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Delayed exponence in Murrinhpatha: Stratal OT, not position classes

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Abstract

In this paper, I analyze an intricate morphological pattern in Murrinhpatha which involves reordering of the dual marker *ngintha* and an alternation in the form of its adjacent morpheme. I will argue that the pattern strongly suggests an analysis in Stratal Optimality Theory: first, phonological correlates of morphological structure provide evidence for cyclic domains within the word. Second, the phenomenon can be derived using independently motivated morphological constraints, thus supporting the idea that morphology is an independent module of grammar with different optimization mechanisms, but the same stratal split as phonology. The cyclic architecture of the word provides a straightforward explanation for the placement of the dual marker and the resulting allomorphy of the classifier stem without resorting to ad hoc mechanisms such as position classes. Furthermore, the cyclic structure neatly accounts for multiple exponence of [DUAL] through the daucal (dual/paucal) classifier stem and *ngintha.* My analysis suggests that this overexponence results from the blocking of *ngintha* in the first cycle and the selection of the featurally more specific daucal stem. However, *ngintha* is not strictly bounded to the first cycle, and its realization is delayed until the second cycle.

1. Introduction

In this article, I explore an unusual morphological alternation in the Australian language Murrinhpatha and propose an analysis in Stratal Optimality Theory (Kiparsky 2000, Bermúdez-Otero 2012, 2018). In Murrinhpatha, agreement with dual, non-sibling subjects is realized by the singular allomorph of the classifier stem (*ba* in (1a)), followed by a dual marker *ngintha.* However, when an object marker like *nhi* in (1b) is present, the classifier stem appears in its dual/paucal form *nguba*, and the dual marker *ngintha* appears at the end of the word.[1]

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Throughout this paper, I will make use of the following abbreviations: APPL = applicative; CAUS = causative;

(1) Allomorphy of the classifier stem (Nordlinger & Mansfield 2021: 8)

(a) ba-ngintha-ngkardu-nu
see.1SG.SBJ.IRR-DU-see-FUT
‘We (dual non-sibling) will see him/her.’

(b) nguba-nhi-ngkardu-nu-ngintha
see.1DC.SBJ.IRR–2SG.OBJ-see-FUT–DU
‘We (dual non-sibling) will see you.’

Using phonological evidence from word stress and subminimal lengthening, I identify two morphophonological strata in Murrinhpatha: the stem-level, spanning from the classifier stem to the lexical stem *ngkardu*, and the word-level, which includes the affixes following the lexical stem. Crucially, *ngintha* is unique among the affixes in Murrinhpatha as it can attach at either level (Kiparsky 2015), which explains the fact that it appears in two different positions.

I will argue that the placement of *ngintha* and the allomorphy of the classifier stem are governed by the interaction of independently motivated morphological constraints. In (1a), the dual marker is inserted at the stem-level next to the classifier stem to satisfy the constraint Coherence (Trommer 2008, Müller 2020), a morphological markedness constraint requiring adjacency of exponents realizing features of the same argument. Crucially, the optimal position of *ngintha* is not a lexical property of the morpheme but follows from the constraint Coherence. Since Coherence acts only on exponents of the same feature set (in this case, the subject argument), it is superior to stipulative morphological primitives such as position classes, as Coherence makes the testable prediction that effects like this should only arise with exponents belonging to the same feature set. In this context, the classifier stem then takes the singular form rather than its dual/paucal form to avoid multiple exponence of the dual. In (1b), the constraint L ⇐ Person (Trommer 2003), which aligns exponents with person features to the left of the word, requires the object marker *nhi* to be adjacent to the classifier stem. As a consequence, *ngintha* cannot appear at the stem-level, as having *nhi* between the classifier and *ngintha*, both expressing subject features, would cause a fatal violation of Coherence. In turn, this allows the classifier stem to take its daucal form *nguba* without causing multiple exponence, since *ngintha* is now absent. When the derivation enters the word-level, some subjects features have not been realized yet, since the stem-level output in (1b), *nguba-nhi-ngkardu*, marks the subject as daucal but not specifically as dual. Crucially, the constraint *MultipleExponence penalizing multiple exponence is now ranked below the Max(Arg)$_{\text{SBJ}}$, the constraint requiring realization of all subject features. As a consequence, the dual affix *ngintha* is inserted at word-level to achieve full exponence of the subject features.

The constraint-based analysis offers a unified explanation for several challenging properties of this alternation. It connects the two positions of *ngintha* with the allomorphy of the classifier stem, explains the avoidance of multiple number exponence when *ngintha* is in the inner position, and accounts for partial multiple exponence when *ngintha* is in outer position. This is achieved without relying on stipulated morphological primitives, such as position

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cl = verb class; DC = daucal; DU = dual; F = feminine; FUT = future; IND = indicative; IRR = irrealis; M = masculine; NFUT = non-future; NPST = non-past; OBJ = object; OBL = oblique; PC = paucal; PFV = perfective; PL = plural; PST = past; RECP = reciprocal; REFL = reflexive; SG = singular; SBJ = subject; TAM = tense/aspect/mood classes, but instead on a stratal architecture with a strong, phonological motivation and the interaction of morphological constraints which rest on strong typological evidence. Since the morphological constraints I adopt refer to specific morphosyntactic categories, such as person or number, my analysis makes falsifiable predictions. This paper contributes significantly to our understanding of the autonomy of morphology and the phonology–morphology interface. First, it states that morphology is an independent module of grammar, but one whose mechanisms and categories are independently motivated, notably by syntactic and phonological evidence. Second, it supports the predictions of Stratal Optimality Theory, showing that while morphology and phonology are independent modules with different optimization mechanisms, they share the same stratal domains. Additionally, it supports the idea of inward cyclic locality resulting from bracket erasure, where word-level morphology only accesses morphosyntactic information encoded by stem-level morphology, but not their internal position.

This paper is structured as follows: I lay out the empirical properties of the alternation in Section 2. Section 3 discusses the phonological evidence that delimit a cyclic architecture of the word. Section 4 introduces a fine-grained feature geometry for number, driven by observations on the distribution of number exponents. In Section 4, I investigate the distribution of number exponents in order to infer assumptions about the internal morphological structure of the number feature, and hence the featural specifications of the number exponents. In Section 5, I will elaborate on the assumptions of the Stratal Optimality Theory framework (Kiparsky 2000, Bermúdez-Otero 2018) that I adopt in my analysis. In Section 6, I demonstrate that constraint interaction causes suppression of *ngintha* in the presence of an overt object marker. Consequently, a more specific form of the classifier stem is selected by the morphological grammar to optimize feature realization. In Section 7.1, I will show how my analysis captures the distribution of number exponents. In my analysis, I assume that *ngintha* may attach at a later morphophonological domain to realize features of the input since it is stratally underspecified. However, this is a lexical property of *ngintha* rather than a general property of Murrinhpatha. In Section 7.2, I provide further evidence that the stratal unboundedness of *ngintha* is independent of its suppression at the first cycle. Overall, my paper provides a new view on patterns where morphemes display a different phonological behavior in the context of other exponents. In Section 7.3, I discuss how my analysis can potentially be extended to more cases of delayed exponence.

2. The peculiar placement of number in Murrinhpatha

Murrinhpatha is a morphologically highly complex language, which is spoken in the Northern Territory of Australia. The relative ordering of bound morphemes within the verbal complex in Murrinhpatha is sketched in Table 1.[2] As shown in Table 1, the left edge of the verbal complex is occupied by a morpheme traditionally labeled as CLASSIFIER STEM or

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[2] The original overview on the relative ordering of bound morphemes within the morphological word in Murrinhpatha in Nordlinger & Mansfield (2021) includes three more suffixal positions: slots 7 and 9 include incorporated adverbials, while slot 10 marks the position for serialized classifiers. Since none of these morphemes is relevant for the phenomenon under discussion nor for the examples in this paper, I decided to omit these slots in Table 1 for reasons of clarity and space.

Table 1. Relative ordering of bound morphemes (Nordlinger & Mansfield 2021: 2)

Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 8
Classifier stem (portmanteau w. SBJ and TAM)	SBJ number OBJ marker OBL marker	REFL/ RECP	incorporated body part/ APPL	lexical stem	TAM	number (SBJ or OBJ)

FINITE STEM. Classifier stems are typically treated as portmanteau forms that encode classifying semantics, subject person and number, as well as tense and mood information (Mansfield 2019, Nordlinger & Mansfield 2021). While information about subject person is realized as part of the classifier stem, object person is marked by affixes that attach right to the classifier stem in slot 2. Another crucial part of the verbal complex is the LEXICAL STEM, which is sometimes referred to as COVERB (Seiss 2013, Mansfield 2017, 2019, among others). In contrast to the classifier stem, the lexical stem does not alternate for inflectional content and is realized in slot 5. In addition, a couple of morphemes may be concatenated in positions after the lexical stem; however, only two of these morphemes are relevant for the purpose of this paper. First, TAM markers are realized after the lexical stem. Second, certain number markers may be realized in positions following the lexical stem. Note also that the relative order of the TAM markers and the number markers is flexible to some extent, while the relative order of morphemes in the domain spanning from the classifier stem until the lexical stem is fixed (Mansfield 2017). Table 1 further shows that subject number is realized in three different positions: first, it is part of the subject information encoded in the classifier stem. Second, additional morphemes realizing subject number are realized either in slot 2 and hence in direct adjacency to the classifier stem or in slot 8 at the right edge of the verb. In this paper, I will explain the distribution and positioning of the number markers in Murrinhpatha and how their position patterns with their phonological properties.

Table 1 illustrates a crucial property of Murrinhpatha morphology: the verbal predicate is typically bipartite, comprising a classifier stem in slot 1 combined with a lexical stem in slot 5. Throughout this paper, classifier stems are boxed, while lexical stems are underlined. Classifier stems form a closed class, consisting of 38 distinct subparadigms (Nordlinger 2015, Mansfield 2019). The majority of predicates require both a classifier stem and an uninflected lexical stem. While a few classifier stems can function as standalone verbs without a lexical stem, lexical stems can never appear in the verb without a classifier stem (Nordlinger & Mansfield 2021). This is illustrated in (2). The predicate which roughly parallels the English predicate 'to tear' is formed by combining an uninflected lexical stem *rartal* with a specific form of the classifier stem subparadigm 24 'slash' which matches the subject and tense information.

(2) Classifier and lexical stems (Nordlinger & Mansfield 2021: 3)
pam-ngintha-nu-ma-rartal
3SG.slash.NFUT-DU-REFL-APPL-tear
'The two (non-siblings) will tear it (the cloth) from each other.'

Table 2. Paradigm of classifier stem *ba* ‘to affect, see’ (Mansfield 2019: 249)

		NFUT	IRR	PST	PST. IRR
SG	1	bam	ba	be	be
	2	dam	da	de	de
	3	bam	ba	be	be
PL	1	ngubam	nguba	ngube	ngube
	2	nubam	nuba	nube	nube
	3	pubam/kubam	kuba/puba	pube	pube
DC	1		nguba	ngube	ngube
	2		nuba	nube	nube
	3		kuba/puba	pube	pube

Nordlinger & Mansfield (2021) discuss a remarkable alternation of the classifier stem in relation to the position of the dual marker *ngintha.* A relevant minimal example illustrating this alternation is given in (3). In (3a), the predicate roughly matching the English predicate ‘to see’ consists of the uninflected lexical stem *ngkardu* and the 1SG form of the classifier stem paradigm ‘see’, which is illustrated in Table 2. Since the subject of (3a) is 1DU, there is an additional dual marker *ngintha* which is realized to the right of the classifier stem. The 3SG object is unmarked. In (3b), in contrast, there is an overt object affix encoding the 2SG object. In this context, the dual marker *ngintha* appears at the right edge of the word. In addition, the classifier stem does not appear in its 1SG form *ba*, but rather in its dual form *nguba.*[3]

(3) Allomorphy of the classifier stem (Nordlinger & Mansfield 2021: 8)

(a) ba -ngintha-ngkardu-nu
see.1SG.SBJ.IRR-DU-see-FUT
‘We (dual non-sibling) will see him/her.’

(b) nguba -nhi-ngkardu-nu-ngintha
see.1DC.SBJ.IRR–2SG.OBJ-see-FUT–DU
‘We (dual non-sibling) will see you.’

In summary, the placement of the dual marker *ngintha* and the form of the classifier stem depend on whether an overt object marker is present. With a covert 3SG object, *ngintha* appears next to the classifier stem, which is in its singular form in this context. However, when an overt object marker is used, *ngintha* attaches to the right end of the word, while the classifier stem appears in its dual form. Thus, the pattern in (3b) looks like an instance of multiple exponence of dual and a discontinuous dependency between the classifier stem and the dual marker *ngintha*, two phenomena typically associated with templatic morphology (Nordlinger 2010). Nordlinger & Mansfield (2021) use position classes to make empirical

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[3] A recurrent comment touches the question whether *ngu-* could be considered to be a prefix to the singular stem. However, the morphological similarity between the singular stem and the dual stem is a coincidence of the ‘see’ paradigm in Table 2 and does not occur in other paradigms, which show exactly the same alternation.

generalizations about these changes in form and position, where the dual marker and object affixes compete for the same position to the right of the classifier stem. In this paper, I will explain the relationship between the form of the classifier stem and the position of *ngintha* without relying on the concept of position classes as a fundamental component of morphological theory. Instead, I will examine the phonological features associated with the placement of *ngintha* in Section 3, arguing that the phonological properties uncover a cyclic structure of the word in Murrinhpatha.

3. Phonological properties of Murrinhpatha morphemes

In Murrinhpatha, the phonological behavior of a bound morpheme is determined by its position within the verbal complex. Put simply, we can predict the phonological processes that apply to a particular morpheme based on its position. Mansfield (2017) observes an interaction between the relative position of an affix to the lexical stem and the phonological processes in which this affix is involved. More precisely, affixes in positions following the lexical stem are not involved in the assignment of word stress, subminimal lengthening or obstruent lenition.[4]

Prosodic words in Murrinhpatha must consist of at least two morae. In (4a), the word is assumed to have an underlying form of /me/. Since short vowels are typically assumed to be monomoraic, /me/ would violate the minimum quantity of having at least two morae. Therefore, the vowel of the syllable is lengthened to satisfy the bimoraicity condition. In (4b), however, the same root /me/ combines with another morph /ngala/. The resulting compound consists of three morae, thus fulfilling the minimum quantity of two morae. In this case, the vowel of the root is not lengthened, suggesting that the underlying form is in fact /me/. In (4c), the word consists of a monosyllabic classifier stem and an object suffix. Like the noun root in (4a), the classifier stem is a monomoraic CV syllable /na/. However, unlike (4a), the vowel of the classifier stem is not lengthened in (4c). This suggests that the presence of the object marker is taken into account for the bimoraicity requirement on prosodic words. Nevertheless, this generalization does not hold for all affixes. Example (4d) demonstrates that some affixes do not prevent subminimal lengthening. The vowel of the monosyllabic classifier stem /ti/ in (4d) is lengthened despite the presence of another moraic future affix. Mansfield (2017) concludes that the absence of subminimal lengthening indicates that a given affix belongs to the same phonological domain as the classifier stem, whereas subminimal lengthening of the root vowel in (4d) suggests that the future affix *nu* does not belong to the same phonological domain as the classifier stem.[5]

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[4] An anonymous reviewer pointed out that phonological alternations triggered by the surrounding morphological environment are commonly attested (e.g. in allomorphy). In contrast to these phenomena, it is not the adjacent morphology that explains the phonological behavior of bound morphemes in Murrinhpatha, but rather the relative position of a morpheme within a morphological word. For example, affixes that attach to the right of the lexical stem will never interact with word stress assignment, subminimal lengthening or obstruent lenition, independent of the phonological form of the surrounding morphs.

[5] The observant reader will notice that the data given in the previous two sections include an orthographic representation of the data, while the examples taken from Mansfield (2017) and Mansfield (2019) give a phonetic representation. In this paper, I provide each example in the way it is presented in the original source.

(4) Bimoraicity and phonological levels (Mansfield 2017, 2019: 173, 362)
(a) méː
'foot'
(b) me-ŋala
foot-big
'Bigfoot'
(c) ná- ŋe
say.2SG.IRR–3SG.F.OBJ
'tell her'
(d) t̪íː-nu
sit.2SG.IRR-FUT
'you will sit'

Mansfield (2017) further notes that this domain coincides with the domain of stress assignment and obstruent lenition. In Murrinhpatha, morpheme-initial voiceless obstruents lenite after vowels. This is shown in (5a) where the initial consonant of /patha/ surfaces as [w] after the vowel-final prefix /ma-/. In similarity to stress assignment and the bimoraicity condition, obstruent lenition does not apply to morphemes appearing to the right of the lexical stem, as demonstrated in (5b). In (5b), the morpheme /paɖi/ would have the correct phonological shape and environment to surface as [waɖi], yet lenition does not apply because the morpheme attaches in a position outside of the relevant phonological domain. In this paper, I will not consider obstruent lenition further because the number affixes discussed lack the phonological shape for it. Therefore, obstruent lenition cannot determine the phonological domain of an affix.

(5) Obstruent lenition and phonological levels (Mansfield 2017: 374)
(a) [ma-wát̪a-nu]
/ma-pat̪a-nu/
use.hands.1SG.IRR-good-FUT
'I'll make it.'
(b) [puménaðapaɖi]
/pume-na-ða-paɖi/
say.3PL.PST–3SG.OBL-PST-BE.IMPFV
'they were saying to him'

Word stress is assigned to the penultimate syllable of the domain relevant to the bimoraicity condition and obstruent lenition. Thus, it follows that monosyllabic affixes that prevent subminimal lengthening interact with word stress, whereas monosyllabic affixes whose presence does not prevent subminimal lengthening are irrelevant for word stress assignment. This is exemplified in (6), where the phonological domain relevant for bimoraicity and word stress assignment is indicated by square brackets, and word stress is indicated by an acute accent.

(6) Word stress and phonological levels (Mansfield 2017: 362, 366, 368)
(a) [pát̪a] [wuɾiní-ŋe]-ða
good go.SG.PST-3SG.F.OBL-PST
‘He was good to her.’
(b) [pumam-ŋa-pát̪a]-nin̪t̪a-pibim
use.hands.3PL.NFUT–1SG.OBL-make-DU-IMPFV
‘the two of them are making it for me’

In (6a), the first word *pata* fulfills the bimoraicity condition and assigns word stress to its penultimate syllable. The second prosodic word of the sentence consists of a classifier stem, an oblique object marker and a PST marker. As shown in the examples in (4), object and oblique object markers prevent subminimal lengthening (see (4c)), while TAM markers do not, as in (4d). Example (6a) strikingly shows that word stress falls on the penultimate syllable of the domain including the oblique object marker ŋ*a*, but excluding the TAM marker *đa*. In (6b), the lexical stem *pata* receives word stress on its penultimate syllable, thus illustrating that the domain relevant for word stress spans from the classifier stem to the lexical stem and includes all affixes attaching between those two, while affixes attaching further right than the lexical stem are always outside the word stress domain. Table 3 integrates these insights and provides an overview of the morphemes within the verbal complex and their phonological domains.

This conclusion makes interesting predictions for the dual marker *ngintha*. As shown in the previous section, *ngintha* appears BEFORE the lexical stem in the absence of an overt object marker, but AFTER the lexical stem whenever an overt object marker is present. The examples in (7a) and (7b) illustrate that the placement of *ngintha* correlates with its phonological behavior. In example (7a), there is no overt object marker, and *ngintha* receives word stress. In (7b), however, an overt oblique object marker is realized next to the classifier stem with the consequence that *ngintha* is realized after the lexical stem. In this case, word stress falls on the penultimate syllable of the lexical stem which clearly shows that *ngintha* is outside the word stress domain.

(7) Word stress and phonological levels (Mansfield 2017: 362, 366, 368)
(a) [piɾim-nin̪t̪a]
stand.3SG.NFUT-DU
‘the two of them are standing’
(b) [pumam-ŋa-pát̪t̪a]-nin̪t̪a-pibim
use.hands.3PL.NFUT–1SG.OBL-make-DU-IMPFV
‘the two of them are making it for me’

In summary, Mansfield (2017) shows that the behavior of affixes offers evidence for distinct phonological domains and that the placement of *ngintha* is closely related to its phonological properties. The presence of overt object markers does not simply cause a reordering of the dual marker *ngintha* but also affects its concatenation within a different phonological domain. This implies that the prosodic word in Murrinhpatha is layered and that its cyclic structure is significant in explaining the behavior of *ngintha*. However, morphological theories that assume a flat, templatic structure of words, such as Nordlinger

(2010), fail to account for this insight. In the following section, I will discuss how number information is scattered among different morphemes to find out more about the featural specifications of these affixes.

4. The distribution of number exponents

In the previous sections, we have seen that the presence of an overt object marker determines the form of the classifier stem as well as the position and the phonological status of the dual affix *ngintha*. To understand and explain this unique property of Murrinhpatha, it is crucial to delve deeper into how number information is distributed among multiple morphemes located in different positions within the verbal complex. Specifically, information on subject number is conveyed through three different positions: first, it is part of the portmanteau classifier stems. Second, additional number affixes can attach to the right of the classifier stem, thus belonging to the domain relevant for word stress assignment (slot 2 in Table 3). Third, number affixes can be found in positions after the lexical stem, and hence outside of the word stress domain (slot 8 in Table 3). I will refer to the former group of number markers as INNER NUMBER AFFIXES and to the latter group as OUTER NUMBER AFFIXES. I follow Mansfield (2017, 2019) in assuming the phonological behavior of an affix is a sufficient condition for this distinction, with inner number affixes affecting word stress assignment and outer number affixes being invisible to it. Crucially, the number value of an argument is conveyed through combinations of these three types of exponents. To capture this fact, I assume that number is morphologically represented by a set of privative features, which are organized in a feature geometry in the style of Harley & Ritter (2002). Let me explain the general logic of a feature geometry using the toy feature geometry in (8). A value consists of a set of privative features, such as A, B, D, E or F. However, there are restrictions on how these features may be combined: sister nodes cannot be combined with each other, as they are assumed to be contradictory. Moreover, daughter nodes entail the presence of their mother (i.e. a feature F entails that D is present, which entails that B is present).

(8) Feature geometry

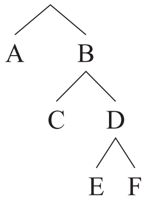

Table 3. The verbal complex and phonological domains

Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 8
Classifier stem (portmanteau w. SBJ and TAM)	SBJ number OBJ marker OBL marker	REFL/ RECP	incorporated body part/ APPL	lexical stem	TAM	number (SBJ or OBJ)

$\underbrace{\text{Slot 1 — Slot 3}}_{\text{domain for stress assignment/minimum quantity condition}}$

domain for stress assignment/minimum quantity condition

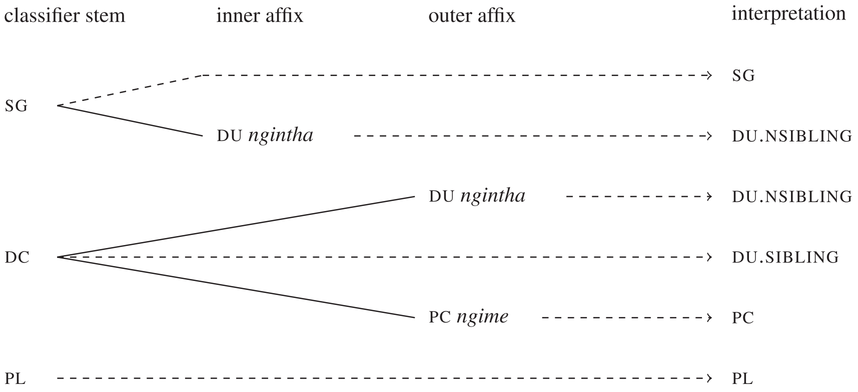

Figure 1. Distribution of subject number in IRR classifiers stems (Mansfield 2019: 143).

In Murrinhpatha, some number exponents can only occur in combinations with other number exponents (i.e. they entail the presence of other number exponents). Hence, we can make implications on the internal structure of the number geometry from the distribution of exponents. The attested combinations of number exponents are listed in Figure 1 for IRR classifier stems and in Figure 2 for NFUT classifier stems. As already mentioned in Section 2, the leftmost position is always occupied by the classifier stem. Hence, it is the only exponent of subject number present in all number contexts.

In the case of IRR classifier stems, there are three different forms: singular, daucal and plural, where daucal refers to a portmanteau of dual and paucal number (Blythe 2009).[6] The singular form of the classifier stem is interpreted as singular when it appears without any other number exponent, but it can also be combined with the dual marker *ngintha* in the inner position to refer to exactly two entities that are not siblings. The plural form of IRR classifier stems does not occur with other number markers and is used to refer to plural entities. The

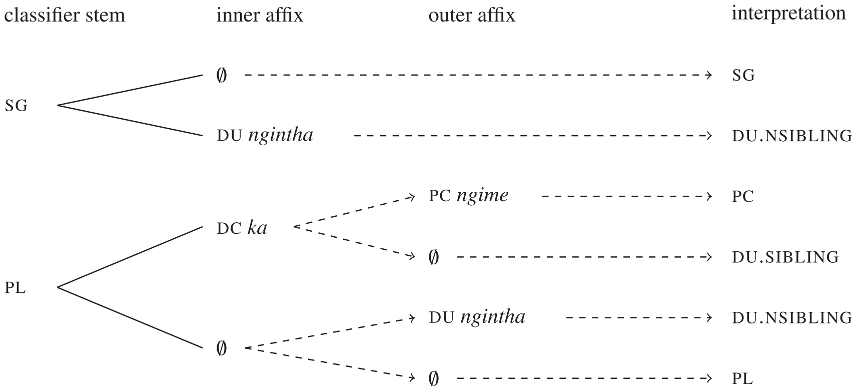

Figure 2. Distribution of subject number in NFUT classifiers stems (Mansfield 2019: 143).

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[6] The observant reader will notice that the DC form is morphologically indistinct from the PL form. This syncretism appears in other classifier stem paradigms as well. However, there exist a number of subparadigms in which the two forms come in different shapes, thus justifying the distinction.

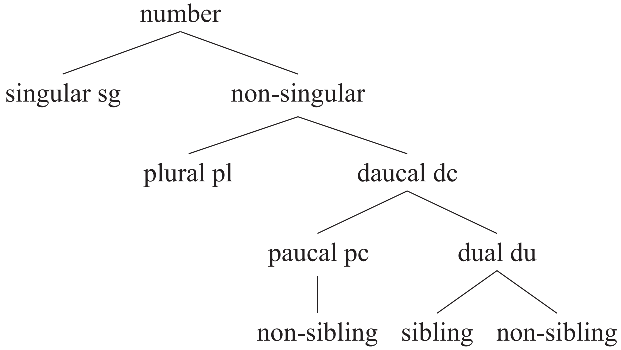
daucal form of the classifier stem, which is used in both dual and paucal contexts, is combined with either the dual marker *ngintha* or the paucal marker *ngime* to refer to dual non-sibling entities and paucal non-sibling entities, respectively. If the daucal classifier stem appears without any additional number affixes, it is used to refer to dual sibling entities. Crucially, the paucal exponents refer to non-sibling contexts only. Paucal sibling entities are realized in the same way as plural entities: using a bare plural classifier stem. Blythe (2009) and Mansfield (2019) note that the difference between paucal and plural is partially about the quantity of the entities referred to, but probably also about recognizable reference. Specifically, the paucal is typically used when the reference can be recognized, while the plural is used to refer to nonspecific referents. It should also be noted that the number system morphologically represents sibling relationships, which indicates the cultural significance of classificatory siblinghood.

The illustration in 1 shows that each number value is realized by exactly one combination of number exponents. However, the alternation of the placement of *ngintha* in the presence of overt object makers yields two possible realizations for dual non-sibling contexts. In the absence of overt object markers, the singular classifier stem is combined with *ngintha* in the inner position. When overt object markers are present, however, this number value is realized by the daucal classifier stem and *ngintha* in the outer position.

Figure 2 illustrates the distribution of number exponents in combinations with NFUT classifier stems. Unlike IRR classifier stems, NFUT stems do not have morphologically distinct daucal forms. Instead, paucal and dual sibling contexts are expressed through the use of an inner number affix *ka* which combines with plural classifier stems. This suggests that the daucal is a specific form of a broader number category I will refer to as NON-SINGULAR.

Drawing on our generalizations of the distribution of exponents, we can make inferences about the featural composition of morphological number and the specifications of the exponents. My conclusions about the complex number resolution patterns (illustrated in Figure 1 and Figure 2) suggest a feature geometry for morphological number as shown in (9). Specifically, the existence of only two distinct classifier forms in NFUT paradigms implies a primary division of number into singular and non-singular entities. However, the non-singular classifier stem can also be combined with the DAUCAL marker *ka*, suggesting that the non-singular category splits into PLURAL and DAUCAL. The DAUCAL markers can be combined with dual non-sibling and paucal non-sibling exponents. An anonymous reviewer asked why the daucal feature is necessary for the analysis. The most compelling piece of evidence comes from the daucal object exponent *ngku* (see Figure 5 in Section 7.1), which combines both with dual and paucal exponents. Hence, DUAL and PAUCAL form a natural class entailing the presence of another exponent, which I label DAUCAL following the terminology by Blythe (2009). Siblinghood is morphologically distinguished for dual participants: dual siblings are encoded with the daucal marker only, while dual non-siblings require an additional exponent. The presence of paucal exponents entails non-siblinghood, while paucal sibling entities always receive the same morphological marking as plurals. There is not a single context to distinguish them morphologically. The distribution of paucal is hard to capture in the feature geometry: we have already established that paucal is a subcategory of daucal, yet it occurs with the plural classifier stem when referring to siblings, rather than with the daucal classifier stem. Blythe (2009) notes that the difference between paucal and plural is probably not primarily about quantity, but rather about referentiality, with paucals being referential and plurals being non-referentials. As a tentative solution to this problem, I assume that paucal sibling is not represented in the feature geometry in (9), given that there are no morphological contexts to distinguish it from plurals. Another solution would be to assume that paucal siblings receive the same features as plural entities plus an additional feature [SPECIFIC].

(9) Number specification in Murrinh-Patha



Based on the morphological structure of number in (9) and the distribution of the number exponents in the different contexts, I further infer the following featural specifications of the different exponents. Crucially, I assume that the singular classifier stem does not carry any number features.

The plural classifier stem realizes only the feature [non-singular] since it can be combined with paucal markers in NFUT contexts. Crucially, the most specific number context – dual non-sibling – is realized by a SG classifier stem and *ngintha* only. Since I have already established that the SG classifier stem does not realize any number features, it follows automatically that *ngintha* realizes [NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING]. The featural specifications of number exponents in IRR contexts are shown in Figure 3, which also demonstrates that each combination of exponents corresponds to the minimal featural representation of each number context. For instance, the paucal context requires three features: [non-singular] and [plural] are represented in combination in the DC classifier stem, while [paucal] is represented by the distinct outer number affix *ngime.*

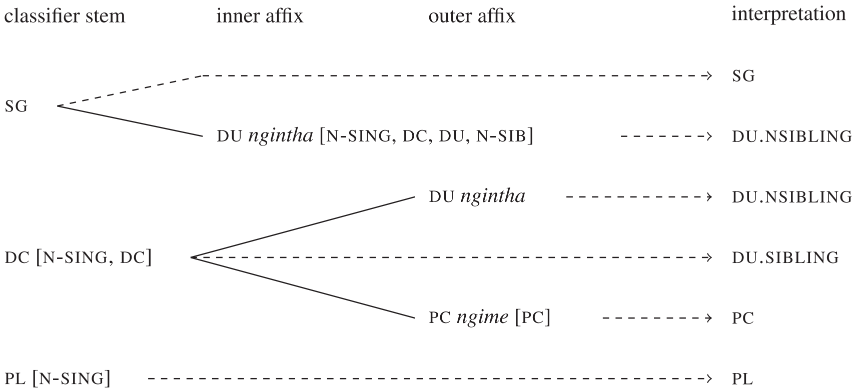


Figure 3. Featural specification of number exponents in IRR classifiers stems.

Figure 3 further shows that combination of the DC classifier stem and *ngintha* as an outer number affix is exceptional, since the features [non-singular] and [daucal] are realized twice in this context. Hence, it is the only number context that is not minimally represented by morphological features. In the following two sections, I will connect the featural specifications of the number exponents to the observation that prosodic words in Murrinhpatha are cyclic in order to explain the exceptional phonological and morphological patterning of *ngintha.*

5. Background assumptions

In Section 3, I have demonstrated that the phonological correlates of morphemes serve as a window into the cyclic structure of the prosodic word in Murrinhpatha. Specifically, the prosodic domain relevant for word stress assignment spans from the classifier stem at the left edge of the word to the lexical stems, with all affixes following the lexical stem being invisible for stress assignment. In this paper, I implement the cyclic structure of the word by assuming that affixes are concatenated at different morphophonological strata, following the ideas of STRATAL OPTIMALITY THEORY (StratOT) (Kiparsky 2000, Bermúdez-Otero 2012). StratOT is a derivational version of STANDARD PARALLEL OPTIMALITY THEORY (SPOT) (Prince & Smolensky 1993) and is based on assumptions similar to those posited by LEXICAL PHONOLOGY AND MORPHOLOGY (Kiparsky 1982). Just as SPOT, StratOT pursues the idea that the grammar of Human language consists of a set of *violable, rankable and universal constraints.* The grammar of each individual language results from an individual ranking of these constraints. A core difference of StratOT is the division of labor into several different cyclic domains. A concrete suggestion with respect to the number of domains comes from Bermúdez-Otero (2012), who assumes three different morpho–phonological domains:[7] the STEMLEVEL, the WORD-LEVEL and the PHRASE-LEVEL.

An important assumption by StratOT is that morphological derivations are accompanied by cycles of phonological optimization such that the morphological component of the grammar and the phonological component of the grammar are interleaved. After each stratum, bracket erasure takes place, which renders morphological structure inaccessible to further cycles. Bracket erasure is a mechanism introduced by Pesetsky (1979) (referring to Chomsky & Halle 1968) and relates to the process of making morphological boundaries invisible to phonological or morphological rules at the end of a cyclic domain. Consequently, neither phonological nor morphological rules can make reference to these boundaries. The question of whether phonological rules have access to morphological structure is not trivial. Embick (2010) argues that allowing global access to morphological structures creates an excessively potent grammar. In cyclic approaches, morphological sensitivity is limited to smaller subdomains (i.e. morphological structure can only be accessed by phonological rules within a given cycle). Hence, cyclic approaches are conceptually less powerful than theories with global access to morphological structure and build on a strong empirical basis (see

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[7] A recurrent question in StratalOT is how the grammar determines at which stratum an affix enters the morphological structure. As for Murrinhpatha, the phonological behavior of the individual morphemes clearly reveals the stratum it belongs to. While it would be highly desirable if affixes belonging to the same stratum would also form a natural class with respect to their morphosyntactic properties, this is not a technical necessity. Rather, it is commonly assumed that it is specified in the lexical entry of each affix at which stratum it enters the optimizing derivation (Bermúdez-Otero 2012, 2018, 2019).

Orgun & Inkelas 2002, among others). Bermúdez-Otero (2012) argues that bracket erasure arises most naturally from the assumption that the output of phonological optimization must be phonetically interpretable and must therefore not contain morphological representations, such as brackets. In this perspective, bracket erasure is not a mere stipulation but rather a logical consequence of modular assumptions. In the works by Pesetsky (1979), Kiparsky (1982), Mohanan (1982), Mohanan & Mohanan (1984), however, bracket erasure is an independent axiom of the theory that requires the existence of brackets as representational objects. This paper does not extensively contribute to this ongoing discussion, remaining compatible with both viewpoints. In the work at hand, I assume that only the morpheme boundaries are deleted, while the grammar still has access to the morphosyntactic information realized in a previous stratum. In other words, a morphologically complex word (e.g. a root plus its affixes) is treated as a morphologically simplex word after bracket erasure. It should also be emphasized that the analysis I forward in this paper does not require phonological access to morphological structure at all. Hence, it would also be compatible with cyclic approaches that are strictly modular.

The exact architecture of the cyclic model of the morphology–phonology interface I adopt is illustrated in Figure 4.

In this paper, I assume that two strata suffice to explain the phenomenon under discussion. Specifically, I assume that the word stress domain corresponds to the STEM-LEVEL, while affixes attaching outside the stress domain belong to the WORD-LEVEL. Example (10) illustrates how these assumptions relate to the exceptional placement of *ngintha*. In the absence of overt object markers, *ngintha* is concatenated at the stem-level, as in (10a). However, when an overt object marker is present, as in (10b), *ngintha* attaches at the word-level.

(10) Anomalous placement of *ngintha* (Nordlinger & Mansfield 2021: 8)

(a) [[$\boxed{\text{ba}}$-ngintha-∅-$\underline{\text{ngkárdu}}$]$_{\text{stem}}$-nu]$_{\text{word}}$
see.1SG.SBJ-DU–3SG.OBJ-see-FUT
'We (dual non-sibling) will see him / her.'

(b) [[$\boxed{\text{nguba}}$-nhi-$\underline{\text{ngk}}$á$\underline{\text{rdu}}$]$_{\text{stem}}$-nu-ngintha]$_{\text{word}}$
see.1DC.SBJ–2SG.OBJ-see-FUT–DU
'We (dual non-sibling) will see you.'

morphological optimization phonological optimization	stem-level
BRACKET ERASURE	
morphological optimization phonological optimization	word-level
BRACKET ERASURE	
morphological optimization phonological optimization	phrase-level
BRACKET ERASURE	

Figure 4. Assumed architecture of the morpho–phonology interface.

Table 4. Murrinh-Patha affixes divided into strata

Stratum	Category	Specification	Form
Stem	[CL.STEM]	[1, SBJ, IRR]	*ba*
	[CL.STEM]	[1, SBJ, N-SING, DAUC, IRR]	*nguba*
	[LX.STEM]	‘to see’	*ngkardu*
	[OBJ]	[2, OBJ, SING]	*nhi*
	[OBJ]	[OBJ, SING]	∅
		[DAUC]	*ka*
Word	[TAM]	[FUT]	*nu*
		[PAUC]	*ngime*
unspecified	[SBJ]	[N-SING, DAUC, DU, N-SIB]	*ngintha*

Moreover, the dispersion of number information across different number exponents allows us to draw conclusions about the featural structure of morphological number, as well as the featural specifications of the exponents. Taking their phonological properties and their morphological position into account, we can now determine the featural specification as well as the stratum a morpheme belongs to. This information is summarized in Table 4 for each affix relevant for the discussion. Following Harley & Ritter (2002), I assume that 1st and 2nd person are realized using privative person features, while the realization of 3rd person does not involve features and is inferred through default interpretation. The minimal pair in (10) involves two different classifier stem forms, both of which refer to 1st person subjects. As concluded above, singular classifier stems do not comprise any number feature, while the daucal stem carries the features [NON-SINGULAR] and [DAUCAL]. Hence, the featural specifications for the two classifier stems are [1, SUBJECT, IRR] for *ba* and [1, SUBJECT, NON-SINGULAR, DAUCAL, IRR] for *nguba.* I further assume that the 3rd person object in (10a) is realized by a covert object marker which has the feature [OBJECT, SINGULAR], while the 2nd person object marker *nhi* comes with the specification [2, OBJECT, SINGULAR].[8]

The final stem-level affix is the number affix *ka*, which combines with NFUT classifier stems and carries the feature [DAUCAL]. Two different types of affixes belong to the word-level in Murrinhpatha. First, all TAM affixes attach at this level, like the [FUTURE] suffix *nu.* Second, some number affixes belong to this stratum, such as the [PAUCAL] suffix *ngime.* Note that the illustration in Table 4 reveals that Murrinhpatha has no morphological possibility to realize the feature [PAUCAL] at stem-level. Rather, its realization is delayed until the word-level. In the previous section, I argued that the dual marker *ngintha* has to be specified for the features [NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING], as it combines with the singular stem in the featurally most specific dual non-sibling context. In order to capture the observation that

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[8] An anonymous reviewer expressed the concern that the zero-marker lacks external justification and raised the question whether it is really necessary for the analysis. The straightforward answer to this question is *no.* Instead of assuming a zero-marker for 3SG objects, one could also assume that *no marker* is concatenated in that scenario. This alternative assumption would not cause any problem for the analysis presented in this paper, since a nonexisting morpheme would not interact with number markers anyway. The reason why I assume null object markers (similar to Kiparsky 2021) is that I assume that the input feature sets are given from the situational context (following Müeller 2020), and zero object markers allow for a consistent input.

Table 5. Murrinh-Patha affixes divided into strata

Stratum	Category	Specification	Form
Stem	[CL.STEM]	[SBJ, N-FUT]	*pan*
	[LX.STEM]	‘to hit’	*bat*
	[OBJ]	[2, OBJ, SING]	*nhi*
	[OBJ]	[1, OBJ, SING]	*ngi*
	[OBJ]	[OBJ, SING]	∅
	[OBJ]	[1, OBJ, N-SING]	*ngan*
		[DAUCAL]	*ngku*
Word		[PAUC]	*ngime*
unspecified	[SBJ]	[N-SING, DAUC, DU, N-SIB]	*ngintha*

it occurs on both stem-level and word-level, I assume that *ngintha* is underspecified with respect to the stratum it belongs to, and may attach at any stratum, an analytical option previously made by Kiparsky (2015). Note that this assumption is not problematic for the Cyclic Principle (see Chomsky 1965, Perlmutter & Soames 1979), given here in (11), which states that an operation has to be carried out as early as possible.

(11) Cyclic Principle (Chomsky 1965, Perlmutter & Soames 1979)
When two operations can be carried out, where one applies to the cyclic domain D_X and the other applies to the cyclic domain D_{X-1} included in D_X, then the latter is applied first.

In fact, I will show in Section 6 that *ngintha* has to be concatenated as early as possible, as long as the context for its realization is given. Hence, the realization of *ngintha* in a later cyclic domain does not pose a problem for the Cyclic Principle, since the context for the rule to apply is not given in the first domain. Without an overt object marker, it attaches at the inner level to fulfill a constraint that ensures the realization of all input features. With an overt object marker, this constraint will be outranked, hence blocking the realization of *ngintha* in the inner domain.

To illustrate how my analysis couched in StratOT derives the peculiar placement of *ngintha*, let me assume that the verb root comes with a list of contextual features that need to be realized by morphological exponents in an optimal way. This list is then checked against the available affixes at each stratum. To ensure that the morphological grammar on a given stratum concatenates only the affixes that are lexically affiliated with it, I assume that the Gen function accesses the lexical entries of the morphemes, in which the stratal specification is stored as a diacritic. Thus, Gen restricts possible output forms to those containing only morphemes with the correct stratal specification. In this paper, I remain agnostic about the origin of these features. Since the core of my analysis rests on the interaction of violable constraints, my analysis is compatible with presyntactic morphological theories based on Optimality Theory (Prince & Smolensky 1993) – for example, Müller (2020) or postsyntactic theories combining OT and Distributed Morphology, like Trommer (2001, 2003) or Rolle (2020). To derive the patterns in (10), let us assume that the verbal complex comes with the input features in (12), since it concatenates a classifier stem, a lexical stem, an object marker and a TAM exponent. I follow the notation introduced by Müller (2020) in using the • symbol to mark features that need to be expressed in a morphological word.

(12) Input feature set: V, [•CL.STEM•], [•LX.STEM•], [•TAM•], [•OBJ•]

These input features are the same for both (10a) and (10b), yet the sentences differ with respect to the features of the arguments that need to be realized. Hence, there are also input feature sets belonging to the arguments of the sentence. The feature sets for (10a) are listed in (13a), while the feature sets of the arguments in (10b) are listed in (13b). An anonymous reviewer asked to specify how TAM information is composed as both the classifier stem and external suffixes carry information about tense, aspect and modality. Similar to the argument features, I assume that TAM information is given through the input features in (13c) where IRR (EALIS) will be provided by the classifier stem, whereas FUT(URE) will be realized by the word-level suffix *nu*. I abstain from a more fine-grained decomposition of TAM features, since TAM morphology does not interact with the number exponents discussed in the paper. Hence, a deeper analysis of TAM is far beyond the scope of this paper, and I refer the reader to Nordlinger & Caudal (2012) or Mansfield (2019: chapter 6.3.2).

(13) (a) SBJ: [SBJ, 1, N-SING, DAUC, DU, N-SIB]
OBJ: [OBJECT, SINGULAR] for (10a)
(b) SBJ: [SBJ, 1, N-SING, DAUC, DU, N-SIB]
OBJ: [2, OBJECT, SINGULAR] for (10b)
(c) TAM: [IRR, FUT]

Previous work by Trommer (2003, 2008), Crysmann & Bonami (2016) and Müller (2020) has highlighted that the mapping between input features and output morphological forms is regulated by rules on morphological well-formedness. In this paper, I follow Trommer (2003, 2008) and Müller (2020) by implementing these morphological rules as violable constraints in Optimality Theory. An exhaustive list of constraints is given in (15). M(AX)(F) constraints are crucial since they ensure that each feature of the input F is realized by an exponent in the output. M(AX)(ARG)$_{\text{SBJ}}$ and M(AX)(ARG)$_{\text{OBJ}}$ are specific versions of M (AX) relating to the argument input feature sets. All M(AX) receive a violation mark for each feature in the input which is not realized by an exponent in the output.

In Section 4, we concluded that number is morphologically represented by a set of privative features and that arguments differ in the number of features in their specification. Concretely, a dual non-sibling argument creates four number features in the input [NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING], while a singular argument only requires [SINGULAR]. I have also stated that some number exponents such as the singular classifier stem *ba* are underspecified for number features. Let me now elaborate on how my analysis formalizes exponent selection. In other realizational models of morphology, like Distributed Morphology (Halle & Marantz 1993), exponence is regulated by the SUBSET PRINCIPLE, given here in (14). The Subset Principle states that an exponent needs to be matching and specific enough to be selected for exponence.

(14) Subset Principle (Halle 1997)
The phonological exponent of a Vocabulary item is inserted into a morpheme if the item matches all or a subset of the grammatical features specified in the terminal

> morpheme. Insertion does not take place if the Vocabulary item contains features not present in the morpheme. Where several Vocabulary items meet the conditions for insertion, the item matching the greatest number of features specified in the terminal morpheme must be chosen.

The Subset Principle prescribes two conditions on exponence: matching and specificity, both of which are relevant to my analysis, as well.[9] With respect to matching, I follow the definition in (14) in assuming that an exponent is matching if it contains a subset of features of the input but no features absent from the input. I further assume that matching is an inviolable condition and hence part of GEN.[10] Formalizing specificity is not that trivial. First, I suggest a stratal model of morphology, which means that exponence selection may target several morphemes at once. That is, an input feature set [A, B, C] is most specifically realized by an exponent [A, B, C] but also by two exponents [A, B] and [C], or even by three different exponents [A], [B] and [C]. Crucially, an exponendum (or a feature set) may also be underexponed (e.g. the input feature set [A, B, C] would only be realized by an exponent [A, B] if there is no way to realize [C] without violating higher ranked constraints). M(AX)(ARG) constraints are violated for each feature in the input that has no realization in the output, thus being the formal implementation of the concept of specificity. This will have the effect that some arguments are more likely to be expressed by underspecified exponents than others: if a [SINGULAR] argument is realized by an underspecified exponent, this will cause one violation of M(AX)(ARG). If, however, a [NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING] argument was realized by an underspecified exponent, the exponent would still be matching but causes four violations for each feature on the input set. Readers familiar with feature geometries like Rice & Avery (1995), Brown (1997), Harley & Ritter (2002) recall that their feature geometries include default nodes. In those systems, if a mother node has more than one daughter node, one daughter is marked as the default. If only the mother were present in an exponent, the default daughter would be inferred by an additional default rule. In my system, I get a similar effect without stipulating defaults: some nodes are more likely to be marked with underspecified exponents. It is, in contrast, not necessary to mark those nodes as special in the feature geometry or to specify an additional default rule. Following the ideas of the Subset Principle, an exponent is selected if it is the most specific and matching exponent of a given set. However, it could still be the case that an underspecified exponent is the most specific one. An anonymous reviewer commented that it is stipulative to assume that the *ba* classifier stem is underspecified, while other singular exponents like the object pronominals *nhi* and *ngi* are specified for [SINGULAR]. It is true that there is no independent evidence for these specifications; however, it is predicted that both specified and underspecified exponents exist in a language. In short, underspecified exponents do not inflate the system, they are part of it.

In addition, there are constraints regulating the relative position of certain categories within a morphological word. To this end, Trommer (2003, 2008) observes that person

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[9] See also Opitz et al. (2013) for psycholinguistics evidence that matching and specificity are two independent conditions on exponence.

[10] In Murrinhpatha, it seems that exponents with nonmatching features never surface. Recent work by Privizentseva (2023), however, has shown that conflicting features do not necessarily cause the derivation to crash. To this end, it can either be assumed that surface forms with conflicting exponents are ruled out due to high-ranked constraints on morphological matching, or excluded from the generated set of output forms by a restriction on GEN.

information is typically aligned to the left edge of the word, while number exponents tend to be realized at the right edge of the word. These cross-linguistic tendencies are captured by two constraints which are violated whenever another exponent intervenes between the left edge of a word and an exponent of [Person] (L ⇐ PERS(ON)) or the right edge of the word and an exponent realizing [Number] (NUM(BER) ⇒ R), respectively. In addition, the markedness constraint *M(ULTIPLE) E(XPONENCE)$_F$ is violated if a feature of the input is realized more than once, thus preventing multiple exponence. Finally, the constraint COH(ERENCE) ensures that features belonging to the same feature set (i.e. the argument feature sets) are realized in adjacency to each other. In this respect, it is irrelevant if the features of the shared feature set are expressed by one and the same exponent or by two different, adjacent exponents. It will only be violated if another exponent which is not part of the shared feature set intervenes.

(15) (a) L ⇐ PERS(ON): (Trommer 2003)
Assign * for each exponent between exponents of [Person] and the left edge of the word.
(b) M(AX)(F): (Trommer 2008, Müller 2020)
Assign * for each feature [F] of the input if it is not realized on an exponent in the output.
(c) M(AX)(ARG)$_{SBJ}$:
Assign * for each feature [F] of the subject argument if it is not realized on an exponent in the output.
(d) M(AX)(ARG)$_{OBJ}$:
Assign * for each feature [F] of the object argument if it is not realized on an exponent in the output.
(e) *M(ULTIPLE) E(XPONENCE)$_F$:
Assign * for each feature F which is realized by more than one exponent.
(f) COH(ERENCE): adapted from Trommer (2008), Müller (2020)
Assign * for each exponent that intervenes between two exponents realizing features from one and the same feature set in the input.
(g) NUM(BER) ⇒ R: (Trommer 2003)
Assign * for each exponent between exponents of [Number] and the right edge of the word.

In contrast to SPOT, the ranking of constraints is only fixed within a stratum. Between the strata, re-ranking may apply. This assumption is based on the observation that certain phonological rules apply only to certain subdomains, suggesting that the ranking of the constraints may differ from one stratum to the other. In the following, I will show how the anomalous positioning of *ngintha* follows from the constraint-driven interaction of the different exponents. Put shortly, my analysis is couched in StratOT and implements the following generalizations:

1. Both objects markers and inner number markers are subject to morphological rules that require them to be a realized in adjacency to the classifier stem. First, L ⇐ PERS(ON) ensures that object exponents carrying [Person] information are realized at the left edge of the word. Second, COH(ERENCE) requires exponents realizing features from the same feature set in adjacency to each other. Hence, both affixes are subject to constraints that

force them to occupy the position to the direct right of the classifier stem, which always occupies the leftmost position in the word.
2. In the presence of both overt object markers and inner number affixes, preference is given to the former.
3. Since the number exponent *ngintha* cannot be concatenated next to the classifier stem, highly ranked placement constraints suppress its realization at the stem-level.
4. To realize as many input features as possible, a featurally more specific form of the classifier stem is selected to minimize violations of $\text{M(AX)(ARG)}_{\text{SBJ}}$, thus explaining the different form of the classifier stem.
5. Since *ngintha* is not strictly bounded to the stem-level, its realization is delayed until the word-level.

6. A StratalOT analysis of Murrinhpatha

Having set the technical preliminaries in the previous section, let me now explain in detail how the peculiar placement of *ngintha* and its phonological correlates can be derived from the interaction of well-established morphological constraints. In this endeavor, let us first consider example (16), repeated from (10a), where *ngintha* attaches to the right of the classifier stem in its singular form.

(16) [[$\boxed{\text{ba}}$-ngintha-∅-$\underline{\text{ngkárdu}}$]$_{\text{stem}}$-nu]$_{\text{word}}$
see.1SG.SBJ-DU–3SG.OBJ-see-FUT
‘We (du. n.-sib.) will see him / her.’ (Nordlinger & Mansfield 2021: 8)

The relevant tableau is given in (17). The input to this derivation is the root $\sqrt{\textit{see}}$, a set of contextual features, as well as the feature sets for the subject and the object argument. As noted earlier in this paper, classifier stems are always portmanteau morphemes carrying subject features. To this end, I assume that the root is an abstract pointer $\sqrt{\textit{see}}$ to the respective classifier stem paradigm. That is, it refers to a set of inflected forms of one and the same classifier stem paradigm, but does not choose a specific form of that paradigm. Note that this assumption is unproblematic in StratOT since the root is not a cyclic domain and does not undergo phonological optimization.

(17) Morphological optimization at stem-level, (16)

ba	[CL.STEM], [1, SBJ, IRR], stem-level
nguba	[CL.STEM], [1, SBJ, N-SING, DAUC, IRR], stem-level
ngkardu	[LX.STEM], ‘to see’, stem-level
∅	[OBJ, SING], [OBJECT], stem-level
nu	[TAM], [FUT], word-level
ngintha	[N-SING, DAUC, DU, N-SIB], unspecified

√*see*, [•cl.stem•], [•lx.stem•], [•tam•], [•obj•] sbj: [sbj, 1, n-sing, dc, du, n-sib] obj: [object, singular] tam: [irrealis, future]			M(cl.stem)	M(lx.stem)	M(tam)	M(Obj)	*ME	M(Arg)$_{\text{Obj}}$	L⇐Pers	Coh	M(Arg)$_{\text{Sbj}}$
a.	☞	ba$_{\text{[1, sbj]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib, irr]}}$-$\emptyset_{\text{[obj, sing]}}$-ngkardu			*						
b.		ba$_{\text{[1, sbj, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-$\emptyset_{\text{[obj, singular]}}$		*!	*						
c.		ba$_{\text{[1, sbj, irr]}}$-$\emptyset_{\text{[obj, sing]}}$-ngkardu			*						*!***
d.		nguba$_{\text{[1, sbj, n-sing, dc, irr]}}$-$\emptyset_{\text{[obj, sing]}}$-ngkardu			*						*!**
e.		nguba$_{\text{[1, sbj, n-sing, dc, irr]}}$-$\emptyset_{\text{[obj, sing]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$			*		*!*				
f.		ba$_{\text{[1, sbj, irr]}}$-$\emptyset_{\text{[obj, sing]}}$-ngkardu-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$			*					*!*	

The contextual features for (16) are [•cl.stem•], [•lx.stem•], [•tam•] and [•obj•], whose exponence is regulated by the constraints Max(cl.stem), Max(lx.stem), Max(obj) and Max(tam). Crucially, all candidates in (17) violate Max(tam) exactly once since there is no morphological way to realize fut at stem-level. Max(cl.stem), Max(lx.stem) and Max (obj) are high-ranked and ensure that a classifier stem, a lexical stem and an object marker are concatenated. As an example, candidate b. is ruled out since it does not comprise a lexical stem, thus fatally violating Max(lx.stem). The remaining constraints make sure that the argument feature sets are realized in an optimal way. Recall that the subject is a 1du non-sibling argument, thus requiring the features [subject, 1, non-singular, daucal, dual, non-sibling], while the 3rd person object only requires [object, singular]. The output form of candidate a. splits the features of the subject onto two different morphemes: the 1st person singular form classifier stem form *ba* realizes [1] and [subject], whereas *ngintha* spells out the remaining number features [non-singular, daucal, dual, non-sibling]. The candidates c. and d., both of which lack the dual marker *ngintha*, cannot become optimal, since they fatally violate Max(Arg)$_{\text{Sbj}}$, which ensures that the subject feature set is exhaustively realized. In candidate a., each feature is realized exactly once, thus avoiding violations of *Multiple Exponence. Candidate e. with the 1st daucal classifier stem, however, is ruled out since the two features [non-singular] and [daucal] are realized twice. Moreover, candidate a. does not violate Coherence, since the two exponents realizing features of the subject feature set are adjacent and not interrupted by different exponents. Most crucially, the object marker does not violate L⇐Pers although it is not at the left edge of the word, since it does not include any person features and is therefore not subject to this constraint. Note that candidate f., in which *ngintha* attaches as an outer affix, is ruled out as it violates Coherence due to two intervening morphemes.

The output of the morphological optimization at stem-level is *ba-ngintha-ngkardu*, which is then taken to the phonological component of the stem-level for further phonological optimization. Note that the output form contains exactly those affixes with are relevant for word stress assignment. Concretely, it contains the classifier stem, inner affixes and the lexical verb, but crucially, no external affixes. Within the phonological component of the stem-level, stress assignment and subminimal lengthening apply. After this computation, bracket erasure takes place and deletes morpheme boundaries. The next step of the derivation takes place in the morphological component at word-level. At this step of the derivation, the grammar has access to the output of the stem-level *banginthangkardu*, as well as word-level and underspecified affixes. The morphological derivation at word-level is illustrated in (18).

(18) Morphological optimization at word-level, (16)

ba	[CL.STEM], [1, SBJ, IRR], stem-level
nguba	[CL.STEM], [1, SBJ, N-SING, DAUC, IRR], stem-level
ngkardu	[LX.STEM], ‘to see’, stem-level
∅	[OBJ, SINGR], [OBJECT], stem-level
nu	[TAM], [FUT], word-level
ngintha	[N-SING, DAUC, DU, N-SIB], unspecified

		banginthangkardu, [●TAM●] SBJ: [~~SBJ, 1, N-SING, DC, DU, N-SIB~~] OBJ: [~~OBJECT, SING~~] TAM: [~~IRREALIS~~, FUT]	M(TAM)	L⇐V	NUM⇒R	*ME	*COH
a.		banginthangkardu$_{\text{[SBJ, 1, N-SING, DC, DU, N-SIB, OBJ, SING, IRR]}}$	*!				
b.	☞	banginthangkardu$_{\text{[SBJ, 1, N-SING, DC, DU, N-SIB, OBJ, SING, IRR]}}$-nu$_{\text{[FUT]}}$			*		
c.		nu$_{\text{[FUT]}}$-banginthangkardu$_{\text{[SBJ, 1, N-SING, DC, DU, N-SIB, OBJ, SING, IRR]}}$		*!			

Most contextual features have already been satisfied at the previous stratum, except for [FUT], which can only be satisfied at word-level. In order to anchor the input at the left edge of the word, I use the high-ranked ALIGNMENT constraint L⇐V which ensures that all affixes attached at word-level will end up in a suffixal position. The concrete definition of L⇐V is given in (19).

(19) L ⇐V
Assign * for each exponent between the base and the left edge of the word.

Since bracket erasure has taken place, the input *banginthangkardu* is treated as a morphologically simplex exponent of the features [SUBJECT, 1, NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING] and [OBJECT] as word-level. Hence, the constraint NUM⇒R is violated once by candidate b. as the TAM exponent *nu* intervenes between *banginthangkardu* and the right edge of the word. Nonetheless, candidate b. becomes optimal since candidate a. does not include any TAM marker and violates the high-ranked MAX(TAM), while candidate c. violates the general suffixing constraint L ⇐V. After this step of morphological optimization, the optimal candidate *banginthangkardu-nu* enters the phonological component of the word-level for further optimization.

Let us now turn to example (10b), which is repeated here in (20), where *ngintha* is concatenated as an external affix and the classifier stem appears in its daucal form.

(20) [[$\boxed{\text{nguba}}$-nhi-ngkárdu]$_{\text{stem}}$-nu-ngintha]$_{\text{word}}$
see.1DC.SBJ–2SG.OBJ-see-FUT–DU
‘We (du. n.-sib.) will see you’ (Nordlinger & Mansfield 2021: 8)

Recall that Nordlinger & Mansfield (2021) describe the pattern in (20) with POSITION CLASSES. Since *ngintha* is blocked in the position after the classifier stem in (20) in the presence of an overt object marker, Nordlinger & Mansfield (2021) assume that both *ngintha* and the object markers compete for the same position class. Moreover, the different shape of the classifier stem in (20) is taken to be evidence for position-conditioned allomorphy where a different allomorph of the classifier stem is chosen in the presence of an object marker. Instead, I argue that the placement of *ngintha* follows from the interaction of well-established morphological constraints and the cyclic structure of the word. The tableau illustrating this derivation is provided in (21).

In contrast to example (16), there is an overt object marker *nhi* in (20), which comes with the featural specification [2, object, sing]. Thus, the constraint L⇐Pers becomes active, shifting the marker to the right of the finite stem.[11] In the previous derivation in (17), the constraint remained inactive since the covert object marker does not spell out person features. In the context of *nhi*, however, L⇐Pers now causes a competition between the object marker and *ngintha* for the position to the right of the classifier, thus following the empirical intuition by Nordlinger & Mansfield (2021). In my analysis, however, the competition arises from morphotactic constraints on positioning preferences rather than from position classes. Specifically, candidate b. replicates the order of affixes that became optimal in (17), yet fatally violates L⇐Pers since the overt object marker *nhi* carries person features. However, shifting the dual marker *ngintha* to the right of the object marker, as in candidates a. or d., causes fatal violations of Coherence. Not realizing an object marker at all in candidate g. or choosing a different object marker in candidate h. in order to avoid violations of L⇐Pers or Coherence is not possible either, due to the high-ranked constraint Max(Obj) and Max(Arg)$_{\text{Obj}}$. Since *ngintha* cannot be realized in the position preferred by Coherence, the grammar chooses to not concatenate the marker at stem-level. Since *ngintha* realized the input features [non-singular, daucal, dual, non-sibling], non-realization of the markers yields four violations of the constraint Max(Arg)$_{\text{Sbj}}$, thus ruling out candidate c. However, the grammar still has the option to choose the more specific classifier stem *nguba*, which is specified for [1, subject, non-singular, daucal], in contrast to *ba*. In (17), the choice of *nguba* was blocked since simultaneous realization of *nguba* and *ngintha* creates a violation of *ME. In the derivation in (21), choosing *nguba* becomes now the preferred option since non-realization of *ngintha* prevents a violation of *ME and creates only two violations of Max(Arg)$_{\text{Sbj}}$. Thus, candidate (e), which includes *nguba*, but excludes *ngintha*, becomes optimal. Note also that all possible candidates violate Max(tam) since there are no exponents of [fut] available at stem-level.

(21) Morphological optimization at stem-level, (20)

ba	[cl.stem], [1, sbj, irr], stem-level
nguba	[cl.stem], [1, sbj, n-sing, dauc, irr], stem-level
ngkardu	[lx.stem], ‘to see’, stem-level
nhi	[obj], [2, obj, sing], stem-level
nu	[tam], [fut], word-level
ngintha	[n-sing, dauc, du, n-sib], unspecified

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[11] Since both the classifier stem and the object marker carry person features, an additional constraint would be needed to determine which affix will end up in the left-most position. This could be achieved with a high-ranked L⇐V, as in (18), which generates structures in which the classifier stem is always to the left.

√*see*, [●CL.STEM●], [●CL.STEM●], [●TAM●], [●OBJ●] SBJ: [SBJ, 1, N-SING, DC, DU, N-SIB,] OBJ: [OBJ, SINGULAR, 2] TAM: [IRREALIS, FUTURE]			M(CL.STEM)	M(LX.STEM)	M(TAM)	M(OBJ)	*ME	M(ARG)$_{\text{OBJ}}$	L⇐PERS	COH	M(ARG)$_{\text{SBJ}}$
a.		ba$_{\text{[1, sbj, irr]}}$-nhi$_{\text{[2, obj, sing]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-ngkardu			*				*	*!	
b.		ba$_{\text{[1, sbj, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-nhi$_{\text{[2, obj, sing]}}$-ngkardu			*				**!		
c.		ba$_{\text{[1, sbj, irr]}}$-nhi$_{\text{[2, obj, sing]}}$-ngkardu			*				*		***!*
d.		ba$_{\text{[1, sbj, irr]}}$-nhi$_{\text{[2, obj, sing]}}$-ngkardu-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$			*				*	*!*	
e.	☞	nguba$_{\text{[1, sbj, n-sing, dc, irr]}}$-nhi$_{\text{[2, obj, sing]}}$-ngkardu			*				*		**
f.		nguba$_{\text{[1, sbj, n-sing, dc, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-nhi$_{\text{[2, obj, sing]}}$-ngkardu			*		*!*		**		
g.		ba$_{\text{[1, sbj, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-ngkardu			*	*!		***			
h.		ba$_{\text{[1, sbj, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-∅$_{\text{[obj, sing]}}$-ngkardu			*			*!			

The optimal output form *nguba-nhi-ngkardu* is taken to the phonological component of stem-level, where the evaluation of the minimum quantity condition, stress assignment and subminimal lengthening apply. After this step, computation at stem-level is complete, bracket erasure takes place and the output is shifted to word-level, illustrated in (22).

(22) Morphological optimization at word-level, (20)

ba	[CL.STEM], [1, SBJ, IRR], stem-level
nguba	[CL.STEM], [1, SBJ, N-SING, DAUC, IRR], stem-level
ngkardu	[LX.STEM], 'to see', stem-level
nhi	[OBJ], [2, OBJ, SING], stem-level
nu	[TAM], [FUT], word-level
ngintha	[N-SING, DAUC, DU, N-SIB], unspecified

ngubanhingkardu, [●TAM●] SBJ: [~~SBJ, 1, N-SING, DC~~, DU, N-SIB] OBJ: [~~OBJECT, SING, 2~~] TAM: [~~IRREALIS~~, FUTURE]			M(TAM)	L⇐V	NUM⇒R	*ME	*COH
a.		ngubanhingkardu$_{\text{[sbj, 1, n-sing, dc, obj, sing, 2, irr]}}$	*!	*			
b.	☞	ngubanhingkardu$_{\text{[sbj, 1, n-sing, dc, obj, sing, 2, irr]}}$-nu$_{\text{[fut]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$			**	**	***
c.		ngubanhingkardu$_{\text{[sbj, 1, n-sing, dc, obj, sing, 2, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$-nu$_{\text{[fut]}}$			***!	**	
d.		nu$_{\text{[fut]}}$-ngubanhingkardu$_{\text{[sbj, 1, n-sing, dc, obj, sing, 2, irr]}}$-ngintha$_{\text{[n-sing, dc, du, n-sib]}}$		*!	*	**	

In contrast to the derivation in (18), no exponent is realizing the input features [DUAL, NON-SIBLING] yet, which caused two violations of M(ARG)$_{\text{SBJ}}$ at stem-level. As a consequence, the grammar will try to find a matching exponent and a TAM exponent. Since *ngintha* is unbounded with respect to the stratum it attaches to, it is concatenated now at word-level and will therefore be realized outside the word stress domain. Since Murrinhpatha does not only have the underspecified *ngintha* number exponent but also a word-level only number marker *ngime*, I believe that the grammar at this level still requires access to the input feature structure to find the matching exponent. Thus, the constraints M(ARG)$_{\text{SBJ}}$ and *ME are still active; however, the relative ranking of these constraints has changed. At word-level, *ME is ranked below M(ARG)$_{\text{SBJ}}$. As a consequence, the grammar will favor candidates in which all input features are realized. The high-ranked MAX constraints require that both a number and a

TAM exponent are concatenated at this step, thus ruling out candidate a. in (22). Again, there is a constraint L⇐V ensuring that all affixes added at this level are suffixes, therefore excluding candidate d. At this point of the derivation, NUM⇒R (Trommer 2001, 2003, 2008) becomes active and regulates the relative ranking of TAM and *ngintha.* Candidate b., which surfaces in (3b), is therefore successfully predicted to become the optimal candidate. It is worth mentioning that the relative order of the TAM exponents and the number exponents are word-level is rather flexible. Thus, it remains unclear whether the relative order should be regulated by morphotactic constraints or whether the order is subject to free variation.

In the analysis suggested in this paper, the anomalous placement of *ngintha* is an instance of CYCLIC COUNTERBLEEDING in grammar. On the surface, the pattern in (20) seems like overexponence of the features [NON-SINGULAR] and [DAUCAL]. However, the phonological properties of the word reveal that the apparent overexponence results from cyclicity. First, *ngintha* is suppressed in the presence of an overt object marker. Due to the non-realization of *ngintha* at stem-level, the grammar selects a featurally more specific classifier stem. Second, *ngintha* is underspecified with respect to the stratum at which it attaches and is therefore realized at word-level. Crucially, the grammar at stem-level cannot anticipate that *ngintha* will be realized in a later step. Hence, the stem-level grammar chooses the optimal option for its domain, although this results in overexponence at a later domain. It is worth mentioning that affixation itself is only limited by *MULTIPLE EXPONENCE and other constraints on morphological well-formedness. As long as these constraints are obeyed, affixation may in principle apply without any restriction on the maximum number of affixes. In this respect, this work differs from a position-class analysis in the style of Crysmann & Bonami (2016), but also from other morphological analyses of affixation, such as Wunderlich & Fabri (1995), Wunderlich (1997), Ortmann (1999), Aissen (2003), Don & Blom (2006), Müller (2020).

In this paper, I follow Nordlinger & Mansfield (2021) in assuming that there is a competition between overt object markers and *ngintha* for the position to the right of the classifier stem. However, the theoretical devices triggering the competition are constraints that are based on crosslinguistic preferences of the realization of person and number markers rather than position classes. An anonymous reviewer notes that assuming a level specification for each morpheme is equally powerful as assuming a position class for each affix. While it is true that the level specification is stored in the lexicon, there are three major advantages in assuming stratification, rather than position classes: first, the level specification of a morpheme does not only explain the morphological irregularities but neatly derives the phonological asymmetries between the affixes involved. If the position of *ngintha* and the allomorphy of the classifier stem were derived with position classes or a similar morphotactic device, the phonological asymmetry would still lack an analysis – which would probably require cyclicity anyway (Mansfield 2017). Second, Nordlinger & Mansfield (2021) refer to position classes to describe the context of the classifier stem alternation to the daucal stem. That way, however, the context and the output of the alternation are not connected. In other words, it remains unclear why the classifier stem is daucal rather than plural in the context of an overt object marker. The analysis I put forth in this paper, in contrast, connects the context and the output. When an overt object marker is present, the interaction of morphological constraints causes the suppression of the dual marker *ngintha* and the choice of the daucal form. The third notable advantage of stratification to position classes, as emphasized by another anonymous reviewer, is that all theoretical tools employed rely on independent evidence, including phonological evidence for the strata and typological evidence for the constraints on linearity. Moreover, the morphological markedness constraints L⇐PERS and COHERENCE refer to specific morphosyntactic categories. Hence, they make clear predictions about the categories involved while position classes may in principle be associated with any morpheme.

In the remainder of this paper, I will first elaborate on how the interaction of morphological constraints can neatly explain the distribution of object number exponents in Section 7.1. Section 7.2 emphasizes that the anomalous placement of *ngintha* is an interplay of suppression, reranking and stratal underspecification, and hence a lexical property of *ngintha*. Moreover, the placement of *ngintha* and its phonological correlates are connected to cyclicity, universal morphological constraints and stratal underspecification. Since these properties can be assumed to exist in other languages as well, the analysis suggests that we should find more patterns of delayed realization in other languages than Murrinhpatha. To this end, I discuss Umlaut in Sinhala in Section 7.3.

7. Discussion

7.1. An extension to object number

In the previous section, we have seen that the realization of *ngintha* is delayed since it cannot be realized in the position to the right of the classifier stem. Specifically, the intervention of an object marker causes a fatal violation of COHERENCE, which ensures that exponents belonging to the same argument appear in adjacency. These assumptions predict that *ngintha* should be allowed to appear after the object marker when it spells out features of the object argument since this would not cause a violation of COHERENCE. The examples in (23), however, illustrate that this prediction is not borne out. In both subexamples, the features of the object are realized by means of three separate markers. In (23a), there is an inner, pronominal affix *ngan*, a daucal marker *ngku* and an outer paucal, feminine affix *ngime.* We already encountered the paucal exponent *ngime* when discussing the distribution of subject number exponents in Figures 1 and 2 and concluded that it always appears as an outer affix. Hence, nothing contradicts the assumption that *ngime* is a word-level affix, thus explaining that it appears as an outer affix after the lexical stem in (23a). However, this assumption cannot be extended to *ngintha* in (23b). For this example, we would expect *ngintha* to appear after the object pronominal *ngan*, since *ngintha* is stratally unbounded and does not violate COHERENCE when it marks object features. Put shortly, the placement of *ngintha* as an outer affix in (23b) seems unexpected and contradicts the analysis suggested in the previous section.

(23) Distribution of object number participants (Mansfield 2019: 150f)
(a) [[$\boxed{\text{pan}}$-ŋan-ŋku-$\underline{\text{bat}}$]$_{\text{stem}}$-Nime]$_{\text{word}}$
slash.3SG.NFUT–1PL.OBJ-DC.OBJ-hit-PC.F
‘she hit us (paucal, female)’
(b) [[$\boxed{\text{pan}}$-ŋan-ŋku-$\underline{\text{bat}}$]$_{\text{stem}}$-ŋin̪t̪a]$_{\text{word}}$
slash.3SG.NFUT–1PL.OBJ-DC.OBJ-hit-DU
‘she hit us (dual, female)’

Let us delve deeper into this pattern and determine the featural specifications of the number exponents by examining the distribution of object number exponents in Figure 5.

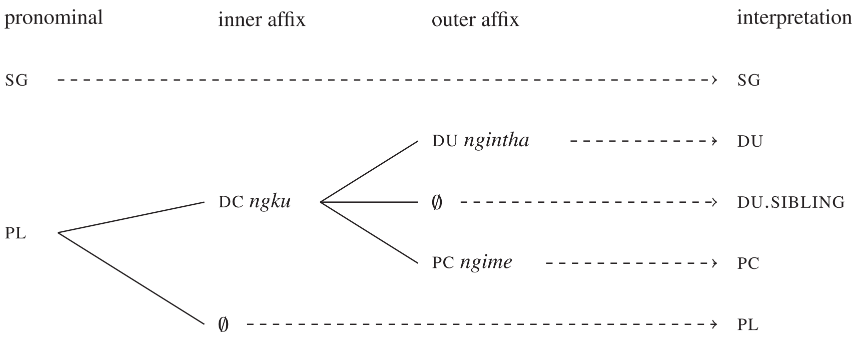

Figure 5. Distribution of OBJ number exponents (Mansfield 2019: 143).

The leftmost column refers to the possible forms of the pronominal affix, which is the 1PL form *ngan* in (23a) and (23b). In contrast to the classifier stem forms in Figures 1 and 2, the singular never combines with other number exponents. As a consequence, I assume that the singular object pronominal is specified for [SINGULAR], whereas singular classifier stems are unspecified. Thus, Murrinhpatha exploits two different realization strategies for the singular category: it is underspecified in the singular classifier stems but realized by the feature [SINGULAR] in the object pronominals. Without any additional number exponents, the PL forms refer to plural entities and can therefore be assumed to be [NON-SINGULAR]. Example (23a) demonstrates that the plural pronominal may combine with an additional daucal marker *ngku.* In the absence of additional outer number exponents, the combination of a plural and daucal *ngku* refers to dual, sibling referents. Thus, I infer that plural pronominals are only specified for [NON-SINGULAR], whereas *ngku* is specified for [DAUCAL]. For *ngime* and *ngintha*, we have already established the featural specifications [PAUCAL] and [NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING], respectively. Recall that *ngime* and *ngintha* differ in their stratal affiliation. While *ngintha* attaches at both phonological domains depending on the morphological context, *ngime* ever only attaches at word-level. Hence, we have to assume that it is a word-level affix.

We can now list the featural specifications and stratal affiliations of the exponents in (23) in Table 5. Crucially, the plural pronominal is specified for [NON-SINGULAR], while the singular pronominal is [SINGULAR].

In the following, I will show that the featural specifications of the number exponents explain why *ngintha* is realized as an outer affix despite referring to the object argument in (23b). The input to the derivation in (24) is the contextual features [• CL.STEM •], [• LX.STEM •], [• TAM •] and [• OBJ •], as well as the feature sets of the arguments. Since the subject is 3SG, the subject argument set requires the features [SUBJECT, SINGULAR]. In this scenario, Murrinhpatha has no morphological means to realize the [SINGULAR] feature, since there is only a [SUBJECT] classifier stem unmarked for number or a nonmatching [SUBJECT, NON-SINGULAR] classifier stem. Hence, the subject features will be underrealized in this case, leading to a violation of MAX(ARG)$_{\text{SBJ}}$. The object argument is 1DU, hence requiring the features [1, OBJECT, NON-SINGULAR, DAUCAL, DUAL, NON-SIBLING]. Note that there is only one TAM feature [N-FUT] in this context, which will always be satisfied by the classifier stem. The tableau in (24) allows the following observation: since the object pronominal is already specified for [NON-SINGULAR], simultaneous realization of *ngintha* will always result in a violation of *MULTIPLE EXPONENCE. Since *MULTIPLE EXPONENCE is higher ranked than M(ARG)$_{\text{OBJ}}$, these violations are fatal for candidates c., d. and f., all of which contain an object pronominal and *ngintha.* Note also that switching to the singular pronominal is not possible, since the [SINGULAR] feature on *ngi* contradicts the required [NON-SINGULAR] feature of the object. Deleting the object pronominal altogether, however, creates a fatal violation of M(OBJ) in candidate b. The only remaining option for the stem-level grammar is to not realize *ngintha* at stem-level. This causes three violations of $\text{M(ARG)}_{\text{OBJ}}$ in candidate e. The grammar has the option to minimize the violations of $\text{M(ARG)}_{\text{OBJ}}$ by concatenating the daucal marker *ngku* in candidate a, which becomes optimal.

(24) Morphological optimization at stem-level, (23b)

pan	[CL.STEM], [SBJ, N-FUT], stem-level
bat	[LX.STEM], 'hit', stem-level
ngan	[OBJ], [1, OBJ, N-SING], stem-level
∅	[OBJ], [OBJ, SING], stem-level
ngku	[DAUC], stem-level
ngime	[PAUC], word-level
ngintha	[N-SING, DAUC, DU, N-SIB], unspecified

√*slash*, [•CL.STEM•], [•TAM•],[•LX.STEM•], [•OBJ•] SBJ: [SUBJECT, SINGULAR] OBJ: [1, OBJ, N-SING, DC, DU, N-SIBL] TAM: [N-FUT]	M(CL.STEM)	M(LX.STEM)	M(TAM)	M(OBJ)	*ME	$\text{M(ARG)}_{\text{OBJ}}$	L⇐PERS	COH	$\text{M(ARG)}_{\text{SBJ}}$
a. ☞ pan$_{\text{[SBJ, N-FUT]}}$-ngan$_{\text{[1, OBJ, N-SING]}}$-ngku$_{\text{[DC]}}$-bat						**			*
b. pan$_{\text{[SBJ, N-FUT]}}$-ngintha$_{\text{[N-SING, DC, DU, N-SIB]}}$-bat				*!		**			*
c. pan$_{\text{[SBJ, N-FUT]}}$-ngan$_{\text{[1, OBJ, N-SING]}}$-ngintha$_{\text{[N-SING, DC, DU, N-SIB]}}$-bat					*!				*
d. pan$_{\text{[SBJ, N-FUT]}}$-ngku$_{\text{[DC]}}$-ngintha$_{\text{[N-SING, DC, DU, N-SIB]}}$-bat				*!	*	**	*		*
e. pan$_{\text{[SBJ, N-FUT]}}$-ngan$_{\text{[1, OBJ, N-SING]}}$-bat						***!			*
f. pan$_{\text{[SBJ, N-FUT]}}$-ngan$_{\text{[1, OBJ, N-SING]}}$-ngku$_{\text{[DC]}}$-ngintha$_{\text{[N-SING, DC, DU, N-SIB]}}$-bat					*!*				*

From this point of the derivation, the computation proceeds as already described in Section 6. The optimal candidate of the derivation in (24), *pan-ngan-ngku-bat* passes the phonological computation at stem-level, after which bracket erasure takes place. Afterwards, *pannganngkubat* enters the morphological derivation at word-level, which is illustrated in (25). Recall that the word-level includes re-ranking of *MULTIPLE EXPONENCE and $\text{M(ARG}_{\text{Obj}})$. Consequently, the optimal output candidate of the derivation in (25) is candidate b., in which *ngintha* serves to realize the remaining features [DUAL, NON-SIBLING] of the object feature set despite violating *MULTIPLE EXPONENCE, while candidate a. which avoids a violation of *MULTIPLE EXPONENCE by not concatenating another number exponent is ruled out since it fatally violates $\text{M(ARG}_{\text{Obj}})$.

(25) Morphological optimization at word-level, (23b)

pan	[CL.STEM], [SBJ, N-FUT], stem-level
bat	[LX.STEM], 'hit', stem-level
ngan	[OBJ], [1, OBJ, N-SING], stem-level
∅	[OBJ], [OBJ, SING], stem-level
ngku	[DAUC], stem-level
ngime	[PAUC], word-level
ngintha	[N-SING, DAUC, DU, N-SIB], unspecified

pannganngkubat SBJ: [~~SUBJECT~~, SINGULAR] OBJ: [~~1, OBJ, N-SING, DC~~, DU, N-SIB] TAM: [~~N-FUT~~]			M(TAM)	L⇐V	M(ARG$_{\text{Obj}}$)	NUM⇒R	*ME
a.		pannganngkubat$_{\text{[SBJ, OBJ, 1, N-SING, DC]}}$			*!*		
b.	☞	pannganngkubat$_{\text{[SBJ, OBJ, 1, N-SING, DC]}}$-ngintha$_{\text{[N-SING, DC, DU, N-SIB]}}$				*	**
c.		ngintha$_{\text{[N-SING, DC, DU, N-SIB]}}$-pannganngkubat$_{\text{[SBJ, OBJ, 1, N-SING, DC]}}$		*!		*	**

Put shortly, the analysis forwarded in this paper can also capture the observation that *ngintha* appears as an outer affix when it refers to the object argument. However, the delayed realization of *ngintha* results from a violation of *MULTIPLE EXPONENCE rather than from a violation of COHERENCE.

7.2. Morphological blocking of stem-level affixes

In the analysis I advance in Section 6, I assume that the grammar at stem-level determines the non-realization of *ngintha* in the context of overt objects. Since *ngintha* is stratally unbounded, it has the chance to be realized at a later level. A core assumption of StratOT is that the stratal affiliation is a lexical property of each affix. Hence, it is a lexical coincidence that *ngintha* can be realized later, which is entirely independent of its suppression at stem-level. This assumption further predicts that stem-level affixes with similar featural specifications would be blocked in the context of overt object markers. Example (26) illustrates that this prediction is in fact borne out. In both subexamples, the subject is 3PC. Recall from Figure 2 that this context is realized by a combination of the PL classifier stem and an additional daucal affix *ka* in inner position in NFUT contexts. This is exactly the combination that surfaces in example (26a), which does not contain overt object markers. In (26b), however, the presence of an overt object marker *nga* blocks the realization of *ka*, yet the subject is 3PC. In contrast to *ngintha*, however, *ka* is a stem-level affix only and can therefore not be realized at word-level. As a result, the feature [DAUCAL] remains unrealized.

(26) *-ka* as a stem-level affix only (Mansfield 2017: 365)
(a) [[$\boxed{\text{Pumám}}$-ka]$_{\text{stem}}$-ŋime]$_{\text{word}}$
say.3PL.NFUT-DC.SBJ-PC.F
‘They (paucal) said’
(b) dráf [[$\boxed{\text{Pumám}}$-ŋ]$_{\text{stem}}$-neme]$_{\text{word}}$
draft do.3PL.NFUT–1SG.OBJ-PC.M
‘They (paucal) drafted me.’

7.3. Another instance of delayed realization: Umlaut in Sinhala

Due to the differential phonological behavior of *ngintha* in the two possible positions, I treat the placement of *ngintha* as delayed realization due to morphological blocking. Given that the morphological constraints, cyclicity and stratal underspecification are expected to exist in other languages as well, my analysis predicts more patterns of delayed concatenation. Specifically, we should find languages in which one and the same affix displays different phonological properties depending on the morphological context of the affix. Such a pattern is found in Sinhala, as exemplified in (27).

(27) Umlaut in Sinhala (Fenger & Weisser 2023: 5, 7)
(a) æ-ə-la tie-n-wa
pull-CL2-PFV be-NPST-IND
'have pulled'
(b) bæl-∅-u-wa
look-CL1-PST-IND
'looked'
(c) ad-ə-wə-la tie-nə-wa
pull-CL2-CAUS-PFV be-NPST-IND
'have made someone pull'
(d) bæl-ə-wə-u-wa
look-CL1-CAUS-PST-IND
'made someone look'

In this language, certain affixes like the perfective suffix *la* trigger umlaut of the root. In (27a), the root with the underlying form *ad* 'to pull' surfaces as *æ* in the context of the perfective suffix *la.* Similarly, the underlying 'root *bal* 'to look' becomes *bæl* in the context of the past suffix *u* in (27b). When a causative suffix intervenes, as in (27c) and (27d), the umlaut-triggering past suffix behaves differently than the perfective suffix. While the past suffix triggers umlaut across the causative in (27d), umlaut is blocked in the context of the causative in (27c). In short, it cannot be assumed that umlaut only applies in strictly local configurations, since it does apply across intervening affixes in (27d). A possible explanation for the blocking of umlaut in (27c) is delayed realization. In similarity to delayed concatenation of *ngintha*, we could assume that the causative blocks concatenation of the perfective marker in the cyclic domain responsible for umlaut. Parallel to *ngintha*, the perfective marker *la* is stratally unbounded and attaches at a later, cyclic domain.

8. Conclusion

In this paper, I have discussed and explained the peculiar placement of the dual marker *ngintha* in the morphologically highly complex language Murrinhpatha, in which the presence of overt object markers affects the position of the dual marker *ngintha* and the form of the classifier stem. Specifically, *ngintha* appears to the right of the classifier stem in the absence of overt object markers in (28a) but at the right edge of the word when object markers are overtly realized in (28b). Furthermore, Murrinhpatha uses the singular form of the classifier stem when adjacent to the dual marker in (28a), but the daucal form when followed by the object marker in (28b).

(28) Placement of *ngintha* (Nordlinger & Mansfield 2021: 8)

(a) $\boxed{\text{ba}}$-ngintha-$\underline{\text{ngkardu}}$-nu
see.1SG.SBJ.IRR-DU-see-FUT
'We (dual non-sibling) will see him / her.'

(b) $\boxed{\text{nguba}}$-nhi-$\underline{\text{ngkardu}}$-nu-ngintha
see.1DC.SBJ.IRR–2SG.OBJ-see-FUT–DU
'We (dual non-sibling) will see you.'

Nordlinger & Mansfield (2021) describe the alternation of the classifier stem as an instance of POSITION-DEPENDENT ALLOMORPHY, where the form of the classifier stem depends on the morphological content of the following position class. Moreover, Nordlinger & Mansfield (2021) assume that the replacement of *ngintha* follows from its competition with the object marker for the position class to the right of the classifier stem. In this paper, I tackle this view and illustrate that both phenomena follow from the interaction of universal and violable morphological constraints, the featural specifications of the exponents and the cyclic structure of the word in Murrinhpatha. To this end, the phonological behavior of affixes in different positions was discussed in Section 3 with the conclusion that the word in Murrinhpatha is separated into two different morphophonological layers. Section 4 examines the distributions and combinations of the different number exponents in Murrinhpatha, which allowed us to infer the morphological structure of number and the featural specifications of the number exponents. Section 5 capitalizes on the StratalOT framework adopted in the analysis. StratalOT neatly captures the cyclic structure of the word and the interaction of violable constraints. Crucially, these universal, morphological constraints are based on typological tendencies of the realization of phi features (Trommer 2001). In sum, my assumptions build upon independent evidence, whereas position classes have to be stipulated as primitive entities of morphological theory.

In Section 6, I explain how the interaction of constraints and the featural specifications of the exponents explain both the placement of *ngintha* and the alternation of the classifier stem form. Specifically, the position of *ngintha* results from a competition between different morphological constraints, where both object markers and inner number markers are required to attach to the right of the classifier stem. First, L ⇐ PERS(ON) ensures that object exponents carrying [Person] information are realized at the left edge of the word. Second, COH(ERENCE) requires exponents realizing features from the same feature set in adjacency to each other. Since L ⇐ PERS(ON) outranks COH(ERENCE), object markers win the competition and appear to the right of the classifier stem in (28b). Since the number exponent *ngintha* can no longer be realized in the position next to the classifier stem, it is suppressed at the first morphophonological cycle altogether. As a consequence, a featurally more specific form of the classifier stem is selected to realize as many input features as possible. Thus, the analysis forwarded in this paper explains not only that the form of the classifier stem changes but also why it changes to the daucal marker. Since *ngintha* is not strictly bounded to the stem-level, its realization is delayed until the word-level.

In the remainder of this paper, I illustrate how my analysis can be extended to object number in Section 7.1. Put shortly, the extraordinary placement of *ngintha* follows from suppression at stem-level, the stratal unboundedness of *ngintha* and constraint reranking, which allows the grammar to delay its realization. Section 7.2 highlights that these factors are independent of each other. Evidence for this claim comes from the paucal marker *ka*, which is suppressed in the very same morphosyntactic context but cannot be concatenated later, thus resulting in deletion of the exponent. This paper opens an entirely new view on patterns where morphemes display a different phonological behavior in the context of other exponents. Section 7.3 illustrates how this generalization can potentially be extended to more cases of delayed exponence.

In sum, I have analyzed a complex morphological pattern by means of a StratOT analysis, which rests on independently motivated assumptions and is therefore beneficial to analyses using position classes. Moreover, this paper has shown that studying the phonological properties of affixes provides a window into the morphological structure of the word, which allows us to answer recalcitrant morphological problems.

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