

Suffix independence in Paraguayan Guaraní nasal harmony

stress, nasality, and nasalization

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21 November 2024

Introduction

- Crosslinguistically, prefixes and suffixes may show asymmetries in their participation in phonological rules.
- Example: Yaka (Bantu, Zaire) prefix independence (Hyman 1995; Elkins 2020)

(1) a. tsúb-iḽi
 'to wander'

b. tsúm-iḽi
 'to sew'

c. ma-ḽáfú, *ma-ḽáfú
 'palm wine'

- **Today:** investigate the phonological behavior of suffixes in Paraguayan Guarani.
 - Tupi-Guarani language spoken in Paraguay by 5-6 million people.
 - **Focus:** nasality and nasalization.
 - Language has oral/nasal contrast and both leftward and rightward nasalization.

Introduction

- ★ I argue that Paraguayan Guaraní shows **suffix independence**.

- (2) a. [ja-jero'ki] b. $\overleftarrow{\text{[nã-kõsĩ'nã]}}$ c. o-[jechu- $\overleftarrow{\text{rõ}}$, * $\overleftarrow{\text{õ-[nẽchũ-rõ]}}$
 'we dance' 'we cook' 'if it happens'

- ★ Suffix independence reveals:
 1. Oral/nasal contrast and nasalization are **right-aligned**, rather than specified at **stressed syllables**.
 2. Cyclic morphological structure for suffixes.
- ★ Stressed syllable positional faithfulness (Beckman 1997; 1998), the prominent analysis for decades, is no longer supported.

Roadmap

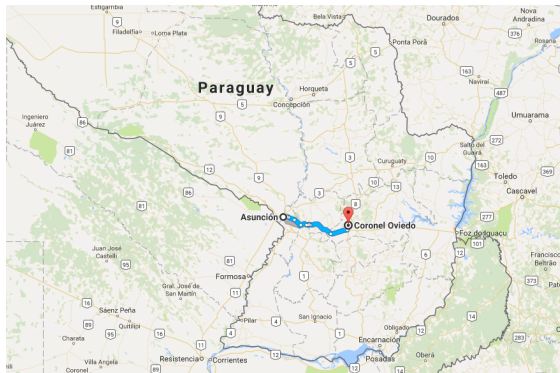
1. Language background and basic phonology
2. σ -positional faithfulness in roots and prefixes (Beckman 1998)
3. Nasality and nasalization in suffixes
4. Analysis
 - Right-edge faithfulness + OO-correspondence
 - Reevaluating σ positional faithfulness
5. Progressive harmony
6. Discussion
 - Typology of prefix-suffix asymmetries
 - A possible prosodic analysis
 - Dialectal variation in progressive harmony

Background

- Paraguayan Guarani (Tupi-Guarani, Tupian) is spoken by 5-6 million in Paraguay and neighboring areas of Argentina and Brazil.
- Guarani and Spanish are the official languages of Paraguay (Guarani since 1992).
- Learned as a first language for many children. Around 80% of the population speak Guarani at home.
- Guarani has been described for decades (Gregores & Suárez 1957, Estigarribia 2020) and has significantly contributed to phonological theory (Beckman 1998; Piggott 2003)

Background

- All data collected in consultation with **8** native speakers.
- **6**: in-situ fieldwork in Coronel Oviedo, Paraguay.
- **2**: virtual fieldwork; Asunción and Concepción.



Basic phonology

Guarani phonemic inventory:

(3)

p	t			k	ʔ '
m ^b	n ^d			ŋ ^g	
m	n		ɲ ñ	ɲ ã	
			ɕ j		
	s	ʃ ch			
ʋ ʋ	ɾ ɾ			ɰ g	

(4)

i, ï	ï, ã (y, ã)	u, ù
e, ë		o, ò
	a, ã	

- Guarani has nasal-oral stops instead of voiced stops.
- These contrast with voiceless stops.
- 6 phonemic vowel qualities, all oral and nasal counterparts.

Basic phonology

- All Guaraní syllables are type CV.
- Nasal-oral stops are legal onsets and occur word-initially.

(5) a. mbokaja b. ndu c. ngotyo
 `coconut' `noise' `towards'

- Predominantly stress final, few words with (ante-)penultimate stress.
- Stress shifts to the rightmost lexically stressed morpheme.
→ Suffixes are unpredictably “stressable” or “unstressable”

(6) a. a-ka'ru-ta b. a-karu-'se c. a-karu-'se-ta
 1SG-eat-FUT 1SG-eat-DES 1SG-eat-DES-FUT
 `I will eat' `I will want to eat' `I will want to eat'

- Prefixes are never stressed.

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σ-positional faithfulness in nasality

- In roots and prefixes, the nasal/oral contrast and regressive nasalization are closely tied to **stress**.
1. Vowel nasality only contrastive at stressed syllables, and these trigger leftward (regressive) nasalization.

- “positional neutralization, triggering” (Beckman 1998)

(7) a. tu'pa b. $\overleftarrow{\text{tũ'pã}}$ c. *tu'pã d. *tũ'pa
 'bed' 'god'

- voiceless segments are *transparent*

σ -positional faithfulness in nasality

2. Leftward nasalization is blocked by other stressed syllables.

- “positional blocking” (Beckman 1998)

(8) a. $\overleftarrow{\text{avati-mi-rĩ}}$
corn-small
‘wheat’

b. $\overleftarrow{\text{ava-ñe-rẽ}}$
man-word
‘Guarani’ (lang.)

c. $\overleftarrow{\text{pi'a-põ-rã}}$
heart-pretty
‘kindness’

\acute{o} -positional faithfulness in nasality

Beckman's (1998) proposal for Guaraní nasality and nasalization:

- IDENT- \acute{o} (NASAL): protect input nasality/orality at stressed syllables.
- $*\tilde{V} \gg$ IDENT(NASAL): neutralizes any input oral/nasal contrast in vowels.
- IDENT- \acute{o} (NASAL) \gg $*\tilde{V} \gg$ IDENT(NASAL): neutralizes only in **unstressed** vowels.


(9)

/tũpa/	IDENT- \acute{o} (NASAL)	$*\tilde{V}$	IDENT(NASAL)
a. <u>tũ</u> pa		*!	
b. tupa			*
c. <u>tũ</u> pā	*!	**	*

\acute{o} -positional faithfulness in nasality

- But, unstressed vowels nasalize in the presence of a stressed nasal vowel: $\overleftarrow{\text{tupã}}$ 'god'
- ALIGN-L(NASAL): align nasality to the left edge of the word.
- ALIGN-L(NASAL) \gg $^*\tilde{V}$ \gg IDENT(NASAL): leftward nasalization.


(10)

/tupã/ 'god'	ID- \acute{o} (NAS)	ALN-L(NAS)	$^*\tilde{V}$	ID(NAS)
a. <u>tupã</u>		*!	*	
b. tupa <u>ã</u>	*!			*
 c. $\overleftarrow{\text{tupã}}$			**	*

σ -positional faithfulness in nasality

- This ranking also predicts “positional blocking” in compounds.
- IDENT- σ (NASAL) \gg ALIGN-L(NASAL): lexically stressed syllables keep their input nasality/orality over demands for leftward nasalization.

(11)

/pi'a-porã/ 'kindness'	ID- σ (NAS)	ALN-L(NAS)	* \bar{V}	ID(NAS)
a. pi'a-porã		***!*	*	
b. $\overleftarrow{\text{pi}}'\tilde{\text{a}}\text{-p}\tilde{\text{o}}\tilde{\text{r}}\tilde{\text{ã}}$	*!		****	****
 c. pi'a- $\overleftarrow{\text{p}\tilde{\text{o}}\tilde{\text{r}}\tilde{\text{ã}}}$		**	**	**
d. $\overleftarrow{\text{pi}}'\text{a-}\overleftarrow{\text{p}\tilde{\text{o}}\tilde{\text{r}}\tilde{\text{ã}}}$		**	***!	***

- Non-local spread also ruled out (Candidate d)

The status of nasal-oral stops

- Recall that Guarani has nasal-oral stops (**mb**okaja ‘coconut’)
- Previous literature describes Guarani nasal-oral stops as “prenasalized stops”, [m^b].
- Implies that they’re underlyingly *plain voiced stops*, argued by Piggott (2003) for Guarani.
- ★ I instead argue that they’re underlying **full nasal consonants** ([m^b]) that **post-oralize** in certain environments.
 1. In full complementary distribution with nasal consonants.
 2. Trigger regressive nasalization in any position (regardless of stress)

The status of nasal-oral stops

1. Nasal-oral stops and nasal consonants are in complementary distribution.

- nasal-oral stops before **oral** vowels
- full nasal consonants before **nasal** vowels
- Same pattern for $j \sim \tilde{n}$.

(12)	a.	$\boxed{mb}o'ʔa$	b.	$\overleftarrow{m\tilde{o}}'ʔ\tilde{a}$
		'position'		'almost'

(13)	a.	$a'jja$	b.	$\overleftarrow{\tilde{a}'\tilde{n}\tilde{a}}$
		'during'		'evil', 'bad'

- alternations reflected in the orthography of the language.

The status of nasal-oral stops

2. Nasal-oral stops trigger regressive nasalization in stressed and unstressed positions.

(14) a. $\overleftarrow{\text{pānā}}\text{m}^{\text{b}}\text{i}$
'butterfly'

b. $\overleftarrow{\tilde{\text{a}}\text{ŋ}^{\text{g}}\text{i}}\text{ru}$
'friend'

→ As with $\tilde{\text{V}}$, they trigger regressive nasalization at a long distance.

(15) a. $\boxed{\text{n}^{\text{d}}}\text{a-}\boxed{\text{j}}\text{a-}\boxed{\text{j}}\text{o-ha}^{\text{i}}\text{hu-}^{\text{i}}$
NEG-1 PL.IN-REC-love-NEG
'we don't love each other'

b. $\overleftarrow{\boxed{\text{n}}\tilde{\text{a}}-\boxed{\text{n}}\tilde{\text{a}}-\boxed{\text{n}}\tilde{\text{o}}\text{-hē}^{\text{i}}\text{n}\tilde{\text{o}}-}^{\text{i}}$
1 PL.IN-REC-call-NEG
'we don't call each other'

(16) $\overleftarrow{\boxed{\text{n}}\tilde{\text{a}}-\boxed{\text{n}}\tilde{\text{a}}-\boxed{\text{n}}\tilde{\text{o}}\text{-hē}^{\text{i}}\text{n}^{\text{d}}\text{u-}^{\text{i}}}$
NEG-1 PL.IN-REC-listen-NEG
'we don't listen to each other'

The status of nasal-oral stops

- I propose *NV: underlying nasal consonants cannot be followed by an oral vowel.
- *NV >> *CONTOUR predicts post-oralization of underlying nasal consonants before an oral vowel.

(17)

/mimi/ 'radiant'	*NV	ID-σ(NAS)	ALN-L(NAS)	*Ṽ	ID(NAS)	*CNTR
a. <u>mimi</u>	*!*		*			
b. m ^b <u>im</u> ^b i			*!			**
c. [←] mim ^b i				*	*	*

→ Supported by previous work (Stanton 2017).

Directionality of nasalization

- Unclear if nasalization spreads in both directions from nasal vowels.
 - in all data so far, the trigger of nasalization has occurred word-finally.
- Nasal-oral stops show that Guarani nasal spread is **directional** (hence ALIGN-L(NASAL)).

(18) a. $\overleftarrow{\text{nã}}\text{n}^{\text{d}}\text{e-}\text{j}^{\text{a}}\text{'g}^{\text{ua}}$
1PL.IN-dog
'our dog'

b. $\overleftarrow{\text{nẽ-m}}^{\text{b}}\text{araka}\text{'j}^{\text{a}}$
2SG-cat
'your cat'

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Nasalization in suffixes

- Recall that prefixes are clear targets of regressive nasalization, for both nasal vowel and nasal consonant triggers.

(19) a. $\boxed{n^d}a\text{-}\boxed{j}a\text{-}\boxed{j}o\text{-}ha^i\text{'hu-}^i$
NEG-1 PL.IN-REC-love-NEG
'we don't love each other'

b. $\overleftarrow{\boxed{n}\tilde{a}\text{-}\boxed{n}\tilde{a}\text{-}\boxed{n}\tilde{o}\text{-}h\tilde{e}'n\tilde{o}\text{-}^i}$
1 PL.IN-REC-call-NEG
'we don't call each other'

- ★ However, new fieldwork data I collected shows clear asymmetries between prefixes and suffixes.
- ★ This challenges the σ -positional faithfulness analysis proposed for roots and prefixes by Beckman 1998.
- Such analysis that stressed and unstressed suffixes are different in nasality/nasalization, due to IDENT- σ (NASAL).

Nasalization in suffixes

1. Unstressed suffixes are contrastively oral/nasal.

→ they also fail to regressive nasalize preceding roots and prefixes.

(20) a. a-ja'po-m̃ā

1SG-work-CMPL

'I already worked'

d. e-'ju-ñā

IMP-come-REQ

'please come!'

b. *a-ja'po-m^ba

e. *e-'ju-n^da

c. *ā-nā'pō-mā

f. *ē-'nū-nā

Nasalization in suffixes

- ★ σ positional faithfulness incorrectly predicts that unstressed suffixes neutralize their oral/nasal contrast.

(21)

/a-japo-mã/ 'I already worked'	ID- σ (NAS)	ALN-L(NAS)	* \tilde{V}	ID(NAS)
a. $\overleftarrow{\tilde{a}-\tilde{n}\tilde{a}p\tilde{o}-m\tilde{a}}$	*!		****	***
☹ b. a-japo- $\overleftarrow{m\tilde{a}}$		****	*!	
☹ c. a-japo-m ^b a		****		*

→ prefer candidates with less nasal vowels (c over b on * \tilde{V}).

Nasalization in suffixes

- But, σ -positional faithfulness makes the right predictions for *stressed* nasal suffixes.
 - they fail to neutralize oral/nasal contrast
 - and they fail to nasalize preceding roots and prefixes.

(22) a. $\overleftarrow{\text{h-}\tilde{\text{e}}\text{n}^{\text{d}}\text{u-}'\tilde{\text{i}}}$
3POSS-listen-PRV
'deafness'

b. $*\overleftarrow{\text{h-}\tilde{\text{e}}\text{n}\tilde{\text{u}}\text{-}'\tilde{\text{i}}}$

(23) a. $\text{o-}\overleftarrow{\text{j}\text{e}\text{h}\text{u-}\tilde{\text{r}}\tilde{\text{o}}}$
3-happen-if
'if it happens'

b. $*\overleftarrow{\tilde{\text{o}}\text{-}\tilde{\text{n}}\tilde{\text{e}}\text{h}\tilde{\text{u}}\text{-}'\tilde{\text{r}}\tilde{\text{o}}}$

Nasalization in suffixes

2. Preceding unstressed suffixes fail to nasalize even when a nasal suffix follows it.

(24) a. che-si-pe-gũãĩrã
1SG-mother-DOM-for
'for my mother'

b. *che-si-pe-gũãĩrã

c. a-ja'po-ta-mã
1SG-work-FUT-CMPL
'I will already work'

d. *a-ja'po-tã-mã

(25) a. mĩtã-'ŋ^guera-n^di
child-PL-with
'with the children'

b. *mĩtã-'ŋ^guerã-n^di

Nasalization in suffixes

- ★ σ -positional faithfulness incorrectly predicts that unstressed suffixes are targets of nasalization.

/che-si-pe-guarã/ 'for my mother'		ID- σ (NAS)	ALIGN-L(NASAL)	* \tilde{V}	ID(NAS)
a.	che-si-pe-guara	*!			*
b.	$\overleftarrow{\text{chẽ-sĩ-pẽ-gũãrã}}$	*!		*****	
c.	$\overset{\text{w}}{\bullet} \text{che-si-pe-}\overleftarrow{\text{gũãrã}}$		**	***	*****
d.	$\text{che-si-pe-}\overleftarrow{\text{gũãrã}}$		***!	**	****

- Not the case when preceding suffix is stressed: protected by IDENT- σ (NASAL).

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Goals for the analysis

- Two problems with σ -positional faithfulness that require fixing:
 1. All suffixes retain oral/nasal contrast regardless of stress.
 2. All suffixes fail to undergo nasalization from other suffixes.
- I propose two new mechanisms to predict suffix independence:
 1. **Right-edge faithfulness**: nasality is specified (faithful) at the right edges of words.
 2. **Output-output Correspondence** (Benua, 2000): language's cyclic morphological structure forces suffix-internal spread of nasalization.
- These will be added to the existing σ -positional faithfulness analysis.
→ which we will reevaluate later on.

Right-edge faithfulness

- ★ Prevent suffixes from neutralizing via high-ranked faithfulness at the right edges of words.

(27) IDENT-R(NASAL)

Assign a violation to each candidate whose rightmost segment doesn't have identical specification for nasality as its corresponding input segment.

(28)

/a-japo-mã/ 'I already worked'	ID-R(NAS)	ID-σ(N)	ALN-L(N)	*V̄	ID-(N)
a. $\overleftarrow{\text{ã-ñãpõ-mã}}$		*!		****	***
b. a-japo- $\overleftarrow{\text{mã}}$			****	*!	
c. a-japo-m ^b a	*!		****		*

Right-edge faithfulness

- Unstressed bisyllabic suffixes are similarly protected from neutralization.

→ they also trigger suffix-internal regressive spread.

- (29) $\overleftarrow{\text{chẽ-r-ẽ}} \text{n}^{\text{d}} \text{u-} \overleftarrow{\text{rãmõ}}$
 1SG-POSS-listen-if
 'if you hear me'

/che-r- <u>en</u> -ramõ/ 'if you hear me'		ID-R(N)	ID- σ (N)	ALN-L(N)	* \tilde{V}	ID(N)
a. che-r-en ^d u-ramõ				9!	1	
(30) b. che-r-en ^d u-ram ^b o		*!		9		1
c. $\overleftarrow{\text{chẽ-r-ẽ}} \text{n}^{\text{d}} \text{u-} \overleftarrow{\text{rãmõ}}$			*!		5	6
☞ d. $\overleftarrow{\text{chẽ-r-ẽ}} \text{n}^{\text{d}} \text{u-} \overleftarrow{\text{rãmõ}}$				4	5	5

Output-output correspondence

- ★ Protect preceding suffixes from nasalization via output-output correspondence (Benua, 2000).

(31) OO-IDENT(NASAL)

Assign a violation to each segment in an output whose specification for nasality is not identical to its corresponding segment in the base.


(32)

/che-si-pe-guarā/ 'for my mother' BASE: (che-si-pe)	ID-R(N)	OO-ID(N)	ID-σ(N)	ALN-L	* \tilde{V}	ID(N)
a. che-si-pe-guara	*!		*			*
b. che-si-pe- $\overleftarrow{\text{gũārā}}$				***	**	***
c. che-si-pē- $\overleftarrow{\text{gũārā}}$		*!		**	***	****

Output-output correspondence

- Suffixes show cyclic morphological structure.
- Prefixes can theoretically be ordered anywhere in the derivation.
- ★ ALIGN-L(NASAL) will require left-aligned nasalization even if prefixes aren't in the base of correspondence.

(33)

/ja-jo-hen _{oi} -se/ 'we want to call e.o.' BASE: (hēnō ⁱ)	ID-R(N)	OO-ID(N)	ID-σ(N)	ALN-L	* \tilde{V}	ID(N)
a. ja-jo-hēnō ⁱ -se				* ***	1	1
b.  nā-nō-hēnō ⁱ -se					4	5
c. ja-jo-hen ^d o ⁱ -se		*	*	***		1

Output-output correspondence

- ★ But, prefixes should be ordered first in the derivation to avoid the “missing base” problem (Benua 2000).
- The base of correspondence must be a legal output in the language

(34) a. $\overleftarrow{\text{ñã-ñõ-hẽnõ}^{\text{ĩ}}}$ - $\overleftarrow{\text{'se-mã}}$
1 PL.IN-REC-call-DES-CMPL
'we already want to call
each other'

b. Illegal base:
 $*\text{hẽnõ}^{\text{ĩ}}\text{'se}$

Legal base:
 $\text{ñã-ñõ-hẽnõ}^{\text{ĩ}}\text{'se}$

Interim summary

- I introduced two new mechanisms added to the existing analysis of \acute{o} positional faithfulness.
 1. **Right-edge faithfulness:** IDENT-R(NASAL)
 - prevents the neutralization of nasality in unstressed suffixes.
 2. **Transderivational faithfulness:** OO-IDENT(NASAL)
 - prevents suffixes from nasalizing other preceding suffixes.
- But, ***there are crucial redundancies*** with \acute{o} positional faithfulness.
 - Ultimately, I argue that \acute{o} positional faithfulness is both unsupported and unnecessary.

Removing $\acute{\sigma}$ positional faithfulness

Redundancy 1: IDENT-R(NASAL) and IDENT- $\acute{\sigma}$ (NASAL).

- Completely overlap in their violations in any form with a final lexically stressed syllable (roots, forms with a final stressed suffix).
→ stress is overwhelmingly final in Guarani.
- Assuming stress is always right-aligned, roots and final suffixes no longer need the protection of IDENT- $\acute{\sigma}$ (NASAL).

Removing \acute{o} positional faithfulness

Redundancy 2: OO-IDENT(NASAL) and IDENT- \acute{o} (NASAL).

- Nasalization of any preceding stressed syllable already violates both OO-IDENT(NASAL) and IDENT- \acute{o} (NASAL).

(35)

/che-r-enu-ramõ/ BASE: [ẽn ^d u]	ID-R(N)	OO-ID(N)	ID- \acute{o} (N)	ALN-L	* \tilde{V}	ID(N)
a. $\overleftarrow{\text{chẽ-r-ẽnũ-rãmõ}}$		*!	*		5	6
b. $\overleftarrow{\text{chẽ-r-ẽn}^{\text{d}}\text{u-rãmõ}}$				4	4	5

Removing σ positional faithfulness

- ★ Not entirely clear if stress is indeed lexically specified: it's overwhelmingly final in Guarani.
 - But, it seems to be...
1. Guarani has a few words with non-final stress, and a handful of stress-based minimal pairs.

(36) a. a'va b. 'ava
 'person' 'hair'

(37) a. eⁱ'ra b. e'ira
 'wild cat' 'honey'

(38) a. a'pe b. 'ape
 'surface' 'here'

(39) a. mbo'i b. 'mboⁱ
 'to undress' 'snake'


Removing σ positional faithfulness

2. Suffixes are “stressable” or “unstressable” in an unpredictable manner.
 - another asymmetry between prefixes and suffixes: prefixes are never stressed.
- This leaves us with an interesting conundrum...
- Suffixes are the only morphemes that require a true lexical specification for stress.
 - assuming that minimal pairs and others are exceptions.
- But, suffixes fail to show σ -positional faithfulness
- σ -positional faithfulness would gain more support if the morphemes that require lexical stress are also those that show σ -positional faithfulness.

Removing \acute{o} positional faithfulness

- ★ Investigate prediction of proposed analysis for morphemes with non-final stress vs. analysis with only \acute{o} positional faithfulness.
- Consider hypothetical input CVC \tilde{V} :



(40)

/ <u>CVC</u> \tilde{V} /		ID-R(NAS)	ID- \acute{o} (NAS)	ALIGN-L(NAS)	* \tilde{V}	ID(NAS)
w/  a. <u>CVC</u> \tilde{V}				*	*	
b. <u>C</u> \tilde{V} C \tilde{V}			*!		**	*
c. <u>CVCV</u>		*!				*

Removing \acute{o} positional faithfulness

- ★ Investigate prediction of proposed analysis for morphemes with non-final stress vs. analysis with only \acute{o} positional faithfulness.
- Consider hypothetical input CVC \tilde{V} :

(41)

/CVC \tilde{V} /	ID-R(NAS)	ID- \acute{o} (NAS)	ALIGN-L(NAS)	* \tilde{V}	ID(NAS)
w/  a. <u>CVC</u> \tilde{V}			*!	*	
w/o  b. <u>C</u> \tilde{V} C \tilde{V}		*		**	*
c. <u>CVC</u> V	*!				*


→ with IDENT- \acute{o} (NASAL): word-internal disagreement in nasality

→ without IDENT- \acute{o} (NASAL): full agreement in nasality

Removing σ positional faithfulness

- Consider another hypothetical input, $\underline{C}\tilde{V}CV$:

(42)



$/\underline{C}\tilde{V}CV/$		ID-R(NAS)	ID- σ (NAS)	ALIGN-L(NAS)	* \tilde{V}	ID(NAS)
w/ 	a. $\underline{C}\tilde{V}CV$				*	
	b. $\underline{C}\tilde{V}C\tilde{V}$	*!			**	*
	c. \underline{CVCV}		*!			*

→ with IDENT- σ (NASAL): word-internal disagreement in nasality

Removing \acute{o} positional faithfulness

- Consider another hypothetical input, $\underline{C}\tilde{V}CV$:

(43)

$/\underline{C}\tilde{V}CV/$		ID-R(NAS)	ID- \acute{o} (NAS)	ALIGN-L(NAS)	* \tilde{V}	ID(NAS)
w/  a. $\underline{C}\tilde{V}CV$					*!	
b. $\underline{C}\tilde{V}C\tilde{V}$		*!			**	*
w/o  c. \underline{CVCV}			*			*

→ with IDENT- \acute{o} (NASAL): word-internal disagreement in nasality

→ without IDENT- \acute{o} (NASAL): full agreement in nasality

Removing \acute{o} positional faithfulness

- ★ Guarani lexicon has ~14 words with non-final stress that distinguish analyses with and without \acute{o} -positional faithfulness (Estigarribia 2020).

(44)	a.	<i>hikáni</i>	freq. aspect	<i>máramo</i>	`never'
		<i>hína</i>	prog. aspect	<i>ména</i>	`husband'
		<i>káma</i>	`scrabies'	<i>naháñiri</i>	`no'
		<i>liméta</i>	`bottle'	<i>ne'ira</i>	`yet'
		<i>mamáne</i>	`papaya'	<i>pohãno</i>	`cure'
		<i>máva</i>	`who'	<i>têra</i>	`or'
	b.	<i>ánga</i>	`soul'	<i>téngé</i>	`slowly'

Removing \acute{o} positional faithfulness

- Guarani lexicon has a few words with non-final stress that distinguish analyses with and without \acute{o} -positional faithfulness (Estigarribia 2020)

(45)	a.	<i>hiká</i> <u><i>n</i></u> <i>i</i>	freq. aspect	<i>má</i> <u><i>r</i></u> <i>a</i> <u><i>m</i></u> <i>o</i>	`never'
		<i>hí</i> <u><i>n</i></u> <i>a</i>	prog. aspect	<i>mé</i> <u><i>n</i></u> <i>a</i>	`husband'
		<i>ká</i> <u><i>m</i></u> <i>a</i>	`scrabies'	<i>nahá</i> <u><i>n</i></u> <i>iri</i>	`no'
		<i>limé</i> <u><i>t</i></u> <i>a</i>	`bottle'	<i>ne'í</i> <u><i>r</i></u> <i>a</i>	`yet'
		<i>mamó</i> <u><i>n</i></u> <i>e</i>	`papaya'	<i>pohā</i> <u><i>n</i></u> <i>o</i>	`cure'
		<i>má</i> <u><i>v</i></u> <i>a</i>	`who'	<i>tē</i> <u><i>r</i></u> <i>a</i>	`or'
	b.	<i>á</i> <u><i>n</i></u> <i>ga</i>	`soul'	<i>té</i> <u><i>n</i></u> <i>ge</i>	`slowly'

- find full nasal consonants to the right of the stressed syllables.
→ so, ***rightmost syllable must be fully nasal.***

Removing σ positional faithfulness

- But, rightmost syllables in these words could be nasal due to **bidirectional** spread from the stressed syllable.
- I argue that Guarani **does not show bidirectional spread**.
 - Nasal-oral stops show that spread is directional: $\overleftarrow{\text{pãnã'm}^b\text{i}}$ 'butterfly'
 - This would leave Guarani 3 different nasalization processes...
 1. bidirectional nasalization for surface nasal consonants
 2. regressive nasalization for surface nasal-oral stops
 3. progressive nasalization
 - Nasal-oral stops and nasal consonants would require different URs
 - but these are in complementary distribution.

Removing \acute{o} positional faithfulness

b. *ánga* 'soul' *ténga* 'slowly'

- Stressed syllable clear target of regressive nasalization when followed by a nasal-oral stop.
- More clearly observed when these forms have prefixes to their left.

(46) a. *ñãndẽ-jagua*
1 PL.IN-dog
'our dog'

b. *ñãñẽ-[←]ãnga*
1 PL.IN-soul
'our soul'

- ★ ***Stressed syllables cannot be protected by IDENT- \acute{o} (NASAL)***, since they would fail to nasalize in presence of nasal-oral stop trigger.

Interim summary

- Proposed right-edge faithfulness + OO-Correspondence analysis explains the independence of suffixes in nasality and nasalization.
- An analysis with **solely** these mechanisms additionally predicts nasalization pattern in roots with non-final stress.
 - they show full agreement in nasalization that may only be attributed to right-edge faithfulness.

Roadmap

1. Language background and basic phonology
2. σ positional faithfulness in roots and prefixes (Beckman 1998)
3. Nasality and nasalization in suffixes
4. Analysis
 - Right-edge faithfulness + OO-correspondence
 - Reevaluating σ positional faithfulness
5. **Progressive harmony**
6. Discussion
 - Typology of prefix-suffix asymmetries
 - A possible prosodic analysis
 - Dialectal variation in progressive harmony

Progressive nasalization

- Guarani also has a system of progressive (rightward) nasalization that is very different from regressive.

(47)

	Regressive	Progressive
Triggers	rightmost nasal vowels, nasal consonants	nasal vowels
Targets	voiced segments	voiceless stops
Locality	local	non-local
Productivity	productive, exceptionless	lexically-specific

- ★ I'll show that the proposed IDENT-R(NASAL) & OO-IDENT(NASAL) analysis is compatible with progressive harmony.
→ progressive nasalization as phonologically conditioned suppletive allomorphy (Russell 2021).

Progressive nasalization

- Often described as phonological conditioned suppletive allomorphy:
1. Only a handful of stop-initial morphemes undergo progressive harmony alternations

(48) a. jagua-[←][k]uera
dog-PL
'dogs'

b. mĩtã-[←][ŋ^g]uera
child-PL
'children'

(49) a. a-ka'ru-[←][t]a
1SG-eat-FUT
'I will eat'

b. ãĩ-pĩtĩ'võ-[←][t]a
1SG-help-FUT
'I will help'

Progressive nasalization

2. Morpheme targets are affected differently by progressive nasalization.

(50) a. o-karu-pa
3-eat-TOT
'he finished eating'

b. $\overleftarrow{\text{o-n}\tilde{\text{e}}\text{'e-}}$ m^ba
3-talk-TOT
'he finished talking'

(51) a. plasa-pe
plaza-LOC
'at the plaza'

b. $\overleftarrow{\text{k}\tilde{\text{o}}\text{s}\tilde{\text{i}}\text{'n}\tilde{\text{a}}-}$ mē
kitchen-LOC
'at the kitchen'

→ *phonologically conditioned:*

- nasal roots select for nasal-initial allomorphs
- oral roots select for oral-initial allomorphs

Progressive nasalization

- Progressive harmony only triggered by phonemic nasal vowels.

- (52) a. $\overleftarrow{\text{pãnãm}^b}\text{i-}[\text{k}] \text{uera}$
 butterfly-PL
 'butterflies'
- b. $\overleftarrow{*pãnãm}^b\text{i-}[\text{ŋ}^g] \text{uera}$

- Alternations may stack and occur non-locally.

- (53) a. o-karu-se- $\overleftarrow{\text{pa-p}}\text{o'ta-peve}$
 3-eat-DES-TOT-INCIP-until
 'until he is about to finish
 wanting to eat'
- b. $\overleftarrow{\text{õ-ñẽ'e-se-}}\text{m}^b\text{a-m}^b\text{o'ta-mẽvẽ}$
 3-talk-DES-TOT-INCIP-until
 'until he is about to finish
 wanting to talk'

Progressive nasalization

- Verbal and nominal roots also show lexically-specific progressive harmony alternations.
- Examples from compounds:

(54)	a.	o- [←] [k̃]i	b.	[←] h-āsē- [←] [ŋ ^g]i	c.	[←] hũ- [←] [ŋ ^g]i	d.	[←] ãmã- [←] [ŋ ^g]i
		3-rain		3POSS-rain		black-rain		rain-rain
		'it rains'		'weep'		'grey, brown'		'rain'

Progressive nasalization

- Examples from causative constructions:

(55) a. o-[←][p̃]aⁱ
3-wake.up
'woke up'

b. ã-m[←]õ-[m̃]^baⁱ diego-pe
3-CAUS-wake.up Diego-DOM
'he woke up Diego'

- Also lexically specific: causatives otherwise follow the general pattern of regressive nasalization.

(56) a. [←]ã-m^bo-pu'pu
1SG-CAUS-hot
'I boiled your water'

b. [←]ã-mõ-kãñẽ'[←]õ
1SG-CAUS-tired
'I made (someone) tired'

Progressive nasalization

- ★ Two possible analyses for causative constructions.

1. Nasal-initial allomorph exceptionally selected regardless of nasality of causative prefix.

(57) a. $\overleftarrow{\tilde{o}-m\tilde{o}-'m^b}a^i$
3-CAUS-wake.up

2. Causative prefix is exceptionally nasal and selects for nasal-initial root allomorphs.

(58) a. $\overleftarrow{\tilde{o}-m\tilde{o}-[m^b]}a^i$
3-CAUS-wake.up

- ★ Alternative 2 is more compatible with analysis of progressive harmony in suffixes.

→ *phonologically conditioned*: phonemic nasal vowel selects nasal-initial allomorphs

Progressive nasalization

- ★ **Major takeaway:** IDENT-R(NASAL) and OO-IDENT(NASAL) make the right predictions for progressive harmony (as allomorphy).
- No suffix-external regressive nasalization even when nasal allomorph is selected.
- Allomorphs follow the general phonotactic restrictions: regressive nasal spread, nasal-oral stop / nasal consonant alternations, etc.

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6. **Discussion**
 - Typology of prefix-suffix asymmetries
 - A possible prosodic analysis to suffix independence
 - Dialectal variation in progressive harmony

Typology of prefix-suffix asymmetries

- Crosslinguistically, prefix independence is more common than suffix independence (Hyman 2008; Elkins 2020).
 - Guarani shows a case of **suffix** independence
- Often attributed to a natural bias towards **initial prominence** (Elkins 2020)
 - segmental contrasts generally preserved in prominent positions
 - phonological processes triggered in prominent positions
 - phonological processes are blocked in prominent positions
- Of course, such analysis is impossible for Guarani
- Instead, suffix independence in Guarani comes from right-aligned specification in nasality and cyclic morphological structure.
- So, Guarani has a special place in the typology of prefix-suffix asymmetries.

Typology of prefix-suffix asymmetries

- ★ Guarani is typologically interesting in other ways as well.
- Heavily prefixing and suffixing language with both leftward and rightward nasalization.
 - expression of these systems not limited by morphological structure
- A counterexample to generalization that languages with both prefixing and suffixing show **bidirectional** spread (Baković 2000).
 - Guarani regressive and progressive nasalization are entirely different processes.
- Additional prefix-suffix asymmetry in lexical specification for stress.
 - suffixes are “stressable” or “unstressable”, but prefixes can never be stressed.

A possible prosodic analysis

- Proposed analysis recruits **morphophonological mechanisms** to account for prefix-suffix asymmetry: OO-Correspondence
- Prefix-suffix asymmetries also often assumed to stem from asymmetries in **prosodic structure**.
 - affixes that exhibit phonological independence are outside the prosodic domain within which expected processes are active.
- ★ Prosodic analysis for Guarani asymmetry is possible, but only when assuming **recursive**.

A possible prosodic analysis

- **Non-recursive** prosodic analysis:

$$(59) \quad [\overleftarrow{P - R}]_{\omega} - [\overleftarrow{S_1}]_{\omega} - [\overleftarrow{S_2}]_{\omega} - [\overleftarrow{S_3}]_{\omega}$$

→ roots and prefixes in same domain ω

→ domain of ALIGN-L(NASAL) and IDENT-R(NASAL) are the ω

- ★ Suffixes don't seem to form their prosodic words in Guarani

→ a good number are monosyllabic and unstressed

- **Recursive** prosodic analysis:

$$(60) \quad [[[[\overleftarrow{P - R}]_{\omega} - \overleftarrow{S_1}]_{\omega} - \overleftarrow{S_2}]_{\omega} - \overleftarrow{S_3}]_{\omega}$$

A possible prosodic analysis

- Recursive self-embedding not universally accepted: each prosodic word could condition different phonotactics (Vogel 2009).
- Often offered as an alternative when morphophonological analysis encounters the “missing base problem” (Mascaró 2016; Bennett 2018)
 - but morphophonological analysis works for Guarani, assuming prefixes are ordered first in the derivation.
- ★ Not committed to morphophonological analysis.
 - prosodic analysis possible, but full range predictions should be evaluated
 - still need right-edge faithfulness (and not IDENT- σ (NASAL)) regardless!

Dialectal variation in progressive harmony

- Asunción and Concepción speakers show less progressive harmony alternations compared to Coronel Oviedo speakers.

C.O. speakers:

- (61) a. $\overleftarrow{\tilde{o}-\tilde{n}\tilde{e}'\tilde{e}}\text{-se-}\boxed{\text{m}^b}\text{a-}\boxed{\text{m}^b}\text{o'ta-}\overleftarrow{\text{m}\tilde{e}|\tilde{v}\tilde{e}}$
3-talk-DES-TOT-INCIP-until
'until he is about to finish
wanting to talk'

Asu / Con speakers:

- b. $\overleftarrow{\tilde{o}-\tilde{n}\tilde{e}'\tilde{e}}\text{-se-}\boxed{\text{p}}\text{a-}\boxed{\text{p}}\text{o'ta-}\boxed{\text{p}}\text{e}\text{ve}$
3-talk-DES-TOT-INCIP-until
'until he is about to finish
wanting to talk'

- But, **only in suffixes**.
- Otherwise, they show alternations in roots (compounds, causatives, etc.) consistent with Coronel Oviedo speakers.

Dialectal variation in progressive harmony

- Asunción and Concepción speakers may also show variation within the same form.

(62) a. jagua-kuera-pe
dog-PL-DOM
'dogs'

b. [←]mĩtã-ŋ^guera-pe
child-PL-DOM
'children'

Dialectal variation in progressive harmony

- Dialectal variation potentially serves as evidence for suffix independence being **generalized** from regressive harmony to progressive.
 - suffixes are increasingly faithful regardless of nasality of preceding elements.
 - both in regressive and progressive harmony
- However, this could also be attributed to **unproductivity** of progressive harmony.
 - but, wouldn't explain why suffixes, and not roots, show lack of progressive harmony alternations.
- No comprehensive studies on dialectal variation of Guarani yet - more work is needed of course!

Closing

- I proposed an updated analysis of Guarani nasality and nasalization, based on original fieldwork data.
- Suffixes in Guarani show ***independence*** from the general phonology of roots and prefixes.
- I take this as evidence that:
 1. Guarani nasality is faithful at the right edges of words, as opposed to at stressed syllables.
 2. Guarani has cyclic morphological structure for suffixes.
- Further evidence for right-edge faithfulness: nasal roots with non-final stress
- (potential) further evidence for general suffix independence: dialectal variation in progressive harmony.

Aguyjevete!

Thank you!

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Appendix

- σ -positional faithfulness also predicts suffix-internal spread of nasalization.
- More clearly observed in bisyllabic nasal suffixes.

(63) a. $n^d\text{-a-ikatu-}\overleftarrow{\text{m}\tilde{\text{o}}}\text{'a-}\tilde{\text{i}}$
 NEG-1SG-able-NEG.FUT-NEG
 'I won't be able to'

b. $\text{re-ju-}\overleftarrow{\text{v}\tilde{\text{a}}}\text{'e}\tilde{\text{r}\tilde{\text{a}}}$
 2SG-come-must
 'you must come'

(64)

/n-a-ikatu-mo'a-i/ 'I won't be able to'	ID- σ (NAS)	ALN-L(NAS)	* $\tilde{\text{v}}$	ID(NAS)
a. $n^d\text{-a-ikatu-}\text{m}^b\text{o'a-}\tilde{\text{i}}$		9!	1	
b. $n^d\text{-a-ikatu-}\overleftarrow{\text{m}\tilde{\text{o}}}\text{'a-}\tilde{\text{i}}$		4	2	*
c. $\overleftarrow{\text{n-}\tilde{\text{a-ik}\tilde{\text{a}}\text{tu-m}\tilde{\text{o}}}\text{'a-}\tilde{\text{i}}}$	*!		5	****
d. $n^d\text{-a-ikatu-}\text{m}^b\text{o'a-i}$	*!	4		*

Progressive nasalization

- What makes the nasal allomorph of the causative prefix control for allomorphy selection of roots?

1. It is stressed, and stressed syllables select nasal allomorphs
→ it is only the root that selects nasal allomorphs in suffixes.

(65) a. $\overleftarrow{\text{õ-ñẽ}}\text{'ẽ-se-m}^b\text{a-'}\text{ta-}\overleftarrow{\text{mẽvẽ}}$
3-talk-DES-TOT-INCIP-until
'until he is about to finish
wanting to talk'

2. Morphological structure: rightmost elements selects nasal allomorphs
→ prefixes are never the rightmost element: they are added first in the derivation