DOMINANCE IS NON-REPRESENTATIONAL: EVIDENCE FROM A'INGAE VERBAL STRESS

MAKSYMILIAN DĄBKOWSKI
UNIVERSITY OF CALIFORNIA, BERKELEY
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ABSTRACT. A'ingae (or Cofán, ISO 639-3: `con`) is a language isolate spoken in the Ecuadorian and Colombian Amazon. This study presents a description and analysis of the language's morphologically-conditioned verbal stress assignment. Specifically, I show that A'ingae verbal morphemes can be classified with two binary parameters: the presence or lack of prestressing and the presence or lack of stress deletion (i. e. dominance), which vary independently.

I formalize my analysis in Cophonology Theory (Anttila, 1997; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Orgun, 1996; others), a non-representational theory of the phonology-morphology interface, which captures morpheme-specific phonology with constraint rankings particularized to morphological constructions.

I argue that while non-representational approaches, such as Cophonology Theory, can handle the facts of A'ingae stress deletion straightforwardly, representational approaches (Jaker and Kiparsky, 2020; Kushnir, 2019; Smolensky and Goldrick, 2016; Trommer and Zimmermann, 2014; others) lack the expressive power necessary to capture the A'ingae stress facts.

1 INTRODUCTION

Phonological alternations are not always fully general in a language; certain phonological effects may show up only in certain morphological contexts, resulting in morpheme-specific phonology. Morpheme-specific phonology is well attested typologically, with the phonological grammars of most (if not all) languages displaying some degree of morphological sensitivity (Sande, 2020). Due to competing perspectives on the nature of morphologically-conditioned phonology, it continues to play an important role in developing theories of the phonology-morphology interface.

One may broadly divide approaches to morpheme-specific phonology into two categories: representational and non-representational. Representational approaches attribute morpheme-specific phonological processes to differences in the underlying symbolic representations of said morphemes. Prominent representational tools include featural underspecification, autosegmental and metrical representations (Goldsmith, 1976; Hayes, 1995; Jaker and Kiparsky, 2020), segmentally empty prosodic nodes (Bermúdez-Otero, 2012; Oostendorp, 2012; Saba Kirchner, 2010; Samek-Lodovici, 1992; Trommer and Zimmermann, 2014), and gradient symbolic representations (Kushnir, 2019; Rosen, 2016; Smolensky and Goldrick, 2016; Zimmermann, 2018a,b).

Non-representational approaches, on the other hand, associate morphemes with specific phonological processes directly. Thus, non-representational approaches locate at least some idiosyncratic phonology outside of the underlying representation of the morpheme itself. The Sound Pattern of English (Chomsky and Halle, 1968) allows for indexing phonological rules to particular morphemes. Indexed Constraint Theory (Benua, 1997; Ito and Mester, 1999; Pater, 2009) and Transderivational Anti-Faithfulness (Alderete, 1999, 2001) allow for morphologically-indexed phonological constraints. Cophonology Theory (Anttila, 1997; Inkelas, 1998; Inkelas, Orgun, and Zoll, 1997; Inkelas and Zoll, 2007; Orgun, 1996) allows for the constraint ranking to vary with the morphological construction. Cophonologies by Phase (Sande, 2019; Sande, Jenks, and Inkelas, 2020) allow for the constraint ranking to vary with the phase and the morphosyntactic features introduced therein.

In this paper, I describe and analyze morphologically-determined stress assignment in A'ingae (or Cofán, ISO 639-3: `con`), a language isolate of the Amazon. A'ingae allows for contrastive stress specification on verbal roots (1a-b) as well as functional morphemes (1c-d),[1] both of which may result in minimal pairs. Phonetically, stress correlates most robustly with duration and pitch (Repetti-Ludlow et al., 2019).

(1)

	a.		b.		c.		d.	
	ˈnepi	*-je*	*neˈpi*	*-je*	*ˈafa*	*-je*	*aˈfa*	*-je*
	disappear	-INF	arrive	-INF	speak	-INF	speak	-PASS
	"to disappear"		"to arrive"		"to speak"		"was spoken"	

I propose that A'ingae verbs form two stress classes: stressed and stressless, and that A'ingae functional morphemes form four stress classes, which can be reduced to two binary parameters. The first parameter distinguishes between stressless and prestressing suffixes. The second parameter distinguishes between stress-preserving (recessive) and stress-deleting (dominant) suffixes. The two parameters vary independently. Typologically similar accentual systems can be found in Japanese (Kawahara, 2015), North-West Caucasian, e. g. Abkhaz (Vaux, 2008), as well as Slavic, Baltic, Greek, and Sanskrit (for a review, see Kiparsky, 2010).

1 The following abbreviations are used: 1 = first person, 2 = second person, 3 = third person, ADD = additive, AND = andative, APPR = apprehensional, CAUS = causative, CNTR = contrastive topic, DEF = definite, DS = different subject, FRST = frustrative, IMP = imperative, IMP2 = imperative 2, IMP3 = imperative 3, INF = infinitive, IPFV = imperfective, IRR = irrealis, LOC = locative, LVL = level attribute, NEG = negative, NEW = new topic, PASS = passive, PAUC = verbal paucal, PERF = perfect, PHON = form attribute, PL = plural, PLS = plural subject, PRCM = precumulative, PRHB = prohibitive, RCPR = reciprocal, RPRT = reportative, SEM = meaning attribute, SG = singular, SMFC = semelfactive, SS = same subject, THUS = manner demonstrative, VEN = venitive, VER = veridical, YNQ = polar interrogative.

I formalize my analysis of A'ingae verbal stress in Cophonology Theory (Anttila, 1997; Orgun, 1996; others), which captures morpheme-specific phonology with constraint rankings particularized to morphological constructions. I argue that while non-representational approaches, such as Cophonology Theory, can handle the facts of A'ingae stress deletion straightforwardly, strictly representational approaches (Jaker and Kiparsky, 2020; Kushnir, 2019; Smolensky and Goldrick, 2016; Trommer and Zimmermann, 2014; others) lack the expressive power necessary to capture the A'ingae facts without abandoning foundational assumptions about the properties of metrical structure (Hayes, 1995).

The rest of the paper is structured as follows. Section 2 gives background on the language, including sociolinguistic context and previous scholarship. Section 3 presents the data, motivating the analysis of A'ingae verbs as forming two stress classes and suffixes as forming four stress classes. Section 4 formalizes the analysis in Cophonology Theory. Section 5 argues that purely representational analyses cannot account for the A'ingae stress data.

2 BACKGROUND

A'ingae is an Amazonian language isolate. The language is agglutinating and heavily suffixing.[2] Verbal morphology is complex and encodes a large number of semantic categories, including valence, aspect, associated motion, subject features, reality, and polarity (2).[3] The ordering of functional morphemes is given in Section 3.

(2) *koˈfi -ã -ʔhe -ⁿgi -ʔfa -ja -ᵐbi =tsɨ*
play -CAUS -IPFV -VEN -PLS -IRR -NEG =3
"they$_{3,\text{PLS}}$ will$_{\text{IRR}}$ not$_{\text{NEG}}$ come$_{\text{VEN}}$ to be$_{\text{IPFV}}$ making$_{\text{CAUS}}$ play"

A'ingae syllable structure is (C)V(V)(ʔ).[4] For the complete phonemic inventory, see Repetti-Ludlow et al. (2019).[5] A'ingae shows limited regressive and robust progressive nasal spreading. Vowel nasality which results from phonologically predictable spreading is not transcribed; consonant nasality and prenasalization is. For more on A'ingae nasality, see Sanker and AnderBois (2021).

2 Categorizing many of the functional morphemes as suffixes or enclitics is a thorny analytical issue. The glossing used in this paper (with hyphens for suffixes and equals signs for enclitics) reflects primarily Zwicky and Pullum (1983)'s criterion of host selection. As no correlation has been found between the suffixhood or clitichood of A'ingae functional morphemes and stress, it is not essential for the present study. For differing views on the syntactic status of A'ingae functional morphemes, see Dąbkowski (2019b) and Fischer and Hengeveld (in press).

3 Subject person features (*=ⁿgi* 1, *=ki* 2, *=tsɨ* 3), polar interrogatives (*=ti* YNQ), and reportative evidentiality (*=te* RPRT) are exponed with second-position clitics. However, when these clitics attach to verbs, their morphophonology patterns with regular suffixes. Thus, they are included within the scope of the present study. For a syntactic analysis of A'ingae second-position clitics, see Dąbkowski (in press[a]).

4 Within a narrow morphosyntactic domain, A'ingae glottalization is licensed by the metrical foot node. The interaction of stress and glottalization is outside of the scope of this study. Thus, only forms in which glottalization does not crucially affect stress placement will be considered. For more details, see Dąbkowski (2019a,b, 2021b,d, in press[b]).

5 The analysis presented in this paper deviates from the inventory proposed by Repetti-Ludlow et al. (2019) in that it includes /*ia*/ (and its nasal counterpart /*ĩã*/) among the language's legal diphthongs. Repetti-Ludlow et al. (2019) claim that /*ia*/ is realized with an intervening glide [*ija*] and posit an optional deletion of the preconsonantal vowel, resulting in tautosyllabic [*ja*]. Here, /*ia*/ is considered a diphthong because it patterns with them for purposes of stress assignment. For example, the stress shift from *ˈmaⁿdiã* 'chase' to *maˈⁿdiã-ᵐbi* 'chase-NEG' is predicted if *ˈmaⁿdiã* 'chase' is disyllabic, but unexpected if trisyllabic.

All the data come from the author's unpublished field notes and recordings of elicitation sessions conducted over the past four years with five native speakers from the two indigenous communities of Zábalo and Dureno in Sucumbíos, Ecuador.

2.1 *Sociolinguistic context*

A'ingae is an endangered and severely underdocumented language isolate spoken by around 1,500 Cofán people. The origin of the Cofán can be traced to the Andes where they used to range over a large territory. Currently, they inhabit the province of Sucumbíos in northeast Ecuador and the department of Putumayo in southern Colombia (Repetti-Ludlow, Zhang, Lucitante, AnderBois, and Sanker, 2019). The national borders coincide with a dialectal divide. The data provided in this paper represent the Ecuadorian variety.

Residing at the foot of the Andes, the modern-day Cofán live in one of the most linguistically diverse regions of the world. Previous claims about A'ingae's genealogical relation to other languages, driven mostly by geography, remain unverified; A'ingae is a language isolate. The lexicon of the language has been influenced primarily by Kichwa, with whom the Cofán have been in contact at least since the late 19th century. Other influences include borrowings and wanderwörter from Siona-Secoya, Spanish, and Cariban (Dąbkowski, 2021a).

In Ecuador, A'ingae is spoken robustly in all domains of life and learned by children. A majority of the Cofán also speak Spanish, and almost all of them understand it to some degree. The Cofán are predominantly endogamous; some intermarriage with the Kichwa is reported. In both Ecuador and Colombia, the Cofán and their language face severe pressures from governmental abuse and environmental degradation caused by poaching and illegal oil extraction. There is little institutional support for the language outside of traditional communities. Despite the challenges, the Cofán people's attitudes towards A'ingae are uniformly positive. They take pride in their language and actively support projects aimed at bolstering its status (Dąbkowski, 2021a).

2.2 *Previous scholarship*

Notable contributions to the systematic study of A'ingae include a short dictionary by Borman (1976), a collection of traditional stories by Blaser and Chica Umenda (2008), a grammar sketch by Fischer and Hengeveld (in press), a phonetic study by Repetti-Ludlow et al. (2019), and an analysis of the apprehensional domain by AnderBois and Dąbkowski (2021) and Dąbkowski and AnderBois (in press, 2021).

There have been few treatments of the language's morphology. A short discussion of verbal morphology appears in Borman (1976). Fischer and Hengeveld (in press) provide the first morphological template attentive to the ordering and co-occurrence restrictions among functional morphemes.

Borman (1962), Fischer and Hengeveld (in press), and Repetti-Ludlow et al. (2019) provide phonetic and phonological descriptions of the language, but only marginally touch on stress. Previous literature does not make systematic attempts to understand the interactions between morphology and phonology. Some of the data and versions of the analysis advanced here appear in Dąbkowski (2019a,b, 2021b,c,d, in press[b]).

3 VERBAL STRESS

By default, A’ingae primary stress is assigned to the penultimate syllable of the word. Nevertheless, it is often the case that the position of stress cannot be computed based on surface properties alone, and instead requires reference to the morphological composition of the word. In this section, I introduce two stress classes of A’ingae verbs, describe stress assignment as conditioned by four classes of verbal suffixes, and present the A’ingae morphological template.

There are two classes of verbal roots in A’ingae: underlyingly stressless and with underlying word-initial stress. (Underlying stress is always word-initial.) The membership of a verb in either class is unpredictable. Underlyingly stressless verbs are assigned the default penultimate stress (3a-b). Underlying word-initial stress is preserved in the surface forms (3c-d). I assume that that primary stress is a phonetic realization of the head trochaic foot, represented with parentheses ( ). Since the analysis of the morphologically-conditioned stress patterns does not rely crucially on the underlying metrical structure, it will not be shown in later examples.

(3) UNDERLYINGLY STRESSLESS VERB / UNDERLYINGLY STRESSED VERB

a. / *pa^{n}dza* /	b. / *atapa* /	c. / (ˈ*afa*) /	d. / (ˈ*ko^{n}da*)*se* /
[(ˈ*pa^{n}dza*)]	[*a*(ˈ*tapa*)]	[(ˈ*afa*)]	[(ˈ*ko^{n}da*)*se*]
hunt	breed	speak	tell

Observe that both (3a) and (3c) have penultimate stress on the surface. Nevertheless, their underlying representations differ—(3a) is underlyingly stressless, whereas the stress of (3c) is specified at the underlying level. The difference between (3a) and (3c) is revealed, for example, in forms suffixed with the precumulative suffix *-hi* PRCM, which counts towards the phonological word, but does not affect preexisting stress. In (4a-b), penultimate stress is supplied by default. In (4c-d), the underlying word-initial stress is preserved.

(4) STRESSLESS VERB + *-hi* PRCM / STRESSED VERB + *-hi* PRCM

a. / *pa^{n}dza -hi* /	b. / *atapa -hi* /	c. / ˈ*afa -hi* /	d. / ˈ*ko^{n}dase -hi* /
[*paˈ^{n}dza -hi*]	[*ataˈpa -hi*]	[ˈ*afa -hi*]	[ˈ*ko^{n}dase -hi*]
hunt -PRCM	breed -PRCM	speak -PRCM	tell -PRCM

The precumulative *-hi* PRCM represents the first of A’ingae’s four suffix classes—*recessive stressless*. Recessive stressless suffixes do not contribute their own stress (hence stressless) and do not affect preexisting stress (hence recessive). However, they form a part of the phonological word, so they count for purposes of default penultimate stress assignment (4a-b). Recessive stressless suffixes are represented without subscripts or superscripts.

The only other recessive stressless suffix is the causative CAUS realized as *-ɲa* on monosyllables (5a), as *-ẽ* on polysyllables ending in *a* or *o* (5b), and as *-ã* on polysyllables ending in *e*, *i*, or *ɨ* (5c-d). The allomorphs *-ẽ* and *-ã* do not form separate syllables, but rather diphthongs with the preceding vowel, which is reflected in the assignment of the default penultimate stress (5a-c). Preexisting stress, when present, is preserved (5d). Syllable boundaries are shown below with a dot (.). Note that white space represents morpheme boundaries, not syllable boundaries.

(5) VERB + *-ɲa* CAUS

a. / *p^{h}i. -ɲa* / [*ˈp^{h}i. -ɲa*] sit -CAUS

b. / *pa.^{n}dza -ẽ* / [*ˈpa.^{n}dza -ẽ*] hunt -CAUS

c. / *a.fe -ã* / [*ˈa.fi -ã*] give -CAUS

d. / *ˈko.^{n}da.se -ã* / [*ˈko.^{n}da.si -ã*] tell -CAUS

When both suffixes are present, the causative *-ɲa* CAUS precedes the precumulative *-hi* PRCM. Stress falls on the penultimate syllable (6a-b) unless blocked by preexisting stress (6c-d).

(6) STRESSLESS + *-ɲa* CAUS + *-hi* PRCM — STRESSED + *-ɲa* CAUS + *-hi* PRCM

a. / *p^{h}i -ɲa -hi* / [*p^{h}i -ˈɲa -hi*] sit -CAUS -PRCM

b. / *pa^{n}dza -ẽ -hi* / [*paˈ^{n}dza -ẽ -hi*] hunt -CAUS -PRCM

c. / *ˈafa -ẽ -hi* / [*ˈafa -ẽ -hi*] speak -CAUS -PRCM

d. / *ˈko^{n}dase -ã -hi* / [*ˈko^{n}dasi -ã -hi*] tell -CAUS -PRCM

The second suffix class comprises *dominant stressless* suffixes. Dominant stressless suffixes do not contribute their own stress (hence stressless) and delete preexisting stress if any is present (hence dominant; see Alderete, 1999; Halle and Vergnaud, 1987; Inkelas, 1998; Revithiadou, 1999; Rolle, 2018; Vaxman, 2016). If there is no preexisting stress, dominant stressless suffixes have no effect. Thus, dominant stressless suffixes turn stressed verbs into stressless ones. The dominant stressless suffixes are represented with a superscripted empty set (∅). There are three dominant stressless suffixes: the reciprocal *-k^{h}o$^∅$* RCPR, the passive *-je$^∅$* PASS, and the verbal paucal *-k^{h}a$^∅$* PAUC.[6]

When a dominant stressless suffix attaches to a stressless verb, the surface form shows the default penultimate stress (7a-b). When a dominant stressless suffix attaches to a stressed verb, the verb's stress is deleted, feeding the assignment of the default penultimate stress even to underlyingly stressed verbs (7c-d).

(7) STRESSLESS VERB + *-k^{h}o$^∅$* RCPR — STRESSED VERB + *-k^{h}o$^∅$* RCPR

a. / *pa^{n}dza -k^{h}o$^∅$* / [*paˈ^{n}dza -k^{h}o*] hunt -RCPR

b. / *atapa -k^{h}o$^∅$* / [*ataˈpa -k^{h}o*] breed -RCPR

c. / *ˈafa -k^{h}o$^∅$* / [*aˈfa -k^{h}o*] speak -RCPR

d. / *ˈko^{n}dase -k^{h}o$^∅$* / [*ko^{n}daˈse -k^{h}o*] tell -RCPR

A dominant stressless suffix may delete preexisting stress across another suffix (8). A dominant stressless suffix may itself be stressed if followed by another stressless suffix (9). Several dominant stressless suffix have the same stress deletion properties as one dominant stressless suffix (10). In all these situations, after the verb's stress is deleted, penultimate stress is assigned by default.

(8) STRESSLESS + *-ɲa* CAUS + *-je$^∅$* PASS — STRESSED + *-ɲa* CAUS + *-je$^∅$* PASS

a. / *p^{h}i -ɲa -je$^∅$* / [*p^{h}i -ˈɲa -ɲe*] sit -CAUS -PASS

b. / *pa^{n}dza -ẽ -je$^∅$* / [*paˈ^{n}dza -ẽ -ɲe*] hunt CAUS -PASS

c. / *ˈafa -ẽ -je$^∅$* / [*aˈfa -ẽ -ɲe*] speak -CAUS -PASS

d. / *ˈko^{n}dase -ã -je$^∅$* / [*ko^{n}daˈsi -ã -ɲe*] tell CAUS -PASS

6 I do not discuss the stress pattern with the preglottalized dominant stressless suffixes *-ʔhe* IPFV, *-ʔɲak^{h}a* SMFC, *-ʔ^{n}gi* VEN, and *-ʔ^{n}ga* AND, but they are included in Figure 1 for completeness. For a discuss of these suffixes and the interaction between glottalization and stress more generally, see Dąbkowski (2019a,b, 2021b,d, in press[b]).

(9) STRESSLESS + *-je*$^{\emptyset}$ PASS + *-hi* PRCM STRESSED + *-je*$^{\emptyset}$ PASS + *-hi* PRCM

a. / *pa*^{n}*dza -je*$^{\emptyset}$ *-hi* / b. / *atapa -je*$^{\emptyset}$ *-hi* / c. / *ˈafa -je*$^{\emptyset}$ *-hi* / d. / *ˈko*^{n}*dase -je*$^{\emptyset}$ *-hi* /
[*pa*^{n}*dza -ˈje -hi*] [*atapa -ˈje -hi*] [*afa -ˈje -hi*] [*ko*^{n}*dase -ˈje -hi*]
hunt -PASS -PRCM breed -PASS -PRCM speak -PASS -PRCM tell -PASS -PRCM

(10) STRESSLESS + *-k*^{h}*o*$^{\emptyset}$ RCPR + *-je*$^{\emptyset}$ PASS STRESSED + *-k*^{h}*o*$^{\emptyset}$ RCPR + *-je*$^{\emptyset}$ PASS

a. / *afe -k*^{h}*o*$^{\emptyset}$ *-je*$^{\emptyset}$ / b. / *atapa -k*^{h}*o*$^{\emptyset}$ *-je*$^{\emptyset}$ / c. / *ˈafa -k*^{h}*o*$^{\emptyset}$ *-je*$^{\emptyset}$ / d. / *ˈko*^{n}*dase -k*^{h}*o*$^{\emptyset}$ *-je*$^{\emptyset}$ /
[*afe -ˈk*^{h}*o -je*] [*atapa -ˈk*^{h}*o -je*] [*afa -ˈk*^{h}*o -je*] [*ko*^{n}*dase -ˈk*^{h}*o -je*]
give -RCPR -PASS breed -RCPR -PASS speak -RCPR -PASS tell -RCPR -PASS

The third suffix class comprises *recessive prestressing* suffixes. Recessive prestressing suffixes place stress on the immediately preceding syllable (hence prestressing) but only if there is no preexisting stress (hence recessive). The recessive prestressing suffixes are represented with a subscripted left-pointing arrow (←). The recessive prestressing suffixes are by far the most numerous class, including the plural subject *-ʔfa*$_{\leftarrow}$ PLS, the irrealis *-ja*$_{\leftarrow}$ IRR, the negative *-*^{m}*bi*$_{\leftarrow}$ NEG, the imperative *-ha*$_{\leftarrow}$ IMP, the apprehensional *-saʔne*$_{\leftarrow}$ APPR, and others. Prestressing suffixes linearly follow stressless suffixes, both dominant and recessive. Thus, because of the morphological organization of the verb, a stressless suffix never comes to the right of a prestressing suffix.

When one monosyllabic prestressing suffix is present on a stressless verb, stress is assigned to the last syllable of the root, resulting in penultimate stress (11a-b). The stress of underlyingly stressed verbs is not affected (11c-d). Thus, the output forms with one monosyllabic prestressing suffix are indistinguishable from those with a recessive stressless suffix (4). However, when the prestressing suffix is disyllabic, prestressing results in antepenultimate stress, which is unlike the penultimate default stress assignment (12).

(11) STRESSLESS VERB + *-ja*$_{\leftarrow}$ IRR STRESSED VERB + *-ja*$_{\leftarrow}$ IRR

a. / *pa*^{n}*dza -ja*$_{\leftarrow}$ / b. / *atapa -ja*$_{\leftarrow}$ / c. / *ˈafa -ja*$_{\leftarrow}$ / d. / *ˈko*^{n}*dase -ja*$_{\leftarrow}$ /
[*paˈ*^{n}*dza -ja*] [*ataˈpa -ja*] [*ˈafa -ja*] [*ˈko*^{n}*dase -ja*]
hunt -IRR breed -IRR speak -IRR tell -IRR

(12) STRESSLESS VERB + *-saʔne*$_{\leftarrow}$ APPR STRESSED VERB + *-saʔne*$_{\leftarrow}$ APPR

a. / *pa*^{n}*dza -saʔne*$_{\leftarrow}$ / b. / *atapa -saʔne*$_{\leftarrow}$ / c. / *ˈafa -saʔne*$_{\leftarrow}$ / d. / *ˈko*^{n}*dase -saʔne*$_{\leftarrow}$ /
[*paˈ*^{n}*dza -saʔne*] [*ataˈpa -saʔne*] [*ˈafa -saʔne*] [*ˈko*^{n}*dase -saʔne*]
hunt -APPR breed -APPR speak -APPR tell -APPR

The behavior of recessive stressless suffixes and recessive prestressing suffixes also comes apart when more than one prestressing suffix is present. The first prestressing suffix assigns stress to the syllable which immediately precedes it (given no preexisting stress). The following recessive prestressing suffixes respect preexisting stress, including that assigned by an earlier suffix, so they do not shift stress. Thus, in forms with multiple prestressing suffixes, the output stress is root-final on underlyingly stressless verbs (13a-b) and word-initial on underlyingly stressed verbs (13c-d).

(13) STRESSLESS + *-ʔfa*$_{\leftarrow}$ PLS + *-ja*$_{\leftarrow}$ IRR STRESSED + *-ʔfa*$_{\leftarrow}$ PLS + *-ja*$_{\leftarrow}$ IRR

a. / *pa*^{n}*dza -ʔfa*$_{\leftarrow}$ *-ja*$_{\leftarrow}$ / b. / *atapa -ʔfa*$_{\leftarrow}$ *-ja*$_{\leftarrow}$ / c. / *ˈafa -ʔfa*$_{\leftarrow}$ *-ja*$_{\leftarrow}$ / d. / *ˈko*^{n}*dase -ʔfa*$_{\leftarrow}$ *-ja*$_{\leftarrow}$ /
[*paˈ*^{n}*dza -ʔfa -ja*] [*ataˈpa -ʔfa -ja*] [*ˈafa -ʔfa -ja*] [*ˈko*^{n}*dase -ʔfa -ja*]
hunt -PLS -IRR breed -PLS -IRR speak -PLS -IRR tell -PLS -IRR

When both recessive stressless and recessive prestressing suffixes are present on a stressless verb, stress falls immediately before the first prestressing suffix (14). The stress of underlyingly stressed verbs remains unaffected (15).

(14) STRESSLESS VERB + RECESSIVE STRESSLESS + RECESSIVE PRESTRESSING

a. / p^h*i* -*hi* -*ʔfa*$_{\leftarrow}$ /
[p^h*i* -ˈ*hi* -*ʔfa*]
sit -PRCM -PLS

b. / p^h*i* -*ɲa* -*hi* -*ʔfa*$_{\leftarrow}$ -*ja*$_{\leftarrow}$ -^{m}*bi*$_{\leftarrow}$ =*ti*$_{\leftarrow}$ =*ki*$_{\leftarrow}$ /
[p^h*i* -*ɲa* -ˈ*hi* -*ʔfa* -*ja* -^{m}*bi* =*ti* =*ki*]
sit -CAUS -PRCM -PLS -IRR -NEG =YNQ =2

(15) STRESSED VERB + RECESSIVE STRESSLESS + RECESSIVE PRESTRESSING

a. / ˈ*afa* -*hi* -*ʔfa*$_{\leftarrow}$ /
[ˈ*afa* -*hi* -*ʔfa*]
speak -PRCM -PLS

b. / ˈ*afa* -*ẽ* -*hi* -*ʔfa*$_{\leftarrow}$ -*ja*$_{\leftarrow}$ -^{m}*bi*$_{\leftarrow}$ =*ti*$_{\leftarrow}$ =*ki*$_{\leftarrow}$ /
[ˈ*afa* -*ẽ* -*hi* -*ʔfa* -*ja* -^{m}*bi* =*ti* =*ki*]
speak -CAUS -PRCM -PLS -IRR -NEG =YNQ =2

Dominant stressless suffixes delete preexisting stress, feeding the recessive prestressing suffixes, which assign stress only if no preexisting stress is present. Thus, when a stressed verb is followed by at least one dominant stressless suffix and at least one prestressing suffix, stress falls immediately to the left of the first prestressing suffix (16), patterning with stressless verbs (14).

(16) STRESSED VERB + DOMINANT(/RECESSIVE) STRESSLESS + RECESSIVE PRESTRESSING

a. / ˈ*afa* -*je*$^{\emptyset}$ -*ʔfa*$_{\leftarrow}$ /
[*afa* -ˈ*je* -*ʔfa*]
speak -PASS -PLS

b. / ˈ*afa* -k^h*o*$^{\emptyset}$ -*je*$^{\emptyset}$ -*ʔfa*$_{\leftarrow}$ -*ja*$_{\leftarrow}$ -^{m}*bi*$_{\leftarrow}$ =*ti*$_{\leftarrow}$ =*ki*$_{\leftarrow}$ /
[*afa* -k^h*o* -ˈ*je* -*ʔfa* -*ja* -^{m}*bi* =*ti* =*ki*]
speak -RCPR -PASS -PLS -IRR -NEG =YNQ =2

Stressless suffixes, both dominant and recessive, always precede the prestressing ones. Therefore, the suffix orders discussed above are the only ones attested.

Finally, the fourth suffix class comprises *dominant prestressing* suffixes. Dominant prestressing suffixes delete preexisting stress (hence dominant) and place stress on the immediately preceding syllable (hence prestressing). Thus, the prestressing associated with these suffixes completely replaces preexisting stress, if any was present. The dominant prestressing suffixes are represented with a subscripted left-pointing arrow (←) and a superscripted empty set (∅). There are two dominant prestressing suffixes: the imperative 2 -k^h*a*$^{\emptyset}_{\leftarrow}$ IMP2 and the prohibitive -*hama*$^{\emptyset}_{\leftarrow}$ PRHB. The dominant prestressing suffixes follow stressless suffixes. Thus, a stressless suffix never comes to the right of a prestressing suffix. However, a dominant prestressing suffix may be followed by a recessive prestressing one.

When a dominant prestressing suffix attaches to a stressless verb, stress is assigned to the last syllable of the root (17-18a-b). When a dominant prestressing suffix attaches to a stressed verb, the verb's stress is deleted and stress is assigned to the last syllable of the root as well (17-18c-d).

(17) STRESSLESS VERB + -k^h*a*$^{\emptyset}_{\leftarrow}$ IMP2

a. / *pa*^{n}*dza* -k^h*a*$^{\emptyset}_{\leftarrow}$ /
[*pa*ˈ^n*dza* -k^h*a*]
hunt -IMP2

STRESSED VERB + -k^h*a*$^{\emptyset}_{\leftarrow}$ IMP2

c. / ˈ*ana* -k^h*a*$^{\emptyset}_{\leftarrow}$ /
[*a*ˈ*na* -k^h*a*]
sleep -IMP2

d. / ˈ*kati* -k^h*a*$^{\emptyset}_{\leftarrow}$ /
[*ka*ˈ*ti* -k^h*a*]
cast -IMP2

(18) STRESSLESS VERB + *-hama*$^{\emptyset}_{\leftarrow}$ PRHB — STRESSED VERB + *-hama*$^{\emptyset}_{\leftarrow}$ PRHB

a. / *pa^{n}dza -hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{ˈn}dza -hama*]
hunt -PRHB

b. / *atapa -hama*$^{\emptyset}_{\leftarrow}$ /
[*ataˈpa -hama*]
breed -PRHB

c. / *ˈafa -hama*$^{\emptyset}_{\leftarrow}$ /
[*aˈfa -hama*]
speak -PRHB

d. / *ˈko^{n}dase -hama*$^{\emptyset}_{\leftarrow}$ /
[*ko^{n}daˈse -hama*]
tell -PRHB

When additional suffixes intervene between a stressless verb and the dominant prestressing suffix, stress is always assigned to the syllable immediately preceding the dominant prestressing suffix, regardless of whether the intervening suffixes are recessive stressless (19a), dominant stressless (19b), recessive prestressing (19c), or any combination of the three (19d-f). The same generalization holds when the verbal root is stressed (20-21).

(19) STRESSLESS VERB + ... + *-hama*$^{\emptyset}_{\leftarrow}$ PRHB

a. / *pa^{n}dza -ẽ -hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{ˈn}dza -ẽ -hama*]
hunt -CAUS -PRHB

b. / *pa^{n}dza -je*$^{\emptyset}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{n}dza -ˈje -hama*]
hunt -PASS -PRHB

c. / *pa^{n}dza -ʔfa*$_{\leftarrow}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{n}dza -ʔˈfa -hama*]
hunt -PLS -PRHB

d. / *pa^{n}dza -ẽ -je*$^{\emptyset}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{n}dza -ẽ -ˈɲe -hama*]
hunt -CAUS -PASS -PRHB

e. / *pa^{n}dza -ẽ -ʔfa*$_{\leftarrow}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{n}dza -ẽ -ʔˈfa -hama*]
hunt -CAUS -PLS -PRHB

f. / *pa^{n}dza -k^{h}o*$^{\emptyset}$ *-ʔfa*$_{\leftarrow}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*pa^{n}dza -k^{h}o -ʔˈfa -hama*]
hunt -RCPR -PLS -PRHB

(20) STRESSED VERB + ... + *-hama*$^{\emptyset}_{\leftarrow}$ PRHB

a. / *ˈafa -ẽ -je*$^{\emptyset}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*afa -ẽ -ˈɲe -hama*]
speak -CAUS -PASS -PRHB

b. / *ˈafa -ẽ -ʔfa*$_{\leftarrow}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*afa -ẽ -ʔˈfa -hama*]
speak -CAUS -PLS -PRHB

c. / *ˈafa -k^{h}o*$^{\emptyset}$ *-ʔfa*$_{\leftarrow}$ *-hama*$^{\emptyset}_{\leftarrow}$ /
[*afa -k^{h}o -ʔˈfa -hama*]
speak -RCPR -PLS -PRHB

(21) STRESSED VERB + *-ʔfa*$_{\leftarrow}$ PLS + *-k^{h}a*$^{\emptyset}_{\leftarrow}$ IMP2

a. / *ˈana -ʔfa*$_{\leftarrow}$ *-k^{h}a*$^{\emptyset}_{\leftarrow}$ /
[*ana -ʔˈfa -k^{h}a*]
sleep -PLS -IMP2

b. / *ˈk^{h}ɨsi -ʔfa*$_{\leftarrow}$ *-k^{h}a*$^{\emptyset}_{\leftarrow}$ /
[*k^{h}ɨsi -ʔˈfa -k^{h}a*]
get drunk -PLS -IMP2

A dominant prestressing suffix can be followed by recessive prestressing suffixes. Since recessive prestressing suffixes do not alter preexisting stress, the stress assigned by the dominant prestressing suffix is preserved (22).

(22) STRESSLESS + *-hama*$^{\emptyset}_{\leftarrow}$ PRHB + PRE REC — STRESSED + *-hama*$^{\emptyset}_{\leftarrow}$ PRHB + PRE REC

a. / *pa^{n}dza -hama*$^{\emptyset}_{\leftarrow}$ *=te*$_{\leftarrow}$ *=ke*$_{\leftarrow}$ /
[*pa^{ˈn}dza -hama =^{n}de =ke*]
hunt -PRHB =RPRT =?[7]

b. / *ˈafa -hama*$^{\emptyset}_{\leftarrow}$ *=te*$_{\leftarrow}$ *=ke*$_{\leftarrow}$ /
[*aˈfa -hama =^{n}de =ke*]
speak -PRHB =RPRT =?

Thus, stress surfaces one syllable to the left of the dominant prestressing suffix regardless of which other suffixes come before and after it. The two dominant prestressing suffixes do not co-occur. Furthermore, prestressing suffixes (both recessive and dominant) never come before stressless

7 The unglossed clitic =*ke* ? appears in third person directives (for a discussion of third person directives, see AnderBois, 2017). Thus, (22a) means "do not hunt (they say)." The clitic =*ke* ? might be related to the second person subject clitic =*ki* 2, the second person singular pronoun *ke* 2SG, or the manner demonstrative clitic =*k^{h}ẽ* THUS, which also introduces clausal complements of some verbs of saying.

suffixes (likewise irrespective of dominance). Thus, the suffixes orders discussed above exhaust all of the attested combinations.

The four suffix classes (recessive stressless, dominant stressless, recessive prestressing, dominant prestressing) can be seen as emergent from two independently varying binary morphophonological parameters: prestressing and dominance. This is schematized in Table 1. All A'ingae suffixes belong to one of the four classes.

	RECESSIVE	*DOMINANT*
STRESSLESS	retains preexisting stress	deletes preexisting stress
PRESTRESSING	prestresses unless stress already exists	always prestresses

Table 1: Stress operations of $2 \times 2 = 4$ suffix classes.

A'ingae heavily-agglutinating suffixation expones multiple semantic and pragmatic categories, organized in a morphological template with a dozen or so slots. The template is given in Figure 1. The first three slots are occupied by valency-changing suffix: the causative (i), the reciprocal (ii), and the passive (iii). They are followed by a slot for aspect (iv), associated motion (v), subject number (vi), reality (vii), polarity (viii), clause type (ix), and information structure (x). In addition, a suffixed verb may host a sentence-level clitic exponing reportative evidentiality or a polar question (xi) followed by a clitic exponing person features of the subject (xii).[8]

(i) CAUSATIVE: *-ɲa* CAUS
(ii) RECIPROCAL: *-k*^{h}*o*$^{\emptyset}$ RCPR
(iii) PASSIVE: *-je*$^{\emptyset}$ PASS
(iv) ASPECT: *-ʔhe*$^{\emptyset}$ IPFV, *-hi* PRCM, *-k*^{h}*a*$^{\emptyset}$ PAUC, *-ʔɲak*^{h}*a*$^{\emptyset}$ SMFC
(v) ASSOCIATED MOTION: *-ʔ*^{n}*gi*$^{\emptyset}$ VEN, *-ʔ*^{n}*ga*$^{\emptyset}$ AND
(vi) SUBJECT NUMBER: *-ʔfa*$_{\leftarrow}$ PLS
(vii) REALITY: *-ja*$_{\leftarrow}$ IRR
(viii) POLARITY: *-*^{m}*bi*$_{\leftarrow}$ NEG
(ix) CLAUSE TYPE
  SUBORDINATE: *-je*$_{\leftarrow}$ INF, *-saʔne*$_{\leftarrow}$ APPR, *-ʔni*$_{\leftarrow}$ LOC, *-ʔma*$_{\leftarrow}$ FRST
  COSUBORDINATE: *-pa*$_{\leftarrow}$ SS, *-si*$_{\leftarrow}$ DS
  MATRIX: *-ha*$_{\leftarrow}$ IMP, *-k*^{h}*a*$^{\emptyset}_{\leftarrow}$ IMP2, *-ʔse*$_{\leftarrow}$ IMP3, *-hama*$^{\emptyset}_{\leftarrow}$ PRHB, *-ʔja*$_{\leftarrow}$ VER
(x) INFORMATION STRUCTURE: *-ʔta*$_{\leftarrow}$ NEW, *-ʔk*^{h}*e*$_{\leftarrow}$ ADD, *-ʔha*$_{\leftarrow}$ CNTR
(xi) SENTENCE-LEVEL: *=te*$_{\leftarrow}$ RPRT, *=ti*$_{\leftarrow}$ YNQ
(xii) SUBJECT PERSON: *=*^{n}*gi*$_{\leftarrow}$ 1, *=ki*$_{\leftarrow}$ 2, *=tsʰi*$_{\leftarrow}$ 3, *=ke*$_{\leftarrow}$?

Figure 1: Inflectional template of the A'ingae verb.

8 There are co-occurrence restrictions found among the suffixes and clitics. Some of them are semantically motivated while others are idiosyncratic. For example, the imperfective *-ʔhe* IPFV is the only aspectual suffix that can be followed by an associated motion suffix. The negative *-*^{m}*bi* NEG cannot co-occur with the infinitive *-je* INF, the prohibitive *-hama* PRHB, or any of the imperatives *-ha* IMP, *-k*^{h}*a* IMP2, *-ʔse* IMP3. The information structure suffixes cannot occur on matrix clauses. The third person subject clitic *=tsʰi* 3 cannot follow the reportative *=te* RPRT or the polar interrogative *=ti* YNQ. These restrictions are orthogonal to the questions of morphophonology and will not be pursued further.

Finally, there is secondary stress in A'ingae. Secondary stress is assigned without reference to the morphological composition of the word and alternates predictably on every other syllable (23a). In forms with an odd number of posttonic syllables, a two-syllable lapse between primary stress and secondary stress arises (23b). Degenerate feet are not constructed (Dąbkowski, 2019b). Since secondary stress does not affect morphologically-conditioned primary stress assignment, I do not transcribe or analyze it in this paper.

(23) SECONDARY STRESS

a. (ˈ*afa*) (-ˌ*ja-ᵐbi*) (=ˌ*ti=ki*)
speak -IRR-NEG =YNQ=2

b. *pa*(ˈ*ⁿdza-ʔfa*) *-ja* (-ˌ*ᵐbi=ti*)
hunt-PLS -IRR -NEG=YNQ

4 ANALYSIS

4.1 *Cophonology Theory*

Cophonology Theory (henceforth CT; Anttila, 1997; Orgun, 1996; others) is a formal framework of the phonology-morphology interface, which particularizes aspects of the phonological grammar to morphological constructions. In doing so, it splits the grammar of a language into multiple phonological subgrammars. Here, the phonological grammars will be modeled with OT constraints (McCarthy and Prince, 1993a,b; Prince and Smolensky, 1993; others).

Cophonology Theory models morpheme-specific phonology by associating morphological processes with phonological subgrammars, known as cophonologies. The phonological subgrammars are themselves morphologically blind, which predicts that the phonology of a word depends on the phonologies of its constituent parts and their hierarchical organization (Caballero, 2011; Inkelas and Zoll, 2007).

Morphological primitives (such as roots and affixes) and morphologically complex expressions are modeled as signs. Morphological processes are modeled as constructions that combine these signs to yield a new sign. Signs are formalized as attribute-value matrices. Each sign is associated with a syntactic category, as well as a meaning attribute SEM(ANTICS) and a form attribute PHON(OLOGY). The value of PHON is a phonological string computed as an output of a construction-specific phonological function (cophonology) applied to its inputs. The OT constraints which make up cophonologies are general; they themselves do not refer to morphological categories. When cophonologies differ across morphological constructions, morpheme-specific phonology obtains (Caballero, 2011; Inkelas, 1998; Inkelas and Zoll, 2005).

In Figure 2, an example of an affixation construction in A'ingae is given, whereby the form ***afaseje*** 'offend-PASS' is licensed by verb ˈ***afase*** 'offend' and the passive suffix ***-je*** PASS. The two daughters correspond to the input verb and suffix; the mother corresponds to the output. Boxed indices mark those values whose identity is imposed by the construction.

The left daughter's category is a *verb*, while the right daughter's category is an *inflectional suffix*. Since the construction is inflectional, the mother node's category is identified with the category of its left daughter. The mother node's SEMANTICS is the output of applying the meaning function of ***-je*** PASS to ˈ***afase*** 'offend.' Finally, its PHONOLOGY is the output of a construction-specific cophonological function whose two arguments are the phonologies of its two daughters. Observe stress deletion in the

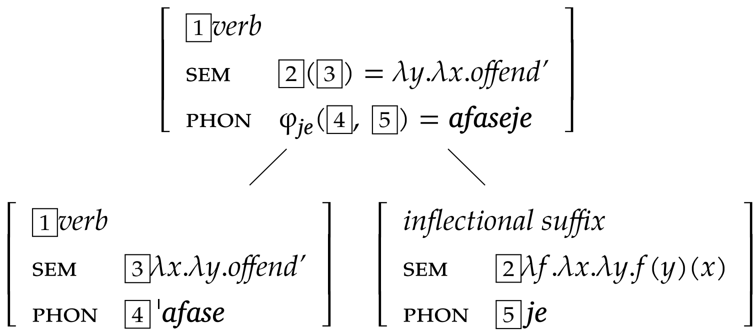


Figure 2: An inflectional construction, ***afaseje*** 'offend-PASS.'

mother node's form ***afaseje***, a consequence of applying the cophonological function associated with the passive suffix ***-je*** PASS to ˈ***afase*** and ***je***. The analysis of stress deletion will be given in Section 4.2.

The dependence of a word's phonology on the phonologies of its constituent parts and their hierarchical organization is derived from the very architecture of Cophonology Theory. Since the morphological constructions apply sequentially, complex words have branching structures, as represented in Figure 3 (Caballero, 2011; Inkelas, 1998; Inkelas and Zoll, 2007). Cophonological functions are represented with the Greek letter φ.

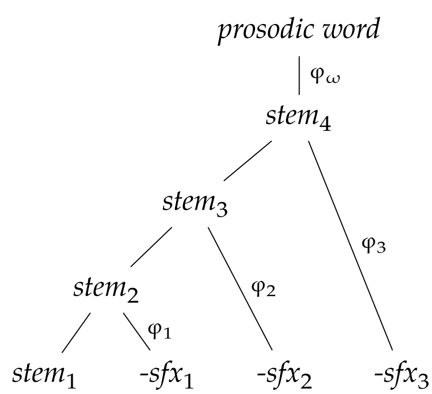


Figure 3: Morphophonological constituency in CT.

This hierarchical structure has a direct phonological correlate: the phonologies of branching nodes depend exclusively on the phonologies of their daughters. For example, the phonology of the *word* node is the output of the function $\varphi_3(\textit{stem}_3, \textit{-sfx}_3)$, blind to the fact that the $\textit{stem}_3$ node is itself a morphological complex of $\textit{stem}_2$ and $\textit{sfx}_2$. Likewise, the function φ_2 as applied to its two arguments, $\textit{stem}_2$ and $\textit{-sfx}_2$, does not have access to information about $\textit{sfx}_3$ and *word*, which come subsequent to it. In this way, the branching structure of morphologically complex words models "bracket erasure," deriving the domains of applicability for particular cophonologies (Caballero, 2011; Inkelas and Zoll, 2007). Finally, I propose that the last output of a morphological operation (here, $\textit{stem}_4$) may undergo one final phonological evaluation by itself, represented as φ_ω, which promotes it to the prosodic word (if $\textit{stem}_4$ is not already prosodified).

In this study, cophonologies are implemented within Optimality Theory, which treats the observed linguistic forms as a consequence of optimal satisfaction of conflicting constraints (McCarthy and

Prince, 1993a,b; Prince and Smolensky, 1993). Thus, different cophonologies correspond to different constraint rankings.

4.2 *Implementation*

In the CT analysis to be pursued, the five stress operations seen in Section 3 (four suffix classes plus the default penultimate stress assignment) will be associated with five different cophonologies, or different rankings of phonological constraints.

First, recessive stressless suffixes are associated with the *recessive stressless* cophonology. Recessive stressless suffixes preserve preexisting stress and do not assign any stress by themselves. Thus, if there is input stress, it is preserved. If there is no stress in the input, none is assigned. In other words, when the recessive stressless cophonology applies, outputs are fully faithful to the inputs. This is captured with high-ranking MaxFoot (24), which favors preservation of the input metrical structure (metrical feet), and DepFoot (25), which prevents the construction of metrical feet in the output if they are absent in the input.

(24) Maximality(Foot), or: MaxFt
For every metrical foot in the input, there is a corresponding metrical foot in the output.

(25) Dependence(Foot), or: DepFt
For every metrical foot in the output, there is a corresponding metrical foot in the input.

When a recessive stressless suffix attaches to a stressless stem, the output is likewise stressless (26a). This is because the candidates which innovate stress incur violations of DepFoot. When a recessive stressless suffix attaches to a stressed stem, that stress is preserved in the output (26b). The candidates which remove stress incur violations of MaxFoot; the candidates which remove input stress and innovate stress somewhere else incur violations of both MaxFoot as well as Dep Foot.[9] Input stems are given in brackets [ ].[10]

(26) a.

	[*pa*^{n}*dza*]*hi*:	*recessive stressless* MaxFt	DepFt
☞	i. *pa*^{n}*dzahi*		
	ii. *ˈpa*^{n}*dzahi*		*!
	iii. *paˈ*^{n}*dzahi*		*!
	iv. *pa*^{n}*dzaˈhi*		*!

hunt-PRCM

b.

	[*ˈafa*]*hi*:	*recessive stressless* MaxFt	DepFt
	i. *afahi*	*!	
☞	ii. *ˈafahi*		
	iii. *aˈfahi*	*!	*!
	iv. *afaˈhi*	*!	*!

speak-PRCM

Note that stress in the output of (26a) is absent, not penultimate (cf. 4a). The default penultimate stress is assigned later, after all the morphophonological operations.

9 I assume that when stress in the output does not match stress in the input, this is a consequence of stress deletion and stress reassignment, not stress shift. Hence, candidates (iii) and (iv) in (26b) incur violations of Maximality(Foot) and Dependence(Foot), not of NoFlop(Foot) (for a discussion of NoFlop constraints, see Alderete, 1999, 2001).

10 I assume that each cophonological function uses the same constraints. The only thing that differs between the cophonologies is the ranking of these constraints. In the tableaux below, I show only the highest crucially ranked constants which determine the output. The complete rankings will be given in Table 2.

Second, dominant stressless suffixes are associated with the *dominant stressless* cophonology. Dominant stressless suffixes delete stress and do not assign any stress by themselves. This is captured with ranking *Foot (27), which favors outputs without metrical structure, above MaxFoot.

(27) *Foot, or: *Ft
There is no metrical structure in the output.

When a dominant stressless suffix attaches to a stressless stem, the output is stressless, as favored by both *Foot and DepFoot (28a). When a dominant stressless suffix attaches to a stressed stem, the output is likewise stressless (28b). All the stressed candidates incur violations of *Foot.

(28) a. *dominant stressless*

	[*pa^{n}dza*]*je*$^{\emptyset}$:	*Ft	DepFt	MaxFt
☞	i. *pa^{n}dzaje*			
	ii. *ˈpa^{n}dzaje*	*!	*!	
	iii. *paˈ^{n}dzaje*	*!	*!	
	iv. *pa^{n}dzaˈje*	*!	*!	

hunt-PASS

b. *dominant stressless*

	[ˈ*afa*]*je*$^{\emptyset}$:	*Ft	DepFt	MaxFt
☞	i. *afaje*			*
	ii. *ˈafaje*	*!		
	iii. *aˈfaje*	*!	*!	*
	iv. *afaˈje*	*!	*!	*

speak-PASS

Third, recessive prestressing suffixes are associated with the *recessive prestressing* cophonology. Recessive prestressing suffixes assign stress to the last syllable of the stem unless there is preexisting stress on the stem. This is captured with ranking AlignStem (29), which favors outputs with stress on the last syllable of the stem, below MaxFoot but above DepFoot.

(29) Align(Stem, R, σ́, R), or: Alσ́]+
The right edge of the stem is aligned with the right edge of a stressed syllable.

When a recessive prestressing suffix attaches to a stressless stem, AlignStem can assign stress to the last syllable of the stem without incurring any violation of the higher ranking MaxFoot (30a). When a recessive prestressing suffix attaches to a stressed stem, the higher ranking MaxFoot prevents stress reassignment, so the output is faithful to the input (30b).

(30) a. *recessive prestressing*

	[*pa^{n}dza*]*ʔfa*$_{\leftarrow}$:	MaxFt	Alσ́]+	DepFt
	i. *pa^{n}dzaʔfa*		*!	
	ii. *ˈpa^{n}dzaʔfa*		*!	*
☞	iii. *paˈ^{n}dzaʔfa*			*
	iv. *pa^{n}dzaʔˈfa*		*!	*

hunt-PLS

b. *recessive prestressing*

	[ˈ*afa*]*ʔfa*$_{\leftarrow}$:	MaxFt	Alσ́]+	DepFt
	i. *afaʔfa*	*!	*	
☞	ii. *ˈafaʔfa*		*	
	iii. *aˈfaʔfa*	*!		*
	iv. *afaʔˈfa*	*!	*	*

speak-PLS

Fourth, dominant prestressing suffixes are associated with the *dominant prestressing* cophonology. Dominant prestressing suffixes always place stress on the last syllable of the stem, regardless of the input. This is captured with ranking AlignStem above MaxFoot, which ensures that stress is assigned to the last syllable of the stressless (31a) as well as underlyingly stressed (31b) stems.

(31)	a. [*pa^{n}dza*]*hama*$^{\emptyset}_{\leftarrow}$:	*dominant prestressing* Al$\acute{\sigma}$]+	MaxFt	DepFt
	i. *pa^{n}dzahama*	*!		
	ii. *ˈpa^{n}dzahama*	*!		*
☞	iii. *paˈ^{n}dzahama*			*
	iv. *pa^{n}dzaˈhama*	*!		*
	hunt-prhb			

	b. [ˈ*afa*]*hama*$^{\emptyset}_{\leftarrow}$:	*dominant prestressing* Al$\acute{\sigma}$]+	MaxFt	DepFt
	i. *afahama*	*!	*	
	ii. *ˈafahama*	*!		
☞	iii. *aˈfahama*		*	*
	iv. *afaˈhama*	*!	*	*
	speak-prhb			

Finally, after all the morphophonological operations apply, each verb undergoes one final phonological evaluation. The final evaluation is associated with the *prosodic word* cophonology; it prosodifies the verb, assigning stress to the penultimate syllable just in case the output of the last morphophonological operation is stressless. This is captured with ranking NonFinality (32), which penalizes word-final stress, and MaxFoot, which ensures faithfulness to input stress, above AlignStem.

(32) NonFinality, or: $*\acute{\sigma}]_{\omega}$
The final syllable of a word is not its prosodic head.

NonFinality eliminates candidates with word-final stress. AlignStem assigns a violation mark for each syllable intervening between the stressed syllable and the right edge of the stem. The last phonological evaluation (*prosodic word* cophonology) is not triggered by a morphological construction associated with a suffix, so the right edge of the stem is coextensive with the right edge of the word. Thus, the interaction of NonFinality and AlignStem yields penultimate stress given stressless input. MaxFoot ranks above AlignStem ensuring that penultimate stress is assigned only when input stress is absent.

If no suffixes attach to a verb, no morphophonological operations apply and the only phonological evaluation it undergoes is that associated with the *prosodic word* cophonology. If the verb is underlyingly stressless, penultimate stress is assigned (33a). If the verb is underlying stressed, that stress is preserved in the output (33b).[11]

(33)	a. [*atapa*]$_{\omega}$:	*prosodic word* MaxFt	$*\acute{\sigma}]_{\omega}$	Al$\acute{\sigma}$]+
	i. *ˈatapa*			**!
☞	ii. *aˈtapa*			*
	iii. *ataˈpa*		*!	
	breed			

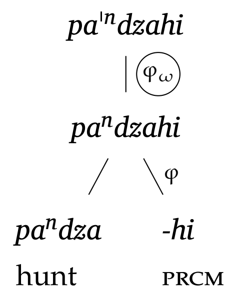
	b. [ˈ*ko^{n}dase*]$_{\omega}$:	*prosodic word* MaxFt	$*\acute{\sigma}]_{\omega}$	Al$\acute{\sigma}$]+
☞	i. *ˈko^{n}dase*			**
	ii. *koˈ^{n}dase*	*!		*
	iii. *ko^{n}daˈse*	*!	*!	
	tell			

11 In (33a-b), I do not consider stressless candidates (*atapa*, *ko^{n}dase*). I assume that these are eliminated by a constraint (not shown in the tableaux) which ranks high in the *prosodic word* cophonology and which requires that each lexical word corresponds to a prosodic word, such as Prince and Smolensky's (1993) LexicalWord≈ProsodicWord.

The *prosodic word* cophonology is also responsible for assigning penultimate stress to morphologically complex forms in situations when the output of the last morphophonological operation is stressless, be it because stress was never assigned (34) or because it was deleted by a dominant stressless suffix (35). If the output of the last morphophonological operation is stressed, the *prosodic word* evaluation has no effect (36). Below, the tableaux show the last cophonological evaluation, which is the one that is circled (◯) in the morphophonological constituency trees given to the right.

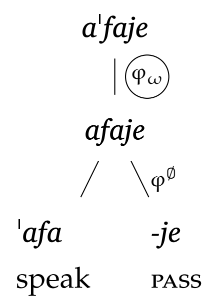
(34)	[*pa^{n}dzahi*]$_\omega$:	*prosodic word* MaxFt	*σ́]$_\omega$	Alσ́]+
i.	*ˈpa^{n}dzahi*			**!
☞ ii.	*paˈ^{n}dzahi*			*
iii.	*pa^{n}dzaˈhi*		*!	

hunt-PRCM



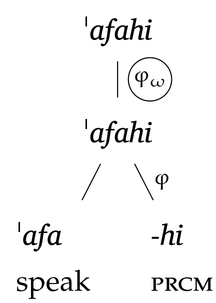
(35)	[*afaje*]$_\omega$:	*prosodic word* MaxFt	*σ́]$_\omega$	Alσ́]+
i.	*ˈafaje*			**!
☞ ii.	*aˈfaje*			*
iii.	*afaˈje*		*!	

speak-PASS



(36)	[*ˈafahi*]$_\omega$:	*prosodic word* MaxFt	*σ́]$_\omega$	Alσ́]+
☞ i.	*ˈafahi*			**
ii.	*aˈfahi*	*!		*
iii.	*afaˈhi*	*!	*!	

speak-PRCM



Complete rankings for the five cophonologies are given in Table 2. A constraint to the left of the dominates symbol (≫) is ranked above the constraints to its right. A comma (,) between two constraints indicates that their relative ranking cannot be determined. Sets of unranked constraints ranked relative to other constraints are given in curly braces { }.

During a phonological evaluation associated with a morphological construction, the stem is morphologically differentiated from the suffix. Above, the input stems were given in brackets [ ]. Thus, constraints such as AlignStem can refer to and access stem edges. Now, the output of one phonological evaluation may serve as input to another. However, the phonological evaluation outputs a phonological string, which does not retain morphological information. Thus, the next phonological evaluation is blind to the morphophonological constitution of the stem. In other words, the brackets in the input of one phonological evaluation (e. g. 26a) are absent from the input of the following one (e. g. 34). This architectural property of CT predicts that the phonological operations associated

COPHONOLOGY	RANKING
φ : *recessive stressless*	{ MaxFt, DepFt } ≫ { *Ft, Al$\acute{\sigma}$]+ }, *$\acute{\sigma}]_\omega$
$\varphi^{\emptyset}$: *dominant stressless*	{ *Ft, DepFt } ≫ { MaxFt, Al$\acute{\sigma}$]+ }, *$\acute{\sigma}]_\omega$
$\varphi_{\leftarrow}$: *recessive prestressing*	MaxFt ≫ Al$\acute{\sigma}$]+ ≫ { *Ft, DepFt }, *$\acute{\sigma}]_\omega$
$\varphi^{\emptyset}_{\leftarrow}$: *dominant prestressing*	Al$\acute{\sigma}$]+ ≫ { MaxFt, DepFt, *Ft }, *$\acute{\sigma}]_\omega$
φ_ω : *prosodic word*	{ MaxFt, *$\acute{\sigma}]_\omega$ } ≫ Al$\acute{\sigma}$]+ ≫ { DepFt, *Ft }

Table 2: Complete ranking for each of the five cophonologies.

with particular suffixes have the same effects on morphologically complex input stems as they have on simplex stems. This prediction is borne out; all verbs forms are captured with the proposed analysis regardless of their morphological complexity.

Underlyingly stressless verbs with several stressless suffixes (recessive or dominant) receive penultimate stress (37). Underlyingly stressed verbs with recessive stressless suffixes retain their word-initial stress (38a). Underlyingly stressed verbs with at least one dominant stressless suffix get their stress erased, followed by default penultimate stress assignment (38b-d). In the representations to follow, the first line gives the underlying form of the verb (*stem*$_1$ in Figure 3) followed by all the phonological evaluations that are to apply (i. e. the morphological constructions *sfx*$_1$ triggering φ_1, *sfx*$_2$ triggering φ_2, etc., followed by the post-morphological prosodification φ_ω). The second line gives the output of the first morphophonological operation (*stem*$_2$, which is the output of applying φ_1 to *stem*$_1$-*sfx*$_1$) followed by the remaining morphophonological operations. The penultimate line (here, the third one) gives the output of the last morphophonological operation. The last line (here, the fourth one) gives the surface form which results from applying the *prosodic word* cophonology (φ_ω) to the output of the last morphophonological operation.

(37)

	a.	b.	c.	d.
	p^{h}i -ɲa -hi φ_ω	*p^{h}i -je$^{\emptyset}$ -hi* φ_ω	*p^{h}i -ɲa -je$^{\emptyset}$* φ_ω	*afe -k^{h}o$^{\emptyset}$ -je$^{\emptyset}$* φ_ω
	phiɲa -hi φ_ω	*phije -hi* φ_ω	*phiɲa -je$^{\emptyset}$* φ_ω	*afek^{h}o -je$^{\emptyset}$* φ_ω
	phiɲahi φ_ω	*phijehi* φ_ω	*phiɲaɲe* φ_ω	*afek^{h}oje* φ_ω
	phiˈɲahi	*phiˈjehi*	*phiˈɲaɲe*	*afeˈk^{h}oje*
	sit -CAUS -PRCM	sit -PASS -PRCM	sit -CAUS -PASS	give -RCPR -PASS

(38)

	a.	b.	c.	d.
	ˈafa -ẽ -hi φ_ω	*ˈafa -je$^{\emptyset}$ -hi* φ_ω	*ˈafa -ẽ -je$^{\emptyset}$* φ_ω	*ˈafa -k^{h}o$^{\emptyset}$ -je$^{\emptyset}$* φ_ω
	ˈafaẽ -hi φ_ω	*afaje -hi* φ_ω	*ˈafaẽ -je$^{\emptyset}$* φ_ω	*afak^{h}o -je$^{\emptyset}$* φ_ω
	ˈafaẽhi φ_ω	*afajehi* φ_ω	*afaẽɲe* φ_ω	*afak^{h}oje* φ_ω
	ˈafaẽhi	*afaˈjehi*	*aˈfaẽɲe*	*afaˈk^{h}oje*
	speak -CAUS -PRCM	speak -PASS -PRCM	speak -CAUS -PASS	speak -RCPR -PASS

Underlyingly stressless verbs followed by stressless suffixes (recessive or dominant) and then recessive prestressing suffixes have stress on the syllable immediately preceding the first recessive prestressing suffix (39). Underlyingly stressed verbs followed by recessive suffixes (stressless or stressed) retain their initial stress (40).

(39) a.

p^hi	-hi	-ʔfa$_\leftarrow$	φ_ω
p^hihi		-ʔfa$_\leftarrow$	φ_ω
p^hiˈhiʔfa			φ_ω
p^hiˈhiʔfa			
sit	-PRCM	-PLS	

b.

p^hi	-ɲa	-k^ho$^\emptyset$	-ʔfa$_\leftarrow$	φ_ω
phiɲa		-k^ho$^\emptyset$	-ʔfa$_\leftarrow$	φ_ω
phiɲak^ho			-ʔfa$_\leftarrow$	φ_ω
phiɲaˈk^hoʔfa				φ_ω
phiɲaˈk^hoʔfa				
sit	-CAUS	-RCPR	-PLS	

c.

p^hi	-hi	-ʔfa$_\leftarrow$	-ja$_\leftarrow$	φ_ω
p^hihi		-ʔfa$_\leftarrow$	-ja$_\leftarrow$	φ_ω
p^hiˈhiʔfa			-ja$_\leftarrow$	φ_ω
p^hiˈhiʔfaja				φ_ω
p^hiˈhiʔfaja				
sit	-PRCM	-PLS	-IRR	

(40) a.

ˈafa	-hi	-ʔfa$_\leftarrow$	φ_ω
ˈafahi		-ʔfa$_\leftarrow$	φ_ω
ˈafahiʔfa			φ_ω
ˈafahiʔfa			
speak	-PRCM	-PLS	

b.

ˈafa	-ẽ	-hi	-ʔfa$_\leftarrow$	φ_ω
ˈafaẽ		-hi	-ʔfa$_\leftarrow$	φ_ω
ˈafaẽhi			-ʔfa$_\leftarrow$	φ_ω
ˈafaẽhiʔfa				φ_ω
ˈafaẽhiʔfa				
speak	-CAUS	-PRCM	-PLS	

c.

ˈafa	-hi	-ʔfa$_\leftarrow$	-ja$_\leftarrow$	φ_ω
ˈafahi		-ʔfa$_\leftarrow$	-ja$_\leftarrow$	φ_ω
ˈafahiʔfa			-ja$_\leftarrow$	φ_ω
ˈafahiʔfaja				φ_ω
ˈafahiʔfaja				
speak	-PRCM	-PLS	-IRR	

Stressed verbs followed by at least one dominant stressless suffix have their underlying stress removed. Then, the first recessive prestressing suffix gets a stressless form as its input and assigns stress to its last syllable (41).

(41) a.

ˈafa	-je$^\emptyset$	-ʔfa$_\leftarrow$	-ja$_\leftarrow$	φ_ω
afaje		-ʔfa$_\leftarrow$	-ja$_\leftarrow$	φ_ω
afaˈjeʔfa			-ja$_\leftarrow$	φ_ω
afaˈjeʔfaja				φ_ω
afaˈjeʔfaja				
speak	-PASS	-PLS	-IRR	

b.

ˈafa	-k^ho$^\emptyset$	-hi	-ʔfa$_\leftarrow$	φ_ω
afak^ho		-hi	-ʔfa$_\leftarrow$	φ_ω
afak^hohi			-ʔfa$_\leftarrow$	φ_ω
afak^hoˈhiʔfa				φ_ω
afak^hoˈhiʔfa				
speak	-RCPR	-PRCM	-PLS	

c.

ˈafa	-ẽ	-k^ho$^\emptyset$	-ʔfa$_\leftarrow$	φ_ω
ˈafaẽ		-k^ho$^\emptyset$	-ʔfa$_\leftarrow$	φ_ω
afaẽk^ho			-ʔfa$_\leftarrow$	φ_ω
afaẽˈk^hoʔfa				φ_ω
afaẽˈk^hoʔfa				
speak	-CAUS	-RCPR	-PLS	

d.

ˈafa	-k^ho$^\emptyset$	-je$^\emptyset$	-ʔfa$_\leftarrow$	φ_ω
afak^ho		-je$^\emptyset$	-ʔfa$_\leftarrow$	φ_ω
afak^hoje			-ʔfa$_\leftarrow$	φ_ω
afak^hoˈjeʔfa				φ_ω
afak^hoˈjeʔfa				
speak	-RCPR	-PASS	-PLS	

Dominant prestressing suffixes delete lexical verb stress (42a) as well as prior prestressing (42b). Recessive prestressing suffixes which come after a dominant prestressing suffix do not affect stress (42c). Thus, when a dominant prestressing suffix is present, stress falls always on the syllable immediately to its left.

(42) a.

ˈafa	-ẽ	-hama$^\emptyset_\leftarrow$	φ_ω
ˈafaẽ		-hama$^\emptyset_\leftarrow$	φ_ω
aˈfaẽhama			φ_ω
aˈfaẽhama			
speak	-CAUS	-PRHB	

b.

pa^{n}dza	-ʔfa$_\leftarrow$	-hama$^\emptyset_\leftarrow$	φ_ω
paˈ^{n}dzaʔfa		-hama$^\emptyset_\leftarrow$	φ_ω
pa^{n}dzaʔˈfahama			φ_ω
pa^{n}dzaʔˈfahama			
hunt	-PLS	-PRHB	

c.

ˈafa	-hama$^\emptyset_\leftarrow$	=te$_\leftarrow$	=ke$_\leftarrow$	φ_ω
aˈfahama		=te$_\leftarrow$	=ke$_\leftarrow$	φ_ω
aˈfahama^{n}de			=ke$_\leftarrow$	φ_ω
aˈfahama^{n}deke				φ_ω
aˈfahama^{n}deke				
speak	-PRHB	=RPRT	=?	

A'ingae verbal roots fall into two stress classes: stressless and stressed. Among morphologically complex forms with exactly two suffixes, the following three combinations are possible: (i) stress-

INPUT	OUTPUT	INPUT	OUTPUT
STRESSLESS ROOT		STRESSED ROOT	
root-sfx-sfx	*root-ˈsfx-sfx*	*ˈroot-sfx-sfx*	*ˈroot-sfx-sfx*
root-sfx-sfx$^{\emptyset}$	*root-ˈsfx-sfx*	*ˈroot-sfx-sfx*$^{\emptyset}$	*root-ˈsfx-sfx*
root-sfx$^{\emptyset}$*-sfx*	*root-ˈsfx-sfx*	*ˈroot-sfx*$^{\emptyset}$*-sfx*	*root-ˈsfx-sfx*
root-sfx$^{\emptyset}$*-sfx*$^{\emptyset}$	*root-ˈsfx-sfx*	*ˈroot-sfx*$^{\emptyset}$*-sfx*$^{\emptyset}$	*root-ˈsfx-sfx*
root-sfx-sfx$_{\leftarrow}$	*root-ˈsfx-sfx*	*ˈroot-sfx-sfx*$_{\leftarrow}$	*ˈroot-sfx-sfx*
root-sfx-sfx$^{\emptyset}_{\leftarrow}$	*root-ˈsfx-sfx*	*ˈroot-sfx-sfx*$^{\emptyset}_{\leftarrow}$	*root-ˈsfx-sfx*
root-sfx$^{\emptyset}$*-sfx*$_{\leftarrow}$	*root-ˈsfx-sfx*	*ˈroot-sfx*$^{\emptyset}$*-sfx*$_{\leftarrow}$	*root-ˈsfx-sfx*
root-sfx$^{\emptyset}$*-sfx*$^{\emptyset}_{\leftarrow}$	*root-ˈsfx-sfx*	*ˈroot-sfx*$^{\emptyset}$*-sfx*$^{\emptyset}_{\leftarrow}$	*root-ˈsfx-sfx*
root-sfx$_{\leftarrow}$*-sfx*$_{\leftarrow}$	*roˈot-sfx-sfx*	*ˈroot-sfx*$_{\leftarrow}$*-sfx*$_{\leftarrow}$	*ˈroot-sfx-sfx*
root-sfx$_{\leftarrow}$*-sfx*$^{\emptyset}_{\leftarrow}$	*root-ˈsfx-sfx*	*ˈroot-sfx*$_{\leftarrow}$*-sfx*$^{\emptyset}_{\leftarrow}$	*root-ˈsfx-sfx*
root-sfx$^{\emptyset}_{\leftarrow}$*-sfx*$_{\leftarrow}$	*roˈot-sfx-sfx*	*ˈroot-sfx*$^{\emptyset}_{\leftarrow}$*-sfx*$_{\leftarrow}$	*roˈot-sfx-sfx*
root-sfx$^{\emptyset}_{\leftarrow}$*-sfx*$^{\emptyset}_{\leftarrow}$	(*root-ˈsfx-sfx*)	*ˈroot-sfx*$^{\emptyset}_{\leftarrow}$*-sfx*$^{\emptyset}_{\leftarrow}$	(*root-ˈsfx-sfx*)

Table 3: Stress as predicted for 2 × 3 × 4 = 24 *root-sfx-sfx* combinations.

less followed by stressless, (ii) stressless followed by prestressing, (iii) prestressing followed by prestressing. A prestressing suffix may not be followed by a stressless one (see Figure 1).[12]. Either of the two suffixes can be recessive and dominant, yielding four different combinations. Thus, in total, there are 2 × 3 × 4 = 24 possible *root-sfx-sfx* combinations, schematized in Table 3. Since there are no licit combinations of two dominant prestressing suffixes, only 22 of them are attested. The account correctly predicts the outputs for all of them. The unverified predictions are given in parentheses

12 The fact that stressless suffixes precede prestressing suffixes suggests that stressless and prestressing suffixes belong to two ordered morphophonological levels. Cophonology Theory does not enforce level ordering; for cross-linguistic arguments against level ordering, see Orgun (1996, p. 150). However, level ordering may be stipulated in CT when necessary. Specifically, level ordering can be modeled with the LVL (LEVEL) attribute (Orgun, 1996, pp. 107–113). The LEVEL attribute is specified for each functional morpheme; its value is passed up from the functional daughter node (here, *suffix*) to the mother node, as demonstrated in the two figures below. This makes the value of the LEVEL attribute accessible to subsequent constructions. Suffixes that belong to the *stressless* level require that the value of their host's (their left daughter's) LEVEL attribute also be *stressless*. This is represented on the left. Suffixes that belong to *prestressing* level, on the other hand, do not impose any restriction on the level of their host. This can be seen on the right.

$$\begin{bmatrix} \textsc{phon} & \varphi(\boxed{1}, \boxed{2}) \\ \textsc{lvl} & \boxed{3}\textit{stressless} \end{bmatrix} \qquad \begin{bmatrix} \textsc{phon} & \varphi(\boxed{1}, \boxed{2}) \\ \textsc{lvl} & \boxed{3}\textit{prestressing} \end{bmatrix}$$

$$\begin{bmatrix} \textsc{phon} & \boxed{1} \\ \textsc{lvl} & \textit{stressless} \end{bmatrix} \begin{bmatrix} \textit{suffix} & \\ \textsc{phon} & \boxed{2} \\ \textsc{lvl} & \boxed{3}\textit{stressless} \end{bmatrix} \qquad \begin{bmatrix} \textsc{phon} & \boxed{1} \end{bmatrix} \begin{bmatrix} \textit{suffix} & \\ \textsc{phon} & \boxed{2} \\ \textsc{lvl} & \boxed{3}\textit{prestressing} \end{bmatrix}$$

This models the fact that *stressless* suffixes do not attach past a *prestressing* suffix, but *prestressing* suffixes can attach to both *stressless* and *prestressing* forms. In other words, *stressless* suffixes all linearly precede *prestressing* suffixes

( ). Stress on the first syllable of a root is represented as ˈ*root*; stress on its final syllable—as *ro*ˈ*ot*. Stress on a suffix is represented as -ˈ*sfx*.

5 ALTERNATIVE FRAMEWORKS

Cophonology Theory (Anttila, 1997; Orgun, 1996; others) allows for associating different suffixes with different phonological rankings. Thus, CT uses non-representational means to capture morpheme-specific phonology. In this section, I sketch the outlines of two alternative representational analyses couched in Stratal Optimality Theory (Section 5.1) and Gradient Symbolic Representations (Section 5.2). I also consider the representational tools of negative floating stress (Section 5.3) and empty prosodic nodes (Section 5.4).

I demonstrate that the representational alternatives struggle with accounting for the full range of A'ingae data. In particular, the dominant stressless suffixes turn out to be the most problematic. The dominant stressless suffixes delete preexisting stress. Thus, their exponence is partially process-like, making it difficult to capture using purely representational means. Overall, the alternative proposals make incorrect predictions or require additional unappealing stipulations.

5.1 *Stratal Optimality Theory*

Classical Optimality Theory (McCarthy and Prince, 1993a,b; Prince and Smolensky, 1993; others) models the correspondence between a phonological input and output without recourse to phonological forms in between. Stratal Optimality Theory (Bermúdez-Otero, 1999, 2012; Kiparsky, 2000, 2008; others) relaxes classical OT's ban on intermediate representations by allowing multiple morphophonological strata. Each stratum may be associated with an arbitrarily different ranking of constraints. However, different morphemes within one stratum may not alter the constraint ranking. Thus, differences in phonological operations triggered by different morphemes within one stratum must be captured with various representational means.

In this section, I outline a Stratal OT analysis of the A'ingae data. The analysis captures most of the observed patterns, including recessive stressless suffixes, recessive prestressing suffixes, dominant prestressing suffixes, and most configurations involving dominant stressless suffixes. However, it fails to capture forms where a dominant stressless suffix is followed by a recessive stressless suffix and recessive prestressing suffixes. Thus, the Stratal OT analysis will ultimately be rejected. (In Section 5.3, I consider another representational analysis, which uses floating stress to supply the missing representational mechanism by which dominant stressless suffixes delete stress.)

In the Stratal OT analysis, I capitalize on the fact that stressless suffixes (both recessive and dominant) precede prestressing suffixes (likewise, both recessive and dominant) and propose that they belong to two different strata: stressless—to stratum 1 and prestressing—to stratum 2. First, I focus on recessive suffixes within each stratum, which I analyze as listed without any metrical specification. I will later extend the analysis to dominant suffixes, which I analyze metrically.

The two strata are associated with two respective constraint rankings. In stratum 1, final stress is assigned unless the verbal root is stressed. This is captured by ranking MAXFOOT (24), which ensures the preservation of lexical stress, above ALIGNWORD (43), which favors stress aligned with the right edge of the word.

(43) ALIGN(WORD, R, $\acute{\sigma}$, R), or: AL$\acute{\sigma}]_\omega$
The right edge of the word is aligned with the right edge of a stressed syllable.

In stratum 2, previously assigned stress is retained, except that word-final stress is moved to the penultimate syllable. The ban on word-final stress is captured by ranking NONFINALITY (32) above MAXFOOT. The retraction of final stress onto the penultimate syllable is modeled by ranking ALIGN WORD below MAXFOOT. The constraint rankings for the two strata are given in Table 4.

STRATUM	RANKING
stratum 1	MAXFT ≫ AL$\acute{\sigma}]_\omega$
stratum 2	*$\acute{\sigma}]_\omega$ ≫ MAXFT ≫ AL$\acute{\sigma}]_\omega$

Table 4: Constraint rankings in the Stratal OT analysis.

The analysis captures the penultimate stress assigned to bare stressless roots. In stratum 1, stress is assigned to the last syllable of the root (44a). In stratum 2, that stress is deleted to avoid a violation of NONFINALITY. In order to minimize violations of ALIGNWORD, stress is then assigned to the penultimate syllable (44b).[13]

(44) a. stratum 1

atapa:	MAXFT	AL$\acute{\sigma}]_\omega$
i. *ˈatapa*		*!*
ii. *aˈtapa*		*!
☞ iii. *ataˈpa*		

breed

b. stratum 2

ataˈpa:	*$\acute{\sigma}]_\omega$	MAXFT	AL$\acute{\sigma}]_\omega$
i. *ˈatapa*		*	**!
☞ ii. *aˈtapa*		*	*
iii. *ataˈpa*	*!		

breed

The analysis also captures the preservation of lexically specified stress. In both strata, the high-ranked MAXFOOT ensures that input stress is retained in the output (45a-b).

(45) a. stratum 1

ˈko^{n}dase:	MAXFT	AL$\acute{\sigma}]_\omega$
☞ i. *ˈko^{n}dase*		**
ii. *koˈ^{n}dase*	*!	*
iii. *ko^{n}daˈse*	*!	

tell

b. stratum 2

ˈko^{n}dase:	*$\acute{\sigma}]_\omega$	MAXFT	AL$\acute{\sigma}]_\omega$
☞ i. *ˈko^{n}dase*			**
ii. *koˈ^{n}dase*		*!	*
iii. *ko^{n}daˈse*	*!	*	

tell

The mechanism seen in (44) is also responsible for the assignment of penultimate stress to underlyingly stressless verbs with stratum 1 (stressless in CT) suffixes (46).

13 In the tableaux to follow, I do not consider stressless candidates, such as *atapa* or *ko^{n}dase*. I assume that these are eliminated by the high-ranking LEXICALWORD≈PROSODICWORD.

(46) a. stratum 1

pa^{n}dza-hi :		MaxFt	Al$\acute{\sigma}$]$_\omega$
	i. ˈpa^{n}dzahi		*!*
	ii. paˈ^{n}dzahi		*!
☞	iii. pa^{n}dzaˈhi		

hunt-PRCM

b. stratum 2

pa^{n}dzaˈhi :		*$\acute{\sigma}$]$_\omega$	MaxFt	Al$\acute{\sigma}$]$_\omega$
	i. ˈpa^{n}dzahi		*	**!
☞	ii. paˈ^{n}dzahi		*	*
	iii. pa^{n}dzaˈhi	*!		

hunt-PRCM

If stratum 2 (prestressing in CT) suffixes are present on a stressless verb, stress falls on the last syllable of the last stratum 1 suffix (or the last syllable of the verbal root if there are no stratum 1 suffixes). In Stratal OT, this is modeled by assigning final stress to the final syllable in stratum 1 (47a). The high-ranking MaxFoot retains this stress in stratum 2 (47b).[14]

(47) a. stratum 1

pa^{n}dza-hi :		MaxFt	Al$\acute{\sigma}$]$_\omega$
	i. ˈpa^{n}dzahi		*!*
	ii. paˈ^{n}dzahi		*!
☞	iii. pa^{n}dzaˈhi		

hunt-PRCM

b. stratum 2

pa^{n}dzaˈhi-ʔfa-ja :		*$\acute{\sigma}$]$_\omega$	MaxFt	Al$\acute{\sigma}$]$_\omega$
	i. paˈ^{n}dzahiʔfaja		*!	***
☞	ii. pa^{n}dzaˈhiʔfaja			**
	iii. pa^{n}dzahiʔˈfaja		*!	*

hunt-PRCM-PLS-IRR

Now, I turn to dominant suffixes. First, consider dominant prestressing suffixes. Dominant prestressing suffixes come after stressless suffixes. Therefore, they belong to stratum 2. However, unlike recessive prestressing suffixes, they always place stress on the syllable which immediately precedes them, regardless of other suffixes present in the derivation. In Stratal OT, this property of dominant prestressing suffixes has to be captured representationally. I propose that dominant prestressing suffixes come with metrical structure. Specifically, they require that the right edge of a trochaic foot coincide with the right edge of their first syllable. Thus, the underlying form of the imperative 2 suffix is *-k^{h}a*) IMP2 and the underlying form of the prohibitive suffix is *-ha*)*ma* PRHB. The rest of the trochaic foot is supplied in the output by footing the first syllable of the dominant prestressing suffix and the syllable before it together. Thus, prestressing obtains: ...($\acute{\sigma}$*k^{h}a*), ...($\acute{\sigma}$*ha*)*ma*.

When a dominant prestressing suffix attaches to a stressed verb (48) or after another stratum 2 suffix (49), there are conflicting metrical specifications. Since there can only be one primary stress in a word, a violation of MaxFoot is inevitable. Thanks to AlignWord, the metrical specification which results in stress closest to the right edge wins. This correctly captures stress assignment with dominant prestressing suffixes. Below, foot structure is shown explicitly for greater clarity.

14 Unlike Bermúdez-Otero (2012), I assume non-cyclic application for both strata.

(48)

		stratum 1	
a.	('*afa*) :	MaxFt	Al$\acute{\sigma}]_\omega$
☞ i.	('*afa*)		*
ii.	*a*('*fa*)	*!	

speak

		stratum 2		
b.	('*afa*)-*ha*)*ma* :	*$\acute{\sigma}]_\omega$	MaxFt	Al$\acute{\sigma}]_\omega$
i.	('*afa*)*hama*		*	***!
☞ ii.	*a*('*faha*)*ma*		*	**
iii.	*afa*('*hama*)		**!	*

speak-PRHB

(49)

		stratum 1	
a.	*pa^{n}dza* :	MaxFt	Al$\acute{\sigma}]_\omega$
i.	('*pa^{n}dza*)		*!
☞ ii.	*pa*('^{n}*dza*)		

hunt

		stratum 2		
b.	*pa*('^{n}*dza*)-*ʔfa*-*ha*)*ma* :	*$\acute{\sigma}]_\omega$	MaxFt	Al$\acute{\sigma}]_\omega$
i.	*pa*('^{n}*dzaʔ*)*fahama*		*	***!
☞ ii.	*pa^{n}dzaʔ*('*faha*)*ma*		*	**
iii.	*pa^{n}dzaʔfa*('*hama*)		**!	*

hunt-PLS-PRHB

Finally, consider dominant stressless suffixes. In Cophonology Theory, they were analyzed as triggering the operation of stress deletion without assigning stress of their own. Stress deletion is difficult to capture by representational means—it does not involve listing metrical structure, but rather a demand that metrical structure be erased. Thus, attempting to capture the dominant stressless suffixes with purely representational means requires reanalyzing the stress deletion associated with them as something fundamentally different.

Observe that in many forms with dominant stressless suffixes, such as the passive *-je*$^{\emptyset}$ PASS, stress falls on the dominant stressless suffix (50a) or moves towards it (50b).

(50) a. / '*afa* -*je*$^{\emptyset}$ -*ʔfa*$_{\leftarrow}$ /
[*afa* -'*je* -*ʔfa*]
speak -PASS -PLS

b. / '*afa* -*je*$^{\emptyset}$ /
[*a*'*fa* -*je*]
speak -PASS

One might try to leverage this fact and propose that what I analyzed as stress-deleting suffixes are actually self-stressed suffixes. In this reanalysis, the underlying form of suffixes such as the passive is -'*je* PASS and the reciprocal—-'*k^{h}o* RCPR. The Cophonology Theory and the Stratal OT analyses of the four suffixes classes are compared in Table 5, with one suffix representing each class.

SUFFIX	CT	STRATAL OT
-*hi* PRCM	-*hi* (*recessive stressless*)	-*hi* (*stratum 1*)
-*k^{h}o* RCPR	-*k^{h}o*$^{\emptyset}$ (*dominant stressless*)	-'*k^{h}o* (*stratum 1*)
-*ʔfa* PLS	-*ʔfa*$_{\leftarrow}$ (*recessive prestressing*)	-*ʔfa* (*stratum 2*)
-*hama* PRHB	-*hama*$^{\emptyset}_{\leftarrow}$ (*dominant prestressing*)	-*ha*)*ma* (*stratum 2*)

Table 5: Cophonology Theory and Stratal OT analyses, compared.

If there are self-stressed suffixes, there may be multiple stresses in the input. ALIGNWORD favors the rightmost of them. The higher-ranking NONFINALITY ensures that a word-final self-stressed suffix does not result in word-final stress. This reanalysis correctly accounts for forms with stratum 1 suffixes only, including forms with one self-stressed suffix (51), a stressless suffix and a self-stressed one (52), a self-stressed suffix and a stressless one (53), and two self-stressed suffixes (54).

(51) a. stratum 1

	ˈafa-ˈje :	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafaje*	*	*!*
	ii. *aˈfaje*	**!	*
☞	iii. *afaˈje*	*	

speak-PASS

b. stratum 2

	afaˈje :	$*\acute{\sigma}]_\omega$	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafaje*		*	**!
☞	ii. *aˈfaje*		*	*
	iii. *afaˈje*	*!		

speak-PASS

(52) a. stratum 1

	ˈafa-ẽ-ˈje :	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafaẽɲe*	*	*!*
	ii. *aˈfaẽɲe*	**!	*
☞	iii. *afaẽˈɲe*	*	

speak-CAUS-PASS

b. stratum 2

	afaẽˈɲe :	$*\acute{\sigma}]_\omega$	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafaẽɲe*		*	**!
☞	ii. *aˈfaẽɲe*		*	*
	iii. *afaẽˈɲe*	*!		

speak-CAUS-PASS

(53) a. stratum 1

	ˈafa-ˈje-hi :	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafajehi*	*	**!*
	ii. *aˈfajehi*	**!	**
☞	iii. *afaˈjehi*	*	*
	iv. *afajeˈhi*	**!	

speak-PASS-PRCM

b. stratum 2

	afaˈjehi :	$*\acute{\sigma}]_\omega$	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafajehi*		*!	***
	ii. *aˈfajehi*		*!	**
☞	iii. *afaˈjehi*			*
	iv. *afajeˈhi*	*!	*	

speak-PASS-PRCM

(54) a. stratum 1

	ˈafa-ˈk^{h}o-ˈje :	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafak^{h}oje*	**	*!**
	ii. *aˈfak^{h}oje*	***!	**
	iii. *afaˈk^{h}oje*	**	*!
☞	iv. *afak^{h}oˈje*	**	

speak-RCPR-PASS

b. stratum 2

	afak^{h}oˈje :	$*\acute{\sigma}]_\omega$	MAXFT	AL$\acute{\sigma}]_\omega$
	i. *ˈafak^{h}oje*		*	**!*
	ii. *aˈfak^{h}oje*		*	**!
☞	iii. *afaˈk^{h}oje*		*	*
	iv. *afak^{h}oˈje*	*!		

speak-RCPR-PASS

The Stratal OT reanalysis correctly accounts for forms with stratum 1 suffixes followed by stratum 2 suffixes, when there is one self-stressed stratum 1 suffix (55), one stressless stratum 1 suffix followed by a self-stressed one (56), and two self-stressed stratum 1 suffixes (57).

(55)

stratum 1		
a. *ˈafa-ˈje*:	MaxFt	Alσ́]$_\omega$
i. *ˈafaje*	*	*!*
ii. *aˈfaje*	**!	*
☞ iii. *afaˈje*	*	

speak-PASS

stratum 2			
b. *afaˈje-ʔfa*:	*σ́]$_\omega$	MaxFt	Alσ́]$_\omega$
i. *aˈfajeʔfa*		*!	**
☞ ii. *afaˈjeʔfa*			*
iii. *afajeʔˈfa*	*!	*	

speak-PASS-PLS

(56)

stratum 1		
a. *ˈafa-ẽ-ˈkʰo*:	MaxFt	Alσ́]$_\omega$
i. *ˈafaẽkʰo*	*	*!*
ii. *aˈfaẽkʰo*	**!	*
☞ iii. *afaẽˈkʰo*	*	

speak-CAUS-RCPR

stratum 2			
b. *afaẽˈkʰo-ʔfa*:	*σ́]$_\omega$	MaxFt	Alσ́]$_\omega$
i. *aˈfaẽkʰoʔfa*			**
☞ ii. *afaẽˈkʰoʔfa*		*!	*
iii. *afaẽkʰoʔˈfa*	*!		

speak-CAUS-RCPR-PASS

(57)

stratum 1		
a. *ˈafa-ˈkʰo-ˈje*:	MaxFt	Alσ́]$_\omega$
i. *ˈafakʰoje*	**	*!**
ii. *aˈfakʰoje*	***!	**
iii. *afaˈkʰoje*	**	*!
☞ iv. *afakʰoˈje*	**	

speak-RCPR-PASS

stratum 2			
b. *afakʰoˈje-ʔfa*:	*σ́]$_\omega$	MaxFt	Alσ́]$_\omega$
i. *aˈfakʰojeʔfa*		*!	***
ii. *afaˈkʰojeʔfa*		*!	**
☞ iii. *afakʰoˈjeʔfa*			*
iv. *afakʰojeʔˈfa*	*!	*	

speak-RCPR-PASS-PLS

However, the analysis makes an incorrect prediction when a self-stressed suffix is followed by a stressless suffix, and by a stratum 2 suffix (58). This is in contrast with the CT analysis which correctly predicts the output form (41b).

(58)

stratum 1		
a. *ˈafa-ˈkʰo-hi*:	MaxFt	Alσ́]$_\omega$
i. *ˈafakʰohi*	*	**!*
ii. *aˈfakʰohi*	**!	**
☞ iii. *afaˈkʰohi*	*	*
iv. *afakʰoˈhi*	**!	

speak-RCPR-PRCM

stratum 2			
b. *afaˈkʰohi-ʔfa*:	*σ́]$_\omega$	MaxFt	Alσ́]$_\omega$
i. *aˈfakʰohiʔfa*		*!	***
💣 ii. *afaˈkʰohiʔfa*			**
☹ iii. *afakʰoˈhiʔfa*		*!	*
iv. *afakʰohiʔˈfa*	*!	*!	

speak-RCPR-PRCM-PLS

In (58), the reciprocal -ˈ*kʰo* RCPR incorrectly attracts stress instead of deleting it. This error of the Stratal OT analysis reveals that the dominant stressless suffixes are not self-stressed, but truly stress-deleting. Using the set of representational mechanisms considered here, it is not clear how deletion of metrical structure can be modeled as metrical structure. Thus, although successful in accounting for most of the forms, the Stratal OT analysis as sketched in this section has to be ultimately rejected.

5.2 *Gradient Symbolic Representations*

Dominant stressless suffixes delete preexisting stress and do not assign stress of their own. In the previous section, I entertained a Stratal OT reanalysis of dominant stressless suffixes as self-stressed, which I ultimately rejected as empirically inadequate. In this section, I consider whether further representational tools can capture the stress deletion triggered by dominant stressless suffixes. First, I consider the framework of Gradient Symbolic Representations (henceforth GSR), which allows for varying the degree to which a segment (or stress) is present in the input. I show that standard GSR representations are insufficient to capture A'ingae stress deletion. I then consider an adaptation of Kushnir's (2019) GSR-based account of accentual dominance in Lithuanian, which involves negatively activated floating material. I show that the adaptation correctly captures A'ingae dominance, but at the cost of remodeling metrical structure as autosegments on a metrical tier. This, I argue, undermines central predictions of metrical theory. Thus, I conclude that the adaptation of Kushnir's (2019) must also be rejected.

Phonological representations are commonly assumed to be discrete: An element may be present or absent from the input; there is no in-between. The framework of Gradient Symbolic Representations (Rosen, 2016; Smolensky and Goldrick, 2016; Zimmermann, 2018a,b) abandons the discreteness assumption and allows for partial activation of phonological elements. This is to say, the degree to which a segment (or metrical structure) is present in the input may have any value of between 0.0, which signifies a complete absence of the phonological material, and 1.0, which signifies its full activation. Thus, GSR is apt at modeling scalar behavior in phonology.

I will now consider a GSR analysis of the A'ingae data. I will show that the analysis captures most of the observed patterns, including recessive stressless suffixes, recessive prestressing suffixes, and dominant prestressing suffixes. However, representations used in Rosen (2016), Smolensky and Goldrick (2016), and Zimmermann (2018a,b) are still insufficient to capture the stress deletion triggered by dominant stressless suffixes.

Recall the following facts: Recessive stressless suffixes do not assign stress (3-6). Recessive prestressing suffixes assign stress only to stressless inputs (11-12). When there are several recessive prestressing suffixes, stress is assigned by the first of them (13-14). Dominant prestressing suffixes assign stress regardless of anything else (17-20). Thus, dominant prestressing suffixes win over any other stress. Stressed roots win over recessive prestressing suffixes, but lose to dominant prestressing suffixes. Recessive prestressing suffixes win over stressless roots and recessive stressless suffixes. Earlier recessive prestressing suffixes win over later prestressing suffixes. This preference hierarchy is summarized in Figure 4.

1. dominant prestressing suffixes ⟫
2. stressed roots ⟫
3. recessive prestressing suffixes
    a. earlier recessive prestressing suffixes ⟫
    b. later recessive prestressing suffixes ⟫
4. stressless roots, recessive stressless suffixes

Figure 4: Preference hierarchy for stress.

GSR translates the above preference hierarchy into a model where the elements from each rung of the hierarchy are associated in descending order with metrical structure of decreasing activation. Stressed roots come with lexically listed metrical feet. Prestressing suffixes (both recessive and dominant) come with the right edge of a trochaic foot aligned with the right edge of their first syllable. Dominant prestressing suffixes win over any other stress. Thus, their metrical structure is fully activated (1.0). The metrical structure listed with stressed roots has a lower degree of activation (0.9). After stressed roots come recessive prestressing suffixes, with even lower degrees of activation of metrical structure. Since earlier recessive prestressing suffixes win over later recessive prestressing suffixes, I assume that the further down a recessive prestressing suffix is in the morphological template (Figure 1), the lower its degree of activation (0.8, 0.7, 0.6, ...). Finally, stressless roots and recessive stressless suffixes, which show no preference for stress, have no metrical structure whatsoever. (Stressless roots and recessive stressless suffixes are stressed only when they are a target of a prestressing suffix or the default penultimate stress assignment.) The Cophonology Theory and the Gradient Symbolic Representations analyses are compared in Table 6.

MORPHEME	CT	GSR
-hama PRHB	*-hama*$_{\leftarrow}^{\emptyset}$ (*dominant prestressing*)	*-ja*$)_{1.0}$*ma*
ˈafa 'speak'	(*ˈafa*) ***(stressed root)***	(*ˈafa*)$_{0.9}$
-ʔfa PLS	*-ʔfa*$_{\leftarrow}$ (*recessive prestressing*)	*-ʔfa*$)_{0.8}$
-ja IRR	*-ja*$_{\leftarrow}$ (*recessive prestressing*)	*-ja*$)_{0.7}$
-^{m}bi NEG	*-^{m}bi*$_{\leftarrow}$ (*recessive prestressing*)	*-^{m}bi*$)_{0.6}$
pa^{n}dza 'hunt'	*pa^{n}dza* ***(stressless root)***	*pa^{n}dza*
-hi PRCM	*-hi* (*recessive stressless*)	*-hi*

Table 6: Cophonology Theory and Gradient Symbolic Representations analyses, compared.

Although both the root and the suffixes may be associated with (partially activated) metrical structure in the input, only one primary stress may emerge in the output. This competition is modeled in OT with gradient constraint violations. Specifically, MAXFOOT (24) is violated by any metrical structure present in the input but absent from the output to the extent that that metrical structure is activated in the input. When no metrical structure is present in the input, penultimate stress is assigned. Penultimate stress is modeled as an interaction of NONFINALITY (32) and ALIGN WORD (43).

Each constraint is associated with a weight w. In the model at hand, MAXFOOT and NONFINALITY each have a weight of 100. ALIGNWORD has a weight of 1. The sum of the products of each constraint's weight w and its degree of violation v makes up the HARMONY score $\mathrm{H} = \sum wv$. The candidate with the lowest HARMONY score wins.

The GSR account correctly predicts that in the absence of stress in the input, stress is assigned to the penultimate syllable (59).

(59)	*paⁿdza-hi* :	MaxFt 100	$*\acute{\sigma}]_\omega$ 100	AL$\acute{\sigma}]_\omega$ 1	H
	i. (ˈ*paⁿdza*)*hi*	0.0	0.0	2.0	2
☞	ii. *pa*(ˈⁿ*dzahi*)	0.0	0.0	1.0	1
	iii. *paⁿdza*(ˈ*hi*)	0.0	1.0	0.0	100

hunt-PRCM

The account also correctly predicts that root stress is preserved when only recessive suffixes (either stressless or prestressing) are present (60). In the tableau below, there are two morphemes in the input which come with metrical structure: (ˈ*afa*) 'speak' with 0.9 activation, and -*ʔfa*) PLS with 0.8 activation. The winning candidate faithfully preserves the former metrical structure, but not the latter; thus, it incurs 0.8 MaxFoot violations. Candidates (iii-iv) faithfully preserve the metrical structure listed with -*ʔfa*) PLS at the cost of discarding that of (ˈ*afa*) 'speak;' they incur 0.9 MaxFoot violations each. Candidate (ii) is faithful to neither; it incurs 0.9 + 0.8 = 1.7 MaxFoot violations.

(60)	(ˈ*afa*)$_{0.9}$-*hi*-*ʔfa*)$_{0.8}$:	MaxFt 100	$*\acute{\sigma}]_\omega$ 100	AL$\acute{\sigma}]_\omega$ 1	H
☞	i. (ˈ*afa*)*hiʔfa*	0.8	0.0	3.0	83
	ii. *a*(ˈ*fahiʔ*)*fa*	1.7	0.0	2.0	172
	iii. *afa*(ˈ*hiʔfa*)	0.9	0.0	1.0	91
	iv. *afahiʔ*(ˈ*fa*)	0.9	1.0	0.0	190

speak-PRCM-PLS

When the root is stressless and only recessive suffixes (either stressless or prestressing) are present, the first recessive prestressing suffix assigns stress. The GSR account captures these data as well (61).

(61)	*paⁿdza-hi-ʔfa*)$_{0.8}$-*ja*)$_{0.7}$:	MaxFt 100	$*\acute{\sigma}]_\omega$ 100	AL$\acute{\sigma}]_\omega$ 1	H
	i. (ˈ*paⁿdza*)*hiʔfaja*	1.5	0.0	4.0	154
	ii. *pa*(ˈⁿ*dzahiʔ*)*faja*	1.5	0.0	3.0	153
☞	iii. *paⁿdza*(ˈ*hiʔfa*)*ja*	0.7	0.0	2.0	72
	iv. *paⁿdzahiʔ*(ˈ*faja*)	0.8	0.0	1.0	81
	v. *paⁿdzahiʔfa*(ˈ*ja*)	0.8	1.0	0.0	180

hunt-PRCM-PLS-IRR

Finally, a dominant prestressing suffix always assigns stress, winning over root stress as well as recessive prestressing suffixes (62).

(62)	(ˈ*afa*)$_{0.9}$-*ʔfa*)$_{0.8}$-*ja*)$_{1.0}$*ma* :	MaxFt 100	*σ́]$_\omega$ 100	Alσ́]$_\omega$ 1	H
	i. (ˈ*afaʔ*)*fahama*	1.8	0.0	4.0	184
	ii. *a*(ˈ*faʔfa*)*hama*	1.9	0.0	3.0	193
☞	iii. *afaʔ*(ˈ*faha*)*ma*	1.7	0.0	2.0	172
	iv. *afaʔfa*(ˈ*hama*)	2.7	0.0	1.0	271
	v. *afaʔfaha*(ˈ*ma*)	2.7	1.0	0.0	370

speak-PLS-PRHB

Thus, the GSR analysis accounts for forms containing stressless roots, stressed roots, recessive stressless suffixes, recessive prestressing suffixes, and dominant prestressing suffixes. However, the Gradient Symbolic Representations used so far do not capture the stress deletion triggered by dominant stressless suffixes. Dominant stressless suffixes do not have any preference for stress assignment. Thus, they are located at the lowest rung of the preference hierarchy, along with stressless roots and recessive stressless suffixes (Figure 4). However, they also have the property of deleting preexisting stress, which is not captured by ranking them with respect to other suffixes or assigning them metrical structure of some intermediate degree of activation.

Given that positive stress preference is modeled by metrical structure of positive activation (more than 0.0 up to 1.0), one might consider modeling stress deletion with metrical structure of negative activation, say −1.0. In this proposal, dominant stressless morphemes are associated with "negative stress," modeled as alignment with a negatively activated metrical foot, e. g. -($_{-1.0}$*k^{h}o* RCPR. This proposal still fails to correctly predict the winner (63).

(63)	(ˈ*afa*)$_{0.9}$-($_{-1.0}$*k^{h}o-hi-ʔfa*)$_{0.8}$:	MaxFt 100	*σ́]$_\omega$ 100	Alσ́]$_\omega$ 1	H
💣	i. (ˈ*afa*)*k^{h}ohiʔfa*	−0.2	0.0	4.0	−16
	ii. *a*(ˈ*fak^{h}o*)*hiʔfa*	0.7	0.0	3.0	73
	iii. *afa*(ˈ*k^{h}ohiʔ*)*fa*	1.7	0.0	2.0	172
☹	iv. *afak^{h}o*(ˈ*hiʔfa*)	−0.1	0.0	1.0	−9
	v. *afak^{h}ohiʔ*(ˈ*fa*)	−0.1	1.0	0.0	90

speak-RCPR-PRCM-PLS

Negatively activated metrical structure listed with a suffix does not interact with the preexisting metrical structure of the root. Thus, it does not delete preceding stress; it only additionally rewards lack of stress on the suffix in question. Thus, I ultimately reject the GSR account as incapable of capturing the stress deletion triggered by dominant stressless suffixes.

5.3 *Floating metrical stress*

In the previous section, I argued that Gradient Symbolic Representations used in Rosen (2016), Smolensky and Goldrick (2016), and Zimmermann (2018a,b) are insufficient to account for A'ingae stress deletion triggered by dominant stressless suffixes. The key example was (63), where negatively activated metrical structure failed to delete stress. However, if that negatively activated metrical structure were able to somehow target preceding stress, the GSR proposal would be capable of modeling stress deletion.

An account that allows negatively activated accent to target the accent of the base is proposed by Kushnir (2019) for Lithuanian. Lithuanian is similar to A'ingae in that it has a complex system of accentual dominance, with strong and weak suffixes as well as dominance phenomena similar to the one discussed above. However, unlike Lithuanian, A'ingae has metrical stress, not pitch accent: A'ingae stress is culminative and obligatory at the level of the phonological word, it correlates with increased duration and intensity (Repetti-Ludlow et al., 2019), and it is accompanied by alternating secondary stress (23).

In the rest of this section, I give an overview of Kushnir's (2019) treatment of dominance, which in Lithuanian involves a weakening of the root's pitch accent. I propose an adaption of the account for A'ingae, but observe that the adaptation requires an autosegmental analysis of stress. I argue that an autosegmental analysis of stress is undesirable since autosegments and stress have very different, sometimes opposite, typological properties. The autosegmental analysis of stress would void the successful predictions of metrical theory and simultaneously predict many unattested stress patterns and operations. Thus, I conclude that the solution advanced by Kushnir (2019) should not be extended to the metrical stress of A'ingae.

Lithuanian is a pitch accent language, with one high tone (H) per phonological word. The tone-bearing unit (TBU) is the mora. Thus, in a bimoraic syllable, either mora can be linked to the high tone. This derives the difference between falling pitch contour (known traditionally as "acute accent") (64a) and raising pitch contour ("circumflex accent") (64b) in bimoraic syllables.

(64)

a. H | *jáu.nas*	b. H | *naú.jas*	Lithuanian (Kushnir, 2019, p. 34)

Some Lithuanian morphemes are dominant—they weaken the pitch accent of the stem they attach to. Strong accent is represented with the double acute (˝). Weak accent is represented with the acute (´). Kushnir (2019) models this by proposing that dominant morphemes come with an unassociated negatively activated tonal autosegment, i. e. a negative floating tone. Floating autosegments are given in dashed boxes (⬚). Kushnir (2019) proposes that the floating tone may coalesce with the root tone. This is to say, two tones may become one. Coalescence is represented with a squiggly left-pointing arrow (⬳). The floating tone has negative activation. Thus, upon coalescence, it diminishes the activity of the root tone (65).

(65)

$H_{1.0}$ ⬳ $\boxed{H_{-0.5}}$				$H_{0.5}$	
|				|	
/ *ɛ̋ln*	+	*-ɛn* /	→	[*ɛ́ln -ɛn*]	Lithuanian (Kushnir, 2019, p. 107)

Kushnir's (2019) analysis could be adapted for A'ingae. However, A'ingae has metrical stress, not pitch accent. Thus, the adaptation of Kushnir's (2019) account for A'ingae requires positing floating stress. Specifically, in this reanalysis, dominant stressless morphemes come with a negatively activated metrical grid mark. The negative grid mark coalesces with the root stress, deactivating it (66). This mechanism can be combined with the analysis sketched out in this section or Section 5.1. In this way, floating stress may supply the missing representational mechanism by which dominant stressless suffixes delete stress.

(66)

$\times_{0.9}$ ⇜ $\boxed{\times_{-0.9}}$

/ ˈ*afa* + -*k*^{h}*o* / → [*afa* -*k*^{h}*o*]

speak -RCPR

However, the above adaptation is not unproblematic. Floating tone, which Kushnir (2019) relies on in his analysis, is a natural consequence of modeling tone as autosegments. Stress, however, shows a number of typological properties which differentiate it from autosegments (Hayes, 1995, pp. 24–26; Hyman, 2016). To address this, Hayes (1995) uses the metrical grid to model stress. The metrical grid representations successfully capture the properties of stress, but they make the notion of floating stress incoherent. Floating stress requires an autosegmental analysis of stress—but this comes at the cost of voiding the predictions of metrical theory.

The autosegmental theory posits the existence of separate tiers populated by different types of autosegments, or bundles of phonological features (Goldsmith, 1976). Thus, for example, tones are modeled as existing on a tier separate from their TBUs. The two tiers are linked via association lines. Tones and their TBUs are therefore semi-autonomous.

The architecture of the autosegmental theory allows for a number of non-isomorphisms between tones (T) and TBUs (τ). First, there may be multiple tones linked to one TBU (67a). Second, there may be multiple TBUs linked to one tone (67b). Third, there may be TBUs unassociated with any tone (67c). (There may even be entirely toneless words.) Fourth, there may be tones unassociated with any TBUs, i. e. floating tones (67d).

(67)

a. T T / τ

b. T / τ τ

c. T / τ τ

d. $\boxed{\text{T}}$ T / τ

Likewise, the autosegmental architecture naturally models changes in association between autosegments. Specifically, a tone may spread (¦), associating to new TBUs. For example, in Guébie, the definite suffix -*a* DEF is underlyingly toneless and the melody of the noun spreads onto it (68).

(68)

H H

/ *jú* + -*a* / → [*jú* -*á*]

child -DEF

"the child" Guébie (Sande, 2017, p. 145)

Tones may also delink (ǂ) from their TBUs. For example, in Kuki-Thaadow, each non-final tone delinks from its TBU and relinks one TBU to the right. In other words, each non-final tone shifts by one TBU. As a consequence, the final TBU may end up realizing two tones. In addition, a boundary low tone (%L) associates with the first TBU (69).

(69)

%L H	L		%L	H	L
/ *zóoŋ*	*gùup* /	→	[*zòoŋ*		*gûup*]
monkey	six				

"six monkeys" Kuki-Thaadow (Hyman, 2010)

In contrast with the above characteristics and operations of tone, metrical stress has a very different set of typological properties. Unlike tone, metrical stress is culminative and obligatory, so each phonological word has exactly one primary stress. Importantly, stress tends to be distributed rhythmically and never assimilates (Hayes, 1995, pp. 25–26).

The rhythmical distribution of stress means that stressed syllables tend to alternate with stressless syllables. Compare (70a), where (secondary) stress falls on every other syllable, with the aberrant (70b), where stress clusters towards the end of the word. The latter clustering of stress is cross-linguistically completely unattested.

(70) a. *ˌApaˌlachiˈcola* b. **Apalaˌchiˌcoˈla* (Hayes, 1995, p. 25)

Moreover, stress never assimilates. In the aberrant (71a), the suffix gains secondary stress from the stressed root. This sort of "stress spreading" is again entirely unattested—unlike tonal spreading which is common (cf. 68). In fact, stress tends to dissimilate. When two consecutive syllables carry stress, one of them often undergoes destressing or there is a stress shift, as in (71b).

(71) a. */ *ˈchild* + *-ren* / → [*ˈchild* -*ˌren*] b. / *fifˈteen* *ˈchairs* / → [*ˈfifteen* *ˈchairs*]

To account for these properties of stress, Hayes (1995) proposes that metrical stress is not a phonological feature (or a set thereof), but rather a linguistic manifestation of rhythmic structure (p. 8). Concomitantly, the representation adopted for metrical stress is a hierarchical grouping of metrical units (syllables) into headed constituents (72).

(72) a.

$\times_4$

$\times_1$ $\times_2$ $\times_3$

((*ˌApa*)$_1$ (*ˌlachi*)$_2$ (*ˈcola*)$_3$)$_4$

b.

(×)

(× .) (× .) (× .)

ˌApa *ˌlachi* *ˈcola*

In (72a), Hayes's (1995) "official" representation is given (p. 39): syllables are grouped into (indexed) feet headed by the rhythmic beats $\times_1$, $\times_2$, and $\times_3$. The three feet make up a larger metrical constituent (a word) headed by $\times_4$. In (72b), the more familiar, though less formally precise, bracketed metrical grid representation is given.

Many of the properties of stress follow from the above representation. The fact that stress tends to rhythmically alternate follows from grouping syllables into binary constituents. The fact that each phonological word has precisely one primary stress follows from the requirement that each word must be headed. Finally, destressing and stress shift in clash can be easily stated as rules operating on grid marks (Hayes, 1995, pp. 35, 37).

In Hayes's (1995) proposal, stress is modeled as a grouping of metrical units. Importantly, the grouping of metrical units does not involve a separate tier with metrical autosegments. Consequently, in Hayes's (1995) model, it is incoherent to speak of association lines between stress and stress-bearing units, or of stress linking, delinking, spreading, and floating.[15]

To make sense of the "floating stress" entertained above, one must abandon metrical theory in favor of an autosegmental theory of stress. An autosegmental theory of stress, however, fails to straightforwardly account for its central properties (culminativity, obligatoriness, rhythmic distribution, lack of assimilation, etc.), while predicting a number of completely unattested stress operations.

For example, consider the non-existent language English′, which shows several stress rules similar to Kuki-Thaadow tonal rules. In the English′ phrase /*a ˈchair to ˈsit ˈin*/, there are three primary stresses (three phonological words) in the underlying form. In the surface form, a boundary floating stress (%×) associates with the first syllable. Moreover, the stress of ***chair*** spreads onto the following phonological clitic ***to***, resulting in one stress associated with two syllables. Finally, the stress of ***sit*** delinks and associates with the following phonological word ***in***, resulting in two stresses on one syllable (73).

(73)

$\boxed{\%\times}$ × × ×

*/ *a ˈchair to ˈsit ˈin* / → [*ˈa ˈchair ˈto sit ˈˈin*]

%× × × ×

English′ shows a number of exotic stress configurations, including floating boundary stress, stress spreading, stressless phonological words, and doubly-stressed syllables. The existence of any and all of the stress operations seen in English′ is predicted by an autosegmental treatment of stress, yet none of these properties is ever attested. Thus, I conclude that "floating stress" is not a viable analytical option, ultimately rejecting the metrical adaptation of Kushnir's (2019) analysis to A'ingae.

5.4 *Empty prosodic nodes*

Finally, a reviewer suggests modeling the stress deletion triggered by A'ingae dominant stressless suffixes with defective prosodic nodes. Segmentally empty prosodic nodes, including morae (e. g. Saba Kirchner, 2010; Samek-Lodovici, 1992), syllables (e. g. Bermúdez-Otero, 2012), and feet (e. g. Oostendorp, 2012), have been proposed to model phenomena such as morphological gemination, vowel lengthening, and stress assignment, and reduplication.

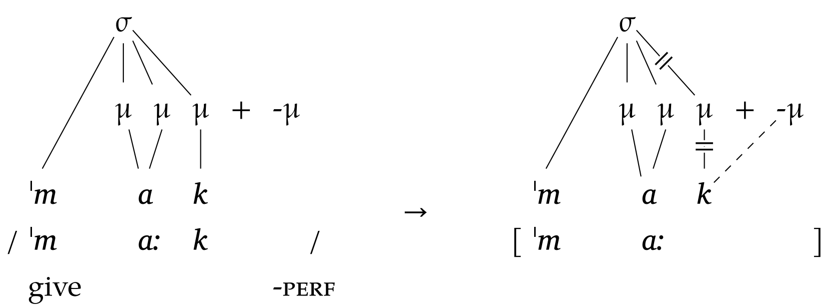
15 This is not to say that morphemes cannot come integrated into (defective) metrical constituents, as was assumed in Section 5.1 or, for that matter, by many classic works on metrical theory, including Halle and Vergnaud (1987). The nature of morpheme-specific metrication, however, is different from autosegmental linking, as evidenced by different phonological processes that characterize the two different types of representations.

Trommer and Zimmermann (2014) extend the representational apparatus of empty prosodic nodes to model subtractive morphology. For example, in Tohono O'odham, the perfect form of a verb is derived from the imperfect by removing its last mora (74).

(74)				
	IMPERFECT	a. ˈ*ma:k*	b. ˈ*hi:nk*	c. ˈ*hihim*
	PERFECT	ˈ*ma:*	ˈ*hi:n*	ˈ*hihi*
		"give"	"bark"	"walk.PL"

Tohono O'odham (Fitzgerald and Fountain, 1995, pp. 5–6; Trommer and Zimmermann, 2014, p. 467)

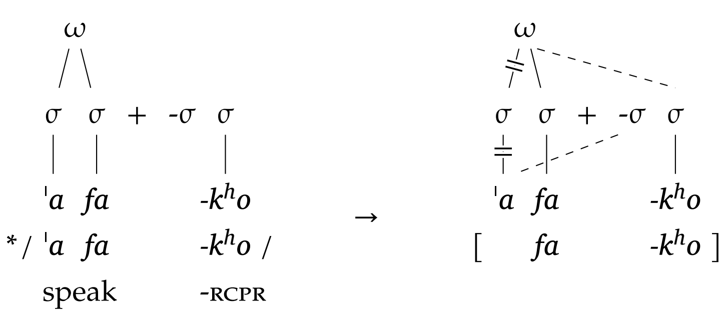
Trommer and Zimmermann (2014) analyze this as suffixation of a defective segmentally empty mora -μ PERF (p. 485). Given an appropriate constraint ranking, the defective moraic suffix links to the last segment of the word and delinks it from its moraic node in the input (75). The phonetic consequence of this process is that the last segment is not pronounced. Thus, the segmentally empty moraic suffix models the Tohono O'odham productive perfect subtractive morphology.

(75)


Tohono O'odham (Trommer and Zimmermann, 2014, p. 468)

Given that stress is a property of syllables, not morae, an adaptation of Trommer and Zimmermann's (2014) model to A'ingae might involve the suffixation of a morpheme with a segmentally empty syllable.[16] Thus, the dominant stressless, or stress-deleting, suffixes would have the following underlying representations: -σk^h*o* RCPR, -σ*je* PASS.

The most immediate problem with the above is that the linking of segmental content to an empty syllable node and delinking it from its input syllable node leads to the deletion of the entire syllable, not just stress (76).

(76)


16 Another option involves the suffixation of a morpheme with a segmentally empty foot. Either analysis eventually runs into the same problems.

Another problem is that of locality: In Tohono O'odham, the suffix which triggers mora deletion targets the last mora of the word, which is adjacent to the suffix. In A'ingae, the stress-deleting suffixes need not be adjacent to the stressed syllable. In the example above, this results in crossing association lines, which are commonly assumed to be ill-formed (Goldsmith, 1976). Given these considerations, I ultimately reject the empty prosodic nodes analysis.

6 CONCLUSIONS

In this study, I showed that the assignment of stress in A'ingae can be most simply modeled as an interaction between two binary parameters: the presence or lack of prestressing and the presence or lack of stress deletion (i. e. dominance). I formalized my account in Cophonology Theory (Anttila, 1997; Orgun, 1996; others), a parsimonious framework of the phonology-morphology interface, which captured all the keys aspects of the A'ingae data.

I showed that dominant stressless suffixes cause the deletion of preceding stress. Thus, their exponence is process-like, making it difficult to capture in a purely representational fashion. I explicitly considered analyses couched in Stratal OT and Gradient Symbolic Representations as well as the representational tools of floating metrical stress and empty prosodic nodes. I concluded that these representational alternatives fail to capture the stress deletion triggered by A'ingae dominant stressless morphemes or require additional stipulations which make them empirically unattractive.

Many recent advances in phonological theory push for purely representational approaches to process morphology (e. g. Bermúdez-Otero, 2012; Jaker and Kiparsky, 2020; Trommer and Zimmermann, 2014; Zimmermann, 2018a,b). At the same time, another intellectual current has argued for capturing the processes of process morphology as such, often retaining simpler underlying representations and eschewing some of the abstraction seen in the other theories (e. g. Inkelas and Zoll, 2007; Orgun, 1996; Sande, Jenks, and Inkelas, 2020). My results support the latter approach—certain phonological operations specific to particular morphemes must be modeled as processes, either via minor rules or constraint reranking, and not by complexifying the underlying symbolic representations of said morphemes.

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