Locality and Lexically Indexed Constraints in Vowel Harmony

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1. Introduction

(1) This talk discusses locality effects in morpheme-specific exceptions in vowel harmony.

(2) Morpheme-specific exceptions in vowel harmony are all cases where either vowel harmony fails to apply or applies only to a select group of morphemes, and cannot be explained using a phonological explanation. It is the morpheme itself that determines whether vowel harmony applies or not.

(3) There are two types of exceptions in vowel harmony[1]: exceptional undergoers, and exceptional non-undergoers.

(4) Exceptional undergoers occur in languages in which vowel harmony is not a regular process, but a select group of morphemes (or a single morpheme) undergo vowel harmony. In these cases, the morpheme will have allomorphs that vary based on the feature of an adjacent vowel.

(5) Exceptional non-undergoers occur in vowel harmony languages. In these cases, a select group of morphemes will fail to undergo harmony. I will focus on exceptional non-undergoers in this talk.

(6) Vowel harmony is a long distance phenomenon, but these long-distance effects become local in the face of harmony exceptions.

(7) This fact has important consequences for distinguishing between two theories of lexical exceptions: lexically indexed constraints and lexically indexed rankings.

(8) While these theories are generally thought to be empirically indistinguishable (but see Pater in prep), each theory makes a different prediction about locality effects in vowel harmony exceptions: lexically indexed constraints predict locality, while lexically indexed rankings predict long distance effects in exceptions.

[1] There is another type of morphological variation in vowel harmony in which a morpheme is realized via feature correspondence on all vowels in a lexical item. Finley (2004) argues that this type of vowel harmony (morphological vowel harmony) is fundamentally different from vowel harmony (phonological vowel harmony) discussed in this paper.

2. Exceptions in Vowel Harmony are Local

(9) In order to understand what it means for a theory to make predictions about locality and non-locality in exceptional behavior, one must define what it means for exceptions to be local/non-local. In this section I will first define what it means to be local/non-local, and give examples from different types of vowel harmony languages and exceptions that behave in a local manner.

2.1. What does it mean for Exceptions to be Local?

(10) Locality in exceptionality means that the behavior of the exceptional morpheme does not affect the behavior of its surrounding morphemes.

(11) The presence of an exceptional undergoer creates a harmonic environment, only where that morpheme exists.

(12) The presence of an exceptional non-undergoer creates disharmony only in the environment where that morpheme is.

2.2. What would it mean for Exceptions to be Non-Local?

(13) Non-locality in exceptionality means that the presence of an exceptional morpheme has an effect on the entire lexical item.

(14) The presence of an exceptional undergoer should create harmony for the entire lexical item.

(15) The presence of an exceptional non-undergoer should create disharmony for the entire lexical item (or for every affix in its cycle)

(16) Except for morphemes that are realized via vowel harmony (morphological harmony (Finley in prep), analyzed differently from regular phonological harmony; the morpheme decides the value of the harmonic feature), non-local behavior does not seem to occur.

(17) Rather, locality in exceptions is the norm (if not only pattern). For all cases of exceptions in vowel harmony presented below, harmony affects only the environment adjacent to the affected morpheme.

(18) We should thus expect the following examples to behave locally.

(19) The majority of cases of exceptions in vowel harmony (not discussed) occur word-initially. Because these morphemes appear at word boundary, these cases are inherently local, but would not necessarily contradict non-local predictions.

2.3. Exceptional Harmony in Non-Harmony Languages: Korean

(20) In Korean, vowel harmony is not a regular process, but the verbal morpheme alternates between [ə] and [a].

(21) Whether the vowel surfaces as [ə] or [a] depends on the vowel immediately to the left of the verbal morpheme ([ə] and [a] do not normally alternate in Korean, only in this morphological context). [2]

(22) The verbal morpheme will surface as [a] if the vowel to the left is [a] or [o]. All other vowels trigger [ə].

(23) Verbal Harmony in Korean (Lee 1998):

(a)	[mək-ə̲]	'eat'
(b)	[ki-ə̲]	'crawl'
(c)	[nɨtʃ-ə̲]	'be late'
(d)	[tʃap-a̲]	'grasp'
(e)	[nok-a̲]	'melt'

(24) The data presented in typical analyses shows this vowel as the verb stem, but the vowels from other intervening morphemes can also have an effect (e.g. the negative marker [an], as in [məg-dʒi-an-a̲-tˀa] vs. [məg-ə̲-tˀa]).

2.3.1. **Locality in Korean**

(25) There are two ways in which harmony is local in Korean.

(26) The first is that the vowel immediately preceding the morpheme will determine the form of the undergoing morpheme (underlined). For example, the stem vowel for [məg] is [ə], but if the negative marker [an] intervenes, [a] surfaces: [məg-ə̲-tˀa] vs.[məg-dʒi-an-a̲-tˀa]. Thus, the vowel that determines the allomorph is local to the morpheme.

(27) Second, the presence of the exceptional undergoer doesn't create harmony for the entire lexical item. The vowel immediately following the affected morpheme is not affected by harmony. In the same example, the past tense morpheme is [a], regardless of whether the verbal morpheme [ə] immediately precedes this vowel: [məg-ə̲-tˀa] vs. [məg-dʒi-an-a̲-tˀa].

[2] Ideophones in Korean also undergo an alternation. However, the cases of ideophones in Korean are analyzed differently, as morphological harmony (Finley in press, in prep)

2.4. Exceptional Non-Undergoers in Stem Controlled Languages: Old Turkic

(28) Old Turkic has both backness/palatal and round/labial harmony.

(29) Round harmony is morphologically conditioned (Anderson 1996), such that suffixes are either unspecified for rounding (undergoers) or specified for [+ROUND] or [–ROUND] (non-undergoers).

(30) Non-undergoers come from a wide range of morphological classes. Since harmony only affects high vowels, both undergoers and non-undergoers are high.

(31) Disharmonic suffixes in Old Turkic (Anderson 1996) (note that these suffixes regularly undergo backness harmony)

(a)	/-dɯ/ 'third singular past'	[øl-ti], [tut-di]	'die'[3]
(b)	/-Ur/ 'causative'	[øl-yr], [jorij-ur]	'die-cause'
(c)	/-t**ɨ**(n)/ 'adj./adv.'	[ædgyti]	'polite'
(d)	/-dUk/ 'partic.'	[bilmædyk]	'know'

(32) The non-participating vowels in non-participating morphemes differ from more general non-participating vowels in that there is no phonological explanation for the non-participation of these vowels (e.g. inventory constraints, licensing); it is entirely morpheme-driven. [4]

2.5. **Disharmony in Old Turkic is Local**

(33) The presence of a disharmonic stem does not disrupt harmony altogether. Suffixes following the disharmonic suffix harmonize with the disharmonic suffix.

(34) Locality of disharmony in Old Turkic (Anderson 1996; Erdal 2004)

(a)	øt-**im**-in	'my advice –acc.'
(b)	olur-**s**~~**ɨ**~~**q**-~~ɨ~~m	'possible-nec.'
(c)	øl-**sik**-in	'die-nec.'
(d)	iniji-**gyn**-ym	gloss unavailable

[3] Glosses were not provided in Anderson (1996); provided are glosses based on translations from a modern Turkish dictionary.

[4] The vowel in the opaque morpheme is always [–ATR]. This has to do with the dominant-recessive nature of vowel harmony. An underlyingly [+ATR] vowel will never undergo a change in feature value to undergo harmony, and thus cannot be an exceptional non-undergoer.

2.6. Exceptional Non-Undergoers in Dominant-Recessive Languages: Nandi-Kipsigis Kalenjin

(35) Nandi-Kipsigis Kalenjin, a Southern Nilotic language, (Hall, Hall et al. 1973; Martin 1985; Lodge 1995) has a dominant-recessive [ATR] harmony system, where [+ATR] is dominant.

(36) Nandi-Kipsigis Kalenjin has a ten-vowel inventory that is completely symmetrical (allowing for contrasts in [ATR] for both low and high vowels).

(37) Vowel inventory ([–ATR] vowels are on the right):

i, ɪ	u, ʊ
e, ɛ	o, ɔ
æ, a	

(38) Vowel harmony in Nandi-Kipsigis Kalenjin:

(a)	/paañ-aan/	[paañ-aan]	‘that walk’
	/tyæææñ -aan/	[tyæææñ-ææn]	‘that beast’
(b)	/sal-ɔ]/	[sal-ɔ]	‘painting’
	/sal-uut/	[sæl-uut]	‘a paint job’

(39) In (a), the [ATR] specification of the suffix varies by the [ATR] value of the root.

(40) In (b), the [ATR] value of the root may change for some suffixes, showing the dominant-recessive nature of Kalenjin vowel harmony.

(41) Because of the symmetry of the inventory, we should not expect any non-participation of vowels. This is generally the case, except that there is a set of affixes which are opaque to harmony (Hall, Hall et al. 1973; Lodge 1995).

(42) Non-Participating Affixes (underlined) in Nandi-Kipsigis Kalenjin (Lodge 1995)

(a) /kɪ-a-un-kɛj/ [ki-æ-un-gɛj] *[ki-æ-un-ge̱j] ‘I washed myself’

(b) /ka-ka:-kɔ-ke:r-a/ [ka-ɣa:-ɣo-ɣe:r-æ] ‘he had seen me’

2.6.1. Locality in Nandi-Kipsigis Kalenjin (Non-Undergoers)

(43) When a non-undergoer occurs in a lexical item harmony still occurs. In the form below, the [+ATR] vowel in /ker/ spreads to the [–ATR] vowels in [kɔ] and [a].

(a) /ka-ka:-kɔ-ke:r-a/ [ka-ɣa:-ɣo-ɣe:r-æ] *[kaɣa:ɣɔɣe:ra]

(44) If the effects of exceptions in harmony were non-local, we would expect the presence of the opaque morpheme to block harmony altogether, producing *[kaɣa:ɣɔɣe:ra], but this does not happen.

(45) The presence of a disharmonic morpheme does not stop harmony altogether. Rather, disharmony is localized around the exceptional morpheme.

2.7. **Conclusion**

(46) For exceptions in vowel harmony to be non-local, the exceptional morpheme must affect the entire lexical item, either propagating harmony beyond its scope, or blocking harmony when it otherwise should occur. The examples given show that only local behavior occurs in exceptions in vowel harmony.

3. Accounting for Exceptionality

(47) This section provides gives an overview of a general framework for accounting for vowel harmony, as well as exceptions. I will give the general schema for using lexically-indexed rankings and constraints, and show why an underspecification approach is not persued.

3.1. **Vowel Harmony**

(48) While many languages show exceptional vowel harmony with locality, I will focus on a single language with exceptional vowel harmony: Nandi-Kipsigis Kalenjin.

(49) I assume that vowel harmony is induced by the ranking[5] AGREE[F] >> ID[F] (Bakovic 2000).

(50) While any theory of harmony should be adequate, I choose AGREE for this demonstration because Nandi-Kipsigis Kalenjin in dominant-recessive, and AGREE provides a simple account of dominant-recessive harmony languages[6]: both AGREE and dominant-recessive harmony are inherently bi-directional.

(51) The dominant-recessive nature of harmony is captured by the asymmetry of faithfulness to [+ATR] elements with the conjunction: *[–ATR] $\&_{SEG}$ ID[ATR].

[5] I assume AGREE to be the harmony-inducing constraint. Lexical indexation works in the same way for other harmony-inducing constraints such as ALIGN, and theories of headed feature domains/spans (e.g. Cole and Kisseberth 1994; McCarthy 2004; Smolensky 1997, 2005).

[6] Bakovic (2000) argues that ALIGN-based analyses make flawed typological predictions about the directionality of dominant-recessive languages.

(52) Dominant-recessive [ATR] harmony

/kɪ-pi/	AGREE [ATR]	*[–ATR] &$_{SEG}$ ID[ATR]	ID[ATR]
a. [kɪpi]	*!		
b. ☞ [kipi]			*
c. [kɪpɪ]		*!	*

3.2. **Exceptions**

3.3. **Underspecification**

(53) Rather than resorting to lexically-indexed rankings or constraints at all, it may be possible to account for variation through underspecification of vowels (Archangeli 1984; Inkelas, Orgun & Zoll 1997; Kiparsky 1985).

(54) Vowels that undergo harmony are unspecified for the harmonizing feature, while non-undergoing vowels are specified for the harmonizing feature.

(55) Still assuming AGREE as the harmony-inducing constraint, underspecification only works if vowel harmony is created as an emergence of the unmarked effect. If AGREE >> ID, all inputs will be harmonized, regardless of their underlying specification.

(56) Harmony as Emergence of the Unmarked with Underspecification

/*pi* + mI/	ID[HIGH]	AGREE[HIGH]
a. [pime]		*!
b. ☞ [pimi]		
c. [peme]	*!	

(57) Because the underspecified suffix vowel does not suffer any ID violations, it will surface to match the stem vowel.

(58) Non-Undergoers

/pi + me/	ID[HIGH]	AGREE[HIGH]
a. ☞ [pime]		*
b. [pimi]	*!	
c. [peme]	*!	

(59) Because the general ranking is ID >> AGREE, specified vowels will not harmonize.

(60) The problem with this approach is that it cannot handle dominant-recessive vowel harmony (the kind found in Nandi-Kipsigis Kalenjin).

(61) The critical case is when the input contains an underspecified vowel in between a specified [–ATR] vowel and a specified [+ATR] vowel. The simple ranking ID >> AGREE doesn't distinguish between the candidate where the underspecified vowel harmonizes with the [+ATR] vowel and the candidate where the underspecified vowel harmonizes with the [–ATR] vowel.

(62) Harmony in Nandi-Kipsigis Kalenjin[7]

/kA-ɣa:-ɣO-ɣe:r-A/ 'he had seen me'	ID[ATR]	AGREE [ATR]
a. [kæ-ɣæ:-ɣo-ɣe:r-æ]	*!	
c. ? [ka-ɣa:-ɣo-ɣe:r-æ]		*
d. [ka-ɣa:-ɣɔ-ɣɛ:r-a]	*!	
e. ? [ka-ɣa:-ɣɔ-ɣe:r-æ]		*

(63) If *[–ATR] outranks *[+ATR], the [+ATR] vowel will surface as needed.

(64) Locality of harmony in Nandi-Kipsigis Kalenjin[8]

/kA-ɣa:-ɣO-ɣe:r-A/ 'he had seen me'	ID[ATR]	AGREE [ATR]	*[–ATR]
a. [kæ-ɣæ:-ɣo-ɣe:r-æ]	*!		
c. ☞ [ka-ɣa:-ɣo-ɣe:r-æ]		*	**
d. [ka-ɣa:-ɣɔ-ɣɛ:r-a]	*!		*****
e. [ka-ɣa:-ɣɔ-ɣe:r-æ]		*	***!

(65) The problem with this ranking is that this predicts that an underspecified vowel will surface as [+ATR] even if there is no [+ATR] vowel to harmonize with, an undesired result[9].

[7] The general constraints presented here are the same from those of Bakovic (2000).

[8] The general constraints presented here are the same from those of Bakovic (2000).

[9] This is essentially Bakovic's (2000) argument against approaches to vowel harmony that involve underspecification, which does not seem to be able to capture dominant-recessive vowel harmony.

(66) Locality of harmony in Nandi-Kipsigis Kalenjin[10]

/kA /	ID[ATR]	AGREE [ATR]	*[–ATR]
a. ✓ [ka]			*!
b. ☹ [kæ]			

(67) Because the underspecification approach in OT predicts assimilation to the unmarked, rather than assimilation to the marked, the underspecification approach to exceptions in vowel harmony will run into the problems shown above.

(68) I now consider two methods for accounting for exceptions: lexically indexed constraints (Fukazawa 1999; Pater 2000; Pater 2004) and lexically indexed rankings (or partial rankings/orders) (Anttila 1995; Anttila 2000)

(69) Generally, these two methods for accounting for exceptions are considered empirically equivalent, but both make important predictions about vowel harmony.

3.4. **Lexically-Indexed/Partial Orders of Constraints**

(70) With lexically indexed rankings, variation is accounted for by a partial order of constraints. Constraints are left unranked with respect to each other, and different morphemes will specify a specific ranking.

(71) Exceptions in vowel harmony can be dealt with by having undergoers select a harmony-inducing constraint AGREE[F] >> ID[F] while non-undergoers select the opposite ranking ID[F] >> AGREE[F]. The language will decide which ranking applies when both undergoers and non-undergoers appear in the same lexical

(72) Undergoers

/*pi* + me/ AGREE >> ID	STEMFAITH	AGREE[HIGH]	ID[HIGH]
a. [pime]		*!	
b. ☞ [pimi]			*
c. [peme]	*!		*

[10] The general constraints presented here are the same from those of Bakovic (2000).

(73) Non-Undergoers

/*pi* + ke/ ID >> AGREE	ID[HIGH]	AGREE[HIGH]
a. ☞ [pike]		*
b. [piki]	*!	
c. [peke]	*!	

3.4.1. **Lexically-Indexed Constraints**

(74) Lexical exceptions are accounted for through indexation; the exceptional morpheme activates a constraint that applies to all and only those morphemes with the same indexation (Pater 2000, 2004, 2005).

(75) An exceptional non-undergoer is marked with the indexation as STRONG. This activates STRONG identity constraint (ranked above AGREE) that applies to this morpheme and only this morpheme.

(76) Non-Undergoers

/pi + me_{STRONG}/	ID[HIGH]-STRONG	AGREE[HIGH]	ID[HIGH]-WEAK
a. ☞ [pime]		*	
b. [pimi]	*!		

(77) Exceptional undergoers have low-ranked faithfulness, and can be indexed as WEAK. This activates a WEAK ID constraint ranked below AGREE.

(78) Undergoers

/pi + me_{WEAK}/	ID[HIGH]-STRONG	AGREE[HIGH]	ID[HIGH]-WEAK
a. [pime]		*!	
b. ☞ [pimi]			*

3.4.2. Locus of violation

(79) Pater (2004) (in prep) defines the locus of violation for lexically indexed constraints: they apply only within the domain of the affected morpheme.

(80) $ID\text{-}X_L$ [11]
Assign a violation mark to any instance of X that contains a phonological exponent of a morpheme specified as L

4. Locality of Exceptions in Vowel Harmony

(81) As noted above, exceptions in vowel harmony tend to localize around the exceptional morpheme. An exceptional non-undergoer will not block harmony

[11] X may be either a markedness constraint (such as AGREE) or a faithfulness constraint, such as IDENT.

altogether, as other undergoing morphemes within the same lexical item will undergo harmony; an exceptional undergoer does not spread harmony beyond its own vowels. Here I show that lexically-indexed rankings make the wrong prediction, while locality is straightforward with lexically-indexed constraints

4.1. **Locality and Lexically-Indexed Rankings**

(82) Suppose the opaque morpheme selects the ranking ID[ATR] >> AGREE[ATR]. This should predict that no harmony should occur in the lexical item.

(83) Locality of harmony in Nandi-Kipsigis Kalenjin

/ka-ɣa:-ɣɔ-ɣe:r-a/ ID >> AGREE 'he had seen me'	ID[ATR]	*[–ATR] & ID[ATR]	AGREE [ATR]	*[–ATR]
a. [kæ-ɣæ:-ɣo-ɣe:r-æ]	*!***			
b. ✓ [ka-ɣa:-ɣo-ɣe:r-æ]	*!*		*	**
c. ☹ [ka-ɣa:-ɣɔ-ɣe:r-a]			**	***
d. [ka-ɣa:-ɣɔ-ɣɛ:r-a]	*!	*		*****

4.1.1. **Stratal OT**

(84) One possible way to get around the prediction that the presence of an opaque morpheme will block harmony entirely is to split up the derivation, so that the opaque morpheme is in one derivation with one ranking, and the non-opaque morphemes apply in a different derivation with different rankings. Presumably, this should be done with Stratal OT.

(85) Stratal OT (Kiparsky 2000) is a way of accounting for effects of morphology on phonological processes. Using Stratal OT, we can assign different rankings at different optimizations of the grammar.

(86) Everything in the root and all following affixes are marked as Level 1. Level 1 is given the ranking AGREE[ATR] >> ID[ATR].

(87) Locality of harmony in Nandi-Kipsigis Kalenjin

/ɣɔ-ɣe:r-a/ Root + Level 1	AGREE [ATR]	*[–ATR] & ID[ATR]	ID[ATR]	*[–ATR]
a. ☞ [ɣo-ɣe:r-æ]			**	
b. [ɣɔ-ɣe:r-a]	*!*			**
c. [ɣɔ-ɣɛ:r-a]		*!	*	***

(88) The opaque prefix is attached at Level 2, with the ranking ID[ATR] >> AGREE[ATR].

(89) Locality of harmony in Nandi-Kipsigis Kalenjin

!/ka/+ /ɣa:/ + [ɣoɣe:ræ] Level 2	ID[ATR]	AGREE [ATR]	*[–ATR] & ID[ATR]	*[–ATR]
a. [kæ-ɣæ:-ɣo-ɣe:r-æ]	*!*			
b. ☞ [ka-ɣa:ɣoɣe:ræ]		*		**
c. [kaɣa:ɣɔɣɛ:ra]	*!**		*	***

(90) This gives the appropriate output, with the consequence that the prefix [ka-] was affixed at Level II. The problem is that [ka-] is not an opaque morpheme, as evidenced by the form [kæɣu:te] 'I was blowing'.

(91) In the present analysis, [ka-] will act as opaque, which is clearly incorrect.

(92) One option is to affix [ka-] after the opaque morpheme with the ranking AGREE[ATR] >> ID[ATR]. This, however, would undo the opacity of the opaque morpheme.

(93) Locality of harmony in Nandi-Kipsigis Kalenjin

/ka/+ [ɣa:ɣoɣe:ræ] Level 2	AGREE [ATR]	ID[ATR]	*[–ATR] & ID[ATR]	*[–ATR]
a. ☹ [kæ-ɣæ:-ɣo-ɣe:r-æ]		**		
b. [ka-ɣa:ɣoɣe:ræ]	*!			**
c. [kaɣa:ɣɔɣɛ:ra]		*!**	*	***

(94) Another possibility would be to infix the opaque morpheme after the first cycle. This, too fails, because harmony spreads to the prefix [ka-], and this spreading is not undone by the opaque ranking.

(95) Locality of harmony in Nandi-Kipsigis Kalenjin: Level 1

/ka-ɣɔ-ɣe:r-a/ Root + Level 1	AGREE [ATR]	*[–ATR] & ID[ATR]	ID[ATR]	*[–ATR]
a. ☞ [kæɣo-ɣe:r-æ]			***	
b. [kaɣɔ-ɣe:r-a]	*!*			**
c. [kaɣɔ-ɣɛ:r-a]		*!	*	***
d. [kaɣo-ɣe:r-æ]	*!		**	*

(96) Locality of harmony in Nandi-Kipsigis Kalenjin: Level 2

[kæ + -ɣa:- + ɣo-ɣe:r-æ] Level 2	ID[ATR]	AGREE [ATR]	*[–ATR] & ID[ATR]	*[–ATR]
a. ☹ [kæɣa:ɣoɣe:r-æ]		**		*
b. [kaɣa:ɣo-ɣe:r-æ]	*!	*	*	**
b. [kæɣæ:ɣo-ɣe:r-æ]	*!			

(97) While there may be other options for getting lexically specific rankings to achieve the local result, lexically specific constraints are clearly simpler, and naturally provide the correct prediction.

(98) The problem with Stratal OT is that it cannot preserve what happens at each level. If one pass has high-ranked faithfulness, and the next pass has low-ranked faithfulness, the high-ranked faithfulness is essentially undone.

4.2. **Locality is Straightforward with Lexically-Indexed Constraints**

(99) In order for non-participating morphemes to be resistant to harmony, faithfulness to the vowels in these morphemes must be ranked higher than the constraints driving harmony.

(100) Thus, a strong faithfulness constraint that applies to all non-participating morphemes, ranked above AGREE[ATR] creates the opacity effect of these morphemes.

(101) Because lexically indexed constraints apply only to the indexed morpheme, locality is predicted.

(102) Locality of harmony in Nandi-Kipsigis Kalenjin[12]

/ka-ɣa:-ɣɔ-ɣe:r-a/ ‘he had seen me’	ID[ATR] STRONG	*[–ATR] & ID[ATR]	AGREE [ATR]	ID [ATR]	*[–ATR]
a. [kæ-ɣæ:-ɣo-ɣe:r-æ]	*!			****	
b. [kæ-ɣa:-ɣo-ɣe:r-a]			**!	***	*
c.☞ [ka-ɣa:-ɣo-ɣe:r-æ]			*	**	**
d. [ka-ɣa:-ɣɔ-ɣɛ:r-a]		*!		*	*****

(103) The fully harmonic candidate (a) violates the identity constraint for the opaque morpheme. Candidate (d) is also fully harmonic, but forces the dominant vowel to become [–ATR], causing a fatal violation of the local conjunction *[–ATR] & ID[ATR].

[12] The general constraints presented here are the same from those of Bakovic (2000).

(104) Candidate (b) shows /-ka/ as transparent, but has more agreement violations than the opaque candidate[13].

(105) Candidate (c) surfaces because it is fully faithful to the non-participating morpheme and causes the fewest agreement violations.

(106) The dominant-recessive nature of vowel harmony in Nandi-Kipsigis Kalenjin is not compromised by opaque morphemes. If a [+ATR] morpheme is adjacent to an opaque morpheme, it remains [+ATR]. This is shown below.

(107) Locality of harmony in Nandi-Kipsigis Kalenjin: Opaque morphemes don't spread [–ATR]

/tʃæ-gaj-ga-tʃwa:k/ 'those cows of ours of yesterday'	ID[ATR] STRONG	*[–ATR] & ID[ATR]	AGREE [ATR]	ID [ATR]	*[–ATR]
a. ☞[tʃægajgatʃwa:k]			*		***
b. [tʃæ-gæj-gæ-tʃwæ:k]	*!*			***	
c. [tʃa-gaj-ga-tʃwa:k]		*!		*	****

(108) Candidate (a), the disharmonic candidate, surfaces in order to preserve the dominant-nature of [+ATR] vowels. For dominant-recessive harmony, opaque morphemes with the recessive vowel will not spread harmony; they simply fail to undergo.

5. **Conclusions and Implications**

(109) Exceptions in vowel harmony are local in scope
(110) These are accounted for using lexically indexed constraints
(111) The locality of exceptions in vowel harmony is not captured with lexically specific rankings
(112) Stratal OT does not appear to offer a solution to the problems found with lexical exceptions
(113) The locus of violation for morpheme-specific constraints make the unusual prediction that long-distance phenomena should localize, which is borne out for vowel harmony
(114) Does this hold for exceptions for other long-distance phenomena?
(115) Are there exceptions in vowel harmony that actually do not obey localization presented here?

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[13] Accounting for transparency is a general difficulty for AGREE constraints. Transparent morphemes should in principle be possible, but would require more complex machinery, beyond the scope of this paper.

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