\boxed{\text{k}}$aigue
[ʃe-ka^{i}ˈɰ^{w}e]
1SG-bore
'I'm bored'

b. nde che-**mo**-$\boxed{\text{ng}}$aigue
[n^{d}e ʃẽ-mõ-ŋ^{g}a^{i}ˈɰ^{w}e]
2SG 1SG-CAUS-bore
'you bored me'

In most Guarani causative constructions though, the causative prefix surfaces as *mbo-* [m^{b}o-] in the presence of oral roots and as *mo-* [mõ-] in constructions with nasal roots, as seen in (54) and (55) below. The examples in (54) also show that, as with compounds, the nasalization of the causative constructions in (52) and (53) above is lexically specific: verb roots such as *páy/mbáy* 'wake up' (52) and *kaigue/ngaigue* 'bore' (53) could be considered Type A roots since they undergo the alternation of their initial consonant, while other roots such as *pupu* 'hot' (54a) and *kapu* 'shot' (54b) do not alternate in causative constructions and so these could be considered Type C roots. And, (55) shows that nasal roots with initial stops follow the expected pattern of regressive nasalization: roots with phonemic nasal vowels or nasal-oral stops regressively nasalize any preceding segments including the causative prefix. In general, causativization in Guarani with the *mbo-/mo-* prefix and of the kind seen in (54) and (55) is very productive and widespread.

(54) a. a-mbo-pupu nde-'y
[$\overleftarrow{\text{ã-m}}$^{b}o-puˈpu n^{d}e-ˈʔɨ]
1SG-CAUS-hot water
'I boiled water'

b. e-mbo-kapu-na
[$\overleftarrow{\text{ẽ-m}}$^{b}o-kaˈpu-$\overleftarrow{\text{nã}}$]
IMP-CAUS-shot-REQ
'shoot!'

(55) a. nde a-mo-kane'**õ**
[n^{d}e $\overleftarrow{\text{ã-mõ-kãnẽˈʔõ}}$]
2SG 1SG-CAUS-tired
'I tired you'

b. ro-mo-mara**nd**u-jevy-vy
[$\overleftarrow{\text{ɾ̃õ-mõ-mãɾ̃ãn}}$^{d}u-ʤeʋɨ-ˈʋɨ]
1SG-CAUS-warning-again-again
'I warned you several times'
(Estigarribia 2020)

The causative constructions in (52, 53) are often deemed "exceptionally nasal" in previous literature since some component of these constructions must be exceptionally nasal in an unpredictable manner (Estigarribia 2021). Underlyingly, the root is fully oral in these constructions given their behavior outside causative constructions (52a, 53a), and the causative prefix, following the basics facts of regressive nasalization, is also underlyinly oral and it would only nasalize in the presence of nasal segments to its right.

At the surface, there are two possible analyses for these exceptional causatives in (52, 53), schematized in Table 8 below. The first is that the alternating roots exceptionally surface with an initial nasal-oral stop (underlyingly, a full nasal consonant) in causative constructions via morphological rule. This in turn triggers regressive nasalization onto preceding segments, including the nasalization of the causative prefix from /mo-/ to [mõ-]. The alternative analysis is that the causative prefix is exceptionally nasal when attached to certain roots via morphological rule, and this causative prefix, being underlyingly nasal, simultaneously selects for the nasal-initial allomorph of alternating roots via ProgHarm, which triggers regressive nasalization onto the causative prefix and other preceding segments.

Analysis 1:	**morphology:** "wake up" ⇔ /maɨ/ / [caus] _____ ⇔ /paɨ/ otherwise **phonology:** Regressive nas. from nasal-initial root [$\overleftarrow{\text{õ-mõ-}\textbf{m}}^{b}a^{\text{ɨ}}$]
Analysis 2:	**morphology:** [caus] ⇔ /mõ/ / _____ {'wake up', 'bored', ...} ⇔ /mo/ otherwise **phonology:** ProgHarm selects nasal-initial allomorph · [mõ-paɨ] violates ProgHarm

Table 8: Two possible analyses for Guarani exceptional causative constructions.

Analysis 1 is simplest compare to Analysis 2 since it involves only one allomorphy: once the nasal-initial root allomorph is selected via morphological rule, regressive nasalization predicts the nasalization of the causative prefix and other preceding segments. Analysis 2 involves two allomorphies: the morphological allomorphy that selects the fully nasal allomorph of the causative prefix when attached to alternating roots, and the phonologically conditioned allomorphy that selects the nasal-initial allomorph of the root given the nasal causative prefix. However, Analysis 2 is the one that is consistent with the proposed mechanism of Guarani progressive nasalization as phonologically conditioned allomorphy for suffixes I argue for in this paper. And, Analysis 2 is further supported by diachronic accounts of Guarani and its proto-languages (Estigarribia 2021).[16]

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[16] As argued in Estigarribia (2021), pre-Proto-Tupi-Guarani had productive progressive nasalization. The nasal causative prefix, the only allomorph of the causative at the time, was a common trigger, along with the phonemic nasal segments in other root-root constructions. Then, progressive nasalization was lost in the

But, it's important to note a major difference between root vs. suffix progressive nasalization in Guarani: the trigger of root nasalization in causative constructions is a segment in a prefix, while the trigger of suffix nasalization as well as root nasalization in compounds is a segment in a root. Recall that, given regressive nasalization, Guarani prosodic structure requires the (first) root and all preceding prefixes to be in the same prosodic word. As we saw with progressive nasalization in suffixes, it is the right edge of the first prosodic word (i.e. the phonemic vowel of the root) that selects the nasal-initial allomorphs of suffixes. So, positing that the causative prefix selects for nasal-initial root allomorphs would go against the prosodic structure we need to account for both Guarani nasalization mechanisms, regressive and progressive. This is the only case in Guarani of a prefix displaying some phonological behavior that is inconsistent with the fact that prefixes are completely cohesive with roots: prefix vowels are never contrastively oral/nasal, and they are never stressed.

Regardless, the crucial property that differentiates root nasalization from suffix nasalization in progressive harmony is that, in both in compounds and causative constructions, root nasalization is considerably less productive than suffix nasalization. Specifically, forms with root nasalization behave as lexicalized forms. So, forms with root nasalization behave as a single phonological unit, where the morphemes that would be the triggers and targets of root nasalization are in the same unit, and so they enter phonological evaluation as a single input. So, I argue that root nasalization, although strikingly similar to the pattern of nasalization in Type A suffixes, should not be analyzed under the proposed analysis: root nasalization is lexically specified and is not accounted for by the same mechanism that accounts for progressive nasalization in suffixes.

The first piece of evidence that root nasalization is an unproductive pattern compared to suffix nasalization is that compounds and exceptional causative constructions have lexicalized meanings (Estigarribia 2020; 2021; Russell 2021). For compounds this is not surprising since compounding is not an entirely productive process in Guarani, and many compounds already have lexicalized meanings. But, these lexicalized meanings become very apparent for causative constructions when comparing the meanings of the exceptionally nasal causative form versus its non-exceptional form. For some causative constructions, the exceptional causative form shows the lexicalized meaning while its non-exceptional form, the expected phonological pattern under no morphological or phonologically conditioned allomorphy, shows a more compositional meaning.[17] The examples in (56) are from my own fieldwork, and the examples in (57) are from Russell (2021).

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passage from pre-Proto-Tupi-Guarani to Proto-Tupi-Guarani, replaced by a new system of regressive oralization. Estigarribia (2021) argues that the loss of progressive nasalization, along with the emergence of regressive oralization in Proto-Tupi-Guarani, explains the current existence of forms that show no progressive nasalization from the causative prefix, such as those in (54), and the emergence of *-mbo* as the now the common and non-exceptional allomorph of the causative prefix in fully oral constructions.

[17] This generalization, supported by the examples in (56) and (57) above, does not hold for every root. My language consultants find that the non-exceptional form of causative constructions is ungrammatical for some roots. For example, my language consultants consistently rejected **a-mbo-*$\boxed{k}$*y* 1SG-CAUS-rain 'I made it rain', preferring the exceptionally nasal causative form *a-mo-*$\boxed{ng}$*y*. It could be the case that, for exceptional causative constructions with lexicalized meanings, the non-exceptional form is grammatical and carries a more compositional meaning, while for exceptional causatives that have non-lexicalized meanings, the non-exceptional form is unacceptable. Further empirical investigation is needed in order to determine the differential acceptability and grammaticality of exceptional vs. non-exceptional causative constructions depending on their meanings, contexts, and verb roots.

(56) a. che n-a-**mo**-$\boxed{\text{mb}}$u-i pe bomba
[ʃe n-ã-mõ-ˈm^{b}u-^{i} pe ˈbõmba]
1SG NEG-1SG-CAUS-sound-NEG DEM balloon
'I didn't **pop/explode** the balloon'

b. che n-a-mbo-$\boxed{\text{p}}$u-i pe i-mbaraka
[che n-ã-m^{b}o-ˈpu-^{i} pe ĩ-m^{b}aɾaˈka]
1SG NEG-1SG-CAUS-sound-NEG DEM 3-guitar
'I didn't **sound** the guitar'

(57) a. o-**mo**-$\boxed{\text{ng}}$arai pe mitã-me
[õ-mõ-ŋ^{g}aɾaˈi pe mĩˈtã-mẽ]
3-CAUS-man DEM child-DOM
'he **baptized** the child' (Russell 2021)

b. pe i-vigote o-mbo-$\boxed{\text{k}}$arai pe mitã-me
[pe i-ʋiˈɰote õ-m^{b}o-kaɾaˈi pe mĩˈtã-mẽ]
DEM 3-mustache 3-CAUS-man DEM child-DOM
'The mustache **makes** the child look **like a man**' (Russell 2021)

The language consultants also varied in the use of exceptional vs. non-exceptional forms across other constructions. For example, the language consultants used the exceptional causative form, the one that shows the alternation, in basic affirmative constructions, but they use the non-exceptional form in negation. The (a) examples in (58, 59) are simple positive sentences that show the exceptional causative form, while the (b) examples show the non-exceptional causative construction, where the roots have initial voiceless stops and the causative prefix remains oral.[18] Still, contrary to the exceptional causatives in (56) and (57) above, the constructions in (58) and (59) have transparent, compositional meanings even when the exceptional form is used in simple affirmative constructions.

(58) a. nde che-**mo**-$\boxed{\text{ng}}$aigue
[n^{d}e ʃẽ-mõ-ŋ^{g}a^{i}ˈɰ^{w}e]
2SG 1SG-CAUS-bored
'you bored me'

b. nde na-che-mbo-$\boxed{\text{k}}$aigue-i
[n^{d}e nã-ʃẽ-m^{b}o-ka^{i}ˈɰ^{w}e-^{i}]
2SG NEG-1SG-CAUS-bored-NEG
'you didn't bore me'

(59) a. che ro-**mo**-$\boxed{\text{mb}}$yta
[ʃe ɾ̃õ-mõ-m^{b}ɨˈta]
1SG 1/2SG-CAUS-stop
'I stopped you'

b. che no-ro-mbo-$\boxed{\text{p}}$yta-i
[ʃe nõ-ɾ̃õ-m^{b}o-pɨˈta-^{i}]
1SG NEG-1/2SG-CAUS-stop-NEG
'I didn't stop you'

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[18] The language consultants produced the negated examples (58b, 59b) on the fly when asked to translate these sentences from Spanish, after having translated their affirmative counterparts right before. Right afterwards, they were asked if the negated form with the exceptional causative is acceptable, and they agree that this is acceptable, but that they prefer and would use the form in the (b) examples. The negated exceptional causative for (58) would be *na-che-mo-ngaigue-i* [nã-ʃẽ-mõ-ŋ^{g}a^{i}ɰ^{w}e^{i}] and for (59) it would be *no-ro-mo-mbyta-i* [nõ-ɾ̃õ-mõ-m^{b}ɨˈta^{i}].

An additional piece of evidence that root nasalization is lexicalized is that alternations due to progressive nasalization fail to stack. The examples in (60) below show that the suffix *-py/-mby* NMLZ.PASS is a Type A alternating suffix since its initial segment nasalizes to a nasal-oral stop in the environment of a nasal root. However, the causative prefix, although fully nasal and triggering root nasalization, fails to trigger the alternation of the Type A suffix, as shown in (61) below. So, the causative prefix and its root seem to behave as a single phonological unit in these forms: the phonemic vowel of the root, and not the causative prefix, selects for the suffix allomorph with the initial voiceless stop since it agrees with the orality of the root.[19]

(60) a. apo-$\boxed{\text{p}}$y-re
[apo-pɨ-ˈɾe]
do-NMLZ.PASS-POST
'realized, made'

b. apytĩ-$\boxed{\text{mb}}$y-re
[ãpɨ̃tĩ-m^{b}ɨ-ˈɾe]
tie-NMLZ.PASS-POST
'tied'

(61) a. ñe-**mo**-$\boxed{\text{ng}}$ora-$\boxed{\text{p}}$y-re
[ɲẽ-mõ-ŋ^{g}oɾa-pɨ-ˈɾe]
AGD-CAUS-corral-NMLZ.PASS-POST
'cornered'

b. ñe-**mo**-$\boxed{\text{ng}}$arai-$\boxed{\text{p}}$y-re
[ɲẽ-mõ-ŋ^{g}aɾa^{i}-pɨ-ˈɾe]
AGD-CAUS-baptize-NMLZ.PASS-POST
'consacrated'

Finally, a piece of evidence that progressive nasalization in roots might be a productive process is that some root alternations are consistent within and across different kinds of constructions, which might suggest that the pattern does have some phonological generalization as with suffixes. The data in (62-63) below gives examples of root alternations across different compound and causative constructions, where these roots consistently alternate across these constructions.

(62) a. $\boxed{\text{k}}$a'u
[kaˈʔu]
'drunk'

b. akã-$\boxed{\text{ng}}$a'u
[ãkã-ŋ^{g}aˈʔu]
head-drunk
'dizzy'

c. **mo**-$\boxed{\text{ng}}$a'u
[mõ-ŋ^{g}aˈʔu]
CAUS-drunk
'to inebriate'

(63) a. $\boxed{\text{t}}$yky
[tɨˈkɨ]
'drop; to drip'

b. amã-$\boxed{\text{nd}}$yky
[ãmã-n^{d}ɨˈkɨ]
rain-to.drip
'rainwater'

c. **mo**-$\boxed{\text{nd}}$yky
[mõ-n^{d}ɨˈkɨ]
CAUS-to.drip
'to squeeze/distill'

But, this consistency does not generalize to all roots. For example, the root *katu/ngatu* 'ability' (64) alternates in various compounds with a first nasal root (65). But, (66)

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[19] Unfortunately, haven't found equivalent examples of this lack of stacking in Guarani compounds to investigate if this lack of stacking across roots generalizes to contructions wherein the trigger of progressive nasalization is not a prefix. This probably due to the fact that compounding in Guarani is not entirely productive, and so there are only a handful of compounds that could serve as good examples to check this generalization. So, it remains to be shown if, for compounds with a phonemic nasal root followed by an alternating (nor non-alternating) oral root, Type A or Type B suffixes alternate given the phonemic nasality of the first root.

shows one exception where, in the environment of a nasal root, the root-initial voiceless stops surfaces as such regardless. And, the root *karai* ‘man’ shows progressive harmony alternations in a causative constructions but not in a compound, as shown in (67) below.

(64) a. $\boxed{\text{k}}$atu
[kaˈtu]
‘able’

(65) a. akã-$\boxed{\text{ng}}$atu
[ãkã-ŋᶢaˈtu]
head-ability
‘memory’

b. ñe’ẽ-$\boxed{\text{ng}}$atu
[ɲẽʔẽ-ŋᶢaˈtu]
talk-ability
‘talker, glossip’

c. marã-$\boxed{\text{ng}}$atu
[mãɾ̃ã-ŋᶢaˈtu]
??-ability
‘holy, noble’

(66) a. **mano-$\boxed{\text{k}}$atú-va**
[mãnõ-kaˈtu-ʋa]
death-ability-NMLZ
‘mortal’

(67) a. $\boxed{\text{k}}$arai
[kaɾaˈi]
‘man’

b. **mo-**$\boxed{\text{ng}}$arai
[mõ-ŋᶢaɾaˈi]
CAUS-man
‘baptize’

c. **kuña-$\boxed{\text{k}}$arai**
[kũɲã-kaɾaˈi]
woman-gentleman
‘lady’

In summary, although the root nasalization attested in Guarani compounds and in some causative constructions is consistent with Type A suffix nasalization, the analysis of progressive nasalization I propose for suffixes cannot be extended to analyze root nasalization. In compounds and causative constructions alike, there’s evidence that these are lexicalized forms, where root-root combinations are lexicalized for compounds and prefix-root combinations are lexicalized for causative constructions. Consistent with previous works (Estigarribia 2021; Russell 2021), the language data from the consultants shows that root nasalization is lexicalized since forms with root nasalization have lexicalized meanings (56-59), they fail to show the stacking of alternations otherwise attested in suffixes (60-61), and root alternations are only semi-consistent across constructions (62-67).

6 Dialectal variation in suffix progressive nasalization

The pattern of progressive nasalization described in Section 3 primarily describes that observed in the language consultants from Coronel Oviedo, Paraguay, where they show robust and productive progressive nasalization in suffixes (albeit this pattern being morpheme-specific). However, the two speakers from Asunción and Concepción seem to show variable progressive nasalization in suffixes, wherein the undergoing Type A and Type B suffixes variably fail to undergo progressive harmony alternations. This section briefly describes the nature of this variation in progressive nasalization, and presents an analysis of this variation based on the analysis proposed in Section 4.

As described in previous sections of this paper, the initial voiceless stop of suffixes in constructions with nasal roots alternates to a nasal-oral stop for some suffixes (Type

A), while other suffixes fully nasalize (Type B). The language consultants from Coronel Oviedo show this suffix nasalization pattern very robustly for many constructions and across different combinations of roots and alternating suffixes. However, the two language consultants from Asunción and Concepción show optional progressive nasalization, where they produce Type A and Type B alternating suffixes without the expected alternations in nasal environments, as seen in (69) below. The two speakers also accept and often produce forms with all suffix alternations in constructions with nasal roots, therefore consistent with the speakers from Coronel Oviedo.

(68) Coronel Oviedo speakers:

a. o-ñe'ẽ-se-mba-mbotá-meve

[õ-ɲẽʔẽ-se-m^{b}a-m^{b}oˈta-mẽʋ̃ẽ]

3-talk-DES-TOT-INCIP-until

'until he is about wanting to finish eating'

(69) Asunción / Concepción speakers:

a. o-ñe'ẽ-se-pa-potá-peve

[õ-ɲẽʔẽ-se-pa-poˈta-peʋe]

3-eat-DES-TOT-INCIP-until

'until he is about wanting to finish eating'

The speakers from Asunción and Concepción also produce optional progressive nasalization in suffixes even within the same form. As shown in (70) below, they variably produce alternating suffixes with their respective alternations, while also failing to produce alternations for other alternating suffixes, as shown in (70) below. But, this variability is still consistent in terms of the specific alternations the alternating suffixes are displaying: Type A suffixes always show Type A alternations, Type B suffixes always show Type B alternations, and Type C suffixes never alternate in the environment of nasal roots.

(70) a. mitã-nguéra-me

[mĩtã-ˈŋ^{gw}eɾa-mẽ]

child-PL-DOM

'children'

b. mitã-nguéra-pe

[mĩtã-ˈŋ^{gw}eɾa-pe]

child-PL-DOM

'children'

However, this optionality in progressive nasalization is asymmetric: although the two speakers produce oral-initial allomorphs in the environment of oral roots, they never produce nasal-initial allomorphs in the environment of oral roots ((b) examples in (71) and (72) below), and they find these forms unacceptable.

(71) a. mitã-kuéra

[mĩtã-ˈk^{w}eɾa]

child-PL

'children'

b. *jagua-nguéra

*[ʤaɰ^{w}a-ˈŋ^{gw}eɾa]

dog-PL

'dogs'

(72) a. che-mitã-$\boxed{\text{pe}}$
$\overleftarrow{\text{[ʃẽ-mĩ}}$ˈtã-pe]
1SG-child-DOM
'my child'

b. *che-sý-$\boxed{\text{me}}$
*[ʃe-ˈsɨ-mẽ]
1SG-mother-DOM
'my mother'

The fact that the variation in progressive nasalization is asymmetric can be interpreted as a general preference for the oral-initial allomorph over the nasal-initial allomorph for Type A and Type B suffixes, where the Asunción and Concepción speakers show less progressive nasalization overall given their regularization of the suffix allomorphy. Although in a recent corpus study Russell (2025) finds that nasal roots are more common than oral roots in Guarani, and so we would expect Type A and Type B nasal-initial suffixes to overall be more common than their oral counterparts, this study also finds that Spanish-origin roots overwhelmingly fail to show progressive nasalization even when these roots show robust regressive nasalization onto preceding prefixes. As mentioned in Section 2 of this paper, Guarani and Spanish have extensive language contact, with mixed languages such as Jopará emerging from Guarani-Spanish mixing. So, the speakers from Asunción and Concepción may be regularizing progressive nasalization for Guarani roots given that they speak Guarani varieties that show more extensive language mixing with Spanish.

I analyze the variation/optionality in suffix progressive nasalization attested in the varieties of the language consultants from Asunción and Concepción as equally-conflicting requirements for progressive nasalization and for preferring the oral allomorphs of alternating suffixes. The overall preference for oral suffix allomorph in the phonological analysis can be analyzed with PRIORITY constraints (Bonet et al. 2007; Mascaró 2007). Here, the lexicon specifies a priority ranking among the suffix allomorphs, and the PRIORITY constraint is violated whenever the phonological grammar selects an allomorph that is not the highest-ranked allomorph in the lexically-specified ranking. The PRIORITY constraint is defined in (73) below.

(73) PRIORITY (Bonet et al. 2007)

Given an input containing allomorphs, assing a violation mark to each morpheme that does not respect the lexical priority ordering of allomorphs.

The variation/optionality in suffix progressive nasalization of language consultants from Asunción and Concepción comes from the variety's flexible ranking between PRIORITY and PROGHARM. As shown in the tableau in (74) below, the competing pressures of lexical preference for orality and progressive nasalization predict two winning candidates: Candidate (a) wins even if it violates PROGHARM since the priority ranking among the allomorphs is respected, and Candidate (c) wins even if it violates the priority ranking among suffix allomorphs since it satisfies PROGHARM.

(74)

/$\tilde{\text{V}}_{\text{RT}}$- { TV ≫ NV }/	*NV	ID-R[NAS]	PRIORITY	PROGHARM	*CNTR
☞ a. Ṽ - TV				*	
b. V - TV		*!			
☞ c. Ṽ - N$^{\text{D}}$V			*		*

On the other hand, the language consultants from Coronel Oviedo rank PRIORITY below PROGHARM without any variation or optionality in ranking. Given this strict ranking of

ProgHarm above Priority, the speakers from Coronel Oviedo show robust and invariable progressive nasalization for suffixes with two input allomorphs. Candidate (c) is the only winner in the tableau in (75) below since Candidate (a), the other winner for Asunción/Concepción speakers, incurs a fatal violation of higher-ranked ProgHarm.[20]

(75)

/$\tilde{V}_{RT}$- { TV ≫ NV }/	*NV	Id-R[nas]	ProgHarm	Priority	*Cntr
a. $\tilde{V}$ - TV			*!		
b. V - TV		*!			
☞ c. $\tilde{V}$ - N^DV				*	*

The flexible ranking between Priority and ProgHarm of the speakers from Asunción and Concepción also predicts optionality in progressive nasalization within the same form, as observed in (70) above. As shown in the tableau below, this flexible ranking predicts multiple winners: candidates may optimally violate Priority multiple times, optimally violate ProgHarm multiple times, or optimally distribute the same total number of violations across Priority and ProgHarm (Candidates (b) and (c)).

(76)

/$\tilde{V}_{RT}$- { TV ≫ NV } - { TV ≫ N$\tilde{V}$ } /	Priority	ProgHarm	*Cntr
☞ a. $\tilde{V}$ - TV - TV		**	
☞ b. $\tilde{V}$ - TV - N$\tilde{V}$	*	*	
☞ c. $\tilde{V}$ - N^DV - TV	*	*	*
☞ d. $\tilde{V}$ - N^DV - N$\tilde{V}$	**		*

Crucially, this data on the variation in suffix progressive nasalization for some varieties of Guarani reinforces the fact that root nasalization and suffix progressive nasalization are different, as argued in the previous section. The language consultants that show variation in suffix progressive nasalization still show the same root nasalization pattern described in Section 5 for compounds and causative constructions, which is the same pattern of nasalization attested in speakers from Coronel Oviedo. This is further evidence that root nasalization and suffix nasalization are different mechanisms: root nasalization is lexicalized and so the speakers show little to no variation in compounds and causatives, while suffix nasalization is a more productive mechanism for Coronel Oviedo speakers compared to speakers from Asunción and Concepción.

Finally, the flexible ranking between Priority and ProgHarm may be probabilistically determined by the speakers from Asunción and Concepción, where the speakers probabilistically choose to produce the oral versus nasal suffix allomorphs in the environment of nasal roots. Given the variation and potentially probabilistic nature of progressive nasalization for these speakers, their data could alternatively be analyzed with true probabilistic phonological grammars with weighted constraints or with variable ranking among constraints, such as Stochastic OT (Boersma 1997; Boersma & Hayes 2001), Noisy Harmonic Grammar (Boersma & Pater 2016), and/or maximum entropy grammars (Goldwater & Johnson 2003; Hayes & Wilson 2008). These grammars may be better

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[20] Naturally, a simpler alternative analysis is that the speakers from Coronel Oviedo have no priority ranking in the lexicon, and so their progressive nasalization is simply predicted by the analysis presented in Section 4.

equipped at modeling the attested variation in progressive nasalization for various reasons. First, the PRIORITY constraint may not be necessary in modeling these patterns since now the regularization of suffix nasalization may stem from the relatively weak weight of the PROGHARM constraint for the Asunción and Concepción speakers compared to the weight of PROGHARM for the Coronel Oviedo speakers. And, as recently shown by Russell (2025), specific suffixes seem to undergo progressive nasalization at different rates. For example, Russell (2025) in a corpus study finds that the totalitative suffix *-pa/-mba* TOT appears with the nasal-initial allomorph *-mba* in 99.4% of forms with Guarani roots and in 45% of forms with Spanish roots, while the localive suffix *-pe/-me* appears with the nasal allomorph *-me* in 40% of forms with Guarani roots and in 11% of forms with Spanish roots. Naturally, more comprehensive studies on the true nature of variation in progressive nasalization are in order, especially those that look at the many phonological, distributional, and dialectal conditions that play a role in the attested variation in progressive nasalization. This work is among the first at more systematically investigating dialectal variation within Paraguayan Guarani nasalization.

7 General discussion

This paper presents the first formal analysis of Guarani progressive nasalization as phonologically conditioned suppletive allomorphy (Carstairs 1988; Russell 2021; 2025). Although Guarani and related languages show systems of both regressive and progressive nasal spread, these two nasalization systems are strikingly different from each other. While regressive nasalization involves the robust and local spread of nasality, Guarani progressive nasalization affects some local and non-local suffixes in different ways, while others remain unaffected. However, although progressive nasalization is lexically-specific and seems to show dialectal variation across speakers, this paper argues that progressive nasalization in Guarani suffixes is indeed productive: among the suffixes that show progressive harmony alternations, they alternate consistently across any nasal root for the speakers from Coronel Oviedo.

The specific analysis of phonologically conditioned allomorphy adopted in this paper roughly follows that of Tranel (1990), where the differential behavior across suffixes in Guarani progressive nasalization falls out of differences in the lexical specification, or the underlying forms, of these suffixes' allomorphs. This paper finds three suffix types according to their behavior in the environment of nasal roots: Type A suffixes undergo the nasalization of their initial consonant, Type B suffixes undergo full nasalization, and Type C suffixes fail to alternate regardless of the orality or nasality of the root. These different behaviors are captured as differences in the lexical specification of their allomorphs: Type A suffix allomorphs only vary in the nasality of their initial consonant, Type B suffix allomorphs vary in phonemic nasality as well as in the nasality of their initial consonant, while Type C suffixes only show one allomorph that is fully specified for phonemic nasality.

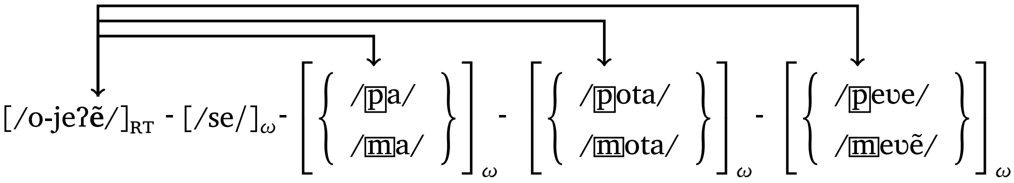
This paper also describes and analyzes novel fieldwork data showcasing the lexicalized nature of root nasalization and dialectal variation in progressive nasalization in suffixes. Consistent with Russell (2021; 2025), I argue that root nasalization in Guarani, although strikingly similar to the progressive nasalization pattern of some suffixes, cannot be analyzed under the same phonologically conditioned suppletive allomorphy mechanism of suffixes since root nasalization is lexicalized: constructions with root nasalization in Guarani, in addition to being lexically-specific, have lexicalized meanings, show inconsistent nasalization across contexts and constructions, and fail to trigger other alternations in suffixes when these are otherwise expected. This paper also described the dialectal variation attested across the language consultants whose data is featured in this paper, where the speakers from larger cities in Paraguay such as Asunción and Concepción show optional and variable progressive nasalization. However, this optionality in progressive nasalization is limited to suffixes, which serves as further evidence for the fact that root and suffix progressive nasalization are different in Guarani.

This section elaborates on two specific issues of interest regarding Guarani progressive nasalization and its proposed analysis. The first deals with the nature of the progressive nasalization mechanism. As may have become clear from Sections 3 and 4, the progressive nasalization constraint is quite complex in nature, and this complexity leads to questions regarding the status of Guarani progressive nasalization in the typology of long-distance harmony patterns, and if the attested allomorphy, controlled by the proposed progressive nasalization constraint, is indeed phonologically optimizing. The second issue I discuss in this section concerns the specific analysis assumed for the phonologically conditioned suppletive allomorphy. Instead of specifying the progressive harmony alternations in the lexical representation of the suffix allomorphs, it might be favorable to account for such alternations in the phonology with true conflicting markedness and faithfulness constraints, wherein the morpheme-specific nasalization patterns could be accounted for via differences across morphemes in the application of specific markedness and faithfulness constraints (Fukazawa 1997; 1999; Ito & Mester 1999; 2001; Pater 2000; 2010: lexically-specific constraints), or via differences across morphemes in the ranking of general markedness and faithfulness constraints (Orgun 1996; Anttila 2002; Inkelas & Zoll 2007: cophonologies). I argue that the proposed analysis is still favorable compared to these alternatives.

7.1 The mechanism of progressive nasalization

As might already be apparent, the ProgHarm constraint proposed in this paper is quite complex. The figure in (77) below repeats example (33) which visualizes the general mechanism of the proposed ProgHarm constraint. Ultimately, the striking complexity of this constraint begs the question of how this nasalization pattern fits into the general typology of long-distance harmony patterns, and also if the progressive harmony alternations attested in Guarani are perhaps motivated by other phonotactic patterns of the language that are simpler in nature and hold more generally across the language.

(77)



From a crosslinguistic perspective, Guarani progressive nasalization could be considered a case of long-distance consonant agreement, as characterized by Rose & Walker (2004). In long-distance consonant agreement patterns, featural agreement holds between consonants that are separated by intervening vowels and/or other consonants that remain transparent (Rose & Walker 2004: p. 476). These kinds of long-distance consonant agreement processes are most notably attested in Bantu languages, and occur across various kinds of agreement patterns including nasal, liquid, laryngeal, coronal, and dorsal agreement. Progressive nasalization in Guarani generally follows this definition, wherein the initial consonants of suffixes alterate to agree in nasality, and this agreement process occurs across intervening consonants and vowels that remain oral.

However, a few crucial properties differentiate Guarani progressive nasalization from the typology of long-distance consonant agreement patterns featured in Rose & Walker (2004). First, Guarani progressive nasalization as formalized in this paper involves a correspondence relation between a vowel and a consonant. According to Rose & Walker (2004), the overwhelming majority, or all, of long-distance consonant agreement patterns involve correspondence relations among consonants, wherein both the triggers and targets of the harmony process are consonants. Even under the analysis that the suffix-initial stops are in a correspondence relation that requires their agreement in nasality, an additional correspondence relation between the phonemic vowel of the root and the initial consonant of the (perhaps, closest) suffix is required to feed the other correspondence relations among subsequent stops. This key difference between progressive nasalization in Guarani and the long-distance consonant agreement patterns in Rose & Walker (2004) is directly tied to a crucial generalization that falls from their typology: that corresponding segments are phonologically similar, and this similarity is at the base of the correspondence relation among the agreeing segments. Naturally, in Guarani progressive nasalization, the phonemic rightmost vowels of roots and the leftmost stop consonants of suffixes are very different segments, and so a correspondence relation among these is not motivated by their phonological similarity.

An additional property that differentiates Guarani from other long-distance consonant agreement patterns is that the attested progressive harmony alternations fail to replicate core morpheme-internal phonotactic patterns in various ways. Across the typology of long-distance consonant agreement patterns, the alternations of consonants in prefixes, roots, and suffixes are motivated by the same phonotactic constraints that determine morpheme-internal sound patterns. In other words, consonant harmony holds within monomorphemes, and these same principles explain morphophonological alternations (Rose & Walker 2004). Notably, Guarani progressive nasalization involves the alternation of the suffix-initial stop in nasality in the environment of oral versus nasal roots, and these long-distance Ṽ...N and Ṽ...$\mathrm{N^D}$ sequences are phonotactically well-formed and are commonly observed in regressive nasalization. But, in Guarani, sequences of a nasal vowel followed by a voiceless stop (the initial consonant of alternating suffixes) are also well-formed within monomorphemes (see (5) and (6) in Section 2 for examples). So, the alternation of suffix-initial voiceless stop to nasal segments in the environment of nasal roots (essentially, PROGHARM) is not motivated by some general phonotactic constraint that rules out local or non-local ṼT sequences since these are well-formed in the language. And, more importantly, progressive harmony alternations in suffixes actually introduce segment sequences that are phonotactically ill-formed within monomorphemes. Specifically, progressive harmony alternations, since they occur at a long distance and across intervening segments, introduce sequences of an oral vowel followed by a nasal-oral stop or a nasal consonant (*VN and *$\mathrm{VN^D}$). These sequences are phonotactically ill-formed morpheme-internally given regressive nasalization: nasal-oral stops trigger regressive nasalization, and nasal consonants emerge from regressive nasalization triggered by a subsequent phonemic nasal vowel, which means that any morpheme-internal vowel before a nasal consonant must also be nasal. Additionally, in the proposed analysis PROGHARM only participates in allomorphy selection and does not account for other phonotactic properties or alternation patterns in the language. And, these progressive harmony alternations are lexically-specific and don't apply to every suffix, and so PROGHARM is not a global phonotactic property of the language, either locally or non-locally.

morpheme-internal phonotactics	**progressive nasalization phonotactics**
ṼT	*Ṽ...T
*VN, *VN^D	V...N , V...N^D

Table 9: Guarani morpheme-internal phonotactics versus phonotactics under progressive nasalization.

This issue of phonological optimization in long-distance agreement patterns also lies at the center of phonologically conditioned allomorphy. In these patterns, the selection of the allomorph is determined by the phonology, meaning that selecting one allomorph over the other improves on one or more constraints in the grammar, and so allomorph selection must be phonologically optimizing (Kager 1996; Paster 2006; Mascaró 2007; Wolf 2008). Given that allomorph selection via PROGHARM *(i)* introduces illegal local *VN and *VN^D sequences, that *(ii)* it is not a general phonotactic property of the grammar, and that *(iii)* it only accounts for a handful of alternations, we could argue that progressive nasalization in Guarani is indeed not phonologically optimizing and that progressive nasalization is not phonologically conditioned.

However, the three points of dissent can be refuted by taking into consideration how progressive nasalization interacts with regressive nasalization, as well as the diachronic origins of progressive nasalization. Phonotactically illegal local *VN and *VN^D are already attested in Guarani forms with multiple suffixes of mixed phonemic nasality. So, PROGHARM, although introducing new local illegal sequences in its selection of nasal-initial allomorphs compared to its selection of the allomorphs, introduces these sequences in a way that is consistent with pattern otherwise attested for other suffixes. Crucially, these illegal *VN and *VN^D sequences introduced by progressive nasalization occur across suffix boundaries. The examples in (78) below show these transitions in orality and nasality across suffix boundaries for non-alternating suffixes, and (79) below shows examples for these same transitions in forms with progressive harmony alternations in suffixes.

(78) a. che-sy-$\boxed{\text{pe-g̃uarã}}$
[ʃe-sɨ-pe-$\overleftarrow{\text{ɣ̃ʷãˈɾ̃ã}}$]
1SG-mother-DOM-for
'for my mother'

b. e-h-endú-$\boxed{\text{ke-na}}$
[$\overleftarrow{\text{ẽ-hẽˈn}}$ᵈu-ke-$\overleftarrow{\text{nã}}$]
IMP-3POSS-listen-FRC-REQ
'please, do listen'

(79) a. o-ñe'ẽ-$\boxed{\text{mba-mbota}}$
[$\overleftarrow{\text{õ-ɲẽʔẽ}}$-mᵇa-mᵇoˈta]
3-talk-TOT-INCIP
'he started to finish talking'

b. mitã-$\boxed{\text{nguéra-me}}$
[$\overleftarrow{\text{mĩtã}}$-ˈŋᵍʷeɾa-$\overleftarrow{\text{mẽ}}$]
child-PL-DOM
'child'

Ultimately, these conflicting requirements for regressive nasalization and progressive harmony alternations show that PROGHARM is a stronger requirement than regressive nasalization, and this is true even for the Type C non-alternating suffixes. Namely, Type A and Type B suffixes must surface with nasal-initial allomorph in the environment of a nasal root regardless if the selection of the nasal allomorph introduces violations of regressive nasalization. The tableau in (80) below shows the analysis of progressive nasalization and regressive nasalization together for an input form with a nasal root, a phonemically oral suffix, and an alternating Type A suffix. Candidate (c) is the winner in this analysis even when the selection of the nasal allomorph for the Type A suffix introduces violations of Align-L[nas], the markedness constraint that drives leftward nasalization. These violations of Align-L[nas] cannot be avoided by selecting the oral allomorph given the higher ranking of ProgHarm (Candidate (b)), or by regressively nasalizing the preceding suffix given that the phonemic nasality of suffixes is protected by the undominated Ident-R[nas] since suffixes form their own prosodic words in Guarani.

(80)

	$/\tilde{V}_{RT}$ - TV - {TV, NV} /	Ident-R[nas]	ProgHarm	Align-L[nas]	Ident[nas]
	a. V - TV - TV	*!			*
	b. Ṽ - TV - TV		**!		
☞	c. Ṽ - TV - N^DV		*	***	
	d. Ṽ - TṼ - N^DV	*!		***	*

Finally the fact that ProgHarm only participates in this allomorphy selection, that it is lexically specific, and that the alternations are not motivated by other general phonotactic constraints (such as a ban on local or non-local ṼT sequences) can be explained by the fact that progressive nasalization was, historically, a robust, local, and generally exceptionless process that was lost on the way to modern day Paraguayan Guarani (Jensen 1998; 1999; Schleicher 1998; Estigarribia 2021). In pre-Proto-Tupi-Guarani, roots and suffixes alike underwent nasalization triggered by preceding nasal segments in other prefixes and roots (including the causative prefix, which was phonemically nasal). Estigarribia (2021) argues that progressive nasalization was replaced with regressive oralization on the way to Proto-Tupi-Guarani, and so progressive nasalization was lost and forms with root nasalization became lexicalized remnants of this previously productive process. This collapsing productivity of progressive nasalization is also supported by various sources of evidence in modern-day Guarani: the lexically-specific nature of the pattern for suffixes, the fact that root alternations are lexicalized, and the regularization of suffix progressive nasalization for some speakers of Paraguayan Guarani all constitute synchronic evidence for a previously productive system of porgressive nasalization. Crucially, this paper argues that progressive nasalization in suffixes remains relatively productive for many speakers even when the system shows both synchronic and diachronic evidence of collapse.

7.2 Guarani progressive nasalization under other theories of exceptionality

This paper analyzed the differential behavior of suffixes under progressive nasalization as differences in the lexical specification of their allomorphs, where the most optimal allomorph is selected via phonological constraints. However, other phonological theories analyze these variable and lexically-specific patterns in different ways. For example, it might be favorable to formalize the different suffix alternations with actual violations of markedness and faithfulness constraints, as opposed to via differences in the underlying representations of their allomorphs, given that the suffix allomorphy is limited to only a few segments across the allomorphs and so the allomorphs are minimally different from each other. Recall that the UR allomorphs of Type A suffixes such as *-kuéra/-nguéra* PL only differ in the nasality of the initial segment (TV vs. NV), and the UR allomorphs of Type B suffixes such as *-peve/-meve* 'until' differ in phonemic nasality as well as in the nasality of the initial segment (TV vs. NṼ).

I now present the analysis of Guarani progressive nasalization under two additional theories of exceptionality: lexically-indexed constraints (Fukazawa 1997; 1999; Ito & Mester 1999; 2001; Pater 2000; 2010) and cophonologies (Orgun 1996; Anttila 2002; Inkelas & Zoll 2007). Under theories with lexically-indexed constraints, morphemes that are exceptional triggers or targets of a phonological process are indexed for lexically-specific markedness constraints, and morphemes that exceptionally block a phonological process, either as a trigger or as a target, are indexed for lexically-specific faithfulness constraints. These specific constraints only apply, or are violated by, forms that are listed for their application in the lexicon. Cophonologies on the other hand is a theory in which morphemes are lexically specified for different constraint rankings, and so morphemes may differ phonologically since some may have rankings of markedness over faithfulness and others may have faithfulness ranked over markedness. I will show that, in the analysis under either of these two theories, the segment alternations observed in progressive nasalization are directly handled by the phonology, namely via the relative rankings of markedness and faithfulness constraints, as opposed to these alternations being explicitly listed in the lexicon and so fail to incurring violations of faithfulness since the phonological input already specifies these alternations.

Before jumping into the analysis under these two theories of exceptionality, it is important to note that there are two kinds of alternations that occur under progressive nasalization. The first was already introduced in Section 4 above, where the PROGHARM constraint requires correspondence in nasality between the phonemic nasality or orality of the root and the initial segment of following prosodic words (or, suffixes). This constraint, along with the lexical specification of oral versus nasal allomorphs, fully accounts for the behavior of Type A suffixes in the environment of oral versus nasal roots. But, Type B suffixes display an additional alternation: the suffixes alternate in phonemic nasality, where they become fully nasal in the environment of nasal roots. So, an additional progressive nasalization constraint is required that builds a correspondence relation between the phonemic nasality of the root and the phonemic nasality of suffixes, defined as PROGHARM-V in (81) below.

(81) $*[\ ...\ [\alpha\ \text{NAS}]\ ]_{\text{ROOT}}\ ...\ [\ ...\ [-\alpha\ \text{NAS}]\ ]_{\omega}$ (PROGHARM-V)

Assign a violation to every non-local sequence of a rightmost [α NAS] segment of the root and a rightmost [$-\alpha$ NAS] segment of a prosodic word to its right.

Note that this additional progressive nasalization constraint was not necessary under the proposed analysis since the two alternations observed in Type B suffixes were simultaneously encoded in their UR allomorphs: the oral and nasal allomorphs differ in both the nasality of the initial segment and in phonemic nasality (TV vs. NṼ). So, in the analysis proposed in Section 4, the selection of the nasal allomorph of Type B suffixes simultanously accounts for both alternations under PROGHARM (henceforth, PROGHARM-C).

The analysis of Guarani progressive nasalization under lexically indexed faithfulness constraints requires Type C suffixes, the non-alternating suffixes, to be indexed for highly-ranked faithfulness constraints that protect them from alternations due to PROGHARM-C and ProgHarm-V. The first constraint, which protects the initial segments of suffixes from alternating given the orality/nasality of the root, can simply be the Ident[voice] constraint proposed in Section 4, which only applies to Type C suffixes. The second can be lexically-indexed version of the Ident-Right[nas] that protects the phonemic nasality of roots and suffixes. Throughout this new analysis, we will see that two separate faithfulness constraints are necessary because different types of morphemes are differentially indexed to these faitfulness constraints.

Now, the differences in the lexical specification of the suffixes for the application of these constraints (as opposed to differences in their UR allomorphs) is what determines their differential behavior under progressive nasalization. Type C suffixes must be indexed for both faithfulness constraints since they undergo no alternations under progressive nasalization, and so Type C suffixes must be indexed for their application. Type A suffixes only undergo the alternation of the nasality of their initial segment and they fail to alternate in phonemic nasality, and so they are indexed for Ident-R[nas]$_j$ which protects their phonemic nasality under the demands of the newly-defined ProgHarm-V constraint. Finally, Type B suffixes are not indexed for either of the lexically-specific faithfulness constraints since they undergo both alternations under progressive nasalization. Table 10 below summarizes the lexical indexation required for each type of suffix to predict their differential behavior in the environment of nasal roots.

suffix type	**example**	**indexed faithfulness**	**tableau**
Type A	-ˈpa ∼ -ˈm^{b}a tot	Ident-R[nas]$_j$	(83)
Type B	-pe ∼ -mẽ loc;dom;adv	-	(84)
Type C	-ta fut -mã cmpl	Ident[voice]$_i$, Ident-R[nas]$_j$	(82)

Table 10: Suffix types by lexically indexed constraints.

The tableau in (82) below analyzes an input form with a nasal root and a Type C suffix indexed for both lexically-specific faithfulness constraints. Given its indexation of both constraints, the input suffix fails undergo progressive harmony alternations: both lexically-indexed faithfulness constraints are ranked higher than ProgHarm-C and ProgHarm-V, and so any candidate that changes its input phonemic nasality or the input nasality of their initial segment to avoid violations of progressive nasalization is ruled out. In the tableau below, Candidate (a) is the winner since it incurs no violations of the highly-ranked lexically-indexed faithfulness constraints. Although not shown in the tableau below, assume that *NV, general Ident-R[nas], and *Contour are in their respective ranking conditions as presented in Section 3.

(82)

/$\tilde{V}_{RT}$ - TV$_{i,j}$ /	Ident[voice]$_i$	Ident-R[nas]$_j$	ProgHarm-C	ProgHarm-V
☞ a. Ṽ - TV			*	*
b. Ṽ - TṼ		*!	*	
c. Ṽ - N^{D}V	*!			*
d. Ṽ - NṼ	*!	*		

The tableau in (83) below analyzes an input form with a nasal root and a Type A suffix, given that it is only indexed for the application of Ident-R[nas]$_j$. This faithfulness constraint is active in its derivation, while Ident[voice]$_i$ is inactive and so a candidate which nasalizes its initial segment, without any other alternations, is most optimal. In the tableau below, Candidates (b) and (d) are ruled out by the highly-ranked Ident-R[nas]$_j$ constraint since the input suffix is indexed for such constraint and both candidates violate it. Candidate (c) is the winner since it contains less violations of the progressive nasalization constraints compared to Candidate (a), which violates both ProgHarm-C and ProgHarm-V.

(83)

/Ṽ$_{RT}$ - TV$_j$ /	Ident[voice]$_i$	Ident-R[nas]$_j$	ProgHarm-C	ProgHarm-V
a. Ṽ - TV	×		*	*!
b. Ṽ - TṼ	×	*!		*
☞ c. Ṽ - N^{D}V	×		*	
d. Ṽ - NṼ	×	*!		

Finally, the tableau in (84) below analyzes an input Type B suffix in the environment of a nasal root. Type B suffixes are not indexed for either of the faithfulness constraints, and so they are predicted to undergo both alternations given the demands of ProgHarm-C and ProgHarm-V. Since both lexically-indexed faithfulness constraints are inactive, any candidates that incur violations of either ProgHarm-C or ProgHarm-V are immediately ruled out, and so the winning candidate is one that avoids violations of both progressive nasalization constraints via alternations in nasality. Crucially, Type B suffixes show that the general Ident-R[nas] constraint, which simultaneously protects the phonemic nasality of input roots and suffixes, must be decomposed into root faithfulness and suffix faithfulness: alternations in the phonemic nasality of the suffix cannot be ruled out over the demands of ProgHarm-V, but the phonemic nasality of roots must still remain faithful. So, Ident-R$_{RT}$[nas] protects the phonemic nasality of roots, and the general Ident-R[nas] is ranked below ProgHarm-V. Now, Candidate (e), although violating general Ident-R[nas], wins.[21]

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[21] The stacking suffix alternations for forms with multiple Type A and Type B suffixes are also predicted under this analysis, as well as the lack of alternations of Type C suffixes even in the environment of alternating suffixes. Note that, for forms with multiple suffixes, the lexically-indexed constraints are only violated by the suffixes that are indexed for these constraints. For example, in the analysis of an input form with a Type B and a Type C suffix, Ident[voice]$_i$ and Ident-R[nas]$_j$ are only violated by candidates wherein the Type C suffix undergoes any alternations in input nasality.

(84)

/Ṽ$_{\text{RT}}$ - TV /	IDENT-R$_{\text{RT}}$[NAS]	IDENT-[VOICE]$_i$	IDENT-R[NAS]$_j$	PROGHARM-C	PROGHARM-V	IDENT-R[NAS]
a. V - TV	*!	×	×			*
b. Ṽ - TV		×	×	*!	*	
c. Ṽ - TṼ		×	×	*!		*
d. Ṽ - N$^{\text{D}}$V		×	×		*!	
☞ e. Ṽ - NṼ		×	×			*

A plausible alternative is to analyze Guarani progressive nasalization with lexically indexed markedness constraints. Under this analysis, Type A and Type B suffixes are exceptional undergoers of lexically specific processes, rather than exceptional non-undergoers of phonological processes that apply to all suffixes. The analysis with lexically-indexed markedness constraints might be favorable since Type C suffixes represent the majority of the stop-initial suffixes in Guarani, and these are the non-alternating suffixes that would not be indexed for the exceptional application of progressive nasalization.

Table 11 below summarizes the lexical indexation profile for each type of suffix. The progressive nasalization markedness constraints PROGHARM-C$_m$ and PROGHARM-V$_n$ are indexed to a subset of the suffixes in Guarani, and so candidates with disagreeing segments are only ruled out by these constraints if they contain suffixes that are indexed for these constraints. Specifically, PROGHARM-V$_n$ only applies to Type B suffixes since these are the only suffixes that alternate in phonemic nasality, and PROGHARM-C$_m$ applies to both Type A and Type B suffixes since both kinds of suffixes alternate their initial consonant in the environment of nasal roots. Finally, Type C suffixes are not indexed for neither of the progressive nasalization constraints since Type C suffixes undergo no alternations in the environment of oral versus nasal roots.

suffix type	**example**	**indexed markedness**
Type A	-ˈpa ~ -ˈm$^{\text{b}}$a TOT	PROGHARM-C$_m$
Type B	-pe ~ -mẽ LOC;DOM;ADV	PROGHARM-C$_m$, PROGHARM-V$_n$
Type C	-ta FUT	-
	-mã CMPL	

Table 11: Suffix types by lexically-indexed markedness constraints.

Before concluding the analysis of Guarani progressive nasalization with lexically-indexed constraints, notice that another logical possibility is the indexation of IDENT-R[NAS]$_j$ alone in the analysis with lexically-indexed faithfulness, or the indexation of PROGHARM-V$_n$ alone in the analysis with lexically-indexed markedness. Both of these constraint indexation profiles would predict a suffix that only alternates in phonemic nasality under progressive nasalization and does not alternate the nasality of the suffix-initial segment (namely, TṼ). Crucially, the Ṽ-TV candidate is ruled out in all preceding tableaus in this section given that all three types of suffixes in Guarani have different indexation profiles.

The analysis of Guarani progressive nasalization under cophonologies (Orgun 1996; Anttila 2002; Inkelas & Zoll 2007) also installs the progressive harmony alternations in the markedness and faithfulness constraints in the phonological grammar, as opposed to these differences across suffix allomorphs being lexically specified in the URs of the allomorphs as in the proposed analysis. In the analysis of Guarani progressive nasalization under cophonologies, the different suffixes are lexically specified for different constraint rankings. So now, the differential behavior of suffixes in the environment of oral versus nasal roots comes from their different rankings among the markedness and faithfulness constraints. For example, some suffixes are lexically specified for the ranking ProgHarm-C ≫ Ident[voice] and so are predicted to alternate the nasality of their initial segment in the environment of nasal roots, while other suffixes will have the opposite ranking and so are predicted to remain faithful under the lower-ranked demands of ProgHarm-C. The table below lists the necessary rankings among the progressive nasalization constraints and faithfulness constraints for each type of suffix.

suffix type	**example**	**lexically-specific ranking**
Type A	-ˈpa ~ -ˈmᵇa TOT	ProgHarm-C ≫ Ident[voice] Ident-R ≫ ProgHarm-V
Type B	-pe ~ -mẽ LOC;DOM;ADV	ProgHarm-C ≫ Ident[voice] ProgHarm-V ≫ Ident-R
Type C	-ta FUT -mã CMPL	Ident[voice] ≫ ProgHarm-C Ident-R ≫ ProgHarm-V

Table 12: Suffix types by lexically-specific rankings under cophonologies (Orgun 1996; Anttila 2002; Inkelas & Zoll 2007).[a]

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[a] Note that the Ident-R constrain int this table refers to general Ident-R only: Ident-R$_{RT}$[nas], which protects the phonemic nasality of the root, must be undominated.

The other logically possible ranking profile that is missing from Table 12 above is Ident[voice] ≫ ProgHarm-C along with ProgHarm-V ≫ Ident-R. This constraint ranking would predict a suffix in which only the phonemic nasality of the suffix alternates given the higher-ranked demands of ProgHarm-V, while the initial segment of the suffix remains faithful, namely a suffix of shape TṼ. As previously discussed, this is the same suffix predicted to win under the indexation of Ident-R[nas]$_j$ only in the analysis with lexically-indexed faithfulness constraints, and of ProgHarm-V$_n$ only in the analysis with lexically-indexed markedness constraints. Table 13 summarizes the different types of suffixes predicted under the two theories of exceptionality discussed in this section: lexically-indexed constraint profiles and lexically-specific rankings (cophonologies). Notice that the two analyses predict the gap in suffixes of shape TṼ in Guarani.

T ∼ N alternation → **full nasalization** ↓	**undergoing:** ProgHarm-C$_m$ or ProgHarm-C ≫ Id[voi]	**non-undergoing:** Ident[voice] or Id[voi] ≫ ProgHarm-C
undergoing: ProgHarm-V$_n$ or ProgHarm-V ≫ Id-R	**Type B** TV ∼ NṼ	
non-undergoing: Ident-R$_j$ or Id-R ≫ ProgHarm-V	**Type A** TV ∼ NV	**Type C** -

Table 13: Predicted suffix types according to lexical specification under lexically-indexed constraints and lexically-specific constraint rankings (cophonologies).

The analysis proposed in Section 4 also predicts this gap in suffixes of shape TṼ but in a different way: this gap in TṼ-type suffixes is specified in the UR allomorphs, wherein there are no UR suffix allomorphs across the three types of suffixes. By contrast, as shown in Table 13 above, two alternative theories predict this gap in TṼ-type suffixes via missing lexical indexation profiles or via missing lexically-specific rankings. It is quite challenging to determine which analysis is best suited to account for Guarani progressive nasalization since these three analyses fully acccount for the attested pattern. However, there are benefits and drawbacks for each of these analyses, including the analysis proposed in this paper. For example, a possible drawback to the proposed analysis is that, if a TṼ-type suffix were to be listed as a UR suffix allomorph, the TṼ suffix is predicted as optimal in the environment of oral roots and for Type C suffixes whose only suffix allomorph is a TṼ-type suffix. On the other hand, the analysis under lexically-indexed constraints and cophonologies presented here immediately rule out possible input TṼ-type suffixes. However, this is under the assumption that all lexical indexation profiles and lexically-specific rankings have already been established for all other suffix types. And, the missing TṼ-type suffixes in Guarani may present a challenge for the Guarani learner since TṼ sequences are phonotactically well-formed within and across roots and prefixes, but not within suffixes. In conclusion, these three theories of exceptionality and morpheme-specific patterns cannot be fully supported or rejected given the pattern of progressive nasalization in Guarani, but these come with their pros and cons when considering the typology of exceptionality and considerations related to learnability and acquisition (Pater 2010; Moore-Cantwell & Pater 2016).

8 Closing

This paper presents the first formal constraint-based analysis of progressive (rightward) nasalization in Paraguayan Guarani, Tupi-Guarani language spoken by 5-6 million people in Paraguay and neighboring areas. Guarani presents an interesting pattern of progressive nasalization since the language also shows a very productive and exceptionless regressive (leftward) nasalization, but progressive nasalization in Guarani is morpheme-specific, non-local, and so strikingly different from regressive nasalization (Lapierre & Michael

2018; Russell 2021; 2025; Cabrera 2025). This paper argues that Guarani progressive nasalization is a case of phonologically conditioned suppletive allomorphy, wherein the differential behavior of suffixes under progressive nasalization comes from differences in the lexical specification of their suffix allomorphs. Consistent with previous works, this paper also presents original fieldwork data showing that the pattern of root nasalization, although very similar to one of the patterns of nasalization of some suffixes, does not fall under the same mechanism as suffix nasalization since root nasalization shows evidence of lexicalization. This paper also describes and analyzes original data showcasing dialectal variation in suffix progressive nasalization, which ultimately reinforces the fact that root and suffix nasalization in Guarani are different. This paper ultimately provides insight into the specific factors that play a role in Guarani nasalization and its variable application across morphemes, constructions, and varieties of the language, as well as how the pattern bears on current theories of exceptionality and variation.

9 Appendix A: root alternations under progressive nasalization

The table below shows a (non-exhaustive) list of root alternations attested in compounds and causative constructions. This table also includes forms that fail to show root nasalization in the environment of other nasal roots if such roots do show root nasalization in other constructions. These are marked with double asterisk (**).

The data is primarily adapted from Britton (2005); Estigarribia (2020); Godoy et al. (2022), and my own fieldwork. Note that *kuera* [kʷeˈɾa] in this table is different from the plural suffix *kuéra* [ˈkʷeɾa]. This table does not include forms in which the initial nasal-oral stop is phonemic (in other words, roots that show initial nasal-oral stops in oral contexts or in isolation are not included).

oral root	**meaning**	**nasal root in context**	**meaning**
kakuaa	'grow'	mo-ngakuaa	'raise'
karai	'man, gentleman'	mo-ngarai	'baptize, bless'
		**kuña-karai	'lady'
karáu	'sprain, dislocation'	mo-ngaráu	'to sprain (trans.)'
karu	'to eat (intrans.)'	mo-ngaru	'to feed'
katu	'ability'	akã-ngatu	'memory'
		**mano-katú-va	'mortal'
		mara-ngatu	'holy, noble'
		ñe'ẽ-ngatu	'talker, gossip'
ka'u	'drunkenness'	mo-nga'u	'to get someone drunk'
		akã-nga'u	'dizzy'
ke	'to sleep'	mo-nge	'to put to sleep'
kolo	'color'	mo-ngolo	'to paint' [22]
kora	'corral'	mo-ngora	'to close/siege'
kuaa	'knowlege'	akã-ngua	'mind, intellect'
		**a-ñe'ẽ-kuaa	'I know how to speak'
kuera	'to get healthy'	mo-nguera	'to heal'
kuerái	'boredom, annoyance'	mo-nguerái	'to bore'
kúi	'to fall, become detached'	mo-ngúi	'to make fall, to tear off'
kurusu	'cross'	mo-ngurusu	'to crucify'
ku'e	'to move'	mo-ngu'e	'to move something, to loosen'
		apytu'ũ-ngu'e	'to meditate'
ku'i	'dust'	mo-ngu'i	'to grind'

ky	‘rain’	mo-ngy	‘to make rain’
kyhyje	‘fear’	mo-ngyhyje	‘to intimidate’
kyra	‘fat, grease’	mo-ngyra	‘to fatten’
ky’a	‘dirty’	mo-ngy’a	‘to make dirty’
pa	‘done’	mo-mba	‘to finish’
pá̃y	‘awake’	mo-mbá̃y	‘to wake (someone) up’
pe	‘flat’	mo-mbe	‘to flatten’
		t-eni-mbe	‘cot’
		ña’ẽ-mbe	‘dish’
pi	‘to cease’	mo-mbi	‘to make stop’
po’o	‘to tear out’	mo-mbo’o	‘to wean’
pu	‘sound’	mo-mbu	‘to burst’
pyta	‘stop’	mo-mbyta	‘to stop’
pytu’u	‘rest, break’	mo-mbytu’u	‘to calm’
tyky	‘a drop’	mo-ndyky	‘to drip’
		ama-ndyky	‘rainwater’
tyryry	‘to crawl’	mo-ndyryry	‘to break violently’

Abbreviations

1: first person; 2: second person; 3: third person; ABS: abstract; ADV: adverbializer; AGD: agent demotion; ATTN: attenuative; CAUS: causative; CMPL: completive; COLL: collective; DEM: demonstrative, DES: desiderative; DEST: destinative; DIM: diminutive; DOM: differential object marker; DUB: dubitative; EMPH: emphatic; FRC: force; FREQ: frequentative; FUT: future; HAB: habitual; IMP: imperative; IN: inclusive; INCIP: incipient; LOC: locative; N3: non-third person; NEG: negation; NMLZ: nominalizer; PASS: passive; PLEA: plea; PL: plural; POSS: possessive; POST: post-stative; PRV: privative; Q: question particle; REC: reciprocal; REQ: requestative; SG: singular; TOT: totalitative; UNCRTN: uncertain; VRD: veridical.

Ethics and consent

The language consultants whose data are described in this paper consented to participate in in-person or remote elicitation session with the author of this paper. The language consultants were offered an hourly salary equivalent to a teacher’s salary typical of the region they live in. They consented to audio and video recordings of the elicitation sessions, and consented for their data to be transcribed and published in academic works.

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[22] [kolo] is borrowed from Spanish *color* [koˈloɾ].

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Competing interests

The author has no competing interests to declare.

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