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A Feature Alignment Approach to Plural Realization in Eastern Andalusian Spanish

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Abstract: Using an optimality theoretic analysis, this study offers a conception of the problem of plural realization in Eastern Andalusian Spanish (EAS) where plural suffix /s/ was deleted diachronically that differs from other accounts that assign the EAS plural an underlying suffixal /s/ synchronically. Using alignment constraints, we argue that plural /s/ does not appear in the underlying form synchronically in EAS, but that instead the plural morpheme is represented by a floating [−ATR]PL feature that aligns to the right edge of the word and spreads left. The [−ATR] feature, represented phonetically as a laxing or opening of vowels, applies to all mid vowels, low vowels in word final position, and combines with vowel epenthesis to explain Eastern Andalusian pluralization tendencies in words with final consonants. We discuss the behavior of high vowels, which can be transparent to harmony, and focus in particular on the plural of words that end in a final stressed vowel that have been rarely discussed in the EAS literature. We develop an optimality-theoretic analysis on the Granada variety and extend that analysis to other varieties with somewhat different patterns.

Keywords: Eastern Andalusia; Peninsular Spanish; optimality theoretic analysis; [−ATR]; pluralization; alignment constraints; vowel harmony; phonology

1. Introduction and Background

In the variety of Spanish spoken in the eastern part of Andalusia, the southernmost region of Spain, vowel laxing has been long documented in dialectological writings going back at least to the work of Navarro Tomás (1938, 1939) and much subsequent work including Alonso et al. (1950) and Zubizarreta (1979) among many others as detailed in Herrero de Haro (2017b) and Herrero de Haro and Hajek (2022). Focusing here on the plural word forms of nouns and adjectives, when the word-final /s/ that marks the plural is deleted, the immediately preceding vowel typically laxes, as do all other preceding mid vowels in the word; and as reported in Jiménez and Lloret (2020), depending on the specific variety of Eastern Andalusian Spanish (henceforth, EAS), other preceding vowels may lax as well, as in the Jaén dialect where all vowels are lax in plural word forms when the historical word-final *s of the plural deletes. For example, in the plural of the word *nenes* /'ne.nes/ 'boys', a prototypical EAS production would include laxed production of the mid-vowels and an absence of a final fricative consonant (i.e., ['nɛ.nɛ]).

Over the past thirty years, the EAS plural has fostered a variety of analyses in Optimality Theory as well as much discussion on specific data issues, especially concerning whether or not low and high vowels can be undergoers (targets) of the harmony process. While some of this research focuses on the plural (e.g., Herrero de Haro 2020), most of these works consider vowel laxing to be largely phonological, since coda /s/ in EAS generally deletes whether it is a morphological marker (as in the noun plural or 2nd person singular *tú* verb forms; e.g., Standard Peninsular Spanish (SPS) *teléfonos* /te.'le.fo.nos/ 'telephones' produced as EAS [tɛ.'lɛ.fɔ.nɔ]) or a lexical /s/ that is underlying in a monomorphemic word (e.g., SPS *jueves* /'hwe.ßes/ 'Thursday' produced as EAS ['hwɛ.ßɛ]).

Along these lines, previous optimality-theoretic analyses, such as those conducted by Jiménez and Lloret (2007, 2020), Walker (2011), Soriano (2012), and Kaplan (2021a, 2021b), have assumed that the EAS plural synchronically contains an underlying suffixal /s/. Vowel laxing is then viewed as a process whereby coda /s/ deletes, leaving behind a [spread glottis] feature that coalesces with the immediately preceding tense [+ATR] vowel resulting in a lax [–ATR] vowel; the [–ATR] feature then spreads regressively as laxing harmony for reasons of feature perceptibility. Jiménez and Lloret rely on licensing and anchoring constraints to achieve spreading. Soriano achieves laxing spreading by an AlignSuffix/ProsodicWord constraint that has the effect of preserving the laxing that is the trace of the intended consonantal gesture of the underlying /s/ plural, which enhances the perceptibility of this plural marker. Kaplan (2021b) using harmonic serialism achieves the spreading of the [–ATR] feature from the deleted plural /s/ by the notion of persistent licensing which has the effect of extending the domain of the licensed [–ATR] feature. Regarding the precise domain of the regressive spreading of [–ATR] in plural word forms, Jiménez and Lloret (2020) note the variation that occurs in Granada EAS. Spreading of [–ATR] leftward minimally goes to the stress vowel (i.e., a foot domain) and maximally to the beginning of the lexical word (word domain), the specifics depending on the specific variety (and perhaps the speech rate).

While previous optimality-theoretic analyses of EAS plural laxing harmony have conceived of it through licensing type constraints that help to maximize the perceptibility of the [–ATR] laxing feature that comes about through the deletion of coda /s/, in this paper we offer and formalize a very different conception of EAS vowel harmony. First, we focus only on the plural under the view that harmony involving the feature [–ATR], which is the exponence of the plural, is different from purely phonological harmony triggered by the deletion of coda /s/.[1] Support for this view comes from Henriksen (2017, pp. 110–11), who shows that the phonetics is not the same between the two situations: laxing is actually stronger when a word-final lexical /s/ deletes (as in *jueves* 'Thursday') than in the morphological laxing of the plural (as in *nenes* 'boys'). Moreover, Herrero de Haro (2020, p. 19) posits a scenario of EAS plural formation where plural marking is becoming perceptible by "an unidentified suprasegmental element" that relates to vowel opening. This suggests to us that the "unidentified suprasegmental element" synchronically is a floating [–ATR] feature that is the exponence of the plural rather than a suffix -s, as has been assumed in all the previous analyses that we are aware of. Henriksen (2017, p. 122) comments "because /s/ has been lost, EAS appears to have co-opted the independently motivated laxing pattern as a plural marker, most likely in tandem with the right-to-left harmony process". Given this, it is not surprising that there can be phonetic differences between laxing harmony triggered by the deletion of lexical /s/ in coda position and laxing as part of the exponence of the plural. We then view EAS laxing as an instantiation of what has been termed by Bermúdez-Otero (2016, and references cited therein) as 'rule scattering', whereby a single process diachronically evolves into two (or more) separate rules, especially if an environment can be morphologically interpreted. Consequently, we consider the EAS plural laxing as having a separate analysis that is conceptually different from the laxing triggered by lexical /s/ deletion in coda position. Furthermore, following the perspective of Construction Morphology (Booij 2010), we view the plural as being different than other morphological constructions that might witness laxing, such as the 2nd person singular verbal conjugation of the tú form of the present tense verb. Different morphological constructions that seemingly have homophonous exponence nonetheless can have different characteristics, as with English suffixal -er, which has a length restriction in the comparative (e.g., intelligent—*intelligenter) but not as an agentive (e.g., interrogate—interrogator).

Based on synchronic EAS, we maintain that suffixal /s/ no longer represents the underlying plural in this variety. Instead, the plural morpheme is represented by a floating [–ATR] feature that aligns to the right edge of the word and spreads left. This [–ATR] feature is represented phonetically as a laxing or opening (i.e., lowering) that occurs most regularly in the mid vowels /e/ and /o/. Because [–ATR] can only be realized on

vowels, final vowel epenthesis is triggered in the plural of EAS words where the singular ends in a lexical consonant so that the plural can be realized (*carbón/carbones* [karbon]—[karbɔnɛ] 'carbon (sg.)/(pl.)') where the mid front vowel acts as a default vowel generally in Spanish phonology as it occurs elsewhere in epenthetic contexts. Additionally, our analysis accounts for word-final high vowels /u/ and /i/, which can be transparent to harmony (Henriksen 2017), as well as the low vowel /a/, which undergoes laxing in word-final position but may or may not elsewhere depending on the subvariety. Furthermore, we analyze the plurals of words that end in final stressed vowels that can differ from the plural pattern of more typical words that end in stressless vowels. As far as we are aware, these have not been systematically discussed in the EAS laxing literature.

The remainder of this paper is organized as follows. In Section 2, we provide an overview of the data we will be analyzing based on Granada EAS. Using the phonetic analysis of Henriksen (2017) to pinpoint vowel height differences, we provide words both studied by Henriksen as well as representative examples of longer words discussed in other sources and from native speaker consultation. We discuss data disagreements especially with respect to whether high vowels actually undergo harmony and the matter of the domain of spreading. In Section 3 we develop an OT alignment analysis of the EAS plural where the plural word form is marked with a floating [–ATR] autosegment aligned to the right edge of the word that spreads leftward. We consider words with vowels of various heights including borrowed words that end in a high vowel, as well as words where the final lexical segment is a consonant. While the data we analyze in Section 3 all involve nouns (and adjectives) that have typical stress patterns, in Section 4 we consider the plural nouns whose singular ends in a final stressed vowel. These do not seem to have been systematically considered in the optimality-theoretic literature on EAS and we extend our alignment account to these forms. In Section 5, we briefly show how our alignment analysis can be extended to other patterns of EAS plural laxing that have been reported in the literature. Section 6 concludes.

2. Presentation of EAS Plural Data

In a typical EAS plural word form (focusing on nouns and adjectives), the word final vowel is usually laxed; then, depending on various factors, other vowels in the word may also surface as lax. We see two issues in describing the plural word forms. First, do EAS plural words underlyingly have a suffixal /-s/ like in other varieties of Spanish? Second, what exactly is the vowel laxing pattern in EAS plural words? Concerning the first issue, almost all previous analyses during the past three decades have assumed that EAS plural word forms synchronically have an underlying final /-s/, even though it does not surface in plural nouns and adjectives (i.e., *bañeras* 'bathtubs' as /ba.'ɲe.ɾas/). This is the case whether the analyses overtly show the plural morpheme in their derivation or optimality-theoretic tableaux (as in Jiménez and Lloret 2007, 2020; Soriano 2012) or just assume it without showing it (as in Kaplan 2021b). Here, though, we follow Herrero de Haro (2020) who makes clear that in EAS the plural -s never surfaces as [s], which makes it unlike Caribbean varieties that have coda /s/ deletion but where the /s/ of the plural can resurface depending on phonological context among other factors (e.g., *meses* /me.ses/ as ['me.ses], ['me.seh], or ['me.se:] 'months'). It also makes it unlike EAS words that end in a lexical /s/ such as *mes* /mes/ 'month' pronounced as [mɛ] in EAS but where the /s/ shows up in the plural form *meses* ['mɛ.sɛ] 'months'.

Further evidence that there is no need to posit an underlying plural /-s/ in EAS comes from Herrero de Haro's (2020) perceptual study that shows that the singular and plural forms of many lexemes can be distinguished from the left edge of the word rather than the right edge (e.g., *coche* ['ko-] 'car' vs. *coches* ['kɔ-] 'cars'). Consequently, Herrero de Haro (2020, p. 19) suggests that plural marking is becoming identifiable by "an unidentified suprasegmental element", which we identify in our analysis as a floating [–ATR] feature that marks plural word forms. Thus, in our presentation and analysis of the EAS plural, we will not include a suffix /-s/ as part of the underlying representa-

tion of plural words. Instead, we will present a feature alignment analysis of the floating morphological [–ATR]PL feature, which begins for the plural in Section 3.

As for the second issue—namely, which vowels are considered lax in plural word forms—there is some disagreement on this subject even for vowels within the same variety of EAS. This particularly pertains to the Granada variety, where there are small disagreements in the data presentation of plurals between Jiménez and Lloret (2020) and Henriksen (2017). The disagreements concern whether high vowels and nonfinal low vowels undergo laxing in plural word forms. This disagreement, which goes back many decades, is reviewed by Jiménez and Lloret (2020, pp. 101–2) and more thoroughly by Herrero de Haro and Hajek (2022, pp. 144–48). The disagreement is mentioned in Ranson (1992, p. 308) where locals transcribing her EAS data and the author differed with respect to the coding of certain words as marking plurality. While the disagreement to a certain extent reflects variation in different subvarieties (and perhaps idiolects), it also reflects an unstated disagreement as to what an acoustic threshold would be for a vowel to be considered lax. In their presentation of the Granada dialect, Jiménez and Lloret (2020, p. 106) seem to consider word-final high vowels and stressed low vowels to always be lax and non-final unstressed low vowels to be optionally laxed in plural word forms, while Henriksen's (2017) analysis of speech data shows them not to be lax. However, these researchers agree that mid vowels always undergo laxing in plural word forms.

To be clear, even researchers who do not consider high vowels or non-final low vowels to be lax in plural word forms may nonetheless note minor phonetic differences of such vowels. So, for example, as discussed by Herrero de Haro and Hajek (2022), several researchers such as Zubizarreta (1979) consider high vowels in laxing contexts to be phonetically, but not phonologically, lax; consequently, such vowels are not viewed as undergoing laxing. Zubizarreta, in particular, distinguishes high-level (phonological) laxing that affects all mid vowels in the harmony domain as well as word-final low vowels from low-level (phonetic) laxing that can affect non-final low vowels and all high vowels in a harmony domain. Those undergoing low-level laxing are not considered real targets of the harmony process and are either transparent or opaque to it. A main reason for the data disagreement is that there does not seem to be an established agreed upon acoustic threshold in the EAS literature that determines when a vowel should be considered lax. As a somewhat related comparison, studies on English diphthong raising whereby /ay/ is raised to [ʌy] before voiceless consonants has an established threshold (Labov et al. 2006) of a 60 Hz difference in F1 lowering for /ay/ to be considered perceptually raised before a voiceless consonant. Speakers showing a 30 Hz difference are not considered to have perceptible raising, despite the slight difference in production this difference suggests. No such acoustic threshold has been agreed upon in the literature on EAS laxing, as pointed out by Pollock (2023, p. 186) in an analysis of vowel harmony among Granada politicians. This author found an average difference of only 15 Hz for F1 between vowels in plural and non-plural wordforms, much lower than the threshold of 60 to 100 Hz identified by Herrero de Haro (2017a) for perceptibility in vowel height identification preceding /s/, /r/, and /θ/ deletion.

Given the above discussion regarding the interpretation of the laxing data in plural word forms from Granada EAS, we must make certain decisions in our data presentation regarding when high vowels and non-final low vowels are considered lax. We follow Henriksen (2017) and Kaplan (2021b) (and also Zubizarreta 1979) in considering high vowels resistant to laxing. However, one pattern that these researchers did not explicitly consider, perhaps because of its rarity, concerns the plural of words ending in a word-final stressed high vowel, although analyses drawing on the work of Jiménez and Lloret predict lax word-final high vowels regardless of stress. Based on Herrero de Haro (2020, p. 4) and our own native speaker consultation, we consider the plural of such words to indeed undergo final laxing. We will discuss and analyze plurals of words ending in final stressed vowels in Section 4 after developing our analysis in Section 3. With respect to low vowels, we follow Henriksen (2017) and Zubizarreta (1979) in considering low vowels as being lax

only in word-final position in plural word forms but not in other positions. Note that this differs from the claims made by Jiménez and Lloret, who state that non-final unstressed vowels in plural word forms can fail to undergo laxing, while stressed low vowels always undergo laxing. It is interesting to note that the view of Henriksen and Zubizarreta that leftward laxing harmony only affects mid vowels finds support in the experimental work of Herrero de Haro (2020) where EAS listeners are much better at identifying a plural word form by hearing just the first vowel of a two syllable paroxytone (i.e., a trochaic word form) if that vowel is mid as opposed to a non-mid vowel. Given all the caveats discussed above, we will present the Granada EAS plural data below in a way that is largely consistent with Henriksen (2017), and our optimality-theoretic analysis in Section 3 will be largely based on that description.

In a comparison of two varieties of Iberian Spanish, Henriksen (2017) maintains that EAS, which has phonological coda /s/ deletion and laxing in plural word forms, has eight vowels phonetically that can be transcribed as [a æ e ɛ i o ɔ u], whereas speakers of the more standard North-Central Peninsular Spanish (NCPS), which tends to retain coda /s/, lack [æ ɛ ɔ]. In Henriksen's perceptual study, speakers of EAS were able to distinguish plural word forms with laxed or [–ATR] vowels from their singular counterpart with tense or [+ATR] vowels (e.g., *jefe* 'chief' [jefe] versus *jefes* 'chiefs' [jɛfɛ]), whereas those who spoke NCPS were slower to identify the difference between plural and singular, and responded at closer to chance. An issue that arises in the analysis of EAS is the phonemic status of the lax vowels [æ ɛ ɔ].[2] For the purposes of this paper, we view the lax mid vowels [ɛ ɔ] as having emerging phonemic status, given that they can appear in all pertinent word positions as well as their perceptual saliency to native speakers, which makes them different from the lax variants of the other vowels. That said, we assume here following the presentations of Henriksen (2017, p. 107), Jiménez and Lloret (2020, p. 106) and Herrero de Haro and Hajek (2022, p. 146) that the underlying vowels in plural forms are the tense vowels that are found in the corresponding singular and that the lax vowels that surface in plural word forms are derived.

In what follows, we present data on the plural that represent several key segmental contrasts. Recall that we do not consider the plural as having an underlying word-final suffix /s/. As mentioned, our data presentation will largely follow the pattern of laxing in Henriksen (2017), which, in turn, is very similar to the pattern of "high-level laxing" in Zubizarreta (1979). First, as Henriksen (2017) and many other researchers on EAS have found, plural word forms where all the vowels are mid, as in (1), surface with [–ATR] on all vowels. (In the data presentation, the orthographic representation is in the leftmost column, singular word forms are in the second column, the corresponding plural is in the third column, and the English gloss of the singular is in the rightmost column. The transcriptions indicate the location of stress and the syllable boundary; allophonic variation not related to the plural will not always be transcribed.)

(1) Mid Vowel Data

	Orthography	Singular	Plural	Gloss
a.	*nene*	['ne.ne]	['nɛ.nɛ]	boy
	pomo	['po.mo]	['pɔ.mɔ]	doorknob
b.	*coche*	['ko.tʃe]	['kɔ.tʃɛ]	car
	velo	['be.lo]	['bɛ.lɔ]	veil
c.	*celebre*	[θe.'le.βɾe]	[θɛ.lɛ.βɾɛ]	famous
	monólogo	[mo.'no.lo.ɣo]	[mɔ.'nɔ.lɔ.ɣɔ]	monologue
d.	*pomelo*	['po.me.lo]	['pɔ.mɛ.lɔ]	grapefruit
	teléfono	[te.'le.fo.no]	[tɛ.'lɛ.fɔ.nɔ]	telephone

In the above data, it can be seen that mid-vowels always acquire [–ATR] when pluralized in EAS, with harmony spreading across the entirety of the word. Word length and stress do not seem to affect the spread of the plural [–ATR] feature as shown, but Jiménez and Lloret note that spreading to the left of the stressed syllable may be optional

and that harmony to the penultimate syllable is optional in words with antepenultimate stress, provided that the vowels are different.

Next, low vowels have a more complicated relationship with harmony. While they are transparent to it, allowing harmony to extend past them word-medially, low vowels, as in (2), only manifest [–ATR] in word-final position:

(2)   Low Vowel Data

	Orthography	Singular	Plural	Gloss
a.	*casa*	['ka.sa]	['ka.sæ]	house
	mapa	['ma.pa]	['ma.pæ]	veil
b.	*tela*	['te.la]	['tɛ.læ]	fabric
	poema	[po.'e.ma]	[pɔ.'ɛ.mæ]	poem
c.	*bañera*	[ba.'ɲe.ɾa]	[ba.'ɲɛ.ɾæ]	bathtub
	colorada	[ko.lo.'ra.ða]	[kɔ.lɔ.'ra.ðæ]	red

In these data, it can be seen that word-final /a/ acquires the plural morpheme [–ATR], which spreads across the word. But word-internal /a/ neither undergoes harmony nor blocks it, as seen in the plural of colorada. That non-final /a/ can be transparent to harmony is one of the optional patterns noted by Jiménez and Lloret (2020, p. 106). However, these researchers indicate a change in /a/ when in the stressed syllable of plural word forms as in the initial syllable of *casas* 'houses' whereas Henriksen (2017, p. 123) is clear that the low vowel in a word like *casas* is not the target of harmony, and in the experimental study of Herrero de Haro (2020), the quality of the low vowel in the first syllable of plural words like *casas* was not used as a cue that the word was plural, while the quality of mid vowels were used in this way.

The pattern of high vowels appears similar to /a/ if we focus on word-internal (i.e., non-final) position. Here, as seen in (3), non-final high vowels do not undergo harmonic spreading when in the first syllable of bisyllabic trochees as in (3a) and they are transparent to it in the middle of a harmonic domain as in (3b) and (3c).

(3)   High Vowel Data (non-final position)

	Orthography	Singular	Plural	Gloss
a.	*nube*	['nu.βe]	['nu.βɛ]	cloud
	vida	['vi.ða]	['vi.ðæ]	life
b.	*poliza*	[po.'li.θa]	[pɔ.'li.θæ]	policy
	seguro	[se.'ɣu.ɾo]	[sɛ.'ɣu.ɾɔ]	certain
c.	*película*	[pe.'li.ku.la]	[pɛ.'li.ku.læ]	movie
	adjetivo	[ad.xe.'ti.βo]	[ad.xɛ.'ti.βɔ]	adjective

A complication arises in plural forms of words that end in a high vowel, which are not common in Spanish nouns and adjectives. In (4a), we see four examples of word forms ending in a stressless high vowel. There is disagreement on the data in (4a) for Granada EAS. Henriksen (2017) and Zubizarreta (1979) do not consider the final high vowel in these plural word forms to be phonologically lax. On the other hand, Jiménez and Lloret (2020) indicate that they are. Here we follow Henriksen. Regarding the non-final vowels in words like those in (4a), for Jiménez and Lloret they reflect the regular harmony pattern in that non-final high vowels fail to lax while mid vowels can undergo laxing. Henriksen (2017) does not discuss vowel laxing of non-final vowels in words ending in a high vowel like those in (4a). Following Jiménez and Lloret (2020, p. 106) we consider the pre-final mid vowels to undergo laxing while the high vowels do not. The last example in (4a) *tribu* 'tribe' is interesting in that neither of the high vowels laxes in the plural.

(4)   High Vowel Data (final position)

	Orthography	Singular	Plural	Gloss
a.	*poli*	['po.li]	['pɔ.li]	cop
	ímpetu	['im.pe.tu]	['im.pɛ.tu]	violent
	espíritu	[es.'pi.ri.tu]	[ɛs.'pi.ri.tu]	spirit
	tribu	['tri.bu]	['tri.bu]	tribe
b.	*club*	['klu] (/klu/)	['klʊ]	club
	clip	['kli] (/kli/)	['klɪ]	clip
	menú	[me.'nu]	[me.'nʊ]	menu
	hindú	[in.'du]	[in.'dʊ]	Hindu

The data in (4a) should be contrasted with (4b) where the word-final high vowel is stressed. (Note that the first two words in (4b) are borrowed from English without the final obstruent being lexicalized. See Bermúdez-Otero 2007 for discussion on such forms.) The data in (4) have been little discussed in the literature on EAS plurals. The occurrence of a word-final high vowel with stress on a noun or adjective as in (4b) is unusual in Spanish and is typically found in borrowed words. The EAS plural form of these words follows an observation by Herrero de Haro (2020, p. 4) that "words that have stress on the last syllable only lower one vowel when [plural] /-s/ is deleted in EAS". One example would be *bebés* 'babies', where the word-final /e/ of the EAS plural laxes but the unstressed first vowel does not experience optional harmonization. This would contrast with a word having stress on the initial syllable, where both vowels lax in the plural. Words like *bebés* and those in (4b) will be discussed in more detail in Section 4 after we develop our optimality-theoretic analysis of the EAS plural data based on the patterns shown in (1)–(4a) above.

Having now seen a variety of nouns with all types of vowels, two questions remain: how are consonant-final nouns treated when pluralized, and what happens along morpheme boundaries? The data in (5) provide examples of consonant final words.

(5)   Consonant-Final Noun Data

	Orthography	Singular	Plural	Gloss
a.	*mes*	['mɛ] (/mes/)	['mɛ.sɛ]	month
	gol	['gol]	['gɔ.lɛ]	goal
b.	*empujón*	[em.pu.'xon]	[ɛm.pu.'xɔ.nɛ]	push
	carbón	[kar.'bon]	[kar.'bɔ.nɛ]	carbon
	seguidor	[se.ɣi.'ðor]	[sɛ.ɣi.'ðɔ.ɾɛ]	follower
c.	*contiguidad*	[kon.ti.ɣui.'ðad]	[kɔn.ti.ɣui.'ða.ðɛ]	contiguity
	observacional	[ob.seɾ.βa.θio.'nal]	[ɔb.sɛɾ.βa.ciɔ.'na.lɛ]	observational
d.	*departamental*	[de.par.ta.men.'tal]	[dɛ.paɾ.ta.mɛn.'ta.lɛ]	departmental

Although diachronically these data could be described as taking on /-es/ as a plural allomorph, in our synchronic analysis, we do not posit any segmental suffix; rather, as mentioned at the beginning of this section, we posit the plural to be a floating [−ATR]PL feature. Because of the need for the plural to be expressed at the right edge of the word, word-final vowel epenthesis is triggered to take on the [−ATR] specification, as it cannot be taken on by consonants in Spanish. That it is the front mid vowel that epenthesizes is consistent with Spanish phonology, as /e/ surfaces as the epenthetic vowel in other contexts (e.g., to break up impermissible initial consonant clusters in borrowed words). The [−ATR] feature that is realized on the epenthetic vowel then spreads leftward as in the other EAS plural word forms.

A final matter concerning the data is the effect of certain morpheme boundaries in blocking or limiting the spread of the [−ATR] plural feature. First, as discussed by Soriano (2012, p. 301), harmony is restricted to the rightmost prosodic word adjacent to the plural morpheme. There must be some type of prosodic word domain where the domain of a secondary stress functions as its own prosodic word. Therefore, in compound words (and others with word-medial prosodic word boundaries which we do not elaborate on), we would not expect to see harmony spreading to the left of that edge, but rather to remain restricted to the rightmost prosodic word, as in the examples in (6):

(6)   Word-medial prosodic boundaries

	Orthography	Singular	Plural	Gloss
a.	*fotomultiplicador*	[fo.to+mul.ti.pli.ka.ˈðoɾ]	[fo.to+mul.ti.pli.ka.ˈdɔ.ɾɛ]	photomultiplier
	autodecremento	[au.to+de.kɾe.ˈmen.to]	[au.to+dɛ.kɾɛ.ˈmɛn.tɔ]	self-decrease

Second, as noted by Jiménez and Lloret (2020, p. 108), the word-final vowel of the plural does not diphthongize over the word boundary unlike a word-final vowel of the singular. They contrast *tomate y* [ei̯] *clavel* 'tomato and carnation', where diphthongization takes place, with *claveles y* [ɛ.i] *tomates* 'carnations and tomatoes', where diphthongization is prevented with a clear boundary between the [ɛ] of the plural and the [i] of the conjunction. This is consistent with our view of the EAS plural having a floating [–ATR] autosegment which is aligned to the right edge of the grammatical word, thus preventing diphthongization over a word boundary.[3]

Having presented the EAS plural data, in the next section we offer an optimality-theoretic analysis that conceptualizes the plural morpheme as a floating morphological autosegment that is realized through various alignment constraints along the lines of morphemic vowel harmony as described by Akinlabi (1996) and Finley (2009).

3. Optimality Theoretic Analysis: Feature Alignment without Suffixal /-s/

In this section we will sketch an optimality-theoretic analysis of the Granada EAS plural data as presented in Section 2. Unlike previous analyses, we will not assume that the plural is marked by suffixal /-s/; rather we maintain that the underlying forms of plural words have a floating morphemic feature [–ATR] that marks the plural and that this feature is realized by alignment constraints (Akinlabi 1996; Finley 2009). Previous analyses such as Jiménez and Lloret (2007, 2020) have assumed that EAS plural words are marked with a word-final /-s/ because EAS has coda /-s/ deletion generally, making word-final plural /-s/ deletion another instance of general coda deletion. Along these lines, Soriano (2012, pp. 302–3) assumes a word-final plural /-s/ for Jaén EAS, though it is never realized, because "the realization of the consonant is intended though it is not finally produced, and the special restrictions that this pseudo-articulation provokes in the oral cavity makes these differences in height [i.e., laxing] appear in vowels". Vowel laxing is viewed as a process whereby coda /s/ deletes, leaving behind a [spread glottis] feature that coalesces with the immediately preceding tense [+ATR] vowel resulting in a lax [–ATR] vowel; the [–ATR] feature then spreads regressively as laxing harmony for reasons of feature perceptibility.

However, given that the plural /-s/ is never pronounced in EAS, making it unlike words in this variety that end in a lexical /s/ (such as *mes* /mes/ 'month' pronounced as [ˈmɛ] in EAS but where the /s/ shows up in the plural form *meses* [ˈmɛ.sɛ] 'months'), we posit that from a synchronic perspective the plural is simply marked by a morphemic [–ATR] floating feature. Our perspective regarding the representation of the plural is also supported by Henriksen (2017, pp. 110–1) who shows that the phonetics of laxing in Granada EAS is different when a word-final lexical /s/ deletes (as in *jueves* 'Thursday') as opposed to the morphological laxing of the plural (as in *nenes* 'boys'). Specifically, Henriksen (2017, p. 111) notes "that the trend toward laxing is greater in /s/-final monomorphemic words than in /s/-final plurals". To us, this suggests that laxing triggered by lexical /s/-deletion is conceptually different than plural laxing: the former may indeed be conceptualized through positional licensing and feature perceptibility as in the analyses of Jiménez and Lloret, Walker, and Kaplan, whereas the latter can be conceptualized as morpheme realization via alignment constraints.

Relatedly, and what has not been previously discussed in the Granada EAS laxing literature, is a difference in laxing in oxytones (i.e., final stress) between plural forms and singular forms with lexical /s/ deletion with respect to the leftward spreading of [–ATR]. This can be seen in the contrast between the singular *revés* 'other side' pronounced as [ɾɛ.ˈvɛ] and the plural of *bebé* 'baby' pronounced as [be.ˈbɛ] where [–ATR] is only realized on the final vowel in plural of oxytones ending in a stressed vowel. This will be discussed

in detail in Section 4. Further, as mentioned earlier, our view that the EAS plural does not have a suffix /s/ also finds support from Herrero de Haro's (2020, p. 19) perceptual study that the plural forms of at least some lexemes can be distinguished from the left edge of the word rather than the right edge, leading him to suggest that plural marking is becoming identifiable by "an unidentified suprasegmental element"; the element we identify as a floating [–ATR] feature.

In our analysis, the plural morpheme represented by [–ATR]PL is aligned to both the right and left edge of the word. The Align-Right [–ATR]PL is categorical and must be manifested on the right edge of the grammatical or lexical word, lest it not be manifested at all; leftward spreading of [–ATR]PL is due to a gradient Align-Left feature constraint that aligns it to the left edge of the prosodic word. Alignment constraints can either be gradient or categorical. While an alignment constraint that aligns a smaller entity with a larger one is evaluated gradiently, an alignment constraint that aligns a larger entity with a smaller one is evaluated categorically. As an example of the latter, in an analysis of the distribution of the feature [spread glottis] in Korean, Davis and Cho (2003) use the constraint Align (Word, Left, [spread glottis], Left) that requires the beginning of the word (i.e., the first phoneme of the word) to have the feature [spread glottis]. If the initial sound of the word does not have the feature [spread glottis], the constraint is violated. There is no gradient evaluation. Both types of alignment constraints will be used in our analysis of EAS plural laxing below and it will be seen that these constraints interact with others, including feature cooccurrence constraints. In what follows, we return to the presented data from Section 2, provide OT constraints that help describe the process of plural vowel laxing, and analyze possible candidates in tableaux, yielding an OT ranking that describes EAS harmonic tendencies. Later, in Section 5, we suggest extensions of our analysis to cover other somewhat different patterns of EAS plural laxing that are reported in the literature.

3.1. Treatment of Plural Word Forms with Mid Vowels

When working with words that contain exclusively mid vowels, there is a clear pattern. For example, in a word such as *nene* 'boy' from (1b), the plural always has [–ATR] applied to both vowels. We will use a categorical alignment constraint that establishes that the right edge of the word will have the plural morpheme (i.e., [–ATR]PL), as described in (7):

(7) AlignPL-R: Align (Word, Right, [–ATR]PL, Right)
   The right edge of the grammatical word is aligned with the right edge of the plural morpheme [–ATR]PL.

The alignment constraint in (7) is categorical in that the [–ATR]PL feature has to surface at the right edge of the grammatical word or category, lest it not be manifested at all. The use of grammatical word or category as part of morpheme alignment constraints can be found in use by Kager (1999), Akinlabi (1996, 2011), or by Finley (2009), who prefers to use Anchoring constraints rather than Alignment constraints (using the term "lexical domain"), but notes that the two types are almost identical in accounting for morphological feature realization. None of these researchers discuss the EAS plural. We note that while the constraint in (7) would be trivially (nonfatally) violated in any word that does not have the floating [–ATR]PL feature in its underlying representation, the constraint plays a central role in plural word forms requiring that plural exponence be manifested in word-final position. The constraint in (7) is similar to a RealizeMorpheme type constraint (Kurisu 2001); in Section 3.3 we will incorporate such a constraint in accounting for the laxing pattern shown by the data in (4a).

In order to ensure that this [–ATR]PL feature spreads leftward, we will set up a second alignment constraint, a gradient one, that will align the left edge of the feature [–ATR]PL to the left edge of the prosodic word, as in (8):

(8) AlignPL-L: Align ([–ATR]PL, Left, Word, Left)
   The plural morpheme [–ATR]PL is aligned with the left edge of the prosodic word.

We refer here to prosodic word in order to account for the data in (6) where spreading only occurs to the rightmost member of a plural compound. As the left alignment constraint is evaluated in a gradient manner, a candidate with the first vowel in the word having the [–ATR]PL feature will completely respect the constraint, but if the second vowel of the word is [–ATR] but not the first one then the constraint is violated once; a candidate where the first [–ATR] vowel in the word is two positions from the leftmost vowel will violate the constraint twice, etc. Since consonants in general do not take the feature [–ATR], distinguishing it from [RTR] which can affect both consonants and vowels (see Goad 1991; Davis 1995), we only consider vowels in determining the gradiency of the constraint in (8).

Further, in order to account for the feature change when [–ATR] is realized on a vowel, we need a faithfulness constraint that will militate against changing the input [+ATR] value in the output; this is shown in (9) and has been used in the analysis of Jiménez and Lloret as well as in other optimality-theoretic analyses of EAS laxing:

(9)   ID[ATR]: Identity [ATR]
  A segment does not change its feature value for [ATR].

Using these three constraints, we can examine four potential candidates for the underlying representation of the plural form of *nene* /ˈne.ne/ 'boy' and explain why the optimal candidate succeeds, in Tableau 1 where the plural morpheme in the input is shown by the floating morphemic feature [–ATR]PL.

[–ATR]$_{PL}$

Tableau 1. *nenes* /ˈne.ne/ 'boys'.

[–ATR]$_{PL}$ /ˈne.ne/	AlignPL-R	AlignPL-L	ID[ATR]
a. ˈne.ne	*!		
b. ˈne.nɛ		*!	*
☞c. ˈnɛ.nɛ			**
d. ˈnɛ.ne	*!		*

Ranking from Tableau 1: *AlignPL-R, AlignPL-L >> ID[ATR].*

This tableau demonstrates a hierarchical ranking, placing both AlignPL-R and AlignPL-L above ID[ATR]. If the ranking were to be reversed such that AlignPL-R was the lowest ranked constraint, candidate (a) would win. If AlignPL-L was the lowest ranked constraint, candidate (b) would win. Therefore, we need to have ID[ATR] as the lowest ranked of these three, although the ranking between the two alignment constraints is as yet undetermined. Regarding the interpretation of the alignment constraints, candidates (a) and (d) in the tableau violate the categorical constraint AlignPL-R because there is no manifestation of the floating [–ATR]PL feature at the right edge of the word. Candidate (a) does not violate the gradient constraint AlignPL-L, since there is no [–ATR]PL vowel in the output word and so it is vacuously satisfied. Candidate (b) violates the AlignPL-L constraint because the [–ATR]PL feature is not extended to the first vowel of the word. Note that, because candidate (d) also violates ID[ATR], it is harmonically bounded by candidate (a), meaning that candidate (d) could only win if another constraint were introduced that (d) respects and (a) violates.

The next step for the analysis of mid vowels is to describe the selection of the winning candidate for words with more than two syllables. In this case, as we will see in Tableau 2 for *telefono* 'telephone' from (1d), we need an additional constraint to select a candidate with the feature [–ATR] spreading to word-internal vowels. We use the NoGap constraint after Archangeli and Pulleyblank (1994), McCarthy (1997), and used for EAS by Soriano (2012). For purposes of this paper, we relativize NoGap to [–ATR] spreading described in (10):

(10)   NoGap
In a string of more than two vowels, the feature [−ATR] cannot skip over a medial vowel.

[−ATR]$_{PL}$

Tableau 2. *teléfonos* /te.'le.fo.no/ 'telephones'.

[−ATR]$_{PL}$ /te.'le.fo.no/	AlignPL-R	AlignPL-L	NoGap	ID[ATR]
a. te.'le.fo.no	*!			
b. tɛ.'le.fo.nɔ			*!*	**
☞c. tɛ.'lɛ.fɔ.nɔ				****
d. te.'lɛ.fɔ.nɔ		*!		***

Ranking from Tableau 2: *AlignPL-R, AlignPL-L, NoGap >> ID[ATR]*.

In Tableau 2, each of the three constraints must be ranked above ID[ATR] to ensure that candidate (c), in which all vowels are [−ATR], is selected as the winning candidate. If ID[ATR] were to outrank any other constraint, including NoGap, one of the other candidates would be incorrectly selected as winner.

3.2. Treatment of Low Vowels

In order to explain the tendency of EAS low vowels to not become [−ATR] in non-word-final position, we need a markedness constraint that militates against [−ATR] in all low vowels. This constraint is described in (11) and is crucially ranked with respect to the two alignment constraints as shown by the evaluation of the plural form of /mapa/ from the data in (2a) in Tableau 3 below:

(11)   *[−ATR, +low][4]
The feature combination of [−ATR] and [+low] cannot cooccur on the same phoneme.

[−ATR]$_{PL}$

Tableau 3. *mapas* /'ma.pa/ 'maps'.

[−ATR]$_{PL}$ /'ma.pa/	AlignPL-R	*[−ATR] [+low]	AlignPL-L	NoGap	ID[ATR]
a. 'ma.pa	*!				
b. 'mæ.pæ		**!			**
c. 'mæ.pa	*!	*			*
☞ d. 'ma.pæ		*	*		*

Ranking emerging from Tableau 3: *AlignPL-R >> *[−ATR +low] >> AlignPL-L*.

Tableau 3 provides evidence for the crucial ranking of various constraints. The comparison of candidate (a) with the winning candidate (d) shows that AlignPL-R must outrank *[−ATR +low] since the reverse ranking would wrongly result in (a) being the winner. Moreover, we see that AlignPL-L must be crucially ranked below the low vowel markedness constraint *[−ATR +low], or else candidate (b) would wrongly be the winner. As a result, the only unranked constraints in the above tableau are AlignPL-L in relation to NoGap; we know from Tableau 2 that NoGap must outrank ID[ATR] placing ID[ATR] at the lowest spot in the hierarchy so far.

Let us extend this analysis now to a word with three syllables and observe the role a high-ranked faithfulness constraint must play to prevent against changing the height of vowels to create permissible [−ATR] vowels in non-word-final position. This constraint is described in (12) and militates against a change in the vowel height features [high] and [low]:

(12)   IdentIO(VowelHeight)
The vowel height feature(s) of an input segment is unchanged in the output.

In Tableau 4, we see in the plural form of *bañera* 'bathtub' from (2c) that the vowel height faithfulness constraint must come into play to prevent candidate (f) from winning out. This candidate violates IdentIO(VowelHeight) because the [+low] vowel in the initial syllable of the input is realized as [–low] in the output. The IdentIO(VowelHeight) constraint is undominated because there are no instances of vowel height feature change reported in the research centered around EAS. In subsequent tableaux we will not show this constraint. Regarding the evaluation of the alignment constraints, both candidates (a) and (d) in Tableau 4 violate AlignPL-R given its formulation in (7) since there is no [–ATR]$_{PL}$ feature aligned with the right edge of the word. Candidate (a), though, vacuously satisfies the AlignPL-L constraint in (8) in that there is no [–ATR]$_{PL}$ feature to left-align while candidate (d) has one violation of AlignPL-L since the [–ATR]$_{PL}$ feature surfaces only on the second vowel in the word thus incurring one violation of the AlignPL-L constraint as shown.

[–ATR]$_{PL}$

Tableau 4. *bañeras* /ba.'ɲe.ɾa/ 'bathtubs'.

[–ATR]$_{PL}$ /ba.'ɲe.ɾa/	IdentIO (Vowel Height)	AlignPL-R	*[–ATR] [+low]	AlignPL-L	NoGap	ID[ATR]
a. ba.'ɲe.ɾa		*!				
b. ba.'ɲe.ɾæ			*	**!		*
c. bæ.'ɲɛ.ɾæ			**!			***
d. ba.'ɲɛ.ɾa		*!		*		*
☞ e. ba.'ɲɛ.ɾæ			*	*		**
f. bɛ.'ɲɛ.ɾɛ	*!					***

Ranking emerging from Tableau 4: *IdentIO(VowelHeight) >> *[–ATR +low]*.

3.3. Treatment of High Vowels

Here we discuss the high vowel data that were shown in (3) and (4a), where word forms ended in a stressless high vowel. The discussion of the data in (4b) where words end in a stressed high vowel will be considered in Section 4. Regarding the high vowel data in (3) and (4a), we will need a markedness constraint that militates against high vowels having the feature [–ATR], which we provide in (13) based on Archangeli and Pulleyblank (1994). This constraint, which we consider to be highly ranked, is commonly used in analyses of EAS vowel harmony. Consider the role of this constraint in Tableau 5, where we first examine its role on word-internal high vowels.

(13) *[–ATR, +high]
The feature combination of [–ATR] and [+high] cannot cooccur on the same phoneme.

[–ATR]$_{PL}$

Tableau 5. adjetivos /ad.xe.'ti.vo/ 'adjectives'.

[–ATR]$_{PL}$ /ad.xe.'ti.vo/	*[–ATR] [+high]	AlignPL-R	*[–ATR] [+low]	AlignPL-L	NoGap	ID[ATR]
a. ad.xe.'ti.vo		*!				
b. æd.xɛ.'tɪ.vɔ	*!		*			****
c. æd.xɛ.'ti.vo			*!		*	***
☞ d. ad.xɛ.'ti.vɔ				*	*	**
e. ad.xe.'ti.vɔ				**!*		*
f. ad.xɛ.'tɪ.vɔ	*!			*		***

Ranking emerging from Tableau 5: *[–ATR +high] >> NoGap; AlignPL-L >> NoGap*.

For the plural of *adjetivo* 'adjective' above, from the data in (3c), we see that the gradient nature of AlignPL-L is necessary to ensure that a candidate like (e) be distinguished from the winning candidate. If AlignPL-L were not evaluated gradiently then (e) would wrongly

be the winner. Further, the comparison between the winning candidate (d) with (e) also shows that AlignPL-L must outrank NoGap or else (e) would wrongly be the winner.

While, just based on the above tableau, it may be unclear where to rank *[–ATR +high], it must be higher-ranked than NoGap lest (f) be the winning candidate. Moreover, *[–ATR +high] must be higher ranked than AlignPL-R because of the example of *tribu* 'tribe' in (4a), where the singular and plural are the same, ['tri.bu], with no laxing in the plural, meaning that AlignPL-R is violated in order to satisfy *[–ATR +high]. Additionally, this also entails that *[–ATR +high] is higher ranked than a Realize Morpheme constraint (Kurisu 2001), specifically RealizeMorpheme-PL (RM-PL, a plural morpheme in the input must be realized in the output) given that there is no overt exponence of the plural in ['tri.bu]. As shown in Tableau 6 for *poli* 'cops', RM-PL plays an important role in the evaluation of the words in (4a). We place it alongside AlignPL-R in the tableau, but it only needs to be critically ranked below *[–ATR +high] because of *tribus* ['tɾi.bu] 'tribes' (in Tableau 6, we do not show *[–ATR +low], as it does not apply).

[–ATR]~PL~

Tableau 6. *poli* /ˈpoli/ 'cops'.

[–ATR]~PL~ /ˈpo.li/	*[–ATR] [+high]	AlignPL-R	RM-PL	AlignPL-L	NoGap	ID[ATR]
a. ˈpo.li		*	*!			
b. ˈpo.lɪ	*!			*		*
c. ˈpɔ.lɪ	*!					**
☞ d. ˈpɔ.li		*				*

Ranking emerging from Tableau 6: *[–ATR +high] >> AlignPL-R; RM-PL >> ID[ATR].*

This tableau demonstrates the crucial ranking of *[–ATR +high] over AlignPL-R. If the ranking of these two constraints were reversed, (c) would wrongly be the winner. Thus, *[–ATR +high] crucially outranks AlignPL-R, making it the highest-ranked constraint along with the undominated faithfulness constraint IDIO(Vowel Height).[5] Crucially, the RM-PL constraint must outrank the ID[ATR] constraint or else candidate (a) would be the winner. Consequently, the evaluation of *polis* 'cops' shows a necessity for the RM-PL constraint in addition to AlignPL-R, but since RM-PL only plays a role for data like those in (4a) we do not otherwise show its function.

3.4. Treatment of Words Ending in Final Consonants

In the case of nouns (and adjectives) ending in a word-final consonant like those in (5), we posit that vowel epenthesis is triggered in the plural so that the floating [–ATR]PL feature can be realized on the right edge of the word, given that it cannot be realized on a consonant. In the example *carbón/carbones* [karbon]—[karbɔnɛ] 'carbon (sg.)/(pl.)'), there is no underlying plural allomorph /s/ or /es/. Rather, the mid front vowel, which acts as a default vowel generally in Spanish phonology, is epenthesized at the end of the word so that AlignPL-R can be satisfied. This entails that AlignPL-R outranks the constraint Dep-V, which militates against vowel insertion. The constraint is shown in (14).

(14) Dep-V

  A vowel in the output has a correspondent in the input.

A complication comes up with singular words ending in a lexical /s/ such as *mes* 'month' in (5a). The singular form of the word *mes* /mes/ 'month' is [mɛ] with a deleted /s/ and not with an epenthetic vowel after the /s/. Given that researchers such as Soriano (2012) have noted that EAS has a coda condition that disallows the surfacing of /s/ in coda position (a constraint that we will refer to as NoCoda-s), the fact that the singular is [mɛ] and not the hypothetical [me.se] with epenthesis means that the Dep-V constraint in (14) must outrank the Max-C constraint in (15)

(15)   Max-C
    A consonant in the input must be realized in the output

That the vowel in the actual output of the singular [mɛ] is laxed is understood by Soriano (2012), and other researchers, most recently by Walker (2024), as coming from the deleted /s/. That is, when the /s/ deletes, it leaves behind a [spread glottis] gesture that coalesces with the immediately preceding tense [+ATR] vowel, resulting in a lax [−ATR] vowel. These researchers posit a high-ranked Max-Gesture constraint that the surfacing candidate [mɛ] respects but would be violated by the alternative *[me] where there is no remnant of the /s/ gesture. Given this, we posit the following tableau, Tableau 7, for the singular *mes* 'month'.

Tableau 7. *mes* /ˈmes/ 'month'.

/ˈmes/	Max-Gesture	NoCoda-s	Dep-V	Max-C	ID[ATR]
a. ˈmes		*!			
b. ˈme	*!			*	
c. ˈme.se			*!		
☞d. ˈmɛ				*	*

Ranking emerging from Tableau 7: *Dep-V >> Max-C; Max-Gesture >> ID[ATR], NoCoda-s >> Max-C, ID[ATR].*

With this ranking, along with the ranking previously established with respect to the plural forms, we now consider the plural of *mes* 'month' which is realized as [mɛsɛ] with the [−ATR]PL feature on the final epenthetic vowel and not as *[mɛ] with deletion like the singular. The hypothetical plural *[mɛ] is a realistic alternative for the plural since it would seem to satisfy AlignPL-R given the ranking of Dep-V over Max-C. Tableau 8 below illustrates the analysis of the realization of the plural of *mes* 'month' where the winning candidate does indeed have a final epenthetic vowel.

[−ATR]PL

Tableau 8. *meses* /ˈmes/ 'months'.

[−ATR]PL /ˈmes/	Max-Gesture	NoCoda-s	AlignPL-R	Dep-V	AlignPL-L	Max-C	ID[ATR]
a. ˈmes		*!	*				
b. ˈme	*!		*			*	
c. ˈmɛ	*!					*	*
d. ˈmɛ			*!			*	*
e. ˈme.se			*!	*			
f. ˈme.sɛ				*	*!		
☞g. ˈmɛ.sɛ				*			*
h. ˈɛmɛsɛ				**!			*

Ranking emerging from Tableau 8: *Max-Gesture >> Dep-V; AlignPL-R >> Dep-V; (Dep-V >> AlignPL-L).*

The first two candidates in Tableau 8 are eliminated because of the violation of AlignPL-R with the first candidate also violating NoCoda-s and the second violating Max-Gesture. The interesting candidates are (c) and (d), both phonetically [mɛ] but different in that the [−ATR] feature on the vowel in candidate (c) comes from the realization of the input [−ATR]PL feature while in candidate (d) the [−ATR] feature is the remnant gesture of the deleted lexical /s/. The former critically violates Max-Gesture while the latter critically violates AlignPL-R. (We assume an independent constraint would rule out a potential candidate where two different [−ATR] features are realized on the same vowel.) The winning candidate (g), violating Dep-V, surfaces with a final epenthetic vowel, on which the plural [−ATR]PL feature is realized.

Tableau 8 illustrates three crucial rankings. First, Max-Gesture outranks Dep-V, since the reverse ranking would result in candidate (c), [mɛ], wrongly being the winner. Second, in our synchronic analysis, the inserted plural vowel is the mid front vowel because it is generally the epenthetic vowel in Spanish that, for example, breaks up impermissible

word-initial consonant clusters. It is inserted so that AlignPL-R can be satisfied. This shows the crucial ranking of AlignPL-R over Dep-V or else candidate (d) would be the winner. Finally, note that from a technical perspective Dep-V should be ranked above AlignPL-L to avoid the possibility of initial vowel insertion, as in candidate (h). While we have not been considering consonant-initial plural words to violate AlignPL-L when the [–ATR] plural feature is realized on the vowel that is immediately after the word-initial onset, as seen for the winning candidate in (g), if it does violate it, then the Dep-V constraint would rule out (h) as the winning candidate. Further, as a reviewer has noted, this ranking of Dep-V over AlignPL-L would be needed in the plural of any word that begins with a vowel that cannot host [–ATR] so that initial epenthesis of [ɛ] would not occur.

In Tableau 9, for the plural of *empujón* 'push' from (5b), we see that the same ranking also works when the constraints NoGap and *[–ATR +high] are brought into play.

[–ATR]_PL

Tableau 9. *empujones* /em.pu.ˈxon/ 'pushes'.

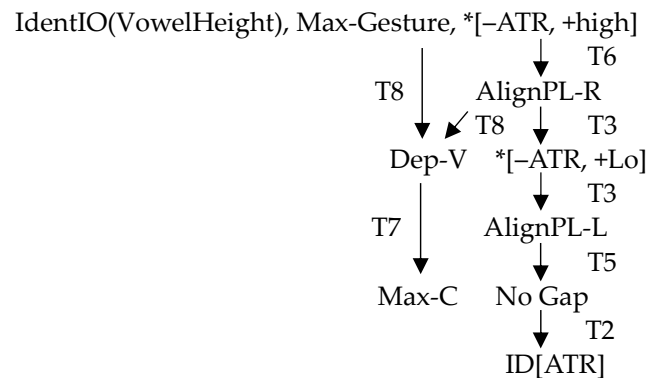| [–ATR]_PL /em.pu.ˈxon/	Max-Gesture	*[–ATR] [+high]	Align PL-R	Dep-V	Align PL-L	NoGap	Max-C	ID[ATR]
a. em.pu.ˈxon			*!					
b. ɛm.pʊ.ˈxɔn		*!	*					***
c. ɛm.pu.ˈxɔ	*!					*	*	**
d. ɛm.pu.ˈxɔn			*!			*		**
e. ɛm.pu.ˈxɔ.ne			*!	*		*		**
☞f. ɛm.pu.ˈxɔ.nɛ				*		*		**
g. em.pu.ˈxo.nɛ				*	*!**			
h. ɛm.pu.ˈxo.nɛ				*		**!		*

In this tableau, we see that the constraints established from the other tableaux account for candidate (f), [ɛm.pu.ˈxɔ.nɛ], being the winning candidate where the [–ATR]_PL floating feature is realized on the epenthetic vowel and then spreads leftward but skips the high vowel /u/ because of the constraint militating against high lax vowels. The evaluation also provides further evidence for the ranking of AlignPL-L over NoGap that emerged from Tableau 5. If this ranking were reversed, then candidate (g) in Tableau 9 without leftward spread would wrongly be the winning candidate. (A modified candidate (c) with nasalization on the final vowel, thus respecting the Max-Gesture constraint, would be ruled out by a high-ranked Max-NasalConsonant constraint, since nasal consonants never delete in EAS, even in coda position.)

Given this analysis of consonant final nouns and adjectives where the floating plural [–ATR]_PL feature triggers right edge epenthesis so that the AlignPL-R constraint can be satisfied, we now must reconsider the plural of words like those in (4a), such as /es.ˈpi.ɾi.tu/ and /poli/, analyzed in Tableau 6 above, where the winning candidate for the plural *polis* 'cops' [ˈpɔ.li] in Tableau 6 violates AlignPL-R, since the final vowel is not lax. A possible alternative with vowel epenthesis, such as [ˈpɔ.liɛ] or [ɛs.ˈpi.ɾi.tuɛ], is hypothetically possible given that Spanish words can end in a vocalic high-mid sequence, as in the words *pie* [pi̯ɛ] 'foot' and *fue* [ˈfu̯e] 'he went.' While we will not show a revised tableau with such plural candidates, we suggest that what rules them out is a high-ranked constraint militating against word-final vocalic sequences. If this is higher ranked than AlignPL-R, then plural forms with final diphthongs would not surface. A form like [ˈfu̯e] from underlying /ˈfue/ would surface with a final vocalic sequence because of a higher ranked Max-Vowel constraint that would prevent the deletion of an underlying vocalic element. The underlying plural for the words in (4a), like /poli/ and /es.ˈpi.ɾi.tu/, do not have final vowel sequences in their underlying representation.

We can summarize our optimality-theoretic analysis in this section by the Hasse diagram below in (16). In the diagram, the top row comprises the undominated constraints

with respect to the analysis of the Granada EAS plural presented. The lower rows are the dominated constraints with reference to the Tableau (T) from which the ranking arguments emerge. (We do not show RM-PL which, as mentioned, would be ranked somewhere lower than *[–ATR, +high] and higher than ID[ATR].)

(16)   Hasse Diagram of the Constraint Rankings

IdentIO(VowelHeight), Max-Gesture, *[–ATR, +high]

T8   AlignPL-R   T6

T8   T3

Dep-V   *[–ATR, +Lo]

T7   AlignPL-L   T3

Max-C   No Gap   T5

ID[ATR]   T2

   While there are other rankings from the tableaux such as the Align-PL constraints outranking ID[ATR] as in Tableau 1, the Hasse diagram in (16) makes clear the strict domination of the constraints in our alignment-based analysis of the EAS plural.

4. Treatment of Words Ending in Final Stressed Vowels

   In this section we consider nouns (and adjectives) that end in a final vowel that carries the main stress. Most of these words are borrowed and many are rare in the plural form. The set of words ending in a stressed high vowel, presented in (4b), are repeated in (17), along with examples of words that end in non-high stressed vowels.

(17)   Plural of words Ending in a Stressed Vowel (final position)

	Orthography	Singular	Plural	Gloss
a.	*club*	['klu]	['klʊ]	club
b.	*clip*	['kli]	['klɪ]	clip
c.	*menú*	[me.'nu]	[me.'nʊ]	menu
d.	*hindú*	[in.'du]	[in.'dʊ]	Hindu
e.	*papá*	[pa.'pa]	[pa.'pæ]	father
f.	*bebé*	[be.'be]	[be.'bɛ]	baby
g.	*olé*	[o.'le]	[o.'lɛ]	olé
h.	*yoyo*	[yo.'yo]	[yo.'yɔ]	yoyo

   The data in (17) are interesting and are little discussed in the literature on EAS plurals. For example, Henriksen (2017) did not examine such words. The occurrence of nouns (or adjectives) ending in a single final stressed vowel is unusual in Spanish and is typically found in borrowed words. According to Martínez-Paricio (2021), this pattern occurs in less than one percent of Spanish non-verbal forms. It is assumed here that such words would come with an underlying stress indicated on the final vowel. The EAS plural of such words follows an observation by Herrero de Haro (2020, p. 4) that "words that have stress on the last syllable only lower one vowel when [plural] /-s/ is deleted in EAS". He gives the example of *papas* 'fathers' where the word-final /a/ of the EAS plural laxes but the unstressed first vowel does not (optionally) harmonize. Based on mentions of this in the literature, as well as on our own native speaker consultation, we view these words as having only final laxing, including the laxing of a word-final high vowel. Thus, the plural of the words in (17a-d) with a final stressed high vowel is different from the plural of the words in (4a) (such as *poli*) which end in a stressless high vowel in that a final stressed high vowel laxes in the plural whereas an unstressed one does not. The two plural word forms in (17c) and (17d) have been discussed for a non-Andalusian variety of Peninsular Spanish by

Bermúdez-Otero ([2007](#)), who distinguishes the plural of these two forms as *menús* [me.'nus] and *hindúes* [in.'du.es], differentiating them by showing that [me.'nu] is athematic where [in.'du] is viewed as being an e-stem adjective; thus [e] appears in the plural. While we are aware that some EAS speakers can have the alternative plural [in.'du.ɛ] for [in.'du], we are not certain whether EAS makes this distinction, as this alternative could be influenced by normative Spanish given the infrequency of the word to most speakers. The matter is in need of further research.

What is truly unique about the plurals in (17), as is most clearly seen by (17c) and (17f–h), is that when the final stressed vowel laxes in the plural, [−ATR] spreading to prior vowels is prevented even if the vowel is mid. As far as we are aware, nouns ending in stressed mid vowels have not been systematically discussed in the analysis of EAS plurals. Moreover, we believe that these data present a problem for the previous optimality-theoretic analyses, though we will not explore it in detail. As one example, Granada EAS plural forms like *bebés* [be.'bɛ] 'babies' are different from cases of final lexical coda deletion, where, as noted by Jiménez and Lloret ([2020](#), p. 103), a word like *revés* 'other side' can be pronounced with both vowels laxed. This distinguishes laxing due to phonological coda deletion from laxing due to plural exponence.

Further, the analysis we developed in Section (3) can neither account for the plural data ending in a stressed high vowel that undergoes laxing, nor can it account for the plurals in (17f-h), where the final mid vowel is lax but there is no subsequent spreading. Under the analysis we developed, the evaluation of the plural of *bebé* should be exactly like the plural of *néne* shown in Tableau 1 where the winning candidate has laxing in both vowels. Here, we will make a first attempt at developing an alignment analysis to account for the data in (17). To see how the detailed analysis that we have developed in Section 3 with strict dominance of constraints predicts the wrong winner for a form like the plural of *bebé* [be.'be] 'baby' in (17f), consider Tableau 10 where * indicates the unintended winner.

[−ATR]$_{PL}$

Tableau 10. *bebés* /be.'be/ 'babies' (intended winner [be.'bɛ]).

[−ATR]$_{PL}$ /be.'be/	Max-Gesture	*[−ATR] [+high]	Align PL-R	Dep-V	Align PL-L	NoGap	ID[ATR]
a. be.'be			*!				
b. be.'bɛ					*!		*
*c. bɛ.'bɛ							**
d. bɛ.'be			*!				*

As we see in Tableau 10, the actual plural (b) violates AlignPL-L, which we have shown to be higher ranked than ID[ATR] in Section 3. Moreover, our current analysis cannot account for the plural of the word forms in (17a–d) that end in a high stressed vowel where the final high vowel laxes given the ranking of *[−ATR +high] over AlignPL-R. This would seem to contradict the ranking that was established in Tableau 6.

What the data in (17) really show is that plurals of words that end in a final stressed vowel have a special status, perhaps because of their unusualness as a nonverbal stress pattern in Spanish. From a metrical perspective, these words end in a monomoraic degenerate foot, under the assumption that Spanish coda consonants are moraic at some level of analysis. Spanish foot structure is typically viewed as being trochaic (e.g., Piñeros 2016). In order to account for the observation of the plural data in (17) that the floating plural feature [−ATR]PL appears on a word-final stressed vowel regardless of its vowel height, we posit a high-ranked alignment constraint that forces the floating plural feature [−ATR]PL to appear on a word-final stressed vowel regardless of its vowel height (and so outranks *[−ATR, +high]). This is shown in (18).

(18)   AlignFootμ, PL-R: Align (Monomoraic Foot, Right, [–ATR]PL, Right)
  The right edge of the monomoraic foot is aligned with the right edge of the plural morpheme [–ATR]PL.

The constraint in (18) is only applicable to nouns (or adjectives) that have a monomoraic foot. Since a monomoraic foot in Spanish would only occur in words ending in a stressed vowel, the constraint is applicable to the plural of all the words in (17) but is not pertinent to any of the data presented earlier in (1)–(6) (4b excluded), since none of those forms have a monomoraic foot. The constraint in (18) would be higher ranked than the feature cooccurrence constraint *[–ATR, +high] so that a final vowel would become lax even if it is a high vowel.

While the constraint in (18) accounts for the appearance of [–ATR] on any final stressed vowel, we need another constraint to account for the lack of leftward spreading of the [–ATR]PL feature to a prior syllable. Here we reference and slightly modify a crisp edge constraint proposed in Kaplan (2018) in an analysis of centralization (laxing) in the Romance variety Tudanca Montañés. His constraint CrispEdge ([–ATR], stressed syllable, L) militates against the extension of [–ATR]PL beyond the left edge of a stressed syllable. We make use of a similar crisp edge constraint in (19), but relativize it to a monomoraic foot.

(19)   CrispEdge ([–ATR]PL, Ftμ, L)
  A monomoraic foot's [–ATR]PL feature cannot extend beyond the left edge of that foot.

The constraint in (19) prevents leftward spreading in the plural forms of the words in (17). The constraint would be high-ranked and crucially needs to reference the plural morpheme feature ([–ATR]PL and not [–ATR] generally. This must be the case to explain why, as noted by Jiménez and Lloret (2020, p. 103), a word like *revés* 'other side' can be pronounced with both vowels laxed due to the deletion of the lexical /s/ in what would be coda position. Tableaux 11 and 12 show our evaluation of the plural forms of *menú* and *bebé*, respectively.

[–ATR]_{PL}

Tableau 11. *menús* /me.'nu/ 'menus'.

[–ATR]PL / me.'nu/	AlignFootμ,PL-R	CrispEdge [–ATR]PL, Ftμ, L	*[–ATR [+high]	Align PL-R	*[ATR] [+low]	Align PL-L	NoGap	ID[ATR]
a. me.'nu	*!			*				
☞ b. me.'nʊ			*			*		*
c. mɛ.'nʊ		*!	*					**
d. mɛ.'nu	*!			*				*

Ranking emerging from Tableau 10: *AlignFoot*μ, *PL-R >> *[–ATR +High]; CrispEdge ([–ATR]PL, Ftμ, L) >> AlignPL-L.*

[–ATR]_{PL}

Tableau 12. *bebés* /be.'be/ 'babies'.

[–ATR]PL / be.'be/	AlignFootμ, PL-R	CrispEdge [–ATR]PL, Ftμ, L	*[ATR] [+high]	Align PL-R	*[ATR] [+low]	Align PL-L	NoGap	ID[ATR]
a. be.'be	*!			*				
☞ b. be.'bɛ						*		*
c. bɛ.'bɛ		*!						**
d. bɛ.'be	*!			*				*

In Tableau 11, we see that the ranking of AlignFootμ, PL-R above *[–ATR, +high] forces a final high vowel to become lax when it is stressed. Candidate (a) in each tableau violates AlignFootμ, PL-R since the monomoraic foot does not have the [–ATR]PL feature on its right edge. In both tableaux, we see that spreading to the first vowel is prevented by the

Crisp Edge constraint, which militates against the sharing of the plural [–ATR]PL feature with any segment to the left of the monomoraic foot boundary. The addition of these two constraints focusing on a word-final stressed vowel expressed in terms of monomoraic foot structure does not affect the ranking of the other constraints and seems to us to be a realistic way of dealing with the rare nouns (and adjectives) that have vowel-final stress.[6]

In this section, we have extended the alignment-based analysis of the Granada EAS plural developed in Section 3 to the plural of nouns (and adjectives) that end in a monomoraic foot (i.e., end in a stressed vowel). As far as we are aware, these data as reflected by the word forms in (17) have not previously been systematically analyzed. The hierarchy that we have developed still applies, but with the addition of the two high-ranked constraints in (18) and (19) that have applicability just to words ending in a monomoraic foot. In the next section, we briefly discuss how our analysis can be extended to some of the different reported varieties of plural laxing in EAS.

5. Extension to Other Plural Patterns in EAS

The data patterns that we presented have largely followed Henriksen (2017). However, we extended our analysis to account for the plural of words ending in stressed vowels, which were not considered by Henriksen. Our analysis is different than previous analyses in not assuming that there is a suffixal plural /s/ in the underlying representation of plural word forms; rather, from the synchronic perspective, we have posited that the EAS plural is marked by a floating [–ATR]PL autosegment that is realized at the right edge of the word by the alignment constraint in (7) AlignPL-R and that spreads leftward due to the gradient alignment constraint AlignPL-L in (8). The alignment constraints interact with the feature co-occurrence constraints, the NoGap constraint, and the various faithfulness constraints as indicated by the Hasse diagram in (16) to produce the Granada EAS pattern consistent with Henriksen (2017). We now discuss how our analysis can be applied to the other patterns of plural laxing reported for EAS.

While the plural laxing in Granada EAS had not been previously analyzed independent of coda deletion and thus not viewed as morphologically conditioned, the Jaén variety of EAS as analyzed by Soriano (2012) and Jiménez and Lloret (2020) is agreed to be a subdialect with morphologically conditioned laxing. This is because the pattern found with vowel laxing specifically in the plural in Jaén is different than what is found for lexical coda /s/ deletion. In plural word forms, all vowels are laxed regardless of their height. Two examples from Jaén mentioned by Jiménez and Lloret (2020, p. 105) include the plural of *cómico* 'comic, masc.' as [ˈkɔ.mɪ.kɔ] with all vowels lax, including the high vowel, and the plural of *asa* 'handle' as [ˈæ.sæ] with both low vowels laxed. Plural laxing is different than lexical /s/ coda deletion in Jaén in that the plural laxing domain is the (prosodic) word while laxing due to coda deletion is local, so that only the vowel immediately preceding the deleted coda is laxed, thus providing a compelling case that the two types of laxing are quite different. This difference is exemplified by the comparison between *nenes* 'boys' pronounced as [ˈnɛ.nɛ] with both vowels [–ATR] and the word *jueves* 'Thursday' pronounced as [ˈhwe.ßɛ], where only the last vowel is lax due to the deletion of lexical /s/ in word-final coda position. In Jaén, its expected production in the plural would be with the last vowel lax and the first vowel tense. Laxing would occur because of the Max-Gesture constraint, while Ident-ATR would be higher ranked than any constraint that would induce spreading or copying and lower-ranked than Max-Gesture. In our analysis of plural laxing, which differs from Soriano's analysis in that we have a floating [–ATR]PL feature rather than a lexical /s/ as the plural morpheme, our alignment constraints developed in Section 3 in (7) and (8) repeated below as (20) and (21) for convenience would be high-ranked, outranking any of the feature cooccurrence constraints, thus making all vowels in the plural domain lax.

(20) AlignPL-R: Align (Word, Right, [–ATR]PL, Right)
   The right edge of the grammatical word is aligned with the right edge of the plural morpheme [–ATR]PL.

(21) AlignPL-L: Align ([−ATR]PL, Left, Word, Left)
   The plural morpheme [−ATR]PL is aligned with the left edge of the prosodic word.

Turning to Granada EAS, in Section 3 we analyzed this variety based on the description in Henriksen (2017), then extended the analysis to account for plural forms ending in stressed vowels in Section 4. An important observation about these latter plurals, as shown by the data in (17), is that, when the final vowel is stressed, laxing is limited to that final vowel. We interpreted this as a limitation on leftward spreading from a degenerate (monomoraic) foot. One of the subpatterns of Grenada EAS plural laxing mentioned by Jiménez and Lloret (2020) is that laxing does not extend leftward beyond the stressed syllable, meaning that the first two vowels need not be laxed in *económicos* 'economic, masc. pl.' (i.e., [e.ko.'nɔ.mi.kɔ]) and spreading of [−ATR] does not go beyond the stressed syllable. As mentioned in Endnote 5, we account for this using the more general crisp edge constraint CrispEdge [−ATR]PL, Ft, L] that prevents spreading to pretonic syllables along with its variable ranking with respect to the AlignPL-L constraint.

A different case of variation in the Granada variety of EAS discussed by Jiménez and Lloret occurs in proparoxytone plurals (i.e., plurals with antepenultimate stress). In these forms, they note that the penultimate vowel does not have to be lax. This is exemplified by the plural of *trébol* 'clover', which can be pronounced as ['trɛ.ßo.lɛ]. Given our alignment approach to the EAS plural, the final vowel of the plural form ['trɛ.ßo.lɛ] has to lax because of the high-ranked AlignPL-R constraint. The antepenultimate vowel undergoes laxing due to the AlignPL-L constraint; the lack of laxing in the penultimate vowel would result from the ID[ATR] constraint being higher-ranked than NoGap, thus preventing the laxing of /o/. The variation reported for the plural of *trébol* as either ['trɛ.ßo.lɛ] or ['trɛ.ßɔ.lɛ] could then be accounted for by the indeterminacy of the two lowest ranking constraints ID[ATR] and NoGap, given our hierarchy of constraints shown in (16). A similar analysis of this variation is given in Jiménez and Lloret, whereby there is variable ranking between ID[ATR] and a LICENSE (−ATR, Ft) constraint, which entails a different conception of EAS laxing.

Finally, we consider how our alignment analysis of the EAS plural can be extended to the pattern found in the Murcian variety reported by Jiménez and Lloret (2020). While plural laxing in this variety is considered to be phonological, in that any non-nasal coda consonant can delete and triggers laxing in a way that is similar to the plural, we will consider the plural to be different in that it is marked by a floating [−ATR]PL feature, rather than a suffixal -s that deletes. In Murcian plural forms, laxing extends throughout the word. The low vowel undergoes laxing but high vowels never undergo laxing. Moreover, unlike Granada EAS, high vowels in Murcian are always opaque in that they block leftward spreading of the [−ATR] feature. An example showing leftward spreading to a low vowel is the word *abeto* 'fir', whose plural form in Murcian is [æ.'ßɛ.tɔ] with all vowels laxed. Considering the hierarchy of constraints that we established for Granada EAS shown in (16), the change necessary to account for the leftward spreading of [−ATR] to low vowels in Murcian would be to demote the feature cooccurrence constraint *[−ATR +Low] below the AlignPL-L constraint so that low vowels would undergo leftward spreading. An example showing the blocking effect of high vowels in Murcian is the plural of *cómico* 'comic, masc.', whose plural form is ['ko.mi.kɔ] with only the last vowel laxed. The blocking effect of high vowels can be accounted for by adjusting the constraint ranking shown in (16) to place NoGap higher than AlignPL-L. A plural form like *['kɔ.mi.kɔ], which occurs in other varieties of EAS, would be ruled out in Murcian by the NoGap constraint. This shows how our alignment conception of the EAS plural without suffixal /s/ can be extended to patterns of plural laxing reported in other varieties described in the EAS literature.

6. Conclusions

In this paper, we have developed a feature alignment approach to the problem of vowel laxing in plural word forms in Eastern Andalusian Spanish with an analysis in

Optimality Theory. Our analysis differs in conception from previous analyses, in that we do not assume overtly or covertly that plural forms have a lexical suffixal /s/ in their underlying representation. Rather, we conceptualize the plural as being marked by a floating [–ATR]PL feature that is realized through morphological alignment constraints that interact with other constraints to account for the various patterns of plural laxing found in EAS. Previous accounts maintain a suffixal plural /s/ because of the similarity found in EAS between plural laxing and laxing due to lexical /s/ deletion in codas.

Diachronically, the EAS plural almost certainly has its origins in lexical coda deletion of /s/ whereby the deleted /s/ leaves behind a [spread glottis] feature that coalesces with the immediately preceding tense [+ATR] vowel, resulting in a lax [–ATR] vowel. This feature then spreads regressively as laxing harmony for reasons of feature perceptibility. While this may be the historical source of plural laxing, we maintain in this paper that this phonological process has morphologized in current EAS so that [–ATR] (as a floating feature) marks the plural. We have argued for this based on synchronic evidence that plural laxing is different from laxing due to lexical /s/ deletion in coda position. As we have detailed, evidence for our view is supported by the phonetic study of Herrero de Haro and Hajek (2022, p. 141), who "found little evidence of so-called aspiration as a pronunciation of coda /s/ in [their] corpus", and by Herrero de Haro (2020, p. 19), who concludes that the EAS plural is coming to be marked by "an unidentified suprasegmental element". This view is further supported by Henriksen (2017, pp. 110–11), who finds a difference between the phonetics of morphological laxing in the plural and laxing triggered by lexical coda /s/ deletion. Importantly, this view is also supported by the observation that there is a difference in laxing in oxytones (i.e., final stress) between plural forms and singular forms with lexical /s/ deletion. This can be seen in the contrast between the singular *revés* 'other side' pronounced as [rɛ.ˈvɛ] and the plural of *bebé* 'baby' pronounced as [be.ˈbɛ] where [–ATR] is only realized on the final vowel in plural of oxytones ending in a stressed vowel. Finally, this view is supported by the Jaen variety of EAS, where plural laxing is clearly distinct in its phonological pattern from coda /s/ deletion. This suggests that EAS laxing exemplifies the notion of rule scattering (e.g., Bermúdez-Otero 2016) where a single diachronic process can evolve synchronically into two similar but separate rules, especially if an environment can be interpreted morphologically.

All these reasons justify an analysis of the EAS plural as entailing a floating [–ATR] feature, represented as [–ATR]PL. Finally, we note that the optimality-theoretic analysis that we have developed in Sections 3 and 4 is consistent with Finley's (2009, p. 478) description of morphemic harmony as "the result of a feature or subset of features functioning as a morpheme on their own" that "follows from faithfulness constraints to the harmonic feature associated with the harmony-inducing morpheme". While Finley uses Anchor constraints rather than Alignment constraints in her work, she notes that Alignment and Anchor have very similar outcomes. Diachronically, then, the change of plural laxing from phonological to morphological would constitute an instance of a rule life cycle (Janda 1987; Bermúdez-Otero 2016) where a phonological rule becomes morphologized.

There are still many remaining problems concerning plural laxing in Eastern Andalusian Spanish. We mention two. One problem is to determine the exact acoustic criteria for low and high vowels to distinguish between lax and tense productions. There is not yet an established acoustic threshold for the degree of F1 raising (and/or F2 change) necessary to determine if a vowel should be considered lax. While Herrero de Haro (2017a) has identified general differences in perceptibility between vowels in different contexts before a diachronically-elided consonant, the exact boundaries of perceptibility merit further investigation. Work regarding the English diphthong /ay/ being raised to [ʌy] before voiceless consonants, for example, has identified an established threshold (Labov et al. 2006) of a 60 Hz difference in F1 lowering for /ay/ to be considered perceptually raised. Speakers showing a difference below this level are not considered to have raising. While this intuition was probably behind Zubizarreta's distinction between low-level and high-level laxing in EAS, no such acoustic threshold has been agreed upon in the literature.

A second problem addressed in Section 4 is the laxing pattern found in the plural of words with the uncommon pattern of having a word-final stressed vowel. Given our native speaker consultation regarding the plural of words like *menú* and *bebé* shown in (17), we concur with Herrero de Haro (2020, p. 4), when he observes that "words that have stress on the last syllable only lower one vowel when /-s/ is deleted in EAS", based on the example of *papás* 'fathers' being produced as [pa.'pæ]. However, this claim is in need of further testing and verification. It would be interesting to know if this is the case in all varieties of plural laxing in EAS, including the Jaén variety that has been described as having laxing throughout the word in plural forms. We suspect systematic investigation of such oxytones would further support the morphological alignment analysis of EAS plural laxing put forward in this paper.

Notes

[1] Previous research has suggested that there is minimal presence of aspiration in Granada Spanish. For example, Herrero de Haro and Hajek (2022, p. 141) state that they "found little evidence of so-called aspiration as a pronunciation of coda /s/ in [their] corpus". As a result, we do not consider aspiration in the subvariety of Granada Spanish described in this paper.

[2] Following Henriksen (2017), we treat [æ] as a [–ATR] vowel alternating with the [+ATR] /a/, due to the acoustic analogy with /e/ and /ɛ/. These three vowels (i.e., /æ/, /ɛ/, /ɔ/) share a raised F1 in comparison to their tense counterparts, which we view as characteristic of a [±ATR] contrast. We note that the low vowel also fronts when it laxes, but we do not know to what extent fronting is salient for the perception of the plural. In languages with one low vowel phoneme, such as Arabic, there is much front-back variation in its realization.

[3] While the data on Granada EAS presented in this section have emphasized the word as the domain of plural [–ATR] realization, we note examples with final high stressed vowels such as *menús* [me.'nʊ] 'menus' in (4b) where only the final syllable is [–ATR]. Similarly, Jiménez and Lloret (2020, p. 106) maintain that a plural word form like *monólogos* [mɔ.'nɔ.lɔ.ɣɔ] 'monologues' in (1c) could optionally be pronounced as [mo.'nɔ.lɔ.ɣɔ] where the spreading of [–ATR] does not extend to pretonic position (before the stressed syllable). This latter pronunciation shows that there can be a foot domain to the realization of the plural [–ATR] feature. We suggest that this is more likely in slower speech, but nonetheless the foot as a domain for plural [–ATR] realization seems to be what is occurring with final stressed high vowels as in *menús* [me.'nʊ] 'menus'. We discuss this in detail in Section 4. In contrast, in the Jaén dialect of EAS, as described by Jiménez and Lloret, the domain of plural [–ATR] is the entire word, with all vowels becoming [–ATR] regardless of their underlying quality.

[4] As a reviewer points out, the constraint *[–ATR, +Low] is somewhat odd, since there tends to be an incompatibility with [+Low] and [+ATR]. However, it is known that languages may differ as to whether they treat certain back and low vowels as [–ATR] or [+ATR] when there is only a single low vowel phoneme. As an example, Hantgan and Davis (2012) show that, in the [ATR] harmony system of the Dogon (Niger-Congo) language Bondu-so spoken in Mali, the single low vowel phoneme /a/ sometimes triggers [–ATR] harmony and sometimes [+ATR] harmony. For Spanish, one could maintain that all five vowel phonemes are by default [+ATR], given that it is not underlyingly contrastive. Thus, with respect to Spanish, the constraint in (11) is plausible, especially given that one of the acoustic correlates found by Henriksen for low vowel laxing is the lowering of the vowel (i.e., raising of F1). We also note that Kaplan (2021a, p. 706) considers /a/ to be [+ATR].

5   While we do not offer a tableau of the words *impetus* 'violence (pl.)' and *espíritu* 'spirits' from (4a), an issue arises in their analysis as to whether the non-final mid vowel is lax or not when the constraint RM-PL is incorporated. Based on the analysis of Jiménez and Lloret (2020), its laxing is optional. Our constraint ranking in Tableau 6 predicts that it should be lax so as to satisfy RM-PL. However, Jiménez and Lloret consider the final high vowel of the plural words in (4a) to undergo laxing (contrary to Henrikesen and Zubizarreta). If the final high vowels of words in (4a) do undergo plural laxing, then the mid vowels in words like *impetus* 'violence (pl.)' and *espíritu* 'spirits' need not be lax, since RM-PL would be satisfied by the laxing of the final vowel (though the first vowel in *espíritu* may be lax because of coda /s/ deletion). In general, the plural of words ending in high vowels in EAS is in need of more detailed empirical study.

6   The CrispEdge constraint in (19) that is relativized to a monomoraic foot prevents spreading of [–ATR]PL to the left of the stressed syllable. We note that a similar crisp edge constraint that is relativized to a foot more generally (i.e., CrispEdge ([–ATR]PL, Ft, L) can be used to account for the Granada variety in Jiménez and Lloret's (2020) analysis, where spreading of [–ATR] to pretonic syllables is optional. In their example of *económicos* 'economic, masc. pl.', the first two vowels are optionally laxed and so can be pronounced as [e.ko.'nɔ.mi.kɔ]. The variable ranking of this CrispEdge constraint with respect to the AlignPL-L constraint can account for the variable pronunciation between [e.ko.'nɔ.mi.kɔ] and [ɛ.kɔ.'nɔ.mi.kɔ], where the former has CrispEdge higher-ranked and the latter has AlignPL-L higher ranked. (See Kaplan 2021a for the use of the CrispEdge constraint in an analysis of EAS using Noisy Harmonic Grammar that has a different conception of the EAS laxing problem).

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