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(In)complete /t d/ deletion in American English – a motion capture study

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American English is well-known for optional /t d/ deletion in clusters, as in best [bes] man, kept [k^{h}ep] going or whipped [wɪp] butter (Coetzee, 2004; Walker, 2012). However, different studies have led to varying conclusions concerning the conditioning of the process and its categoricity. Even in the absence of an acoustic trace of /t d/, articulatory gestures related to the alveolar constriction may still be there (Browman & Goldstein, 1990; Purse & Turk, 2019), although they may be of a smaller magnitude, which questions the completeness of deletion from a phonological standpoint. Research also shows that heritage Spanish speakers in the US have a particularly high rate of /t d/ deletion (e.g. Santa Ana, 1991). As Spanish syllable structure does not allow complex codas at the end of a word, and many Spanish varieties weaken or delete even simple codas (Hualde, 2005), it is only natural for Spanish speakers to simplify final clusters. Assuming an influence of Spanish on the English of bilingual speakers, we expect more frequent /t d/ deletion and/or different articulatory patterns in this group.

The disadvantage of previous articulatory studies on the subject is that they are based on a small number of tokens from few speakers. Our aim was to elicit a larger data sample using a cheaper alternative: motion capture, following previous work (e.g. Broś & Krause, 2024). With more recorded speakers and tokens, we look at the articulatory dynamics of /t d/ to determine whether we can reliably distinguish between fully produced, weakened and deleted segments.

46 American English speakers (23 monolinguals and 23 heritage Spanish speakers) from California were recorded while producing 320 sentences each, with regular verbs ending in a bilabial sound, produced either in the present or the past tense and followed by a bilabial or a vowel (e.g. *stop making, stop eating, stopped making, stopped eating*). Recordings were made using AAA software. This enabled the analysis of pronounced vs. unpronounced /t d/ segments under the assumption that the initial lip closure for the bilabial sound must be interrupted to produce an alveolar stop and will not be interrupted or will only be weakened in the case of lenited or unpronounced /t d/. We compared the acoustic results (audible and inaudible /t d/) with lip tracking data and additionally corroborated our results with ultrasound imaging.

The results show differences between acoustically audible sounds, inaudible sounds accompanied by lip aperture and/or smaller lip compression (incomplete deletions) and inaudible sounds without changes in lip aperture (complete deletions). Overall, heritage Spanish speakers show much higher rates of deletion than monolinguals, which is in line with the literature on Chicano English and may be due to the phonological properties of Spanish. The results are interpreted in the framework of Articulatory Phonology (Browman & Goldstein, 1990), whereby gestural masking is responsible for inaudible but otherwise (weakly) articulated sounds. This is of consequence for the phonological representation of incomplete deletion and its interaction with other phonological processes in the language. It also lends support for theories which allow for the inclusion of unpronounced segments in outputs of phonological computation (e.g. containment, Prince & Smolensky, 1993; van Oostendorp, 2008).

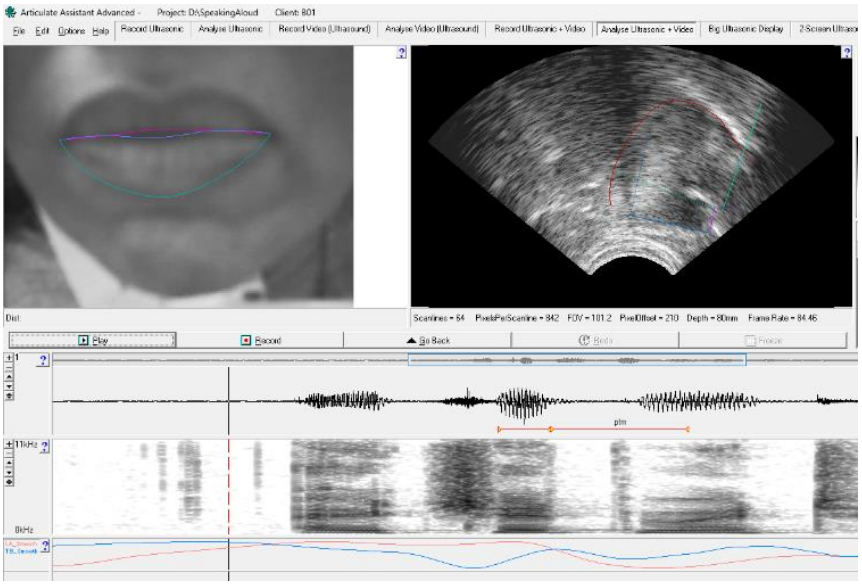

Fig. 1. Tongue and lip contours for the sentence containing the sequence /ptm/ during closure.

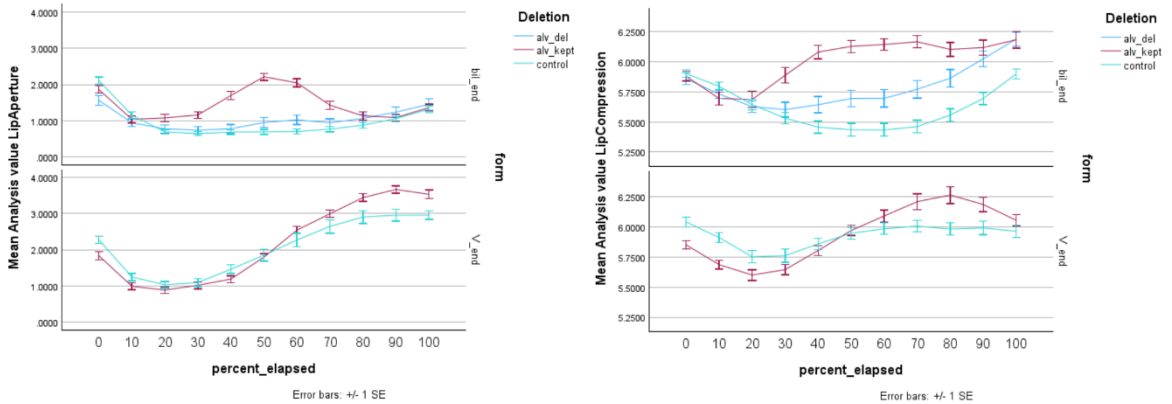

Fig 2. Lip trajectories over the sequence of interest showing lip aperture (left) and lip compression (right) on a subset of speakers. Higher values correspond to greater lip aperture (left) and smaller lip compression (right).

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A principle of balancing non-alternation and alternation in tonal metres

Background (Wang, 1962; Huang, 2000): Regulated verses (RV) contains 4 or 8 lines, each having 5 or 7 characters/syllables. Middle Chinese (MC) used in RV has four tones, divided into two categories: *Level* (L) category has only the level tone, and *Oblique* (O) category has the rising, falling, and checked tones. RV's metrical templates restrict the tone *category* allowed at a particular position in a line. This paper focuses on 4-line poems only because 8-line poems repeat the template of the first 4 lines for their second half. Depending on the tone category of a poem's beginning character and the number of characters in a line, 4 optimal metrical templates exist, and their key features are summarised in table (1).

Observations: The need for both alternation and non-alternation can be observed from the optimal templates directly. 'Alternation' is shown in two ways: ① Like other tonal systems (e.g., Vietnamese Luc Bat), RV regulates even-numbered positions more strongly (i.e., no inversions in these positions) to yield an iambic metre (Kiparsky, 2020) and to avoid monotony (since the tone categories in these positions are usually different in each line). ② The number of characters from the same tone category in a row never exceeds three. 'Non-alternation' mainly comes from the fact that non-final characters in each line always have at least one neighbour from the same tone category.

Case study: A requirement named *No Lonely L Tone* in RV also illustrates why non-alternation and alternation must be both in place. There are two positions that could have allowed inversions but do not (yellow in ex. 1). In traditional Chinese literature, these exceptions are said to avoid a phenomenon called *lonely L* (*gū píng*) because, if these positions also allow inversions, the entire line end up with only one L-tone character (red in ex.3) besides the extra-metrical final position. If inversions at these positions cannot be avoided, a possible remedy is to 'change the tone category of the character immediately following this L' (green in ex.3).

I propose that the *No Lonely L Tone* restriction and its remedy is a result of the interaction between the non-alternation and alternation features of RV summarised in the generalisations above. This proposal can be shown in OT with constraints in (4). With the optimal template being the UR, the solution to lonely L can be chosen from candidates showing the possible changes to the line (5-6). BIN-L and BIN-O are key to non-alternation, and lonely-L cases (5b) are penalised for lacking binarity. ODD-INVER ensures that, even if an L ends up having no neighbour from the same category, remedies should be sought in odd-numbered positions only i.e., removing the non-binary L (5c) or adding an L (5d) is not a solution. NO-INVER-FIN keeps 'LOL' at the end of a line as it is (i.e., don't change to 'LOO') even though non-alternation is violated, because no inversion is allowed at line-final positions (5e).

Implications: Evidence from RV is valuable in three ways. First, the case study shows that, the simultaneous requirement of non-alternation and alternation is found not only in the shape of RV's optimal templates, but also *where* and *to what extent* the templates allow variations / inversions. Second, in contrast to the well-studied stress / accentual / quantitative metres which prefer alternating prominence (i.e., WSWS patterns where every position is surrounded by items from the opposite category), this tonal metre presents a novel case where positions are ideally *not* surrounded by two items from the other category. This enriches the typology of metres and range of principles that should be considered in metric analysis. Finally, these patterns demonstrate how metres are informed by and in turn serve as windows to investigate phonological theories of languages. The non-alternation features show that, even when looking at abstracted higher-level categories, the tendency for tones to spread across multiple TBUs (Hyman, 2011) still holds. The requirement on having at least two adjacent syllables from the same tone category also aligns with the generalisation that many tonal languages avoid rapid excursions of pitch in a short time (McPherson, 2016; cf. *HLH, Cahill, 2007; *TROUGH, Yip, 2002). Alternation, besides being the key of metres, also mirrors natural language preferences: The 'up-to-three' pattern on the number of syllables from the same tone category resembles the limit that tonal spreading usually does not extend beyond two adjacent TBUs (e.g., Jardine, 2020; Odden, 2001). In other words, the optimal template shape of RV is not merely a choice to the poets' liking, but the most balanced option under the tension between the natural-language tendency of tones to spread vs. the rhythmic alternation of poetry.

(1) Four optimal metrical templates of RV and their characteristics

		Initial tone			Note and Key
			L	O	
Length	5	Couplet 1	**L**LL**O**O **O**OO**L**L	**O**OL**L**O **L**LO**O**L	grey = final positions *must* use category specified; restrictions to other positions do not apply **bolded** = inversions (i.e., using the opposite tone category) allowed teal = 'extensions' of 5-syllable lines to get 7-syllable ones; so only the last five syllables are studied in 7-syllable lines
		Couplet 2	**O**OL**L**O **L**LO**O**L	**L**LL**O**O **O**OO**L**L	
	7	Couplet 1 = LL + couplet 5O	**LL**O**O**LL**O** **O**O**L**LO**O**L	**OO**LLL**O**O **LL**O**O**LL	
		Couplet 2 = OO + couplet 5L	**OO**LLL**O**O **LL**O**O**LL	**LL**O**O**LL**O** **O**OL**L**O**O**L	

(3)	with lonely L	solution
5O	OLOOL	OLLOL
7L	OOOLOOL	OOOLLOL

(4)	Constraint	Assign one violation for …
	BIN-L	each non-final L without an L neighbour.
	BIN-O	each non-final O without an O neighbour.
	ODD-INVER	each inversion occurring in an even-numbered position
	NO-INVER-FIN	each inversion occurring in the line-final position.

(5)	LLOOL	BIN-L	ODD-INVER	NO-INVER-FIN	BIN-O
a. ☞	OLLOL				**
b.	OLOOL	*!			*
c.	OOOOL		*!		
d.	OLOLL	*!	*		**
e.	OLLOO			*!	*
(6)	OOLLOOL	BIN-L	ODD-INVER	NO-INVER-FIN	BIN-O
a. ☞	OOOLLOL				*
b.	OOOLOOL	*!			
c.	OOOOOOL		*!		
d.	OOOLOLL	*!	*		*
e.	OOOLLOO			*!	

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A unified analysis of nasality and glottalization in Nadahup

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Like many Amazonian languages, the Nadahup languages (Yuhup, Hup, Nadëb, and Dâw) display nasal-oral alternations whereby the surface realization of voiced occlusives depends on the orality or nasality of adjacent vowels. Analyses of these phenomena across Nadahup languages vary considerably, with highly disparate phonemic inventories as well as conflicting analyses of nasality as either a segmental or morpheme-level phenomenon. Moreover, some of these analyses raise issues language-internally, where some purported nasalization processes lack any phonological trigger or articulatory motivation. In our analysis, oral vowel phonemes—which contrast with nasal vowels in all varieties—trigger local oralization of adjacent nasal consonant phonemes. We also posit contrastive glottalized nasal consonants, which likewise undergo oralization in this context.

Nadahup languages feature a pattern of complementary distribution whereby nasals [m, n] surface after nasal vowels, and complex oral-nasal consonants [bm, dn] surface after oral vowels (**Table 1**). Since voiced stops contrast with nasal consonants in Nadëb and Dâw (i.e., /m, n/ ≠ /b, d/), descriptions of these varieties agree that the nasals undergo pre-oralization (Martins, 2004; Barbosa, 2005). However, Yuhup and Hup exhibit one series of voiced occlusive phonemes with varying degrees of nasality, surfacing as [m~b~bm~mb, n~d~dn~nd]. Some authors (Martins, 2005; Epps, 2008) describe them as underlying voiced stops that undergo post-nasalization after oral vowels (e.g., /d/ → [dn]), while others (Lopes & Parker, 1999; Silva & Silva, 2012) describe them as underlying nasals that undergo pre-oralization after oral vowels, as in Nadëb and Dâw. Pan-Nadahup cognates demonstrate that the same pre-oralization occurs family-wide (e.g., 'hide' [**Table 2**], /n/ → [dn]), providing evidence for underlying nasals—not voiced stops—in Yuhup and Hup.

Another source of contention is the level of phonological representation of nasality and glottalization in Yuhup and Hup. Most authors either treat both as morpheme-level features (Lopes, 1995; Ospina Bozzi, 2002 [**Table 3**]), or both as segmental (Martins, 2005; Epps, 2008). The former group posit no phonemic nasal vowels or glottalized consonants; instead, nasality and glottalization apply to entire morphemes, affecting the realization of morpheme-internal segments. Nasality is usually analyzed as a morpheme-level feature in nearby Tukanoan languages (e.g., Tukano [Ramirez, 2019]); this successfully accounts for frequent cases of non-contiguous nasality in disyllabic morphemes. However, we show that analogous analyses are untenable for Yuhup and Hup, where morphemes are typically monosyllabic and nasalization is typically limited to segments adjacent to a morpheme's single vocalic nucleus. Similarly, morphemic analyses of Yuhup and Hup glottalization, which purportedly never or rarely occurs on morphemes with certain unmarked onsets (e.g., /p/), are problematic (**Table 4**). These facts point instead to a segmental analysis of glottalization where most but not all non-glottalized onset consonant phonemes have glottalized counterparts (Martins, 2005).

We argue that there is no empirical support for a morpheme-level analysis of these features and demonstrate that a segmental analysis not only accounts for the patterns in all four Nadahup varieties but also aligns with similar patterns observed in other Amazonian languages (e.g., Panãra [Lapierre, 2023]).

Table 1. Positional allophones of nasal consonant phonemes in Nadahup

phoneme	position	
	Ṽ_$	V_$
/m/	[Ṽ**m**]	[V**bm**]
/n/	[Ṽ**n**]	[V**dn**]
/ɲ/	[Ṽ**ɲ**]	[V**ɟɲ**]
/ŋ/	[Ṽ**ŋ**]	[V**gŋ**]

Table 2. Pan-Nadahup cognates

gloss	Yuhup	Hup	Nadëb	Dâw
'hide'	/jɤn/ [jɤdn]	/jɤn/	/jɤn/	/jen/ [je:dn]
'give'	/nɔ̃ʔ/ [nɔ̃:ʔ̄]	/nɔ̃ʔ/	/nɔ̃:ʔ/	/nɔ̃ʔ/
'liana'	/jum/ [ju:bm]	/jum/ [jubm]	/ju:m/ [ju:bm]	/jum/ [jubm]
'axe'	/mɔ̃m/ [mɔ̃:m]	/mɔ̃m/	/mũ:m/ [mũ:m]	/mãm/ [mã:m]
'louse'	/nɛ̃m/ [nɛ̃:m]	/nɛ̃m/	/nã:m/ [nã:m]	/nɛ̃m/ [nɛ̃:m]

Table 3. Summary of past analyses of Yuhup

source	voiced occlusive phoneme inventory		analysis of nasality
	plain set	glottalized set	
Lopes (1995)	/m n ɲ ŋ/	NA; morpheme-level	morpheme-level
Lopes & Parker (1999)	/m n ɲ ŋ/	NA; morpheme-level	morpheme-level
Gutiérrez (2000)	/b d ɟ g/	not discussed	nasal vowel phonemes
Ospina Bozzi (2002)	/m n ɲ ŋ ᵇm ᵈn ʲɲ ᵍŋ/	NA; morpheme-level	morpheme-level
Martins (2005)	/b d ɟ g/	/bˀ dˀ ɟˀ/	nasal vowel phonemes
Silva & Silva (2012)	/m n ɲ ŋ/	/mˀ nˀ ɲˀ ŋˀ/	nasal vowel phonemes

Table 4. Conflicting analyses of glottalization in Yuhup words, with Hup cognates

	Yuhup			Hup
gloss	**Ospina Bozzi (2002)[1]**	**Lopes (1995)[2]**	**Martins (2005)**	**Epps (2008)**
'buriti fruit'	/˷cak/ [c'a̰:k̄]	/cak [cg]/	/cˀak/	/ɟˀak/
'pot'	/˷bok/ [ɓɔ̰:k̄~m̰ɓɔ̰:k̄]	/mɔk [cg]/	/bˀɔk/	/bˀɔk/

1. Uses a preceding creaky voice diacritic /˷/ to mark morpheme-level glottalization
2. Uses a following *[cg]* 'constricted glottis' to mark morpheme-level glottalization

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Acoustic Markers of Corrective Focus in L1 Polish and L2 English

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The prosodic marking of focus plays a fundamental role in shaping meaning and structuring information in spoken discourse. While the acoustic correlates of focus have been extensively studied in Germanic languages such as English and German, Polish remains comparatively understudied. The present study addresses this gap by examining the prosodic realisation of corrective focus in L1 Polish and L2 English, with particular attention to pitch (F0), intensity, duration, and proportional peak alignment.

Previous findings on Polish show that focus (including corrective focus) triggers prominence shifts to focused constituents. Pitch and intensity are the main acoustic correlates for focus marking in Polish (Cruttenden, 2006; Dogil, 1980; Dogil & Williams, 1999; Dłuska, 1976; Hamlaoui et al., 2015; Hamlaoui et al., 2019;). Duration also showed significant differences in most focus types, including correction focus. Hamlaoui et al. (2015) indicate that, under corrective focus, the stressed syllable retains primary stress and exhibits significantly greater pitch prominence and increased duration than the initial syllable. This suggests that Polish speakers signal corrective focus by integrating both pitch-related and durational cues. Building on this foundation, the present study investigates whether Polish speakers employ comparable acoustic strategies when producing corrective focus in their second language, English.

To explore this question, 52 native Polish-speaking students of English Philology with at least B2+ CEFR level of English participated in the study. Acoustic measurements included pitch (ERB), intensity (RMS), duration (ms), and F0 proportional peak alignment relative to the stressed syllable. Statistical analysis was conducted using linear mixed-effects models.

The results revealed systematic cross-linguistic differences in the prosodic realisation of corrective focus. In L2 English, corrective focus was consistently marked by a distinct pitch peak on the focused word. In contrast, L1 Polish productions lacked such pitch peaks; instead, corrective focus was encoded through significantly increased intensity and durational lengthening of all sentence constituents. These findings suggest that Polish speakers may prioritise duration and intensity over pitch-based cues when signalling corrective focus in their native language. While L1 Polish showed peak alignment on the stressed syllable, L2 English exhibited earlier alignment—near the onset of the stressed syllable or on the preceding syllable (see Figure 1).

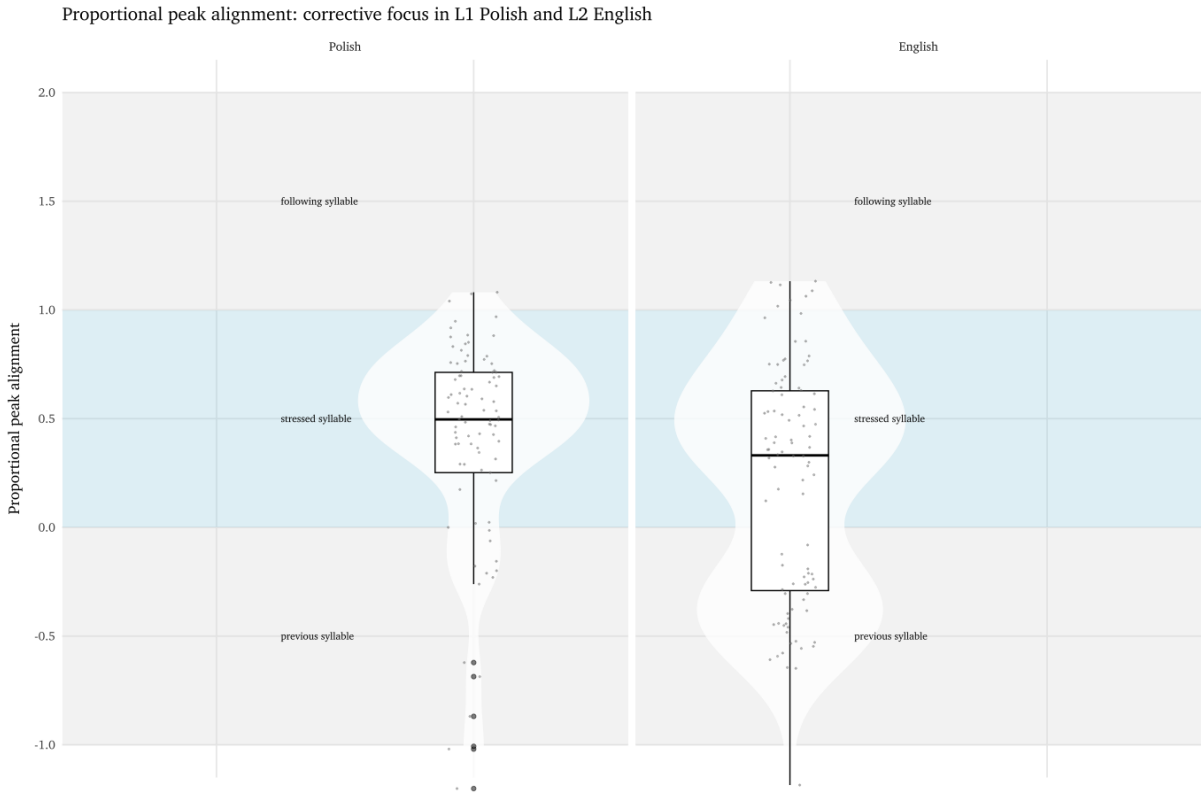

Figure 1. Proportional peak alignment of H1 with respect to the stressed syllable.

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Against Occam's razor

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Classical phonological analysis consists of determining a mapping between the observed surface form and an (abstract, unobserved) underlying form. There are typically many logically possible ways to effect this mapping, and there are various (often implicit) theoretical rules and principles for determining which mapping is the preferred one. One such principle is Occam's razor, "entities must not be multiplied beyond necessity".

This common formulation of Occam's razor is often invoked as a justification for particular choices in phonological analysis, such as unifying two apparently dissimilar processes with a single rule, or simplifying a phoneme inventory. Hale & Reiss (2000) equate Occam's razor with the entire scientific method (cf. Eddington, 2008; McFadden, 2023).

However, consistently applying Occam's razor requires a coherent understanding of what counts as an "entity" and what counts as "necessity". These concepts differ between different scholars and there is no consensus within phonology about the entities that "matter". For example, Aziza (2008) motivated an analysis of the Urhobo vowel system as possessing 10 contrastive underlying vowels, which are neutralized to 7 surface vowels. This reanalysis considerably streamlines the description of vowel harmony processes in the language, which are otherwise subject to stipulative rules and lexically-specific variation. Does this multiplication of entities (phonemes) violate Occam's razor? Is the "tidying up" of the vowel harmony system a "necessity"?

Likewise, we can come to several pleasing generalizations about the nature of the English velar nasal — such as the fact that it only occurs before velar stops or morpheme boundaries — if we are willing to overlook data from loanwords (*orangutan*, *angst*), proper nouns (*Shanghai*, *Birmingham*), and a handful of recalcitrant lexemes (*dinghy*, *hangar*). What is "necessary" is determined by what we consider to be limits of the explanandum of our theory. Indeed, a consideration of the history of phonological theory suggests a waxing and waning adherence to Occam's razor over the decades (Klausenburger, 2014).

Occam's razor is not a reliable or consistent method for justifying phonological analysis, absent a very strictly defined understanding of the "entities" and "necessities" that accompany the analysis. This apparently radical view finds support from "harder" sciences too, such as biology (Gross, 2019), medicine (Bleakley, 2010), and psychology (Endress, 2023).

A resolution to the problematic nature of the razor can be approached through consideration of phonological analysis in terms of Marrian levels (Marr, 1982). A description of a phonological process at a neurological level will necessarily require different entities and necessities than a description of the same process at a cognitive level, and again different at a structural level. Suitably contextualized, Occam's razor can contribute towards our theory-building, but without these safeguards it is at best a distraction.

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Akebu (Kwa): a unique vowel system with three [-ATR] central vowels?

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Akebu, a Kwa language of Togo (e.g. Sossoukpe 2017; Makeeva 2022; Shluinsky 2022), appears to have an unusual asymmetrical vowel system (cf. Table 1) which suggests:

(a) the relevance of the contrast between interior and peripheral vowels, rarely discussed and absent from most generative feature geometries (e.g. McCarthy 1988; Lahiri 2018);

(b) a cross-linguistically unique feature — three harmonically non-neutral central vowels not contrasting in ATR.

Tables 2a-c show the "static" vowel harmony rule (within morphemes) and two "dynamic" rules (across morphemes) together with the activated feature contrasts they suggest. Dynamic rule 1 indicates the [-ATR] status of at least the peripheral central vowel /a/. Table 3 shows our proposed feature hierarchy of vowels which would account for all the explicated harmony rules.

Akebu is already typologically unusual in that it manifests both the ATR feature (in vowel contrasts and harmony) and the presence of interior vowels (within the interior regions of the vowel space). ATR and the interior vowels were shown to be antagonistic in a survey of 681 languages of the Macro-Sudan belt by Rolle et al. (2020). The hierarchy in Table 3 additionally suggests that all the three central vowels in Akebu are [-ATR]. This would make Akebu unique in Rolle's sample, as other languages there have at least one [ATR] contrast in central vowels.

Still, the harmony rules do not indicate the [-ATR] status of the two interior vowels /ə, ɨ/ in an absolutely univocal manner. Therefore, we discuss additional less direct support for this, based on typological data, field data on Akebu and related languages, and our tailored acoustic study on the Akebu vowels (Djon village, 6 speakers, 1980 tokens). Our evidence includes:

(a) typological data on /a/ as harmonically triggering [-ATR] vowels (cf. with the Dynamic rule 2 in Table 2c, where /a/ triggers /ɨ/ or /ə/);

(b) the parallel occurrence of /ɨ/ and of the [-ATR] vowels /ʊ, ɪ/ as default vowels in non-harmonising contexts (cf. Casali 2003), e.g. in the third person object pronouns, each of which replaces a noun of a certain nominal class: *ŋɔ̀, pɨ̄, ʧɨ̄, wʊ̄, yɪ̄, kɨ̄, kpɨ̄*;

(c) the shift of /ʊ, ɪ/ towards /ɨ/ in the vowel reduction processes (Shluinsky 2020), e.g. *y**ɨ̄**=yɔ̄ɔ̄-wə* 'something tender' from the original **y**ʊ̄**=yɔ̄ɔ̄-wə*;

(d) origins of /ə, ɨ/ from either [-ATR] vowels or from **V?*, as suggested by the comparison between Akebu and the closely related but more conservative Animere language (Casali 2006), e.g. *m**ɨ́*** (Akebu) – *m**ʊ́*** 'I' (Animere), *ə̀l**ə́*** (Akebu) – *al**aʔ́*** (Animere) 'who';

(e) the same F1 frequency belt for /ə, ɨ/ and the peripheral [-ATR] vowels in our acoustic data;

(f) F1 bandwidth size metrics in our data, also indicating the [-ATR] status of interior vowels.

This sum of evidence indeed indicates a unique vowel system with three central [-ATR] vowels observed in Akebu (see details in Makeeva & Kuznetsova 2024).

Table 1. Akebu vowel system

	front [+ATR] – [-ATR]	central [-ATR]?	back [+ATR] – [-ATR]
high	i – ɪ (peripheral)	**ɨ** (interior)	u – ʊ (peripheral)
mid	e – ɛ (peripheral)	**ə** (interior)	o – ɔ (peripheral)
low		**a** (peripheral)	

Table 2a. Static harmony rule (within roots)

{e, o, i, u}	[+ATR, +PER]
{a, ɛ, ɔ, ɪ, ʊ}	[–ATR, +PER]
{a, ə, ɨ}	[+CNT]

Table 2b. Dynamic harmony rule 1 (leftward spread)

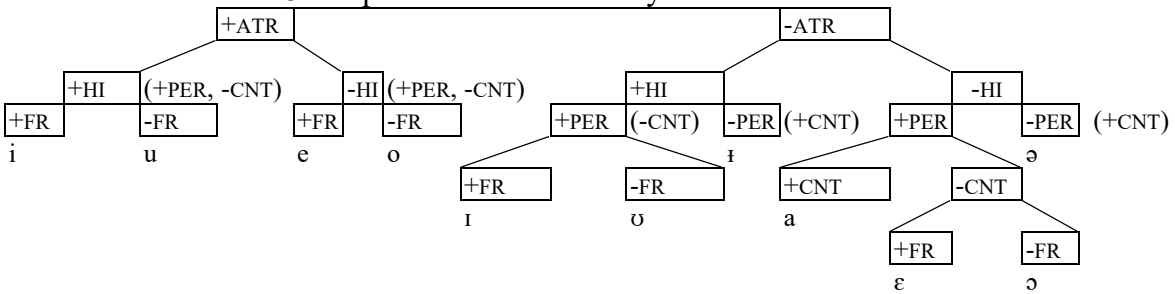
prefix V [-HI]	←	**root V**	
e	←	**e / i**	[+ATR, +PER, +FR]
o	←	**o / u**	[+ATR, +PER, –FR]
a	←	**a / ɛ / ɔ / ɪ / ʊ**	[–ATR, +PER]
ə	←	**ə / ɨ**	[–PER]

Table 2c. Dynamic harmony rule 2 (leftward and rightward spread)

	reduplication V [+HI]	←	**root V**	→	suffix V [+HI*]	
[+ATR, -CNT, +FR]	i	←	**e / i**	→	i	[+ATR, -CNT, +FR]
[+ATR, -CNT, –FR]	u	←	**o / u**	→	u	[+ATR, -CNT, –FR]
[–ATR, -CNT, +FR]	ɪ	←	**ɛ / ɪ**	→	ɪ	[–ATR, -CNT, +FR]
[–ATR, -CNT, –FR]	ʊ	←	**ɔ / ʊ**	→	ʊ	[–ATR, -CNT, –FR]
[+CNT]	ɨ	←	**ə, ɨ**	→	ɨ	[–PER, +CNT]
			a	→	ɨ / $C_{nasal\_}$, ə / $C_{non\text{-}nasal\_}$	[+PER, +CNT]

* With the exception of the rightward spread for a → ə / $C_{non\text{-}nasal\_}$.

Table 3. Proposed feature hierarchy for Akebu vowels



Abbreviations in the tables: ATR – advanced tongue root, CNT – central, FR – front, HI – high, PER – peripheral, V – vowel, C_{nasal} – nasal consonant, $C_{non\text{-}nasal}$ – non-nasal consonant.

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An articulatory study of high vowels in Norwegian. A case against feature [± front]

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Norwegian, with its three-way frontness distinction in high vowels, is often invoked as an argument for two features describing the frontness distinction, [± back] and additionally [± front] (Hayes, 2009:81). In the system with vowels commonly transcribed as /y, y:, ʉ, ʉ:, u, u:/, the central vowels /ʉ, ʉ:/ do not contrast with true back vowels in [± round], justifying the use of additional [± front].

The vowels transcribed as /ʉ, ʉ:/ have usually been assumed to be central or advanced central (Kristoffersen 2000:14, and references therein). However, Endresen (1991:112) interprets them as phonetically front, slightly centralized in comparison to [y/y:]. Kristoffersen (2000:33) assumes that phonologically /ʉ, ʉ:/ are Dorsal [- back], unlike /y, y:/, which are Coronal, and /u, u:/, which are Dorsal [+ back]. Yet another analysis has been proposed in literature, in particular, utilizing the degree of lip rounding as the distinctive feature. Vanvik (1972:127) describes the lip rounding in /ʉ, ʉ:/ as identical to /u, u:/, while the lips in /y, y:/ are more protruded and further apart. Similarly, Endresen assumes that /ʉ/ and /ʉ:/ have the same degree of rounding as the cardinal /y/ but the Norwegian /y, y:/ is less rounded.

In this paper we report the results of an ultrasound study of Norwegian vowels and propose an alternative analysis. We have collected data from 5 native speakers of Norwegian, originally from the area of Oslo. For the data analysis, we have extracted the location of the mid-tongue root point and a mid-dorsum point using DeepLabCut plug-in for AAA (2019), Articulate Instruments software. The z-score normalized values were then analyzed using linear mixed–effects models with speaker as a random factor. While /ʉ:/ is usually a little lower than /i:/ and /y/, cf. Fig. 1A representing individual articulations and Fig.2A (mean values), the front-back position of the dorsum does not differ significantly for long vowels /i:, y:, ʉ:/. The dorsum in /u:/ is significantly retracted when compared to /i:, y:, ʉ:/. This confirms the earlier findings that /ʉ:/ is a front vowel. /ʉ:/ is significantly different from /i:, y:/ in terms of the advancement of the tongue root. The results indicate that /ʉ:/ may be interpreted as a front vowel articulated with a relative retraction of the tongue root. In short vowels too, /u/ is visibly different from all the other higher vowels, cf. Fig. 2B and Fig. 1B. While short /i/ and /y/ differ a little in height (the difference is significant), they are otherwise very similar. /ʉ/ lies between /i,y/ and /u/ on the frontness axes – both the dorsum and the tongue root. The dorsum in /ʉ/ is also relatively lowered as compared to other high vowels, which is a typical effect of the tongue root retraction.

Under the proposed analysis in terms of feature [± ATR] we do not need to introduce [± front] as the second frontness feature. We also do not have to introduce any features referring to the level of lip rounding or their protrusion – instead, we utilize the feature which is already well-established in the phonological theory.

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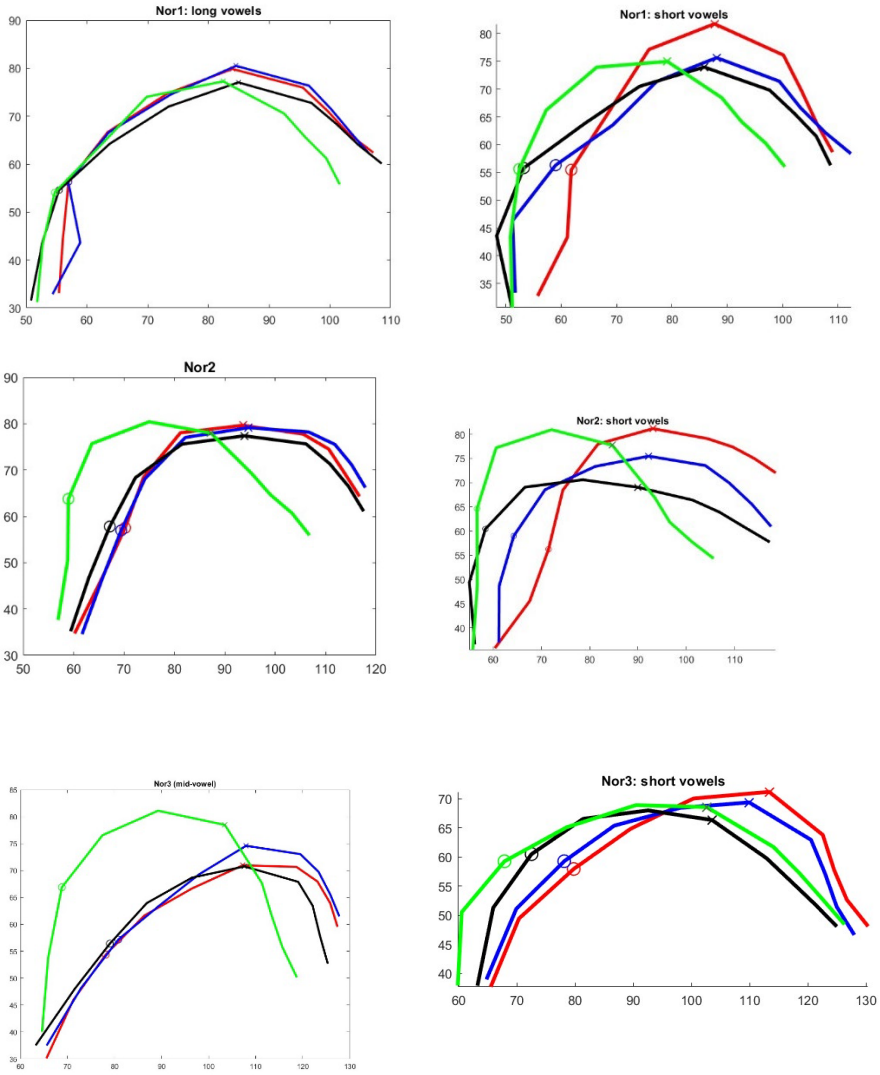
Fig. 1: Tongue shape of high vowels in Speakers 1-5 (individual articulations)

1.1.A 1.1.B



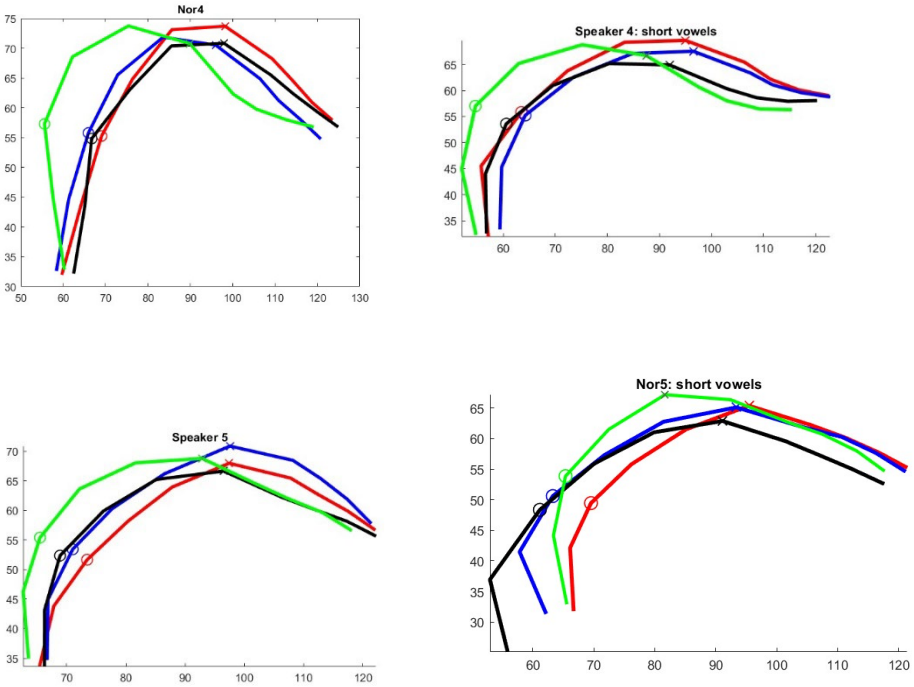
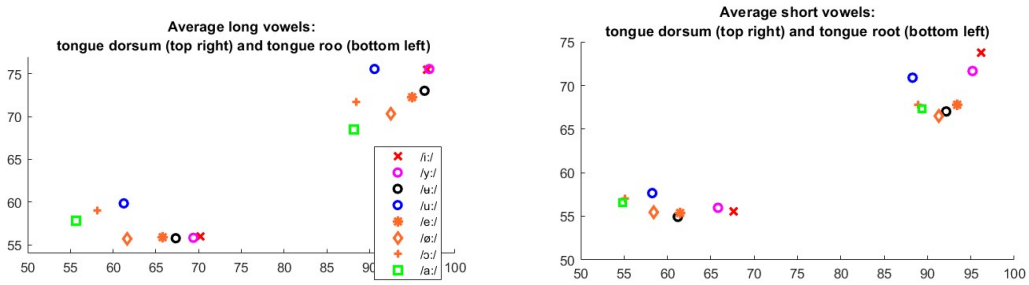


Fig. 2: Mean values, speakers 1-5



An exploration into the rhythmic properties of Bishnupriya Manipuri

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This study explores and examines the rhythmic properties of the Bishnupriya Manipuri language, a creole of Meitei (Tibeto-Burman language spoken in Manipur, India) and Bengali-Assamese (Indo-Aryan languages spoken in the states of West Bengal and Assam in India and in Bangladesh) (Sinha, 1960). It is considered "developing" by Ethnologue ('Bishnupuriya', 2023) and "potentially vulnerable" by UNESCO (*Bishnupriya Manipuri in India*). It is unique as it has been shaped by features of languages from two different language families, one tonal (Tibeto-Burman) and the other non-tonal (Indo-Aryan). The creole borrows from Assamese, as the people from the Bishnupriya Manipuri community have been living in Assam for generations. The primary data used for this study consists of speech samples from 15 native speakers from the Guwahati region of Assam, which were processed through Praat. The preliminary calculation of %V, VarcoC and VarcoV has shown us that Bishnupriya Manipuri falls closer to syllable-timed languages in the speech rhythm continuum suggested by Dauer (Ramus et al., 1999). It takes after Meitei (Singh, 2017) in terms of speech rhythms, since it was born in Manipur although it currently survives only in the states of Assam and Tripura in India, and in some parts of Bangladesh (Laskar, 2008); the native languages of these regions- Bengali (Roy & Babu, 2016) and Assamese (Dihingia & Sarmah, 2020)- fall closer to Mora-Timed languages.

For this study, consultants were asked to read the short story "North Wind and the Sun", which was translated into Bishnupriya Manipuri. It was observed that the language has borrowed sounds and lexicon from Meitei, but its word order follows the Indo-Aryan way. The basic syllable structure is CVC, though other patterns exist. Despite having approximately 120,000 speakers across the borders of two countries, it's still a lesser-explored language, especially the phonology of Bishnupriya Manipuri. This study emphasises on enriching the phonological inventory of the language by focusing on the rhythm aspect from an empirical standpoint.

Keywords: Bishnupriya Manipuri, rhythm, phonetics, phonology, creole, potentially vulnerable language.

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An indexed constraint account of incomplete neutralization in Huai'an Mandarin

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In incomplete neutralization, a contrast neutralized in the surface phonology resurfaces in the phonetics. One such case is tone sandhi in Huai'an Mandarin (Du & Durvasula, 2022): of two consecutive T(one)1 syllables, the first syllable changes to T3: see (1a), where tones are indicated with superscript. Of two consecutive T3 syllables, the first syllable changes to T2: see (1b). These two processes are in a feeding relationship, as in (1c), indicating that underlying T1 has truly shifted to T3. However, underlying T3 and sandhi-derived T3 have different phonetic realizations, as in (1d), loosely based on Du & Durvasula (2022:573, fig. 3). The derived T3 melody is closer to the T1 melody than the underlying T3 melody is.

(1) a. /u^{2} pa^{1} xa^{1}/ → [u^{2} pa^{3} xa^{1}] 'Mr. Wu^{2} plays with shrimp' (Du & Durvasula p. 590)
b. /u^{3} pa^{3} xa^{1}/ → [u^{2} pa^{3} xa^{1}] 'Mr. Wu^{3} smashes shrimp (to eat)'
c. /u^{3} pa^{1} xa^{1}/ → (u^{3} pa^{3} xa^{1} →) [u^{2} pa^{3} xa^{1}] 'Mr. Wu^{3} plays with shrimp'
d. /pa^{1}/ → [pa̋āā^{1}] /pa^{1} xa^{1}/ → [p**áàā**^{3} xa^{1}] /pa^{3} xa^{1}/ → [páäà^{3} xa^{1}]

Existing constraint-based proposals like Van Oostendorp (2008) and Braver (2019) cannot account for this pattern. Instead, I propose using indexed constraints. If applied to individual segments (Round, 2017), such constraints provide a way to encode underlying contrasts in a way that persists into the surface representation, opening up the door to phonetic differences even when the contrasting sounds have identical phonological feature values on the surface.

I assume that any segment (in this case: vowel/TBU) S may be assigned an index *i*, and segments with index *i* are associated with high-weighted constraints that limit such segments to bearing Tone 1 only (e.g., *T2$_i$, *T3$_i$, *T4$_i$, *T5$_i$). By default, then, S$_i$ will be realized with the feature [T1]. However, there is an even higher-weighted ban on consecutive [T1] syllables (*[T1][T1]), that will force S$_i$ to have a different tone feature on the surface, e.g., [T3]. Assuming that phonetic and phonological constraints can co-occur in the same grammar (e.g., Boersma, 1998; Flemming, 2001) and any constraint can be indexed, I posit phonetic constraints that refer both to feature values like [T3] and indices like *i*. Specifically, this pattern requires constraints that require T3 to be realized with the T3 melody, as well as constraints requiring any tone (Tx) co-occurring with the index *i* to be realized with the T1 melody. The Harmonic Grammar tableaux in (2) show separate constraints on the beginning, middle, and end of a tone melody. The violations of these are based on increments of 0.5 SD on the F0 scale in Du and Durvasula (2022:573, fig. 3), and their violations are squared, following Braver (2019).

In (2a), an underlying and unindexed T3 syllable is realized with surface [T3] due to high-weighted *T1 and *[T1][T1], and with the canonical T3 melody due to the constraints on T3 realization. (2b) shows that /T1$_i$/ followed by another /T1$_i$/ is realized with [T3] due to *[T1] and *[T1][T1], but the optimal phonetic realization of [T3] is not the canonical T3 melody, as in the last candidate, but a compromise, as in the second candidate, due to the activity of constraints that require any tone indexed *i* to be realized with the T1 melody. In (2c), /T3-T1$_i$-T1$_i$/ is changed to [T2-T3$_i$-T1$_i$] to satisfy *[T1][T1] and *[T3][T3], showing that there is really a phonological shift in the middle syllable, while the phonetics of the surface T3$_i$ is still a compromise between T1 and T3. The current analysis predicts no lexical exceptions to the pattern, as illustrated in (2de): /T1/ without index *i* is consistently realized as T3 due to high-weighted *T1 and *[T1][T1]. Similarly, underlying T3$_i$ will behave like underlying T1$_i$

(2)	*w* = 20	20	20	5	5	3	1	1	Harmony
a. /u^{T2} **pa^{T3}** xa$_i$^{T1}/	*[T1][T1] *[T3][T3]	*T1	*T2$_i$ *T3$_i$ …	T3=v́vv	T1=v́vv T1=vv̄v T1=vvv̄	Tx$_i$=v́vv Tx$_i$=vv̄v Tx$_i$=vvv̄	T3=vv̀v T3=vvv̀	ID(T)	
u^{T2} páāā^{T1} xa$_i$^{T1}	-1	-2						-1	-61
u^{T2} páàā^{T1} xa$_i$^{T1}	-1	-2			-1-1-0=-2			-1	-71
u^{T2} páāā^{T3} xa$_i$^{T1}		-1		-1			-(3^2)-(2^2)=-13		-38
u^{T2} páàā^{T3} xa$_i$^{T1}		-1					-(2^2)-(2^2)=-8		-28
☞ u^{T2} páàà^{T3} xa$_i$^{T1}		-1							**-20**
b. /u^{T2} **pa$_i$^{T1}** xa$_i$^{T1}/									
u^{T2} páāā$_i$^{T1} xa$_i$^{T1}	-1	-2							-60
☞ u^{T2} páàā$_i$^{T3} xa$_i$^{T1}		-1	-1			-1-1-0=-2	-(2^2)-(2^2)=-8	-1	**-55**
u^{T2} páàà$_i$^{T3} xa$_i$^{T1}		-1	-1			-1-(3^2)-(2^2)=-14		-1	-83
c. /**u^{T3}** pa$_i$^{T1} xa$_i$^{T1}/									
u^{T3} páāā$_i$^{T1} xa$_i$^{T1}	-1	-2						-1	-61
u^{T3} páàā$_i$^{T3} xa$_i$^{T1}	-1	-1	-1			-1-1-0=-2	-(2^2)-(2^2)=-8	-1	-76
☞ u^{T2} páàā$_i$^{T3} xa$_i$^{T1}		-1	-1			-1-1-0=-2	-(2^2)-(2^2)=-8	-2	**-56**
u^{T2} páàà$_i$^{T3} xa$_i$^{T1}		-1	-1			-1-(3^2)-(2^2)=-14		-2	-82
d. /u^{T2} **pa^{T1}** xa$_i$^{T1}/									
u^{T2} páāā^{T1} xa$_i$^{T1}	-1	-2							-60
u^{T2} páàā^{T3} xa$_i$^{T1}		-1					-(2^2)-(2^2)=-8	-1	-29
☞ u^{T2} páàà^{T3} xa$_i$^{T1}		-1						-1	**-21**
e. /**pa^{T1}**/									
páāā^{T1}		-1							-20
páàā^{T3}							-(2^2)-(2^2)=-8	-1	-9
☞ páàà^{T3}								-1	**-1**

for all intents and purposes because of high-weighted constraints *T2$_i$, *T3$_i$, etc. This is all made possible by the interaction of indexed and non-indexed constraints.

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Andoke word-level prosody: A preliminary view on a mixed stress / tone system

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Andoke is a language isolate spoken by some 20—30 ethnic Andoke in the Colombian Amazon along the tributaries of the Caquetá River. Previous descriptions of Andoke have identified it as a tonal language with little underlying tonological processes and a basic H vs. L level tone contrast (Landaburu, 1979, 2023). New original fieldwork by the author conducted between 2023 and 2025 provide a refreshed look at Andoke word-level prosody, which will be presented in this talk. I use a set of 931 vowel tokens gathered from both wordlists and semi-naturalistic data for the analysis presented here, all of which having been processed using Praat (Boersma & Weenink, 2024), VoiceSauce (Shue et al., 2011) and R (R Core Team, 2024).

This revised analysis posits Andoke as featuring a demarcational, obligatory and culminative prosodic prominence primarily associated with high vowel duration (stress), as well as a lexically active, pitch-based prominence (tone) (Hyman, 2006). I propose that Andoke stress is fixed, appearing on the penultimate syllable of the stress domain. I suggest in opposition to previous work that the underlying tonemic distinction in Andoke is a privative /H/ vs. /Ø/ distinction. Further, I propose that the tone-bearing unit is the syllable, as opposed to the vowel, as diphthongs may only bear one toneme as opposed to two.

Tonal surface realizations are obfuscated by several lexical and post-lexical tonological processes. Most saliently, a pervasive process of 'H copy-raising' produces S(uperhigh) tones in specific contexts. Tonally unmarked TBUs receive either M(id) or L(ow) tones depending on their position within a constituent (cf. Fig. 1 for pitch tracks). Further, a notable post-lexical process involves a boundary contour LH% which appears on prosodic phrase edges – and not, as previously assumed, pre-pausally. This boundary tone is blocked by existing tonal associations on the penultimate and ultimate TBUs of a given constituent.

As for stress, I examined a set of possible correlates by fitting several linear mixed-models with speaker, syllable position and word as random effects, and stress and tone, as well as their interaction as fixed effects. After reducing and fitting the models, post-hoc Bonferroni corrected tests were used to ascertain the model's significance. I conclude that the primary correlate of stress is increased duration of the stressed vowel. An increase of F1 on the respective vowel is associated with stress as well, although less robustly. Future investigations should target prosodic constituency (see, e.g., Tallman et al., 2024), the distribution of vowel glottalization, as well as sentence-level prosody and intonation.

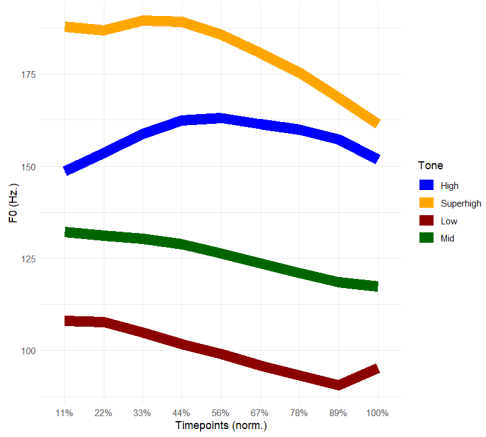

Figure 1. Time-normalized F0 contours of tones.

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Beyond Locality: Proparoxytone Metaphony and Morphophonological Domains in Romance

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This talk explores the phenomenon of non-myopic vowel harmony in proparoxytonic forms of Italo-Romance varieties, with particular attention to Neapolitan and central-southern dialects exhibiting metaphony. Traditional accounts characterize metaphony as a local, phonologically motivated raising of stressed mid vowels triggered by a high vowel (/i/ or /u/) in posttonic position. However, data from both medieval and modern varieties reveal that metaphony may apply across non-adjacent segments and syllables, challenging locality-based phonological models and pointing instead to a morphophonological interpretation.

Building on a detailed empirical foundation drawn from 14th–18th century Neapolitan texts, we identify a class of non-myopic proparoxytones where metaphony applies to stressed mid vowels even when intervening low vowels (typically /a/) appear between the trigger and the target. This contradicts the expectation that low vowels block metaphonic effects and raises questions about the nature of domain boundaries in harmony processes. For example, in forms such as Neapolitan proparoxytone <cèf**a**ro> SG / <ciéf**a**re> PL 'cephalus' (<ie> = [je], <-e> = [-ə] = /i/) plural triggers metaphony despite the presence of posttonic /a/, revealing that morphological number plays a central role in licensing harmony.

These observations support a non-myopic view of metaphony, in which harmony operates over larger morphophonological domains. This resonates with Mascaró's (2024: 84ff.) assertion that vowel harmony may be "sensitive to stress domains," showing evidence of prosodically mediated, non-adjacent dependencies that override purely phonological opacity. Calabrese (2024: 220), Russo (2007: 224ff.), Calabrese & Russo (2025) likewise emphasize that in systems such as Serviglianese and Neapolitan harmony patterns correlate with morphological structure rather than with linear adjacency alone.

From a theoretical perspective, the Italo-Romance data push against the assumption that vowel harmony operates through strictly local spreading or tier-based strictly local constraints. Instead, they suggest the need for representations that incorporate morphological boundaries, morphosyntactic heads and stress-based foot structure. Proparoxytones—words with antepenultimate stress—offer a crucial testing ground, as they force metaphonic triggers to operate across two pretonic syllables, a pattern not predicted by foot-based locality.

Our empirical base includes 14th–18th century Neapolitan texts and new evidence from the *Corpus testuale informatizzato dell'Italia Mediana* (CorTIM online), which documents central Italian varieties. We focus on proparoxytones—words stressed on the antepenult—where metaphony regularly affects the stressed vowel despite an intervening vowel that would be expected to block harmony under locality assumptions. For example, in Neapolitan:

- <pr**é**ncepe> SG 'prince' (HistTroya 148), <pr**í**ncipi> PL 'princes' (HistTroya 183)
- <i**ó**dece> SG 'judge' / <i**ù**dece> PL 'judges' (CorTIM and De Rosa)

The forms above exhibit metaphonic alternations that go beyond strict adjacency constraints. Notably, <*pr**é**ncepe*> reflects an underlying etymological /i/ and belongs to a morphological class in which mid vowel raising appears analogically in the plural (<pr**í**ncipi>). In contrast, <*dom**é**nec**a***> (F) 'Sunday' (*Statuti Perugini*, 1374) exemplifies an etymological proparoxytone with an inherited structure that does not undergo metaphony in the feminine form. However, the masculine counterpart, as in <*Dom**í**n**i**c**o***> (M) (ibid.) 'proper name', does show metaphonic behavior, highlighting a gender-based asymmetry in the application of the process. The alternation between metaphonic and non-metaphonic plurals in learned forms (e.g., *t**é**rmene*/ *ti**é**rmini*, *d**é**beto* / *di**é**bete*) also demonstrates how lexical or orthographic

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conservatism can interact with analogical leveling to produce mixed paradigms. The coexistence of metaphonic and non-metaphonic allomorphs in the plural reflects a morphologization of metaphony, where alternations are retained or suppressed depending on paradigm structure, lexical class, or etymological transparency.

These patterns lead us to conclude that metaphony in these dialects is not a purely phonological vowel harmony process, but rather a morphophonological phenomenon shaped by stress, morphological boundaries, and analogical extension. The evidence compels a revision of locality assumptions in phonological theory and supports a modular architecture in which morphology and phonology jointly determine the application of harmony rules.

Ultimately, this study contributes to ongoing debates about the limits of phonological locality, the role of prosodic domains in rule application, and the integration of morphology into phonological computation. It shows how Romance varieties, particularly Neapolitan, provide rich data for testing the scope and nature of harmony systems beyond classical models.

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2

Blurry word boundaries: procedural vs. representational analyses of Ancient Greek

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The specific phonological rules applying to proclitic=host in Ancient Greek (AG) have received various analyses in the literature: as a cyclic/stratal effect (Kiparsky 2003), or, within the Prosodic Hierarchy (Nespor & Vogel 1986), as a Clitic Group (Golston 1990), a Phonological Phrase (Golston 1995), or a recursive Prosodic Word (Agbayani & Golston 2010). This variety of approaches reflects a core challenge in studying the morphosyntax-phonology interface: the ambiguity in deciding between procedural and representational analyses (Bermúdez-Otero 2011). The **goal of this paper** is to provide a solution to the AG puzzle by arguing that both strata and recursive prosodic word structures are necessary. The arguments come from the phonology of the prefix-base boundary.

The phonology of prefix+base. In Ancient Greek, prefixes—defined as all morphemes preceding the root, including tense and aspect markers—exhibit a dual behaviour: they act like [1] independent words for some segmental processes (such as cluster phonotactics, partial resyllabification, /h/ distribution, a.o.), yet [2] display cohesion for others (nasal and laryngeal assimilation) (Threatte 1980, Lejeune 1972). While this [prefix[base]] structure is typologically common (Peperkamp 1997), what makes AG notable is its accentuation system. High tone marks the accented syllable, which is calculated within the final three syllables of the word. In mophologically complex words, this accent may fall on the prefix, but only within the limits of its final tone-bearing unit (Dieu 2022: 227).

a. *parádos* /para+dos/ from /para+didɔːmi/ ‘give’ Imp. 2sg., instead of ***párados*
b. *eksέːgon* /eks+e+agon/ from /eks+agɔː/ ‘lead’, Aor. 1sg., instead of ***éksɛːgon*

I argue that this pattern requires a prosodic representation: the phonology must be able to see the prefix while also seeing the prefix+base boundary within the same computation. However, some degree of derivation is also needed: the accent pattern is opaque, as it needs to apply before hiatus resolution. The pattern is then consistent with Stratal OT in combination with the Prosodic Hierarchy (Bermúdez-Otero 2018).

The phonology of proclitic=host. Analysing the [prefix[base]] domain allows us to break the tie between the multiple possible analyses of the [proclitic[host]] domain. I propose that both structures instantiate a recursive prosodic word: [proclitic[host]] is subject to the same domain-edge processes as the [prefix[base]] in [1], and to the same domain-span processes in [2], pointing to a shared prosodic structure. Nonetheless, a key difference lies in accentuation: proclitics are independent words and cannot carry word accent. This asymmetry can be naturally explained by assuming that different phonological rules apply at the lexical and postlexical levels. I develop a full analysis of the Greek facts, compare it to an approach using an extended version of the Prosodic Hierarchy and to other procedural approaches, and argue that an analysis combining cyclic and prosodic domains such as Stratal OT allows for a more economical account of the Greek data.

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Command and Align

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Sentence prosody is generally derived with three distinct rules/constraints that relate X0 to ω, XP to φ, and clause to ι, by rule (Nespor & Vogel, 1986), alignment (Selkirk, 1986), alignment + wrap (Truckenbrodt, 1995), or matching (Selkirk, 2005). I propose a single constraint that produces ω, φ, ι by generalizing the c-command approach of Kalivoda 2018, who deals only with φ (see also 'Tree diagram for Command', after references):

> Command: x is a prosodic constituent iff something in x c-commands everything within x and nothing outside of x.

Command yields ω, φ, ι using only structure/scope, without referencing syntactic labels:

(mɛ̃ni) (lĩŋgw–ɪst–s) (ɹi–ĩnvɛ̃nt) (wiɬ-z)	*sets of morphemes ≈ ω*
((mɛ̃ni lĩŋgw–ɪst–s)) ((ɹi–ĩnvɛ̃nt) (wiɬ-z))	*sets of sets of morphemes ≈ φ*
(((mɛ̃ni lĩŋgw–ɪst–s)) ((ɹi–ĩnvɛ̃nt) (wiɬ-z)))	*sets of sets of sets of morphemes ≈ ι*

Utterances that are not fully grouped into prosodic constituents are increasingly ill-formed:

	COMMAND
☞ ((mɛ̃ni lĩŋgwɪsts) ((ɹiɪnvɛnt) (wilz)))	
(mɛ̃ni lĩŋgwɪsts) ((ɹiɪnvɛnt) (wilz))	*
(mɛ̃ni lĩŋgwɪsts) (ɹiɪnvɛnt) (wilz)	**

This provides domains for robust processes like initial strengthening (Keating e.a., 2004) and final lengthening (Paschen e.a., 2022). Multiple L-edges yield greater fortition, just as multiple R-edges yield greater lengthening. Command rightly predicts that adjuncts are more loosely joined than arguments and avoids intermediate projections like $\varphi^{[+max,-min]}$ and the like.

Faithful mapping of syntax to prosody is insufficient. We also need to account for *mis*matches like those in Kwak'wala (Anderson, 1985, 1992, 2005), Halkomelem (Brown & Thompson, 2013), and Gitkxsan (Rigsby, 1986), where clitics are grouped with the word *preceding* their morphological hosts, e.g., –x̣a with 'child' rather than 'house':

nep'id–i–da	gənanəm–x̣a	guk^{w}–sa	t'isəm
throw=SUBJ=ART	child=OBJ	house=INSTR	rock

'The child threw a rock at the house.' (Anderson, 1985:166)

Clitics left-align in Kwak'wala despite a right-branching syntax. ALIGN-L(surprisal) puts a prosodic boundary at the left edge of open class words with high surprisal (Shannon, 1949; Kermes & Teich, n.d.): (throw=SUBJ=ART (child=OBJ (house=INSTR (rock, which forces clitcization to the left. Mismatched prosodic constituents also *move* in a number of languages (Agbayani & Golston, 2010, 2016; Agbayani e.a., 2015; Agbayani e.a., *to appear*). So with right-alignment, the prosodic constituent *v ochen*^{j} 'in very' can undergo hyperbaton (phonological fronting), although it is not a syntactic constituent:

v ochen^{j}	ona	spala	[*v* [*ochen*^{j}	[urodlivoj	mašine]]]
in very	she	slept		ugly	car

'She slept [in [[very ugly] [car]]]' (Russian, Agbayani et al., *to appear*)

This Command+Align model has the advantages of a Match+Align model (Bellik e.a. 2022),

without the disadvantages of STRONGSTART, a necessary part of Match theory that makes it overgenerate typologically in SVO and VOO constructions (Kalivoda 2022).

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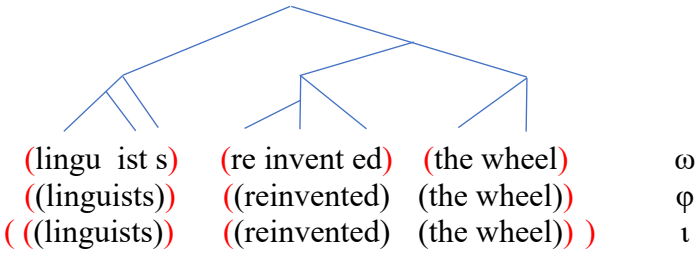
Tree diagram for Command



Contrasting accounts of consonant gradation in Northern Sámi

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Consonant gradation is the shifting of consonants between multiple levels of phonological weight. Consonants in Northern Sámi (henceforth Sámi) are said to exist in one of three grades (called Q1, Q2, and Q3 in order of weakest to strongest), but fluctuate between two of them in any given paradigm (Hedlund & Larsson, 2021, Bartens, 1989). Sámi nominals undergo a regular consonant gradation process as outlined in Table 1 (Hedlund & Larsson, 2021). There are three classes of nominals, each with a slightly different paradigm: even-stemmed, odd-stemmed, and contracted. Every ending which "demands" the strong grade also contains an extra mora, μ. Under my current analysis, each inflectional class has its own set of endings, even if some of them differ only in the presence or absence of μ.This μ docks itself to the consonants following the last stressed syllable, causing it to strengthen (Baal et al., 2012). Gradation is largely productive in Sámi, but it is not ubiquitous.

The problem: While almost all even-stemmed and contracted nominals undergo gradation, only half of odd-stemmed ones do. The source of this dual patterning is unclear.

In this paper, I present and examine two contrasting hypotheses:

1. Every nominal is modified by a diacritic "+/–G" that determines whether it undergoes gradation.
2. A ghost suffix "$Ø_{SUF}$," originally from a word-final vowel in Proto-Sámi (Sammallahti, 1998), is present in the underlying representation of all non-gradating odd-stemmed nominals and blocks further gradation processes from happening.

I argue more for hypothesis 2. Under a Distributed Morphology (Halle and Marantz, 1993, et seq.) framework, I posit that each Sámi nominal can be broken down into 4 heads (as seen in Figure 1): √ROOT, SUFFIX, NUMBER, and CASE. I show that whenever the SUFFIX head is filled (either by $Ø_{SUF}$ or by an overt suffix such as the demonym suffix *-laž*), no further gradation processes can occur. All suffixes in Sámi demand that the preceding stressed syllable be in a certain grade. Following Baal et al.'s analysis, this means that each suffix demands that the syllable must have a specific moraic shape, as illustrated in Figure 2. Q1 consonants contribute no morae. Q2 consonants are moraic and ambisyllabic, sharing a mora with the preceding syllable. Q3 consonants contribute an entire mora on their own. This can be modeled using Optimality Theory (Prince and Smolensky, 1993, et seq.) and a constraint I call MATCH μ, which governs the shape of the relevant consonants and syllables as outlined previously (shown in Figure 3). MATCH μ assigns violations to all outputs whose consonants after the last stressed syllable do not match the moraic structure required by the suffix's diacritic,thereby disallowing all forms which are in the incorrect grade. Because the syllable shape of these nominals is already governed by a suffix (which can be $Ø_{SUF}$), any morae introduced after this point undergo stray erasure (McCarthy, 1979, et seq.).

This analysis suggests further evidence for the existence of ghost segments and their impact on overt morphophonological processes, as described in Kiparsky (2003), Tan (2023), a.o. Following Trommer (2001), this analysis also supports a systematic interaction of Optimality Theory and Distributed Morphology throughout the Phonological Form phase of syntax as illustrated by the Y-model.

Additional Materials and Selected References

	Even		Odd		Contracted	
	Sg	Pl	Sg	Pl	Sg	Pl
Nom	áhčči	áhčit	duottar	duoddarat	boazu	bohccot
Gen-Acc	áhči	áhčiid	duoddara	duoddariid	bohcco	bohccuid
Ill	áhččái	áhčiide	duoddarii	duoddariidda	bohccoi	bohccuide
Loc	áhčis	áhčiin	duoddaris	duoddariin	bohccos	bohccuin
Com	áhčiin	áhčiiguin	duoddariin	duoddariiguin	bohccuin	bohccuiguin
Ess	áhččin		duottarin		boazun	

Table 1: Declension of *áhčči* 'father' (even), *duottar* 'tundra' (odd), and *boazu* 'reindeer' (contracted); forms in the strong grade are written in blue text, and those in the weak grade are written in red text.

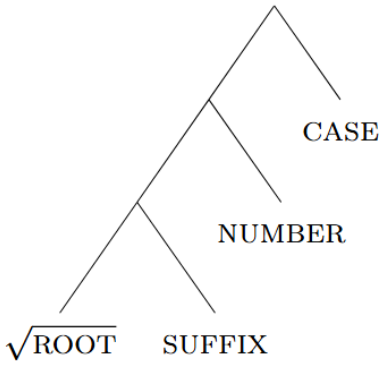

Figure 1: Underlying representation of Sámi nominals

(14) a. Q1 C b. Q2 V C c. Q3 C

μ μ

Figure 2: The moraic structures of consonants in different grades. (Baal et al., 2012:175)

/sáme-laž/		MATCH μ	MAX	DEP
a.	sámelaš	∗!		
b. ☞	sápmelaš			∗
c.	sábmelaš	∗!		∗

Figure 3: Tableau showing the derivation of *sápmelaš* 'Sámi person' from underlying /sáme-laž/ using the constraints MATCH μ, MAX, and DEP.

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Convergent Equilibria in Cross-Lingual Phoneme Surprisal Distributions: Statistical and Simulation-Based Analysis

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Most computational models of phoneme distributions across languages neglect the diachronic emergence of contrastive representations (Macklin-Cordes & Round, 2020). We present a computational model that **identifies a previously unobserved statistical pattern in phoneme distributions across languages and reproduces it through simulation**, capturing the underlying stochastic processes of naturalistic phoneme inventories. We first analyse phoneme frequency and surprisal (negative log-probability) data from 166 Australasian languages and English (Crystal 1995; Fry 1947; see Fig. 1). This reveals a **consistent pattern**. Kernel Density Estimator (KDE) analysis shows the **smoothed distribution of phoneme surprisals**, revealing a quasi-normal shape with a central tendency and exponential tails (Fig. 2). Zipfian rank-frequency plots show that phoneme surprisals decrease with phoneme rank, producing an exponential decay of low-frequency phonemes in both English and Australasian languages (Fig. 3). Together, these analyses indicate that naturalistic phoneme distributions cluster tightly around a mean with a thin tail. Phoneme surprisal distributions **converge toward a constrained statistical equilibrium** with a power-law–like rank-frequency pattern with a constrained thin tail that decays exponentially, unlike the long-tailed distributions observed for words and morphemes.

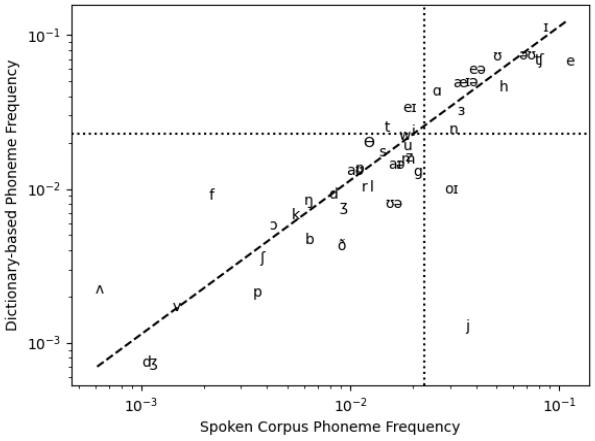

Figure 1. **Comparison of the distribution of English phonemes from Spoken Corpora** (Fry 1947) **and Dictionary-based Corpora** (Crystal 1995)**.** Phoneme frequencies are strongly correlated (Pearson r = 0.867), indicating stable probabilities. The dashed line shows that uniform probability (1/V) poorly approximates phoneme frequencies.

To model the emergence of these distributions, we introduce two statistical simulation models of phoneme inventory evolution. At each iteration, **one operation is randomly selected per language**. For an inventory containing *n* phonemes, the operation can be a Primary Split, which redistributes probability mass between two existing phonemes (typically leaving *n* unchanged); a Secondary Split, which duplicates part of a phoneme into a new category

(increasing n by one); or a Merger, which collapses one phoneme into another if $n>2$ (decreasing n by one). Each operation modifies **a single phoneme per iteration**, with the fraction of probability mass transferred drawn randomly between 0 and 1, and inventories renormalised after each step. **Simulation 1** applies these operations with equal probability, producing inventories that converge toward ~50 phonemes and surprisal distributions with exponential tails (Fig. 4a). **Simulation 2** introduces **robustness weighting**, selecting phonemes for change in proportion to their surprisal so that frequent (low-surprisal) phonemes are less likely to change, yielding distributions that more closely match empirical data (Fig. 4b). Together, these simulations reproduce the statistical properties of naturalistic phoneme inventories and support the observation that frequent phonemes are more diachronically stable.

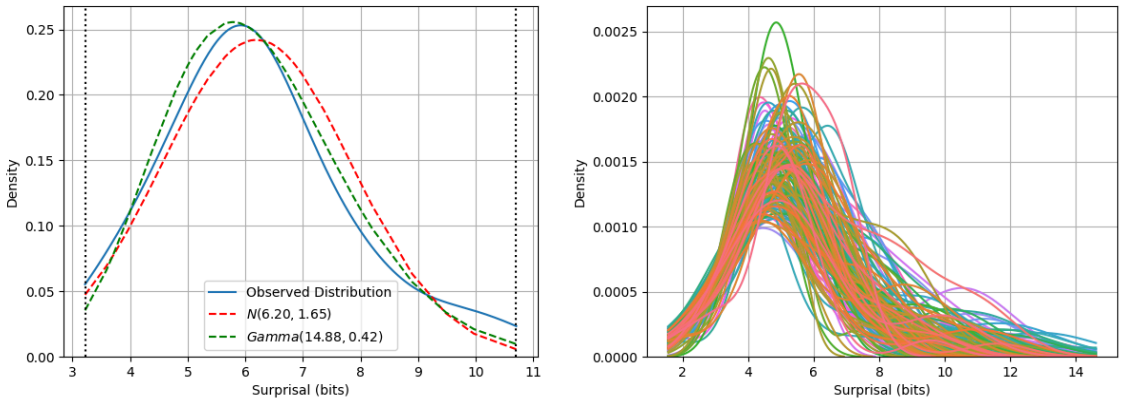

Figure 2. **Estimated distributions of phoneme probabilities and their associated surprisal values** (defined as negative log-probabilities) for English (left) and Australasian (right).

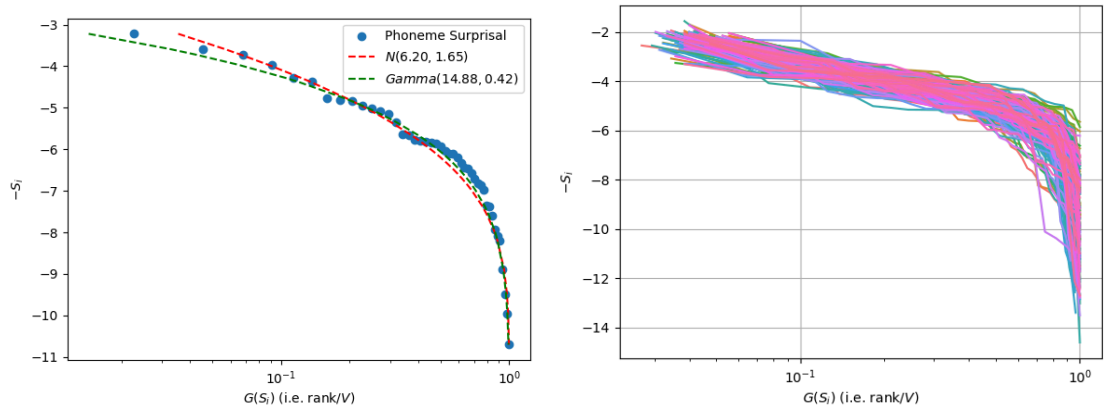

Figure 3. **"Zipfian" Rank-frequency plots show exponential tail** (English, left; Australasian, right). The cumulative distribution of phoneme surprisals is estimated using their rank order, where higher-frequency phonemes have lower surprisal.

Discussion and Implications. Our statistical models assume that a common distribution underlies phoneme surprisals across languages. Empirical analysis supports this: phoneme surprisal distributions are quasi-normal across a typologically diverse sample, and inventory size, entropy, and surprisal variability are tightly interrelated. This suggests that phonemic systems evolve toward a constrained statistical equilibrium, shaped by shared pressures,

resulting in robust cross-linguistic regularities. Change probabilities are inversely related to phoneme frequency, reflecting the empirical tendency for frequent phonemes to be more diachronically stable. The vanishing "thin" tail of phoneme distributions reflects their exponential family nature, which stands in contrast to the power-law-like distributions observed for words and morphemes (Zipf 1936, 1949; Mandelbrot 1953). Whereas word distributions exhibit long-tailed patterns with extreme frequency asymmetries, phoneme systems converge toward a narrower equilibrium range that resists runaway skew. This contrast suggests that different statistical pressures operate at different linguistic granularities: crosslinguistically, phonemes cluster around a typical frequency, with very few extremely rare or extremely common phonemes. The probability of observing very rare phonemes drops off **rapidly**, forming a "thin tail" in the distribution. Our findings thus provide a systems-level explanation for the emergence and stability of contrastive phonemic inventories and a novel perspective on how classic linguistic laws apply across representational levels.

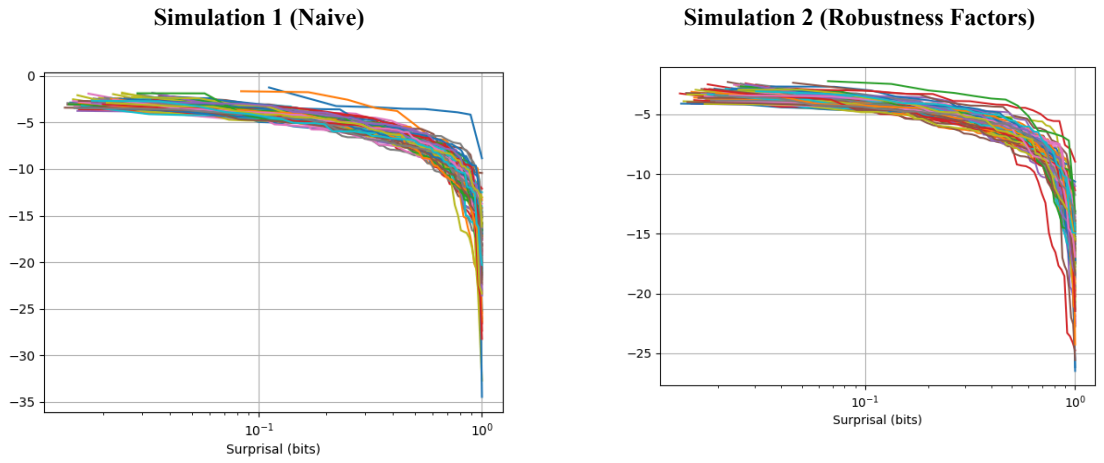

Figure 4. **Computational simulations of phoneme inventory evolution.** Given 100 synthetic languages with uniform 50-phoneme inventories, inventories evolve over 300 iterations that modify only one phoneme, with the fraction drawn randomly between 0 and 1 and probabilities renormalised. (a) Simulation 1 (naive): operations chosen with equal probability, yielding inventories converging toward ~50 phonemes with exponential decay. (b) Simulation 2 (robustness-weighted): phonemes are selected proportional to surprisal, so high-frequency phonemes are less likely to change.

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Correlation between word-final consonants and stress position in Catalan

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Stress assignment in Catalan has been described in the literature as a process based on applying a right-aligned moraic trochee to the word, assuming that all closed syllables are heavy (Oliva & Serra, 2008). However, this model leaves non-negligible word sets displaying exceptional behavior, which require somewhat ad hoc formalizations (Torres-Tamarit & Serra, in press). At the same time, in certain languages there is the tendency that prosodic weight correlates with the sonority of coda consonants, showing a gradient progression among them (Ryan, 2019). In this study, we analyze the connection between the position of stress in the prosodic word and the type of word-final segments, an issue that has not yet been addressed regarding Catalan. Our findings suggest that *i*) the prosodic weight of consonants can be described as forming a continuum, and *ii*) that this continuum depends not on sonority, but primarily on the phonological complexity of the segments (Fig. 1).

These conclusions are based on a statistical analysis of word-final singleton codas using the corpus of the official normative dictionary of Catalan (*DIEC2*) by means of the searching tool *Diccionari RegEx* (https://visca.com/dr/intro.html). This analysis yields the following general result: the three stress patterns in Catalan (oxytone, paroxytone, and proparoxytone) exhibit a high degree of correlation with the type of word-final segments, following a structure of successive inclusion (Fig. 2). This structure can be defined as follows: *a*) the segments that can occur as singleton codas at the end of a proparoxytone word ([t], [s], [m], [n], [ŋ], [r], and [l]) can also occur at the end of paroxytones and oxytones, but not vice versa; *b*) the segments that can appear word-finally as singleton codas in paroxytones (the aforementioned segments plus [p], [k], [t͡s], and [f]) can also appear in oxytones, but, again, not vice versa. The segments that can only appear at the end of oxytones ([t͡ʃ], [ʃ], [ɲ], [ʎ], [j], and [w]) share the property of being complex segments (i.e., segments featuring two place specifications; Palmada, 1995; Pons Moll, 2007), which we associate with articulatory effort. The following OT constraint hierarchy captures this last pattern (Fig. 3): *CompSeg-Final/Unstr >> Non-Finality (see, for instance, Padgett, 2002, for a use of markedness constraints banning complex segments).

The aforementioned structure appears to be determined, in fact, by a combination of segmental complexity and perceptibility: in the case of proparoxytones, the only segments that can appear as a singleton coda at the end of the word (in orange in Fig. 4) are those that combine high perceptibility with low articulatory effort. Regarding high perceptibility, the most frequent final sounds ([s] and nasals) exhibit very distinctive spectral features: an exclusive high-frequency band in the case of the fricative, and an additional formant in the case of nasal murmur (Recasens, 1986, 1996, 2014). The other final consonants in proparoxytones, [r], [l], and [t], display high sonority and a waveform with an abrupt transition, respectively. All these elements can be interpreted as contributing to greater perceptibility. At the same time, the final consonants in proparoxytones are non-complex and coronal (except for the nasals, which compensate it with their high perceptibility), the unmarked place of articulation, and thus tend to involve minimal articulatory effort. In the case of oxytones, which are mostly of low perceptibility, [ʃ] appears to have relatively high perceptibility, suggesting that segmental complexity is a more determining factor in this word type. Regarding paroxytones, [p], [k], and [f] are non-complex but have low perceptibility and are non-coronal, while [t͡s] is complex but the [s] component may be attributable to the plural morpheme. Taking all this into account, we conjecture that stress tends to compensate for the lack of prominence of low-perceptibility final consonants and to minimize the articulatory effort of complex final consonants. Therefore, complex and low-perceptibility final segments tend to attract stress (oxytones), whereas non-complex and perceptible segments tend to repel it (proparoxytones).

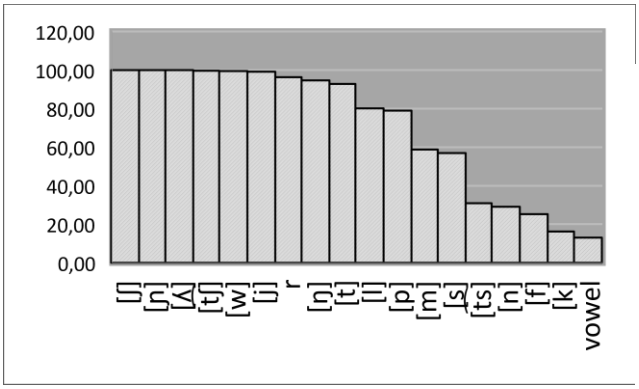

Fig. 1. Percentage of occurrences of each word-final segment (forming a singleton coda) in oxytones, relative to its total occurrences across all three word types (oxytones, paroxytones and proparoxytones).

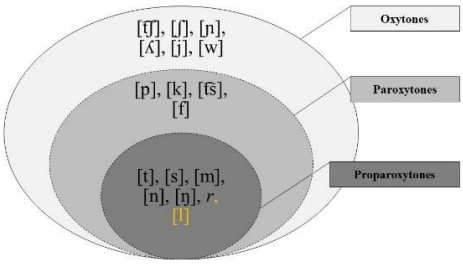

Fig. 2. Final segments occurring in each word type: successive inclusion structure. The segment [l] can appear in proparoxytone prosodic words consisting in clitic groups with verbal hosts (e.g., *porta'ns-el* 'bring it [MASC.] to us').

/aldaɾuʎ/	*COMPSEG-FINAL/UNSTR	NON-FINALITY
☞ [əldəˈɾuʎ]		*
[əlˈdaɾuʎ]	*!	
[ˈaldəɾuʎ]	*!	

Fig. 3. Final stress assignation to the word *aldarull* 'riot', which ends with the palatal lateral, [ʎ], a complex segment. The constraint **COMPSEG-FINAL/UNSTR* assigns a violation mark for each complex segment appearing word-finally within an unstressed syllable.

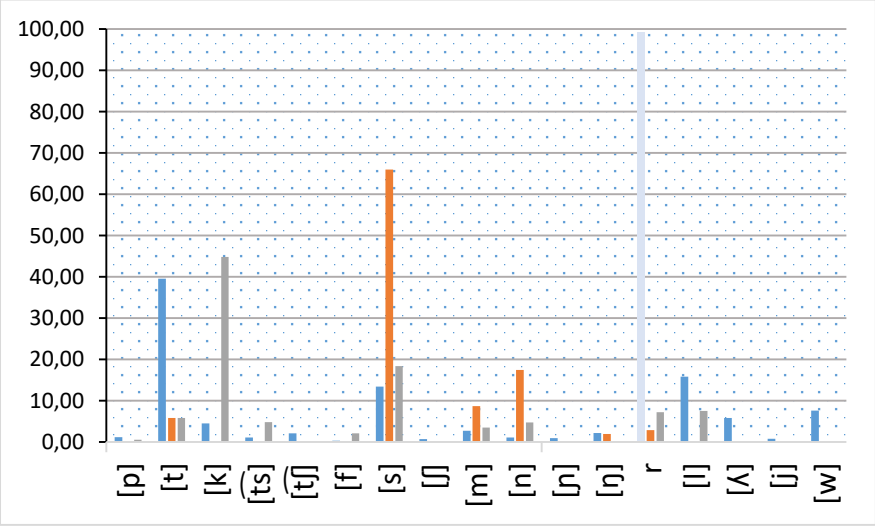

Fig. 4. Normalized frequencies of each segment (percentage of occurrences relative to the total occurrences of all segments) within each word type (oxytones in blue; proparoxytones in orange; and paroxytones in gray). Occurrences of final *r* in oxytones are highlighted in light blue due to the final *r* deletion process occurring in most Catalan dialectal varieties.

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Devoicing and obligatory length in the North Saami vowel system

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This paper reanalyses the vowel system of North Saami (Guovdageaidnu dialect), using both morphophonological patterns and phonetic data to show that non-high diphthongs /ea oa/ are prosodically distinct from high diphthongs /ie uo/ and are obligatorily long, patterning with long /aː/, a vowel whose contrastive status in the inventory is disputed (Table 1). Although all vowels are reported to alternate between three different prosodic length categories in the language, I demonstrate that these three vowels only have two length categories, and cannot be monomoraic. This finding also provides insight into the prosodic interaction of vowel length with preaspiration: vowels are shown to shorten when sharing a mora with a following consonant, but partially devoice when sharing with preaspiration.

North Saami is well known for its ternary distinctions in segment duration and complex morphophonological quantity alternations (e.g., Aikio & Ylikoski, 2022; Hiovain et al., 2020). The duration of the first vowel and medial consonant are always complementary, with minimal triplets like [ruoːsa] 'Sweden.ACC', [ruossa] 'cross.ACC', and [rŭosːsa] 'cross.NOM' showing a short vowel before an overlong consonant and vice versa. These duration differences are a result of different associations of segments to moras, and all vowels (monophthongs and diphthongs) are reported to appear in all three lengths (Bals Baal et al., 2012). For consonants, these changes in prosodic structure cause "gradation": alternations in either duration or fortition/lenition. A subset of the gradation pattern is illustrated in (1) with NOM-ACC case alternations in nouns; (1a) shows medial sonorants and fricatives; (1b–c) show preaspiration before medial stops.

Although not discussed in previous accounts, words where the first vowel is /ea/, /oa/, or long /aː/ show distinct prosodic patterns from words with other V1s. Typically, words with medial consonant clusters also exhibit grade alternations, but words with V1 /ea oa aː/ and a medial cluster (e.g., [measːtu] 'jam', [boasːta] 'mail', [naːsti] 'star') are invariant across NOM and ACC forms. I argue that this is because the pre-cluster prosodic alternation requires a monomoraic V1 in one form, as in (2a), but /ea oa aː/ cannot be monomoraic and thus cannot shorten (2b).

A similar prosodic distinction is seen in words with epenthesis, which occurs to break up medial clusters with coda /r, l, ð/, as illustrated in (3). The duration of the epenthetic vowel depends on the identity of the initial vowel, with much shorter epenthetic vowels appearing after long initial /ea oa aː/ (3b) than after other vowels (3a). Phonetic evidence of this duration difference is shown in Figure 1, with data from two Guovdageaidnu speakers (Odden, 2005; fieldwork).

Mid-vowel diphthongs /ea oa/ are reported to be short only in one environment: before long preaspiration (Bals Baal et al., 2012). Upon phonetic investigation, measurements of diphthong formant trajectories in words with and without preaspiration show very different patterns: diphthongs typically shorten before longer consonants, compressing their trajectory. However, formant trajectories before [h] do not compress in this way. This is illustrated in Figure 2. This finding suggests that mid diphthongs /ea oa/ are not actually short in this environment, but partially devoiced. This finding has implications for the prosodic properties of preaspiration, which is shown to be able to either occupy a mora separately or partially devoice long vowels when sharing a mora with them.

This paper presents phonetic and phonological evidence for some previously unexplained alternations in the North Saami gradation system and provides evidence for contrastive /aː/ within the inventory. It also illustrates an unexpected pattern of obligatory vowel length within a ternary length system, and uses this to draw conclusions about the prosodic nature of preaspiration.

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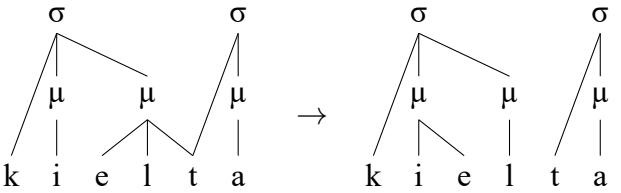
Examples, Tables, & Figures

(1)

	NOM.SG	ACC.SG			NOM.SG	ACC.SG	
a.	guolli	guoːli	‘fish’	b.	neahpi	neaːbi	‘nephew, niece’
	mearra	meaːra	‘sea’		goahti	goaːði	‘big tent’
	davːvi	davi	‘north’		tʃiehka	tʃieːga	‘corner’
	lumːma	luːmma	‘pocket’	c.	ðahhpa	oahpa	‘teaching’
					mĭehhki	miehki	‘sword’
					bihhtsi	biːhtsi	‘frost’

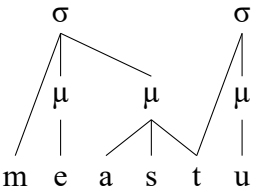
(2) Diphthong duration alternation before medial cluster (Bals Baal et al., 2012, p. 201)

a.



[gieltta] ‘community.ACC’ [gĭellda] ‘community.NOM’

b.



[meastu] ‘jam.NOM/ACC’

(3)

	NOM.SG	ACC.SG			NOM.SG	ACC.SG	
a.	balaːva	balvva	‘cloud’	b.	saːlaga	salkka	‘piece of meat’
	mĭeleːga	mĭelkka	‘animal sternum’		gealabu	gealppu	‘ability’
	dŭolaːva	dŭolvva	‘filth’		goaragu	goarkku	‘last name’

i	u	ie	uo
e	o	ea	oa
(a)	ɑ		

Table 1: Guovdageaidnu North Saami vowel inventory. Bals Baal et al. (2012) list distinct low monophthongs /a ɑ/, while Aikio and Ylikoski (2022) consider them allophones.

i	u	ie	uo		
e	o			ea:	oa:
	ɑ			a:	

Table 2: Revised Guovdageaidnu North Saami vowel inventory, separating vowels that have no weight restriction and vowels that must be associated to two moras.

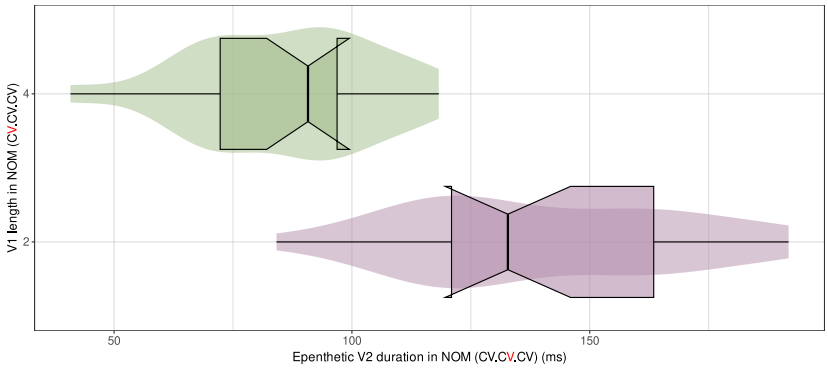


Figure 1: Duration of epenthetic V2 in words with long V1 (top) and short V1 (bottom).

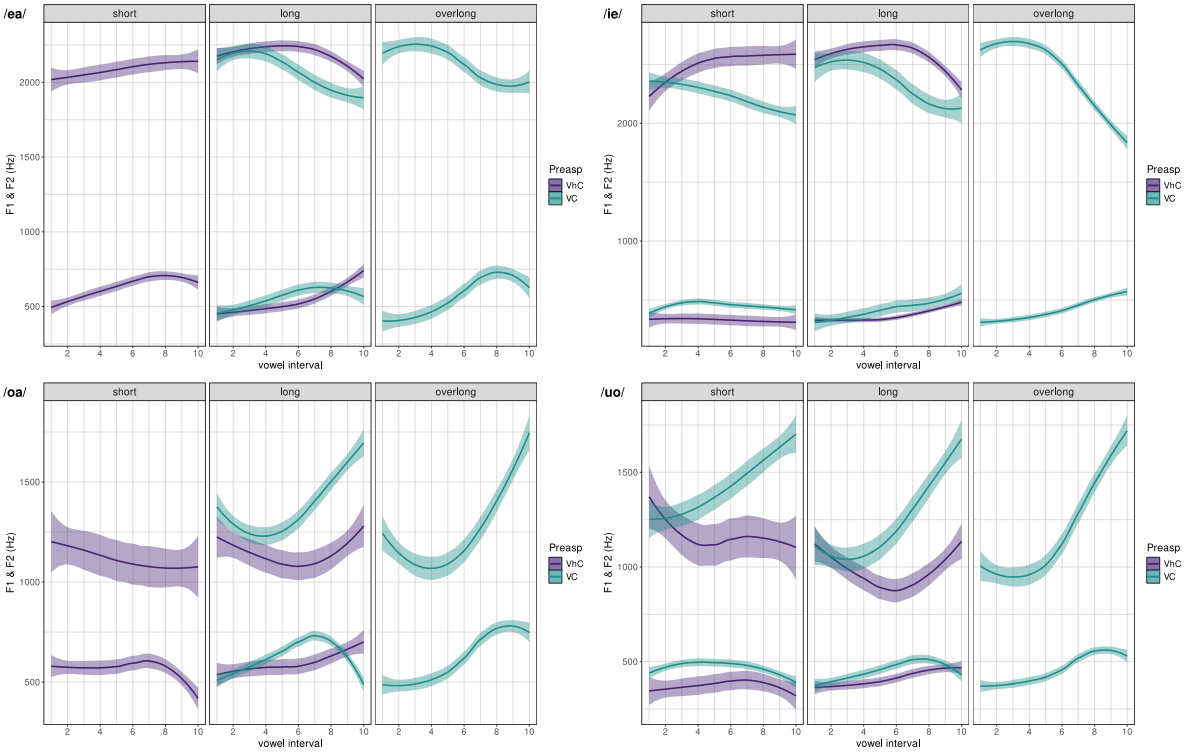


Figure 2: Average duration-normalized formant trajectories for voiced portion of short, long, and overlong diphthongs before preaspiration (purple) and before any other consonant (green). Trajectories for all diphthongs are different before preaspiration.

Differences within aspiration languages and the internal structure of |H|

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Aspiration languages exhibit a two-way laryngeal contrast in oral stops based solely on the presence or absence of aspiration (e.g. [pʰ] vs [p]), or of the element |H|/the feature [spread glottis]. While these languages may be assumed to display uniform or broadly similar laryngeal behaviour, closer analysis reveals that some exhibit different patterns from others. This paper argues that such differences follow from how the element |H| is internally structured.

|H|-related Phenomena. Many aspiration languages exhibit **sonorant devoicing**. Some of them, such as English, German and Welsh, show the process in Onset Clusters, as in (1a-c), while others, such as Icelandic, Faroese and Scottish Gaelic, show it in Coda(-Onset) clusters, as in (1d-f), but not vice versa (see also Gussmann, 2002).

(1)

		Onset clusters			Coda(-Onset) clusters		
a.	**English**	[pl̥eɪt]	*plate*	'plate'	[sɒɬt]	*salt*	'salt'
b.	**German**	[pl̥ats]	*Platz*	'place'	[ʔalt]	*alt*	'old'
c.	**Welsh**	[pl̥ant]	*plant*	'children'	[tʰant]	*tant*	'string'
d.	**Icelandic**	[pʰlaːta]	*plata*	'disk'	[val̥t]	*valt*	'rolled'
e.	**Faroese**	[pʰlaŋ̊ŋ̊ɟi]	*planki*	'plank'	[fʏl̥t]	*fúlt*	'foul-NEUT'
f.	**Scottish Gaelic**	[pʰlaːʰtə]	*plàta*	'plate'	[tʲuːl̥ᵛt]	*diùlt*	'refuse'

(The above data are from Arnason, 2011; Cruttenden, 2014; Hannahs, 2013; Honeybone, 2002; Ladefoged et al., 1999; Nance & Ó Maolalaigh, 2021)

Phonologically, these two subtypes of aspiration languages differ as follows: in the former group, |H| spreads rightwards into a following sonorant, whereas in the latter, it spreads leftwards into a preceding sonorant. Let us call the former languages 'right-oriented languages (ROL)' and the latter ones 'left-oriented languages (LOL)'. Remarkably, a common feature among LOLs is the presence of **preaspiration**. This suggests that the leftward |H|-spreading and preaspiration are strictly intertwined (Ringen, 1999; Arnason, 2011). Another notable point is that **passive voicing**, whereby an unmarked lenis stop becomes fully voiced in a voiced environment, is observed only in ROLs, not in LOLs. Passive voicing can be analysed as an extension of spontaneous voicing from a preceding voiced segment onto an unmarked lenis stop (Iverson & Salmons, 2003). These facts are summarised as in (2).

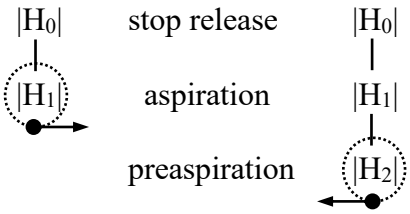
(2)

	Directionality of sonorant devoicing?	Preaspiration?	Passive voicing?
ROL	Rightwards (→)	NO	YES
LOL	Leftwards (←)	YES	NO

Proposal. I argue that the differences between these two subtypes of aspiration languages can be attributed to how the element |H| is internally structured. As illustrated in (3), |H| in aspirated (and preaspirated) stops should be considered not as a single presence, but as a multi-layered structure. In (3b), for example, the highest $|H_0|$ represents stop release, the middle $|H_1|$ represents aspiration, and the lowest $|H_2|$ represents preaspiration. Note that ROLs exhibit a two-layered structure, lacking $|H_2|$, as shown in (3a), whereas LOLs possess a three-layered structure, as shown in (3b). The typological rarity of LOLs may be attributed to the complexity of their three-layered |H|-structure. There are three assumptions that have to be made in order for this account to work. First, the element that occupies the lowest position of a hierarchy is the most salient property, following the view of Precedence-free Phonology (Backley & Nasukawa, 2020; Backley, 2021). Second, only this salient element (circled in (3)) can be targeted by phonological operations like spreading, which ensures that not every |H|-layer freely spreads and avoids overgeneration. Third, when spreading applies, $|H_1|$ only spreads rightwards, and $|H_2|$ only spreads leftwards, as indicated by the arrows in (3). The directionality

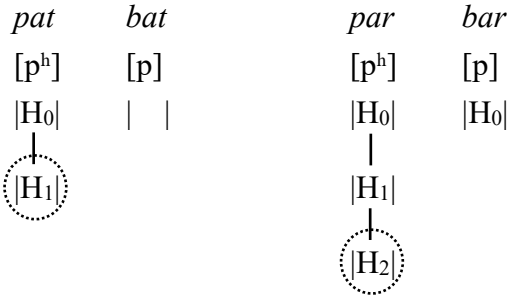
of spreading might be associated with that of government assumed in Standard Government Phonology: $|H_1|$ with Constituent Government, $|H_2|$ with Inter-constituent Government.

(3) a. ROL b. LOL



Analysis. In ROLs, aspirated stops are represented with a two-layered structure. Here, $|H_1|$ is targeted by spreading, which results in devoicing occurring only in a following sonorant (e.g. [pl̥eɪt]). In contrast, LOLs employ a three-layered structure for both aspirated and preaspirated stops. Here, $|H_2|$ is targeted by spreading, leading to devoicing being observed only in a preceding sonorant (e.g. [val̥t]). Likewise, preaspiration can also be explained by this left-oriented behaviour of $|H_2|$. In word-initial position, however, $|H_2|$ has no preceding slot to attach to, and is therefore realised as a regular post-aspirated stop (e.g. [pʰlaːta]). Furthermore, the presence or absence of passive voicing can also be accounted for in terms of differences in internal structure, as illustrated in (4). Lenis stops in ROLs lack any laryngeal element, which creates a structural "space" into which spontaneous voicing from a preceding voiced segment can seep, resulting in passive voicing (see (4a)). In contrast, lenis stops in LOLs contain $|H_0|$, which occupies that space and thus blocks the occurrence of passive voicing (see (4b)).

(4) a. English (ROL) b. Icelandic (LOL)



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Effects of passive exposure in second language phoneme acquisition

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Research on second language phonology has largely ignored the role of exposure, especially passive exposure, in acquisition (Lowie, 2017). Usage-based accounts address exposure by assuming that each learning event with L2 input updates the exemplar cloud of interlanguages, leading to a shift to more native-like phoneme representations (Ellis & Wulff, 2020). This shift of representations should counteract L1 transfer, suggesting a benefit even from passive exposure to the L2, especially if this exposure is recent or frequent. Experimental or generally empirical implementations testing these key assumptions of usage-based approaches are, however, rare. Initial evidence from two studies (Hutchinson & Dmitrieva, 2022; Weber & Geissler, 2023) showed that speakers produced more native-like vowels in the experimental posttests after watching episodes of TV series in a second language. Furthermore, research has suggested long-term effects of single instances of exposure (Escudero & Williams, 2014; Tamminen et al., 2024). Despite these findings several questions remain unanswered. First, can these reported effects be replicated, second, do they equally apply to different accent features, and third, for how long do they last?

To answer these questions the current study investigates three phonemes that pose challenges for German learners of English. First, the TRAP vowel /æ/, which German does not have, leading to a frequent substitution with the closest vowel /ɛ/, i.e., the DRESS vowel (Bohn & Flege, 1992). Second, the voicing contrast of word-final plosives, as German has final devoicing (Wiese, 1995). Third, the two interdental fricatives /θ/ and /ð/, which again German does not have, leading to a frequent substitution with /s, z/, or /t, d/ (Brannen, 2002; Hanulíková & Weber, 2010). To test passive exposure effects, an experimental paradigm was implemented, with (1) a pretest, (2) exposure to the second language, and (3) two posttests, one immediately after the exposure and one on the next day. 36 German advanced learners of English, completed the experiment. In the pretest of the first session, participants narrated a comic-like story-board (see Table 1) and read a wordlist (Table 2). The exposure was implemented in the form of 40 minutes of the Netflix documentary *Our Living World* (Coates et al., 2024). After the exposure, participants answered questions (Table 3) about the documentary and reread the wordlist. For the second session on the following day, participants had to read the wordlist from the first session and filled out a questionnaire for demographic information.

We expect the results of linear mixed effects regression models (Bates et al., 2015) to show that the acoustic correlates of the three phonemes under investigation differ between the pre- and the two posttests. We expect longer durations and higher F1 of TRAP vowels, longer preceding vowels, shorter closer durations, and more voicing in the closure of word-final voiced stops (Röttger et al., 2014), and differences in duration, center of gravity, and amplitude of the interdental fricatives (Brannen, 2002; Hanulíková & Weber, 2010). In other words, we hypothesize that the recordings after the exposure and from the next day indicate more native-like phonetic measurements. These results would be in line with usage-based accounts of second language acquisition, as they suggest that even individual instances of exposure or passive use play a crucial role in the acquisition and adjustment of non-native phoneme categories.

	Target sound	Estimated number	Example
Word-final plosives	/d/	2	*dad*
	/g/	2	*meg*
	/b/	2	*bob*
Interdental fricatives	/θ/	2	*path*
	/ð/	2	*they*
TRAP & DRESS vowels	/æ/	2	*lap*
	/ɛ/	2	*red*

Table 1. Stimuli in the nine pictures of the storyboard (pretest). The number can vary by participant.

	Target sound	Number	Examples
Word-final plosives (preceded by a consonant + TRAP, KIT, STRUT, LOT, and DRESS vowels)	/d/	14	*mad, lid, nod*
	/g/	14	*wig, hug, tag*
	/b/	13	*cab, rub, sob*
Interdental fricatives	/θ/	10 (5 word-initial, 5 word-final)	*thin, math*
	/ð/	10 (5 word-initial, 5 word-final)	*they, soothe*
TRAP & DRESS vowels (followed by /p/, /t/, or /k/)	/æ/	9	*mat, lap, back*
	/ɛ/	9	*pep, tech, wet*
Filler	-	21	*pin, dot*

Table 2. Stimuli in the wordlist (pre- and posttests).

	Target sound	Estimated number	Example
Word-final plosives	/d/	4	*hood, wide*
	/g/	3	*big, egg*
	/b/	3	*cub, web*
Interdental fricatives	/θ/	2	*earth*
	/ð/	1	*mother*
TRAP & DRESS vowels	/æ/	4	*crab, dad*
	/ɛ/	3	*web, egg*

Table 3. Stimuli in the eleven questions (posttest). The number can vary by participant.

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Evidence from dichotic listening suggests that gaps in initial RT clusters are accidental

Gaps in #RT clusters. In languages that allow for initial #RT clusters (R=sonorant, T=obstruent), are gaps in the inventory of #RTs systematic (i.e. mandated by grammar), or accidental? We provide evidence from a dichotic listening experiment that they are accidental. This speaks to the typology of grammatically induced restrictions on #CC clusters: is it binary (either a language allows only for #TR, or for any #CC), or are there more options: i) #TR-only, ii) #TR plus all logically possible #RTs (e.g. Moroccan Arabic), iii) #TR plus a subset of logically possible #RTs (e.g. Russian, Greek)? The results suggest that ii) and iii) share the same grammar (any #CC is possible, gaps in #RTs are accidental), the typology thus being strictly binary (there are only two grammars governing #CCs).

French vs. Czech. In dichotic listening, two distinct stimuli are sent to the left (L) and right ear (R): English natives for instance perceive *play* when inputted simultaneously with *pay* (L) and *lay* (R) (Cutting 1975). In experiment #1 (1), we contrasted Czech (where both #RT and #TR occur) with French (#TR-only) based on nonce words (in order to avoid interference with lexical properties such as word frequency). Results show that when French natives are exposed to simultaneous T and R and thus have no means to decide on linear order, they systematically perceive #TR, while Czech natives perceive #TR or #RT at chance level. This suggests that, as expected, the two grammars are different: the absence of #RT in French is mandated by grammar, while Czech grammar does not induce a bias for or against any #CC.

Czech existing vs. non-existing RTs. In experiment #2 (2), we have probed whether gaps in the inventory of Czech #RT clusters are systematic or accidental (again using nonce words). Speakers prompted with simultaneous stimuli for, say, *r* (R) and *t* (L) have no means to decide in favour of either #tr or #rt. If the gaps are due to grammar, a bias should be observed in favour of occurring #RTs (such as #rt, #rd, #lb), against non-occurring #RTs (such as #rb, #rk). In case the gaps are accidental, clusters of both groups are expected to be perceived at chance level. A forced choice setting enforced the competition of a possible #RT percept with a possible #TR percept. Thus speakers simultaneously received e.g. [ri:f] (L) and [ti:f] (R) and were then asked whether they perceived i) [rti:f] or ii) [tri:f], or iii) neither. If our hypothesis is correct, they have no evidence for either percept, and their choice will be chance – *for existing and non-existing clusters alike*. Results show that perception in this setting is indeed chance. This suggests that Czech grammar has no preference for any type of initial cluster: neither #TR is preferred over #RT (experiment #1), nor occurring #RTs are preferred over non-occurring #RTs (experiment #2). Thus all gaps appear to be accidental.

The initial CV. In the framework of Strict CV (Lowenstamm 1999, Scheer 2012), the quality of initial clusters is regulated by what is called the initial CV. Rather than a typewriting diacritic such as # (SPE) or ω (Prosodic Hierarchy), the beginning of the word is represented by truly phonological material: empty syllabic space (an empty CV unit). Or rather, it may be, on a parametric basis: languages where the initial CV is present are TR-only, while those where it is absent are anything-goes. As a consequence, the cross-linguistic typology is predicted to be strictly binary: either a language has the initial CV (TR-only), or it does not (anything goes) – there is no third possibility. Therefore the prediction is that whatever variation is observed within languages that have #RTs has nothing to do with grammar: the gaps observed are accidental. That is, whether a language shows 10%, 40% or indeed all logically possible #RT clusters is irrelevant: the grammar (initial CV absent) is identical.

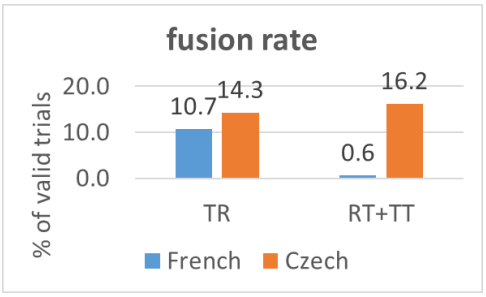
Conclusion. Our experimental results suggest that existing and non-existing #RT clusters have the same status in Czech: the phonology does not militate against the latter in any way. Their absence thus appears to be accidental, rather than systematic. This is evidence in

support of the prediction made by the initial CV according to which the typology of grammatical restrictions on #CCs is strictly binary. Further work will need to show whether this is also the case in other anything-goes languages with gaps in #RT clusters.

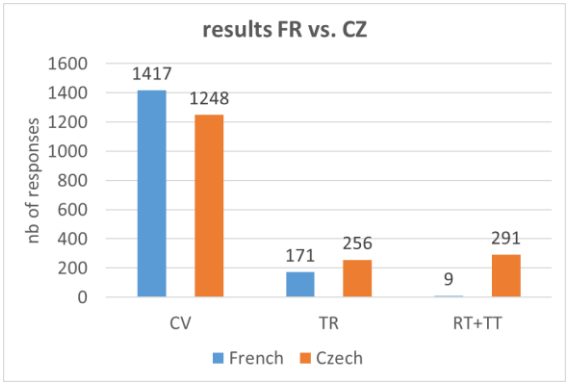
Table 1: Experiment #1 (French vs. Czech)

- 50 participants for each language
- stimuli: 32 nonce words (FR), 36 nonce words (CZ), one run
- number of trials: 1600 (FR), 1800 (CZ)
- randomization of the order in which stimuli are presented.
- randomization of left - right ear (to level out putative one-sided hearing deficiency).
- free choice: participants hear the doctored stereo file three times in a row through a headset (750ms interval) and are then asked to say what they have heard (keyboard input).
- fusion of #T and #R was considered successful if perception was #CC (#TR, #RT or #TT, there was no case of #RR percept). It was considered failed in case anything else was perceived (typically #CV).

- fusion rate
  (percentage of total valid trials)



- results

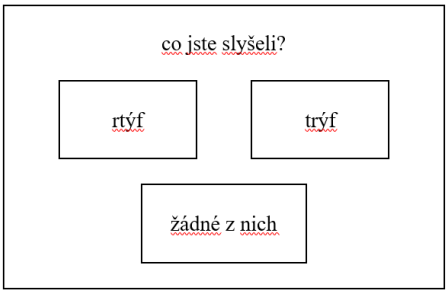


difference between #TR and #RT/#TT percepts

- FR: #RT/#TT is at blunder level (9 trials), the difference is highly (171 vs. 9) significant.
- CZ
  - frequentist analysis: difference (256 vs. 291) is non-significant: RM Anova $F(1,49) = .555$; $p = .46$; $\eta 2 = .005$
  - Bayesian analysis (carried out in JASP): Bayesian Model Comparison (M0 = chance, M1 = #RT/#TT percepts). Bayes Factor 01 = 5.8 (moderate evidence in favour of M0)

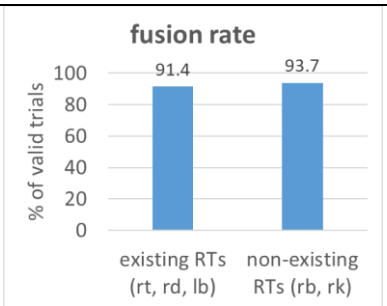
Table 2: Experiment #2 (Czech existing vs. non-existing #RT clusters)

- 50 participants, 54 stimuli (nonce words), one run, thus 2700 trials.
- forced choice: participants hear the doctored stereo file three times in a row through a headset (750ms interval). Then, given three choices, they are asked to pick the one that corresponds to what they heard ("co jste slyšeli?" "what did you hear?").
- Decision was made on the screen below, here input [ri:f] (L) / [ti:f] (R), competitors (in spelling) rtýf vs. trýf (or "none of these")

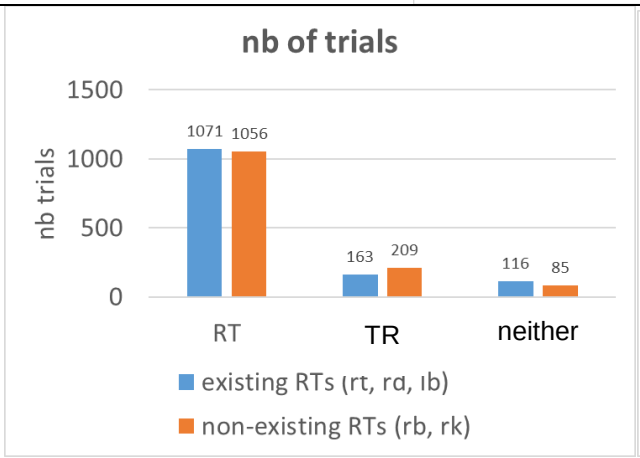


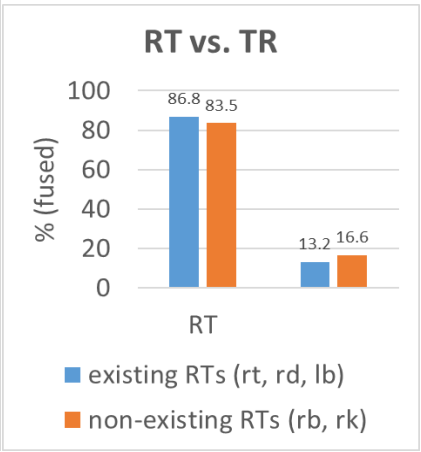
- randomization of the order in which stimuli are presented.
- randomization of left - right ear (to level out putative one-sided hearing deficiency).
- randomization of left / right location of TR / RT competitor on the screen.

- fusion rate
  (percentage of total valid trials)
  high because of forced choice.



- results





- difference between existing and non-existing #RT clusters
  - frequentist analysis: difference (1071 vs. 1056) is non-significant: RM Anova $F(1,49) = .396$; $p = .532$; $\eta 2 = .002$
  - Bayesian analysis (carried out in JASP): Bayesian Model Comparison (M0 = chance, M1 = responses non-existing #RTs). Bayes Factor 01 = 6.1 (moderate evidence in favour of M0)

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Explaining light initial vowels in "moraic onset" languages

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Many Pama-Nyugan languages (Australia) have a typologically unusual stress-assignment profile: initial vowels are ignored by stress. Historically, too, this phenomenon correlates with a rare process, namely initial consonant loss: **páma* → **pamá* → *amá*. This unusual characteristic is modelled by Topintzi & Nevins (2017) (T&N) as a typological rarity: onsets in Arrernte are argued to be moraic, until recently a banned configuration. However, T&N's claim relies on specific and debatable interpretations of [ə] and its alternations with zero, as well as facts from a language game for which there is little data (Breen & Pensalfini 1999). Alternative analyses are conceivable, but these complications make arbitration between analyses difficult. Fortunately, the weightlessness of initial vowels can also be found in other languages, such as Umpithamu (Verstraete 2020, 2022), which do not share Arrernte's complications.

We present an alternative analysis that does not require positing moraic onsets. Instead, language learners arrive at a specific type of *initial weakness* based on cross-linguistically sound correlations between metrical weight and onset realization. This analysis is made possibly by the formal approach of Strict CV Metrics (Faust & Ulfsbjorninn 2018 *et passim*), which links the metrical strength of a nucleus to its ability to license a preceding onset.

As shown in (1), Umpithamu exhibits penultimate stress everywhere except on initial, onsetless short vowels (elsewhere, there are no onsetless syllables). An initial *long* vowel, if it does not carry main stress, is secondarily stressed. Codas, internal or final, do not contribute weight. Verstraete (2021) develops a mora based-analysis which, he admits, fails to explain the lack of stress on the initial vowels in the disyllabic words in (1a). He thus designates initial V syllables as "extra-light". Again, this could be interpreted using moraic onsets, following T&N – see analysis in (2). But categorically attributing weight to onsets is problematic. If onsets can be moraic, one would expect compensatory lengthening (CL) after onset loss to be a widespread phenomenon – just as it is after coda loss – contrary to fact. Indeed, the framework of standard moraic theory was originally predicated on this very asymmetry (Hayes 1989). The moraic onset analysis therefore represents a step back from a more restrictive view of weight, even questioning the purpose of positing moras over x/CV-slots in the first place.

Consider now the language learner meeting Umpithamu from the point of view of Strict CV Metrics, where moraic onsets are not an option provided by UG. Faced with (1), the learner notices that all unstressed penultimate syllables are onsetless (and short). They may then attribute this to a deficiency in the licensing potential of these vowels. One such deficiency is identified by Faust & Ulfsbjorninn for Italian (2024) (F&U24). Operating with Strict CV's grid-based system, F&U24 show that final vowels in Italian are learned as projecting only to Level (L)1 (other vowels project to L2). Consequently, default stress is penultimate. Faust & Ulfsbjorninn (2025) (F&U25) show that deficient projection can also correlate with lesser licensing force. In Burmese sesquisyllables, the first nucleus of disyllabic forms projects only to L1, and therefore it can only host [ə], and it may not be preceded by branching onsets. F&U25 also show that in American English, nuclei projecting to L1 *cannot* be preceded by aspirated stops; but those projecting to L2 *can* be, and those projecting to L3 *must* be. Assuming that projection to L1 is universally available as a way to encode weakness, a learner of Umpithamu may arrive at the following generalization: "Nuclei lacking an onset project to L1 only".

This in turn leads to understanding why such nuclei are ignored by stress (reversing the moraic onset analysis into an explanation for onsetlessness). Main stress is assigned to the penultimate L2 projection (underlined in 3b,c). In (3a), there is only one such projection. As for initial long vowels, these involve the joining of the two projections through the mechanism of Incorporation (F&U25). Thus in (3d,e), the initial vowel is long, and through incorporation, its length allows it to reach L2 and be visible to stress. Secondary stress is heard because the first two L2 projections in (3e) are separated by an empty one.

(1)

a.	ikán	‘fat’	c.	úːrin	‘take away’
	amá	‘man’		úːku	‘language’
	ilaŋ̼nci	‘cold’		èːt̪ɛ́ri	‘bowerbird’
b.	kálin	‘bring’	d.	cóːcun	‘cotton tree’
	káṯa	‘rotten’		káːnta	‘cane grass’
	kɔlɔ́ji	‘taipan’		kàːrímpa	‘pied heron’

(2)

/iᵘ.kᵘaᵘn/	WBP	Non-Final	AlignR
☞ iᵘ.kᵘáᵘn		*	
íᵘ.kᵘaᵘn	*!		*

/kᵘaᵘ.lᵘiᵘn/	WBP	Non-Final	AlignR
☞ kᵘáᵘ.lᵘiᵘn	*		*
kᵘaᵘ.lᵘíᵘn	*	*!	

/kᵘɔᵘ.lᵘɔᵘ.jᵘiᵘ/	WBP	Non-Final	AlignR
kᵘɔ́ᵘ.lᵘɔᵘ.jᵘiᵘ	**		**!
☞ kᵘɔᵘ.lᵘɔ́ᵘ.jᵘiᵘ	**		*

/uᵘːᵘkᵘuᵘ/	WBP	Non-Final	AlignR
☞ úᵘːᵘ.kᵘuᵘ	*		*
uᵘːᵘ.kᵘúᵘ	*	*!	

(3) a.

		*̲	
*		*	
i	k	a	n

b.

	*̲		*	
	*		*	
k	a	l	i	n

c.

	*		*̲		*
	*		*		*
k	ɔ	l	ɔ	j	i

d.

*̲α			*
*	*α		*
u	ː	k	u

e.

	*α			*̲		*
	*		*α		*	
k	a	ː	r	i	mp	a

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Exploring the interaction of semantic priming and lexical frequency in German prosodic structure

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The Smooth Signal Redundancy Hypothesis (Aylett & Turk, 2004; Turk, 2010) proposes an inverse correlation between language redundancy and acoustic salience that is mediated via prosodic prominence and boundary structure. Existing findings on prosodic boundary phenomena indicate a preference for producing stronger boundaries in cases of lower language redundancy, e.g., when the given sections of speech are less frequent or less predictable from the context (Andreeva et al., 2020; Bögel & Turk, 2019).

While lexical frequency has been well-documented as a reliable factor, the semantic aspect still requires further exploration. Semantic priming, as one of the semantically-driven factors, refers to the faster processing of a word when it follows one or more semantically related items (Balota et al., 1989; Meyer & Schvaneveldt, 1971). Prior research has reported an interaction between these two redundancy factors (Becker, 1979; Yap et al., 2009), yet it remains less clear how this interaction is represented in acoustic cues at prosodic boundaries. Following previous investigations (Freiseis et al., 2024; Zhao et al., 2024), the present studies examines effects of lexical frequency and semantic priming as well as their interaction in German with a carefully controlled production experiment. As data collection is currently still in progress, our data presented here are limited to a small sample of five German native speakers (2 female, 3 male). These initial results may be subject to change and will be corroborated by a larger data set with a full analysis.

Priming context for *Apotheke* 'pharmacy'
Auf dem Rezept steht die kurze Information über die Medikamente. 'The prescription contains brief information about the medication.'
Target sentence for *Apotheke* 'pharmacy'
Sie sagen: ***D ie Apotheke*** *prüft die Angaben.* they.3PL say-3PL.PRS DEF.F.SG pharmacy.F.SG check-3SG.PRS DEF.PL info-PL 'They say: The pharmacy checks the information.'
Priming context for *Arabeske* 'arabesque'
Ornamente an der Wand zeigen einen beeindruckenden islamischen Stil. 'The ornaments on the wall show an impressive Islamic style.'
Target sentence of *Arabeske* 'arabesque'
Sie sagen: ***D ie Arabeske*** *prägt die Gestaltung.* they.3PL say-3PL.PRS DEF.F.SG arabesque.F.SG shape-3SG.PRS DEF.SG design-SG 'They say: The arabesque shapes the design.'

Table 1. An example of the word pair *Apotheke* ('pharmacy', frequent) and *Arabeske* ('arabesque', infrequent) with their priming contexts; the priming context becomes non-priming when the sentences are switched, i.e., when the context for *Apotheke* 'pharmacy' is paired with *Arabeske* 'arabesque'. The intervals of interest are marked.

The materials include 44 context-target pairs (11 targets × 2 frequency condition × 2 priming condition) in Standard German (see Table 1). Each pair contains a target sentence with either an infrequent (e.g., *Arabeske* 'arabesque') or a frequent target word (*Apotheke* 'pharmacy'), with identical first and last syllables, and is preceded by a priming or non-priming context. Syllable count, the determiners of the target words, and the onset of the verb following the target words are controlled within each pair.

The context-target pairs (+ two fillers per pair) are divided into two experimental lists. Every target sentence appears only once in each list, either in a priming or non-priming context, and participants are assigned to one of the two lists. During the experiment, participants read both the contexts and the target sentences aloud and respond to a simple judgment task after each trial to check their comprehension while reading. Three intervals are measured (see the marked intervals in Table 1): the two boundary intervals at both target word edges; and an additional interval between the carrier phrase and determiner, which is included based on observations in Freiseis et al. (2024). Preliminary results from *lmer* models (Kuznetsova et al., 2017) suggest robust redundancy effects of lexical frequency for the boundaries at both target-initial ($p<0.001$) and -final positions ($p<0.01$). Semantic priming effects are not significant in the current data. However, the pre-determiner interval shows an interaction between frequency and priming condition ($p<0.05$) as reflected in Figure 1.

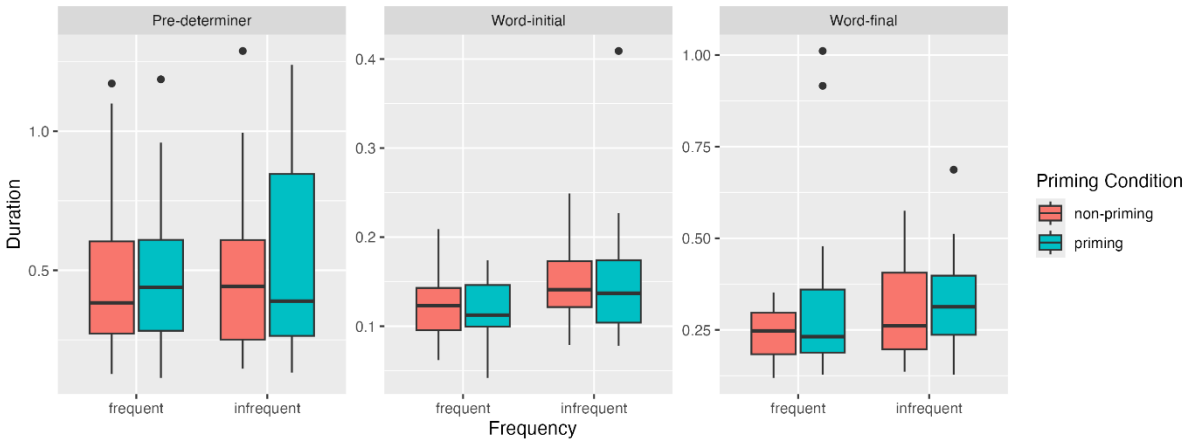

Figure 1. Descriptive comparison for pre-determiner, word-initial and word-final boundary intervals (Table 1) by frequency and priming condition.

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Feature spreading and redundancy with BMRS

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Overview. We propose a typology of feature spreading patterns involving redundantly specified segments using Boolean Monadic Recursive Schemes (BMRS; Bhaskar et al., 2020; Chandlee & Jardine, 2021), a computational formalism describing phonological maps as subsequential functions using conditional IF . . . THEN . . . ELSE . . . terms. While BMRS can encode any subsequential function, our aim here is to identify the computational structures that align with substantive phonological processes like spreading. We focus here on four spreading pattern types, formally distinguished from each other based on the presence and scope of the condition responsible for redundant specification: full spreading, opaque blocking, and a variant on each.

Syntax. BMRS define string-to-string maps by determining whether a position within a string carries an output feature. A feature f for position x is determined by a function $\varphi_f(x) :=$ IF . . . THEN . . . ELSE . . . that returns a Boolean value ($\top$ = true, $\bot$ = false). When $\varphi_f(x) = \top$, x is $[+f]$ in the output, and when $\varphi_f(x) = \bot$, x is $[-f]$. Local context is determined with immediate successor $s(x)$ and immediate predecessor $p(x)$ functions. Spreading phenomena require a recursive call of $\varphi_P(x)$ within the IF . . . THEN . . . ELSE . . . structure, causing a feature value to extend from a non-local trigger through intermediate elements to each target.

Typology. Our proposed typology consists of four different types of spreading patterns, example BMRS functions for which are provided in Table 1. For present purposes we assume that the relevant computations occur on a vowel tier string. The basic elements of the typology are a source condition, identifying the origin of spreading and being faithful to its underlying spreading feature value; a redundancy condition, identifying segments that must be given a default spreading feature value; and a spreading condition, determining whether spreading is from the successor $s(x)$ (= leftward) or the predecessor $p(x)$ (= rightward). The four patterns are formally distinguished from each other by the presence and scope of the redundancy condition.

❶ *Full spreading* is exemplified by backness harmony in Turkish, where the source is the root, spreading of [±back] is rightward, and there is no redundancy condition. Some examples are provided in (1). The lack of a redundancy condition ensures that [±back] is fully contrastive in the root and that only the spreading condition determines the value of [±back] in suffixes.

❷ *Opaque blocking* is exemplified by ATR harmony in Standard Yoruba, where the source is the final vowel, spreading of [±ATR] is leftward, and [+high] vowels are redundantly [+ATR]. Some examples are provided in (2). The top scope of the redundancy condition ensures that [+high] vowels are [+ATR] in all positions, thus impeding the spread of [−ATR] from the final vowel in (2f–h) and initiating the spread of [+ATR] themselves more specifically in (2g–h).

❸ *Inventory reduction* is exemplified by rounding harmony in Turkish, where the source is the root, spreading of [±round] is rightward, and only *suffix* [−high] vowels are redundantly [−round]. Examples are again in (1). The lower scope of the redundancy condition ensures that [±round] is fully contrastive in the root but that [−high] suffix vowels are consistently [−round]. These vowels thus impede [+round] spreading from the root and initiate [−round] spreading themselves. This blocking behavior is shown by the conditional suffix in (1e–h).

❹ *Inventory expansion* is exemplified by ATR harmony in the Ijẹṣa variety of Yoruba, which is just like Standard Yoruba except that only *final* [+high] vowels are redundantly [+ATR]. Some examples are provided in (3). The mid-level scope of the redundancy condition, tucked in the THEN clause of the source condition, ensures that only final vowels are affected; spreading of [−ATR] can thus create [+high, −ATR] vowels, as shown by the penultimate vowels in (3d–f).

Conclusion. A small but significant typology of attested spreading pattern types arises simply by adding a redundancy condition and adjusting its scope within a basic BMRS spreading function. In our presentation we show how this characterization of the typology is an improvement over the characterization offered in Baković (2000). This contributes to our growing understanding of which BMRS constructions best capture recurring phonological phenomena.

❶ *Full spreading* (*Turkish backness*)	❷ *Opaque blocking* (*Std. Yoruba ATR*)	❸ *Inventory reduction* (*Turkish rounding*)	❹ *Inventory expansion* (*Ijẹṣa Yoruba ATR*)
$\varphi_{\texttt{back}}(x) :=$ IF $\texttt{root}(x)$ THEN $\texttt{back}(x)$ ELSE $\varphi_{\texttt{back}}(p(x))$	$\varphi_{\texttt{ATR}}(x) :=$ IF $\texttt{high}(x)$ THEN $\top$ ELSE IF $\texttt{final}(x)$ THEN $\texttt{ATR}(x)$ ELSE $\varphi_{\texttt{ATR}}(s(x))$	$\varphi_{\texttt{round}}(x) :=$ IF $\texttt{root}(x)$ THEN $\texttt{round}(x)$ ELSE IF $\texttt{low}(x)$ THEN $\bot$ ELSE $\varphi_{\texttt{round}}(p(x))$	$\varphi_{\texttt{ATR}}(x) :=$ IF $\texttt{final}(x)$ THEN IF $\texttt{high}(x)$ THEN $\top$ ELSE $\texttt{ATR}(x)$ ELSE $\varphi_{\texttt{ATR}}(s(x))$

Table 1: Instantiations of BMRS typology of spreading and redundancy
(Note: low in ❸ is intended to be a predicate that identifies [−high] vowels).

(1) Turkish (Clements & Sezer, 1982); √*root*+caus.+cond.+past

a.	√gir+dir+sej+di	‘enter’	e.	√gyl+dyr+sej+di	‘laugh’
b.	√gel+dir+sej+di	‘come’	f.	√gør+dyr+sej+di	‘see’
c.	√kɯr+dɯr+sɑj+dɯ	‘break’	g.	√dur+dur+sɑj+dɯ	‘stop’
d.	√ɑʧ+dɯr+sɑj+dɯ	‘open’	h.	√ol+dur+sɑj+dɯ	‘become’

(2) Standard Yoruba (Awobuluyi, 1967)

a.	èrò	‘crowd’	e.	ilé	‘house’
b.	ɛ̀fó	‘vegetable’	f.	iʃɛ́	‘work’
c.	òɡèdè	‘incantation’	g.	òwúrɔ̀	‘morning’
d.	ɔ̀ɡèdɛ̀	‘banana/plantain’	h.	ɔ̀kíɡ͡bɛ	‘magical drug’

(3) Ijẹṣa Yoruba (Bamgboṣe, 1967)

a.	ìgó	‘bottle’	d.	ɪlá	‘okra’
b.	ulé	‘house’	e.	ʊsɛ	‘work’
c.	ódiwèrè	‘he became a mad man’	f.	ɔ́dɪbàbá	‘he became an old man’

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Formalizing phonological knowledge verses usage with weighted logic

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Overview There is debate over the role that gradience/probability plays in the formalization of phonological generalizations as a continuously growing body of evidence has shown that said generalizations do not always hold over the entire lexicon, and are often variable in application even when they do. Some researchers take this to mean that phonological knowledge is itself gradient (e.g., Hayes 2022). Here, I take a different approach. Drawing on the competence/performance distinction, I formalize the distinction between *phonological knowledge* (the possible discrete mappings from underlying to surface form) and *phonological usage* (the observed gradient probability distributions over surface forms) with weighted logic and semirings.

Competence and Performance with Weighted Logic First, a function $k : \Sigma^* \rightarrow \mathcal{P}(\Sigma^*)$ represents phonological **k**nowledge as a function from strings over an alphabet Σ to sets of strings. The output set will always contain the fully faithful input as well as the additional strings where the phonological process may have applied. Second, a function $u : \mathcal{P}(\Sigma^*) \rightarrow P(X \in E)$ represents phonological **u**se as a function from sets of strings to a probability distribution over that set. These functions can be formalized using weighted logic and semirings (Droste and Gastin 2009; Heinz Forthcoming). While Boolean logic provides a way to characterize functions of the type $f : \Sigma^* \rightarrow \{\texttt{TRUE}, \texttt{FALSE}\}$, weighted logic allows for more general interpretation of functions of the type $f : \Sigma^* \rightarrow \mathcal{S}$ where $\mathcal{S}$ is any semiring. The important characteristics of a semiring are that it is a set that is closed under two binary operations $\oplus$ (with a corresponding identity element 0) which acts like disjunction and $\otimes$ (with a corresponding identity element 1) acts like conjunction. Additionally, members of $\mathcal{S}$ may appear as atoms in weighted logical formula. Some semirings are shown in Figure 1 and additional stipulations are shown in Figure 2. The finite language semiring interprets union ($\cup$) as $\oplus$ with $\emptyset$ as its identity 0 and interprets language concatenation ($\cdot$) as $\otimes$ with the set containing the empty string ($\{\lambda\}$) as its identity 1. The set $\mathcal{S}$ in this instance is the set of all finite sets of strings. This is used to implement the *knowledge* function. The *usage* function maps the outputs set of strings to a weight vector with the probability semiring which uses positive real numbers as its set $\mathcal{S}$, addition as $\oplus$ and multiplication as $\otimes$. The output of this function normalizes to a probability distribution.

English nasal-place assimilation A basic example is given using English nasal-place assimilation based on the analysis from Coetzee (2016). For ease of exposition, it relies on the predicates $\texttt{velStop}(x)$ and $\texttt{labStop}(x)$ which evaluate to TRUE for any velar or labial stop and the variable ? as a stand in for all non-nasal sounds in the language. The formula in (1) defines function k for the English nasal-place assimilation map. This ensures that domain elements with an **n** followed by a velar stop can be either **n** or **ŋ** and similarly **n** followed by labial stops can be either **n** or **m**. All other domain elements surface faithfully. The formula in (2) defines function u for the same process. Here, non-phonological information such as speech rate and experiment type map to real numbers which scale the weights asigned to the structural outputs of k. This provides a way for extra-grammatical factors to influence the likelihood of a given form under a given condition while maintaining an encapsulated phonological grammar.

Conclusion Semirings and weighted logic are used to formally distinguish phonological knowledge from phonological usage. The analysis requires two functions and composing them suggests that they can be viewed as a single function. But only the latter is considered to be affected by extra-grammatical factors and is therefore different in kind from the former. Formal logic provides a way to be explicit about the systems one is analyzing and how certain commitments such as discrete phonological knowledge and modularity can coexist with gradient usage data.

Name	$\mathcal{S}$	$\oplus$	$\otimes$	0	1
Boolean	$\{\texttt{TRUE}, \texttt{FALSE}\}$	$\vee$	$\wedge$	FALSE	TRUE
Finite Language	FIN	$\cup$	$\cdot$	$\emptyset$	$\{\lambda\}$
Probablity	$\mathbb{R}_{\geq 0}$	$+$	$\times$	0	1
Natural	$\mathbb{N}$	$+$	$\times$	0	1
Viterbi	$[0, 1]$	max	$\times$	0	1

Figure 1: A list of semirings

Stipulations for Weighted MSO Logic
$s \in$ S is an atomic formula
Negation is only allowed in atomic formulas
$\phi \wedge \psi$ is interpreted as $\phi \otimes \psi$
$\phi \vee \psi$ is interpreted as $\phi \oplus \psi$
$\forall x\phi$ is interpreted as $\phi(x_1) \otimes \phi(x_2) \otimes \cdots \otimes \phi(x_n) \;\; \forall x \in \mathcal{D}$
$\exists x\phi$ is interpreted as $\phi(x_1) \oplus \phi(x_2) \oplus \cdots \oplus \phi(x_n) \;\; \forall x \in \mathcal{D}$
...

Figure 2: Stipulations for Weighted MSO Logic

(1) a. *Nasal Place Assimilation Formula* $\varphi \stackrel{\text{def}}{=} \forall x[(\eta(x) \wedge \{\eta\}) \vee (n(x) \wedge \{n\}) \vee (m(x) \wedge \{m\}) \vee (n(x) \wedge \texttt{preLabStop}(x) \wedge \{m\}) \vee (n(x) \wedge \texttt{preVelStop}(x) \wedge \{\eta\}) \vee (?(x) \wedge \{?\})$

b. Extension: {(nt,{nt}), (np,{np,mp}), (nk,{nk,ŋk}), (mp,{mp}), ...}

(2) a. *Output weighting formula* $\varphi \stackrel{\text{def}}{=} (\texttt{speechRate} \vee \texttt{expType}) \wedge \forall x[(n(x) \wedge \texttt{preLabStop}(x) \wedge w_1 \in \mathbb{R}_{\geq 0}) \vee (n(x) \wedge \texttt{preVelStop}(x) \wedge w_2 \in \mathbb{R}_{\geq 0}) \vee \ldots]$

b. speechRate : {slow,faster,fastest} $\rightarrow \mathbb{R}_{\geq 0}$

c. expType : {exp1,exp2} $\rightarrow \mathbb{R}_{\geq 0}$

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From Oman to Georgia and back, carrying an idle glottis

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Bendjaballah & Ségéral (2014) propose a new binary feature [±idle glottis]: voiced and ejective consonants are [–idle glottis] and voiceless ones are [+idle glottis]. This distinction, they convincingly argue, plays a central role in several phenomena in the South Semitic language Mehri, spoken in Oman. In this talk, we propose an answer to the question of how to express this binary feature in Element Theory (e.g. Backley 2011). We propose that the answer is to be found in the meeting between Georgian (Kartvelian) and Tush (Nakh), both spoken in modern day Georgia, and more specifically in the distribution and realization of the epiglottal trill /ʜ/ in Tush. In Tush, there is a tripartite opposition between voiced (=D), ejective (=Tˀ), and voiceless stops (=T; realized as aspirated stops) (see Wichers Schreur 2024 [henceforth WS2024]). There is also lenis vs. fortis opposition, instantiated by short /t, tˀ/ on the one side vs long /tː, tːˀ/ on the other. Lenis consonants combine variously to form clusters that come in three types, as listed in (1).

In this talk, we focus on (1c), and show that these clusters behave like those in (1a,b). According to WS2024, as well as the authors' own fieldwork in August 2024 in Georgia, D and Tˀ pattern together in selecting for the voiced epiglottal [ʢ] (first two columns in (2)), whereas the voiceless epiglottal [ʜ] appears after T (third column in (2)). Note that epiglottals appear after neither fricatives nor pharyngeals, hence *sʜ/χʜ and *qʜ/qˀʢ.

With Kojima (2007), we assume that, in Tush, a voiced allophone of /ʜ/ emerges in initial clusters after voiceless ejectives or voiced consonants, hence [Tʜ, Tˀʢ, Dʢ], where T/D are any plosive. We thus hypothesize that the underlying epiglottal trill is voiceless: /ʜ/. Crucially, only [ʜ] occurs outside clusters, as we illustrate in (3).

We propose to analyze Cʜ clusters as "harmonic clusters", like those of Georgian where the two consonants share a laryngeal feature. Assuming Element-based representations of segments within an autosegmental framework, we hold that the structure of a consonant employs at least three tiers: place, manner and larynx, pharyngeals having the place element A (Angoujard 1995). Unmarked /T/ has no element on the laryngeal tier (4a), its aspiration being passive: it is the neutral term within Laryngeal Realism (Honeybone 2005; Beckman, Essen & Ringen 2013). D involves the element |L| (4b), which heads the expression, and Tˀ involves a non-head |L| (4c). Thus, the element common to D and Tˀ is |L|. As shown in (4a-c), the Cʜ clusters all behave like harmonic clusters, in that the laryngeal element, if there is one, is shared. (4d) shows why *[tˀʜ] and *[dʜ] are impossible: the laryngeal element of the first C is not shared. Bendjaballah & Ségéral's binary feature [±idle glottis] is thus expressible as the presence vs. absence of (head or non-head) |L| on the laryngeal tier. (Time permitting, the ban on *sʜ/χʜ and *qʜ/qˀʢ will be explained.)

The hypothesis concerning |L| as the laryngeal element, and the possibility of it being head or non-head, is mirrored by the fact that |H| can show the same variation. Admitting that |H| and |L| cannot govern each other, we shall assume the phonemic organization of plosives in (5) (of which /t/ is a representative). Interestingly, if an element cannot govern itself, there can be no voiced ejectives nor fortis aspirates in the world's languages, which seems to be the case.

Given the combinations it displays, |H| is never head in Tush; Tush is an |L|-language. In this respect, Tush appears to be the mirror image of Korean, where the only headedness-based contrast concerns |H| (/tʰ/ ~ /tː/), and |L| is never head, as shown in (6).

In sum, (i) the allophony of the epiglottal in Tush brings crucial evidence for the feature [±idle glottis]; (ii) the phonemic inventory of Tush makes it possible to reanalyze this feature into a typology of laryngeal contrasts using Element Theory.

(1)

	Type of cluster	Composition	Examples (from WS2024)
a.	"Harmonic clusters" (share glottal feature, Chitoran 1998)	Anterior stop + posterior C	[tχir] 'frost'; [tˀqˀa] 'twenty'; [bʒã] 'large cattle'
b.	*Muta cum liquida*	Stop + liquid	[tsru] 'show-off'; [qˀlortˀ] 'gulp'
c.	C + epligottal	C ≠ fric. + pharyngeal	See (2)

(2)
a. [bʕarkˀ] 'eye' [pˀʕã] 'wing' [pʜarʧ] 'dogs'
b. [dʕeʔ] 'liver' [tˀʕir] 'star' [tʜak] 'footprint'
c. [nʕan] 'worm' [kˀʕakˀ] 'heel' [kʜekĩ] 'ready'

(3)

#_		_#		V_V	
[нaχ]	'Caucasian'	[baн]	'budock'	[qенar]	'fetch'
[нeχ]	'hollow'	[boн]	'goat kid'	[qˀaнẽ]	'bitter'

(4)

Lar	a. -	b. L	c. L	d. 💣 L/L
Manner	- h	- h	- h	- h
Place	I A	U/I A	U/I A	I A
	C C	C C	C C	C C
	t н	d ʕ	tˀ ʕ	tˀ/d н

(5)

	Tush Consonants						
Head	H	**Ø**	**Ø**	**L**	**Ø**	**Ø**	H,L
Non-head	Ø	**H**	**Ø**	**Ø**	**L**	**H,L**	Ø
	/tʰ/	**/t:/**	**/t/**	**/d/**	**/tˀ/**	**/t:ˀ/**	/dʰ/

(6)

	Korean consonants						
Head	**H**	**Ø**	**Ø**	L	Ø	Ø	H,L
Non-head	**Ø**	**H**	**Ø**	Ø	L	H,L	Ø
	/tʰ/	**/t:/**	**/t/**	/d/	/tˀ/	/t:ˀ/	/dʰ/

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From perception to phonology: Vowel height alternations in SJQ Chatino

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Introduction: This paper focuses on a bidirectional vowel height shift in San Juan Quiahije Chatino (SJQ Chatino), an Oto-Manguean language. The shift is triggered by nasalization and depends on the anteriority of the preceding consonant, a seemingly novel pattern. We hypothesize that this pattern is due to the phonologization of a perceptual distortion from nasal coupling that is known to shift the F1 frequency and make high vowels sound lower, while low/mid vowels sound higher (Arai, 2012; Krakow et al., 1988). Furthermore, we postulate that this shift does not occur in contexts in which the vowel has better co-articulation with the preceding consonant for the feature [+high], as well as in contexts in which the vowel is lengthened, both of which contribute to better perception of height.

Data: SJQ Chatino has a rare phonemic contrast between what E. Cruz (2011) considers apico-dental and lamino-alveolar consonants (see Table 1). In verbs and possessive inalienable nouns, first singular forms are marked by nasalization on the final vowel. The data, based on our own fieldwork and recordings from H. Cruz et. al. (2020), reveal the following pattern of allomorphy found in the first singular form: /i/ is lowered to /e/ if preceded by a [+ant] non-nasal C (1a), otherwise it remains unchanged, including when the vowel is already nasalized (1b); /e/ is raised to /i/ if preceded by [-ant] consonant (2a), otherwise it remains unchanged (2b). Glottal consonants /h/ and /ʔ/ are transparent to this process (3), which is consistent with Oto-manguean literature that analyzes glottal consonants as autosegmental elements (Macaulay 1996; Cruz 2011; Campbell & Cruz 2012). Finally, nasalization is also added to the first inclusive form with an additional change of vowel lengthening. The /i/->/e/ rule applies in first inclusive as well, but the /e/->/i/ rule applies only in the first singular (4).

Analysis: It is known that nasalization can affect the perception of vowel height: high vowels are often perceived as lower, and low or mid vowels as higher, due to changes in formant structure. Krakow et al. (1988) showed that these misperceptions do not occur when nasality is co-articulatory (i.e., in contexts where it is expected before a nasal C). We hypothesize that [-ant] (post-alveolar) consonants in Chatino are co-articulated with /i/ in the feature [+high], which makes the combination of [-ant] followed by /ĩ/ less likely to be misperceived as /ẽ/. On the other hand, [+ant] consonants, including apico-dentals, do not have a high body position, which makes them more co-articulated with /e/. As a result, misperceptions of height are more likely when the vowel is not already nasalized and not preceded by a consonant that agrees with it in height. Vowel length can also make the height more salient, which is why /e/ → /i/ does not apply to a long nasal vowel. This pattern of misperception has become phonologized.

Discussion: Most attested vowel shifts are unidirectional, but our data show a bidirectional shift conditioned by the anteriority of the preceding consonant that appears to be typologically unattested. Our argument that the observed /i/~/e/ alternations originate from perceptual distortions due to nasalization, which have been phonologized in a morphologically restricted domain, adds support to theories of phonologization via misperception (Ohala, 1996; Blevins, 2007) and sheds light on how phonetic pressures can shape allomorphy.

Table 1. SJQ Consonant Inventory ([+anterior] obstruents are bolded)

	Labials	Apico-dentals	Lamino-alveolar	Palatal	Velar	Glottal
Stops	**p**	**t̪ ⁿt̪ ⁿd̪**	t ⁿt ⁿd		k	ʔ
Fricatives		**s**	ʃ			h
Affricates		**t̪s ⁿd̪z**	tʃ			
Nasals	m	n				
Glides	**w**			j		
Approximants		ɾ l				

(1) a. [kwi] ‘he hung’ [kwẽ] ‘I hung’
[siʔ] ‘waist’ [sẽʔ] ‘my waist’
[ht̪iʔ] ‘he sucked’ [ht̪ẽʔ] ‘I sucked’

b. [ʃki] ‘he bent over’ [ʃkĩ] ‘I bent over’
[ʃtiʔ] ‘breastmilk’ [ʃtĩʔ] ‘my breastmilk’
[snĩ] ‘he held’ [snĩ] ‘I held’

(2) a. [ke] ‘head’ [kĩ] ‘my head’
[tʔa ʃeʔ] ‘urine’ [tʔa ʃĩʔ] ‘my urine’
[ⁿde] ‘he endured’ [ⁿdĩ] ‘I endured’

b. [ʔne] ‘he did’ [ʔnẽ] ‘I did’
[sẽ] ‘he squeezed’ [sẽ] ‘I squeezed’
[t̪e] ‘clothes’ [st̪ẽ] ‘my clothes’

(3) [ⁿthi] ‘he is getting something’ [ⁿthĩ] ‘I am getting something’
[ⁿt̪hi] ‘he is spending money’ [ⁿt̪hẽ] ‘I am spending money’

(4) [ⁿtkeʔ] ‘he is cooking’ [ⁿtkĩʔ] ‘I am cooking’ [ⁿtkẽːʔ] ‘We (incl.) are cooking’

Table 2. F1 Measurements of Minimal Set [sVʔ]

Chatino	Gloss	Average F1 (Hz)
[siʔ]	‘side’	377
[sẽʔ]	‘my side’	427
[seʔ]	‘theater’	494
[sĩʔ]	‘nose’	436

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Georgian pre-sonorant syncope is no longer phonological

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In Georgian, vowel-initial affixes (other than the nominative /–i/ and vocative /-o/ in nouns[1]) often trigger the deletion of the last *non-high* vowel in a sonorant-final (/n/ /m/ /l/ /r/ /v/) stem (Hewitt 1995, 25–27, 34–37, Butskhrikidze and van de Weijer 2001; Butskhrikidze 2002, 90–93)[2]. The typical pattern, which generalises to some recent borrowings, is shown in (1); most obstruent-final stems and stems in which a final sonorant is preceded by a high vowel do not participate, inverting the more usual typology of targets for syncope (Gouskova 2003, 211). /o/ alternates with [ʷ][3] rather than deleting outright: /p'ɑmidɔr-is/ [p'ɑmidʷris] 'tomato-GEN'.

(1) Pre-sonorant syncope in Georgian (Butskhrikidze 2002, 90–93, Hewitt 1995, 34–37).

-NOM	-PL /-ebi/	-GEN /–is/	-PL-GEN	*Gloss*
bɑli	blebi	blis	blebis	'cherry'
mʁvdeli	mʁvdlebi	mʁvdlis	mʁvdlebis	'priest'
rest'ɔrɑni	rest'ɔrnebi	rest'ɔrnis	rest'ɔrnebis	'restaurant'
k'ɑmɑtʰi	k'ɑmɑtʰebi	k'ɑmɑtʰis	k'ɑmɑtʰebis	'debate'
p'ɑnduri	p'ɑndurebi	p'ɑnduris	p'ɑndurebis	'(string instrument)'

Several further complications arise, illustrated in (2). First, there exist obstruent-final stems which do undergo syncope; second, there exist sonorant-final stems that do not. The failure of sonorant-final stems to syncopate is not predictable from phonological information, and this can result in homophonous pairs distinguished solely by the failure of one item to undergo syncope, as shown. (Hewitt (1995, 35) does, however, observe that monosyllabic stems are much more likely to escape syncope than polysyllabic stems.) Compounds involving exceptionally non-syncopating members often regularise (although not always): /dɑr–/ 'climate' is non-syncopating, but /ɑv+dɑr-is/ [ɑvdris] 'bad climate-GEN' (Vogt 1971, 21–22). Finally, inter-speaker variation in both directions can be found in natural corpora.

(2) Exceptional obstruent-final undergoers and sonorant-final non-undergoers.

-NOM	-PL /-ebi/	-GEN /–is/	-PL-GEN	*Gloss*
ɑrɑq'i	ɑrq'ebi	ɑrq'is	ɑrq'ebis	'vodka'
k'ɑk'ɑbi	k'ɑk'bebi	k'ɑk'bis	k'ɑk'bebis	'partridge'
t͡seli	t͡slebi	t͡slis	t͡slebis	'year'
t͡seli	t͡selebi	t͡selis	t͡selebis	'waist'

One possible analysis of the facts in (1) is as typical metrical syncope targeting weak positions (with pre-obstruent vowels protected by phonotactic constraints), as proposed by Butskhrikidze (2002, 152–153); even in the absence of the data in (2), however, questions arise. First, it is not clear why nominative /-i/ and vocative /-o/ (and further verbal affixes) are excluded. Second, if word-level stress in Georgian is initial (see Borise 2023 for an overview), then syncope in monosyllabic roots like /bɑl/ and /t͡sel$_1$/ targets surface-strong syllables, and elsewhere is further insensitive to a phrasal accent that applies leftward from the right edge (see Kaplan 2022 for some implications). I argue here that both the lexical specificity of the alternation and the non-participation of certain affixes instead motivate a stratal account (Bermúdez-Otero 2013) of pre-sonorant syncope as stem allomorphy, and as such, that this is a *lexicalised* pattern that is no longer under the control of the phonological computation (but once was); this reasoning also allows an account of the non-participation of the synchronic high vowels, which in fact postdate (Gamkrelidze and Mac'avariani 1965; Gamkrelidze 1966) the prior state of the language in which this pattern must first have entered the phonology.

[1]The situation of the verbs is similar, including the presence of non-participating affixes and stems.

[2]Or both the final and penultimate vowels in a vowel-final stem in which a sonorant precedes the final vowel.

[3]Butskhrikidze (2002, 95) gives /v/ but on p. 88 gives [ʷ] as narrowly-transcribed post-consonantal /v/.

Grammatical consequences of Zipf's Law of Abbreviation in Hungarian

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According to Zipf's Law of Abbreviation (ZLA), in natural languages the more frequently a word is used the shorter it tends to be, and vice versa [1]. ZLA is a statistical regularity which seems to be universal and has been empirically verified for about a thousand languages (between the number of letters in words and word token frequency) [2] and also holds when phonetic word duration is measured [3]. ZLA has significant consequences on linguistic patterns. We tend to use shorter words, on the one hand, by phonetically motivated phonological shortening (e.g. the more likely deletion of reduced vowels in more frequent words: e.g. *mem(o)ry* vs. *mamm*(a)ry*, see [4]) and, on the other, by lexical selection, i.e. the tendency to use shorter/shortened words for concepts as they become more frequent (e.g. *velocipede* > *bicycle* > *bike*, see [5]). In this paper we explore the effect of ZLA on grammar, specifically on morphophonology focussing on (i-ii) patterns of lexical variation and (iii) deviations from a templatic pattern in verbal paradigms.

i. The past suffix in Hungarian shows vowel–zero alternation with a suffix-initial vowel present or absent: -V*tt* ~ -*t*. The distribution of the allomorphs is generally phonologically conditioned but after certain stem-final sequences we find *lexical variation* [6],[7]. The distribution obeys ZLA: frequent stems tend to have a vowelless allomorph (and are shorter accordingly) while less frequent ones have an initial vowel (and thus are longer). This is demonstrated below in (1a,b,c) with monosyllabic *Cd*-final, V*t*-final and V*ll*-final stems, respectively, listed in decreasing order of token frequency (data are from Hungarian Webcorpus [8]). We can see that there is a frequency threshold in all three cases above which the shorter form is preferred in accordance with ZLA.

ii. ZLA also applies to lexical variation in the consonant–zero alternation of the yodful and yodless back harmonic allomorphs of the 3SG and 3PL possessive suffix *-ja* ~ *-a* and *-juk* ~ *-uk* (see [9]): under the same relevant phonological conditions, the shorter, yodless forms are preferred with frequent stems and the longer, yodful ones with less frequent ones, cf. (2) for 3SG. ZLA holds statistically: a frequency threshold can also be defined here, too; of the relevant 18 short yodless stems, the majority (16) are above the threshold and of the 51 longer yodful forms, the majority (47) are below it.

iii. The Hungarian verbal paradigm is subject to a templatic restriction where in analytic inflected forms the exponents (for TENSE, MOOD, DEFINITENESS, PERSON/NUMBER) have to fit into a phonologically circumscribed **CVC** template (cf. 3a where, as a consequence, some of the morphosyntactic categories appear fused). However, some definite forms systematically disobey the template in two ways, in accordance with ZLA: the exponent of the least frequent person/number feature (2PL) is oversized **CVCVC**, cf. (3b) and that of the most frequent person/number feature (3SG) is undersized **CV** (due to zero person/number markers), cf. (3c). In the imperative, it is the 2SG form which is the most frequent one and shows up even more undersized: **C** (INDEF *-j* or DEF *-d*). Although "conforming" templatic CVC exponents of the imperative (INDEF *-jál~jél* or DEF *-jad~jed*) are also available, the undersized C-exponents are much more frequent, cf. (3d).

We have found then that ZLA is observable in diverse areas of morphophonology. It occurs where longer and shorter suffix allomorphs are available and are subject to lexical variation (e.g. V~zero or C~zero alternation). ZLA also holds for the selection of phonologically constrained exponents which differ in size: in the verbal paradigm, oversized exponents are less frequent than the templatically defined norm and undersized ones are much more frequent.

(1a) non-3SG.INDEF past of C*d*-final monosyllabic verbs (standard variants are highlighted)

shorter form	**longer form**	**gloss**	**freq_all (k)**	**% of shorter**
mond-t-V	%*mond-ott*-V	say	**280.6**	**99.31**
kezd-t-V	**kezd-ett*-V	start	**87.1**	**100**
küld-t-V	**küld-ött*-V	send	**19.7**	**100**
hord-t-V	?**hord-ott*-V	wear	**4.5**	**100**
?%*old-t*-V	*old-ott*-V	solve	3.5	0.25
?%*küzd-t*-V	*küzd-ött*-V	struggle	2.7	0.84
?*áld-t*-V	*áld-o-tt*-V	bless	1.0	2.20
**told-t*-V	*told-o-tt*-V	lengthen	0.09	5.62

(1b) non-3SG.INDEF past tense of V*t*-final monosyllabic verbs

shorter form	**longer form**	**gloss**	**freq_all (k)**	**% of shorter**
lát-t-V	**lát-ott*-V	see	**149.4**	**100**
**jut-t*-V	*jut-ott*-V	get	28.5	0
**köt-t*-V	*köt-ött*-V	bind	17.6	0
**nyit-t*-V	*nyit-ott*-V	open	17.1	0
**fut-t*-V	*fut-ott*-V	run	6.0	0
**hat-t*-V	*hat-ott*-V	affect	2.9	0
	...			
**tát-t*-V	*tát-ott*-V	gape	0.26	0

(1c) 3SG.INDEF past tense of V*ll*-finall monosyllabic verbs

shorter form	**longer form**	**gloss**	**freq_all (k)**	**% of shorter**
áll-t	%*áll-ott*	stand	**82.7**	**92.4**
száll-t	%*száll-ott*	fly	**8.5**	**95.4**
hull-t	*hull-ott*	fall	**4.6**	**18.5**
?*vall-t*	*vall-ott*	profess	2.9	0
**ill-t*	*ill-ett*	match	2.3	0
**ell-t*	*ell-ett*	yean	0.15	0
**züll-t*	*züll-ött*	spree	0.09	0
?**máll-t*	*máll-ott*	peel	0.07	0

(2) 3SG possessive forms (monosyllabic VC-final back harmonic regular nouns, C ≠ pal/sib)

shorter forms	**token_freq (k)**	**longer forms**	**token_freq (k)**
szám-a ‘number’	137.9		
ok-a ‘reason’	94.1	*tag-ja* ‘member’	88.3
jog-a ‘right’	46.0		
sor-a ‘row’	11.0		
nyom-a ‘trace’	7.0	*lap-ja* ‘sheet’	5.3
kor-a ‘age’	3.9		
fok-a ‘grade’	3.4		
szag-a ‘smell’	2.9	*rab-ja* ‘captive’	1.7
hón-a ‘armpit’	1.6		
kár-a ‘damage’	1.6		
húg-a ‘younger sister’	1.5	*sír-ja* ‘grave’	1.4
bor-a ‘wine’	1.4		
kar-a ‘choir, faculty’	1.2		
dal-a ‘song’	1.0		
tan-a ‘doctrine’	0.62		
por-a ‘dust’	0.46		
+2 forms	<0.20	+47 forms	<0.40

(3a) **CVC** template: non-agglutinative (fusional) patterns:

	C	V C			C V		C
v á r	*- t*	*- á l*		*v á r*	*- n á*		*- m*
‘wait	-PAST	-INDEF.2SG’		‘wait	-COND		-DEF.1SG’
	C V		C		C	V	C
v á r	*- j á*		*- k*	*v á r*	*- t*	*- á*	*- k*
‘wait	-PRES.INDV.DEF		-DEF.3PL’	‘wait	-PAST	-DEF	-DEF.3PL’

(3b) oversized **CVCVC**: (more) agglutinative patterns:

	C	**V**	**CVC**	**C V**		**CVC**
v á r	*- t*	*- á*	*- t o k*	*v á r*	*- n á*	*- t o k*
‘wait	-PAST	-DEF	**-2PL**’	‘wait	-COND.(IN)DEF	**-2PL**’

(3c) undersized **CV** patterns: zero marker

	C	**V**		**C V**		
v á r	*- t*	*- a*	*- ∅*	*v á r*	*- n á*	*- ∅*
‘wait	-PAST	-DEF	**-3SG**’	‘wait	-COND.DEF	**-3SG**’

(3d) undersized **C** patterns: 2SG imperative short forms: zero marker or extreme fusion

	C			**C**		
v á r	*- j*	*- ∅*		*v á r*	*- d*	
‘wait	-IMPV	-INDEF.**2SG**’		‘wait	-IMPV.DEF.**2SG**’	
	C	V C			C	V C
v á r	*- j*	*- á l*		*v á r*	*-j*	*- a d*
‘wait	-IMPV	-INDEF.2SG’		‘wait	-IMPV	-DEF.2SG’

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Hierarchy of difficulty in the acquisition of dynamic alternations

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Although interest in third language phonetic and phonological acquisition has grown over the past decade (e.g. Wrembel 2023 for a review), studies on the acquisition of allophonic processes in this domain remain scarce. This paper aims to establish a hierarchy of difficulty in acquiring voicing-related processes and phonetic categories in the speech of multilingual learners. Fourteen young adult subjects participated in the production and perception experiments: L1 Hungarian, L2 English and L3 Spanish speakers with high proficiency (B2+ CEFR) in both without clear dominance patterns. By examining advanced learners' interlanguage, we can explore what pronunciation features tend to get entrenched.

The study takes a closer look at (i) Regressive Voicing Assimilation (RVA) (between adjacent obstruents), which is present in participants' L1 and in most true voice languages, (ii) Pre-sonorant Voicing (PSV), which is only present in participants' L3 and is a typologically uncommon process. Both are dynamic phonological processes, and neither of them creates new segments for our participants. We will also consider (iii) aspiration of voiceless stops in English (Voice Onset Time) in which case a new phonetic category has to be learned, and finally (iv) voiced stop lenition in Spanish (LEN), an L3-specific allophonic alternation that does create new segments.

Production experiments were time-limited reading tasks with target words embedded in carrier sentences. They measured voicing in /s/ before voiced obstruents (RVA) and sonorants (PSV) both within and across word boundaries in participants' English and Spanish interlanguage. Lenition of intervocalic /b d ɡ/ in Spanish was assessed by comparing the intensity maximum of the following vowel with the stop minimum (lower values indicating greater lenition; see Eddington, 2011; Rogers & Alvord, 2014). VOT of initial voiceless stops in English was measured sentence-initially. Despite interspeaker variation, pre-obstruent /s/ in English averaged ~50% voicing in both contexts, showing speakers generally did not block RVA. By contrast, pre-sonorant /s/ in Spanish showed <20% voicing, indicating learners did not extend assimilation to sonorants. VOT of initial stops varied widely, with Hungarian-like, intermediate, and target-like values; LEN was not acquired either.

Perception experiments using manipulated recordings to mirror the L1 voicing patterns of listeners confirmed that while learners could phonetically perceive all processes (96.9% and 98.7% of accuracy rate for PSV and LEN in forced-choice tasks), only RVA and VOT were treated as linguistically relevant.

The results establish a hierarchy where phonetic categories are learned more readily, followed by unmarked processes, while marked dynamic processes prove most resistant to acquisition. However, the interaction between specific language pairs and the privileged role of L1 influence warrant further research.

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How coronal blocking of initial consonant mutation reflects domain structure in Irish

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Initial consonant mutation (ICM) is the systematic phonological alternation of word- or morpheme-initial consonants in a range of morphosyntactically defined environments: e.g. word-initially on adjectives modifying feminine nouns (1a); following certain "trigger words" (1b); or within words following a derivational prefix (2) (glossed as **L**). However, mutation is sometimes blocked when two coronal consonants come together at the word/morpheme boundary ("coronal blocking"; CB). Between words, CB is regular in some mutation contexts (3b), but not in others (3a). Within words, there is considerable variability, with both mutation and non-mutation possible (4).

(1) a. *bróg **dh**earg* 'a **L**.red shoe'
b. *aon **bh**róg* 'one **L**.shoe'

(2) a. *mion-**ph**íosa* 'small-**L**.piece'
b. *fad-**ch**luasach* 'long-**L**.eared'

(3) a. *trae**in dh**earg* 'a **L**.red train'
b. *ao**n t**eanga* 'one language'

(4) a. *mio**n-sh**onra* 'small-**L**.detail'
b. *fa**d-t**éarmach* 'long-term'

The CB patterns are puzzling because there is no obvious domain of applicability. The "between words" examples (3) suggest that a preceding coronal must be "close enough" to the target consonant to interfere with the mutation process; but CB seems to become less robust within the narrowest (within word) domain (4). However, I show that the observed patterns are explained by considering the visibility of the preceding coronal consonant at the point of mutation.

I assume an autosegmental model of ICM: mutation is caused by floating phonological material {L} that docks onto the target consonant to produce the mutated form (Lieber 1983; Iosad 2014; Breit 2019; Laoide-Kemp 2023). CB results from a "coronal fusion" process that requires adjacent coronals to share their [+Cor] feature, which in turn renders the target consonant inaccessible to mutation (Ní Chiosáin 1991). I also assume that spell-out proceeds cyclically over distinct domains; and that within each spell-out domain, morphemes are inserted on a piece-by-piece basis with limited phonological processing after each morpheme is added (cf. Kalin 2022).

My central claim is that the patterns in (3)-(4) relate to the relative positions of the mutation-inducing material {L} and the preceding coronal consonant (T) within the spell-out domain structure. If T and {L} are separated by a spell-out domain boundary (5a), then T will **never** be visible when {L} docks onto the target consonant, and thus cannot affect the mutation process; this gives regular mutation, as in (3a). If T and {L} belong to the same spell-out domain and are part of the same morpheme (5b), then T will **always** be visible when {L} is inserted, and therefore will always block mutation if the target word also begins with a coronal consonant, as in (3b).

(5) a. T $[_{\textbf{domain}}$ {L} Target $\longrightarrow$ Regular mutation
b. $[_{\textbf{domain}}$ ... T-{L} Target $\longrightarrow$ Regular CB
c. $[_{\textbf{domain}}$ ... T {L} Target $\longrightarrow$ Both CB and mutation possible

If T and {L} belong to separate morphemes in the same spell-out domain (5c), the situation is more complicated. Here, {L} is inserted before T, but both {L} and T are visible by the end of the spell-out cycle. This gives two possibilities, depending on whether mutation proceeds as soon as the {L} is inserted or only once the entire domain has been spelt out. We see in (4a)/(4b) that both outcomes are possible in Irish, which suggests some variation in the fine timing of mutation.

My analysis offers a principled explanation for the CB patterns in (3)-(4), showing that they directly reflect the spell-out domain structure in Irish. In particular, it demonstrates the relevance of both broad spell-out domain boundaries and the more fine-grained timing of morpheme insertion.

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How to model stylistic variation in phonology: one or multiple grammars?

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Introduction. There has been relatively little work dedicated to modeling stylistic variation in phonological theory (Coetzee & Pater 2011). Yet there is ample evidence from sociolinguistics that phonological processes apply differently in casual and formal speech. We build on Boersma & Hayes' (2001) proposal to model stylistic variation by making constraint ranking values (or weights) style-sensitive. More specifically, we test their assumption that style sensitivity is constraint-specific, allowing different phonological processes to be affected differently by a change in formality. This assumption is related to a larger debate whether stylistic variation involves distinct grammars (e.g., a casual-speech grammar and a formal-speech grammar; van Oostendorp 1997) or whether the locus of variation is specific linguistic processes (or "sociolinguistic variables"; Labov 1966) within a single grammar. The former view predicts that phonological processes should be affected uniformly by a change in formality whereas the latter view does not. This question is investigated using French as a testing ground – a language for which the nature of stylistic variation as involving multiple grammars or a single grammar with process-specific stylistic sensitivity is still actively debated (e.g., Hornsby 2019).

Hypotheses. We focus on French schwa (e.g., *cerise* [s(ə)ʁiz] 'cherry') and liaison (e.g., *gros* [gʁo(z)] 'big'), two variables which have been shown to be style-sensitive, with schwa and liaison variants ([səʁiz] and [gʁoz]) being generally more likely in formal speech. We assume that schwa and liaison variants are promoted by faithfulness (Max-V and Max-C, respectively) and penalized by markedness (*Schwa and *C#, respectively). We test the following prediction: under the multiple-grammar model of stylistic variation, the weights of Max-V and Max-C are scaled by the same factor λ (relative to the corresponding conflicting markedness constraints) when changing style. This parameter ultimately reflects the probability of using each grammar in a given formality context. Under the one-grammar approach, scaling factors are constraint-specific ($\lambda_{\text{Max-V}}$ and $\lambda_{\text{Max-C}}$).

Methods. We use the PFC corpus from Neuchâtel (Racine & Andreassen 2012) to arbitrate between these two hypotheses. This corpus is ideal for our purposes because it documents stylistic variation through three production tasks (form least to most formal: free conversation, guided conversation, read speech). We use a Bayesian logistic regression to estimate the rates of schwa and liaison in the three speech styles, controlling for word-specific and speaker-specific effects. We then model these rates using two Maxent grammars. The two grammars include the four aforementioned constraints but differ in how faithfulness constraints are reweighted when changing style. Constraint weights for free conversation are estimated jointly with scaling factors for guided conversation and read speech.

Results & Discussion. Table 1 shows the values of the scaling factors under the two theories. The grammar with constraint-specific scaling factors (one-grammar model) better fits the data than the grammar with uniform scaling factors (multiple-grammar model), as indicated by a smaller Deviation Information Criterion (DIC). This means that the locus of variation is specific phonological processes rather than whole phonological grammars, in line with the one-grammar model of stylistic variation. These results also have implications for the understanding of stylistic variation in French, as they provide evidence against the diglossia hypothesis. Finally, on the methodological side, this work provides a robust statistical architecture (Maxent grammars implemented with scaling factors in a Bayesian statistical framework) that can be used to study other stylistic effects in phonology.

	Guided conversation	Read speech	DIC
Multiple-grammar model (uniform scaling factor)	$\lambda=-0.04$	$\lambda=0.19$	100.5
One-grammar model (constraint-specific scaling factors)	$\lambda_{Max\text{-}C}=-0.04$ $\lambda_{Max\text{-}V}=3.16$	$\lambda_{Max\text{-}C}=0.18$ $\lambda_{Max\text{-}V}=23.67$	61.07

Table 1. Scaling factors under the two theories of stylistic variation (the baseline is free conversation; scaling factors indicate how faithfulness constraints must be reweighted relatively to markedness constraints when going from free conversation to guided conversation or read speech)

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Lexicalization and modularity in the Finnish Stem Constraint

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A conspiracy in Finnish morphophonology, dubbed the 'Stem Constraint' by Kiparsky (2003), is that stems can only receive a suffix if they end in a vowel. Bare stems are all underlyingly vowel-final (Keyser & Kiparsky 1984: 13), including loans, which are lexicalized as vowel-final via various strategies (Kiparsky 2003: 148). However, some case endings, which are stem-level affixes, end in a consonant. Here, the Stem Constraint triggers deletion of this final consonant upon suffixation (1a). If there is no further suffixation, the consonant remains (1b).

(1)	a.	/peruna-i-**ten**-si/ potato-PL-GEN.PL-2.SG.POSS	peruno-i-**de**-si	'your (sg.) potato', gen.pl.
	b.	/peruna-i-**ten**/ potato-PL-GEN.PL	peruno-i-**den**	'potato', gen.pl.

The conditions for *n*-deletion in (1a) require reference to morphological information: the input string /perunoidensi/ is phonotactically licit, and deletion only happens because the *n* is stem-final preceding a word-level suffix. Crucially, the final *-n* must be present in the output of the stem-level phonology, firstly because it triggers consonant gradation of /t/ -> [d] (Kiparsky 2003: 150), and secondly because it remains as long as no further suffixes are added (1b).

In this paper, I show how a modular, feed-forward model of grammar forces a tradeoff between architectural restrictiveness and phonological productivity. I argue that strict modularity leads to an analysis in which the Finnish possessive construction subcategorizes for a vowel-final base, and that no active grammatical conditions on stems themselves are needed. The controversial upshot is that the underlying allomorphs of the genitive plural suffix would include {ten, de} – but *not* {den}. In effect, sufficiently opaque cases of consonant gradation become lexicalized, even as consonant gradation remains an active stem-level process in deriving the more transparent cases. Such 'rule scattering' is predicted by the life-cycle hypothesis (Bermúdez-Otero 2015), whose final stage is the movement of stem-level phonology into morpholexical control (cf. Rasin 2023). I support the life-cycle analysis with evidence from the verbal system, where most consonant gradation is still unarguably phonological, but a minority of cases are purely morphologically conditioned – with a residue of intermediate cases whose analysis depends on the level of phonological abstraction permitted by the linguist, or ultimately, by the learner.

Though initially bizarre, I show that subcategorization can unify the deletion in (1a), which obtains with *structural* case, with another manifestation of the Stem Constraint, i.e. morphological gaps when combining *adverbial* cases with possession (Kiparsky 2003: 153). The present analysis also correctly predicts that Word-level to Word-level suffixes do not induce deletion even when attached directly to a stem. In contrast, another potential line of analysis would be to treat the deletion in (1a) as a derived environment effect. While I show that it is possible to derive (1a) with an updated representational approach to non-derived environment blocking that uses Gradient Symbolic Representations, it does not capture the same range of generalizations across Finnish morphophonology.

Loanword-final vowel insertion in standard Italian spoken in Florence.

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The issue of phonological adaptation of loanwords ending in a consonant has already been investigated for Italian, but no uniform pattern of word-final epenthetic vowel occurrence has emerged so far. Some sources claim that words such as *weekend* are pronounced in Italian with a vowel inserted at the end of the word, as in [wiˈkɛndə] (e.g. Lepschy & Lepschy, 1981). However, some authors (e.g. Bertinetto, 1985), point out that this process is restricted to non-standard varieties of Italian. As for standard Italian, opinions are divided. Some linguists state (e.g. Passino, 2008) that in this system words such as *weekend* are realized identically to the original language, i.e. without an inserted vowel, e.g. as [wiˈkɛnd]. Broniś (2016), who limited her analysis of vowel epenthesis in borrowing adopted into standard Italian to the area of Rome, came to the conclusion that the occurrence of an epenthetic vowel is very common in standard Italian spoken in this city, and, significantly, it is phonologically determined. Also Grice et. al. (2018) confined their research to a local variety of standard Italian, specifically, to the one spoken in Bari. They examined the relation between the presence of the word-final epenthetic vowel and various variables, showing a strong correlation between the epenthetic vowel's occurrence and intonation. Next, Miatto (2020) analyzed a variety of Italian spoken in the Veneto region. The results presented by Miatto show that in Veneto there is a very high inconsistency and divergence in the use of epenthesis, making the author consider this phenomenon as phonologically unpredictable.

Clearly, when conducting phonological research in standard Italian, it is necessary to take into account that its phonology is regionally "colored" by the phonology of local dialects. The goal of our presentation is to examine word-final vowel epenthesis in yet another regional variety of standard Italian. We try to determine whether the presence of a word-final epenthetic vowel in consonant-final loans adapted into standard Italian spoken in Florence is conditioned by some phonological factors, such as word stress, structure of the word-final syllable, quality of the word-final consonant, prosody. We also aim to establish if the epenthesis is affected by any cross-linguistic influences (CLI; Sharwood Smith, 2021) related to participants' proficiency in English and their tendency to insert a word-final vowel while speaking English.

Our study was conducted in 2023 in Florence. The participants were 20 Florentines, who completed the following tasks: a background questionnaire, a production task in Italian (*figure 1*), designed as a quiz and coded in PsychoPy (Peirce et al., 2019), a similar production task in English, English proficiency DIALANG Vocabulary Placement Test (Alderson & Huhta, 2005). The stimuli used in the main Italian production task were 80 loanwords, balanced in terms of frequency across four different phonological sets.

The work is still in progress. All the Italian recordings have already been analyzed acoustically and annotated in PRAAT (Boersma, 2001; *figure 2*). The preliminary analysis of 2961 outputs obtained from 20 participants in the Italian production task shows that 1982 of the collected outputs (67%) were pronounced with a vowel inserted word-finally. Also, some phonological conditions proved to yield vowel insertion more frequently than others (for two illustrative examples, see *figures 3-4*). A complete analysis will be available in the course of a few months. It will include the investigation of correlations between the occurrence of the word-final vowel

and word-final consonant quality (sonorant vs. obstruent), word stress, prosodic context, level of English proficiency, and some self-declared personal data items. The processing of the phonological data will be illustrated with constraint ranking within the framework of Optimality Theory (Prince & Smolensky, 1993/2004; McCarthy & Prince 1993). To account for the phonological variation in loanword adaptation, the data will be modeled with Stochastic Optimality Theory (Boersma & Hayes, 2001).

figure 1

figure 2

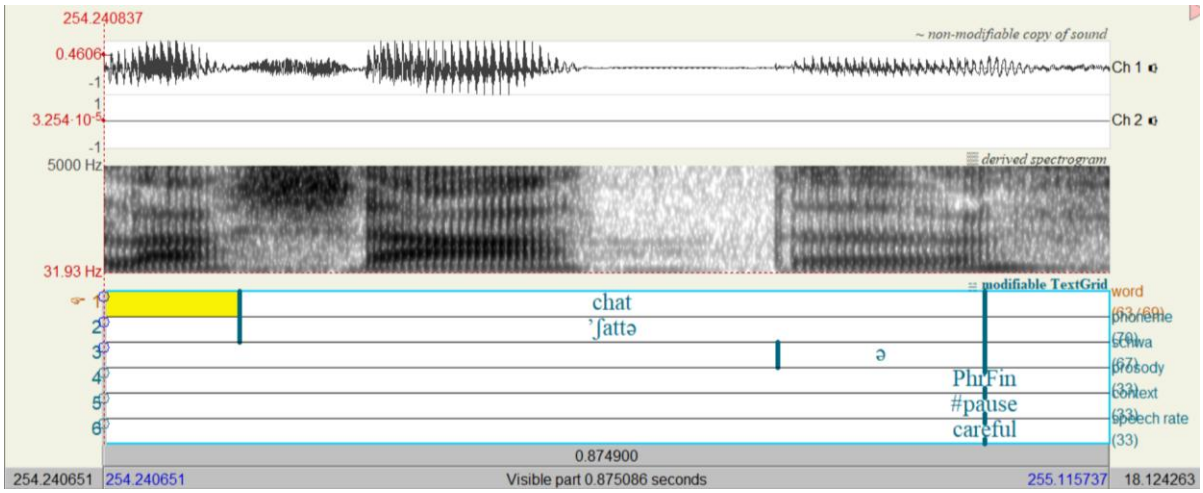


figure 3

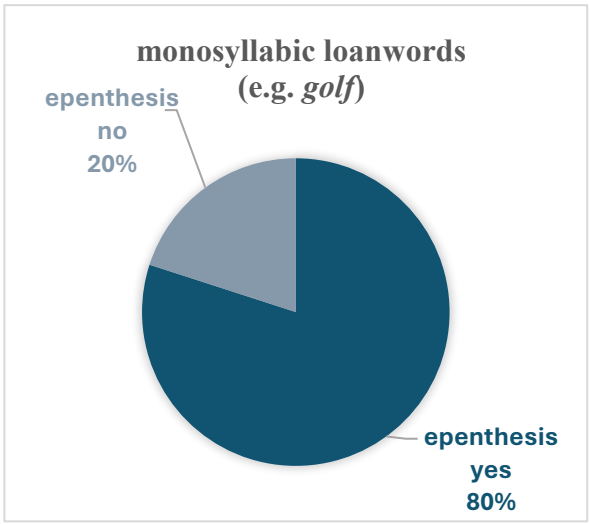
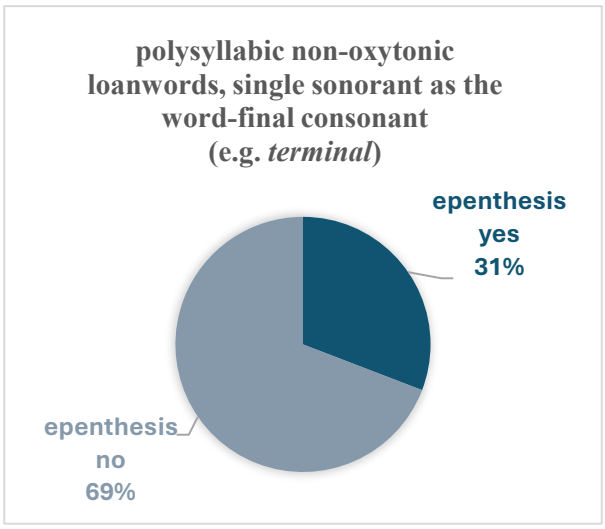


figure 4



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Markedness and Exceptionality in Lexical Accentuation

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The usual way of treating exceptions to phonological generalizations is with faithfulness to underlying representations. We argue that this makes no reference to markedness and so fails to capture the generalization that *what is exceptional in a language is always marked in that language*. We offer an analysis within Direct OT (Golston, 1996; Krämer et al., 2024), according to which morphemes are represented solely by the constraints they violate on the surface with Colored Containment (van Oostendorp, 2007 & 2008), where the input is always contained in the output. This directly captures the insight that exceptional forms within a language are always marked. We base our claims on stress patterns in four languages.

Latin stress has right-aligned moraic trochees subject to non-finality, with a final consonant not part of the final syllable: (ˈsimi)li<s> ‘similar’, fi(guː)ra ‘figure’. A simple grammar is offered (NONFINALITY, FTBIN, WSP, RIGHTMOST) and we note that no (known) words violate it.

‘Italy’	WSP	FTBIN	NONFIN	RMOST
i(tali)(ˈa)		*!	*	
(ita)(ˈlia)			*!	
☞ i(ˈtali)a				
(ˈita)(lia)			*!	*

English stress is like Latin’s but has three kinds of exception. We show that each kind of exception violates one or more of the constraints used to capture the unmarked stress rule: (vɪnə)(ˈgɹɛ)t ‘vinaigrette’ violates NONFINALITY, FTBIN, and WSP; (mɪsɪ)(ˈsɪpi) ‘Mississippi’ violates NONFINALITY; (ˈpʌmpɚ)(nɪkl) ‘pumpernickel’ violates RIGHTMOST. Words like *pumpernickel* also violate a putative three-syllable window in English (see Kager 20xx).

Modern Greek has default antepenultimate stress, (ánθro)pos ‘person’, equivalent to Latin but with syllabic trochees. MG has a great many cases of penultimate fan(táros) ‘soldier’ and final stress (ura)(ˈnos) ‘sky’, all within a three-syllable window (Revithiadou 2007). We show that the window falls out from an analysis in which exceptions are merely marked approximations to the norm: fan(táros) violates NONFINALITY and (ura)(ˈnos) violates FTBIN and NONFINALITY.

Ancient Greek is a quantity-sensitive version of Modern Greek with a HL* pitch-accent (Sauzet 1989): (án)(ˈθrɔ̀ː)pos ‘person’. While the stress rule of AG is exceptionless—identical to Latin except NOLAPSE outranks NONFINALITY, its pitch-accent has several exceptional patterns. The default pitch-accent for lexical words is recessive, with high tone falling immediately before the stressed syllable. The exceptional patterns are pre-recessive (pólὲ)(ˈɔː)s ‘city GEN.SG’, progressive (sɔɔ)(téὲ)ra ‘savior’, oxytone (ou)(ˈranós) ‘sky’. Function words have two patterns: default proclitic pros ‘toward’, and exceptional enclitic ´ tis ‘someone’. We show that the exceptional cases are derived from the default by violations of one or more of the constraints required for the default recessive and proclitic cases.

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Military commands that are formed with pitch, rhythm, intonation

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The particular language register of military directives requires immediacy, power, and clarity. Pitch, rhythm, and intonation are prosodic characteristics that go beyond lexical choice and syntactic structure to significantly influence the pragmatic efficacy of directives in military settings. These suprasegmentally (prosodic) components improve the impact, immediacy, and comprehensibility of oral instructions, particularly in battle or high-stress scenarios when a misunderstanding might lead to catastrophic failure. This study investigates the ways in which pitch, rhythm, and intonation serve as fundamental pragmatic mechanisms in the perception and formulation of military directives, rather than only as phonetic characteristics. Pitch is used to convey authority and draw attention. In order to convey decisiveness and non-negotiability, commands like "Fire!" or its Uzbek counterpart, "O‘t och!" are usually given with a high, abrupt beginning followed by a dropping pitch contour (Roach, 2009). Similar to this, the English phrase "Move!" and the Uzbek phrase "Oldinga yur!" both use a sudden, abrupt drop in pitch to express urgency and direction. Conversely, rhythm helps with discipline and synchrony. To guarantee synchronized physical action, rhythmic orders such as "Left, right, left" or the Uzbek "Chap! O‘ng! Chap!" are timed exactly during drills. According to Ladd (2008), this rhythmic regularity promotes quick motor response, social bonding, and improved memory.

Emotional and functional weight are further added by intonation. To establish authority and eliminate uncertainty, a flat, clipped tone with minimal fluctuation is employed in both Uzbek and English. For example, the Uzbek order “Tashqi ko‘rinishni tekshir!” (“Inspect appearance!”) has a falling intonation that sets it apart from a query or suggestion. For a clear delivery, especially in multilingual military units or combat situations, the regulated melodic contour in both languages is essential. Prosodic characteristics of military speech, such as heightened amplitude, regular pitch drop, and well defined prosodic borders, appear to be universally understood signals of urgency and obedience, according to cross-linguistic studies. In addition to enhancing command effectiveness, these patterns have real-world uses in multilingual force coordination, AI voice command systems, and military training.

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Minimal word constraint in Turkish final devoicing

Basic pattern. Final devoicing in Turkish is more intricate a pattern than in other final devoicing languages (like German or Russian). Voiced fricatives never undergo this process (*kaz* "goose.Nom" - *kaz-ɨ* "id. Acc"). In bisyllabic (or bigger) roots, word-final voiced stops afford a regular 2-way distinction: voiced (always devoicing) (1a1) vs. voiceless (1a2). Monosyllabic CVC roots show a 3-way distinction, though: in addition to voiceless Cs (1b3), voiced final Cs may (1b1) or may not devoice (1b2). Whether or not a CVC root undergoes final devoicing cannot be predicted: it is a lexical property of roots (e.g. Inkelas 1995). As was noticed by Inkelas & Orgun (1995: 779), CVCC monosyllables side with bisyllables: they show the same 2-way distinction (1c). Thus Inkelas & Orgun conclude that Turkish final devoicing is governed by a size restriction. We propose an analysis of this size restriction.

Three-way contrast. Followed by other authors, Inkelas & Orgun (1995) analyze the three-way distinction between voiceless, devoicing and non-devoicing CVC roots in terms of Laryngeal Realism (Iverson & Salmons 1995), as under (2). We subscribe. Non-devoicing stops are phonologically specified as such and therefore cannot devoice (2a: they bear L (or [voice])). By contrast, devoicing stops are neutral consonants C° (2b), which are unspecified for voicing: they undergo passive voicing when intervocalic, otherwise are voiceless. Finally, voiceless stops are phonologically specified as such (2c: they bear H (or [spread glottis])) and therefore cannot be passively voiced.

Analysis. The size restriction identifies as a minimal word constraint: words in Turkish must make at least 3 morae (codas moraic) or, in terms of Strict CV, bear two nuclei (Final Empty Nuclei extrametrical). When spelt out by themselves (i.e. without suffixes), roots that are too small (3a1) geminate their final consonant in order to meet the minimal word size (3a2). This gemination uses epenthetic syllabic constituents (grey-shaded under 3a2). When a suffix is added, as under (3a3), the minimal word size is met and no gemination occurs. The non-devoicing of CVC roots is then a consequence of gemination: geminates do not devoice (reminiscent of geminate integrity). What geminacy protects against is the phonological alteration of the consonant. In regular L systems with final devoicing, the L is removed in word-final position by a phonological process. This is disallowed when the consonant is a geminate, thus devoicing is blocked (4a1). In roots that meet the minimal word size, though, the L may be happily removed since here the C^{L} is not a geminate (4a2). Neutral C° (4b) is phonologically unspecified: it will receive passive voicing upon phonetic interpretation when followed by a vowel in the Acc, otherwise is pronounced voiceless. In regular H systems with final devoicing, the phonetic interpretation of C° word-finally is voiceless. A geminate C° as under (4b) is a case in point: unlike under (2a)/(4a1), no prime needs to be removed in order to get final devoicing (2b)/(4b). The pronunciation of a geminate C° is voiceless due to phonetic interpretation, whether simple or geminate. Finally, nothing happens to C^{H} (2c): it is pronounced voiceless, whether singleton or geminate.

Geminates. Turkish has lexical geminates (3b1), which are pronounced singleton in word-final position, though: *ha[tt]-ɨ* (3b2) "line.Acc" - *ha[t]* (3b1) "id. Nom". Note that on our analysis size-driven gemination only occurs word-finally (3a2), where the geminate has the regular singleton pronunciation. Since the root-final C is not a geminate in the suffixed form (3a3), it is also a phonetic singleton here. Time permitting, we discuss suffix-initial stops.

Suffix-initial stops may either take on the voicing of the preceding segment (5a), or come with their own fixed voicing. In the latter case, stop clusters disagreeing in voicing are produced: [ʤk] under (5b1), [nʧg] under (5b2). If a C° were involved in clusters that disagree in voicing,

it should be passively voiced. Since this is not what we see, clusters disagreeing in voicing suggest that no C° is involved: both consonants are specified for voicing (C^HC^L or C^LC^H). Stops like in -tA / -dA, though, are C° unspecified for voicing. Thus the behaviour of voicing assimilation supports that Turkish contrasts three types of stops: C^L, C^H and C°.

(1) basic pattern

		Acc	Nom	gloss
a.	bisyllabic or bigger roots			
	1. voiced devoicing	kitɑb-ɨ	kitɑp	"book"
	2. voiceless	sepet-i	sepet	"basket"
b.	monosyllabic CVC roots			
	1. voiced devoicing	tɑd-ɨ	tat	"taste"
	2. voiced non devoicing	sɑʤ-ɨ	sɑʤ	"sheet metal"
	3. voiceless	top-u	top	"ball"
c.	monosyllabic CVCC roots			
	1. voiced devoicing	gɑrb-ɨ	gɑrp	"West"
	2. voiceless	ʧift-i	ʧift	"pair"

(2) laryngeal distinctions in Turkish

a.	C^L phonologically voiced	no devoicing	sɑʤ - sɑʤ-ɨ
b.	C° phonologically unspecified	devoicing	tɑt - tɑd-ɨ
c.	C^H phonologically voiceless	voiceless anyway	top - top-u

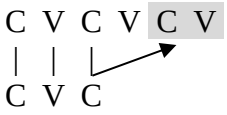
(3) subminimal CVC roots

a. derived geminate to meet word minimality

1. lexical

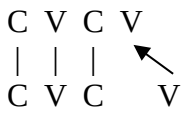
s ɑ ʤ

2. Nom



[sɑʤ]

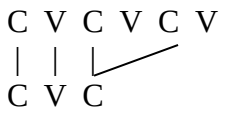
3. Acc



[sɑʤ-ɨ]

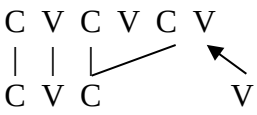
b. lexical geminate

1. lexical / Nom



[hɑt]

2. Acc

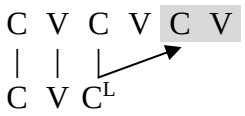


[hɑtt-ɨ]

(4) final devoicing as delaryngealization (C^L) vs. passive voicing (C°)

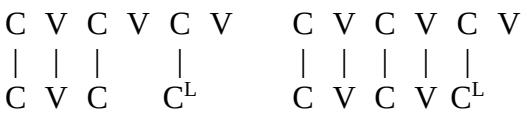
a. final C^L

1. subminimal roots



s ɑ ʤ

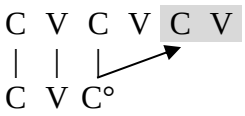
2. roots meeting the minimal size



g ɑ r b

k i t ɑ b

b. final C° subminimal roots



t ɑ t

(5) suffix-initial consonants

a. suffix-initial C agrees in voicing with the preceding C

	C-	Nom	Acc	-tA/-dA	gloss
-tA/-dA "locative"	C^L	sɑʤ	sɑʤ-ɨ	sɑʤ-dɑ	"sheet metal"
	C°	tɑt	tɑd-ɨ	tɑt-tɑ	"taste"
	C^H	top	top-u	top-tɑ	"ball"

b. suffix-initial C has fixed voicing

		C-	Nom	Acc	-ken	gloss
1. always voiceless	-ken "converb marker"	C^L	sɑʤ	sɑʤ-ɨ	sɑʤ-ken	"sheet metal"
		C°	tɑt	tɑd-ɨ	tɑt-ken	"taste"
		C^H	ɑʧ	ɑʧ-ɨ	ɑʧ-ken	"hungry"

		C-	Nom	Acc	-gil-ler	gloss
2. always voiced	-gil-ler "as a whole"	C^L	turunʧ	turunʤ-u	turunʧ-gil-ler	"citrus"
		C°	tɑt	tɑd-ɨ	tɑt-gil-ler	"taste"
		C^H	ʒet	ʒet-i	ʒet-gil-ler	"jet"

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Modeling biases, learning, and sound change: coarticulatory to allophonic nasalization

Cross-linguistically, nasal contrasts are more common for low vowels than high vowels, e.g. Amuzgo contrasts [a] and [ã], but has no nasal counterpart to [i] (Kingston, 2007). Parallels found in phonetics experiments are hypothesized as causes of the difference (e.g. Henderson, 1984; Whalen & Beddor, 1989). While explaining the typological frequency of phonetically-motivated phonological patterns is an active research area (Blevins, 2004; Garrett & Johnson 2011; Glewwe, 2022; Flemming, 2005; Ohala, 1981), less is known about the input distribution properties required for learners to innovate new allophonic or contrastive categories and how they interact with perception and production effects. Using nasal vowel contrasts as a case study, I implement the experimental phonetic height and nasality effects within a computational category learning and sound change model, generating new empirical predictions for hypothesized phonetic influences on the typology of contrasts.

One hypothesized phonetic cause is that low vowels are produced with a lower velum (associated with nasality) than high vowels (e.g. Henderson, 1984). Contrastive vowel nasalization has been assumed to develop first from nasal vowel allophony (*a → a and *an → ãn) and then consonant loss (*a → a and *ãn → ã) (Hajek, 1997; cf. Beddor, 2009). For nasal contrasts to be more common for low than high vowels, these changes would need to be more likely for low vowels. However, it remains unclear how this hypothesized phonetic cause would achieve this difference in likelihood at the level of individual learners.

To further specify the hypothesized phonetic cause (Henderson, 1984), I implement it alongside a Mixture of Gaussians (MOG) model of sound category learning and sound change (cf. Kirby, 2013; Gubian et al., 2023). A MOG learner searches for the set of categories that maximizes the likelihood of its input data, which is a set of uncategorized vowel tokens (Fig. 3). A Dirichlet process prior allows the learning of any number of categories, with a pressure for fewer. Generations are modeled with a parent MOG and a child MOG. The child's learning input consists of the parent's productions: noisy samples from the parent's categories. Nasal allophony arises in this model when vowels neighboring different consonants split into two categories, a nasal and an oral allophone (Fig. 2). Because of noise in the child's input, it can learn different categories from the parent. The less overlap between vowel distributions, the more likely they'll be learned as separate categories (cf. Feldman 2013). If a phonetic effect causes more low nasal contrasts, then adding it to the learning data should make MOG more likely to split low vowels into oral and nasal categories.

To implement the production bias identified by Henderson (1984), who found greater nasality for low vowels regardless of consonant context, the parent generation's intended low vowels are all shifted toward greater nasality. However, Fig. 3 demonstrates that even with greater nasality, splitting into oral/nasal allophones is *not* more likely for low vowels given MOG, because the degree of distributional overlap is unchanged. This result informs further study into the amount of distributional overlap between nasal and oral consonant contexts for low versus high vowels' (not the focus of the existing experimental work) as well as further detail on the mechanisms by which individual learners innovate sound categories.

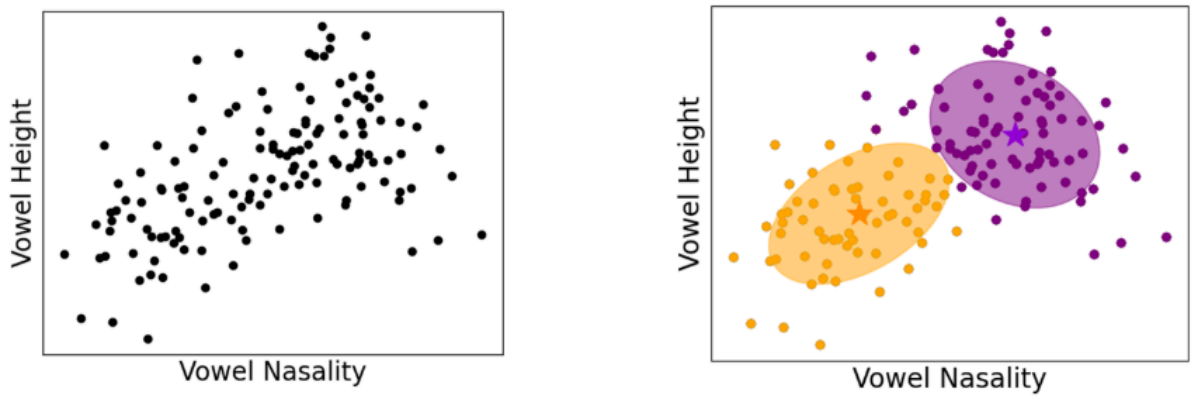

Figure 1. Example MOG uncategorized input (left) and categorized output (right). Categories are Gaussian distributions. Each point represents a vowel token defined by two dimensions, F1 and nasality. "Nasality" is abstracted here, but could be quantified by a perceptual scale (Whalen & Beddor 1989) or velar port measurements as in (Henderson 1984).

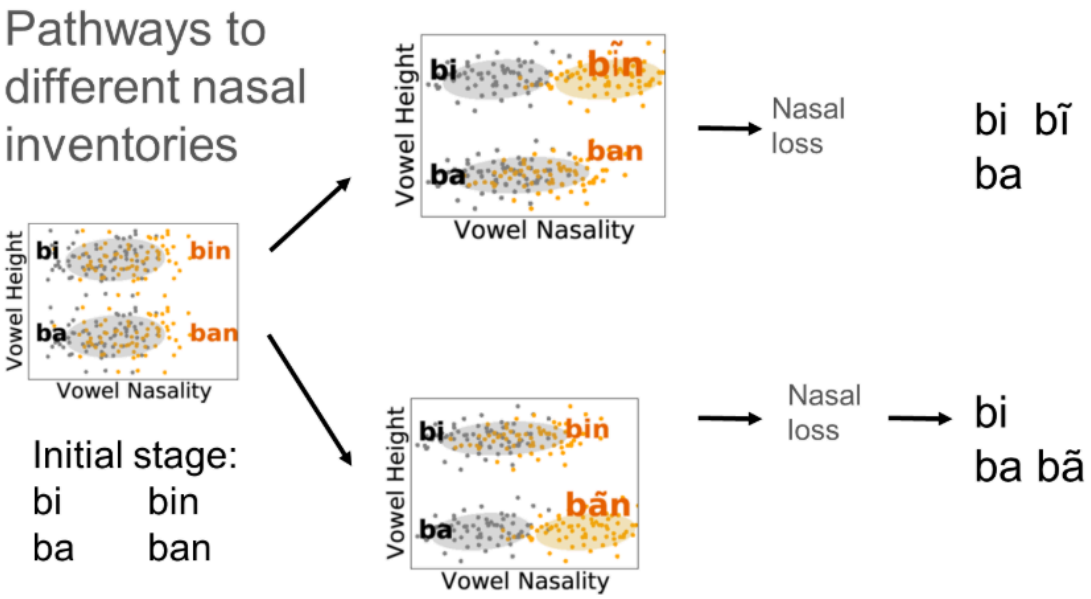

Figure 2. Example with a toy lexicon, showing progression of nasal coarticulation (slightly more nasality in [ban] than [ba]) leading to separate nasal/oral allophone categories (e.g. ba vs bãn), with consonant deletion assumed to happen afterward. In this model, there is no implemented phonetic effect, so the development of allophony is equally likely for high and low vowels.

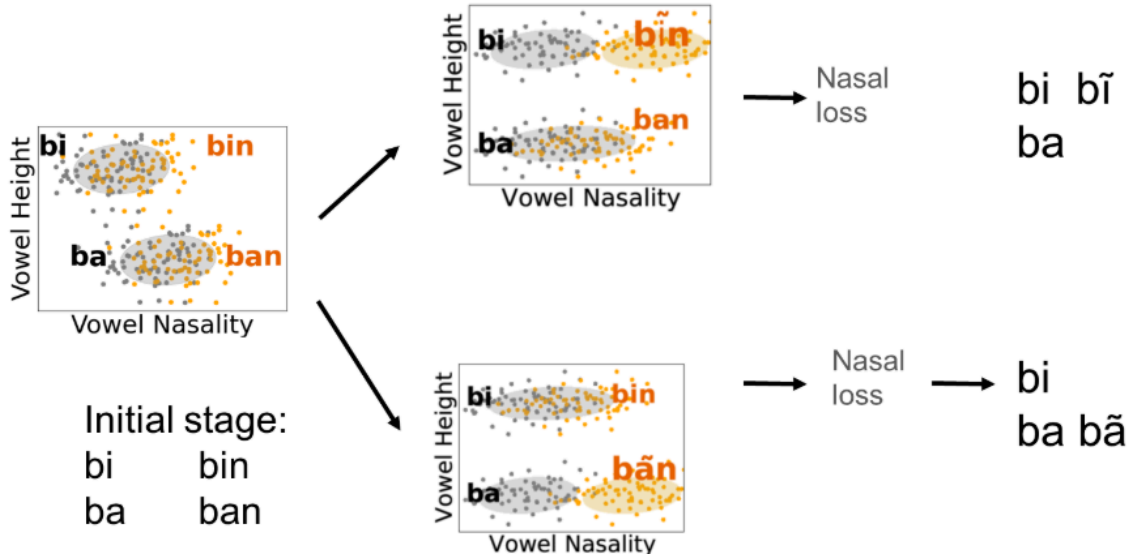

Figure 3. Illustration of how low vowels' greater nasality (compare the initial stage in Figure 2 and this figure) does not change the degree of overlap in low vowels' nasal and oral distributions, and thus does not change the predicted likelihood of developing nasal allophony for low vowels when assuming MOG learning.

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Modeling Mandarin Phonotactics: Categorical vs. Gradient Approaches

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I carried out a nonword acceptability judgement experiment using Mandarin data to compare 3 models of grammars (a-c) with 2 approaches to defining constraints (manual & data-driven) to find the one which can best reflect speakers' phonotactic intuitions. Thus 6 grammars (3 models* 2 approaches) are discussed: (a) categorical grammars: forms are assessed on whether they have a constraint violation or not; (b) cumulative categorical grammar: forms are assessed based on the number of violated constraints; (c) gradient grammar: forms are assessed based on the weight of violated constraints as determined by Hayes & Wilson's Maxent Grammar Tool and on penalty scores generated by a Phonotactic Learner (Hayes & Wilson, 2008).

My research questions are: (i) Is a gradient grammar more or less predictive of speakers' grammaticality judgements than a categorical grammar? (ii) Is a gradient grammar derived from the Phonotactic Learner ("data driven") more or less predictive of speakers' grammaticality judgements than one derived manually ("phonologically driven")? Gong & Zhang (2019) carried out a Mandarin nonword judgment experiment and found that systematic gaps received lower acceptability ratings than accidental gaps, allophonic gaps and tonal gaps. The present experiment builds on Gong & Zhang (2019) and further divides the systematic gaps based on the number of constraints each token violates, the weight of the violations, and the penalty score.

Methods: ***Participants:*** 50 Mandarin native speakers participated in this experiment online via Qualtrics. ***Stimuli:*** The stimuli include 1255 (C)(G)V(X) syllables in Mandarin, among which 400 are attested (Tsai, 2000). ***Procedures:*** Each participant was presented with 81 randomized audio tokens with 0-5 constraint violations. After listening to each recorded token, the participants rated the acceptability of each syllable on a scale of 1 (完全不可能 "impossible) to 7 (完全可能 "definitely possible). **Data Analysis:** Five factors for acceptability ratings (z scores) are included: (1) syllable type: attested, accidental gap, systematic gap; (2) number of constraint violations based on phonological generalizations ("no"); (3) weight of violated constraints based on phonological generalizations ("weight"); (4) number of constraint violations generated in the Phonotactic Learner ("plno"); (5) penalty score generated by the Phonotactic Learner ("penalty").

Discussion & Summary: Compared to other factors, the effect of syllable types on acceptability ratings stands out ($p < 0.001$). Neither categorical grammar can explain the gradient decreasing tendency among the ratings of the "more grammatical" syllables (threshold: no≤2, weight<10, plno<10, penalty<10), as the number of violations, violation weight, and penalty increase. In contrast, both the cumulative categorical grammars and the gradient grammars predict the negative correlation between the ratings and the factors for all syllables. The predictions from both the manually-constructed grammars and machine-driven grammars are only partially accurate, because the ratings of the highly ungrammatical nonwords are indistinguishable from each other. In summary, cumulative categorical grammars and gradient grammars are better at predicting "more grammatical" syllables, but categorical grammars can account for highly ungrammatical nonwords.

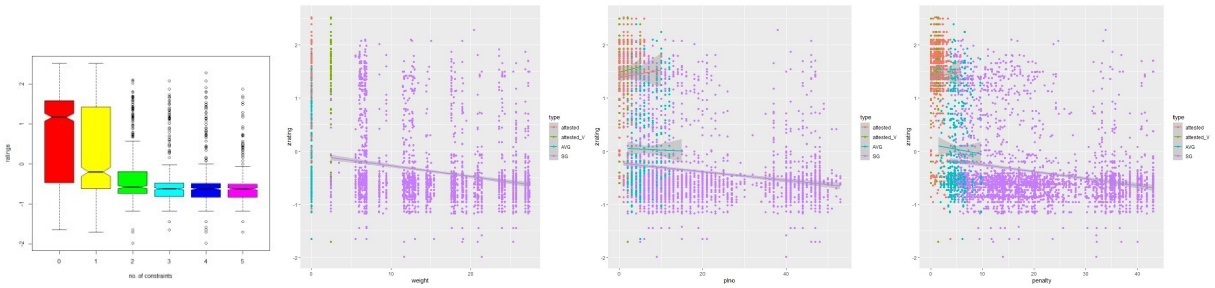

Figure 1. Effect of factors (no, weight, plno, penalty) on syllable acceptability ratings

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Moraic Suffixation in Rushan Mandarin

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Background Rushan Mandarin is spoken in the eastern area of Shandong province in China. It is an East Lai dialect that belongs to the Denglian branch of Jiaoliao Mandarin (Qian et al., 1985). Rushan has only three tones, in contrast to the more common four-tone systems in other Mandarin dialects. Its nominal categorizer and durative aspect are homophonous with multiple phonetic exponents that are predictable from the base ending segments.

Data description They are realized as a schwa by default (tsʰa 'to wipe', tsʰa-ə 'eraser; wiping'), but acquire a (labial) nasal or a glide onset when the base ends with an alveolar nasal or a high vowel respectively, (jin 'to lead', jim-mə 'yeast; leading'; tei 'to face', tei-jə 'couplet; facing'), or become nasalized if the base ends with a velar nasal (kʰuŋ 'empty', kʰũ-ə̃ 'loophole; keep empty').

Analysis Compared with the related dialects which assume -tə in Muping, -rə in Yantai, -lə in Yazi county, but -tsɿ in other dialects, Rushan stands as a phonologically reduced variant that is not only reduced in vowel, but also lacks an independent onset segment. I propose a moraic suffix analysis couched in Optimality Theory (Prince & Smolensky, 1993) to account for the phenomenon.

Due to the higher ranked faithfulness constraint Max_{μ} that an input mora must have an output correspondent, the mora suffix must be phonetically substantialized. It cannot simply lengthen the base vowel because of the maximality constraint on the quantity of syllable, *σ>2μ, a syllable cannot have more than two moras. Combined with the constraint ranking of DEP >> ONSET, the suffix mora projects its own syllable and obtains an onset from the base coda, a nasal or a glide, by gemination. Since velar nasal is prohibited from the syllable onset position, $*_{\sigma}$[ŋV, it is deleted after nasalizing the base vowel, and the nasal feature spreads to the suffix in a prosodic word.

What remains unexplained is the labial feature of the nasal onset in the moraic suffix when the base ends with an anterior nasal coda. The expected gemination output of an anterior nasal onset is indeed attested in nearby dialects such as Haiyang and Fushan, tsian-nə 'scissors'. The variation in Rushan might result from reanalysis in language acquisition. Evidence awaits to be provided.

Conclusion The case study of morpho-phonology interaction in Rushan Mandarin exemplifies how an autosegmental morpheme can provide a unified account for the multiple exponents of a suffix. As a floating underspecified autosegmental unit, the suffix mora gains its phonetic content through well-formedness constraints on the prosodic structures of the morphological output, which falls in line with research assuming the scheme of Generalized Non-linear Affixation (Bermúdez-Otero, 2012).

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Morphological effects in phonological change: The shift from trapped to syllabic liquids in Czech

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This paper investigates how morphological complexity influences phonological change. We examine the historical development of trapped liquids (L) in Czech, which arose from the loss of weak jer vowels (ь/ъ) in Proto-Slavic (Bethin, 1998), as shown in (1).

(1)	Late Proto-Slavic		Old Czech	
a. CL(ь/ъ)C > CLC	slь.za, krъ.ty	>	slza, krty	‘tear; moles’
b. CL(ь/ъ)# > CL#	my.slь, vět.rъ	>	mysl, vietr	‘mind; wind’

Trapped Ls violate the SSP (Zec, 1995), which explains their typological markedness and their repairs in Czech such as cluster simplification (*se*[dlk]*a* > *se*[lk]*a* ‘female farmer’) and vowel epenthesis ([blx]*a* ‘flea’ > [blex]*a* ‘flea’).

In this paper, we focus on the lest invasive repair strategy, where the segmental string is preserved but its prosodic structure changes, as trapped Ls are reanalyzed as syllabic. We argue that the historical change in (2), where originally monosyllabic words became bisyllabic, occurred in two stages and was conditioned by morphological structure.

(2)	Old Czech		Modern Czech	
a. CLC > CL$_\sigma$C	slza, krty	>	sl$_\sigma$.za, kr$_\sigma$.ty	‘tear; moles’
b. CL# > CL$_\sigma$#	mysl, vietr	>	my.sl$_\sigma$, vie.tr$_\sigma$	‘mind; wind’

Our analysis is based on a corpus study of texts written between the 14th and 16th centuries. These texts contain over 23,000 syllable-based verses, from which we extracted 662 tokens with original trapped Ls. To distinguish trapped from syllabic Ls, we use a simple diagnostic: if the L does not contribute to verse rhythm, it is trapped; if it does, it is syllabic.

The corpus results are summarized in Tables 1–3, showing the distribution of trapped and syllabic Ls across three centuries. Table 1 indicates a gradual shift from trapped to syllabic Ls in word-final position. However, this process remained incomplete in the 16th century, with 61% of tokens still trapped. Table 2 shows a similar trend in heteromorphemic word-medial CLC structures, where Ls occur at the boundary before a consonant-initial suffix.

	trapped CL#		syllabic CL$_\sigma$#	
century	tokens	proportion	proportion	tokens
14th	112	94%	6%	7
15th	138	91%	9%	13
16th	65	61%	39%	41

Table 1: CL# > CL$_\sigma$#

	trapped CL-C		syllabic CL$_\sigma$-C	
century	tokens	proportion	proportion	tokens
14th	11	100%	0%	0
15th	52	96%	4%	2
16th	33	65%	35%	18

Table 2: CL-C > CL$_\sigma$-C

While morphologically complex CLC structures pattern with word-final CL# sequences, root-internal trapped Ls show a different tendency. Table 3 indicates their shift to syllabic Ls is already attested in the 14th century and appears complete by the 16th. In sum, our corpus study shows that morphological complexity affects the shift from trapped to syllabic Ls.

Specifically, morphologically complex CL-C forms like *smysl-ný* 'wise' behave like word-final CL# (*smysl* 'reason'), showing a slower change than simplex forms like *slz-a* 'tear'

	trapped CLC#		syllabic $CL_{\sigma}C$#	
century	tokens	proportion	proportion	tokens
14th	24	63%	37%	14
15th	27	50%	50%	27
16th	0	0%	100%	27

Table 3: CLC > $CL_{\sigma}C$

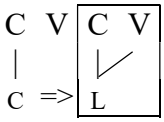
The pattern whereby suffix and word boundaries trigger the same phonological effects is widely attested cross-linguistically and is effectively accounted for in Strict CV (Lowenstamm, 1996; Scheer, 2004; Newell, 2021), as both C# and C-C configurations are unified through an empty, domain-final V-slot: $CV_{Ø}$(-C). Based on this structural unification, we explain a diachronic development revealing a parallel between CL-C and CL# on one hand, and a contrast between CL-C and monomorphemic CLC on the other. Both types of CLC involve an empty $V_{Ø}$ after the liquid ($CLV_{Ø}C$), either domain-final (as in *smysl*$V_{Ø}$*-ný*) or domain-internal (as in *sl*$V_{Ø}$*z-a*). From this perspective, the shift from trapped to syllabic Ls occurred more rapidly before domain-internal $V_{Ø}$, and only later before domain-final ones.

To account for the change from trapped to syllabic Ls, we adapt Cyran's (2010) proposal that consonant clusters must be licensed by a following V-slot, and that different structural V-slot types form a universal scale. We assume the scale in which full V-slots are default licensors (as proposed by Cyran), and empty $V_{Ø}$ are divided into two subtypes: full V>final $V_{Ø}$>internal $V_{Ø}$. We argue that the gradual elimination of trapped Ls follows this scale.

Originally, i.e., after the loss of weak jers, all three licensor types were employed in Czech, a situation still attested in contemporary Polish. Gradually, however, the scale was reduced: first, the most marked internal $V_{Ø}$ lost the ability to license CL clusters (V>final $V_{Ø}$>~~internal $V_{Ø}$~~), and later, the less marked final $V_{Ø}$ lost their licensing ability as well (V>~~final $V_{Ø}$~~>~~internal $V_{Ø}$~~).

The syllabic Ls that replaced unlicensed trapped Ls represent a repair strategy, as illustrated in Figure 3. We adopt the Strict CV view that syllabic consonants branch into the adjacent V-slot: specifically, the following one (Rowicka 2003; Scheer 2009). This branching provides a full V-slot, which became the only licensor available for CL clusters in Czech.

(3) CL_{σ}



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Morphological Lengthening in Eastern Nuer Targets Both Consonants and Vowels

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This talk examines morphologically conditioned consonant gemination in the Eastern Nuer dialect (Jikany), a phenomenon previously unreported for this variety. While Western Nuer dialects exhibit rich morphophonological alternations involving consonantal manner and phonation features, Eastern Nuer has been described as lacking comparable consonantal alternations (Gjersøe 2019, Reid 2019, Monich 2020, 2023). I show, however, that Eastern Nuer instead displays subtle but systematic patterns of consonantal gemination – a development likely influenced by contact with neighbouring Anywa which also displays morphological gemination, though with notable differences in its distribution (Reh 1999). This talk thus contributes to the typology of how morphology can manipulate prosodic structure.

Using instrumental data, I demonstrate that the root-final consonant (C_2) undergoes gemination in specific morphological contexts. Drawing on several phonetic cues to vowel length – including segmental duration and the realization of glides and diphthongs – I show that while Nuer exhibits a three-way contrast in vowel length (short, long, overlong), gemination occurs only after short root vowels. For example, in singular transitive forms with a short vowel, the average duration of C_2 is 110 ms, compared to just 77 ms in forms with long vowels.

Crucially, the contrast in consonantal duration is not a phonetic byproduct of the vowel length contrast. Rather, it reflects a morphologically conditioned gemination process. Short vowels are not uniformly followed by geminated consonants: in applicative forms such as ***nɪ̤́k-ɪ̀*** "kill.APPL-2SG", gemination does not occur. In contrast, gemination is obligatory in singular transitive forms of short roots and in shortened frequentative forms, as in ***nɪ̤̄kk-ɪ́*** "kill.TR-2SG"; ***bʌ̤̀ll-ɪ́*** "jump.FREQ-2SG" (from the root *bʌ̤:l-* "jump over"). These patterns confirm that consonantal gemination is a morphological phenomenon.

An especially striking pattern emerges in the formation of the antipassive stem. In short roots with a modal vowel and a non-sonorant C_2, the antipassive involves both vowel quality mutation (*i*-mutation, which introduces breathiness and a [+ATR] feature) and consonant gemination: *pat-* "slap" → ***pɪ̤̄tt-ɪ́*** "slap.AP-2SG". In contrast, roots with a breathy vowel and/or a sonorant C_2 undergo *i*-mutation and vowel lengthening without consonant gemination: *pal-* "pray" → ***pɪ̤̀:l-ɪ́*** "pray.AP-2SG", *pʌ̤t-* "graze" → ***pɪ̤̀:t-ɪ́*** "graze.AP-2SG". Thus, depending on the segmental properties of the root, antipassive stem formation involves either consonant lengthening accompanied by vowel quality change, or vowel lengthening without it.

I propose that gemination arises from the association of C_2 with a mora made available in the course of a morphological operation. This may occur either (i) through the affixation of a floating mora to a root with a short vowel, or (ii) via the reassociation of a mora vacated by morphologically induced vowel shortening. The affixation of a floating mora is particularly intricate, as its outcome depends on whether it associates with the vowel (resulting in vowel lengthening) or with the consonant (resulting in gemination). The choice between these outcomes is conditioned by the segmental properties of the vowel and C_2, as well as by the nature of the vowel mutation involved e.g., *i*-mutation vs. *a*-mutation).

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Morphological stød alternations in Danish

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The distribution of the prosodic phenomenon called *stød* in Danish depends in part on morphological context (Basbøll, 2005; Itô & Mester, 2015; Goldshtein, 2023; Schachtenhaufen, 2023). This study investigates the occurrence of stød in nonce words in order to determine the contribution of individual suffixes and morpheme combinations to the distribution of stød. When real morphemes are combined with nonce stems, the occurrence of stød cannot be due to lexicalized forms or lexical marking on the stem and so it becomes easier to determine the contribution of the affixes.

The focus of this study is the suffixes *-er* [ɐ] (present tense) and *-er* [ɐ] (nomen agentis), in simple forms as well as in the second member of compounds, where the first member is either a preposition or a noun. The distribution of stød in these forms is charted in Table 1, together with imperative and infinitive forms. These examples show the contrast between nomen agentis *-er* (no stød) and present tense *-er* (sometimes stød) in simple forms. The contrast disappears in the second part of a compound, if the first part is a preposition. If the first part of the compound is a noun, there is variation between obligatory stød, facultative stød and no stød (Brink & Lund, 1975).

The patterning makes it interesting to investigate speakers' assignment of stød in nonce stems in the following morphological contexts: 1) present tense, 2) nomen agentis, 3) compounds with preposition + present tense, 4) compounds with preposition + nomen agentis, 5) compounds with noun + present tense, and 6) compounds with noun + nomen agentis. A production task was designed where participants read nonce words such as *smeser, modsmeser* (with the preposition *mod* 'against/towards) and *håndsmeser* (with the noun *hånd* 'hand') in sentences where they appear as either a verb in present tense or a derivation of a verb with nomen agentis. The prepositions and nouns in the compounds are thus real words. The participants read sentences with 24 different nonce stems occurring once in each morphological context, i.e. 144 sentences on total, as well as a list with the infinitive forms of the nonce words.

If stød is assigned by categorical rules or constraints triggered by specific morphological contexts or word structures, the expected result is that nonce stems in specific morphological contexts, e.g. present tense or nomen agentis, either always or never receive stød. However, previous studies indicate that speakers' knowledge of language reflects trends in their lexicon (e.g. Coleman & Pierrehumbert, 1997; Frisch et al., 2000; Zuraw, 2000; Albright & Hayes, 2003; Ernestus & Baayen, 2003; Hayes & Londe, 2006; Pierrehumbert, 2006; Coetzee & Pater, 2008; Alderete & Finley, 2016; Lau et al., 2017). If the participants assign stød based on the distribution of stød in the same morphological contexts in the lexicon, it is predicted that there will be variation within the same morphological context, with for example nonce verbs in present tense sometimes, but not always, being pronounced with stød. Data collection and analysis is currently ongoing. Preliminary results will be presented at the conference.

Table 1: The occurrence of stød in different morphological contexts. Gray shaded cells have stød, light gray shaded cells have facultative stød and white cells do not have stød.

Not compound			
Imperative	Infinitive	Present tense *-er*	Nomen agentis *-er*
løb [ˈlø:ˀp] ‘run’ *send* [ˈsɛnˀ] ’send’	*løbe* [ˈlø:pə] ‘run’ *sende* [ˈsɛnə] ’send’	*løber* [ˈlø:ˀpɐ] ‘run’ *sender* [ˈsɛnɐ] ’send’	*løber* [ˈlø:pɐ] ’runner’ *sender* [ˈsɛnɐ] ’sender’
Compound with preposition			
Imperative	Infinitive	Present tense *-er*	Nomen agentis *-er*
udløb [ˈuðˌlø:ˀp] ‘expire’ *indsend* [ˈenˌsɛnˀ] ‘send in’	*udløbe* [ˈuðˌlø:ˀpə] ‘expire’ *indsende* [ˈenˌsɛnˀə] ‘send in’	*udløber* [ˈuðˌlø:ˀpɐ] ‘expire’ *indsender* [ˈenˌsɛnˀɐ] ‘send in’	*udløber* [ˈuðˌlø:ˀpɐ] ‘offshoot’ *indsender* [ˈenˌsɛnˀɐ] ‘submitter’
Compound with noun			
Imperative	Infinitive	Present tense *-er*	Nomen agentis *-er*
håndhæve [ˈhɒnˌhɛʊˀ] ‘enforce’	*håndhæve* [ˈhɒnˌhɛʊˀʊ] ‘enforce’	*håndhæver* [ˈhɒnˌhɛʊˀɐ] ‘enforce’	*håndhæver* [ˈhɒnˌhɛʊˀɐ] ‘enforcer’
støvsug [ˈstøʊˌsu:ˀ] ’vacuum’	*støvsuge* [ˈstøʊˌsu:⁽ˀ⁾u] ’vacuum’	*støvsuger* [ˈstøʊˌsu:ˀɐ] ’vacuum’	*støvsuger* [ˈstøʊˌsu:⁽ˀ⁾ɐ] ’vacuum cleaner’
			skiløber [ˈskiˌlø:pɐ] ‘skier’ *nødsender* [ˈnøðˌsɛnɐ] ‘emergency transmitter’

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Morphologically specific constraints are learned over general for Arabic OCP

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Introduction. In many languages, phonological constraints can be sensitive to the morphological domain in which they apply (Paster 2013). However, morphologically specific patterns have been argued to be difficult to learn because learners are biased towards general, morphologically insensitive constraints. One piece of evidence is that restrictions which apply across morphemes but not within, known as morphologically derived environment effects, are severely underlearned in the laboratory (Chong 2017). Additional support for this bias comes from studies on morpheme-bounded patterns, where a constraint applies within morphemes but not across (Gallagher et al. 2019). For example, Martin (2011) argues on the basis of evidence from the lexicon that, because of this bias, a within-morpheme anti-geminate constraint in English "leaks" and additionally applies across morphemes, albeit with weaker strength.

Here I investigate another reported morpheme-bounded pattern, Arabic OCP, where co-occurrences of consonants with similar places of articulation are restricted within roots, e.g., *[mabak], cf. [ma+bruuk] 'blessed' (Greenberg 1950, Pierrehumbert 1993, Frisch & Zawaydeh 2001). I examine (a) whether leakage of OCP into across-morpheme contexts is found in the Arabic lexicon and (b) crucially, whether native speakers' nonce word judgments provide any evidence for a general bias that also extends across morphemes. The latter is predicted if learners are biased towards morphologically insensitive constraints.

Lexicon study. Within- and across-morpheme consonant bigram counts were obtained from the Maknuune Palestinian Arabic lexicon (Dibas et al. 2022; 17,000 lemmas), and analyzed using Maximum Entropy harmonic grammar (Hayes & Wilson 2008). A model with both root-internal and morphologically-general OCP constraint (**Table 1**) yielded significantly better likelihood than a model with only root-internal OCP ($p < 0.001$). This is evidence that OCP restrictions leak into across-morpheme contexts.

Nonce word judgment. Next, 50 native Arabic speakers were recruited through Prolific and asked to rate the goodness of nonce words as words of Arabic on a scale of 0-100 (0 is worst). A list of 90 stimuli was created by combining nonce consonantal roots with two prosodic templates, ta+$C_1aC_2C_2uC_3$ (verbal noun of Form V verbs) and mu+$C_1aC_2C_2iC_3$ (active participle of Form II verbs). Each stimulus contained a) consonant bigrams with no OCP violation (e.g., [ta+bassuʕ]), b) a between-morpheme OCP violation (e.g., [ta+daffuʕ]), or c) a within-morpheme OCP violation (e.g., [ta+baffuʕ]). Their z-transformed ratings were analyzed with Bayesian mixed effects models. As shown in **Figure 1**, stimuli with within-morpheme OCP violations were rated lower than those with no OCP violations ($\beta = -0.07$, 95% CrI [-0.15, 0.01], $p(\beta<0) = 0.96$), but stimuli with between-morpheme OCP violations were not ($\beta = -0.00$, 95% CrI [-0.07, 0.07], $p(\beta<0) = 0.54$). That is, Arabic speakers learned OCP as a morpheme-bounded restriction with no leakage into across-morpheme contexts.

Discussion. I have shown experimental evidence that Arabic speakers have learned OCP as a strictly morpheme-bounded pattern; leakage effects exist in the lexicon but are not internalized by speakers. That is, Arabic speakers only learned a constraint that applies morpheme-internally but not a general one, despite evidence for both in the lexicon. These new results challenge Martin's (2011) account where leakage effects are the result of a learning bias for general constraints. I will discuss alternative accounts for leakage effects and the implication of these results for other proposals (Chong 2017) which use this bias for general constraints.

	n	*m- ROOT w = 1.2	*m- AFFIX w = 0	*b- ROOT w = 0	*ʕ- ROOT w = 0.3	…	OCP- WITHIN MORPHEME w = 1.6	OCP- GENERAL w = 0.6	H
mb	0	1		1			1	1	3.4
mʕ	22	1			1				1.5
m+b	96		1	1				1	0.6
m+ʕ	116		1		1				0.3
…									

Table 1. A segment from the Maximum Entropy harmonic grammar with both within-morpheme and general OCP constraints. The data is consonant bigram counts from the Maknuune lexicon. Unigram constraints accounted for segmental frequencies in roots and affixes (a subset shown).

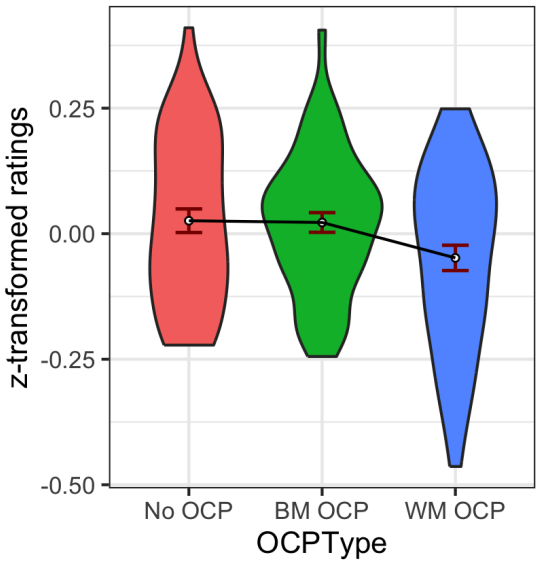

Figure 1. z-transformed ratings by the type of OCP violation: No OCP, between-morpheme (BM) OCP, and within-morpheme (WM) OCP

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Native phonology shapes the perception of non-native voicing contrasts: an experimental study

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This study investigates how speakers of languages with different laryngeal-contrast systems perceive voicing distinctions. To this end, we selected Czech (CZ) and Taiwanese Mandarin (TM) as representative languages with distinct laryngeal properties. In CZ, obstruents are organized into voiced-voiceless pairs such as [p] vs. [b] in [p]*uk* 'crease' vs. [b]*uk* 'beech' (Skarnitzl, 2013). In contrast, TM features an aspirated-unaspirated contrast (e.g. [p] vs. [pʰ] in [p]*ei* 'cup' vs. [pʰ]*ei* 'embryo') rather than a voicing contrast (Třísková, 2011). As voicing is not part of TM's phonological system, this absence is expected to present difficulties for TM speakers perceiving CZ voiced-voiceless distinctions, as suggested by previous research (e.g. Alharbi et al.2020; Bohn et al., 2012; Fokese et. al., 1991; Chaursiya et al., 2022).

To investigate how well native speakers of TM can distinguish CZ voicing pairs, we designed a perceptual experiment. Our main predictions were that native speakers of CZ would perform without difficulty; that TM speakers who have studied CZ would outperform those with no prior exposure; and that additional factors might influence participants' performance. The experiment included 3 participant groups differing in knowledge of CZ: native CZ speakers, native TM speakers with some knowledge of CZ, and native TM speakers with no knowledge of CZ (or any language displaying voiced-voiceless contrast). All 3 groups performed the same perceptual experiment using a go/no-go task design, in which participants pressed a key when they detected a 'go' signal (voiced phoneme) among other 'no-go' signals (voiceless phonemes) (Fig1).

The experiment tested 3 CZ minimal pairs representing the voicing contrast: [t] vs. [d], [p] vs. [b], and [c] vs. [ɟ] (voicing among plosive is more consistent compared to fricatives). A total of 15 stimuli were used (5 items per pair). Tab1 shows that each pair was represented by 1 syllable, 2 real CZ words, and 2 nonce words. For data analysis, we used two binomial GLMM models to assess the relevance of different variables (Tab3, Tab4).

The key findings are that native CZ speakers were highly accurate in detecting voicing contrasts, while TM speakers struggled with the task. The data reveal no statistically significant difference between the performance of TM speakers with some knowledge of CZ and those without, while both groups performed significantly worse than native CZ speakers (Tab2, Fig2). This suggests that the perception of voicing contrasts is shaped by the listener's phonological system, not solely by the acoustic salience of the cues. The results also suggest that voicing detection is influenced by place of articulation (most difficult for labials) and consonant position within the word (initial position being harder). No lexical effect was detected, indicating that participants' responses were based primarily on phonetic/phonological cues.

The experiment confirmed that the phonological system acquired through one's native language (aspiration) affects the ability to detect contrasts not present in the language (voicing), even when later encountered through exposure to a second language. Perception was also influenced by consonant position (initial/medial) and place of articulation.

Figure 1: Go/no-go task design

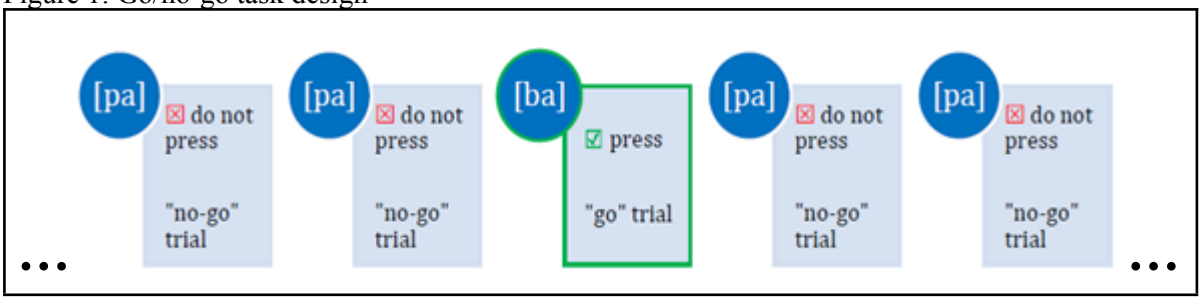
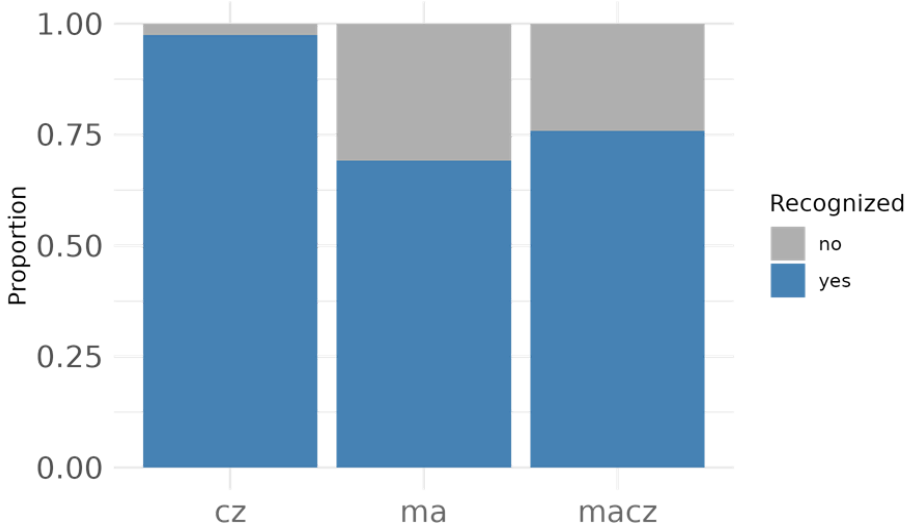


Table 1: Tested items							
item		**meaning**		**phoneme pair**		**position in the word**	**real CZ word**
tomu	*domu*	that.DAT.SG	house.GEN.SG	[t]	[d]	initial	yes
boty	*body*	shoe.NOM.PL	point.NOM.PL	[t]	[d]	middle	yes
taso	*daso*	nonce word	nonce word	[t]	[d]	initial	no
mato	*mado*	nonce word	nonce word	[t]	[d]	middle	no
ta	*da*	nonce word	nonce word	[t]	[d]	initial	no

Glossary: cz (native CZ speakers), ma (native TM speakers without exposure to voicing language), macz (native TM speakers with exposure to CZ), long (bisyllabic stimuli), short (monosyllabic stimuli), existent (existing word in CZ), non-existent (nonce word in CZ)

Table 2: Number of non-recognitions by type of speaker out of 900 responses				
type of speaker	cz	macz	ma	SUM
non-recognition	7	68	85	160

Figure 2: Recognitions by type of speaker (cz vs ma vs macz)



GLMM: Logistic regression predicting recognition from Czech proficiency, phoneme pair, word length, existence of the word, and other predictors

Table 3: Czech proficiency (reference: [macz], [p-b], [initial], [existent])

	Recognition (yes = 1)			
Predictors	*OR*	*SE*	*95% CI*	*p-value*
(Intercept)	1.37	0.38	0.00 – Inf	0.253
cz level [cz]	14.19	6.83	0.00 – Inf	**<0.001**
cz level [ma]	0.68	0.19	0.00 – Inf	0.168
phoneme [t-d]	1.69	0.42	0.00 – Inf	**0.036**
phoneme [c-ɟ]	2.02	0.52	0.00 – Inf	**0.006**
position [middle]	2.49	0.54	0.00 – Inf	**<0.001**
existence [non-existent]	1.25	0.26	0.00 – Inf	0.295
Random Effects				
σ^2	3.29			
$\tau_{00\ speaker}$	0.29			
ICC	0.08			
$N_{speaker}$	60			
Observations	720			
Marginal R^2 / Conditional R^2	0.373 / 0.424			

Table 4: Czech proficiency (initial pos. only, non-existent) (reference: [macz], [p-b], [short])

	Recognition (yes = 1)			
Predictors	*OR*	*SE*	*95% CI*	*p-value*
(Intercept)	7.20	2.87	0.00 – Inf	**<0.001**
length [long]	0.21	0.07	0.00 – Inf	**<0.001**
cz level [cz]	10.63	6.29	0.00 – Inf	**<0.001**
cz level [ma]	0.51	0.18	0.00 – Inf	0.052
phoneme [t-d]	0.89	0.31	0.00 – Inf	0.729
phoneme [c-ɟ]	2.35	0.91	0.00 – Inf	**0.027**
Random Effects				
σ^2	3.29			
$\tau_{00\ speaker}$	0.20			
ICC	0.06			
$N_{speaker}$	60			
Observations	360			
Marginal R^2 / Conditional R^2	0.418 / 0.452			

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Neutralisation in Korean: When an onset devours its nucleus

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Prevocalically (_V), Korean contrasts neutral, tense and aspirated obstruents stops, affricates and fricatives. Elsewhere (_C/#), all obstruents merge as unreleased non-continuants. The object forms [na**d**-il] 'grain', [na**tʰ**-il] 'piece', [na**s**-il] 'sickle', [na**dʒ**-il] 'day', [na**tʃʰ**-il] 'face' illustrate several contrasts, which are lost in the unsuffixed base form of all five lexemes: [na**t**˺] (Chang, 1996: 16). Neutralisation affects continuancy and phonation, but not place, except for *palatoalveolar* affricates turning into *alveolar* stops. Three questions arise: **Q1.** Why does *place* change exactly here? **Q2.** Why is continuancy affected? **Q3.** Why is phonation affected?

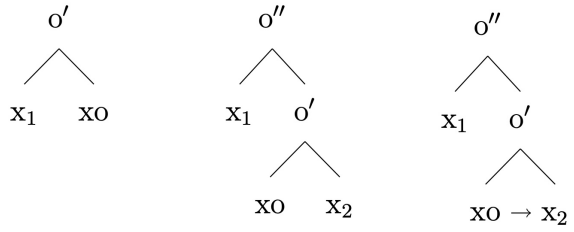
In Government Phonology, final consonants are onsets (Kaye, 1990) followed by an empty nucleus (Ø); [na**t**˺] is /na**t**˺Ø/. Final Ø is silent by parameter, as per the Empty Category Principle (ECP; Kaye, Lowenstamm & Vergnaud, 1990). Korean clusters also contain Ø (Heo, 1994; Kim, 1996): CC is CØC. Neutralisation uniformly applies before Ø, allegedly due to Ø's inability to license too many elements in its onset, e.g. **h** (release). Yet Ø must also *add* the stop element **ʔ** ([s] → [t˺]). Weak licensing power of Ø *cannot* explain neutralisation.

Proposal. Stops, affricates, and fricatives are structured as in (1) (Pöchtrager, 2006, 2021); xo represents a skeletal slot that is an onset head, x_1/x_2 non-head skeletal slots, the arrow *control*. Control (as part of the ECP) keeps its target silent. Lack of control (fricatives/ affricates, 1a–b) encodes friction. Projection (o′/o″) follows the x-bar schema; x_1 hosts laryngeal properties. (Lenition is uniformly expressible as loss of structure/control/both.)

I concur with Heo (1994) and Kim (1996) on the distribution of Ø's, but propose that *Ø, in order to be silenced, must be controlled by a preceding xo.* Control silences (as in stops) and happens under sisterhood, thus Ø (a nuclear head xn) must be sister to xo. Heads project maximally twice, so trees with complement *and* specifier (stops, affricates) jettison the original complement along with its (palatality) element **I**. (Independent support from Japanese/ Portuguese; Pöchtrager, 2021). Thus, xn is integrated as complement and, with **I** now lost, a *palatoalveolar* ends up as an *alveolar* (2a; **A** = alveolarity). **Q1** is answered.

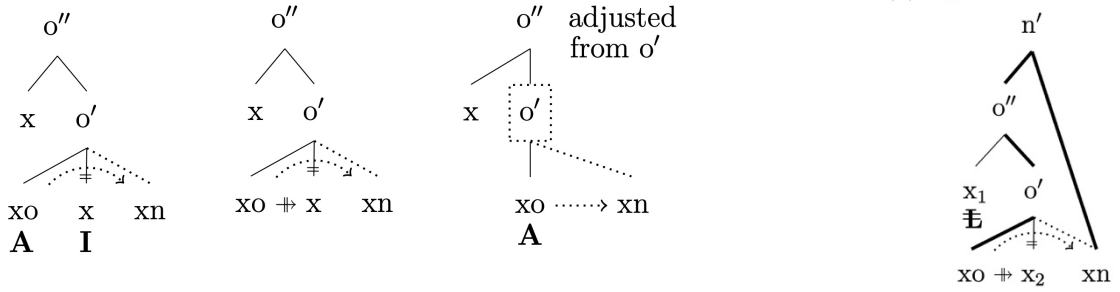
Three further predictions fall out, all correct: (i) Control of xn guarantees loss of **I** *and* non-continuancy (**Q2**), since occlusion *is* control by xo (1b). (Loss of release results from integration of xn.) Stops (2b) are correctly predicted to be affected vacuously (but lose release). (ii) In fricatives, xo projects once (1a). Thus, xn can be integrated/controlled *without* losing any positions (o′ in a dotted box, 2c), the bar level adjusts (o′ → o″), creating a stop structure, thus [s] → [t˺]. (iii) Laryngeal contrasts (Kim & Duanmu, 2004 argue for voiced/neutral/ aspirated) all merge as neutral before Ø. Integration of xn requires a search that traverses the (more detailed) tree in (3), where onset and nucleus form a constituent (n′, left out in (2) for simplicity). Assume that this search path, bold in (3), must be cleared (no elements in dominated positions like x_1). We predict laryngeal properties (**L** in x_1) to be given up in favour of neutral (**Q3**). **Q1–3** all receive the same answer: xn needs to be silenced. The proposal *links all changes* (place; manner; phonation) *to the same environment* (_Ø) *in a non-arbitrary fashion.*

(1) a. fricatives b. affricates c. stops



(2) a. tʃ → t⌝ b. k → k⌝ c. s → t⌝

(3) g̊ → k⌝



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On efficient constraint optimisation

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The computational problems presented by the real-world task of learning and using the language are highly non-trivial. They have received considerable attention across paradigms in formal phonological theory. Whereas Optimality Theory (OT) and related constraint optimisation grammars are argued to be beneficial for inference problems (Tesar & Smolensky, 1998), it does not in itself suggest how the optimal candidates which are assumed to be the grammatical surface form are determined from the underlying form.

This "universal generation problem" is NP-hard, even when constraints are fairly restricted (e.g. Idsardi, 2006). This means that efficient algorithms for such problems are unlikely to exist in general. On the other hand, (Tesar, 1995) presents an algorithm for determining optimal candidates in certain sufficiently limited versions of OT that can describe syllable structure phenomena. Algorithms which can deal with many OT grammars in practice exist (Gerdemann and Hulden, 2012). Subsequent discussion in the literature has argued that the computational problems encountered by humans are actually limited in ways that avoid the computational hardness results mentioned above (e.g. Kornai, 2006 and Heinz, Kobele, & Riggle 2009). At the same time, more computational problems presented by OT were shown to be computationally even harder than NP-hard (e.g. Hao, 2024). Thus the status of the computational complexity of constraint optimisation problems relevant for phonology must be regarded as unsettled.

I will describe a formalisation of OT that is able to capture more general interactions than in (Tesar, 1995), yet still allows for reasonably efficient computation of optimal candidates. Thereby many restrictions on co-occurrence of features can be captured. I will discuss which constraints from simple OT-based analyses can be incorporated in efficient algorithms and which pose computational problems. To do this I will draw on classical ideas in the theory of parsing.

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Palatalization is a lexically triggered phonological process operating at multiple levels

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This paper investigates how palatalization (PAL) is triggered at morphological boundaries and proposes a model in which phonology applies two types of readjustment: one at the CV level and one at the subsegmental (melodic) level. We argue that both operations are lexically triggered: that is, shaped by lexically stored information which guides the phonological structure toward a form that can be externalized, that is, mapped onto phonetic form and thus made pronounceable.

We begin by examining the types of configurations that invoke PAL across languages. These include: i) floating melodic material (as in Czech, Polish or Basque), ii) certain consonant clusters (e.g., C+glide in Zoque, English, Kirundi), and iii) hiatus (e.g., Tswana, Latvian). Crucially, all three phenomena (shown in Tab1) are connected to the CV string processes. This is evident in cases of (ill-formed) cluster correction and hiatus resolution. For floating material, the connection may seem less direct, but since its definition hinges on the absence of linking to CV string, it is likewise necessarily tied to syllabic layer. As such, all three represent crosslinguistically ill-formed configurations of the CV string, in that, while phonologically licit, they cannot be phonetically realized in a given language. Their presence triggers readjustment processes beginning at the CV level and culminating at the subsegmental level.

Following this, we propose that readjustment involves the application of a *merge* operation to the CV string. This *merge*-operation allows for the fusion of two separate CV units into a new CV unit (see Tab2). Merging two CVs into one constitutes a recursive process (CV+CV=CV). Crucially, however, this recursion is not driven by any phonological requirements, but by lexical requirements that demand the possibility of string-externalization. In other words, we propose that merge/recursion may occur in phonology, but only in case it is lexically motivated. This merge-based mechanism may result in surface configurations that resemble VC deletion (see Tab3), although no deletion has actually taken place. Instead, new CV-structure is built to accommodate an otherwise unpronounceable string.

Once merge is applied at the CV level, the same operation is triggered at the subsegmental level. This constitutes the second component of our analysis which focuses on the typological variability of PAL outcomes. The proposed analysis aims to account for their full range, which is described in Tab4.

The tripartite typology in Tab4 can be formally derived using the *Lexicalization Algorithm* and *Superset Principle* (Caha et al., to appear; Starke, 2009), a tool employed in *Nanosyntax* to derive lexicalizable structures. The Lexicalization Algorithm not only captures the existence of these 3 outcomes (*override*, *affixation*, "no change"), but also predicts that no other outcomes are possible.

To conclude, the paper argues that: i) palatalization arises as a readjustment strategy that targets phonological strings incompatible with a language's lexical requirements; ii) the phonological system applies merge at both the CV and the subsegmental level; iii) merge at the CV level creates a recursion which is not phonologically driven, but lexically driven; iv) once the CV string is repaired, merge is reapplied at the subsegmental level; v) the typological variation in PAL outcomes is captured by the *Lexicalization Algorithm* and *Superset Principle*, which not only derives the observed 3-way typology, but also predicts that no other outcomes are possible.

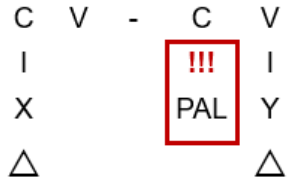
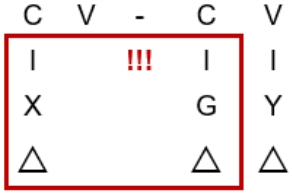
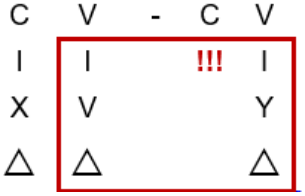
Table 1:	Three types of configurations that invoke PAL across languages	
floating melodic segment	consonant cluster (consonant+glide)	hiatus (vowel+vowel)
		
/ v knih-(PAL)e / → [fkɲize] in book-LOC.SG “in the book” Czech (Cavinari & Wyngaerd 2024)	/ wiht-jahu / → [wihtʸahu] / [wihcahu] walk-past.3PL “they walked” Zoque (Bateman, 2007)	/ kolobɛ-ane / → [kolodʒʷane] pig-DIM ‘piggie’ Tswana (Gorecka, 1990)

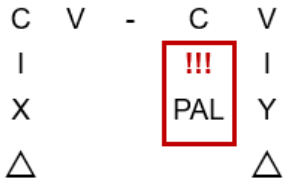
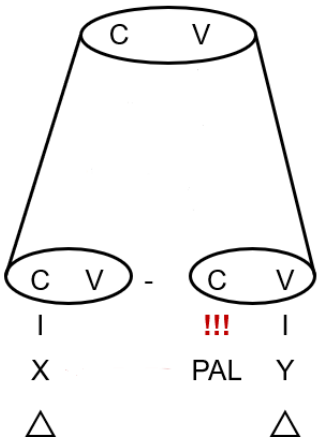
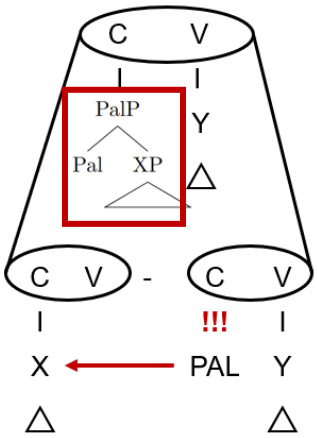
Table 2:	PAL triggered by floating melodic segment which cannot be lexicalized	
		
0th step: non-lexicalizable structure arises	1st step (at CV level): CV + CV = CV (recursion)	2nd step (at melodic level): C + PAL = new C / Cj / C

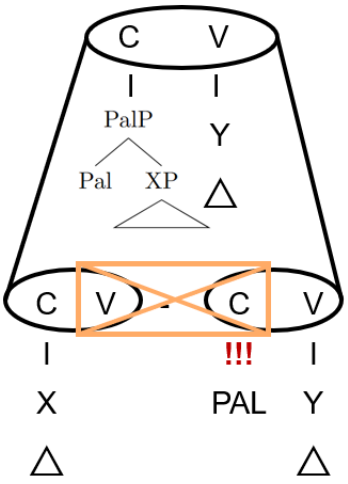
Table 3:	Merging two CVs creates an illusion of VC deletion
	

Table 4:	**Typology of palatalization processes and how to look at them**		
type		**outcome**	**examples** (from Czech)
X+PAL → Z	(true) palatalization	palatal	[d] + PAL → [ɟ]
	spirantization	coronal fricative/affricate	[d] + PAL → [z]
	coronalization	coronal	[ɦ] + PAL → [z]
	- conceptualized as cases of ***override*** (syntactic parallel: *person*+PL → *people*)		
X+PAL → XY	glide insertion (or other C insertion)	original consonant + glide	[p] + PAL → [pj]
	- conceptualized as cases of ***affixation*** (syntactic parallel: *tree*+PL → *tree-s, likely*+NEG → *un-likely*)		
X+PAL → X	PAL-deletion/absorption ("no change")	original consonant	[s] + PAL → [s]
	- conceptualized in terms of ***syncretism*** and ***morpheme/phoneme sizes*** (syntactic parallel: *sheep*+PL → *sheep*)		

Note: Syntactic terminology (merge, tree-structure, recursion, etc.) has previously been used in phonology, e.g. in *GP 2.0* (Pöchtrager, 2021) or *Precedence-free Phonology* (Nasukawa, 2016), mostly drawing on principles from *Minimalism* and *Distributed Morphology.* In a similar spirit, our model adopts *Nanosyntax* (Baunaz et al., 2018).

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Parameters of vowel variation in two verbal prefixes in Qatari Arabic

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One source of phonetic variation in Arabic dialects is the Nomadic-Sedentary division (Cadora 1989). Recent sound changes in large cities have led to the emergence of new distinctions between the two varieties. For example, spread of the glottal variant [ʔ] of <q> alongside the traditional Bedouin variant [g] has been reported for the urban dialect of Amman, Jordan (Al-Wer 2007). In Qatari Arabic, this division is realized as a distinction between the Bedouin and Hadari dialects. Being socially stigmatized, the Bedouin dialect has long demonstrated a tendency to shift toward the prestige Hadari dialect (Al-Amadidhi 1985). While variation in the use of consonantal variables (e.g. realization of <ʤ> as [ʤ] or [j]) is well documented (Al-Amadidhi 1985; Al-Kababji & Ahmad 2020), little is known about variation in realization of vowels.

The Bedouin and Hadari dialects in Qatar have the same inventory of vowels (Al-Mazrouei et al. 2024), but they systematically differ in vowel quality in verbal inflections. The Bedouin dialect has short /a/ both in the 1st-person singular and 3rd-person fem. singular prefixes of the imperfect verb: e.g. *a-gra* 'I'm reading', *ta-fham* 'she understands'. The Hadari dialect has different vowels in both prefixes. The first-person singular verb has long /a:/, but the third-person feminine singular verb has short [i]: e.g. *aa-gra* 'I'm reading', *ti-fham* 'she understands'.

The current study investigates phonetic variation in realization of three acoustic correlates – F1, F2, and vowel duration – of a vowel in two grammatical prefixes in Qatari Arabic. The data were obtained from 20 speakers (n=10 for each dialect), who were recorded saying verbs (n=16) with the A- and TA- prefixes. A total of 320 items were analyzed.

The results revealed that the two dialects systematically differed in realization of the vowel in the prefixes (Figure 1). Bedouin speakers consistently produced short [æ] in both contexts: F1 = 730 Hz, F2: 1930 Hz, duration: 85 ms. Hadari speakers revealed a different pattern with considerable variation in vowel quality and duration. The vowel in A- prefix was produced in the range between [æ] and [ɑː] with significantly lower F2: 1610 Hz (p = .004) and longer duration: 107 ms (p = .032). The vowel in TA- prefix was in the range between [æ] and [ɪ] having significantly lower F1: 550 Hz (p < .001) and shorter duration: 69 ms (p < .001). Most importantly, this variation was gradient: duration of the vowel increased with more back articulation and decreased with higher articulation. In addition, some speakers demonstrated independent changes of each parameter: the A- vowel could be produced as front but long, or it was short but back.

The findings suggest that 1) counter to the findings of previous studies (e.g. Al-Kababji & Ahmad 2020), Hadari speakers can also shift their grammatical forms toward the Bedouin variant and 2) this shift has a gradient rather than categorical nature.

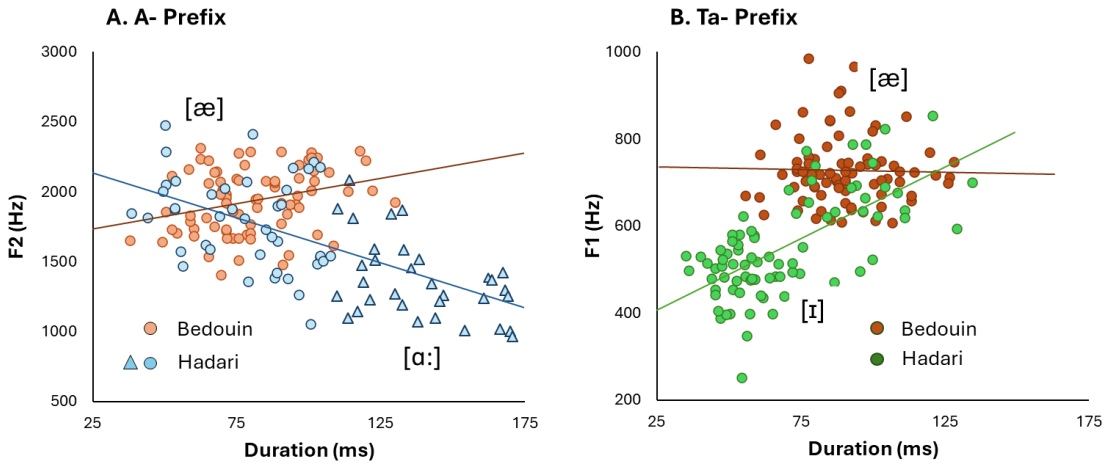

Figure 1. Differences in F1, F2 and duration between vowels in the A- and TA- prefixes in the Bedouin and Hadari dialects of Qatari Arabic.

Phonologically overspecified exponents cause both polarity and disharmony

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So far, disharmony and morphophonological polarity have been treated as two separate phenomena. The former implies that a certain feature [αF] must appear as [¬αF] in an adjacent phonological constituent, such as the segment or the syllable. An example of disharmony is shown in (1) by means of the (unproductive) suffix *-pVV* in Mam (England, 1983: 47–49, 319f). Here, the feature [±round] disharmonises with the stem vowel whereby the suffix surfaces as *-puu* after /a e i/ (1a–c) and as *-pii* after /o u/ (1d–e). The latter is similar to disharmony in the sense that a feature /αF/ is realised as [¬αF] in a specific morphological context (De Lacy, 2012; cf. Trommer, 2008; Wunderlich, 2012), as illustrated by European Spanish in (2). In the Spanish subjunctive mood (Fitzpatrick et al., 2004; Trommer, 2008), the theme vowel *-a* becomes *-e*, and both *-i* and *-e* become *-a*, i.e. low vowels become non-low whereby non-low vowels become low. As we can see, both phenomena require dissimilation. But while this happens in disharmony to overtly realised features, polarity constitutes a type of dissimilation that is only visible by looking at the input-output relation.

(1) Vowel disharmony of [±round] in Mam (Mayan, Quichean-Mamean)

a. jas-puu ‘to cut with one chop’
b. ch’ex-puu ‘to change’
c. qit-puu ‘to loosen’
d. tzoq-pii ‘to free’
e. yutz-pii ‘to frighten’

(2) Vowel hight polarity in European Spanish (Indo-European, Romance)

	doblar ‘to bend’		*comer* ‘to eat’		*morir* ‘to die’	
Pres. ind.	doblo	doblamos	como	comemos	muero	morimos
	doblas	dobláis	comes	coméis	mueres	morís
	dobla	doblan	come	comen	muere	mueren
Pres. subj.	doble	doblemos	coma	comamos	muera	muramos
	dobles	dobléis	comas	comáis	mueras	muráis
	doble	doblen	coma	coman	muera	mueran

The paper shows, following Wolf (2007), that input representations specified with contradictory features are responsible for morphophonological polarity. For Spanish, this implies that the subjunctive is expressed by the floating features [+low] [−low]. If the floating suffix is attached to *dobla-*, [+low] cannot surface due to high ranked NoVacuousDocking (Wolf, 2007), but [−low] can, producing *doble-*. If it is suffixed to *come-* and *mori-*, only [+low] cannot dock to the stem for the same reason, licensing *coma-* and *muera-* (which has also vowel breaking).

The present account is extended to disharmony in Mam. The example of Mam is explicitly suitable because it has both harmonising and disharmonising affixes in the same morphophonological domain. Thus, the argument made by Krämer (1998, 1999) that harmony in Yucatec Maya operates on words but disharmony on stems cannot be made for Mam. The semi-productive suffix *-Vj* in Mam is shown in (3). Since both harmonising *-Vj* and disharmonising *-pVV* are not fully productive, they evidently belong to the stem level.

(3) Total vowel harmony of *-Vj* in Mam

a. ch'uq-uj 'heap'
b. tx'an-aj 'piece of wood'
c. ten-ej 'group'

The analysis proposes that harmony is caused by underspecified segments (cf. Krämer, 1998, 1999) and disharmony by overspecified segments, i.e. $V_{[+high][+round][-round]}$. The second ingredient of the analysis consists of the constraint rankings IDENT(F)-V >> OCP(PLACE) >> AGREE(PLACE) and {SPECIFY, DEP(PLACE)} >> INTEGRITY. While IDENT(F)-V assures that only underspecified segments harmonise, OCP is responsible for picking the dissimilar vowel feature out of the overspecified affix. Moreover, the need for full specification paired with high penalties on feature insertion make sure that underspecified segments harmonise.

The account presented here is maximally restrictive in the sense that no co-phonologies or indexed constraints are required. Simultaneously, Morph Integrity (Bermúdez-Otero 2012: 50–53) is guaranteed because morphology is not allowed to alter associations between morphosyntactic information and the phonological exponents (in contrast to the analysis of Ainu disharmony by Krämer, 1998, 1999).

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Phonologising 'phonetic erosion': the daughters of Latin *ille*

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In historical syntax 'phonetic erosion' is often said to cause change (e.g. Roberts and Roussou, 2003) and phonology burdened with actuation. Using the example of the Latin demonstrative *ille* > Romance definite articles (RDA) (focusing on Spanish here due to space constraints) I argue that (i) 'erosion' is not a phonological concept and (ii) here, syntactic change 'caused' (= created the environment for) phonological change.

By the late Classical (CL) period *ille* had two distinct functions (demonstrative and 3rd person pronoun). The demonstrative is grammaticalised into the RDAs which are phonologically reduced compared to [ˈil.lə]. Despite all being monosyllabic the RDAs are not all descended from the same syllable of *ille* e.g., most of the Spanish DAs ([la], [los], [las]) descend from *ille*'s second syllable (σ2) apart from the masculine singular, [el], from the first (σ1). How can the phonology account for this? Moreover, the pronominal descendants of *ille* did not undergo syntactic change between CL and Romance and have largely retained their phonological form suggesting that it was in fact grammaticalisation that created the environment for 'erosion'.

Unlike previous accounts of the grammaticalisation of the RDAs (e.g. R&R, 2003) I propose that each RDA evolved through its own series of cross-linguistically common phonological processes rather than undergoing some phonologically special process of 'erosion'. Examples (1) – (4) below show proposed development pathways for the four definite articles in Modern Spanish. Each step of each pathway shows an unremarkable phonological processes (the order is not yet meant to precisely reflect every change chronologically).

(1) ˈil.lum	> nasal syncope	ˈil.lu	> degemination	ˈil.u	> vowel syncope	il	> lowering	el
(2) ˈil.lam	> nasal syncope	ˈil.la	> degemination	ˈi.la	> vowel syncope	la		
(3) ˈil.lo:s	> degemination	ˈi.lo:s	> vowel syncope	ˈlo:s	> shortening	los		
(4) ˈil.la:s	> degemination	ˈi.la:s	> vowel syncope	ˈla:s	> shortening	las		

(1) is unsurprising and the seemingly surprising loss of stressed syllables can be accounted for with the nuances of Latin prominence marking. RDAs developed from the corresponding accusative forms of *ille* all of which are formed of two heavy syllables. Given that Latin assigns stress to weight (Lahiri et al, 1999) I propose that weight is significant to prosodic prominence. In (3) and (4) degemination removes σ1 coda minimising the difference in prominence between σ1 and σ2: σ1 is light and stressed while σ2 is heavy and unstressed, making loss of either syllable unremarkable. Loss of the stressed syllable in (2) requires more detailed analysis but may be attributed to function words having lower prosodic prominence making them more susceptible to lenition, an established idea in Latin philology (Radford, 1906) and prosodic theory (Selkirk, 2004). I argue that the observed variability in syllable retention is unsurprising given there is no straightforwardly 'strong' syllable in grammaticalised *ille* (cf pronominal *ille*).

Thus, (i) there is no need for special 'phonetic erosion' to account for the development of *ille* to the RDAs as this is explained by various series of normal phonological changes. (ii) since some later phonological developments in these series are dependent on conditions created by grammaticalisation of *ille* it seems syntactic change is facilitating phonological in this case.

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Pluralia Adriatica: Unified Exponence of the Plural across categories in Fiuman and Zaratin

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We propose a unified account of the exponence of plurality across both verbs and nouns in two critically endangered Venetian varieties: Fiuman (originally spoken in Rijeka/Fiume, Croatia) and Zaratin (originally spoken in Zadar/Zara, Croatia).

Simonović (2025) observes that the exponence of plurality in all verbal forms in Fiuman involves front vowels (*e* and *i*). The relevant forms are 1PL and 2PL, as the third person does not realise number distinctions. This generalisation, which applies to both regular and irregular verbs, is illustrated in Table 1 for the Present Tense, in Table 2 for the Future Tense, and in Table 3 for the Imperfect. Based on this, Simonović proposes a single plural exponent, which contains two floating features [-back] and [+high], and is arguably present in nominal plurals, illustrated in Table 4, but the details of a unified analysis are left for future work. The presented empirical picture for Fiuman also applies to Zaratin, though the Zaratin described by Wengler (1915: 51) also had a class of masculine nouns ending in *-o* in singular and *-e* in plural (e.g. *brats-o* 'arm-SG', *brats-e* 'arm-PL').

In this talk, we follow Simonović' (2025) analysis assuming a single plural exponent across categories, but we use a different phonological toolbox, assuming that vowels and consonants are made of (combinations of) Elements, i.e. basic phonological primes in the sense of Element Theory (ET, KLV 1985, Backley 2011). Similar to what Lampitelli & Ulfsbjorninn's (2023) and others have proposed for Italian nouns, we take that plural is exponed by Element |I|, whereas singular (as well as the third person in verbs) is exponed by Element |A|. Our hypothesis is that these exponents are used for both verbs and nouns, as shown in (1) and (2), respectively. According to ET, the following operations underlie a five-vowel system such as Fiuman and Zaratin's: [i]=|I|, [u]=|U|, [a]=|A|, [e]=|I.A|, and [o]=|U.A|. Crucially, in verbs 1PL and 2PL always contain |I|, as do all plural exponents in nouns. Similarly, |A| is the common denominator of those forms that overtly expone singular forms of nouns and 3rd person forms of verbs. When there is no vowel, then we observe a coronal sonorant (/l, r, n/). We argue that Element |A| is underlyingly there, but it does not surface because it is absorbed by the preceding consonant. (In TE, coronals generally contain Element |A|, see Backley 2011.)

This account aligns with two generalizations discussed by Simonović (2025): (i) 1PL corresponds to 2PL with the addition of suffix *-mo*; when there is PL root allomorphy (cf. last three verbs in Table 1), then the same allomorph is used for both 1PL and 2PL; (ii) 3SG and 3PL are always identical, plausibly marked by the elsewhere allomorph in the paradigm, as is SG in nominal paradigms. The examples in (1) illustrate the comparison between SG and PL forms of verb [tʃaˈmar] 'call'; in (2), we show the SG and PL forms of noun [ˈrod-a] 'wheel'.

Examples

Table 1. Front vowels expone plurality in the Present Tense in Fiuman

INF	PRS.3	PRS.1PL	PRS.2PL	Gloss
tʃaˈm-a-r	ˈtʃam-a	tʃaˈm-e̲-mo	tʃaˈm-e̲	‘call’
ˈtaz-e-r	ˈtaz-e	taˈz-e̲-mo	taˈz-e̲	‘be silent’
parˈt-i-r	ˈpart-e	parˈt-i̲-mo	parˈt-i̲	‘leave’
tʃor	tʃol-Ø	tʃoˈl-e̲-mo	tʃoˈl-e̲	‘take’
ˈes-e-r	ˈz-e	ˈs-e̲-mo	s-e̲	‘be’
gaˈv-e-r	ˈga-Ø	gaˈv-e̲-mo	gaˈv-e̲	‘have’

Table 2. Front vowels expone plurality in the Future Tense in Fiuman

INF	FUT.3	FUT.1PL	FUT.2PL	Gloss
ˈtaz-e-r	taz-e-ˈr-a	taz-e-ˈr-e̲-mo	taz-e-ˈr-e̲	‘be silent’
ˈes-e-r	saˈr-a	saˈr-e̲-mo	saˈr-e̲	‘be’
tʃor	tʃoleˈr-a	tʃoleˈr-e̲-mo	tʃoleˈr-e̲	‘take’
gaˈv-e-r	gaveˈr-a	gaveˈr-e̲-mo	gaveˈr-e̲	‘have’

Table 3. Front vowels expone plurality in the Imperfect in Fiuman

INF	IMPF.3	IMPF.1PL	IMPF.2PL	Gloss
ˈtaz-e-r	taˈz-e-v-a	taˈz-e-v-i̲-mo	taˈz-e-v-i̲	‘be silent’
ˈes-e-r	ˈ(j)er-a	ˈ(j)er-i̲-mo	ˈ(j)er-i̲	‘be’
tʃor	tʃoˈl-e-v-a	tʃoˈl-e-v-i̲-mo	tʃoˈl-e-v-i̲	‘take’
gaˈv-e-r	gaˈv-e-v-a	gaˈv-e-v-i̲-mo	gaˈv-e-v-i̲	‘have’

Table 4. Common exponence patterns for [PL] in nouns and adjectives

SG	PL	Gloss
kan	ˈkan-i̲	‘dog’
ˈrod-a	ˈrod-e̲	‘wheel’
tuˈrist-a	tuˈrist-i̲	‘tourist’
ˈpes-e	ˈpes-i̲	‘fish’
ˈtʃav-e	ˈtʃav-e̲	‘key’
ˈdit-o	ˈdit-i̲	‘finger’

(1)

a. PRS.3	b. PRS.2PL
[ˈtʃam-a]	[tʃaˈm-e]
/tʃam+a+A/	/tʃam+a+I/
root+Th+3	root+Th+2pl

(2)

a. F.sg	b. F.pl
[ˈrod-a]	[ˈrod-e]
/rod+A+A/	/rod+A+I/
root+Th+sg	root+Th+pl

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Predictability effects on contrastive hyperarticulation

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Lexical competition—e.g., the existence of a minimal pair (Baese-Berk & Goldrick, 2009) or high neighbor density (Munson & Solomon, 2004; Wright, 2004)—is associated with measures of contrastive hyperarticulation such as more peripheral vowels. Less predictable words are also produced with greater hyperarticulation (e.g., Lieberman, 1963). In American English, vowels are longer before voiced consonants compared to voiceless ones, so speakers may lengthen vowels before voiced codas and shorten them before voiceless codas to enhance this voicing cue. While previous work has focused on vowel quality and VOTs, this study examines vowel duration in minimal pairs across predictable and neutral contexts, showing that speakers adjust durations depending on coda voicing and word predictability.

This study looks at vowel durations in words with voiced and voiceless codas—e.g., *pod* and *pot*. Participants (n = 11) performed a task in which they initially saw the minimal pair on a screen. Then, one of the two words became bolded, and a sentence frame appeared (Figure 1). The sentence frame either provided a Predictable Context or a Neutral Context. Participants then read the sentence with the bolded word completing the sentence. A confederate listener circled the correct word on a worksheet.

(a) (Predictable Context) The siblings are like two peas in a ___. [pot **pod**]
(b) (Neutral Context) The winning Scrabble word was ___. [pot **pod**]

Vowels followed by voiced codas had an average duration of 0.195 s in the Predictable Condition and 0.202 s in the Neutral Condition. For vowels followed by voiceless codas, mean durations were 0.138 s and 0.141 s in the predictable and Neutral Conditions, respectively (Figure 2). Linear mixed-effects models were fit to the data to examine the simple effect of condition (Predictable and Neutral) on coda types (voiced and voiceless) to predict vowel duration with condition as a fixed effect and with random intercepts for speaker and word. For voiced coda words, vowels in the Predictable Condition were significantly shorter than those in the Neutral Condition (est. = −0.0071, SE = 0.0023, t = −3.074, p = 0.0022). On the other hand, for voiceless coda words, vowels in the Predictable Condition were not significantly shorter than those in the Neutral Condition (est. = −0.0043, SE = 0.0026, t = −1.68, p = 0.094). In other words, vowels were significantly shorter in predictable sentences compared to neutral ones, but only when the word ended in a voiced coda; for words with voiceless codas, there was not a significant difference in vowel durations between the two conditions.

This pattern fits accounts where predictability reduces duration before either coda type, but contrastive hyperarticulation lengthens vowels before voiced codas and shortens them before voiceless codas. A post hoc spectral analysis further shows that for voiceless coda words with lax vowels (e.g., *bet*), vowels were produced more peripherally in Neutral than in Predictable contexts, despite no significant durational difference (Figure 3). This makes sense: predictability reduces both time and spectral distinctiveness (hypoarticulation), while contrastive hyperarticulation maintains or enhances distinctiveness, yielding a more peripheral vowel space.

These results are taken to support a listener-directed mechanism for contrastive hyperarticulation—e.g. Lindblom's (1990) H&H Theory—in which speakers, speaking in order to be understood, lengthen or shorten vowels (as a voicing cue) in the contexts where target words may be the most confusable.

Figures

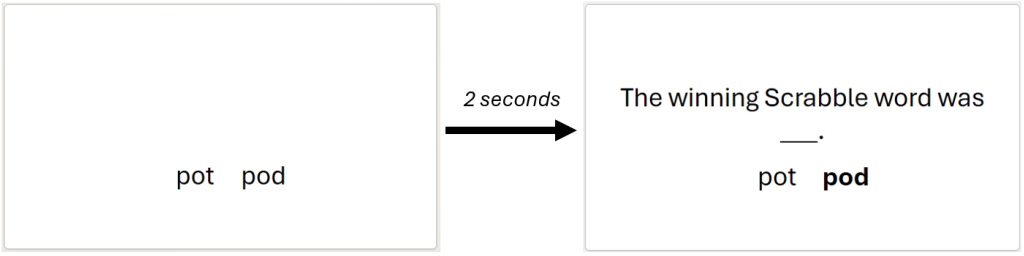

Figure 1. Sequence of trial.

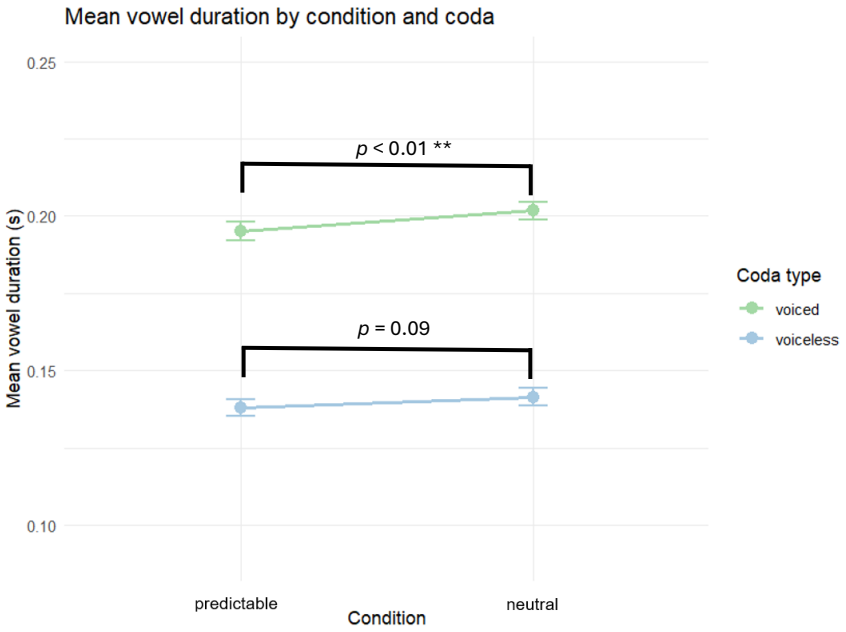

Figure 2. Summary of vowel duration means by condition (Predictable and Neutral) and coda type with standard error bars.

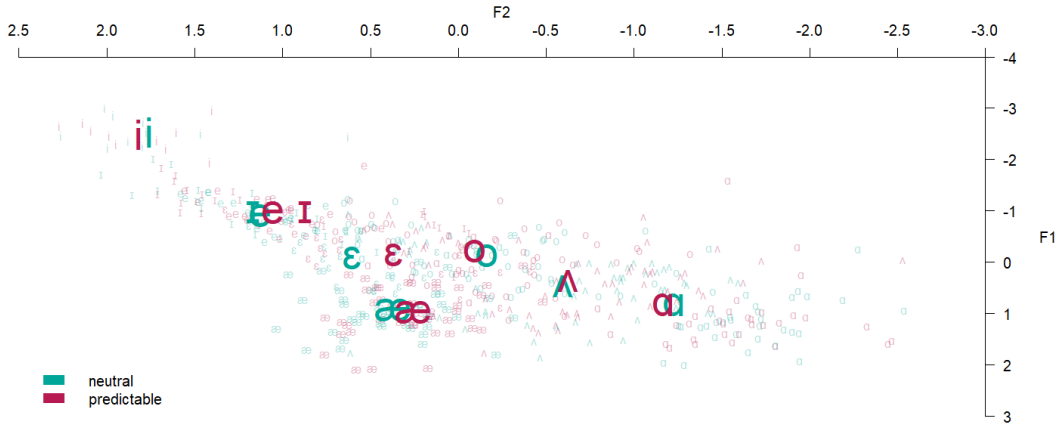

Figure 3. Plot of pre–voiceless coda vowel F1 and F2 (Bark-transformed and Lobanov-normalized) by condition.

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Quantifying Disharmony in Turkish Roots: The Case of French Loanwords

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Introduction. Turkish possesses a robust vowel harmony system: vowels in roots merely display stable harmonic forms, whereas suffix vowels usually alternate to match the last vowel of root. Due to this distinction, numerous borrowings may violate harmony without any repair. Whether Turkish tolerates these disharmonic loans or gradually regularizes them is still debated. Although some argue that loaned roots undergo changes in vowels, others note that disharmonic roots remain in the lexicon, confirming the idea that root harmony is a static lexical tendency (Kabak, 2011; Özçelik, 2024). Considering French has given 5,508 loanwords to Turkish and has no vowel harmony, it provides an ideal case (Alver, 2022). We present a statistical analysis of vowel (dis)harmony in French loans in Turkish lexicon, counting the rate of disharmony and any adaptations.

Methods. We analyzed 246 two-syllable French-origin roots taken from the Turkish Electronic Living Lexicon (TELL). Using Turkish front harmony constraints, every loanword was categorized as either harmonic or disharmonic (rounding harmony was not examined). We also calculated the rate of disharmony among French two-syllable words (Lexique 3.83 corpus~142,000 words; New et al., 2007) to check whether Turkish prefers to avoid disharmonic vowel sequences. To identify any adaptations of disharmonic words, such as vowel deletion, schwa realization, or vowel substitution, we also matched vowels from each French word to its Turkish equivalent.

Results. Slightly over half of the French origin words are front–back disharmonic (52.4%), and nearly similar percentage remains disharmonic in their Turkish adaptations (47.6%). The small decrease indicates that during borrowing, disharmony was not consistently regularized. A similar reference is given by the fact that 43% of native disyllabic words in a large French corpus are disharmonic. In addition to that, just 12 of the 246 loans (4.9%) in TELL were adapted to become harmonic in Turkish, indicating that regularization was not common. The repair strategies of these 12 words are vowel deletion /makijaʒ/ → /mɑkjɑʒ/ “make-up”, regressive assimilation /ʒakɛt/ → /dʒeket/ “jacket”, progressive assimilation /dosje/ → /dosjɑ/ “file”, or schwa realization /məny/ → /møny/ “menu”. The schwa /ə/ which occurred in seven borrowings (2.8%) was adapted as /e/ or /ø/ in Turkish. While the word like /ʒətɔ̃/ → /ʒeton/ “token” surfaced as disharmonic and /pɔʁtəfoej/ → /portføj/ “portfolio” deleted the schwa but still became disharmonic.

Discussion & Conclusion. Based on our analysis, Turkish mostly permits front disharmony in French borrowings: only 4.9% of these words undergo adaptation(s), and almost half of them stayed disharmonic. A clear tendency for harmony is absent in these rare adaptation strategies, which appear to be idiosyncratic. In accordance with listener-based accounts of loanword adaptation (Boersma & Hamann, 2009), schwa’s acoustic features indicate a perceptual

reinterpretation, allowing listeners to assign it to any Turkish vowel best suits to local environment. Therefore, the schwa produces harmonic form, but it also creates disharmonic form or is deleted without producing harmony.

To sum up, most disharmonic words enter into Turkish lexicon without any repair, and schwa in these loans may permit harmony and disharmony. French borrowings longer than two-syllable need further research because our analysis was limited to disyllabic roots. To examine how word length affect loanword adaptation, ongoing study is enlarging the dataset to trisyllabic-plus loanwords (e.g., /ʃəvalje/ → /ʃøvɑlje/ ~ /ʃovɑlje/ "knight", and /paʁdəsy/ → /pɑʁdøsy/ ~ /pɑʁdesy/ "overcoat"). This study, which reveals that Turkish largely preserves disharmonic words, will be enhanced by the new findings.

Table 1. Front-back disharmony and repair outcomes in French disyllabic loans to Turkish

Metric	**French**	**Turkish**
Disharmonic disyllables (front–back)	129 / 246 = 52.4%	117 / 246 = 47.6%
Harmonic disyllables (front–back)	117 / 246 = 47.6%	129 / 246 = 52.4%
Disharmonic → Harmonic repairs	—	12 roots (4.9 % of corpus)
Repairs involving French schwa	—	1 root (12.5% of repairs)
Repairs via other mechanisms	—	11 roots (87.5% of repairs)

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Re-evaluating the vowel system of Truku: a phonological perspective on schwa

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This paper analyses the phonological behaviour of schwa in Truku Seediq (Atayalic, Austronesian, an endangered language), focusing on its distribution, represntation and relation to stress. Truku is reported to have a four-vowel system: *a*, *i*, *u* and *ə*. While the corner vowels *a*, *i* and *u* behave in typologically expected ways, schwa displays distributional and prosodic patterns that call into question its classification as a weak or reduced vowel. Notably, *ə* never appears in word-finally (which is prosodically weak in Truku) but does occur in the penultimate syllable—a strong position which regularly carries primary stress. Moreover, only *ə* is attested in the antepenultimate and pre-antepenultimate syllables, revealing a marked distributional asymmetry (e.g., *m-* 'AF-be', *ħú**ə**way* 'generous', *-su* '2SG.NOM'. *bi* 'very' → *məħ**ə**w**ə**ysúbi* 'Thank you very much, = literally, You are very generous').

These observations suggest that *ə* in Truku behaves more like a full vowel than a reduced one. Building on this, and on data collected in Februrary 2025, we propose that schwa in Truku corresponds to two phonologically distinct forms: *ə*$_1$ is a strong vowel that can bear stress and appears in prosodically strong positions, while *ə*$_2$ is a weak vowel that is restricted to unstressed, prosodically weak positions. Using representations based on Government Phonology and Element Theory, we analyse *ə*$_1$ as having the element structure |A I|, while *ə*$_2$ corresponds to an empty nucleus lacking melodic content. There are two reasons for representing *ə*$_1$ as |A I|. First, in most languages the structure |A I| represents [e], which occupies a region of the vowel space close to that of [ə]; so, when the distance between F1 and F2 in [ə] increases slightly, vowel quality shifts from [ə] to [e]. Second, in other dialects of Seediq, [e] (with the structure |A I|) appears in the same positions where *ə*$_1$ occurs in Truku (e.g., *kəɮebaŋ* 'lizard' in Truku corresponds to qulebaŋ 'lizard' in another Seediq, Paran; Lee, 2010: 132).

Under this two-schwa analysis, Truku has four phonetically distinct vowels but a five-vowel system phonologically. This aligns it with other languages such as Japanese, where phonetic *u* displays a similar dual phonological behaviour (Nasukawa, 2010). The Truku data show how surface-identical segments may hide underlying structural differences, highlighting the importance of prosodic and representational analysis in phonology. This study contributes to a broader understanding of segmental identity, vowel markedness and the phonology–phonetics interface.

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Segmental and tonal near-merger: insights from Beijing retroflex suffixation

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Background. Near-merger has long posed a challenge to generativist frameworks, which assume that phonological representations in the lexicon are categorical and contrastive, while phonetic implementation computes the gradient and variable aspects of articulation (see e.g. Bermúdez-Otero, 2007; Keating, 1990; Kenstowicz, 1994; Pierrehumbert, 2002). As a result, neutralised phonological categories should not retain subtle phonetic differences. It remains perplexing how speakers manage to produce systematic distinctions that cannot be consistently identified by listeners (Yu, 2007). The question arises whether such apparent mergers are in fact complete. While prior studies have focused on languages where orthography may serve as a cue to contrast – such as final devoicing in German (e.g. Port & O'Dell, 1985; Roettger et al., 2014) and Dutch (e.g. Warner et al., 2004), this study examines a case of synchronic merger in Beijing Mandarin (BM), namely retroflex suffixation (BRS). e.g. [a-ai-an] → [aɻ].

In the morphophonological process, rimes show spectral (Y. Wang & Sabev, 2023) and prosodic reduction (Y. Wang et al., 2025) when the retroflex suffix is added. As to tone, BRS tends to flatten the F0 contour as the suffixed forms are produced in a more reduced manner as a weak element in the speech. The majority of work has not looked at cross-tonal merger under BRS, as opposed to mergers within the same tonal category (e.g. L. Wang & He, 1985). This study presents new cases of near-merger in BM where orthography provides no indication of either spectral contrast or tonal variation.

Experiment Methods & Results. Two experiments were conducted: (1) to examine spectral changes in BRS rimes, and (2) to analyse tonal changes after suffixation. In Experiment 1, the formant frequencies of unsuffixed and suffixed monosyllables were analysed (11 participants). In Experiment 2, F0 in unsuffixed and suffixed Neutral Tone (NT) syllables was analysed (6 participants). Spectral near-merger was found only in high-nucleus rime groups (see Figure 1), while in all other rime groups, mergers were complete. For tonal neutralisation, we found that suffixed rimes bearing NTs showed significant changes in F0, resulting in converging contour shapes after suffixation (Figure 2).

Discussion. The near-mergers identified in BRS are consistent with the prediction of generative phonology that the acoustically distinct realisations are not in fact merged. We propose that different mechanisms underlie the segmental and tonal neutralisation. Drawing on Du & Durvasula's (2024) dual accounts of incomplete contrast neutralisation, we argue that the segmental and tonal patterns in BRS reflect different speech planning schemes. The suprasegmental neutralising effects among the derived suffixed NTs, relatively large, can be explained by *Simultaneous Multiple Planning*. When multiple competing phonological forms are planned simultaneously – as in cases where a phonological rule is optional or variable – there is greater interaction between forms. This can lead to larger, more robust phonetic differences because the competing alternatives leave stronger traces in the realised output. In such cases, incompletely neutralising contrast results in a clearly detectable phonetic distinction that may even affect perception and lexical access. On the other hand, the subtle acoustic contrast in the vowel quality can be accounted for by an *Incremental Unitary Planning*. When speakers plan speech one unit at a time (e.g. word by word or morpheme by morpheme), some residual features from the underlying contrast can 'leak through' into the output. However, because the planning is incremental and linear, the effect of the more recently planned surface representations is stronger due to a recency bias. What remains is a subtle phonetic trace – small enough that it is not usually perceptually salient, but still measurable with fine-grained acoustic tools.

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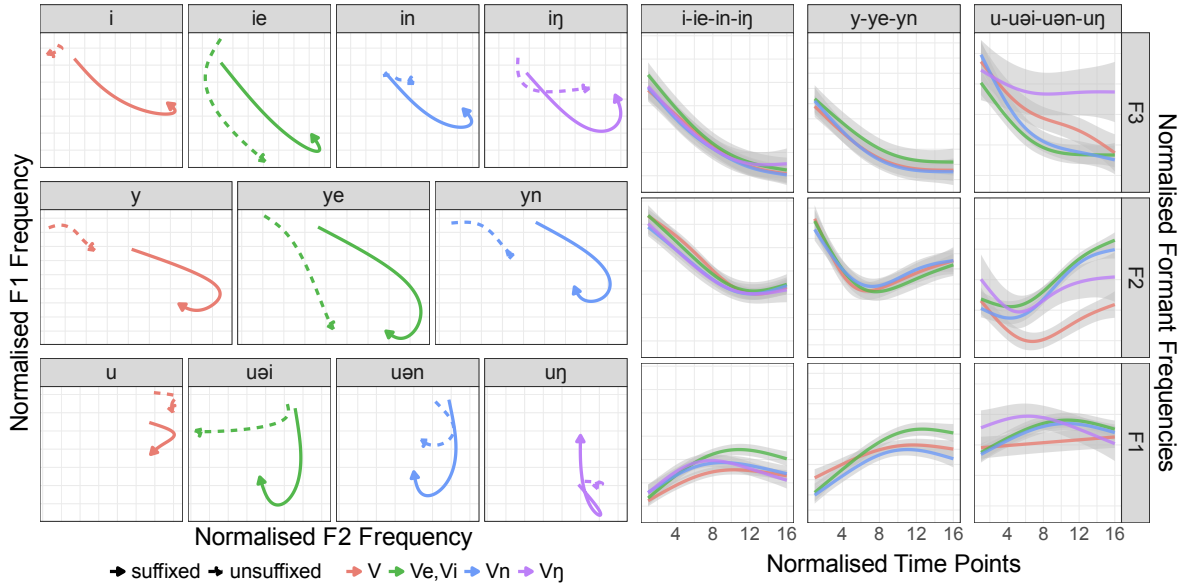

Figure 1. Generalised Additive Mixed Models (GAMMs; Hastie & Tibshirani, 1986; Wood, 2017) fitted for *F*1-2 vowel space (left); *F*1-3 formant trajectories of the merging rimes with high-nuclei (right); all formant frequency values were Lobanov-normalised (1971)

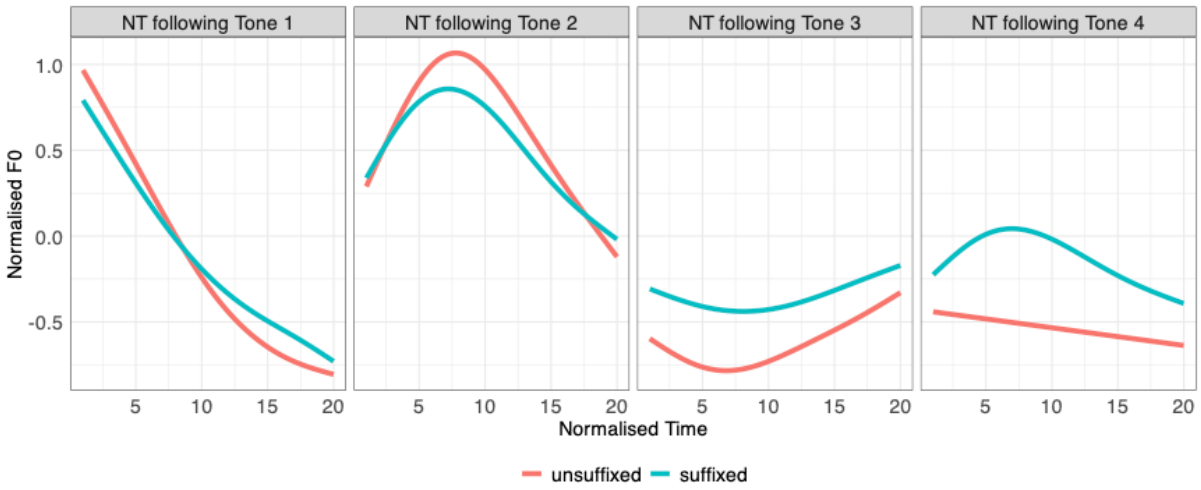

Figure 2. GAMMs fitted for normalised *F*0 contours of unsuffixed and suffixed NT syllables (elicited via reduplicative phrases) derived from Tone 1-4

Serial Directional Evaluation of Kosraean Reduplication

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In Kosraean, primary stress occurs on the penultimate syllable, with secondary stress on the antepenult in three-syllable forms (Lee, 1975: 33). Kennedy (2005) shows stress assignment plays an important role in Kosraean reduplication (1)-(4), wherein each reduplicative affix is sensitive to the form of the stem, giving rise to multiple prosodic variants. Specifically, while both affixes show curious effects of vowel-initial stems (3)-(4), the prefix, in contrast to the suffix, illustrates a *lookahead* effect, cf. (1a-c) vs. (1d), and (3a) vs. (4), wherein the reduplicant is binary, bearing secondary stress, if and only if the base is binary. This is significant as coda consonants do not contribute to syllable weight in the language; they are moraic only in prefixed reduplicants (Kennedy, 2005). Moreover, glide insertion only applies to suffixed vowel-initial disyllables (3b). The present study demonstrates that the lookahead is superficial and can be resolved in *Serial Template Satisfaction* (STS; McCarthy et al., 2012) and *directional Harmonic Serialism* (DHS; Lamont, 2022) without i) stipulated weight conditions on the template and ii) reliance on FTBIN and ALIGN.

(1) *Initial reduplication*

a. ˈ**fo**.-foʃ 'to emit smoke' ˈ**kæ**.-kæl 'to touch repeatedly' ˈ**ʃi**.-ʃik 'very small'
b. ˌ**mo**.-ˈmo.ul 'not completely dead' ˌ**fo**.-ˈfo.ul 'to emit smell'
c. ˌ**fi**.-ˈfi.jɔ 'sweating' ˌ**fi**.-ˈfi.jɛ 'to turn grey'
d. ˌ**fur**.-ˈfu.rok 'to turn gradually' ˌ**mis**.-ˈmɨ.sɛ 'being frayed' ˌ**pʌʃ**.-ˈpʌ.ʃæk 'slopping'

(2) *Final reduplication*

ˈpʌk.-**pʌk** 'sandy' ˌkɨ.ˈpat.-**pat** 'broken' ˌmɨ.ˈsɛ.-**sɛ** 'frayed'

(3) *Reduplication of vowel-initial monosyllables*

a. ˈ**e**.**k**-ek 'to rub repeatedly' ˈ**o**.**n**-on 'to keep on singing' ˈ**i**.**p**-ip 'in pieces'
b. ˈaf.-**jaf** 'rainy' ˈek.-**jek** 'to keep on changing' ˈeŋ.-**jeŋ** 'windy'

(4) *Prefixed vowel-initial disyllables*

ˌ**ew**.-ˈʌwʌ 'to lift gradually' ˌ**ol**.-ˈolaŋ 'to open repeatedly' ˌ**ip**.-ˈi.pɨs 'to roll bit by bit'

(5) Initial reduplication (1st/2nd iterations): cf. (1a)

σ-foʃ	PARSE(σ)$^{<=}$	HD(σ)$^{=>}$	TROCHEE$^{=>}$	*CODA(μ)$^{=>}$	*CODA$^{=>}$
☞ a. (ˈσ$_1$-foʃ$_2$)		$1_1 0_2$			$0_1 1_2$
b. (σ$_1$-ˈfoʃ$_2$)		$1_1 0_2$	$W0_1 1_2$		$0_1 1_2$
c. fo$_1$-foʃ$_2$	$W1_2 1_1$	L			$0_1 1_2$
d. (ˈσ$_1$-foʃ$_2$)		$W1_1 0_2$			$0_1 1_2$
e. (ˈfoʃ$_1$-foʃ$_2$)				$W1_1 0_2$	$W1_1 1_2$
f. (ˈfoʃ$_1$-foʃ$_2$)					$W1_1 1_2$
☞ g. (ˈfo$_1$-foʃ$_2$)					$0_1 1_2$

(6) Initial reduplication (2nd/3rd iterations): cf. (1d)

σ$_1$-(ˈfu$_2$rok$_3$)	PARSE(σ)$^{<=}$	HD(σ)$^{=>}$	TROCHEE$^{=>}$	*CODA(μ)$^{=>}$
☞ a. (ˌσ$_1$)-(ˈfu$_2$rok$_3$)		$1_1 0_2 0_3$		
b. fu$_1$-(ˈfu$_2$rok$_3$)	$W0_3 0_2 1_1$	L		
c. (ˌσ$_1$)-(ˈfu$_2$rok$_3$)		$W1_1 0_2 0_3$		L

d. (ˌfur$_1$)-(ˈfu$_2$rok$_3$)			W1$_1$0$_2$0$_3$	L
☞ e. (ˌfu**r**$_1$)-(ˈfu$_2$rok$_3$)				1$_1$0$_2$0$_3$
f. (ˌfu$_1$)-(ˈfu$_2$rok$_3$)			W1$_1$0$_2$0$_3$	L

(7) Prefixed vowel-initial disyllables (3rd iteration): cf. (4)

(ˌσ$_1$)-(ˈi$_2$pis$_3$)	*VV$^{=>}$	HD(σ)$^{=>}$	TROCHEE$^{=>}$	*CODA(μ)$^{=>}$	ONSET$^{=>}$
☞ a. (ˌi**p**$_1$)-(ˈi$_2$pis$_3$)				1$_1$0$_2$0$_3$	1$_1$1$_2$0$_3$
b. (ˌσ$_1$)-(ˈi$_2$pis$_3$)		W1$_1$0$_2$0$_3$		L	L0$_1$1$_2$0$_3$
c. (ˌi$_1$)(p-ˈi$_2$pis$_3$)			W1$_1$0$_2$0$_3$	L	L1$_1$0$_2$0$_3$
d. (ˌi$_1$)-(ˈi$_2$pis$_3$)	W0$_1$1$_2$0$_3$		W1$_1$0$_2$0$_3$	L	1$_1$1$_2$0$_3$

(8) Initial reduplication (3rd iteration): cf. (1b)

(ˌσ$_1$)-(ˈmo$_2$ul$_3$)	*VV$^{=>}$	HD(σ)$^{=>}$	TROCHEE$^{=>}$
☞ a. (ˌmo$_1$)-(ˈmo$_2$ul$_3$)	0$_1$0$_2$1$_3$		W1$_1$0$_2$0$_3$
b. (ˌmou$_1$)-(ˈmo$_2$ul$_3$)	W1$_1$0$_2$1$_3$		L
c. (ˌσ$_1$)-(ˈmo$_2$ul$_3$)	0$_1$0$_2$1$_3$	W1$_1$0$_2$0$_3$	L

(9) Final reduplication (2nd/3rd iterations): cf. (2)

kɨ$_1$(ˈpat$_2$-σ$_3$)	PARSE(σ)$^{<=}$	HD(σ)$^{=>}$	TROCHEE$^{=>}$	ONSET$^{=>}$	*CC$^{=>}$
☞ a. (ˌkɨ$_1$)(ˈpat$_2$-σ$_3$)		0$_1$0$_2$1$_3$	1$_1$0$_2$0$_3$		
b. kɨ$_1$(ˈpat$_2$-pat$_3$)	W0$_3$0$_2$1$_1$	L	L		W0$_1$0$_2$1$_3$
c. (ˌkɨ$_1$)(ˈpat$_2$-σ$_3$)		W0$_1$0$_2$1$_3$	1$_1$0$_2$0$_3$		L
☞ d. (ˌkɨ$_1$)(ˈpat$_2$-pat$_3$)			1$_1$0$_2$0$_3$		0$_1$0$_2$1$_3$
e. (ˌkɨ$_1$)(ˈpat$_2$-at$_3$)			1$_1$0$_2$0$_3$	W0$_1$0$_2$1$_3$	L

(10) Reduplication of vowel-initial monosyllables (2nd iteration): cf. (3a)

(ˈσ$_1$-on$_2$)	*VV$^{=>}$	HD(σ)$^{=>}$	ONSET$^{=>}$	σ-R$^{=>}$
a. (ˈon$_1$-on$_2$)			W1$_1$1$_2$	L
b. (ˈσ$_1$-on$_2$)		W1$_1$0$_2$	L0$_1$1$_2$	L
c. (ˈo$_1$-on$_2$)	W0$_1$1$_2$		W1$_1$1$_2$	L
☞ d. (ˈo$_1$-non$_2$)			1$_1$0$_2$	0$_1$1$_2$

(11) Reduplication of vowel-initial monosyllables (2nd/3rd iterations): cf. (3b)

(ˈaf$_1$-σ$_2$)	HD(σ)$^{=>}$	ONSET$^{=>}$	σ-R$^{=>}$	DEP(j)$^{=>}$	*CODA$^{=>}$
☞ a. (ˈaf$_1$-af$_2$)		1$_1$1$_2$			1$_1$1$_2$
b. (ˈaf$_1$-σ$_2$)	W0$_1$1$_2$	L1$_1$0$_2$			L1$_1$0$_2$
c. (ˈaf$_1$-af$_2$)		W1$_1$1$_2$		L	1$_1$1$_2$
d. (ˈa$_1$f-af$_2$)		1$_1$0$_2$	W0$_1$1$_2$	L	L0$_1$1$_2$
☞ e. (ˈaf$_1$-jaf$_2$)		1$_1$0$_2$		0$_1$1$_2$	1$_1$1$_2$

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Similarity avoidance and Non-Derived Environment Blocking in Classical Arabic

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Deletion and metathesis of short vowels between identical consonants are a well studied aspect of the phonology of Classical Arabic (CA) (McCarthy, 1981; 1986; Rose, 2000; Gafos, 2003; 2018). These effects drive stem alternations in verbal paradigms when bi-consonantal roots are mapped onto templates with three C positions (1a), and tri- and quadri-consonantal roots onto templates with four and five C positions, respectively (1bc).

(1) Identical consonant effects in Classical Arabic verbs

	root	PFV.3fp	PFV.3mp	JUSS.3fp	JUSS.3mp	
a.	√r**d**	ra**d**a**d**-na	ra**dd**-ū	ya-r**d**u**d**-na	ya-ru**dd**-ū	‘oppose’
(cf.	√ktb	katab-na	katab-ū	ya-ktub-na	ya-ktub-ū	‘write’)
b.	√ħm**r**	iħma**r**a**r**-na	iħma**rr**-ū	ya-ħma**r**i**r**-na	ya-ħma**rr**-ū	‘turn red’
c.	√ṭmʔ**n**	iṭmaʔ**n**a**n**-na	iṭmaʔa**nn**-ū	ya-ṭmaʔ**n**i**n**-na	ya-ṭmaʔi**nn**-ū	‘be content’

Some reading traditions of the Quran reflect a variety of CA where vowel deletion between identical consonants is not restricted to templatic derivation, but also occurs, optionally, at stem-affix boundaries (2ab) and between words in external sandhi (2cd) (Van Putten, 2022). As the examples show, partial identity is sufficient to trigger vowel deletion, provided the consonants have the same major place and are eligible to undergo regressive total assimilation.

(2) Vowel deletion between similar consonants at morpheme/word boundaries

a.	*ya-**t**a-**š**aqqaq-u*	→	*ya**šš**aqqaqu*	‘splits apart’	(*Q* 2:74)
b.	*mu-r<**t**a>**d**if-īna*	→	*mu**dd**ifīna*	‘in succession’	(*Q* 8:9)
c.	*la-ðaha**b**a # **b**i-samʕihim*	→	*laðaha**bb**isamʕihim*		(*Q* 2:20)
d.	*fa-z-zāğirāt**i** # **z**ağran*	→	*fazzāğirā**zz**ağran*		(*Q* 37:2)

This paper presents a unified analysis in Stratal Optimality Theory of similarity-driven vowel deletion and metathesis in CA, making use of previously overlooked data from medieval grammatical and orthoepic texts. In agreement with Rose (2000), I regard vowel deletion as a strategy to avoid sequences of adjacent identical elements on a tier, enforced by OCP constraints. For example, the process in (2c) repairs a violation of OCP[Labial] by fusing the two labial stops into a single geminate stop.

Underapplication of vowel deletion/metathesis in contexts such as those in (3) is a case of Non-Derived Environment Blocking (NDEB). While the OCP violations in (2), which stem from consonants in separate morphemes or words, can be repaired by fusion, this is not possible in the forms in (3), where the two violating consonants belong to the same morpheme or word. The data in (1) differ from both (2) and (3) in that they involve mapping of consonantal roots onto templates. In templatic derivation, vowel deletion/metathesis is obligatory, as it does not require fusion of input consonants but, rather, avoids fission of the final root consonant.

(3) Some exceptions to similar consonant effects

a. Underived nouns: *sa**b**a**b**-un* ‘rope/means’, *ʕa**d**a**d**-un* ‘number’, *wati**d**-un* ‘tent peg’
b. Denominal and deadjectival verbs: *ta-ğal**b**a**b**-a* ‘he put on a robe’ from *ğil**b**āb-* ‘robe’, *da**m**u**m**-a* ‘he was ugly’ from *da**m**īm-* ‘ugly’
c. Phonologically derived glide sequences: *ħa**y**i**y**-a* ‘he lived’ from the root √*ħyw*
d. Word-final CVC#, even before a vowel: *la-fasa**d**a**t**‿il-ʔarḵu* (*Q* 2:251), *fa-qṣu**ṣ**‿il-qaṣaṣa* (*Q* 7:176)

I follow the approach to NDEB advanced by Horwood (2002; 2004; 2006), adapted to a Stratal OT framework. Horwood has proposed that relational faithfulness constraints — those that protect the configuration of the input with respect to precedence, adjacency, and autosegmental association — come in pairs in a stringency relation. Alongside the generic LINEARITY, UNIFORMITY, CONTIGUITY, and CONSISTENCY (≈ "don't insert association lines") are the more specific HOMLIN, HOMUN, HOMCONTIG, and HOMCONS, which ban metathesis, fusion, skipping, and association of homomorphemic segments or nodes. NDEB effects are explained as emergence of the unmarked in heteromorphemic contexts under the following constraint ranking: homomorphemic faithfulness ≫ markedness ≫ generic faithfulness.

In stratal-cyclic models (Bermúdez-Otero, 2012; Trommer, 2025), it is commonly assumed that information about the morphosyntactic affiliation of segments is lost after each phonological cycle ("bracket erasure"). "Homomorphemic" faithfulness constraints should not, therefore, be sensitive to morpheme affiliation per se; in later cycles, they should only be able to see whether two segments or nodes passed through the previous cycle together. This explains why NDEB effects in external sandhi (3d) are blind to the internal morphological composition of words: at the phrase level, HOMUN bans fusion of any two segments that exited the word level together.

The analysis is summarized in (4). Vowel deletion is blocked if it would violate HOMUN (4a), optional if it violates UNIFORMITY but not HOMUN (4b), and obligatory if it violates neither constraint, as is the case in templatic derivation (4c). I take optionality to reflect indeterminacy in a pairwise constraint ranking (indicated in tableaux by a jagged line between columns).

(4) A simplified OT analysis

a. Vowel deletion blocked in an underived stem

Input: *sab₁ab₂-un*	HOMUN	OCP	UNIF	MAX-V
→ *sab₁ab₂un*		*		
sabː₁,₂un	*!		*	*

b. Optional vowel deletion in sandhi

Input: *ðahab₁a # b₂i*	HOMUN	OCP	UNIF	MAX-V
→ *ðahab₁a b₂i*		*(!)		
→ *ðahabː₁,₂i*			*(!)	*

c. Obligatory vowel deletion in templatic derivation

Input: *√rd₁ + CaCaC-ū*	HOMUN	OCP	UNIF	MAX-V
rad₁ad₁ū		*!		
→ *radː₁ū*				*

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Sonorants and the feature [voice]

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In theoretical discussions of laryngeal contrast and its neutralisation, usually the obstruents are discussed, and in the languages analysed, sonorants are by default voiced (e.g., Lombardi 1999; Iverson & Salmons 2011; Brown 2016). They might have voiceless/aspirated allophones, as in English. Lombardi (1991) discusses laryngeal contrast and neutralization in sonorants and concludes that they can only be contrastive for the laryngeal features aspiration and glottalization, but not for voicing. Voicing is their default state as sonorants. Cho (1991), Kehrein (2002), Kehrein & Golston (2004) and Botma (2011) reiterate this. Obstruents maximally contrast plain, voiced, aspirated, ejective/glottalized, voiced aspirated and voiced glottalized, i.e, up to six series, as in Beja (Ladefoged 1973), while sonorants maximally contrast three series, i.e., voiced versus glottalized/ejective and aspirated.

Data from Aleut (Bergsland 1997), Central Alaskan Yup'ik (Reed et al. 1977; Miyaoka 2012), and Natchez (Kimball 2005) show that sonorants can be contrastively specified for the feature [voice]. Aleut distinguishes voiceless and voiced fricatives and aspirated from voiced nasals and approximants (Bergsland 1997; as illustrated for the sonorants in (1a/b). There is no laryngeal contrast attested for stops in the native vocabulary. This contrast is found in Russian loanwords, however. Russian is generally described as a true voicing language. Aleut has no labial stops in its native vocabulary. In older loanwords from Russian, the labial stops are replaced by labial nasals, with the voiceless/aspirated labial nasal substituting the voiceless labial stop and the voiced labial nasal replacing the voiced stop (2a-c). The laryngeal contrast of sonorants is neutralised to voiceless adjacent to voiceless stops (3a,b) and in word-final position (3c). Since the voiceless stops of Aleut are unlikely to be specified with any laryngeal feature, the devoicing of sonorants cannot result from spreading of [spread glottis] from the stop and hence must be delinking of the laryngeal feature of the sonorant, i.e., of [voiced]. The same analysis, positional delinking of the laryngeal feature of the sonorant accounts for word-final devoicing (3c). Central Alaskan Yup'ik displays a similar pattern, with word-internal contrast among nasals and generally among fricatives, but no contrast among stops, and contextual devoicing of sonorants. The non-typical sonorants of Natchez are described as phonetically voiceless by Kimball (2005). The laryngeal contrast is found intervocalically and neutralised to voiceless in approximants in word-final syllable codas. (Word-final nasals coalesce with the preceding vowel). Six suffixes trigger voicing of a preceding voiceless sonorant. We analyse this as a floating feature [voice] that comes with the affix and that links to the next available compatible segment. Natchez voiceless sonorants are thus underspecified while the voiced sonorants are specified as [voice].

In conclusion, sonorants can be specified for any of the three laryngeal features, but only obstruents can be specified with two laryngeal features simultaneously. Sonorants thus pattern with fricatives typologically, which also only allow single feature specification. This asymmetry is accounted for by allowing more complex laryngeal nodes for plosives than other classes (4a,b)

(1) Aleut voicing contrast in nasals

a. hmatal ‘to put into the bosom’
matalix ‘to be such as’

b. ahmasix ‘to ask’
uman ‘this one (invisible)’

(2) Russian loanword adaption in Aleut

a. luhmaatkax̂ ‘shovel’ (Russian *lopátka*)
b. maanax ‘bath house’ (Russian *bánya*)
c. tamaakax̂ / tahmaakax̂ ‘tobacco’ (Russian *tabák*)

(3) Aleut positional sonorant devoicing

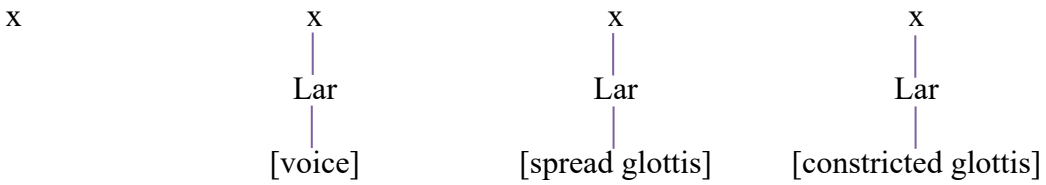
a. Preceding a voiceless stop
kamtix̂ ‘scapula’ i.e., [kaṃ̥tiχ]

b. After a voiceless stop
katmilix ‘to stretch (skin)’ i.e. [katṃ̥ilix]

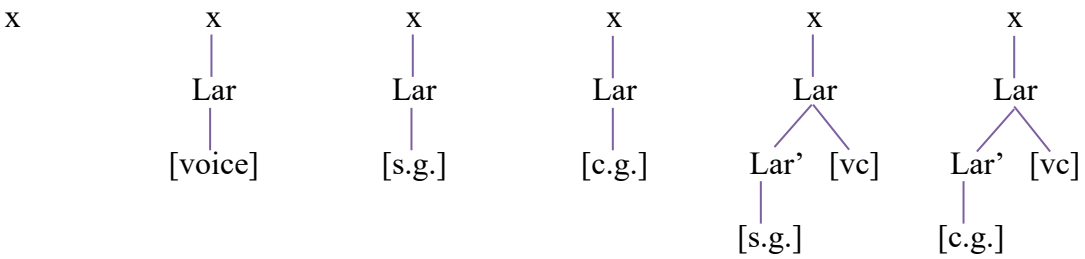
c. Word-final
qilam ‘in the morning’ i.e. [qilaṃ̥]

(4) Laryngeal representations

a. Sonorants and fricatives



b. Plosives



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Sonority and language attitudes: Indexicality versus iconicity

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French sounds beautiful and romantic, German sounds harsh and aggressive—but why do people think so? The *indexical* view (Peirce, 1958; Silverstein, 2003) understands such language attitudes as a result of differences in power, prestige, and sociocultural stereotypes (Giles & Niedzielski, 1998). Particular sounds point to groups of speakers and to their supposed character traits, like friendliness or harshness (see, e.g., Bayard et al., 2001; Coupland & Bishop, 2007). However, the *iconic* view suggests that aesthetic judgments may be directly activated by properties of sound. For instance, voiced obstruents may be perceived negatively because of the articulatory challenge in producing them (Kawahara et al., 2021) or trilled /r/ may be associated with roughness because its discontinuous phonetics resembles rough textures (Winter et al., 2022). Some recent studies test both sociocultural and phonetic-phonological factors (e.g., Anikin et al., 2023; Hilton et al., 2022; Mooshammer et al., 2023; Reiterer et al., 2020), but it remains unclear which features can carry which meanings.

To explore this question, this study focuses on one of the properties that are most commonly hypothesized to affect how listeners rate language—sonority. In a controlled experimental approach using newly created languages, 500 listeners of different language backgrounds rate 3 out of 15 high-sonority target stimuli and 3 out of 15 low-sonority control stimuli on ten semantic differential scales (pleasantness, beauty, softness, shape, education, intelligence, friendliness, ordinariness, goodness, eroticism). Stimuli were generated with a newly written program, the sonority-sensitive pseudotext generator (SSPG). The SSPG uses weighted random sampling to vary the probability of sounds depending on the target sonority of the text (following Parker, 2008). Target and control stimuli are matched in properties like their phonemic inventory, CV ratio, syllable structure, and syllable probability. Audio files are generated with Amazon Polly using different language optimizations and voices. Mixed models regressed the ratings on condition (target or control) and on covariates encoding, e.g., the sonority score of the listener's L1s, how familiar the stimulus language felt to them, which real language they thought it was similar to, and demographic information.

Results show that high-sonority stimuli are rated significantly better (as hypothesized by Reiterer et al., 2020, but see Mooshammer et al., 2023) on almost all scales—interestingly, by listeners with both high- and low-sonority L1s. This suggests that sonority can predict ratings irrespective of previous exposure, lending some support to the iconic view. However, for beauty, shape, and across all scales, high-sonority (but not low-sonority) stimuli are rated better only by participants with high-sonority (but not low-sonority) L1s. This suggests an exposure effect on top of a phonetic-phonological effect. In addition, the results show effects of other sociocultural predictors, most of which are shown by random forests to outweigh sonority. For example, listeners may rate language worse if they perceive it as being less familiar, if they are male, or if they felt it sounded similar to a language from a specific region (e.g., Middle East). These findings speak in favor of the indexical view. The results have implications for the interplay of social and aesthetic meaning: While listeners may have some inherent preference for certain types of sound, they largely rely on attitudes towards groups of speakers.

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Sonority-conditioned reduplicant shape in Wubuy

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In languages that make use of reduplication, the shape of the reduplicant may vary from one context to another. Where the distribution of these shapes is phonologically conditioned, it is often argued that the choice of one or the other pattern should be optimising, in the sense of avoiding marked structures in the output (e.g. Saba Kirchner 2010; Spaelti 1997). Wubuy, a polysynthetic Gunwinyguan language of northern Australia (Heath 1984), provides crucial counter-evidence to this claim, of a kind unknown to the theoretical or typological literature on reduplication. In this language's only productive reduplication pattern, the shape of the reduplicant alternates according to the sonority of the initial segment of the base, to which it attaches as a prefix. Where the base-initial segment is a stop, the reduplicant is a light monosyllable (CV-); where that segment is a sonorant, the reduplicant is a minimal disyllable (CVXV-). The vowels in the reduplicant are always short, no matter the length of their correspondents in the base, and in the disyllabic pattern the second vowel must have the same quality as the first. Thus the base in (1), *puɾi*, reduplicates as *pu-puɾi*, while the base in (2), *wulɻaŋi*, reduplicates as *wulɻu-wulɻaŋi*. The shape alternation is sensitive only to base-initial sonority: it is not affected by the number or type of syllables in the base, nor by any feature of the base beyond the initial segment. Outside of reduplication, the language shows no preference for stop-initial morphological or prosodic constituents to be monosyllabic, nor for sonorant-initial constituents to be disyllabic — cf. the stop-initial prefixes *pa-* '2sg', *paɾa-* '2sg>3pl', and the sonorant-initial prefixes *wa-*'1sg>2sg.Irr', *waɾa-* '3pl>3pl'.

We therefore have no grounds for construing the alternation as a repair for some marked structure. That being so, it is difficult to capture within parallel OT approaches to reduplication (e.g. McCarthy & Prince 1993, 1995; Saba Kirchner 2010; Spaelti 1997; Urbanczyk 2001), as they assume that one reduplicant shape allomorph is the 'unmarked' default, and that 'marked' deviations from this default emerge when the constraints that enforce it are violated in deference to some higher-ranked constraint on well-formedness. In the Wubuy case, no such higher constraint is apparent, and without it, any constraint ranking that selects one reduplicant shape must globally prohibit the other (3-7). Instead of driving allomorphy through markedness, this paper argues that morphological operations must be able to subcategorise for the phonology of their host. While other authors have argued for phonological subcategorisation in the context of a stratal or otherwise layered approach to phonology (e.g. Inkelas & Zoll 2005; Kiparsky 2009; Paster 2006; Yu 2007), in this paper I analyse Wubuy reduplication in Relational Morphology (Jackendoff & Audring 2020), a declarative, schema-based theory with a single-level phonological component that relates full surface word forms to each other according to corresponding parts of structure. In reduplication, two parts of the reduplicative word correspond to one part of its non-reduplicative equivalent, coindexed with Greek letters, as in (8,9). The formalism restricts morphological operations to phonologically-defined classes, without assuming either allomorph repairs the other. Stop-initial and continuant-initial stems are organised into distinct paradigms for the purposes of reduplication, which turns out to have desirable consequences for other areas of Wubuy morphophonology. In this way, we can embrace all the facts of the Wubuy reduplicant shape alternation while committing even more fully to the surface-oriented spirit of OT than level-ordered approaches allow.

(1) a. wini-puɾi
3duM-sit.Past2
'Those two (men) sat' (34.1.1)

b. wini-pu-puɾi
3duM-Red-sit.Past2
'Those two (men) stayed' (34.2.2)

(2) a. wini-wulɻa-ŋi
3duM>3Resid-cut-Past2
'They two (men) cut it' (17.1.3)

wini-wulɻu-wulɻa-ŋi
3duM>3Resid-Red-cut-Past2
'They two (men) kept cutting it' (17.1.4)

(3) Minimal disyllable reduplication with Red=σσ >> NoCoda >> MaxBR

/ŋaŋu, RED, muɾkuʈi, ɻa, ŋi/	CONTIG	MAX-IO	RED=σσ	NOCODA	MAX-BR
☞ a. ŋaŋu-muɾku-muɾkuʈi-ɻa-ŋi				**	ʈiɻaŋi
b. ŋaŋu-muɾkuʈ-muɾkuʈi-ɻa-ŋi				***!	iɻaŋi
c. ŋaŋu-mu-muɾkuʈi-ɻa-ŋi			*!	*	ɾkuʈiɻaŋi
d. ŋaŋu-muku-mukuʈi-ɻa-ŋi		ɾ!			ʈiɻaŋi
e. ŋaŋu-muku-muɾkuʈi-ɻa-ŋi	ɾ!			*	ɾʈiɻaŋi

(4) CV reduplication with Red=σ » NoCoda » Max-BR:

/waɾa, RED, ʈuɾapata/	CONTIG	MAX-IO	RED=σ	NOCODA	MAX-BR
☞ a. wa.ɾa-ʈu.-ʈu.ɾa.pa.ta					ɾapata
b. wa.ɾa-ʈuɾ.-ʈu.ɾa.pa.ta				*!	apata
c. wa.ɾa-ʈu.ɾu.-ʈu.ɾa.pa.ta			*!*		pata

(5) Unified ranking 1: Red=σ » Red=σσ ensures disyllabic reduplicant can never win

/RED, muɾuŋun/	MAX-IO	RED=σ	RED=σσ	NOCODA	MAX-BR
(☞) a. mu.ɾu.-mu.ɾu.ŋun		*!*		*	ŋun
b. muɾ.-mu.ɾu.ŋun			**	**!	uŋun
☹ c. mu.-mu.ɾu.ŋun			**	*	ɾuŋun

(6) Unified ranking 2: Red=σσ » Red=σ ensures monosyllabic reduplicant can never win

/waɾa, RED, ʈuɾapata/	MAX-IO	RED=σσ	RED=σ	NOCODA	MAX-BR
(☞) a. wa.ɾa-ʈu.-ʈu.ɾa.pa.ta		*!*			ɾapat!a
b. wa.ɾa-ʈuɾ.-ʈu.ɾa.pa.ta		*!*		*	apata
☹ c. wa.ɾa-ʈu.ɾu.-ʈu.ɾa.pa.ta			**		pata

(7) Unified ranking 3: Max-BR breaks the tie between equal Red=σ and Red=σσ, favouring disyllabic reduplicant

/waɾa, RED, ʈuɾapata/	Max-IO	Red=σ	Red=σσ	NoCoda	Max-BR
(☞) a. wa.ɾa-ʈu.-ʈu.ɾa.pa.ta			**		ɾapat!a
b. wa.ɾa-ʈuɾ.-ʈu.ɾa.pa.ta			**	*!	apata
☹ c. wa.ɾa-ʈu.ɾu.-ʈu.ɾa.pa.ta		**			pata

(8) RM sister schemas for verbal reduplication: stop-initial class (monosyllabic)

a. Morphosyntax $\{ V_{\alpha}, Pro_x \}_y$
Phonology $[...[+\text{SYLL}]_x\ [[-\text{SON}]V(:)_{\beta}\ ...]_{\alpha}\ ]_y$

b. Morphosyntax $\{ V_{\alpha}, Pro_x, \text{DISTR}_y \}_z$
Phonology $[...[+\text{SYLL}]_x\ [[-\text{SON}]V_{\beta}\ [[-\text{SON}]V(:)_{\beta}\ ...]_{\alpha}\ ]_y\ ]_z$

(9) RM sister schemas for verbal reduplication: sonorant-initial class (disyllabic)

a. Morphosyntax $\{ V_{\gamma}, Pro_x \}_y$
Phonology $[...[+\text{SYLL}]_x\ [\begin{bmatrix}-\text{SYLL}\\+\text{SON}\end{bmatrix}VC(C)V_{\delta}\ ...]_{\gamma}\ ]_y$

b. Morphosyntax $\{ V_{\gamma}, Pro_x, \text{DISTR}_y \}_z$
Phonology $[...[+\text{SYLL}]_x\ [\begin{bmatrix}-\text{SYLL}\\+\text{SON}\end{bmatrix}VC(C)V_{\delta}\ [\begin{bmatrix}-\text{SYLL}\\+\text{SON}\end{bmatrix}V(:)C(C)V(:)_{\delta}\ ...]_{\gamma}\ ]_y\ ]_z$

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Spanish diminutives: stratification, allomorphy and prosodic prespecification

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Spanish diminutives have been studied in morphophonology (see Smith, 2011), but their workings remain debated. This paper analyzes Peninsular Spanish diminutives in Stratal OT, with morphology–prosody alignment, prosodic subcategorization, and phonologically optimizing allomorph selection. Only by combining these elements can the complex patterns of diminutive formation be explained. Data come from the *Nueva gramática de la lengua española* (2025).

According to Bermúdez-Otero (2013), Spanish nouns fall into four classes. In o-stem and a-stem nouns, the theme vowel appears in both singular and plural (e.g., *camin-o(s)*, *mes-a(s)*). E-stem nouns split into ordinary e-stems, where -e appears only in the plural (e.g., *cruz*, *cruc-e-s*), and only e-stems, where -e surfaces in both singular and plural (e.g., *cruc-e(s)*). Athematic stems lack a theme vowel entirely (e.g., *clip(s)*).

The descriptive generalizations about Spanish diminutive formation are as follows:

a. O-stem and a-stem nouns delete the theme vowel before *-it-o/a*: *diner-o* 'money' → *diner-it-o*; *libr-o* 'book' → *libr-it-o*; *mes-a* 'table' → *mes-it-a*; *ram-a* 'branch' → *ram-it-a*.

b. In disyllables with a stressed rising diphthong *ie* or *ue*, the theme vowel is also deleted, and the ending *-e-cit-o/a* is added: *vient-o* 'wind' → *vient-e-cit-o*; *juego* 'game' → *juegu-e-cit-o*; *cuerd-a* 'rope' → *cuerd-e-cit-a*; *piern-a* 'leg' → *piern-e-cit-a*.

c. In only e-stem nouns, deletion of the theme vowel and addition of *-it-o/a* occurs in nouns longer than two syllables, whereas in disyllabic e-stems, diminutives are formed by adding *-cit-o/a*: *aceit-e* 'oil' → *aceit-it-o*; *horizont-e* 'horizon' → *horizont-it-o* vs. *hombr-e* 'man' → *hombr-e-cit-o*; *hambr-e* 'hunger' → *hambr-e-cit-a*.

d. Athematic stems ending in a stressed vowel add *-cit-o/a*: *café* 'coffee' → *cafe-cit-o*; *sofá* 'sofa' → *sofa-cit-o*.

e. Ordinary e-stem nouns select *-cit-o/a* if they are at least disyllabic in the singular, whereas they select *-e-cit-o/a* if they are monosyllabic in the singular: *mujer* 'woman' → *mujer-cit-a*; *joven* 'youngster' → *joven-cit-o* vs. *pan* 'bread' → *pan-e-cit-o*; *flor* 'flower' → *flor-e-cit-a*.

We propose a Stratal OT analysis of Spanish diminutives based on the following claims:

a. The diminutive affix is stem-based and word-level. It exhibits two allomorphs: *-it-o/a*, *-cit-o/a*. Theme vowels delete before the diminutive affix in the word-level phonology.

b. Ordinary e-stem nouns take the allomorph *-cit-o/a* due to a morphology–prosody alignment constraint requiring the R-edge of a stem to align with the R-edge of a syllable (e.g., *mujer].-cit-a*). The same happens with athematic nouns ending in a stressed vowel (e.g., *cafe].-cit-o*). However, when the singular of an ordinary e-stem noun is monosyllabic, the theme vowel -e emerges in the diminutive because the *-cit-o/a* allomorph requires at least a disyllabic foot to precede it (e.g., *flor-e-cit-a* cf. **flor-cit-a*).

c. O-stem and a-stem nouns do not take *-cit-o/a* but *-it-o/a* because two homophonous theme vowels are prohibited (e.g., *libr-it-o* cf. **libr-o-cit-o*), which means that stem-syllable alignment and theme vowel maintenance is possible in e-stem nouns (e.g., *hombr-e-cit-o*).

d. The allomorph *-cit-o/a*, when combined with an only e-stem, is further subject to a prosodic subcategorization requirement: it needs to be preceded by a disyllabic foot aligned with the L-edge of a prosodic word. This is why the theme vowel -e is maintained in *(hombr-e)$_{Ft}$(-cit-o)$_{Ft}$* but deleted in *aceit-it-o*, which selects *-it-o* instead (cf. **a(ceite)$_{Ft}$(-cit-o)$_{Ft}$*).

e. The vowel -e- preceding *-cit-o/a* is not a theme vowel, but an epenthetic vowel, in o-stem and a-stem nouns containing a rising diphthong in stressed position. This vowel is inserted to

allow the diphthong to occupy the head position of a disyllabic foot (e.g. *(vient-e)$_{Ft}$(-cit-o)$_{Ft}$*), as opposed to, for instance, the -e- in *nub-e-cit-a* (cf. *nub-e* 'cloud'), which is a theme vowel.

(1) Constraints

a. *[σ ... Ft, *-cit-o/a*]$_{\omega}$
Assign * if the foot preceding *-cito/a* is not aligned with the L-edge of a prosodic word. (The allomorph *-cit-o/a* subcategorizes for a preceding disyllabic foot that L-aligns with the prosodic word; active in the cophonology for only e-stem nouns.)

b. *[σ, *-cit-o/a*]
Assign * if *-cito/a* is not preceded by a disyllabic foot. (The allomorph *-cit-o/a* subcategorizes for a preceding diyllabic foot.)

c. ANTIHOMOPHONY
Assign * for every pair of morphemes that are homophonous within a single morphosyntactic word (based on Golston, 1995).

d. DIPHTHONG/HEAD
Assign * for every diphthong not parsed into a metrical foot's head.

e. ALIGN-R(Stem, σ)
Assign * for every stem whose R-edge does not coincide with the R-edge of a syllable.

f. DEP-V
Assign * for every vowel in the output that has no correspondent in the input.

g. MAX-V
Assign * for every vowel in the input that has no correspondent in the output.

h. PRIORITY(*-it-o/a* > *-cit-o/a*)
Assign * for every *-cit-o/a* diminutive.

(2) Grammar (word-level phonology)

input	*winner* ~ *loser*	*ranking arguments*
libr-o	libr-it-o ~ *libr-o-cit-o	ANTIHOMOPH ≫ AL-R(St, σ), MAX-V
mujer-{∅, e}	mujer-cit-a ~ *mujer-it-a	AL-R(St, σ) ≫ PRIOR
vient-o	(vient-e)$_{Ft}$(-cit-o)$_{Ft}$ ~ *vient-o-cit-o	ANTIHOMOPH ≫ DEP-V, AL-R(St, σ), MAX-V
	(vient-e)$_{Ft}$(-cit-o)$_{Ft}$ ~ *vient-it-o	DIPH/HEAD ≫ DEP-V, PRIOR
horizont-e	horizont-it-o ~ *hori(zont-e)$_{Ft}$(-cit-o)$_{Ft}$	*[σ ... Ft, *-cit-o/a*]$_{\omega}$ ≫ AL-R(St, σ), MAX-V
flor-{∅, e}	flor-e-cit-a ~ *flor-cit-a	*[σ ... *-cit-o/a*]$_{\omega}$ ≫ PRIOR

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Spanish, English and Dutch versus Guaraní: prosody and sound patterns

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Van Soeren (2023) analyses the distribution of labials and coronals in corpora of Spanish, English, and Dutch CVCVC(V) forms and observes that, in all three languages, labial consonants are favoured in initial position (C1) with a smaller proportion of labials for C2 and the smallest proportion for C3. The reverse pattern is observed for coronals: the smallest proportion for C1 position, a larger proportion for C2 and a strong favouring for C3, even in Spanish, where C3 is followed by a vowel in CVCVCV forms. In line with Diver (1979/2012) and Tobin (1997), Van Soeren explains the observation with communicative load; as a word is uttered, many word candidates are eliminated, and therefore the beginning has a higher communicative load than the end (cf. Grosjean 1980; King & Wedel 2020). Labials have a perceptual advantage over non-labials; they are visible as well as audible, and are thus favoured in positions of high communicative load (and high burden on distinctiveness) and *some* coronals are favoured at the more redundant end, which is explained with their articulatory efficiency.

The study also takes prosodic factors into account: in Figures 1 and 2 we observe that in Spanish, the distribution of labials and coronals is different in words with stress on the first and second syllable (highly similar patterns are observed for English and Dutch). It is argued that stress may play a role in the elimination of word candidates; in Spanish, English and Dutch discourse, most forms start with a stressed syllable, and a word-initial unstressed syllable may thus eliminate more candidates (Van Soeren 2023). This results in a stronger reduction of communicative load in the rest of the word, affecting the distribution of labials and coronals.

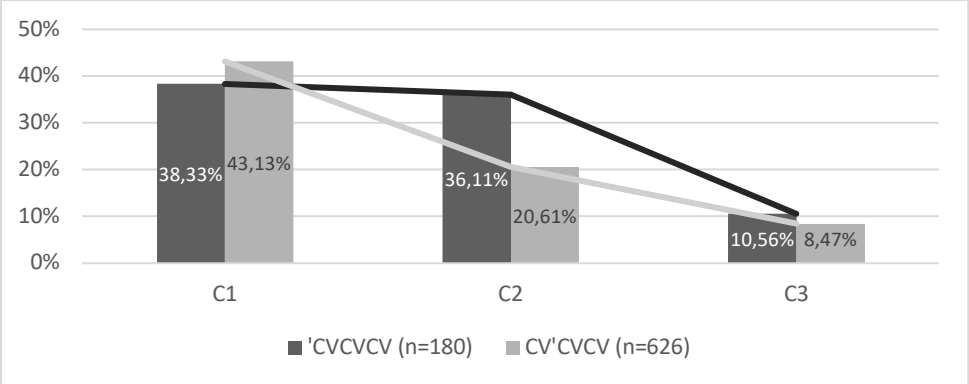

Figure 1 - Distribution of labial consonants for C1, C2 and C3 in Spanish CVCVCV words (n=806) with stress on the first syllable (dark) or stress on the second syllable (light). Significance: C1: p = 0,251, C2: p < 0,001, C3: p = 0,386. From Van Soeren (2023: 168).

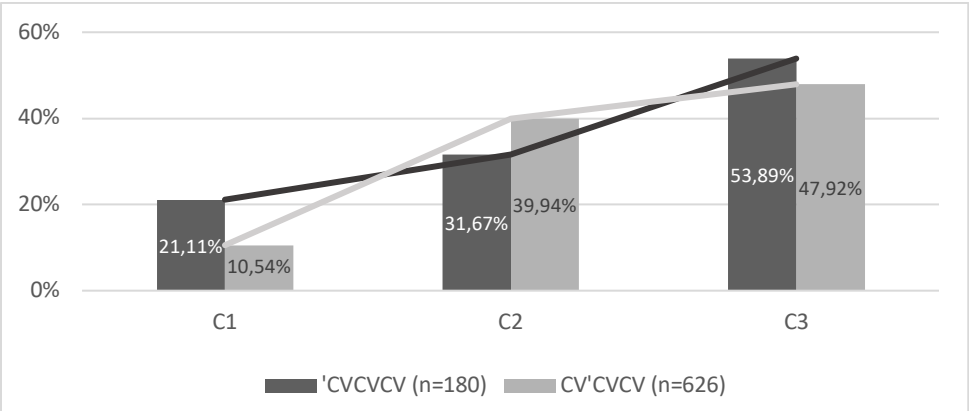

Figure 2 - Distribution of coronals /l n r t/ for C1, C2 and C3 in Spanish CVCVCV words (n=806) with stress on the first syllable (dark) or stress on the second syllable (light). Significance: C1: p < 0,001, C2: p < 0,05, C3: p = 0,158. From Van Soeren (2023: 170).

This explanation works, firstly, because the patterns seem to be very similar in the three studied languages; secondly, because in all three languages, stress has a distinctive function; and thirdly, because in Spanish, English and Dutch discourse the majority of words begin with a stressed syllable. Many factors are similar, which is not surprising, as two of the three languages are from the same language family, and all three are Indo-European. It would therefore be interesting to analyse a similar dataset from a non-IE language with different prosodic patterns, but whose syllable structure allows the collection of a similar corpus of CVCVC(V) forms.

I will thus collect and analyse a corpus of Guaraní CVCVCV forms. Guaraní is an indigenous South-American Tupi language, which seems to have enough vocabulary with the aforementioned syllable structure (e.g. *jopara* 'corn stew'*, karatī* 'potato'*, manóne* 'papaya' and *pakova* 'banana'), and in which the vast majority of words has stress on the last syllable. For optimal comparability, the corpus collection process should be as similar to Van Soeren (2023) as possible. In general, I expect to find distributions of labials and coronals that are similar to the ones reported in Van Soeren (2023). One can argue that the account of the corpus data in terms of communicative load (which was posited after the analysis of many (IE and non-IE) language families; Tobin [1997]) applies to any language, as all languages have forms with a beginning and an end, where the end will always be more redundant for its identification. As for the effect of prosody on Guaraní sound patterns, I find it more difficult to make predictions.

The added value of comparing previous results to an analysis of Guaraní CVCVCV forms goes beyond the insights that a new language with different prosodic patterns may bring. Guaraní is an underresearched language, and analysing the sound patterns of more non-Indo-European languages is important for our understanding of phonology, that is still disproportionally based on research on IE languages. It is expected that by January, I have a full corpus analysis.

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Specific before default in phonological learning

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Intro. Studies have shown that when phonological patterns align with natural classes, learners can abstract rules based on shared features (Finley & Badecker, 2009; Cristia et al., 2013). However, how "default" patterns (complements of one or more natural classes) are learned is not known. Some computational learning algorithms (e.g., a rule-based classifier RIPPER) start by assigning the default status to the more frequent class before learning rules for less frequent classes. Other learning algorithms (e.g., Minimal Generalization Learner of Albright, 2002) start with minimal generalizations, learning the narrowest, specific classes before more general or default classes.

Overview. We report on several AGL experiments testing how people generalize when learning phonologically-conditioned suffix allomorphy that involves a **narrow** rule (applying to a natural-class) and a **default** rule that applies elsewhere. Online participants (recruited via Prolific) were presented with audio-picture pairs for a singular noun, made a forced choice between two possible plural forms, then received feedback. Figure 1 shows training and testing regimes and example stimuli. We varied the two suffixes' frequency (equal vs. majority default) and the type of narrow rule: voiceless fricative, alveolar obstruent, word-final CC cluster (see Table 1). Overall results showed that speakers mostly failed to generalize the default rule above its frequency-based chance (75% in the majority-default condition and 50% in the equal-frequency condition) but performed above chance on the narrow pattern. This result is consistent with the claim that speakers learn by forming narrow rules or memorizing specific segments before noticing general, elsewhere patterns.

Specific results. For reasons of space, we focus on the condition with most successful learning (when the suffixes were of equal frequency and the narrow suffix applied to a natural class of sounds). Figure 2 shows performance on novel words that ended in the same segments as the trained words. Participants were at chance on the default suffix but were significantly above chance (odds ratio ≈ 0.49, $p < .01$) on the narrow suffix. To see if they generalized a rule (vs. memorized segments) we also tested performance on novel segments, including segments held out from training and foreign (non-English) sounds. We expected that participants would choose the default suffix for completely novel segments that do not fit the narrow rule. We also expected that they would apply the rule to conforming novel segments (unless they memorized segments in training). Our expectations were confirmed in the voiceless fricative condition (see Figure 3). Participants' average correct responses on novel held-out segments in this condition were at 57% for both the narrow and the default suffix, above chance according to a mixed-effects logistic regression (odds ratio = 1.41, p = 0.002). Similar, but not significant trends were observed in other conditions.

Conclusions. Overall, we found that human learners seem to **prefer specificity over maximal coverage**, with no across-the-board default rules early in learning. We found that (1) narrow rules are learned better than default rules and (2) more perceptually salient properties (voiceless fricatives) have an advantage over the syllabic pattern (CC clusters) and alveolar obstruents. Since learners were reluctant to generalize the default even when they showed signs of learning or memorizing its complement (the narrow pattern), many "defaults" in natural language may actually be learned as disjunctions of several narrow rules. A follow-up experiment, with an equal number of segments in the two classes, showed a trend for the narrow suffix to be chosen as default.

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Figure 1. Number of items in training and testing

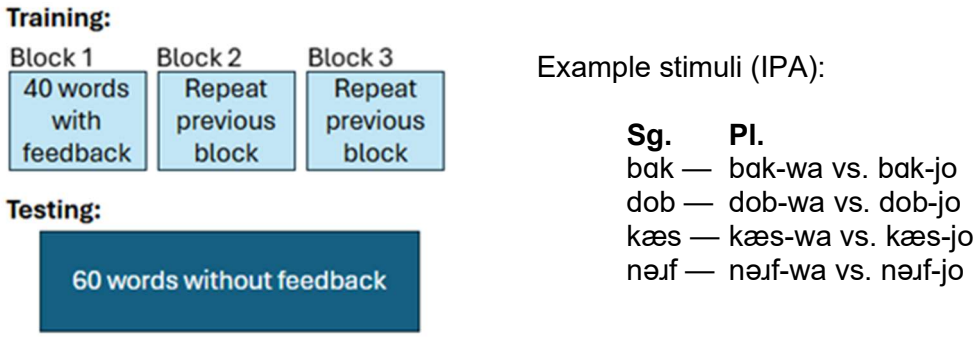


Table 1. Types of narrow rules used to define the plural pattern. Starred segments (or sets of segments) were held out in training and presented in testing.

Version	Narrow category	Word final segments	Default category (elsewhere)
Version 1	Voiceless fricatives	[f, θ*, s, ʃ]	[v, z] [p, t, k] [b, d, g, l*, ɹ, m*, n]
Version 2	Alveolar oral obstruents	[t, d, s*, z]	[l, ɹ*, n*] [b, p, k, g, f, v, ʃ, m]
Version 3a	Consonant clusters	[lʃ, ɹf, lm, mp, st] [nt, sk, sp]*	[p, b, f, v, t, d, s, z, ɹ, n, ʃ, k, g] [m, θ, l]*
Version 3b		[lʃ, lm, sk, sp, st] [nt, mp, ɹf]*	[p, b, m, f, v, t, d, z, l, ʃ, k, g] [ɹ, n, s]*

Figure 2. Proportion of correct suffix-choices (in Versions 1 & 2 on novel words with seen segments) based on Category: “Narrow-class” are words that end in consonants belonging to the learned natural class, “Default” encompasses all other words.

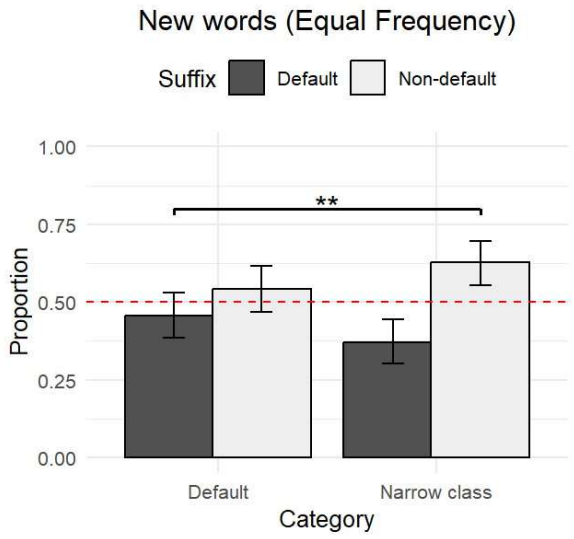
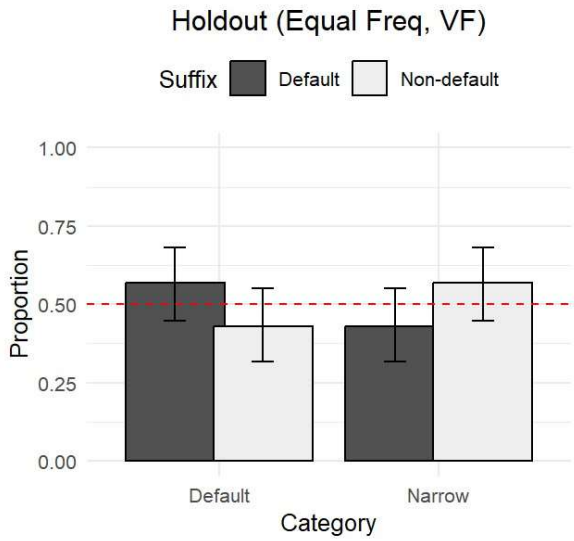


Figure 3. Proportion of correct suffix choices in Version 1 on novel test words containing segments that were held out during training.



Stratal OT and Scottish Gaelic initial mutation/prothesis

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As is typical of Insular Celtic languages, Scottish Gaelic displays a complex series of morphophonological alternations affecting the left edge of the word. Alongside *initial mutation* (IM), which normally involves the replacement of one initial consonant by another, we must also consider *prothesis* (P), which typically affects vowel-initial forms and consists of the insertion of an initial consonant. Besides the sheer complexity of the alternations involved, some of these processes have proven difficult to account for in purely concatenative morphological frameworks due to their superficially non-additive nature. I present a unified account of IM/P in Scottish Gaelic in the framework of Stratal OT (Bermúdez-Otero, 2018), in which the observed alternations are triggered by underlyingly-floating segmental or sub-segmental material that docks to the initial onset of the target morpheme (cf. Lieber, 1983; 1987; Massam, 1983; Wolf, 2005; 2007; Iosad, 2014; 2017; Breit, 2019). Foregrounded here are converging strands of evidence for the stratal affiliations of different processes of IM/P in Scottish Gaelic, thus highlighting the power of a stratified phonological framework to account for these phenomena.

A crucial distinction is made between (i) *morphologically-triggered* IM/P, which occurs in a particular morphosyntactic context and marks categories such as gender, number and case or aspect, tense and mood; and (ii) *lexically-triggered* IM/P, which occurs in the presence of an immediately-preceding closed-class word such as a determiner or a preposition. In the former case, I assume that the triggering phonological material is contained within an inflectional prefix that is inserted by the morphology and docks to the initial onset of the target in the word-level phonology after the concatenation of morphemes into words. In the latter case it forms part of the lexical representation of the immediately-preceding word, docking to the initial onset of the target in the phrase-level phonology after the concatenation of words into phrases. It follows that (i) lexically-triggered IM/P requires phonological adjacency of lexical trigger and target, in order for the phonological content of the former to affect the latter in the phrase-level phonology, while morphologically-triggered IM/P requires no adjacent lexical trigger; and (ii) lexically-triggered IM/P will apply exceptionlessly to all potential targets, since the phrase-level phonology is blind to the lexical identity of the target, while morphologically-triggered IM/P may apply irregularly to certain targets, since regular morphology can be overridden by lexically-specific suppletive allomorphy at the point of lexical insertion.

It is found that these two criteria display a striking degree of consistency when applied to specific IM/P processes. For instance, *lenition* does not always require an adjacent lexical trigger, e.g. *caileag bheag bhàn* [kʰalʲak vek vãːn] ‘girl small.F fair-haired.F’ (*[pãːn]), and also displays irregular underapplication in a number of closed-class items, e.g. *cha dèan* [xa tʲĩa̯n] ‘won’t do’ (*[ɣʲĩa̯n]), both of which indicate morphological triggering. On the other hand, *nasalisation*/*n-prothesis* always requires an adjacent lexical trigger, e.g. *am balach* [ə ᵐbaLəx] ‘the boy’, and applies exceptionlessly even to those targets that resist lenition, e.g. *an dèan?* [ə ᴺdʲĩa̯n] ‘will … do?’ (*[ə tʲĩa̯n]), thus suggesting lexical triggering according to both criteria. In turn, the respective stratal affiliations of these two processes are borne out by the fact that lenition may be seen to feed or bleed nasalisation/*n*-prothesis in certain contexts, e.g. *an fhuil* [ə Nulʲ] ‘the blood’, *a’ chaileag* [ə xalʲak] ‘the girl’, whereas the reverse ordering is never observed.

These data show that a successful analysis of IM/P in Scottish Gaelic must recognise the fact that these alternations reflect a diverse set of morphophonological phenomena that are actualised at different stages of the phonological derivation (cf. Iosad, 2014). Evidence from triggering patterns, exceptional targets and ordering effects points to a phonology with ordered strata operating upon specific morphosyntactic domains such as stems, words and phrases.

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Stress-conditioned contrast maintenance: disentangling the role of acoustics and attention

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Prosodically prominent positions within the word are known to be privileged, manifesting the positional maintenance of consonantal contrasts otherwise neutralized, and the resistance to processes applying elsewhere. The positional maintenance of contrasts has traditionally been accounted for as an effect of Positional Faithfulness (PF; Beckman, 1998). This study explores the underpinnings of these effects. We examine the relative contribution of two factors which may modulate the perceptual availability of a consonantal contrast: **(i)** the acoustic effects of lexical stress on stress-adjacent consonants and **(ii)** the modulation of temporal attention (Astheimer & Sanders, 2009) in correspondence of the stress-domain. We investigate velar palatalization in Italian, a case of stress-conditioned contrast-maintenance (Giavazzi, 2010): the [ki] - [t͡ʃi] contrast is neutralized far from stress (/kómiki/ [kómit͡ʃi], 'comic'-masc.pl), while it is maintained in post-tonic position (/antíki/ [antíki], 'antique'-masc.pl.). We present the results of two ABX tasks and a third ongoing experiment investigating the role of (i) and (ii) on the maintenance of contrast in post-tonic position.

Study I. The first study is an ABX task in which Italian participants (N=46) were asked to discriminate words ending in [ki] and [t͡ʃi], and [gi] and [d͡ʒi], where these sequences occurred either far from stress (e.g. pítaki - pítatʃi - pítaki) or in post-tonic position (e.g. pitáki - pitátʃi - pitáki). We show that participants discriminate the contrast better in the post-tonic position, **Figure 1** [main effect of prosody: β= 0.23, SE = 0.08, X2 (1) = 6.41, $p < 0.01$]. We discuss these findings as arising from the two possible effects in **(i)** and **(ii)**.

Study II. This study aims at understanding the source of our results in Study I. This ABX task aims at disentangling the acoustic effects of stress on post-tonic consonants in Italian (Shao et al., 2023), from the possible effects of temporal attention to the stress domain, as both factors could yield greater discriminability of post-tonic Cs. We edited stimuli to yield a 2x2 design (**Figure 2)**: endings had the acoustic properties of either post-tonic or far-from-stress consonants (ending type), and they were either adjacent to a stressed vowel, or far from it (stress type), N=42. Accuracy results reveal only an effect of stress type (as in Study I), possibly because participants were almost at ceiling. RT results reveal both an effect of stress type and an iteration between stress type and ending type [β= -0.05, SE = 0.009, X2 (2) = 28, $p < 0.001$], **Figure 3**. These results show a possible contribution of both effects, though the study was probably too easy for both to emerge.

Study III (ongoing). Study III also aimed at testing the acoustic vs attentional effects of stress on post-tonic consonants, overcoming some limitations of Study II. Study III includes filler stimuli, i.e. words in which the target syllables appear as the first or second syllable of the word, which serve the purpose of lowering predictability of word structure. Finally, we used the results from Study II to conduct a prospective power analysis that determined the number of items and speakers for the design. The analysis showed that 5 items and 42 participants will constitute an adequate sample size.

We will discuss the implications of our findings for the diachronic emergence of stress-conditioned phonological processes, as well as for listeners' ability to direct attentional

resources to informationally rich portions of the speech signal during language processing (Nobre et al., 2018).

Figures:

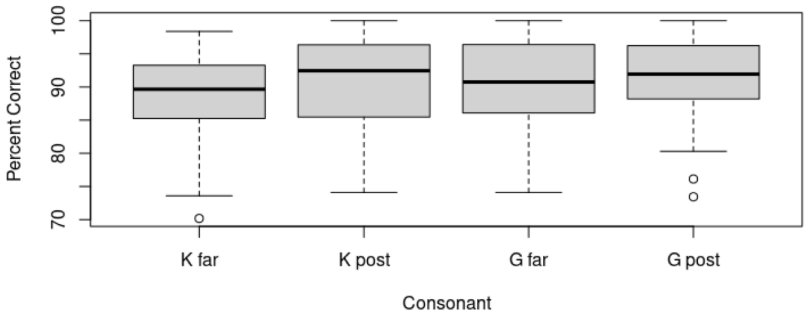

Fig. 1 - Box-plots showing accuracy the ABX task of Study I

		Stress Type (Position of lexical stress)	
Ending Type (Acoustic properties of the ending)		**Antepenultimate** (far-from-stress [K], **FAR**)	**Penultimate** (post-tonic [K], **POST**)
	Antepenultimate (far-from-stress [K], **FAR**)	[píta][ki] 'FAR_far'	[pitá][ki] 'POST_far'
	Penultimate (post-tonic [K], **POST**)	[píta][ki] 'FAR_post'	[pitá][ki] 'POST_post'

Fig. 2 - Stimuli design of Study 2: Stimuli of the ABX task where constructed through splicing, to yield a 2x2 design in which nonce-word endings ([-ki], [-gi], [-t͡ʃi], [-d͡ʒi] - Ending Type) had acoustic properties which were either congruent or incongruent with respect to the position of lexical stress (Stress Type).

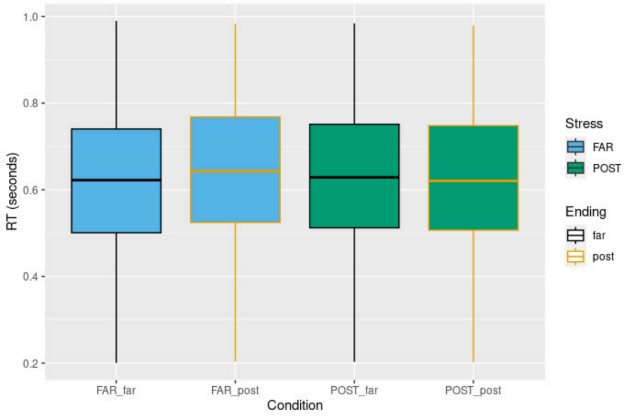

Fig. 3 - Box-plots showing RT in the ABX task of Study II

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Substance-freely, the two Japanese words for 'tea' share an underlying onset cluster

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Problem. Nineteenth-century Japanese had no [ti]-sequences. English words with the sequence [ti] were subsequently borrowed in Japanese, leaving present-day [tɕi] (e.g. *team* [tɕiːmu], from 1890) as well as [ti] (e.g. *tea* [tiː], from 1930; Crawford, 2008). This paper shows by computer simulations how such sequences could have been incorporated into Japanese phonologically. We distinguish 4 levels of representation: 'meaning', |underlying|, /surface/, [phonetic].

Data. A phonetic [tɕi] could be analysed underlyingly as either |ti| or |tji|. A case for |ti| is made by (1) native verbal alternations as in [kɑtoː] 'let's win', [kɑtebɑ] 'if we win', [kɑtɑnɑi] 'not to win', but [kɑtɕimɑsu] 'I/we/they win', (2) lexical economy, and (3) simplicity of analysis (similar influence of high front vowel /i/ and semivowel /j/). A case for |tji| is made by (1) lexical contrasts for non-front vowels such as in [tɑbi] 'journey' versus [tɕɑme] 'mischief', and (2) the similar pronunciation of the beginnings of [tɕi] and [tɕa]. *Our virtual learners are to decide how to weigh these sources of evidence.*

Grammar. We model the learner with the following constraints: lexical constraints such as *'win'|kɑt|, *'win'|kɑtj|, a (biased) morpheme-structure constraint *|tjV| (lexical economy), (biased) faithfulness constraints *|tV|/tjV/, *|tjV|/tV/, (biased) structural constraints */tjA/, */tji/, and a granular set of (substance-free, unbiased) cue constraints */.tA./[tA], */.tA./[tɕA], */.tjA./[tA], */.tjA./[tɕA], */.ti./[ti], */.ti./[tɕi], */.tji./[ti], */.tji./[tɕi].

Learning algorithm. We throw all data and constraints in the mix, and run an OTMulti simulation in Praat, using MaxEnt (Jäger, 2007) to stay close to distributed neural networks, and exponential weighting (Boersma & Pater, 2016) to prevent negative weights. Thus, the meaning 'let's win' has underlying candidates |kɑt + oo| and |kɑtj + oo|, surface candidates /.kɑ.too./ and /.kɑ.tjoo./, and phonetic candidates [kɑtoː] and [kɑtɕoː], i.e. 8 chains. The *learner's winner* is the most harmonic of these 8 chains, while the *adult winner* is the most harmonic of the 4 chains that contain [kɑtoː]. If the adult winner differs from the learner's winner, the weights of the constraints that prefer / disprefer the "adult winner" are raised / lowered (for multi-level OT production simulations, see Boersma & Van Leussen, 2017).

Results. A nineteenth-century Japanese learner ends up with the grammar in Table 1. When subsequently presented with a one-off English *team* [tiːm], she perceives this as surface /.tjii.mu./ and underlying |tjiimu| (Tableau 2), i.e. **with an initial consonant cluster!** She subsequently pronounces this variably as [tiːmu] and [tɕiːmu] (Tableau 3). The next generation of learners handles [tiːmu] by creating the full chain 'team' |tjiimu| /.tjii.mu./ [tiːmu] (Table 4).

What is going on? To understand the counterintuitive underlying |tjiimu|, we can realize that in 19th-century Japanese there was a gap *|tji| in the lexicon, simultaneously with a phonetic gap *[ti]. Our virtual actuators and next-generation learners consistently find chains such as 'team' |tjiimu| /.tjii.mu./ [tiːmu] that connect these former gaps, exactly mirroring 'soil' |timi| /.ti.mi./ [tɕimi]. The strange-looking connection of [tiːmu] to |tjiimu| and /.tjii.mu./ underscores the arbitrariness of phonological representations in a substance-free view of phonology (Boersma, Chládková & Benders, 2022). And our title? Well, the two Japanese words for 'tea', pronounced [tɕɑ] and [tiː], turn out to be underlyingly |tja| and |tji|, respectively.

	ranking value	*disharmony*	*plasticity*	$e^{disharmony}$
***'mischief' |tɑme|**	3.895	4.054	1.000000	57.61
***/.ti./ [ti]**	3.016	3.153	1.000000	23.4
***|tV| /tjV/**	2.720	3.059	1.000000	21.3
***/.tjA./ [tA]**	2.841	2.763	1.000000	15.84
***|tjV| /tV/**	2.976	2.719	1.000000	15.17
***/.tA./ [tɕA]**	2.658	2.599	1.000000	13.45
***|tjV|**	2.123	2.124	1.000000	8.364
***'journey' |tjɑbi|**	2.116	2.115	1.000000	8.29
***'win' |kɑtj|**	2.065	2.093	1.000000	8.113
***/tji/**	1.868	1.888	1.000000	6.604
***'soil' |tjimi|**	1.837	1.828	1.000000	6.223
***/.tji./ [tɕi]**	1.037	1.018	1.000000	2.769
***/.tji./ [ti]**	0.831	0.801	1.000000	2.227
***/tjA/**	-0.0009	-0.286	1.000000	0.7516
***'soil' |timi|**	-1.837	-1.578	1.000000	0.2064
***'win' |kɑt|**	-2.065	-2.182	1.000000	0.1128
***'journey' |tɑbi|**	-2.116	-2.421	1.000000	0.08884
***/.tA./ [tA]**	-2.657	-2.956	1.000000	0.05202
***/.tjA./ [tɕA]**	-2.842	-2.964	1.000000	0.05162
***'mischief' |tjɑme|**	-3.895	-3.692	1.000000	0.02491
***/.ti./ [tɕi]**	-4.884	-4.839	1.000000	0.007912

Table 1. Exponential-MaxEnt grammar after learning from exposure to the meaning–sound pairs 'win-ɑ' [kɑtɑ], 'win-i' [kɑtɕi], 'journey' [tɑbi], 'mischief' [tɕɑme]', and 'soil' [tɕimi]. The symbol "A" in constraint names refers to any non-"i" vowel.

	23.4	21.3	15.17	8.364	6.604	2.769	2.227	0.0	
[tiːm]	*/.ti./ [ti]	*|tV| /tjV/	*|tjV| /tV/	*|tjV|	*/tji/	*/.tji./ [tɕi]	*/.tji./ [ti]	*/.ti./ [tɕi]	
|tiimu| /.tii.mu./	*								-23.4
|tiimu| /.tjii.mu./		*			*		*		-30.1
|tjiimu| /.tii.mu./	*		*	*					-47.0
☞ |tjiimu| /.tjii.mu./				*	*		*		-17.2

Tableau 2. Perception tableau for "naïve" loanword adaptation (Boersma & Hamann, 2009): comprehension of a newly incoming English *team* [tiːm] with the grammar of Table 1.

	23.4	21.3	15.17	8.364	6.604	2.769	2.227	0.0	
|tjiimu|	*/.ti./ [ti]	*|tV| /tjV/	*|tjV| /tV/	*|tjV|	*/tji/	*/.tji./ [tɕi]	*/.tji./ [ti]	*/.ti./ [tɕi]	
/.tii.mu./ [tiːmu]	*		*	*					-47.0
/.tii.mu./ [tɕiːmu]			*	*				*	-23.6
☞ /.tjii.mu./ [tiːmu]				*	*		*		-17.2
☞ /.tjii.mu./ [tɕiːmu]				*	*	*			-17.8

Tableau 3. Production of the borrowed 'team' for the adapter of Tableau 2. The pronunciation is 63% [tiːmu] and 37% [tɕiːmu]. Many other adapters do 100% [tɕiːmu] or 100% [tiːmu].

meaning	underlying	surface	phonetic	proportion
‘win-ɑ’	|kɑt + ɑ|	/.kɑ.tɑ./	[kɑtɑ]	100%
‘win-i’	|kɑt + i|	/.kɑ.ti./	[kɑtɕi]	100%
‘journey’	|tɑbi|	/.tɑ.bi./	[tɑbi]	100%
‘mischief’	|tjɑme|	/.tjɑ.me./	[tɕɑme]	100%
‘soil’	|timi|	/.ti.mi./	[tɕimi]	100%
‘team’	|tjiimu|	/.tjii.mu./	[tɕiːmu]	80%
	|tjiimu|	/.tjii.mu./	[tiːmu]	20%

Table 4. Winning chains for a second-generation learner who had been exposed not only to the meaning–sound pairs ‘win-ɑ’ [kɑtɑ], ‘win-i’ [kɑtɕi], ‘journey’ [tɑbi], ‘mischief’ [tɕɑme]’, and ‘soil’ [tɕimi], but also to 20 percent ‘team’ [tiːmu] and 80 percent ‘team’ [tɕiːmu], and then learned with Exponential MaxEnt. The learner ends up matching the environmental probabilities.

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Tautosyllabic high vowel sequences in Catalan: an acoustic and phonological analysis

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This study examines tautosyllabic sequences of two high vowels (*ui* and *iu*) in Central Catalan. These are phonologically interesting since the sonority sequencing principle cannot determine which segment acts as the syllabic nucleus and which one as a glide (Martínez-Paricio & Torres-Tamarit, 2013). While described as falling diphthongs in Catalan (Cabré & Ohannesian, 2013, 2017; Cabré & Prieto, 2004) and rising diphthongs in Spanish (Cabré & Ohannesian, 2017; Chitoran & Hualde, 2007), no clear consensus exists, and detailed acoustic studies on their realisation are scarce.

This study provides phonetic data on the production of *ui* and *iu* by unbalanced bilinguals of Catalan and Spanish in Barcelona, assessing the influence of dominant language and word position, and offering a phonological analysis within Optimality Theory. Ten female university students aged 19–22, half dominant in Central Catalan and half in Spanish (according to the Bilingual Language Profile, BLP), participated in a controlled reading task. The corpus consists of 160 Catalan words containing *ui* and *iu* sequences, balanced for stress (stressed vs. unstressed, *cuina* (*kitchen*) vs. *piulet* (*chirp*)) and word stress placement (oxytone vs. paroxytone, *avui* (*today*) vs. *deslliure* (*released*)). Data were analysed using custom R scripts that extracted formants (F1–F4) and F0, aligned with phonetic annotations (TextGrid).

Results show that sequence (*ui* vs. *iu*), stress, and position within the word significantly influence diphthong realisation. *ui* sequences are shorter ($p < 0.000$), less dynamic ($p = 0.001$), and show greater F2 trajectories than *iu* ($p < 0.000$). In final stressed position, both diphthongs exhibit longer durations ($p < 0.000$). Out of 800 tokens per sequence, 216 *iu* diphthongs (27%) and 157 *ui* diphthongs (20%) were realised as rising, with little effect of L1. Rising realisations of *iu* are most frequent in unstressed positions (over 40%), whereas the final stressed position strongly disfavours them. For *ui*, unstressed contexts also favour rising realisations, though to a lesser extent than for *iu*, while final stressed contexts remain those with the lowest proportion. Consonantal context shows that [ɾ], [l], and [ʃ] favour rising realisations, but overall, there is considerable idiolectal variation not explained by sequence, stress, or L1.

Building on Martínez-Paricio & Torres-Tamarit (2013), we extend the phonological analysis to account for patterns that were not previously explained, namely the behaviour of *iu* and *ui* sequences in unstressed positions, as motivated by the evidence emerging from our data. To capture this asymmetry, we define two additional constraints that specifically target unstressed contexts: *U-Nucleus (violated by sequences with *u* as nucleus) and *I-Nucleus (violated by sequences with *i* as nucleus). These constraints are unranked (see *Fig. 3*), which explains the double possibility of rising and falling diphthongs in unstressed positions.

This study provides a solid empirical foundation for understanding the phonetic variability of these sequences, while also highlighting the need for further acoustic and phonetic descriptions. Future research could expand the number of speakers and gather data from different contexts.

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Figures

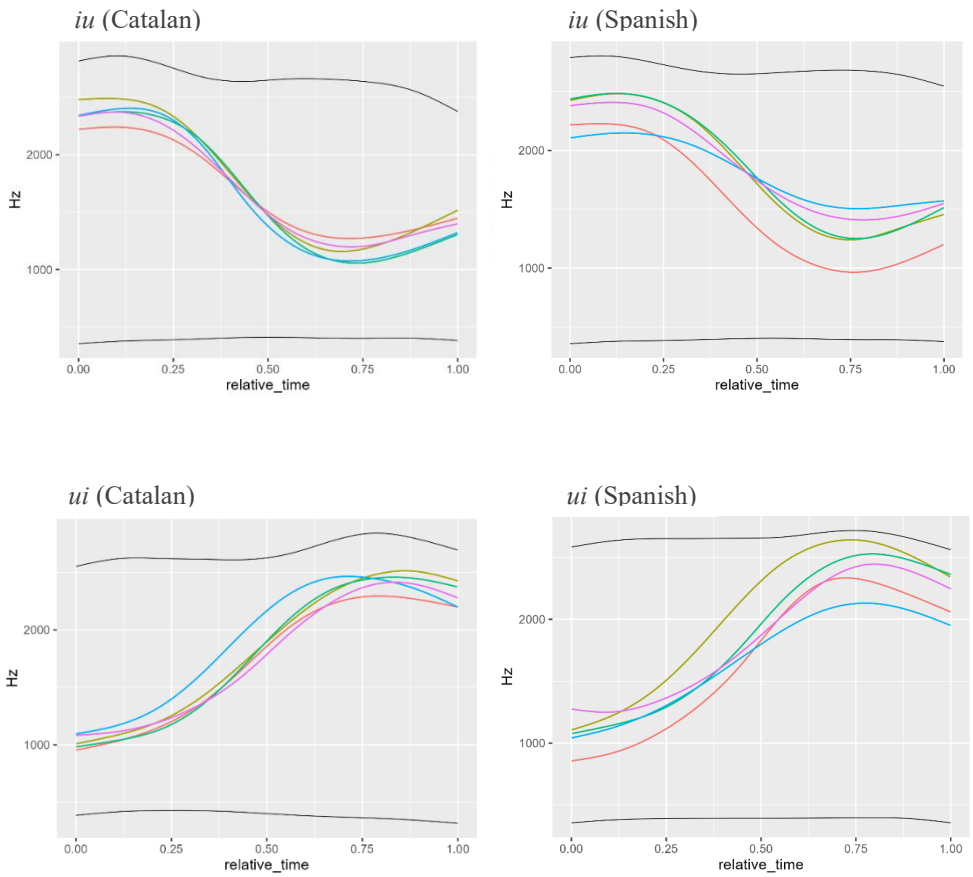

Figure 1. Differences between speakers according to sequence and language.

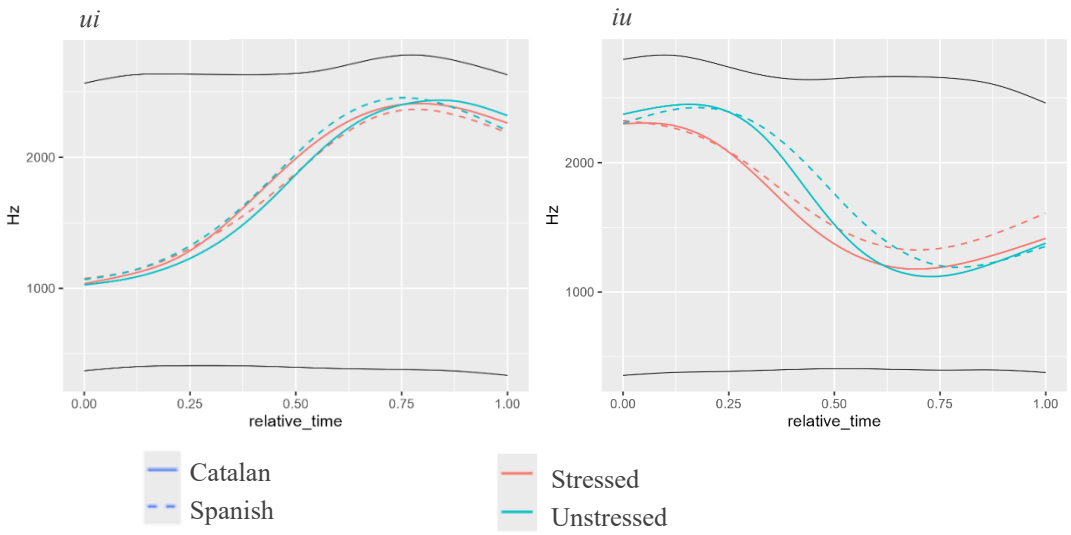

Figure 2. Differences according to sequence, language, and stress.

lliurat	Align-Edges	Align-Right	*Dependent-Leftμ	*U-nucleus	*I-nucleus
a. ☞ ʎ i w. ɾ á t | | | | μ μ (μc μ) ⋁ ⋁ σ σ					*
b. ☞ ʎ j u. ɾ á t | | | | μ μ (μc μ) ⋁ ⋁ σ σ				*	
c. ʎ i w. ɾ á t | | | | μ μ (μ μc) ⋁ ⋁ σ σ			*!		*
d. ʎ i w. ɾ á t | | | | μ (μ μc) μ ⋁ ⋁ σ σ	*!	*	*		*
e. ʎ í w. ɾ a t | | | | (μc μ) μ μ ⋁ ⋁ σ σ		*!			*
e. ʎ j ú. ɾ a t | | | | (μ μc) μ μ ⋁ ⋁ σ σ		*	*!	*	

Figure 3. Phonological analysis for unstressed positions (*lliurat* (*delivered*)).

The autosegmental route to a^nb^n patterns

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Argument: Simple two-tiered autosegmental representations (Goldsmith, 1976), together with extrinsically ordered rules (EOR, Chomsky and Halle 1968) or Stratal OT (StrOT, Kiparsky 2000) can derive so-called a^nb^n patterns, which exceed the computational power of phonology. Thus, if ① autosegmental representations are correct, and ② phonological mapping system must exclude a^nb^n patterns, EOR and StrOT are not adequate models of phonology.

a^nb^n patterns: Phonological processes have been shown to be (sub)regular (Johnson 1972; Chandlee and Heinz 2012). a^nb^n patterns, where sequence of n elements a is followed by a sequence of elements b of the same number n cannot derived by a regular grammar, they require a context free grammar. Recently, Lamont (2021a,b) has shown that specific implementations of OT can generate such (or equivalent, or more complex) patterns and are thus computationally inadequate.

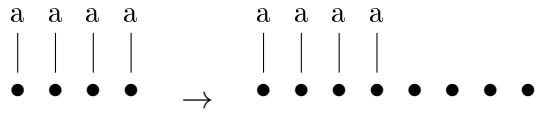
Representations: Specific implementations of EOR (Johnson 1972) and OT (Eisner, 2000) have been proven to be regular, they thus cannot derive a^nb^n patterns. These implementations rely crucially on representations that are not (any more) mainstream in theoretical phonology. The autosegmental representations assumed here are almost universally adopted in phonological analyses of tone (cf. Hyman 2011).

Derivation: Let us assume an autosgmental language that has two tiers, a root node tier and an A tier, and an input that consist of n=4 root nodes associated to an a each. This maps to an a^nb^n output where those 4 associated root notes (equal to a in a^nb^n) are followed by 4 non-associated root nodes (equal to b in a^nb^n), see (1). The first rule turns the a^n structure into a $(ab)^n$ structure (2-b). Given that such structures abound (e.g. $(CV)^n$ in CV languages), a rule that can create it must be uncontroversial. While such structures are derivable with Johnson's framework, it is crucially impossible to reorder the elements so that every a precedes every b. An intermediate step that makes this reordering possible with autosegmental representation is to delink the two tiers. Dissociation must be a possibility in autosgmental frameworks in order to account for e.g. mobile or floating tones (e.g. Paster 2010). The dissociation rule creates an output where we have n elements on one tier, and $n \times 2$ elements on the other (2-c). These two tiers are not ordered with respect to each other. At the next step, iterative left-to-right association (Leben, 1973; Yip, 2002) associates the floating a-elements to root nodes, creating so the a^nb^n pattern (2-d). EOR can do this because one rule can undo the effect of a previous rule (here, association undoes dissociation). StrOT can derive the same effects, by giving stratum 1 and 3 the same and stratum 2 a different ranking regarding one output condition (here, association status of as). Parallel OT or Harmonic Serialism do not have the same property, as they have either no, or only harmonically improving, intermediate representations.

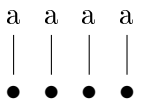
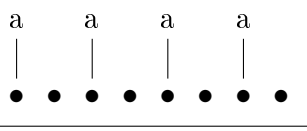
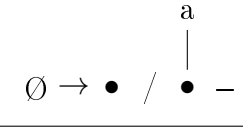
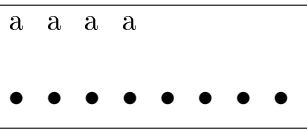
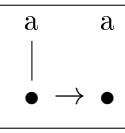
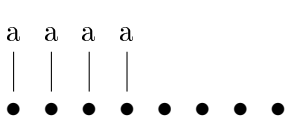
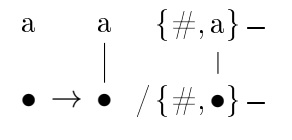
Potential Consequences: ① Reject EOR and StrOT. This would come at a cost: These two theories can handle Duke-of-York opacities (McCarthy, 2003), which are arguably attested (Gleim, 2019), due to the capacity to undo previous changes, which is also resoponsible for deriving the a^nb^n pattern.② Reject one of the premises: e.g., the lack of a^nb^n patterns could derive from extra-linguistic factors like diachrony (cf. Blevins 2004). ③ Keep the premises and add a generalised OCP (Goldsmith, 1976; Tebay, 2025): adjacent identical elements on the same tier (except timing/prosodic tiers) are automatically collapsed into one. In our toy example this would mean that there is always only one a element, and not four, the a^nb^n pattern thus could not be derived.

Figures and Tables:

(1) a^n to $a^n b^n$ mapping



(2) Derivation

	Derivation	Rule	Comment
a.			Input
b.			•-Insertion
c.			Dissociation
d.			L-to-R association

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The Distribution of Phonemic Contrasts across the World's Languages: Chance, Costs, and Integration across Linguistic Tiers

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In contrast with the broad corpus of research addressing the distribution of the frequencies of words across languages, the distribution of the frequencies of phonemic contrasts is remarkably understudied, with rare exceptions being Sigurd (1968), Martindale, Gusein-Zade, McKenzie, & Borodovsky (1996), Martindale & Tambovtsev (2007), and, most recently Macklin-Cordes & Round (2020). Using data from over one hundred language varieties, broadly distributed in typological, geographical, and genetic terms, we discuss that all of them can be modelled a priori by a virtually parameter-free distribution. Importantly, and in contrast with previous approaches, this distribution does not require any complex assumptions related to optimisation, preferential attachment, or the like. Rather, just two unquestionable facts of probability distributions (normalisation and symmetry) lead to a basically perfect model of the distribution of phonemic contrasts in any language. Using this distribution as a starting point, we demonstrate how the Principle of Maximum Entropy can be used to demonstrate how the plain marginal distribution of phoneme frequencies in a language contains important traces of its properties at other levels of description, including perceptual/articulatory factors, aspects of the specific language's phonotactics, and lexical information. Finally, we discuss how informational and diachronic constraints give rise to these distributions.

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The Enunciative vowel in Old Tamil

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The 'enunciative' vowel in Dravidian languages is an epenthetic vowel that occurs at the end of words for 'euphonic purposes' (Bright, 1972). It is mostly the short [u] in these languages, which is the 'weakest and lightest' (Bright, 1972). This paper is an optimality theoretic analysis of the constraints that determine the shape of the enunciative vowel in Old Tamil. It is epenthesised to fulfill markedness constraints like NOCODA and *COMPLEX. It is a context-free, unmarked vowel applied only to native words.

This enunciative vowel is non-morphemic i.e. it is not part of the grammatical word but only a part of the prosodic word. The traditional grammars of Old Tamil like the Tolkāppiyam (*Tolkāppiyam*, ed.: 2021) have described the phonological environment of this epenthetic vowel to be after plosive-ending words only. Tolkāppiyam calls this vowel the Kurriyalukaram 'the shortened u'. Let us consider some examples:

(1) /ka:ʈ̪/ 'ear' > [ka:.ɖ̪ɯ]
(2) /paʈʈ/ 'silk' > [pɐʈ.ʈɯ]
(3) /ʈ̪irump/ 'turn(intr.)' > [ʈ̪ɪ.rum.bɯ]

Based on the typology of epenthetic vowels, context-free constraints like *[+low], *[-back] and *[+round] are postulated which require "an epenthetic segment to be maximally underspecified" (Kager 1999). Such a vowel has to be part of the vowel inventory of the language in order to be used for epenthesis (Harrison & Kaun, 2000). "In Tamil, Malayalam (in some dialects), Kodagu and Tulu, the more common enunciative vowel is the back unrounded ï " (Subrahmanyam, 2008). Of all the vowels of Old Tamil, [ɯ] is the one which satisfies all three of these constraints. The traditional grammarians knew intuitively that this enunciative vowel is very short in duration. A study of duration of Japanese vowels reveals that [ɯ] is the shortest (Han, 1962). This further supports the choice of this vowel to be the enunciative one in Old Tamil. Hence, our analysis reveals that this is the high, back unrounded [ɯ].

We use constraints *LOW (vowels should not be low), *FRONT (vowels should not be front), *ROUND (vowels should not be round), HIGH (vowels should be high) and BACK (vowels should be back) in our OT analysis (Shoji, 2014).

Generation of epenthetic [ɯ] in Old Tamil:

CVC	*ROUND	*LOW	*FRONT	HIGH	BACK	DEP-IO
CVCɐ		*!		*	*	*
CVCɪ			*!		*	*

CVCu	*!					*
☞CVCɯ						*
CVCɛ			*!		*	*
CVCo	*!			*		*

Hence, we can assert that the constraint hierarchy that produces the optimal epenthetic/enunciative vowel in Old Tamil is : *ROUND, *LOW >> *FRONT >> HIGH >> BACK. Now, for epenthesis of this vowel to be triggered to repair prohibited coda consonants and clusters, we need the following constraint hierarchy: *COMPLEX, NOCODA >> MAX-IO >> *ROUND, *LOW >> *FRONT >> HIGH >> BACK >> DEP-IO. A relatively higher ranking MAX-IO with respect to DEP-IO makes epenthesis a strategy to repair prohibited clusters and coda, rather than deletion of consonants. Also, HIGH and BACK are not redundant formulations of *LOW and *FRONT respectively, since [o] violates HIGH but not *LOW, and [ɐ] violates BACK but not *FRONT.

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The ghosts of Manam: A GSR analysis of V~∅ alternations

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In Manam (Austronesian, Papua New Guinea), there are multiple V~∅ alternations, most of which have not been formally accounted for. This study proposes a GSR analysis of these V~∅ alternations, arguing that Manam has multiple types of ghost vowels, alternating with ∅. All data come from Lichtenberk (1983) (L83). The main goal of this study is to show that ghost segments with different activity levels can coexist and interact in a single language. Furthermore, the analysis unifies what L83 analyzes as two separate morphological phenomena into a single phonological phenomenon.

Background: Zimmermann (2019) defines ghost segments (=ghosts) as segments that 1) are idiosyncratically bound to specific morphemes and 2) alternate with zero in a way that a majority of segments in the language do not. Within the framework of Gradient Symbolic Representations (GSR; Smolensky and Goldrick (2016); Rosen (2016)), ghosts are analyzed as weakly active elements.

Data: In Manam, multiple segments adhere to this definition. First, a group of adnominal suffixes (1) exhibit an i~∅ alternation in the suffix-initial position (=M-initial ghosts), where the vowel surfaces if preceded by a nasal and is deleted if preceded by a vowel. This alternation is not typical in these environments, as both nasal codas and sequences of vowels are permitted elsewhere in the language (e.g., *tauan* 'trading partner'). As sequences of vowels are not only allowed but rather common, the vowel in these suffixes, which has to be underlying, must have a representational difference from regular vowels in the language, i.e., it is a ghost vowel.

The second type of V~∅ alternation (2) occurs in a group of vowels referred to as "buffers" (L83), which follow certain morphemes when followed by additional morphemes but are deleted word-finally (=M-final ghosts).

Analysis: This presentation argues for an analysis of Manam ghosts within the framework of Gradient Harmonic Grammar (Smolensky and Goldrick (2016)), employing segmental activity between 0-1.

M-initial ghosts: The ghost vowel has an underlying activity of 0.5. When preceded by a vowel, it is deleted causing a 0.5 violation of MAX (3b). Realizing the vowel, however, is more costly, as it results in a violation of *HIATUS and a 0.5 violation of DEP (3a), since activity must be inserted to achieve a fully active surface vowel. When preceded by a nasal, the vowel is realized causing only a 0.5 violation of DEP (4b). Deleting the vowel is more costly, as it results in a violation of *CODA and a 0.5 violation of MAX.

M-final ghosts: The ghost vowel has an underlying activity of 0.9. When followed by another affix, the vowel is realized, despite the violation of *HIATUS (5a), since a 0.9 violation of MAX is more costly (5b).

Word finally, the M-final ghosts are never realized. This is accounted for by posing a positional faithfulness (Beckman (1998)) constraint, $\text{DEP}_{\text{FINAL}}$, penalizing epenthesis of activity in the word-final position. Thus, a 0.9 violation of MAX in (6a) is less costly than addition of activity (6b), resulting in a deletion of the ghost. The high weight of $\text{DEP}_{\text{FINAL}}$ seemingly penalizes the ghost segment of 3SG AD from surfacing word-finally. However, this suffix is followed by the "buffer" -na, an M-final ghost. Its underlying presence makes the initial ghost of the suffix non-final, protecting it from $\text{DEP}_{\text{FINAL}}$, even though it is deleted on the surface (7a).

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(1) Morpheme-initial ghosts

Affix	V-final stem	N-final stem	Affix	V-final stem	N-final stem
1SG AD	tamá-gu 'my father'	tamim-ígu 'my urine'	EXC AD	táma-ma 'our father'	matadaŋ-íma 'our tears'
2SG AD	tamá-ŋ 'your father'	matadaŋ-íŋ 'your tears'	2PL AD	tama-míŋ 'your father'	matadaŋ-imíŋ 'your tears'
3SG AD	táma-∅ 'his father'	zín=zim-i 'black'	3PL AD	táma-di 'their father'	ʔúŋ-idi / ʔúŋ-di 'their ears'
INC AD	tamá-da 'our father'	matadaŋ-ída 'our tears'			

(2) Morpheme-final ghosts

Buffer	Used after	Example
-i	ʔeʔa '1EXC IP', -ʔama '1EXC OBJ', -ma 'EXC AD', -to 'paucal', certain question words	ʔeʔá-**i**-la
-u	-a '1SG OBJ'	di-ruʔu-já-**u**-ru
-a	ŋai '3SG IP', -i '3SG OBJ', -di '3PL OBJ', -di '3PL AD', -ru 'dual'	ʔan-rú-**a**-la
-na	-∅ '3SG AD', -lo 'general', -ma 'SPEC', -la 'LIM'	teʔé-∅-**na**-la

(3) *tama-igu* 'my father'

/tama-$i_{0.5}$gu/	MAX 16	DEP 16	*HIATUS 10	*CODA 8	HS
a. tama-igu		0.5	1		18
b. ☞ tama-gu	0.5				8
c. tam-igu	1	0.5			24

(4) *tamim-igu* ‘my urine’

/tamim-$i_{0.5}$gu/	MAX 16	DEP 16	*HIATUS 10	*CODA 8	HS
a. tamim-gu	0.5			1	16
b. ☞ tamim-igu		0.5			8
c. tami-gu	1.5				24

(5) ʔeʔai-la ‘only we’

/ʔeʔai$_{0.9}$-la/	MAX 16	DEP 16	*HIATUS 10	HS
a. ☞ ʔeʔai-la		0.1	1	11.6
b. ʔeʔa-la	0.9			14.4

(6) i-lele-au ‘he looked for me’

/i-lele-$a_{0.9}$u/	MAX 16	DEP 16	*HIATUS 10	DEP$_{FINAL}$ 1000	HS
a. ☞ i-lele-a	0.9		1		24.4
b. i-lele-au		0.1	2	0.1	121.6

(7) zin=zim-$i_{0.5}n_{0.9}a_{0.9}$ ‘black’

/zin=zim-$i_{0.5}n_{0.9}a_{0.9}$/	MAX 16	DEP 16	*CODA 8	*HIATUS 10	DEP-C 60	DEP$_{FINAL}$ 1000	HS
a. ☞ zin=zim-i	1.8	0.5	1		0.1		44.8
b. zin=zim-in	0.9	0.6	2		0.1		46
c. zin=zim-ina		0.7	1		0.1	0.1	125.2
d. zin=zim	2.3		2				154

The influence of orthography on second language perception: an experiment with Marathi listeners of German and Dutch

English /d/ and /t/ are unanimously adapted into Indo-Aryan languages/Indian English as /ʈ/ and /ɖ/, respectively. This is curious for two reasons: First, Indo-Aryan languages typically have a two-way coronal contrast, distinguishing a retroflex from a dental place of articulation (PoA). Second, most Indo-Aryan languages have a four-way laryngeal contrast. Thus, we might wonder why retroflex voiced and retroflex voiceless adaptations are chosen, rather than dental and aspirated adaptations. Previous research (Dauenhauer, 2025) argued that these adaptations happen due to specific cue-constraint rankings in the L1-perception grammar, following the theoretical framework BiPhon (Boersma & Hamann, 2009). Specifically, it was argued that retroflex adaptations are chosen due to a higher ranking of burst-related constraints compared to F3-constraints. Aspirated adaptations were ruled out because English aspiration was deemed too short to be adapted as phonologically aspirated. Furthermore, it was suggested that in the latter case, orthography might have played a role, as it has been shown that orthography can influence L2-production (Zhou & Hamann, 2020).

The present perception experiment investigates these claims by presenting naïve listeners of the Indo-Aryan language Marathi with stimuli from German – which is phonetically very similar to English – and Dutch, which unlike English is a voicing language with dental stops. One key methodological innovation is the elicitation of an orthographic answer (in Marathi's Devanagari script), thereby directly inferring participants' categorical perception as opposed to their production. Stimuli were first presented only in audio form, followed by a second block where the spelling of each stimulus was provided. Acoustic analysis carried out on the stimuli indicated that they largely corresponded to the assumptions made for each language. For PoA, a generalized mixed effects model (Glmer) was fit with dental and retroflex as possible answers; for the laryngeal contrast, a cumulative-link mixed model was fit (CLMM), with an ordinal target variable (voiced – plain voiceless – aspirated).

German coronal stops were perceived as more retroflex than Dutch ones by Marathi listeners in this experiment ($p < 0.001$), with no significant orthography effect (see Figure 1). German /d/ was more often perceived as plain than Dutch /d/ and German /t/ was more often perceived as aspirated than Dutch /t/ ($p = 0.0063$). The German stimuli were clearly more confusing to listeners than the Dutch ones (see Figure 2), although this largely went way when orthography was provided ($p < 0.001$). This happened due to the association of the letters <d> and <t> with voicing and plain voicelessness, respectively, in Indian English or Marathi romanization This could indicate that orthography might also have played a role when English coronal stops were adapted into Marathi. Finally, for both PoA and laryngeal contrast, substantial individual differences were found (see Figures 3 and 4).

This study provides evidence for perception-based accounts that rely not simply on acoustic similarity (such as Best & Tyler, 2008 or Flege et al., 2021), but on a language- and speaker-specific ranking of cue-constraints and orthographic constraints. This multimodal cue integration highly varies between individuals, ranging from very strong to not present at all.

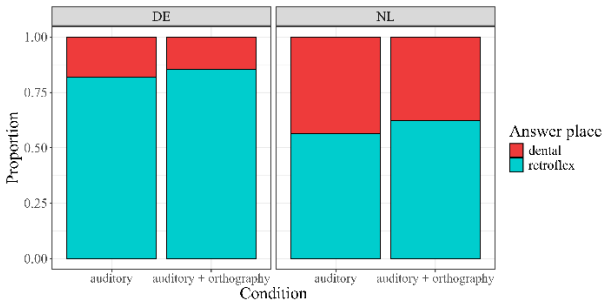

Figure 1. Proportion of retroflex and dental responses by language and whether orthography was present or not.

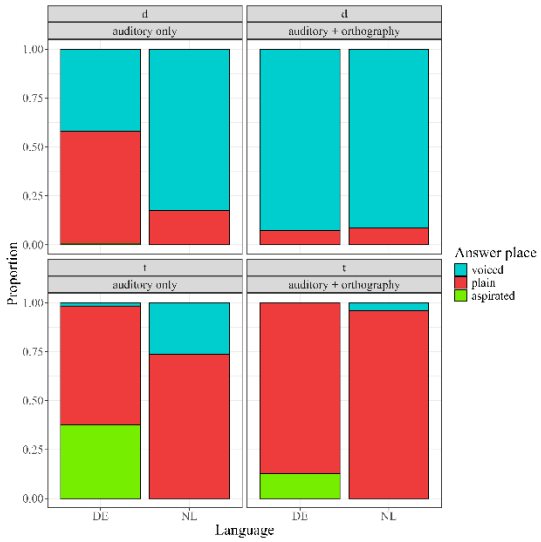

Figure 2. Proportion of voiced, plain and aspirated responses by language and whether orthography was present or not.

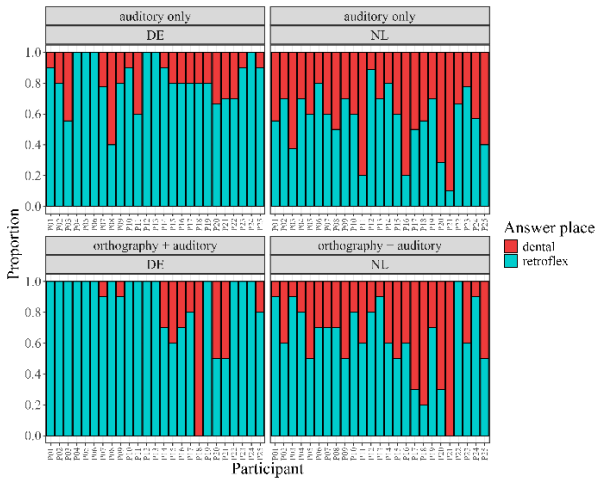

Figure 3. Proportion of retroflex and dental responses split by individual participants and language/condition.

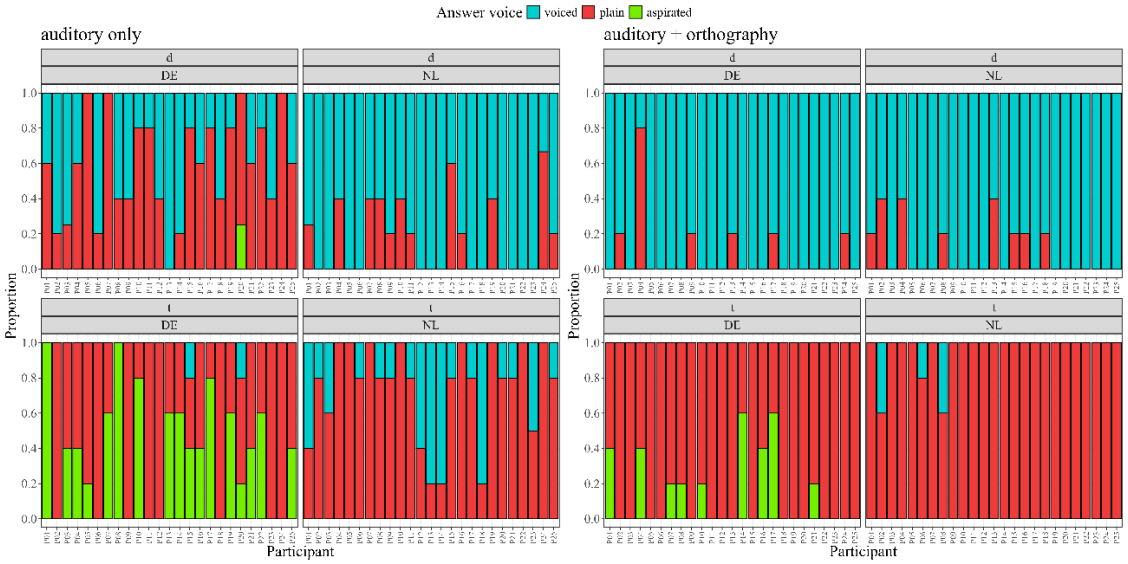

Figure 4. Proportion of voiced, plain and aspirated responses split by participants and language/voicing in the auditory only condition (left) and in the auditory + orthography condition (right).

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The prosodic and morphological structure of proper names in Brazilian Portuguese

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Compound nouns present challenges to Nespor & Vogel's (1986) phonological phrase mapping rule, as they involve independent phonological words that need not be in a restructuring configuration. Furthermore, several phonological processes occur within compounds, but not between words of a phonological phrase (e.g. ellipsis, vowel deletion, stress-retraction, blocking of stress-forward-movement). Previous studies have argued that differences in the morphosyntactic structure of compounds in Brazilian Portuguese (BP) do not affect the phonological processes that apply to them (Silva 2010, Vigário & Fernandes-Svartman 2010, Guzzo 2018). Interestingly, Vigário & Fernandes-Svartman (2010) analyzed tonal groupings in BP compounds and among them were 3 proper names, which unexpectedly patterned like sequences of prosodic words in noncompounds. They hypothesized that this difference is due to the lack of head-complement relationship within proper names. However, this cannot be the case, for the prominence of the Prosodic Word Group is independent from the position of the morphological head. Besides, acronyms, which clearly lack a head-complement relationship, also behaved differently from proper names.

This paper discusses compound proper names and surnames in BP, building on Fabregas's (2023) work, according to which compound first names in Spanish form a coordinating unit that is spelled out before the rest of the DP, whereas compound surnames involve recursion of Locative Phrases. Hence, compounds names in Spanish are parsed into a single prosodic group, whereas each part of a compound surname forms a distinct prosodic group.

Based on grammaticality judgements by native speakers of BP and the results of a production experiment in which 30 subjects had to create 20 small stories with compound names, I argue that BP differs from Spanish in that surnames also form a coordinative unit and accordingly, one prosodic group, The production experiment and the grammaticality judgements show that stress retraction can occur between names ((1a)) or between surnames ((1c)), but not between names and surnames ((1b)) (capital letters mark syllables bearing primary stress). In addition, grammaticality judgements on tonal group divisions in (2a-d) also identify the same pattern: as shown in Figure 1(a-d), surnames form a tonal group regardless of how many first names there are, but do not form a tonal group with the first name. Independent evidence for this proposal is provided by morphological blending, which is possible between names and between surnames, but is never found between names and surnames ((3a-c)).

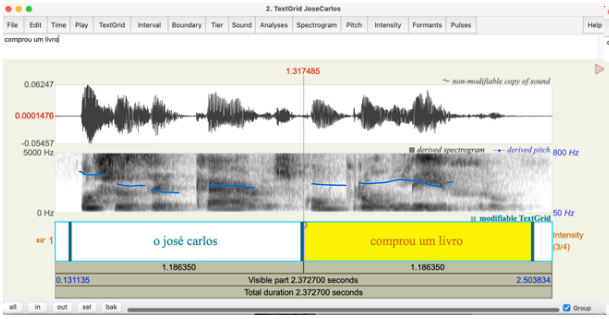
(1) a. JoSÉ CARlos >> JOsé CARlos
b. JoSÉ CAStro >> *JOsé CAStro
c. Carlos branDÃO NUnes >> Carlos BRANdão NUnes

(2) a. [José Carlos]
b. [José] [Carlos]
c. [Lúcia] [Santana Santos]
d. [Maria Lúcia] [Santana Santos]

(3) a. blending with first names: Brumar (*Bru*na + Ney*mar*)
b. blending with surnames: Bolsodoria (Jair *Bolso*naro + João *Doria*)
c. blending with first name + surname: *Cargel (*Car*los Rang*el*)

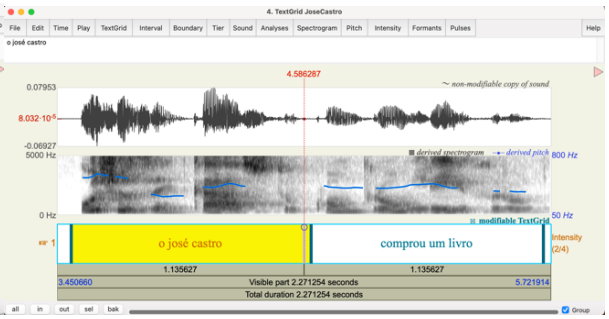
Figure 1

a)



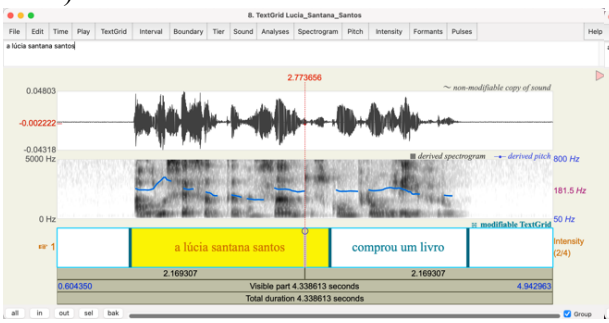
José Carlos: two first names

b)



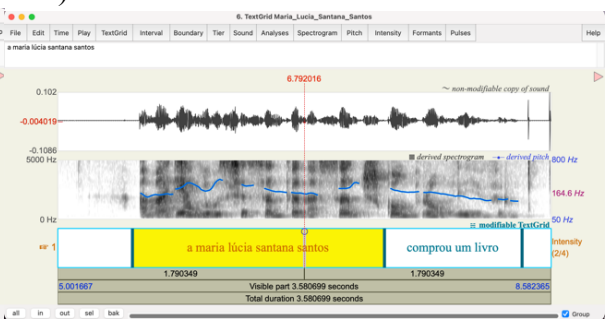
José Castro: first name + surname

c)



Lúcia Santana Santos: 1 first name + 2 surnames.

d)



Maria Lúcia Santana Santos: 2 first names + 2 surnames

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There are more lenis obstruents in English than you'd think

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It has been observed that plosives in English spelled by *p, t, c(h)/k/q* that follow *s* may be lenis, not fortis (Twaddell, 1935; Trager & Smith, 1957; Lotz & al., 1960; Reeds & Wang, 1961; Davidsen-Nielsen, 1969). Our hypothesis is that it is not only [s]+plosive clusters that do not allow both members to be fortis in English, but clusters of any two obstruents within a morpheme (and, in the case of vowelless suffixes, even across a morpheme boundary, e.g., in past and plural forms).

We conducted two production experiments on data harvested from YouTube videos by YouGlish (https://youglish.com). In the first experiment the stressed vowel and the following obstruent clusters were examined in *acting* and in *packed in*, with a focus on the durational parameters, voicing in the clusters, and VOT. Contrary to the standard assumption manifested in the transcription of these two items, we have found that there is a statistically significant phonetic difference between them for all of the above phonetic properties (cf. Figs. 1–3), corroborating that *acting* is /agtɪŋ/, while *packed in* is /pakdɪn/. The data of the second experiment show that there is no statistically significant phonetic difference between the stressed vowel and the following obstruent clusters in *absolute* and *rhapsody* (cf. Figs. 4–6), despite the contrast in spelling and consequently in transcription, too. We are planning a third experiment involving *cost* /kosd/ and *lost* to determine whether the latter form preserves the stem-final lenis fricative of its base form to which the "irregular" past suffix /t/ is added (i.e., /lozt/, cf. *meant*), or the two forms have become phonetically levelled (i.e., /losd/).

As a consequence of our findings the regular three-way past and plural allomorphy is reduced to a two-way distinction of a vowelful (/ɪd/ and /ɪz/) and a vowelless (/d/ and /z/) allomorph. We also provide a very simple explanation of why aspirated plosives typically do not occur after /s/ (or /f/) or, when they seem to, the fricative is generally assumed to be lenis (e.g., *Aztec, gazpacho*).

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Fig. 1: Duration of the vowel before the consonant cluster, and that of the consonant cluster; the vowel is consistently longer and the cluster is shorter in *acting* than in *packed in*:

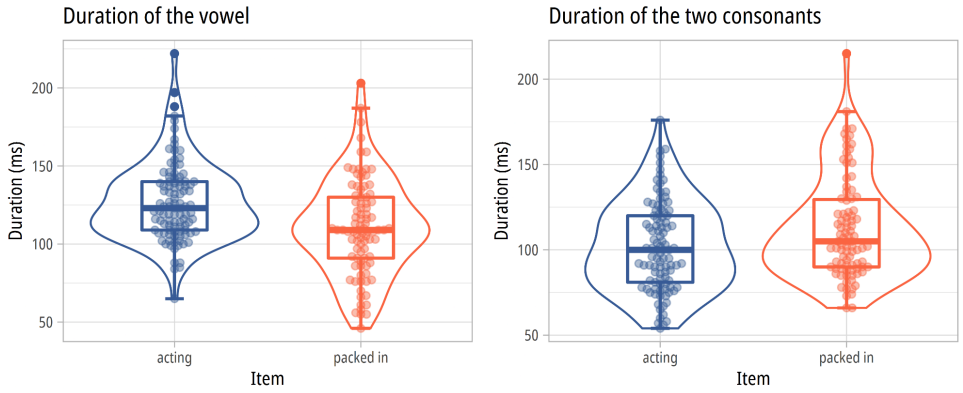


Fig. 2: Duration ratio of the vowel to the total duration, and to the consonant cluster; the ratio is consistently greater in *acting* than in *packed in*:

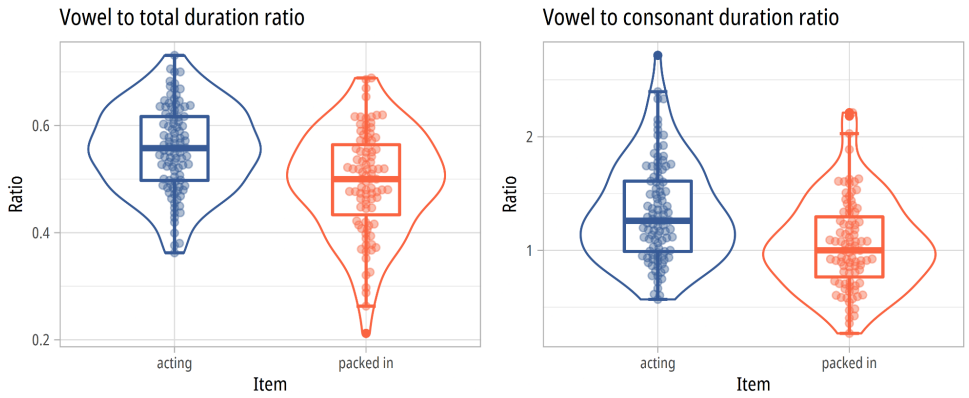


Fig. 3: Voicing duration in the consonant cluster, and VOT following the cluster; there is more voicing, and the VOT is longer in *acting* than in *packed in*:

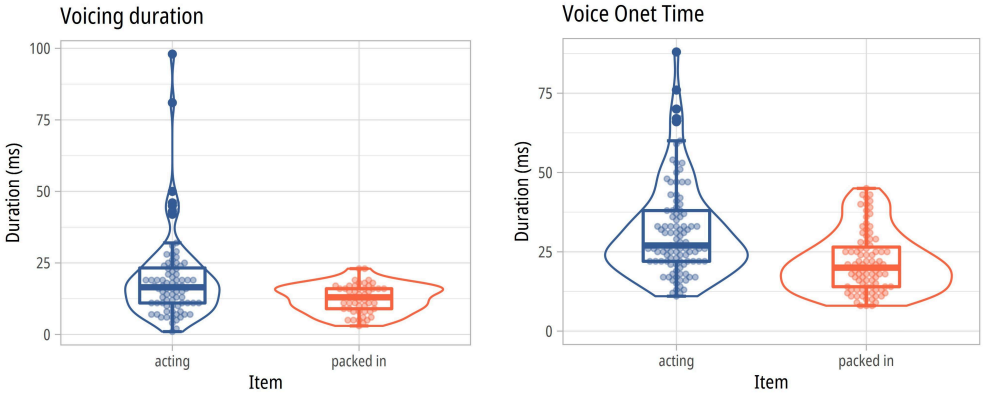


Fig. 4: Duration ratio of the vowel to the consonant cluster; the ratio is consistently smaller in *knapsack* (the control item) than in *absolute* and *rhapsody*:

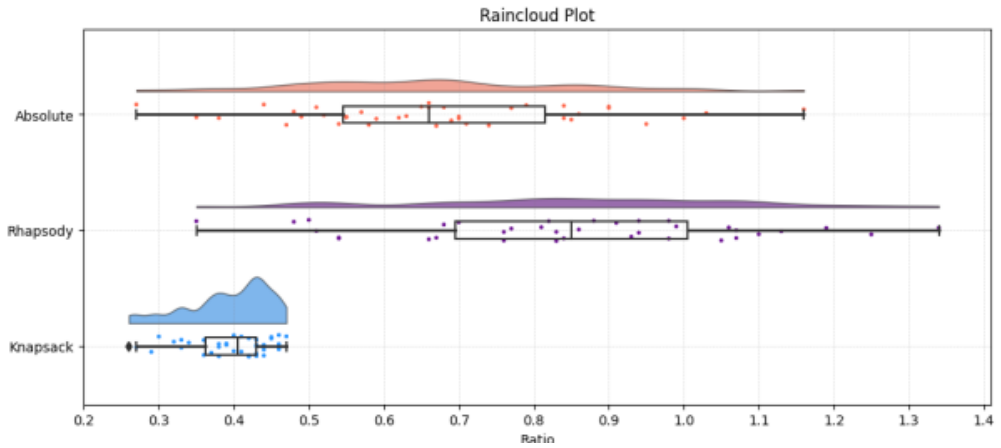


Fig. 5: Duration ratio of the vowel to the total duration; no consistent difference is observed between *absolute* and *rhapsody*, contrarily to the consistently smaller ratio in *knapsack*:

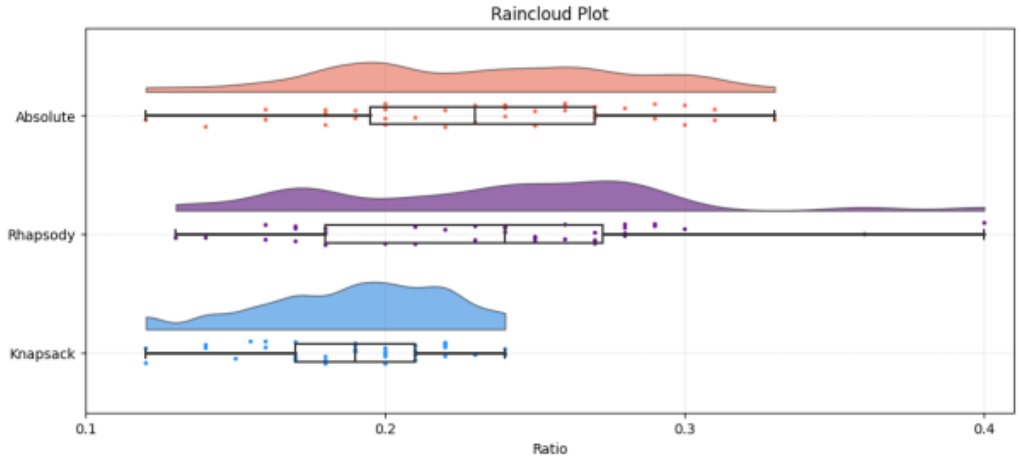
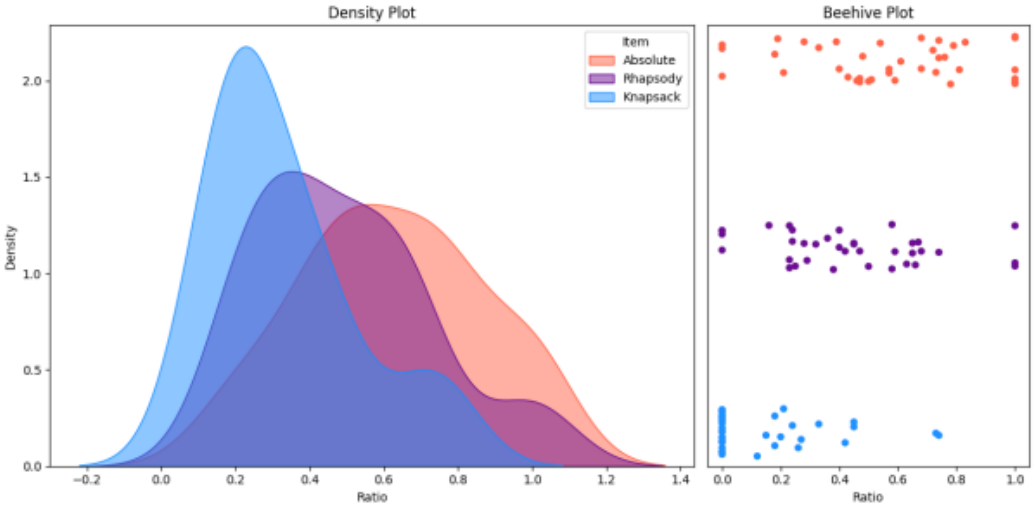


Fig. 6: Voicing density and ratio in the bilabial stop; there is considerably more and longer voicing stretching into the consonant in *absolute* and *rhapsody* compared to *knapsack*:



Tonal Circumclitics: A modular Approach to Tonosyntax

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Main Claim: Tonosyntax, i.e. tonal processes restricted to certain syntactic contexts, has proven challenging for modular approaches. I argue that it receives an explanatory and restrictive analysis by combining recent insights from tonal overwriting (Trommer, 2022) and prosodically conditioned clitic placement (Weisser, 2024).

Problem: In several languages, some tonal processes are restricted to certain syntactic contexts, yet they are neither triggered by an overt segmental exponent nor is their target strictly local to the conditioning syntactic context nor does their application seem to be restricted by word boundaries. As a matter of fact, in many of these patterns, a large portion of the tonal specification of a multi-word target can be overwritten, cf. (1). These processes have been taken as an argument in favor of non-modular devices, e.g. constraints linking tonal overlays to syntactic constructions (2) (McPherson, 2014), construction-specific adjustments of a phonological grammar (Sande et al., 2020), phonological rules whose context description directly refers to syntactic structure Clark (1990), or syntax directly incorporating and manipulating tonal representations (Mbah and Mbah, 2015).

Analysis: Trommer models tonal overwriting inside words as a circumfix consisting of two tautomorphemic floating tones, which trigger the deletion of all intervening tonal material by violating Contiguity. Weisser on the other hand analyzes second-position coordinators using exponent-specific subcategorization frames that require a position following or preceding some prosodic constituent. If we combine these ideas, tonosyntax can be modeled as overwriting triggered by tonal circumclitics. Two floating tones are inserted into the same head — i.e. they are tautomorphemic — but one is equipped with a subcategorization frame (3a). After the subcategorization is satisfied by adjusting the position (3b) — potentially across words and phrases — the floating tones enter the phonology as a tautomorphemic circumfix. In the phonology, the constraint Contiguity (3c) requires both tones to be adjacent and all intervening tones are overwritten (5).

Predictions: Adding a restrictive theory of subcategorization frames (Kalin and Rolle, 2022), only a limited number of patterns are predicted. (i) An overwriting pattern is only expected if at least one floating tones is repositioned into a position that can be described as a phonological or prosodic edge. (ii) Since repositioning is restricted by locality considerations (Kalin and Rolle, 2022; Weisser, 2024) overwriting should only occur in a position that is sufficiently local to the assumed position of a syntactic head that can bear the morphosyntactic feature that conditions the tonal overwriting.

Case Study — Igbo Question Overwriting: In Igbo (Igboid, Nigeria), the last tone of a subject DP in a polar question is overwritten by a low tone even if the tone spans multiple words (4). This cannot be easily modeled as word-level affixation because the tone is associated across multiple words. It can also not be modeled as a general phrase-level process since it only applies to subject DPs in polar questions. This led Clark (1990) to analyze this as a syntactically conditioned phonological rules — a device that reference both the syntactic and the phonological module. In the present account, two floating low tones are inserted into a head in the C-domain, which bears a polar question feature (7) (Amaechi, 2020). One of these tones is repositioned to precede the final tone of the subject DP (5) (cf. Tebay, 2024). In the phonological component, a contiguity constraint requires the tone to be adjacent, triggering overwriting of all intervening material, which in these cases is just the final tone of the subject DP (7).

(1) Tonosyntax in Tommo So (Dogon, Mali, McPherson (2014, 36,41))

a. jàndùlù tàándù-gò mànd-áá-dɛ=gɛ̀=mbe
donkey three-ADV be.lost-PFV-IMPF.REL=DEF=PL
'the three donkeys that got lost' (cf. jànd´ulu tàándú-go)

b. Sáná gàmmà tàándù-gò
Sana cat three-ADV
'Sana's three cats' (cf. gámmá tàándú)

(2) Non-modular constraint in (McPherson, 2014, 78)

a. X^{L} Rel: Assess a violation for every word c-commanded by the relative clause DP that does not take a {L} overlay.

b. PossNonP ^{L}X: Assess a violation for every word c-commanded by the non-pronominal possessor that does not take an {L} overlay.

(3) Schematic Analysis of Tonosyntax as Overwriting

a. [+Feature] ↔ τ,τ[_P]

b. [H τ $t_{\tau[\_P]}$] Pτ[_P]

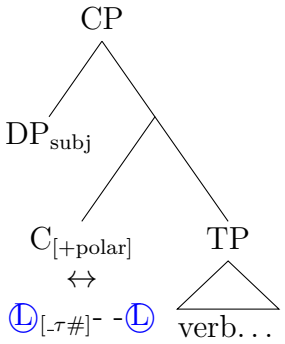
c. CONTIGUITY: Count $*$ for a tone intervening between tautomorphemic tones.

(4) Low Overwriting in Igbo Polar Questions (Clark, 1990)

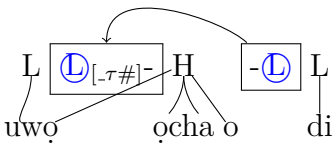
a. Ùwò ọ̀chọ̀ ò dì n-ébá à?
shirt clean 3SG COP P-place this.
'Is there a clean shirt here?' (cf. ùwọ́ ọ́chá)

b. Ụ́mụ̀#tàkịrị̀ hà àzàálá á↓má?
children 3PL sweep.PFV yard.GEN
'Have the children swept the yard?' (cf. ụ́mụ̀#tàkírí)

(5) Insert Ⓛ$_{[\_\tau\#]}$- -Ⓛ into $C_{[+polar]}$



(6) Reposition due to [_τ#] subcat. frame



(7) Overwriting due to CONTIGUITY in the phonology

	MAXFLOAT	CONT	MAX(τ)
I: L Ⓛ H Ⓛ L / uwọ ọcha o di			
a. L Ⓛ H Ⓛ L / uwọ ọcha o di		*!	
☞b. L L L L / uwọ ọcha o di			*
c. L H L / uwọ ọcha o di	*		

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Typological rarities and learning biases: The case of syllable-copy reduplication

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Introduction: In morphological reduplication, reduplicants are rarely defined in terms of the syllable structure of the base. For instance, while copying a segmental melody template from the base (e.g., CV, CVC) is typologically frequent, copying a syllable from the base is exceedingly rare (Marantz, 1982). Using an artificial language learning paradigm with written stimuli, Haugen et al. (2022) reported a learning bias in line with the typological facts, i.e. a bias against syllable-defined reduplication. Here, we use auditory rather than written stimuli and report on 4 preregistered experiments, 2 with a perception and 2 with a production task. For each experiment, we recruited 100 native speakers of Italian, a language that has no morphological reduplication. Half of them were attributed to the syllable-defined condition (*CVX*) and the other half were divided over two string-defined conditions (*CV* and *CVC*).

Stimuli: Sixty trisyllabic base items and associated reduplicated ones, one with a CV- and the other with a CVC-reduplicant, were recorded by a fluent Italian speaker. Sample items are shown in Table 1. Half of the base items had an initial open syllable and half an initial closed syllable. Forty items were used for exposure, 20 for testing.

Exp. 1: We used an exposure + test design. On each exposure trial, participants heard an item and saw a picture of either one object or two identical objects. As the participants were told, the pictures only served to show whether the word was a singular or a plural. To increase task difficulty and promote implicit rather than explicit learning, a given item appeared only in either the singular or plural form. On each test trial, participants heard a novel base item and two associated reduplicated forms, one with a CV- and the other with a CVC-reduplicant; their task was to choose the correct one. The results (Fig. 1A) showed no difference between the syllable-defined and the string-defined conditions ($t<1$), hence no learning bias.

Exp 2: The exposure phase of this experiment was identical to that of Exp. 1, but during the test phase, participants were asked to produce for each base form they heard the corresponding reduplicated form. The results (Fig. 1B) now showed worse performance in the syllable-defined condition ($p<.0001$). Yet, as 44 participants had been rejected and replaced because they failed to produce any reduplication in the majority of the test trials, this experiment may have suffered from a sampling bias. We therefore ran two more experiments.

Exp. 3 and 4: Compared to Exp. 1 and 2, these experiments only differed in that exposure trials consisted of the presentation of a singular-plural pair of a given item. Learning was therefore easier and more explicit, and there was no sampling bias anymore. The results (Fig. 1C-D) are in agreement with the previous ones: no difference between conditions in perception ($p=.08$), but worse performance in the syllable-based condition in production ($p<.0001$).

Additional analyses: First, in the production task, participants in the *CVX* condition tended to regularize towards either CV or CVC string reduplication ($p<.001$). Second, none of the individual experiments showed a difference between the two string-defined conditions; taken together, though, performance was better in the *CVC* compared to the *CV* condition in perception ($p<.02$) but not in production ($t<1$).

Conclusion: In line with the typology and regardless of exposure design, we found a robust bias against syllable-based reduplication in production but not in perception. We will discuss possible reasons for this difference, as well as for the advantage of CVC compared to CV string reduplication in perception. Time permitting, we will show additional data from 2 experiments with written stimuli that shed more light on the original bias reported in Haugen et al. (2022).

Table 1: Sample items.

	base form	CV-reduplicated	CVC-reduplicated
CV-initial base	/kilamo/ /bumifra/ /varoge/	/ki-kilamo/ /bu-bumifra/ /va-varoge/	/kil-kilamo/ /bum-bumifra/ /var-varoge/
CVC-initial base	/dantrupo/ /vilmapre/ /ʃurfita/	/da-dantrupo/ /vi-vilmapre/ /ʃu-ʃurfita/	/dan-dantrupo/ /vil-vilmapre/ /ʃur-ʃurfita/

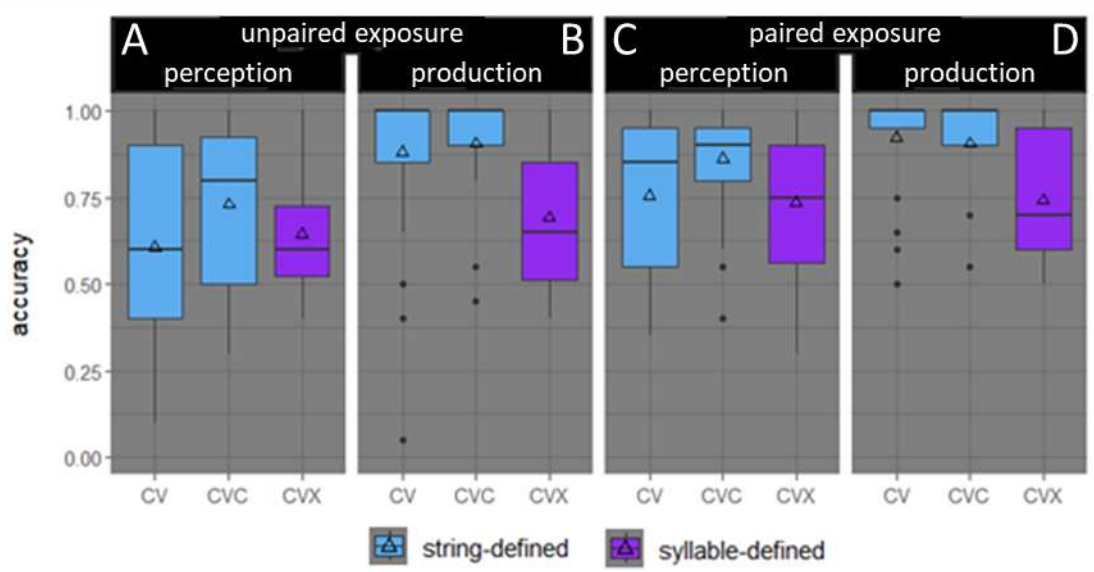

Figure 1: Boxplots of results for Exp. 1 (A), Exp. 2 (B), Exp. 3 (C), and Exp. 4 (D); triangles indicate mean accuracy, and error bars 1 SE.

Statistical model for all experiments:
Accuracy ~ Type (string- vs. syllable-defined) + (1 | participant) + (1 | item)

References:

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Unstressed diphthongs in English are all fake

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Harris (2023) argues that the sound sequence after the /l/ in *yellow* is a "fake" diphthong, that is, it is a vowel followed by a consonant. We demonstrate that the same is true of the second vowel in *valley* and *value,* too, in British English. (The latter two vowels are diphthongal, as evidenced by Sweet (1900, 233), Jones (1960, 66, 85), or Gimson (1989, 101f, 121), despite Jones's (1917) decision to use the long monophthongal symbols, /i:/ and /u:/, for transcribing them. Note that they may occur prevocalically like diphthongs, but unlike other long vowels.)

The set of vowels that may occur in unstressed position in English is limited to three short vowels, /ɪ/, /ə/, and /ʊ/, the last of which is rare and always alternates with /ə/, and the three further vowels mentioned in the first paragraph, GOAT in *yellow,* FLEECE in *valley,* and GOOSE in *value.* Two of these, GOAT and GOOSE, derive from an earlier long/(fake) diphthongal vowel, however, FLEECE was earlier short, its "length" came by in a process referred to as HAPPY tensing by Wells (1982).

Stress in English is weight sensitive: heavy syllables are more likely stressed than light ones (Hayes, 1995). This is especially true of non-primary-stressed vowels (e.g., the first vowel of *cartoon* or *pontoon* is stressed, that of *lagoon* or *platoon* is not, likewise the last vowel of *consort* or *aspect* is stressed, that of *mascot* or *aspen* is not). In light of this fact, HAPPY tensing is unexpected, since in it an unstressed light syllable allegedly becomes heavy.

It is noteworthy that unstressed FLEECE, GOAT, and GOOSE shun preconsonantal position: FLEECE does not occur there at all, GOAT and GOOSE often turn into a short vowel, cf. (1). Word finally and prevocalically all three occur freely. This distribution is expected only if these "vowels" are VC. Only in this case are the first syllables of *create, duet,* and *coerce,* as well as the last syllables of *happy, value,* and *yellow* are light, since the glide is an onset between vowels and is extrametrical word finally (Hayes, 1982), while the first syllables of *unite* and *obese* are heavy in (1), motivating their "vowels" to become short. If these syllables contained a long vowel or a diphthong, as is commonly assumed, then they would be heavy.

In this view, HAPPY tensing is consonant epenthesis. In *create* /j/ is epenthesised to fill hiatus, in *happy* this occurs to avoid a word-final short vowel. In *unite* and *obese* the consonant /w/ is moraic, making the unstressed syllable heavy, hence it is prone to get deleted, but in all the other words the glides are not moraic, in fact, they block hiatus and the occurrence of word-final short vowels, making their position stable.

If, as we mentioned, unstressed /ʊ/ alternates with /ə/, then the question arises why this does not occur in *value* or *duet* (note that it does in *unite* /jʊwnájt/ > /jʊnájt/ or /jənájt/). The same alternation can also be observed for /ɪ/ and /ə/ in, e.g., *chicken, menace, elect,* etc., and would thus be expected in *happy* or *create,* if /ʊw/ and /ɪj/ in these are indeed VC. Crucially, this alternation is not common for /ʊ/ before a labial consonant (e.g., *volume* is /-ʊ(w)m/, but not /-əm/ in Wells, 2008), including /w/ (e.g., *value* /-ʊw/), and for /ɪ/ before a palatal or velar consonant (e.g., *college, ostrich, vanish, panic, morning*), including /j/ (e.g., *happy* /-ɪj/).

(1) Unstressed nonshort vowels in English

	preconsonantally glide (/w/) moraic	**word-finally glide not moraic**	**prevocalically glide not moraic**
FLEECE	∅	*happy* /hápɪj/	*create* /krɪjɛ́jt/
GOOSE	*unite* /jʊ(w)nájt/	*value* /váljʊw/	*duet* /dʒʊwét/
GOAT	*obese* /ə(w)bíjs/	*yellow* /jɛ́ləw/	*coerce* /kəwə́ːs/

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Vowel rounding: between phonetics and phonology

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Vowels are usually represented in charts according to degree of aperture (height), tongue position (row) and lip rounding (cf. IPA). These parameters are based on phonetic characteristics of sounds, whereas phonemes should be organised into a system according to their phonological features. To reveal such features, instrumental analysis is of no use. Contrary to Trubetzkoy's claim in the chapter on distinctive oppositions (1939/1969: 91: "no other discipline except phonetics can teach us about individual sound properties") phonological features are not derived from phonetic characteristics.

A commonly used term 'distinctive feature' does not cover the whole range of phoneme categorisation, because in a system, phonemes are not only opposed, but also united into classes according to their morphophonological behaviour, i.e. their functional similarity. Due to this similarity the phonemes having no counterparts also find their place in a correlation (e.g. Russian /t͡ɕ/ enters (1) the class of unvoiced phonemes, despite of the lack of voiced /d͡ʑ/, because it requires the devoicing of the preceding consonant, and (2) the class of soft phonemes regardless the lack of hard /t͡ʃ/, because it causes a certain vowel alternation in an unstressed position).

In Russian, /u/ and /o/ are defined as rounded vowel phonemes, but what do they have in common apart from articulatory lip rounding? According to Trubetzkoy, it is the rounding, not the row, that distinguishes /u/ from /i/ and /o/ from /e/. Trubetzkoy deprives the Russian vocalic system of the phonological feature of row, but does it on purely PHONETIC grounds: "In Russian the front or back position of the tongue is contextually conditioned in the realization of the vowel phonemes <...> Back or front position of the tongue is therefore phonologically irrelevant for Russian vowels: the correlation of lip rounding of the vowel phonemes alone has distinctive force" (Trubetzkoy, 1939/1969: 100). On the contrary, it is the difference of conditions for PHONOLOGICAL neutralisation that brings Trubetzkoy to the essentially differing interpretation of superficially identical systems of Japanese and Artshi (East Caucasian) vowels (*i*, *e*, *a*, *o*, *u*): "The correlation for tongue position alone is the phonological basis of the one, the correlation of lip rounding of the other" (Trubetzkoy, 1939/1969: 101).

Table 1: Vocalic systems with correlation of (1) lip rounding, (2) tongue position

(1)	Russian and Artshi	
	Unrounded	**Rounded**
High	i	u
Mid	e	o
Low	**a**	

(2)	Japanese	
	Front	**Back**
High	i	u
Mid	e	o
Low		**a**

(Trubetzkoy, 1939/1969: 100–101)

The same functional approach will discover another grouping of the Russian vowels: according to the sensibility to the correlative feature of softness-hardness of the preceding consonant they are distinguished as sensitive (/i/, /e/, /ɨ/) or indifferent (/u/, /o/, /a/) to it. In terms of articulation, the first group is characterised by lip spreading, the second by the lack of it (see Andronov, 2020). The traditional 'lip rounding' seems to have no functional grounds in the descriptions of many languages. It should be considered as an incorrect substitution of an articulatory characteristic for a phonological feature.

Table 2: Russian vocalic system (six-member)

	Traditional (phonetic) model		
	+ Front	− Front	
	− Lip rounding		**+ Lip r.**
High	i	ɨ	u
Mid	e		o
Low		**a**	

	Functionally organized model		
	+ Lip spreading		**− Lip s.**
	+ Front	− Front	
High	i	ɨ	u
Mid	e		o
Low			**a**

Although distributional analysis is the most common approach in describing phonological properties of phonemes, it is morphophonological alternations which provide the most reliable information both for paradigmatic identification of phonemes (distinction between phonemes and allophones) and for classifying them. Not every language, however, is rich in alternations. In German vocalism, the feature of row is substantiated functionally due to the umlaut alternation /u/ ~ /y/, /o/ ~ /ø/, /a/ ~ /ɛ/ (each symbol stays for short and long vowel), but the rounded vowels (/u, /o/, /y/, /ø/) lack a common FUNCTIONAL feature.

Languages obviously differ with respect to the degree of how well functionally founded are the structures of their phonological systems. This can serve as a ground for phonological typology proper as against the phonetic one.

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When is vowel reduction (not) about predictability?

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Vowel reduction (VR), both in duration and in centralisation in acoustic space, has often been linked to *predictability*: the more predictable the segment (and the further away from the edge of a prosodic domain) the more likely it is to reduce. As such, connections have been drawn to phonological harmony, and to the predictability that it induces: Pearce (2008, 2012) claims that vowel harmony (VH) blocks vowel reduction, with harmonic vowels resisting VR where non-harmonic vowels do not. The inverse claim is made by McCollum (2020) for Kyrgyz, in which non-initial vowels are consistently more centralised than their initial-syllable counterparts; McCollum argues that VR is in fact driven by VH-related phonological predictability, with rightward-spreading backness and rounding harmony entirely determining the quality of a vowel in a non-initial syllable, and claims further (after Binnick 1991) that a relationship holds between predictability-driven VR and the decay or loss of harmony: McCollum (2019) finds larger reduction in Uzbek, which has lost VH almost entirely, than in Kyrgyz which retains it, and this link between phonetic reduction and the loss of harmony has in fact been drawn for several cases (Binnick 1991; Shiraishi and Botma 2017; Li 1996). At the same time, coarticulatory reduction has been implicated in the phonologisation of VH (Hyman 2002), especially left-to-right VH of the type seen in the Turkic languages; and it is not implausible that gradient phonetic reduction should persist in languages of this type even after the instantiation of the categorical phonological process (see e.g. the *rule scattering* of Bermúdez-Otero 2007, 506).

This talk therefore considers the relationship between VH and VR in the Turkic languages, most of which show fixed final stress, and almost all of which show (well-known) left-to-right backness and rounding harmony; we compare languages for which the decay of one or both of these systems has been reported (Crimean Tatar, McCollum and Kavitskaya 2022; Kazakh, McCollum 2015; (Kazan) Tatar, Conklin and Dmitrieva 2018; Uzbek, Sjoberg 1963; Harrison et al. 2006), and those for which this diagnosis can be definitively ruled out (Dolgan; Kyrgyz, McCollum 2020; Sakha, Chan and Kuang 2023; Uighur, McCollum et al. 2024).

We use two datasets: the first of these consists of a total of 1,340,918 vowel tokens extracted from the 'validated' subsets of the Mozilla Common Voice corpora (Ardila et al. 2020) of Azerbaijani (27 speakers, 2 hours), Bashkir (177 speakers, 230 hours), Chuvash (108 speakers, 120 hours), Kazakh (140 speakers, 2.2 hours), Kyrgyz (251 speakers, 35 hours), and Turkmen (70 speakers, 2.8 hours), and from the INEL corpus of Dolgan (48 speakers, 12 hours) (Däbritz et al. 2022; Däbritz 2020), all segmented using the Montreal Forced Aligner (a further 4 corpora are being processed). The second dataset consists of 32,791 vowel tokens extracted from a small corpus of texts (2.5 hours total) collected by Károly (2022), covering 24 of the Turkic languages with one speaker each; for these data points, segmentation was manually-corrected. For all data, F0, F1, F2, and F3 measurements were taken at three points (25%, 50%, 75%), and datapoints for which these differed by more than 25% were dropped to mitigate automation error; values were z-score normalised, and tokens were automatically coded for vowel type (phonemic length, rounding, fronting, and height), position within the word, and root vs. affix status where inferrable. Preliminary results are shown in Figures 1 and 2: although we see considerable variation in degree, there is no language in the family, irrespective of the synchronic state of the harmony system, for which we do not find a statistically-significant distinction between initial and non-initial vowels. The relationship to duration, however, is not consistent; as McCollum (2020) does, we find that duration and centralisation are statistically independent in Kyrgyz (and Chuvash); in Dolgan, Sakha, Bashkir, and Turkmen, however, shorter vowels are more centralised, and as such a coarticulatory explanation may be desired.

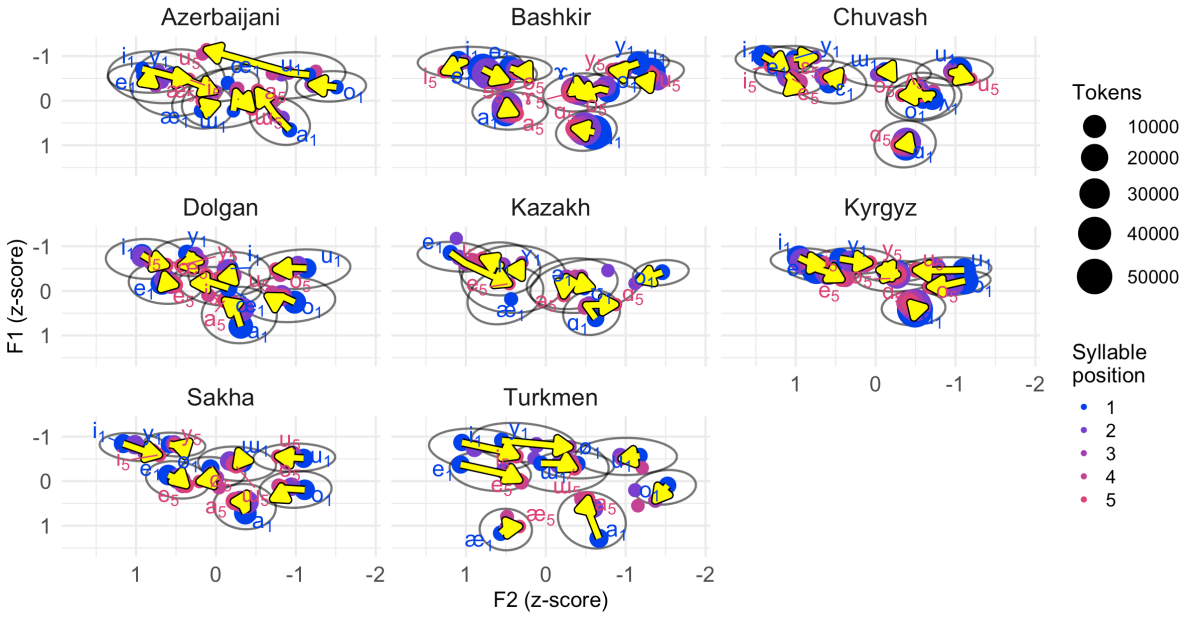

Figure 1: F1 × F2 space for short monophthongs in 8 Turkic languages, showing ellipses corresponding to 50% of the total spread of the data, and points corresponding to the median F1-F2 values by category and syllable number; arrows indicate the magnitude and direction of change in F1 × F2 space between syllables 1 and 5.

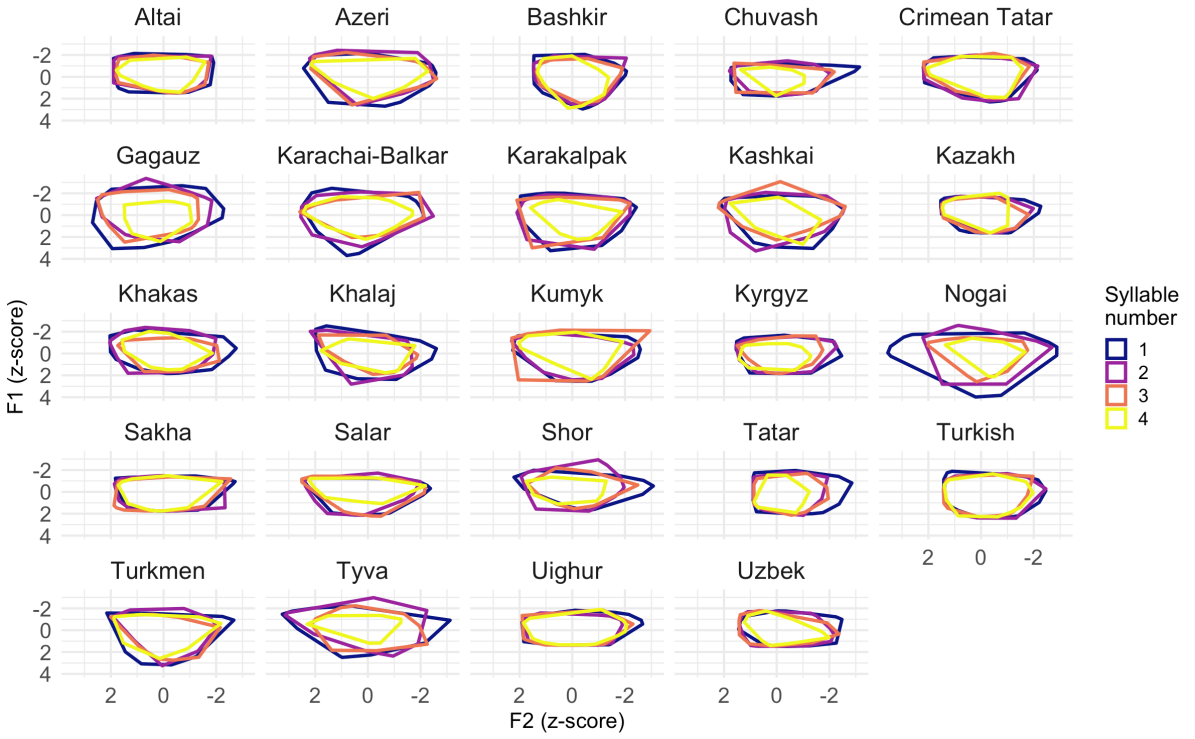

Figure 2: F1 × F2 space for short monophthongs in 24 Turkic languages, showing polygons corresponding to the total spread of the data in each syllable.

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Who wins out? Vowel preservation and nucleus selection in syllable contraction

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Introduction. Merged from two syllables into one, some syllables in Taiwan Southern Min (TSM) have undergone complete syllable contraction and extreme intervocalic reduction (Chung 1996; Hsu, 2003; Chuang, 2023), where all the intervocalic consonants are deleted ($C_1G_1V_1X_1$+$C_2G_2V_2X_2$—> CGVX), while which vowel left is an unsettled problem. The study proposes an OT analysis to capture the unsolved cases and unify previous accounts.

Insights and problems from literature. The major problem of TSM contractions falls on which segment from the source syllables can be preserved. A standard syllable in Chinese has three skeletons (X-slots) linked to Onset, Nucleus, and Coda (**Figure 1**). Edge segments (C_1 or X_2) in the output are mostly settled under the effect of Edge-in Association and skeletal association (Yip, 1988; Chung, 1996), respectively re-linked to the 1st and 3rd slots. The remaining 2nd slot can be associated with a vowel from the 1st syllable (V_1) or the 2nd syllable (V_2). To predict which one to stand out, Chung (1996) argues for a left-to-right stylistic dominance, while Hsu (2003) proposes that the vowel with higher sonority takes priority. Even though the latter model captures more cases than the former, there remain some cases in favor of linear-based selection (Xu 2020).

Data & Categorization. We summarize types of vowel selections and compare the predictability of the two models (**Table 1**). Sonority is a dominant factor, except when two low vowels ([ɔ] and [a]) compete for the nucleus position, as in (1), where the linear order is relatively dominant. For non-low vowels, like (2) or (3), sonority is decisive. However, note that the glide (G) or the non-low vowel ($V_{[-low]}$) in the 1st syllable always has a corresponding representation in the output. It is more proper to say that sonority is a decisive factor in nucleus selection; however, in terms of segment/vowel preservation, the leftmost vowel/glide (G or V) has to be preserved in the output, to form a maximal syllable (Prince 1985). This is, the impact of the linear order is held in selecting the output G and/or V. See Chuang (2023) for an overview.

Constraint ranking. Following Li and Myers (2005), we posit a faithfulness constraint—**Anchor(L,V)**, to ensure that the leftmost vowel or glide can be preserved and has a correspondence in the output. Note that we consider the prenuclear glide to belong to Rime and counts as a vowel (Lin, 1988). Besides, when having maximal associations, in order not to violate the phonotactics or breach the possible phonological combination in a language, we assume that **Phonotactics** and **Max-SO(V)** are ranked highest, while **Max-SO(V)** is violable, which should be ranked lower than **Phonotactics**. Note vowel neutralization and gliding are not primary but possible to satisfy **Phonotactics** (cf. Hsu 2003). Last, high vowels or prenuclear glides can survive only one association. When two high vowels compete (e.g., si: + tsun -> sin/sun 'timing'), the leftmost vowel is not necessarily saved, and the potential violation of **Anchor(L,V)** yields the ranking that the sonority-based nucleus selection constraints of high vowel (***Nuc/i** & ***Nuc/u**) are co-ranked but far higher than **Anchor(L,V).** Even though [i] is somehow better than [u], both are possible in contexts. The overall ranking turns out to be **Phonotatics > Max-SO(V), *Nuc/i, *Nuc/u >> Anchor(L,V)**.

Conclusion. The present study analyzes vowel preservation and nucleus selection in TSM contractions. We argue that the more sonorous vowel is more likely the output nucleus under vowel selection in complete contractions, which is similar to Hsu (2003); however, it should be constrained to non-low vowels only. Also, the linear order may still play a role, in light of Chung (1998). Overall, we fill the gap with cases that previous accounts failed to explain.

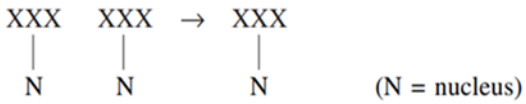

Figure 1. Chinese syllable template with x-slots

Table 1. Data summary

Type		Contraction	Gloss	Chung (1996)	Hsu (2003)
1.	V_1→V	[hɔ + laŋ] → [hɔŋ]	'by someone'	O	X
2.	G_1/V_1→G V_2→V	[bo + ai] → [buai] [sio + kaŋ] → [siaŋ]	'not want' 'the same'	X	O
3.	V_1→G, V_2→V	[he + ɔ] → [hiɔ:]	'interjection'	X	O
4.	V_1/V_2→V	[si + tsun] → [sin]/[sun]	'timing'	?	?

Type 1: V1→V (no gliding!)

hɔ + laŋ	PHONOTACTICS	MAX-SO(V)	ANCHOR(L,V)
→ hɔŋ		*	
haŋ		*	*!
hɔaŋ	*!		

Type 2: V2→V (gliding: o→u)

bo + ai	PHONOTACTICS	MAX-SO(V)	ANCHOR(L,V)
→ buai			
bai		*!	*
boai	*!		
boa	*!	*	
boi	*!	*	

Type 3: V1→G, V2→V (gliding: e→i)

he + ɔ	PHONOTACTICS	MAX-SO(V)	ANCHOR(L,V)
→ hiɔ			
heɔ	*!		
he		*!	
hɔ		*!	*

Type 4: V1/V2→V (no gliding!) ([i] is better than [u], but both are possible.)

si + tsun	PHONOTACTICS	MAX-SO(V)	*Nuc/i	*Nuc/u	ANCHOR(L,V)
→ sin		*	*		
→ sun		*		*	*
siun	*!			*	

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Why metrical strength is best expressed with foot structure

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The issue. While foot structure is a staple in 'mainstream' metrical phonology, there remain voices that doubt the usefulness of feet for modeling stress, such as work on *incorporation*, couched in Strict CV (Ulfsbjorninn 2014). Faust & Ulfsbjorninn (2025; F&U) claim that a well-accepted metrical strength hierarchy *Foot Head* (FH) > *Unparsed* (UP) > *Foot Dependent* (FD) follows from incorporation but not from foot structure. I argue that we need to recognize not one but *two* relevant hierarchies that emerge from interactions of metrical structure and segmental/tonal structure via top-down structure licensing (resulting scale = FH > UP > FD) versus bottom-up licensing (= FH > FD > UP) and show how both scales can be modelled with feet, while only the scale discussed in F&U seems compatible with the incorporation approach.

F&U's argument. It is widely accepted that FHs attract more prominent structure while FDs attract less prominent structure; unparsed syllables appear to be located between FHs and FDs. Consider an example from optional vowel reduction in Dutch in (1), shown in a basic foot-structure model for the word 'phonology' (e.g., Kager 1989, Oostendorp 2000). Reducing the third, unparsed vowel is only possible if the second vowel in the foot dependent is reduced as well, which suggests that unparsed syllables are metrically stronger than foot dependents. F&U argue that it is unclear why an unparsed syllable should be stronger than a foot dependent, particularly since parsing syllables is preferable (e.g., Parse-σ in OT); their basic analysis of the Dutch facts is provided in (2), taken from F&U (p. 7). In F&U's model, incorporation is the reassignment of a grid mark from a vowel to an adjacent vowel; in (2), the initial vowel incorporates a grid mark from the adjacent second vowel to resolve a lapse (= adjacent nuclei projecting to the same level). After losing its grid mark, the second vowel projects to a lower level than the third vowel and is now metrically weaker (= more susceptible to reduction).

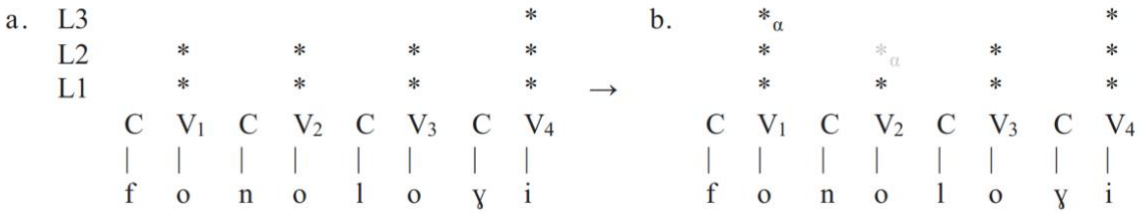
A second hierarchy. While FHs are generally the strongest positions, there also exist (trochaic) metrical phenomena where third positions are *weaker* than second positions. Examples include Old English high vowel deletion (Dresher & Lahiri 1991, Goering 2016), Old Norse vowel balance (Smith 2024), or Suzhou Chinese tone sandhi (Zhu 2023). For instance, in Old English, "high vowels delete after a heavy syllable or after two light syllables if they are themselves in an open syllable" (Dresher & Lahiri 1991: 252). One way to model this pattern is to argue that unparsed high vowels after an initial bimoraic trochee are subject to deletion, shown in (3) after Goering (2016). While other metrical approaches exist (such as Dresher & Lahiri's *Germanic Foot*), the main point here is that the third position is indeed weaker than the second one; this is a reversal of the Dutch hierarchy in (2) and thus appears to be problematic for F&U.

A foot-based analysis. In a foot-based model, the two hierarchies can be expressed by differentiating between top-down vs. bottom-up structure-licensing scales, which I derive from implicational OT constraints along the lines of Anttila & Bodomo (2000) and Köhnlein (2011, 2016). In top-down licensing, foot heads prefer hosting 'heavier' structure (4a), such as full vowels in Dutch. Conversely, foot dependents prefer carrying lighter, non-prominent structural loads (4b), such as Dutch schwa, which can lead to reduction/deletion. This is compatible with sonority-based constraints in, e.g., de Lacy (2007), but might be best modelled with underspecification (e.g., van Oostendorp 2000 for Dutch). Since unparsed syllables are not footed, they cannot attract any structure, and their strength on the top-down scale is thus located between structure-attracting FHs and structure-repelling FDs (4c). Conversely, bottom-up constraints require structure to be licensed by metrical units such as feet (5a), or, even better, FHs (5b). Assuming that features/segments/tones 'want' to occur in the strongest possible position, we expect no bottom-up constraints to specifically target FDs. Once again, unparsed positions cannot be referenced at the foot level, so they are weaker than foot dependents on the bottom-up scale (as FDs are a possible target in (5a)), thereby flipping the top-down ranking between UPs and FDs, as shown in (5c); this derives patterns of the Old English type.

(1) Metrically sensitive optional vowel reduction in Dutch: FH > UP > FD

FD+UP unreduced	*FD reduced*	*FD+UP reduced*	**UP reduced*
a. [(fò.no)lo(ɣíː)]	b. [(fò.nə)lo.(ɣíː)]	c. [(fònə)lə(ɣíː)]	d. *[(fò.no)lə(ɣíː)]

(2) V3 is stronger than V2 after incorporation



(3) Metrically sensitive high vowel deletion in Old English: FH > FD > UP

a. (góμμ)duμ → (góμμd) ‘good, nom. pl. neut.’
b. b. (wéμruμ)duμ → (wéμruμd) ‘troops’

(4) Top-down licensing:

a. FOOT-HEAD → STRUCTURE: Assign one violation mark for every foot head that does not license structure (= feature/segment/tone)
b. FOOT-DEPENDENT → NOSTRUCTURE: Assign one violation mark for every foot dependent that licenses structure (= feature/segment/tone)
c. Resulting scale: FH > UP > FD

(5) Bottom-up licensing:

a. STRUCTURE → FOOT: Assign one violation mark for every feature/segment/tone that is not licensed by a foot (= FH *or* FD)
b. STRUCTURE → FOOT-HEAD: Assign one violation mark for every feature/segment/tone that is not licensed by a foot head
c. Resulting scale: FH > FD > UP

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[k]-allomorphs in Mapudungun: accounting for [-kɨle] and other inflectional affixes

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Only a few allomorphic alternations occur in the mostly agglutinative morphology of Mapudungun (ISO:arn), most of which can be explained by purely phonological processes (Zúñiga, 2017). A notable exception to this type of generalisation is the phonologically conditioned suppletive allomorphy (PCSA) of [k]-allomorphs. In (a–e), stative [-le] and ambulative [-jaw] occur after stems ending in a vowel, while in (g–j), the semantically identical "long" forms —[-kɨle] and [-kiaw]— occur after a consonant.

a. [kint**u**-le-] 'to be searching'
b. [aʌf**ɨ**-le-] 'to be injured'
c. [longk**o**-le-] 'to be acting as leader'
d. [moŋ**e**-le-] 'to be living'
e. [ʈ͡ʂèk**a**-jaw-] 'to walk about'
f. [ko**n**-kɨle-] 'to be entering'
g. [li**f**-kɨle-] 'to be clean'
h. [poʈ͡ʂo**ŋ**-kɨle-] 'to be bent down, crouched'
i. [ɲɨkɨ**f**-kɨle-] 'to be silent'
j. [kɨθa**w**-kiaw-] 'to work here and there'

The pattern is frequently cited in the literature both for descriptive and pedagogical purposes (see Norin et al., 2013), especially since the stative affix is a very frequent construction denoting states, ongoing events, or temporary features (Loncon, 2007; Smeets, 2008). Despite this, no attempt has, to my knowledge, been made to account for the phenomenon beyond this descriptive focus, which I tackle here from both synchronic and diachronic perspectives.

First, I argue that the allomorph selection in this case has been lexicalised as a feature of the respective affix, specifically as part of its subcategorisation frame (Paster, 2015). Following Paster's predictions for PCSA (2015), I show that [k]-allomorphy is non-optimising and input-conditioned. For instance, an offglide predictably arises from a high vowel at the word boundary, as in (1), but the stative suffix consistently selects the input form ending in a vowel, as in (2).

(1) antɨ→ antɨɣ 'sun'
(2) antɨ-le-j 'it is sunny, there is sun' *[antɨɣkɨley] (Smeets, 2008, p.29)

Secondly, given the extensive textual record of Mapudungun, spanning more than 400 years, I surveyed the pattern diachronically, showing that it emerged from the "conglutination" of two suffixes (Haspelmath, 1995) — an internal affix that lost its meaning, and an external affix that kept the original meaning (stative or ambulative respectively). I reconstruct the internal affix as a historical *antipassive* that evolved from an original form that left "reflexes" in forms attested in Valdivia (1606), Febrés (1765), and Havestadt (1777). Due to historical phonological processes, such as fricativisation of stops (Berríos, 2025) and epenthesis of [ɨ], the affix became restricted to appear only after consonants, thus, in time, being lexicalised as a suppletive form of [k]-allomorphs.

This paper examines the behaviour of this set of affixes in Mapudungun from a synchronic perspective, while also showing how suppletive allomorphy can arise through historical interactions between morphology and phonology. Approaching the phenomenon from an "amphichronic" perspective (Kiparsky, 2006) helps clarify the division of labour between phonology and morphology, and advances our understanding of the mechanisms behind these processes in a comparatively less studied language.

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