Prosodic Licensing of /o/ in Katki and Sambalpuri: A nonce-based study

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ABSTRACT
Katki and Sambalpuri, two closely related varieties of Odia, exhibit microvariation in the phonological environments in which they allow the vowel /o/ to surface. This paper explores the Licensing Conditions on this vowel in the phonological grammar of Odia by asking three questions. First, what is special about the phonological composition of the vowel /o/ within the repertoire of Odia; second, what is special about the leftmost and rightmost syllables in Katki and Sambalpuri; and finally, is this phonological phenomenon a consequence of diachronic sound change, or is it reflected in the synchronic grammar of these languages. By comparing the cognates across the two varieties, we first establish what happens to the underlying /o/ in contexts where they do not meet the licensing conditions. Then, analyzing the lexical data from these languages we propose that contrastive characteristics of phonemes, such as headedness associated with Elements, is preserved in marked positions but neutralized elsewhere. Further a nonce-word based language game reveals that the synchronic grammar of Katki Odia does not replicate the phonological output observed in the lexical words.

1 Introduction

In this paper we will discuss the central role played by *Licensing Conditions* in phonological systems. The assumption underlying the idea of Licensing Condition is that, unless there is some phonological factor blocking its expression, a consonantal or vocalic phoneme should be present in all positions in a phonological string that corresponds to consonants or vowels. In other words, if /a/ is a phoneme in a language, then it should be attested in all possible phonological contexts where a vowel can be present. A Licensing Condition thus describes what is absent in the empirical data and the factors that block its expression in that environment.

Licensing Conditions on the expression of vowels have been discussed in preceding literature on the Eastern Indo-Aryan (EIA) language Bangla, where the vowel /a/ is severely restricted in disyllables where the preceding syllable contains the vowels /i/ or /u/ (Sanyal, 2010). The Eastern dialects of Bangla that do not have this Licensing Condition continue to have the vowel sequences [i-a] and [u-a] in surface representation. But the South-western variety has devised alternative pronunciations for such words that avoid these sequences.

(1) Licensing Condition on /a/ in Bangla

Nouns				**Verbs**	
d̪ukan~d̪**o**kan	‘shop’	šiṭ̪ar~še**ɛ**ṭ̪ar	‘sitar’	ɖʰuk-a-no~ɖʰ**o**k-a-no	‘enter.cause’
šuṭ̪a~šuṭ̪**o**	‘thread’	pʰiṭ̪a~pʰiṭ̪**e**	‘tape’	šik-a-no~ š**e**k-a-no	‘learn.cause’

A similar licensing condition on the vowel /a/ is seen in the inflectional paradigm of Katki Odia where two consecutive syllables with the vowel /a/ are avoided (Sanyal 2025). Although Katki Odia has some lexical items with the vowel /a/ in consecutive syllables, such as /ʈala/ ‘lock’ and /ɟama/ ‘dress’, when compared to cognates from Bangla and Hindi, other IA languages, the distributional restriction becomes apparent. This is further seen clearly in the inflectional domain of Katki verbs (Nayak 2023). These are shown in (2).

(2) Licensing Condition on /a/ in Katki Odia

Nouns			**Verbs**	
Katki Odia	Bangla/Hindi cognates		ɖak	‘call’
cʰɔʈa	cʰaʈa	‘umbrella’	ɖak-e	‘call.1p’
ɔʈa	aʈa	‘flour’	ɖɔk-a-e	‘call.cause.1p’

These examples show that Licensing Conditions that restrict the distribution of certain vowels are not uncommon in the phonology of EIA languages. Unlike other Indo-Aryan languages that typically show phonemic length distinction in the vowels /i/, /u/ and /a/, EIA languages lack phonemic length distinction altogether.

In this paper, we focus on the distribution of the vowel /o/ with respect to specific Licensing Conditions in the Sambalpuri and Katki varieties of Odia. Since the phenomenon that we seek to describe entails the absence of a phoneme x from the surface representation in a particular phonological context, methodologically, we will compare cognates across related languages and varieties to establish that the phoneme was indeed present at some level of representation before some phonological factors blocked its expression in the surface representation. Consequently, we have chosen to compare cognates across the two varieties of Odia, Sambalpuri and Katki. As the same vowel /o/ has different distributional restrictions in these two varieties, comparing the cognates helps us visualize the Licensing Conditions on /o/ in Odia. The empirical data pertaining to this is described in §1.1.

1.1 Comparison of cognates

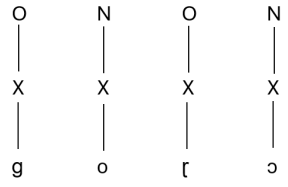
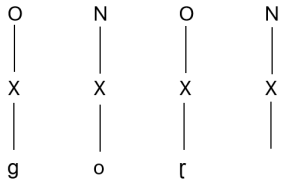
The vowel /o/ is a phoneme in both Sambalpuri and Katki forming near minimal pairs. Both varieties share the same vowel repertoire /i, e, a, ɔ, o, u/ (Pandey 2014, Sahu 2001) which includes three middle vowels: one front and two back. (3) shows that the vowel /o/ is found in contrastive distribution in both the languages.

(3) Contrastive distribution of /o/ with other vowels in both varieties

	Katki				**Sambalpuri**			
/o/-/ɔ/	corɔ	‘thief’	cɔrɔ	‘to gaze’	cor	‘thief’	cɔr	‘gaze’
/o/-/a/	goʈɔ	‘leg’	galɔ	‘cheek’	goʈ	‘leg’	gal	‘cheek’
/o/-/u/	koɭɔ	‘lap’	kuɭɔ	‘dynasty’	kol	‘lap’	kul	‘dynasty’
/o/-/i/	bolɔ	‘talk’	bilɔ	‘burrow’	bol	‘talk’	bil	‘burrow’
/o/-/e/	toɭɔ	‘to weigh’	telɔ	‘oil’	tol	‘to weigh’	tel	‘oil’

When we compare the Katki words with their cognates in Sambalpuri in (3) it becomes apparent that these words are underlyingly monosyllables. As Katki does not allow phonological strings to end in consonants, an epenthetic vowel /ɔ/ is inserted in the string final position in Katki. A visualization for this is shown in (4) using CV Theory (Lowenstamm, 1996).

(4) Visualization of monosyllabic CVC strings in Katki and Sambalpuri

Katki	**Sambalpuri**
	
No Licensing of final Empty Nucleus	Toleration of final Empty Nucleus

Comparison of the cognates for underlyingly disyllabic words between the two languages reveals the differences in the licensing of /o/. This has been shown in (5) and (7) below.

(5) Alignment to the Left Edge

Katki	**Sambalpuri**	
ɡora	ɡura	'fair.Masc'
ɟoɽe	ɟuɽe	'pair'
ɖoɭi	ɖuli	'cradle'

In Sambalpuri there are no polysyllabic words that have the vowel /o/ in the leftmost syllable. On contrary, in Katki such words are commonly found. When we compare the Katki words with /o/ in the leftmost syllable to their cognates in Sambalpuri, the /o/ seems to have been systematically replaced by the vowel /u/. Note that the dataset presented in (5) lends itself to two symmetric generalizations. First, the underlying vowel in the leftmost syllable for the words is /o/. Second, the underlying vowel in these positions is /u/. Based on the former position we can state the rule for Sambalpuri as [o→u/ σ1]. Similarly, based on the latter position we can also state the rule for Katki as [u→o/ σ1]. To select between these two descriptive positions, we need to observe whether the vowels /o/ and /u/ are attested in the σ1 position in Sambalpuri and Katki. In disyllables, while there are no Sambalpuri words with /o/ in σ1, there are plenty of Katki words with /u/ in σ1 position. This is shown in (6) below.

(6) Katki words with /u/ in σ1 position

Katki	**Sambalpuri**	
suta	suṯa	'thread'
sure	sure	'rhythmic'
muṛi	muṛi	'popped rice'

The data presented in (6) establishes the following two points. First, the vowel /u/ in Sambalpuri σ1 does not generally correspond to the vowel /o/ in cognate vocabulary from Katki. And second, most /o/ in Katki σ1 position corresponds to the vowel /u/ in Sambalpuri cognates. Just as the vowel /o/ is restricted to the leftmost syllable in Katki, /o/ is restricted to the rightmost syllable in Sambalpuri.

(7) Alignment to the Right Edge

Katki	**Sambalpuri**	
seu	seo	'apple'
hɔu	hɔo	'okay'

Comparing the rightmost syllable of lexical words across Sambalpuri and Katki is not as straightforward as comparing the leftmost syllables. As discussed in (4), contrary to Sambalpuri, which can have C-final words, Katki adds an epenthetic vowel to all C-final lexical words making that the last syllable. Such as, a disyllabic C-final word like [kɔməl] 'lotus', in Sambalpuri corresponds to the Katki cognate [kɔmə[ɔ], a trisyllable. So, for every penultimate Sambalpuri syllable, the corresponding anti-penultimate Katki syllable is to be observed. Hence, for the Sambalpuri word [kɔ(məl)], we shall observe the Katki word [kɔ(mɔ)[ɔ]. So, we are comparing the rightmost syllable in V-final words from Sambalpuri to the penultimate syllable of the corresponding Katki cognates.

Similar to the phonological pattern in (5) and (6), we find that the vowel /o/ is never realized in the rightmost syllable of polysyllabic words in Katki, but /o/ is readily attested in this position in Sambalpuri. Further, the rightmost /o/ in Sambalpuri corresponds to the vowel /u/ in Katki cognates. Hence, concluding that both varieties of Odia show the same change in vowel quality [o→u] in different environments. An interim generalization from this section is summarized in (8).

(8) Interim generalization 1

Language	Rule-based description	
Katki Odia	o→u/__(C)#	/o/ changes to /u/ in the rightmost syllable
Sambalpuri Odia	o→u/ # (C)__	/o/ changes to /u/ in the leftmost syllable

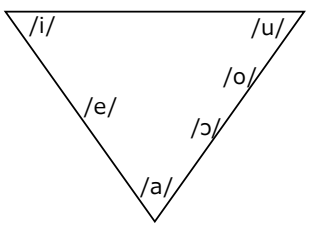
The following section discusses why these phonological changes take place in these environments.

1.2 Theoretical discussion on phonological change

There are three distinct aspects to the phonological change in vowels discussed in §1.1. First, the phonological process affects the initial and final syllables in the two varieties of Odia. What is special about these boundary positions and why do they trigger change? Second, we have deduced phonological change by comparing cognates across varieties. The phonological change does not tell us whether the process was part of a diachronic sound change or is it current in the phonological grammar of these languages. Third, among the six-vowel repertoire of Odia, only the vowel /o/ is subject to Licensing Conditions. Why does the same phonological environment not affect other vowels? Of these three aspects, we will discuss the last one in this section and come back to the first and second aspect in §2 and §4 of this paper.

Odia has six vowel repertoire: two front vowels (/i/, /e/), three back vowels (/u/, /o/ and /ɔ/) and a low vowel (/a/). If we look at the schematized placement of these vowels in the cardinal vowel space, the back appears to be more crowded in comparison to the front. Similarly, if we describe the six vocalic melodies of Odia using Element Theory (Backley, 2011), then headedness[1] appears to become crucial for phonemic identity only in case of the mid-back vowels, one of which is /o/. (9) below shows both these visualizations for the six-vowel repertoire of Odia.

(9) Visualization of the six-vowel phonemic inventory of Odia



Phoneme	Melody
/i/	|I|
/u/	|U|
/a/	|A|
/e/	|IA|
/o/	|U̲A|
/ɔ/	|UA̲|

For the first three vowel phonemes in (9), /i/, /u/ and /a/, headedness is not a crucial distinctive characteristic since the language does not contain any other phoneme with the headed |I̲|, |U̲| and |A̲| that would contrast with the non-headed |I|, |U| and |A|. Similarly, there is only one phoneme with the melodic combination |IA| in Odia. As there is no phonemic contrast between |I̲A| and |IA̲|, the headedness parameter is not distinctive for this context either.

In contrast to these cases, the headedness parameter becomes meaningful to describe the contrast between the phonemes /o/ and /ɔ/ since both of them are expressed with the melodic combination |UA|. While /o/ is expressed with a headed |U|, as in |U̲A|, /ɔ/ is expressed with a headed |A|, as in |UA̲|. Considering one of the phonemes were to be restricted to a particular position in the word, the headedness parameter would be restricted to that position. Whereas, elsewhere in the language the melodic tier would not have to be specified by headedness at all.

Of these two vowels with the melodic combination |UA|, the one with the headed |A| element forms the epenthetic vowel /ɔ/ in Katki and vocalises the empty nucleus in

[1] Headedness is marked by underlining the head element.

word-final positions (4). Being the word final epenthetic vowel in Katki, /ɔ/ cannot be restricted to a specific phonological position. Consequently, the other vowel with the |U̲A| melody, /o/ gets restricted to leftmost syllables.

Since the vowel /o/ is restricted to the leftmost syllable in Katki, one of the possibilities would be to assume that the headedness parameter is restricted to this position and does not get expressed elsewhere. However, this assumption would predict that the vowels |U̲A| and |UA̲| both get expressed the leftmost syllable but lose the headedness parameter and get expressed as |UA| elsewhere. This approach would entail that we revise the element-based configuration of the six-vowel repertoire and consider the vowel /o/ to be the only vowel that is phonologically specified for the headedness parameter. This is shown in (10).

(10) Revised description of the phonemic inventory of Odia

Phoneme	Melody
/i/	|I|
/u/	|U|
/a/	|A|
/e/	|IA|
/ɔ/	|UA|
/o/	|U̲A|

With this theoretical description, we propose that the Licensing Conditions on the vowel /o/ in Katki and Sambalpuri is in actuality a Licensing Condition on the headedness parameter. The other vowels in the phonemic repertoire do not exhibit distributional restrictions as they do not require the expression of the headedness parameter.

While the theoretical reformulation of the vowel inventory in (10) successfully explains why the vowel /o/ is the only vowel in the repertoire with such distributional restrictions, there is a remaining issue that it does not answer. If the headedness parameter can only be expressed in the specific phonological position, then elsewhere the loss of headedness should have changed the /o/ to /ɔ/. Instead, the data in §1.1 shows that elsewhere the /o/ changes to /u/. This issue will be discussed further in §4 and §5 of the paper.

2 An argument for Prosodic Licensing

In §1.1 of this paper we showed that the phoneme /o/ is restricted to the leftmost and the rightmost syllables in Katki and Sambalpuri, respectively. Eventually we revised this observation in §1.2 with the proposal that the headedness parameter is restricted to the leftmost syllable in Katki and rightmost syllable in Sambalpuri. This results in the vowel /o/, |U̲A|, to be the only vowel in the repertoire with an expression of headedness, having positional restrictions. Following this line of argumentation, in this section, we will explore why the headedness parameter is restricted to distinct positions in the two varieties of Odia.

In the Optimality Theory approach (Prince & Smolensky, 1993) to phonology, there are correspondence constraints like ANCHORING-IO (McCarthy & Prince, 1993a) that militate against any non-correspondence between the input and output segments at the designated edge. In doing so, these constraints preserve marked configurations at these locations that are otherwise lost in the string internal positions. However, the skeletal position associated with the vowel in the leftmost or rightmost nucleus in Katki and Sambalpuri is not a peripheral position in the skeletal tier and hence cannot be preserved with these formal mechanisms. Formally, one could re-calibrate ANCHORING-IO constraint to the domain of the edgemost syllable instead of segment. This adapted formal device will preserve the headedness specified melody in the Anchored position and bleach the headedness parameter elsewhere. This has been shown in (11) below.

(11) Anchoring-based formal analysis for positional restriction on /o/

Anchoring-IO : Any *segment* at the designated edge of the input has a correspondent at the same edge of the output.	Original formulation
Anchoring-IO : Any *syllable* at the designated edge of the input has a correspondent at the same edge of the output.	Revised formulation

The headedness parameter introduces one more structural device into the configuration of the melodic tier. Therefore the segment |U̲A| is more complex than the segment |UA|. |U̲A| is marked for headedness, |UA| is not. This is the reason we proposed that the headedness parameter is restricted to the edgemost syllable in §1.2. This idea is converted into the formal device of a markedness constraint in (12).

(12) Markedness constraint

*HEAD: Do not use headedness distinction in the melodic tier.

The ranking of the markedness constraint *HEAD lower than the positional faithfulness constraint ANCHORING-IO results in the preservation of headedness parameter in the nucleus of the edgemost syllable. This has been shown for the schematized disyllabic inputs [o-i] and [i-o] in (13) and (14), respectively.

(13) Input representation [o-i] with the vowels /o/ and /i/ in adjacent syllables

Katki		
|U̲A|-|I|	ANCHOR-L	*HEAD
a. ☞|U̲A|-|I|		*
b. |UA|-|I|	*!	

Sambalpuri		
|U̲A|-|I|	*HEAD	ANCHOR-L
a. |U̲A|-|I|	*!	
b. ☞|UA|-|I|		*

The two evaluation tables in (13) follow the theoretical approach of Standard Optimality Theory (Prince & Smolensky, 1993) with ranked constraints. The two output candidates are evaluated with respect to the markedness constraint *HEAD and Anchor-L that were discussed in (11) and (12). Candidate (a) violates the markedness constraint *HEAD, since it contains a headed melody |U̲A| in the output. Similarly, candidate (b)

incurs a violation of the faithfulness constraint Anchor-L as the output representation |UA| does not match the input representation |U̲A|. In Katki, Anchor-L being ranked higher than *HEAD, the headedness of the input |U̲A| is preserved in the output. In Sambalpuri, *HEAD being ranked higher than Anchor-L, the input |U̲A| corresponds to the optimal output |UA| without headedness. A similar evaluation for the input [i-o] with respect to Anchor-R and *HEAD reveals how headedness is preserved in the right edge in Sambalpuri. This is shown in (14).

(14) Input representation [i-o] with the vowels /i/ and /o/ in adjacent syllables

Katki		
|I|-|U̲A|	*HEAD	ANCHOR-R
a. |I|-|U̲A|	*!	
b. ☞|I|-|UA|		*

Sambalpuri		
|I|-|U̲A|	ANCHOR-R	*HEAD
a. ☞|I|-|U̲A|		*
b. |I|-|UA|	*!	

In (14) the input has the headed vowel /o/ in the rightmost syllable of the word. So, the constraints used for evaluation are *HEAD and Anchor-R. In Sambalpuri, candidate (a) preserves the headed input and emerges as the optimal output, ranking Anchor-R higher than *HEAD. However, in Katki, the faithfulness constraint Anchor-R ranked lower than *HEAD, hence, making candidate (b) as the optimal output.

While the evaluation tables in (13) and (14) successfully explain the preservation of the marked segment /o/ in the leftmost and rightmost syllable positions of Katki and Sambalpuri words, it does not accurately predict the vowel that the an underlying /o/ change to. By simply removing the headedness parameter from non-anchored positions, the analysis predicts that the underlying /o/ will surface as /ɔ/. However, based on the comparison of cognate vocabulary in §1.1 we have established that the underlying /o/ changes to the vowel /u/.

The change from input |U̲A| to output |U| entails loss of two melodic properties: headedness and the element |A|. Based on the element-based description of the phonemic inventory of Odia shown in (10), the element |A| is part of the melodic composition of the three other phonemes other than /o/. These are, /a/-|A|, /e/-|IA| and /ɔ/-|UA|. None of these three phonemes undergo loss of the element |A| in any phonological context in Katki or Sambalpuri. Therefore, the loss of the element |A| from the input |U̲A| is specifically linked to the presence and loss of headedness in these languages.

The formal mechanism to incorporate this dependency is to locally conjoin two markedness constraints *|A| and *HEAD. Local Conjunction (Smolensky, 1995) is that idea that a conjoint constraint A+B is violated if and only if both of its constituent constraints A and B are simultaneously violated within the specified local domain. In this case, the melodic combination *|A| and *HEAD is simultaneously violated by the output candidate |U̲A|. This formulation has been shown in (15).

(15) Local Conjunction of constraints

Constituent 1	*|A|: Do not have the element |A| in the melodic tier of a vowel segment.
Constituent 2	*Head: Do not use headedness distinction in the melodic tier of a vowel.
*|A|+*HEAD: Do not violate both constraints simultaneously in a single vowel segment	

One of the possible strategies to avoid violating this conjoint constraint is the loss of headedness. This was the case of the optimal outputs in (13) and (14). Another strategy to avoid violating this constraint is the loss of |A|. In the revised analysis presented in (16) and (17) we have introduced two additional faithfulness constraints Ident-HEAD and Ident-|A| pertaining to the two crucial melodic properties. The evaluation tableaux presented in (16) and (17) has two sub-parts each showing a possible outcome.

(16) Revised Evaluation tables for Katki, for the inputs [o-i] and [i-o]

|U̲A|-|I|	ANCHOR-L	*|A|+*HD	ID-HD	ID-|A|	*|A|	*HD	ANCHOR-R
a. ☞|U̲A|-|I|		*			*	*	
b. |UA|-|I|	*!		*		*		
c. |U̲|-|I|	*!			*		*	
d. |U|-|I|	**!		*	*			
|I|-|U̲A|	ANCHOR-L	*|A|+*HD	ID-HD	ID-|A|	*|A|	*HD	ANCHOR-R
a. |I|-|U̲A|		*!			*	*	
b. |I|-|UA|			*		*!		*
c. ☞|I|-|U̲|				*		*	*
d. |I|-|U|			*	*!			**

(17) Revised Evaluation tables for Sambalpuri, for the inputs [o-i] and [i-o]

|U̲A|-|I|	ANCHOR-R	*|A|+*HD	ID-HD	ID-|A|	*|A|	*HD	ANCHOR-L
a. |U̲A|-|I|		*!			*	*	
b. |UA|-|I|			*		*!		*
c. ☞|U̲|-|I|				*		*	*
d. |U|-|I|			*	*!			**
|I|-|U̲A|	ANCHOR-R	*|A|+*HD	ID-HD	ID-|A|	*|A|	*HD	ANCHOR-L
a. ☞|I|-|U̲A|		*			*	*	
b. |I|-|UA|	*!		*		*		
c. |I|-|U̲|	*!			*		*	
d. |I|-|U|	**!		*	*			

In the revised evaluation tables for Katki and Sambalpuri, (16) and (17), the constraints are ranked into three sets. First, the Anchoring-IO constraint dominates the conjoint

constraint and preserves the marked melodic combination |U̲A| in the designated edge. Second, the conjoint constraint outranks the faithfulness constraints triggering deletion of either headedness or |A| in candidates (b) and (c). Candidate (d) is ruled out since it violates both the faithfulness constraints simultaneously. Finally, the mutual ranking between the markedness constraints *|A| and *HD, determines (c) to be a better candidate than (b).

In this section we have proposed that the leftmost syllable of the prosodic word is preserved in Katki Odia just as the rightmost syllable is preserved in Sambalpuri Odia. While we have used the formal device of Anchoring-IO in the evaluation tables, this constraint does not clearly explain why the edgemost syllables would be preserved. One possible case could be that these are the positions for primary stress assignment in these languages. This hypothesis however needs to be independently verified through the application of other stress sensitive phonological processes in these languages. Since describing such processes would be outside the scope of this paper, we will leave this as a suggestion.

Further, note that the optimal candidate for [o→u] change in (16) and (17) is the candidate (c) rather than the candidate (d). This makes the output for sound change, |U̲|, phonologically distinct from the underlying vowel |U|. Analytically, (d) would emerge as the optimal output if and only if the markedness constraint *|A| is ranked higher than the faithfulness constraint Id-|A|. This ranking of these two constraints would trigger the deletion of the |A| melody from other vowel phonemes such as |UA| and |IA|. This is not empirically true for either of the languages. Thus, given our analytical proposal the vowel /u/ that emerges because of sound change from an underlying /o/ is predicted to be phonologically distinct from the vowel /u/ that appears lexically specified in the phonological string. In the following section, we show that this phonological distinction has empirical consequences in Sambalpuri and Katki.

3 Dissimilation in phonologically derived context

In this section we will discuss the case of blocking of [o→u] vowel raising in both Sambalpuri and Katki, when the prosodic word already has an underlying /u/ vowel. This has been shown in (18).

(18) Comparing cognates with underlying /u/

Katki		**Sambalpuri**		
Actual form	Expected form	Actual form	Expected form	
goru		gɔru	*guru	‘animal’
kʰu̲ɔ	*k(ʰ)u̲u	ku̲o		‘a type of rice’

Given the analysis in § 2, the data presented in (18) shows that an underlying |U̲A| (vowel /o/) changes to the surface form |UA| (vowel /ɔ/) instead of the expected surface form |U̲| (vowel /u/) when the other vowel in the lexical word is a non-headed |U| (vowel /u/). Thus, in Katki, the candidate output with the sequence |U|-|UA| is preferred over the candidate output with the sequence |U|-|U̲|. Similarly, in Sambalpuri the output sequence |UA|-|U| is evaluated to be more optimal than the output |U̲|-|U|. The blocking

of two segments with similar properties within the same phonological domain is referred to as Obligatory Contour Principle (OCP) (Leben 1973).

(19) Formal definition of OCP

Obligatory Contour Principle: At the melodic level, adjacent identical elements are prohibited.

(McCarthy 1986)

However, this dispreference for the sequence of two consecutive /u/ vowels is not reflected in the underived words of either Katki or Sambalpuri. This is shown in (20).

(20) Underived words with two consecutive /u/

Katki			**Sambalpuri**		
Actual form	Expected form		Actual form	Expected form	
guru	*gurɔ/*gɔru	‘teacher’	kukur	*kukɔr/ *kɔkur	‘dog’
			munus	*munɔs/*mɔnus	‘human’

This scenario where a phonological process does not apply to underived contexts but emerges a well-formedness requirement in the derived context is described as an outcome of the Strict Cycle Condition by Kiparsky (1982). The SCC states that a cyclic phonological rule only applies to contexts that have been either phonologically or morphologically derived. In (18) and (20) we see that OCP emerges as a phonological process in Katki and Sambalpuri if and only if the underlying phonological string started out with an /o/ vowel in the input. It does not apply to underived domains.

Theoretically, SCC includes both the phonologically derived and morphologically derived contexts within the ambit of the term derived environments. However, in case of Odia, both Katki and Sambalpuri, we find that OCP is not triggered by morphologically derived environments with two consecutive vowels either. This is shown in (21).

(21) Inflected verbs with two consecutive /u/

Katki	**Sambalpuri**	
c^hũ-uc^hi	c^hu-uc^he	‘touch.prog.1p’
buj^h-uc^hi	buj^h-uc^he	‘understand.prog.1p’

In (21), the CV and CVC verb roots with the lexically specified /u/ is immediately followed by the inflectional suffix for progressive aspect, also beginning with an /u/. Yet, despite the two vowels appearing in morphologically derived environments, neither the /u/ in the affix nor the /u/ in the verb root undergoes any modification in order to avoid OCP.

In summary, (18) shows that the potential for OCP violation blocks the [o→u] change in both Katki and Sambalpuri. However, the OCP violation is tolerated in both underived and morphologically derived environments, (20) and (21). Thus, the OCP in Odia treats the phonologically and morphologically derived environments differently.

This is contrary to the theoretical formulation of SCC that clubs together phonologically and morphologically derived environments as the domain for lexical rules.

If we re-analyze the dissimilation of /u/ in (18) in the context of our analysis for the [o→u] raising in §2, there is a distinction between the phonological environment of (18) and those in (20) and (21). As per the evaluation tables (16) and (17) and the two /u/ vowels in (18) are not identical. One of them is a headed |U̲| and the other a |U|, underspecified for headedness. In contrast both the /u/ vowels in (20) and (21) have the same melodic specification |U|. In summary, OCP applies when the two |U| are similar but does not apply when they are the same.

Empirical studies on the similarity effects of OCP have shown that the more similar two segments are, greater is the identity avoidance (Padgett 1991, 1992; Selkirk 1988, 1991, 1993; Yip 1989 and Pierrehumbert 1993). These studies predict that if the identity between two adjacent segments with the near identical melody |U̲| and |U| is being avoided, the language would also avoid identity between adjacent segments with completely identical melody |U|-|U|. However, this is not the case in Odia.

In (22) we show that OCP in Odia is violated by the output candidates |U̲|-|U| as well as |U|-|U|. However, this constraint being ranked lower than faithfulness constraint Id-|U|, does not have an impact on the lexically specified |U| in the input representation. OCP emerges as a crucial markedness factor in contexts where the effects of the faithfulness constraint Id-|U| is not relevant as the input segment is not an /u/.

(22) Evaluation tables for OCP effects in Katki and Sambalpuri

Katki									
|U|-|U̲A|	ANCHOR-L	*|A|+*HD	ID-HD	ID-|A|	ID-|U|	OCP	*|A|	*HD	ANCHOR-R
a. |U|-|U̲A|		*!					*	*	
b. ☞|U|-|UA|			*				*		*
c. |U|-|U̲|				*		*		*	*!
d. |U|-|U|			*	*!		*			**
e. |U|-|A|			*		*!		*		**
Sambalpuri									
|U̲A|-|U|	ANCHOR-R	*|A|+*HD	ID-HD	ID-|A|	ID-|U|	OCP	*|A|	*HD	ANCHOR-L
a. |U̲A|-|U|		*!					*	*	
b. ☞|UA|-|U|			*				*		*
c. |U̲|-|U|				*		*		*	*!
d. |U|-|U|			*	*!		*			**
e. |A|-|U|			*		*!		*		**

The evaluation tables in (22) are identical to the evaluation tables presented in (17) and (18) except for one factor. The output candidates (c) and (d) with a sequence |U̲|-|U| and |U|-|U| incur a violation of the markedness constraint OCP each. Candidate (e) is maximally distinct by avoiding the melody |U| altogether in the adjacent segments. However, this is blocked by two violations of faithfulness constraints. This the candidate (b), |UA| emerges as the optimal output.

A summary of the analysis proposed in this paper is presented in the (23).

(23) Interim generalization 2

Observation	*Analysis*
Element-based phonemic repertoire	Headedness parameter is contrastive in |UA|
Distributional restriction on /o/-|UA|	Headedness restricted to Leftmost or Rightmost
/o/→/u/ if not Leftmost/ Rightmost	ANCHOR-L/R >> *|A|+*HD >> IDENT-IO >> *|A| >>*HD
/o/→/ɔ/ if adjacent /u/	ANCHOR-L/R>> *|A|+*HD >>IDENT-IO>>OCP,*|A| >>*HD

While the data from the lexical words of Katki and Sambalpuri analysed so far paint a picture of a phonological grammar for these languages, it does not tell us whether this was a diachronic sound change or is it a synchronic process in the language. In some aspects the phonological phenomena under discussion here is similar to the case of Trisyllabic Laxing (TSL) in English. In SPE (Chomsky and Halle 1968) it was shown the long vowels in derived words like *serene* /səˈriːn/ *-serenity /səˈren.ə.ti /*, were shortened in the third syllable from the right edge but left unmodified in underived words like *ivory* and *nightingale*. Based on some of these observations theoretical architectures such as lexical phonology were proposed that involved a step-by-step interaction between morphology and phonology (Kiparsky 1982). Eventually, counter-examples such as *obesity* came to light that indicated that TSL might not have been a synchronic phonological process in English. It was a diachronic sound change that remained fossilized to certain sections of the lexicon.

Consequently, we wanted to check if the process of [o→u] raising as well as the [o→ɔ] lowering under OCP conditions is part of the synchronic grammar of Odia. In §4, we discuss the pilot study we undertook and its results.

4 Between the synchronic and diachronic processes

The native core vocabulary of a language often shows markedness restrictions that are not seen in loanwords. This observation by Ito and Mester (1995a) formed the foundation for subsequent studies on the phonology of grammaticalization processes in the lexicon. Although these lexicon stratification studies are based on meaningful lexical items, the question remains whether nonce words would be treated akin to the innermost or outermost layer of the lexicon. What we do know however is that the phonological processes associated with each stratum are supposed to be part of the synchronic phonological grammar of the language. Keeping that in mind, we designed a small nonce based elicitation task to check if the vowel /o/ raises to /u/ in non-anchored position.

4.1 Design of the study

The elicitation task had four parts. In the first part, we taught a simple syllable transposition game to the participants. They saw a disyllabic word CVCV with the

vowels /i/ and /a/ on the computer screen and were taught to read the word and then produce the game word where the two syllables were transposed. For example, [mika] should elicit [kami]. The second part was like the first but without prompts for the game word. This aimed to verify if the participants had learnt the transposition game.

In the third part, the participants were presented the actual test set of nonce words. In this set, the stimuli were categorized into two main types: disyllables, containing /o/ in both the initial or final syllables (e.g., CoCV and CVCo), and trisyllables, such as CVCVCo and CoCVCV. The design of the stimuli set is presented in (24).

(9) Stimuli patterns for the familiarity and game set

Familiarity set		Game Set			
CVCV		CVCV		CVCVCV	
CaCi	CiCa	CuCo	CoCu	CuCaCo	CoCaCu
CuCi	CiCu	CiCo	CoCi	CeCaCo	CoCaCe
CiCe	CeCi	CeCo	CoCe	CiCaCo	CoCaCi
CeCa	CaCe	CaCo	CoCa	CaCaCo	CoCaCa
CaCu	CuCa	CoCo		CɔCaCo	CoCaCɔ

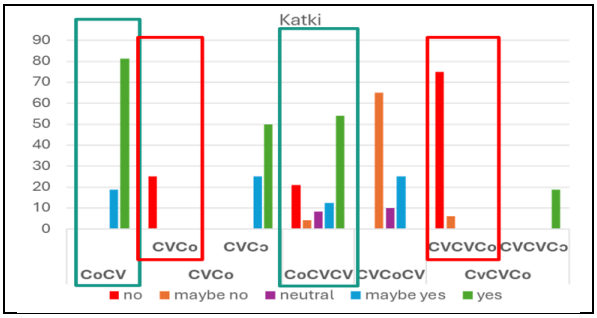
In the fourth part of the study, the participant was asked to evaluate whether the resulting transposed form could plausibly occur as a word in their respective variety of Odia. They did that using a 5-point Likert scale.

The pilot study was conducted with eight participants. Four native speakers of Katki and Sambalpuri.

4.2 Results of the study

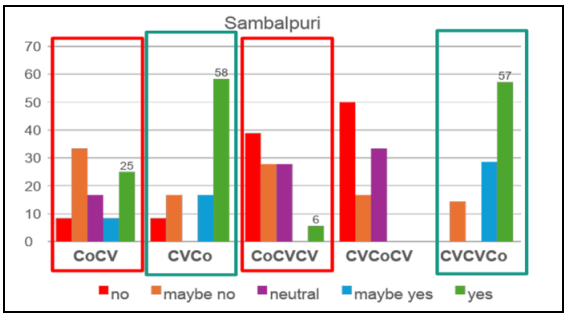
The study showed that as expected speakers of Katki showed higher acceptance rate for words with /o/ in the leftmost syllable and speakers of Sambalpuri showed a higher acceptance for rightmost /o/. The Katki speakers systematically lowered the /o/ to /ɔ/ in non-initial positions of both disyllables and trisyllables instead of the expected raising to /u/. They also remained unaware of this lowering of the vowel in their transposed utterances and gave a high rating to the transposed CVCo uttered by them as CVCɔ. The participants were less certain in trisyllables.

(10) Results for Katki speakers



In contrast to the Katki speakers, the Sambalpuri speakers accurately identified the offending vowel /o/ in non-rightmost syllable transposed contexts and reported gradient acceptability. There was a higher acceptance rate of /o/ in the rightmost syllable as compared to penult and a lower acceptance rate for /o/ in the anti-penult. Further, we observed that in the syllable transposition game, the participants altered the pattern in trisyllables to obtain a final /o/, e.g., CaCoCu is transposed as CuCaCo instead of CuCoCa.

(11) Results for Sambalpuri speakers



4.3 Analysis

The findings from the Pilot study suggest that the distributional restriction on /o/ in lexical words in both Katki and Sambalpuri is extended to nonce words. The vowel /o/ emerges as a marked vowel in both the varieties, licensed only in the anchored position. This shows that the anchoring constraint as well as the markedness of the headedness parameter are part of the synchronic phonological grammar of these languages. However, the strategy to avoid /o/ in non-anchored positions in nonce words is different from the strategy observed in lexical words.

In Katki lexical words, the vowel |U̲A| is preserved at the left-edge of the word due to the high ranking of Anchor-L. Elsewhere it changes to |U̲| in lexical words. Unlike the lexical words we see that the non-anchored /o/ emerges as |UA| in the nonce words even without an OCP context. This shows that the markedness constraint *|A|, active in the lexical domain is not active in the synchronic grammar of Katki. With *HEAD being the only active factor we have seen in (14), |UA| is expected to emerge as the optimal candidate. The evaluation table for this is repeated here in (27).

(12) Evaluation table for Katki nonce words

|I|-|U̲A|	*HEAD	ANCHOR-R
a. |I|-|U̲A|	*!	
b. ☞|I|-|UA|		*

Unlike Katki, the non-anchored /o/ in Sambalpuri, changes to either /u/ or /ɔ/ in the utterance of transposed words depending on the other vowels in the word. This shows

that the markedness constraint *|A| is active in the synchronic grammar of Sambalpuri. The relevance of Anchor-R is further underlined in the syllable transposition data from Sambalpuri participants who altered the pattern of syllable transposition in trisyllabic stimuli in order to place the syllable with /o/ in the word-final position.

5 Conclusion

This study demonstrates that the distributional restriction of the vowel /o/ in Katki and Sambalpuri varieties of Odia, is best accounted for as a case of prosodic and positional licensing, constrained by the headedness feature in the melodic tier. Comparative analysis of cognates reveals that the vowel /o/, characterized by a headed element |U|, is a marked vowel and it surfaces exclusively in edge positions: in the leftmost syllables in Katki and rightmost syllable in Sambalpuri.

This pattern is effectively explained by the interaction of the faithfulness constraints such as Anchoring-IO which preserves the marked segment in the edgemost syllables. These conclusions are further corroborated by the nonce-word experiments, confirming that the licensing conditions are active components of the synchronic phonological grammar.

The theoretical model predicts that in unmarked, non-edge positions, the headedness feature is lost, resulting in the surfacing of the non-head counterpart of the vowel /o/, *i.e*., /ɔ/ which is composed of |UA|. However, the empirical data contradicts this prediction in lexical words, the vowel /u/ characterized by the element |U| surfaces in all non-anchored positions. This represents not just a loss of headedness but also a reduction in melodic complexity. The interaction of various faithfulness and markedness constraints reveal this pattern. Notably, the non-head counterpart /ɔ/ emerges only when the lexical word already contains /u/, indicating a contextually conditioned alternation.

Furthermore, the study elucidates the role of Obligatory Contour Principle in interaction with other markedness and faithfulness constraints. It reveals how identity avoidance effect leads to dissimilation in phonologically derived environments but is systematically circumvented in underived and morphologically derived contexts wherein adjacent [u-u] sequence, can freely occur. This nuanced behaviour challenged traditional assumptions within the Strict Cycle Condition that equates both phonologically and morphologically derived environments as domains for phonological processes.

Importantly, the analysis distinguishes between the lexical vowel /u/ (|U|) and the phonetically identical /u/ (|U̲|) that has emerged from an underlying /o/. While both surface as /u/ and act as a triggering environment for OCP, they are phonologically distinct: the lexical /u/ is specified for the non-headed element |U|, the derived /u/ retains the headed element |U̲|. This distinction is maintained by a higher ranked faithfulness constraint Ident-|U| which preserves a lexical /u/ in both phonologically underived and morphologically derived context.

These findings substantiate the theoretical premise that headedness is a contrastive feature in the mid-vowel space of Odia, providing formal insight into the microvariation observed in the varieties of Katki and Sambalpuri. Furthermore, by integrating element-based analysis accompanied with the edge anchoring constraints within the theoretical framework of Optimality Theory, the research advances

understanding of how segmental markedness interacts with positional licensing to account for segmental distribution and variation across related languages.

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