The Architecture of Derivational OT: Evidence from Icelandic Syncope*

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1. Introduction

Classic or parallel OT is an extremely powerful model of phonology, but there are empirical areas, such as syncope, where it is inadequate.[1] In order to account for these phenomena, several derivational variants of classic OT have been proposed. Deciding between these variants, if that can or even should be done, is an important theoretical and empirical issue. In this paper, I will use evidence from Icelandic syncope (IS) to shed light on this debate. In Icelandic, the syncopating vowel is realized when it is in a heavy syllable, and it is deleted otherwise. I will show that a recent analysis of syncope within the derivational framework Harmonic Serialism (HS, McCarthy 2008, *inter alia*) cannot account for Icelandic syncope due to the fact that its constraint ranking remains fixed. Instead, I will analyze Icelandic syncope using Stratal OT (Kiparsky, 2000), arguing that we must have the ability to re-rank constraints in derivational phonology. The organization of the paper is as follows. In §2, I describe the data and generalizations in detail. I outline my analysis in Stratal OT in §3, and in §4, I show why an analysis in HS does not work. I conclude in §5.

*First and foremost, I would like to thank Armin Mester for unending guidance and support. Thanks as well to Eric Baković, Ryan Bennett, Emily Elfner, Melissa Frazier, Junko Itô, Jaye Padgett, participants of the winter 2010 Research Seminar at UCSC, and audiences at LASC 2010 and NELS 41. Any remaining errors lie with me.

[1]Of course, there have been analyses of syncope in classic OT, most notably Gouskova (2003, 2007).

2. A V/∅ alternation in Icelandic

In Icelandic, some words show an alternation between forms with a vowel (V-forms) and forms with no vowel (∅-forms). Some preliminary examples showing this alternation are given in (1), where the V-forms are given on the left and the ∅-forms are given on the right. The alternating vowel is always in the second syllable.[2]

(1)	a.	[ˈhaː.mar]	'hammer'	noun	acc. sg.	[ˈham.rɪ]	dat. sg.
	b.	[ˈaː.kʏr]	'field'	noun	acc. sg.	[ˈak.rar]	nom. pl.
	c.	[ˈlɪː.kɪl]	'key'	noun	acc. sg.	[ˈlɪk.lar]	nom. pl.
	d.	[ˈhœː.vʏð]	'head'	noun	acc. sg.	[ˈhœv.ðɪ]	dat. sg.
	e.	[ˈiː.mɪs]	'diverse'	adjective	nom. f. sg.	[ˈim.sa]	acc. f. sg.

There are two likely sources for a V/∅ alternation such as this: epenthesis or deletion. The data in (1) suggest that this alternation is not epenthesis in any straightforward way, as the vowel, which can be [a], [ɪ], or [ʏ], does not appear to be predictable from the context. While there are no exact minimal pairs (as far as I know),

Before continuing, I must point out that IS is a lexically-specific process. There are some words that simply do not undergo syncope, despite phonological similarity to words that do. There are no exact minimal pairs as far as I know, but Stong-Jensen (1993) gives some examples of near minimal pairs (e.g., [sɛn.dɪl] ∼ [sɛnd.lar] 'messenger (acc.sg.∼ nom.pl.)', but [heɪː.mɪl] ∼ [heɪː.mɪ.lar] (*[heɪm.lar]) 'available (nom.f.sg. ∼ nom.f.pl.)'. Importantly, although IS is a lexically-specific process, there are recent loanwords (e.g., [biː.tɪl] ∼ [bit.lar] 'Beatle(s)') that undergo syncope, suggesting that it still has a synchronic status in the phonology.[3]

A cursory glance at the data in (1) reveals an apparent generalization: whenever the vowel is not realized, the initial syllable is closed. When the vowel *is* realized, the initial syllable is open, but its vowel is long. Thus, there is a clear preference for initial (stressed) syllables to be heavy. Given that fact, it seems reasonable to suggest that the deletion process is driven by the desire to produce a heavy initial syllable, along the lines of Gouskova's (2007) proposal for syncope in Tonkawa. Then, we could view syncope as a means of producing heavy syllables that is "preferred" to vowel lengthening. However, this

[2] For the most part, I will use standard IPA transcription for Icelandic examples with one adjustment. Icelandic has two series of stops: one unaspirated (orthographically *b, d, g*), and one (pre-)aspirated (orthographically *p, t, k*). I will use the orthographic consonants to represent the stops in the IPA transcription.

[3] I will not have anything to say in this paper about how to capture the difference between words showing syncope and words that do not show syncope, but see Gibson (1997) or Norris (2010) for some possibilities.

could not be the whole story, as there are forms showing syncope whose initial syllables are always closed. Some examples are given below in (2).

(2)	a.	[sɛn.dɪn]	'sandy'	adjective	acc. m. sg.	[sɛnd.nɪr]	nom. m. pl.
	b.	[mɔr.gʏn]	'morning'	noun	acc. m. sg.	[mɔrg.nɪ]	dat. m. sg.
	c.	[stɛn.sɪl]	'stencil'	noun	acc. m. sg.	[stɛn.slar]	nom. m. pl.

In the above forms, the initial syllable is closed in both the V-form and the ∅-form. If we motivated syncope by a preference for heavy syllables, then we would need to say something different about the forms in (2). It seems fairly clear that the shape (i.e., weight) of the initial syllable is not the driving force behind syncope in Icelandic. Instead, it is the shape of the syllable containing the alternating vowel that is responsible for the alternation.

The forms we have seen so far either involved a bare stem (alternatively, a stem followed by a phonologically null suffix) or a stem followed by a V-initial suffix. We saw that the V-form surfaces when no suffix is added, and the ∅-form surfaces when a V-initial suffix is added. The V-form surfaces when followed by a C-initial suffix as well, as we can see in (3):

(3)	a.	[sɛn.dɪn]	'sandy'	acc. m. sg.	[sɛnd.ɪn.na]	gen. pl.	*[sɛndn.na]
	b.	[iː.mɪs]	'diverse'	nom. f. sg.	[iː.mɪs.sɪ]	dat. f. sg.	*[ims.sɪ]
	c.	[tɛː.kɪn]	'taken'	acc. m. sg.	[tɛː.kɪn.nar]	gen. f. sg.	*[tɛkn.nar]

In these cases, the attested forms are the V-forms, but we can clearly see that the ∅-forms are phonotactically bizarre. Many involve sonority violating codas, and all involve codas consisting of at least once consonant in addition to part of a geminate consonant. Thus, it would be tempting to suggest that V-forms surface here because ∅-forms are not phonologically licit. I set this idea aside for now, but we will see later that this story does not extend to all forms in the language.

Instead, when we consider the syllabification of the various possibilities, a generalization emerges. The alternating vowel is realized if and only if it is in a heavy syllable. V-initial suffixes differ from C-inital and zero suffixes because the addition of a V-initial suffix causes the medial syllable (that is, the second syllable of a trisyllabic string) to lose its coda consonant and thus become light. It is only when the medial syllable is light (or would be light) that the vowel is deleted. We can view syncope in Icelandic as a means of avoiding medial syllables that are light. Notice, it is only vowels in *medial* light syllables that are deleted. Vowels in initial light syllables are lengthened, and vowels in final light syllables are neither lengthened nor deleted. Any analysis of Icelandic syncope must capture what makes medial light syllables special.

3. Icelandic Syncope in Stratal OT

Stratal OT (Kiparsky 2000, *i.a.*) is a derivational variant of classic OT. The key difference is that Stratal OT allows forms to go through the constraint ranking more than once. Ideally, the inputs to each "pass" through the constraint ranking are correlated with the morphological levels of Lexical Phonology (Kiparsky 1982, *inter alia*): stem, word, and post-lexical. Trying to fit the Icelandic data into these levels requires some costly assumptions. For example, we would have to say that syncope is a post-lexical process, which is strange given that there are so many lexical exceptions (see Norris 2010 for further discussion). What I propose instead is an analysis of IS split over two levels, with metrical structure being assigned on the first level and syncope happening on the second level. At the second level, the output of the previous step serves as the new input. Importantly, the constraint ranking does not need to remain fixed between each level.

3.1 Level One: Metrical Structure

As we saw in section 2, syncope only leads to deletion in medial syllables that are light. Ideally, whatever constraint leads to syncope would only be violated in those forms. Borrowing from McCarthy's (2008) analysis of syncope in HS, I assume that the constraint driving syncope is *V-PLACE$_{\text{weak(-in-foot)}}$, or simply *V-wk.

(4) *V-wk: Place-bearing vowels in the non-head positions of disyllabic feet are prohibited. Assign one violation mark for every place-bearing vowel in the non-head position of a disyllabic foot.

Since it is only vowels in medial light syllables that are deleted, we can ensure that it is only those syllables that lead to deletion if those are the only syllables that lead to violations of *V-wk. We can do this if we build (HL) feet, but not (HH) feet. I capture this using a version of the WEIGHT-TO-STRESS PRINCIPLE (Prince, 1990) parameterized to feet (WSP$_{\text{ft}}$), which formalizes Hayes's (1985) notion of Quantity Sensitivity.

(5) WSP$_{\text{ft}}$: If a footed syllable is heavy, then it is stressed. Assign one violation mark for every heavy syllable that is in the non-head position of a disyllabic foot. (Bennett, 2009)

For reasons of space, I cannot go into detail about the constraints controlling the placement of stress in Icelandic, but see Árnason (1985); Hayes (1995); Árnason (1996); Norris (2010) for discussion. The basic generalizations are that Icelandic does not tolerate stress clash (i.e., stress is alternating), and stress is never final. I capture this using NON-FIN and *CLASH.

(6) NON-FIN(ALITY): The final syllable of a word must not be footed. Assign one violation mark for any final syllable that is part of a foot. (Prince and Smolensky, 1993/2004)

(7) *CLASH: Stressed syllables must not be adjacent to other stressed syllables. Assign one violation mark for every pair of adjacent stressed syllables. (Liberman and Prince, 1977)

Following McCarthy (2008) further, I assume that building feet is driven by WDCON and EXH(AUSTIVITY)(wd):

(8) WDCON: Lexical words must correspond to prosodic words and vice versa. Assign a violation for outputs lacking a prosodic word node. (Selkirk, 1996)

(9) EXH(wd): Assign one violation mark for every syllable node that is immediately dominated by a prosodic word node. (Itô and Mester, 1992; Selkirk, 1996)

WDCON requires the presence of a prosodic word node (and by assumption, a foot), and EXH(wd) requires that the foot be as large as possible. It is clear that the constraints on footing (NON-FIN, *CLASH, and WSP_{ft}) must dominate EXH(wd), as when they are in conflict, the footing constraints are satisfied, and EXH(wd) is violated.

In order to have metrical structure precede deletion, we must prevent deletion from occurring in level one. For simplicity, I assume that deletion is prevented due to high-ranking MAX-V. Some representative tableaux are given below:[4]

(10) *ýmsa* 'diverse' (acc. m. pl.)

/imɪs-a/	WDCON	FTCON	EXH(wd)	*V-wk
a. iː.mɪ.sa	*!			
b. [(ˈiː.mɪ)(ˈsa)]		*NON-FIN!		*
c. [(ˈiː)(ˈmɪː)sa]		*CLASH!	*	
d. [(ˈiː)mɪ.sa]			**!	
e. ☞ [(ˈiː.mɪ)sa]			*	*

The tableau in (10) represents what happens when the medial syllable is light. We see that candidate (a), with no prosodic word node, loses due to a violation of WDCON. Candidate

[4] In the following tableaux, I have left out MAX-V for simplicity, as it is undominated in the first level. Furthermore, in the following and all remaining tableaux, I use [] to indicate prosodic word boundaries.

(b) loses because its final syllable is footed, in violation of NON-FIN. Candidate (c), which perversely builds two adjacent, monosyllabic feet, violates *CLASH. The choice between candidate (c) and (d) comes down to EXH(wd): because candidate (d), with a disyllabic foot, has fewer violations of EXH(wd), it is the winner.

(11) *ýmissa* 'diverse' (gen. pl.)

/imɪs-sa/	WDCON	FTCON	EXH(wd)	*V-wk
a. i.mɪs.sa	*!			
b. [(ˈiː)mɪs(ˈsa)]		*NON-FIN!	*	
c. [(ˈiː)(ˈmɪs)sa]		*CLASH!	*	
d. ☞ [(ˈiː)mɪs.sa]			**	
e. [(ˈiː.mɪs)sa]		*WSP_{ft}!	*	*

In (11), we have a candidate where the medial syllable is heavy. Candidates (a)–(c) lose for the same reasons as in (10), but we see a difference in candidates (d) and (e). Although candidate (e) has fewer violations of EXH(wd) than candidate (d), it also has a violation of higher-ranked WSP_{ft}. Thus, when the medial syllable is heavy, we cannot build a disyllabic foot, and we build a monosyllabic foot instead.

3.2 Level Two: Deletion

In order to allow deletion in the second level, *V-wk must be re-ranked above MAX-V. For our purposes, it will be sufficient to say that *V-wk is promoted to the top of the constraint hierarchy. This predicts that deletion will be used to avoid violations of *V-wk. This re-ranking is schematized below:

(12) Level one → Level two

MAX-V ≫ EXH(wd) ≫ *V-wk → [*V-wk] ≫ MAX-V ≫ EXH(wd)

However, deletion is not the only strategy for removing violations of *V-wk. We could also avoid violations of *V-wk by retracting the right foot boundary, that is, unfooting the second syllable. This would result in an extra violation of EXH(wd) as opposed to the violation of MAX-V incurred as a result of deletion:

(13) *Deletion:* (ˈiː.mɪ)sa → (ˈim)sa (violates MAX-V)
Unfooting: (ˈiː.mɪ)sa → (ˈiː).mɪ.na (violates EXH(wd))

Given the ranking we reached in (12) above, a candidate with more violations of EXH(wd) will be preferred to one with more violations of MAX-V. As it stands now, our account will never predict deletion, as unfooting will always be the better option.

An apparent solution to this would be to make deletion the preferred repair mechanism by ranking EXH(wd) above MAX-V. Thus, given the candidates from (13), we would choose the one that violates MAX-V every time. However, in addition to predicting that deletion would be the preferred way of removing violations of MAX-V, this ranking would also predict deletion to reduce violations of EXH(wd), for example, by deleting vowels in unfooted syllables, thereby destroying the syllable. The only forms where such deletion could occur are forms where the second syllable is heavy and thus unfooted. By and large, deletion in those forms would lead to outputs that cannot be syllabified:

(3)	a.	[sɛn.dɪn]	'sandy'	acc. m. sg.	[sɛn.dɪn.na]	gen. pl.	*[sɛndn.na]
	b.	[iː.mɪs]	'diverse'	nom. f. sg.	[iː.mɪs.sɪ]	dat. f. sg.	*[ims.sɪ]
	c.	[tɛː.kɪn]	'taken'	acc. m. sg.	[tɛː.kɪn.nar]	gen. f. sg.	*[tɛkn.nar]

The forms showing deletion (on the far right) involve clusters that are phonologically illicit in Icelandic. The only form that does not have a coda which violates sonority is *[ims.sɪ], and that form has a coda consisting of a coda consonant and part of a geminate consonant, which Icelandic does not allow. Thus, we could say that, while the ranking of EXH(wd) above MAX-V predicts deletion to avoid violations of EXH(wd), higher ranking constraints on syllabification prevent this deletion from occurring.

However, there are also forms where this deletion does *not* lead to forms that cannot be syllabified. Some examples are given below:[5]

(14)	a.	[nauː.ɪn]	'near'	acc. m. sg.	[nauː.na]	acc. m. pl.	
					[nauː.ɪn.na]	gen. pl.	*[naut.na]
	b.	[luː.ɪn]	'tired, weary'	acc. m. sg.	[luː.na]	acc. m. pl.	
					[luː.ɪn.na]	gen. pl.	*[lut.na]
	c.	[buː.ɪn]	'lived, done'	acc. m. sg.	[buː.nɪr]	nom. m. pl.	
					[buː.ɪn.nar]	gen. f. sg.	*[but.nar]

Importantly, the unattested forms above do not involve phonologically illicit clusters in Icelandic. There are attested words of similar form, e.g., [rut.na] 'to round (something) off', or [spautn] 'Spain'. If there is nothing wrong with the syllabification of these forms,

[5]Two notes about the forms in (14): First, Icelandic has both short and long diphthongs (Orešnik and Pétursson, 1977), and second, after diphthongs, [i], and [u], geminate [nn] is realized as something like [tn]. I take these facts for granted here.

then we cannot prevent spurious deletion by appealing to syllabification constraints. If we rank EXH(wd) above MAX-V, we predict too much deletion, but if we rank MAX-V above EXH(wd), we do not predict enough deletion.

Consider the comparative tableaux below, where the desired (attested) candidate is marked with ➔. For other candidates, constraints that favor the desired winner are marked with W, and those which favor the desired loser are marked with L.

(15) *búna* 'lived, done' (acc. m. sg.)

[(ˈbuː.ɪ)na]	*V-wk	MAX-V	SWP	*Vː	EXH(wd)
a. ➔ [(ˈbuː)na]		1		1	1
b. [(ˈbuː)ɪ.na]		0 L		1	2 W

(16) *búinna* 'lived, done' (gen. pl.)

[(ˈbuː)ɪn.na]	*V-wk	MAX-V	SWP	*Vː	EXH(wd)
a. ➔ [(ˈbuː)ɪn.na]				1	2
b. [(ˈbut)na]		1 W		0 L	1 L

In order to get the correct outputs, we must rank at least one constraint marked with W above all constraints marked L. Thus, to get the proper winner in (15), we must rank EXH(wd) above MAX-V, but to get the proper winner in (16), we must rank MAX-V above EXH(wd). No matter the ranking we propose between MAX-V and EXH(wd), we will fail to capture all of the data. We must find some other way to distinguish unfooting and deletion.

What we need is some kind of faithfulness constraint that enforces faithfulness to metrical structure, such that unfooting would incur a violation, but deletion would not. Intuitively, we need to "freeze" the metrical structure that is built in level one. To that end, I propose a prosodic faithfulness constraint on feet, which I call IDENT(foot-role):

(17) ID(ft): A substring in the input and its correspondent in the output must have the same foot role (i.e., head or nonhead). Assign one violation mark for any substring that is present in both the input and the output whose foot role is not the same in the input and output.

Crucially, only substrings (segments) that are present in both the input and output can result in violations of ID(ft), because the constraint penalizes input-output pairs. The kinds of violations ID(ft) produces are given in (18) below, where the offending segments are given in the "segments" column:

(18)

Input		Output	ID(ft)	segments	change
(ˈta.pi)na	→	(ˈta)pi.na	**	p, i	*unfooting*
(ˈta.pi)na	→	(ˈtap)na	*	p	*deletion*
(ˈtap)na	→	(ˈta.pi)na	*	p	*epenthesis*

ID(ft) is reminiscent of prosodic faithfulness constraints proposed by Itô et al. (1996) in their analysis of a particular language game in Japanese. The constraints they proposed were versions of MAX and DEP for footheads and foottails (i.e., non-heads). For example, MaxFtTail assigns violations for any substrings in foottails in the input that are not in foottails in the output. However, this conflates deletion and unfooting of segments, which is exactly where we need to draw the line. Deletion is allowed, but unfooting is not.

If we rank ID(ft) above MAX-V, then we predict deletion will be the preferred means of removing a violation of *V-wk. Since ID(ft) penalizes substrings (i.e., segments) that change their foot roles, resyllabifying the onset of a foot (non)head to become a coda for a foot head (as in tɛ.kɪ.na → tɛk.na) will incur a violation of ID(ft). We must rank *V-wk above ID(ft) in order to ensure that removing the violation of *V-wk is the first priority. We can see ID(ft) at work in the derivation for *búna*, given below:

(19) *búna* ‘lived, done’ (acc. m. pl.), Level One

/bu-ɪn-a/	WDCON	MAX-V	FTCON	EXH(wd)	*V-wk
a. bu.ɪ.na	*!				
b. [(ˈbuː.ɪ)(ˈnaː)]			*NON-FIN		*
c. [(ˈbuː)ɪ.na]				**!	
d. ☞ [(ˈbuː.ɪ)na]				*	*
e. [(ˈbuː)na]		*!		*	

Level Two

[(ˈbuː.ɪ)na]	*V-wk	ID(ft)	MAX-V	EXH(wd)	SWP	*Vː
a. [(ˈbu.ɪ)na]	*!			*	*	
b. [(ˈbuː.ɪ)na]	*!			*		*
c. [(ˈbuː)ɪ.na]		*!		**		*
d. ☞ [(ˈbuː)na]			*	*		*

As before, we built a disyllabic foot in Level One as in candidate (d), because it minimizes violations of EXH(wd). The critical comparison in Level Two is between candidates (c)

and (d). Candidate (c) is the version that avoids the violation of *V-wk by unfooting the offending syllable, and candidate (d) is the version that avoids it through deletion. Candidate (c) has an extra violation of EXH(wd), while candidate (d) has a violation of MAX-V. Crucially, in addition to the extra violation of EXH(wd), candidate (c) violates ID(ft), and this is what causes it to lose.

Because only *V-wk dominates ID(ft), violations of ID(ft) are only tolerated when they remove a violation of *V-wk. This allows us to prevent the spurious deletion in forms like *búinna*:

(20) *búinna* 'lived, done' (gen. pl.), Level One

/bu-ɪn-na/	WDCON	MAX-V	FTCON	EXH(wd)	*V-wk
a. bu.ɪn.na	*!				
b. [(ˈbuː)ɪn(ˈnaː)]			*NON-FIN!	*	
c. [(ˈbuː)(ˈm)na]			*CLASH!	*	
d. ☞ [(ˈbuː)ɪn.na]				**	
e. [(ˈbuː.ɪn)na]			*WSP_{ft}!	*	

Level Two

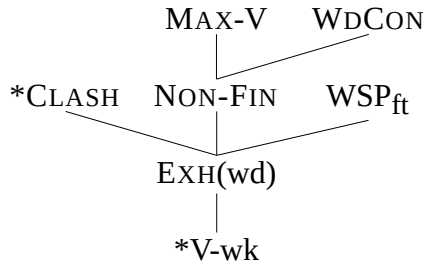
[(ˈbuː)ɪn.na]	*V-wk	ID(ft)	MAX-V	EXH(wd)	SWP	*Vː
a. [(ˈbu)ɪn.na]				**	*!	
b. ☞ [(ˈbuː)ɪn.na]				**		*
c. [(ˈbut)na]		*!	*	*		

In Level One, we build a monosyllabic foot, because building a disyllabic foot would lead to a violation of WSP_{ft}. In Level Two, the candidate with spurious deletion (candidate (c)) loses, because deletion does not reduce violations of *V-wk. It only reduces violations of EXH(wd). Because the constraints penalizing deletion outrank EXH(wd), deletion is less harmonic than having an extra unfooted syllable, and thus candidate (b) wins. The only situation where deletion is more harmonic is when it removes a violation of *V-wk, which is exactly the right result.

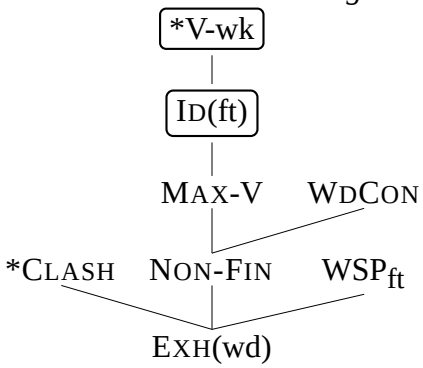
3.3 Interim Summary

The constraint rankings for each level are given below:

(21) *Level One constraint ranking:*



(22) *Level Two constraint ranking:*



Without constraint re-ranking, we cannot capture the fact that EXH(wd) is more important than (i.e., is ranked above) *V-wk with respect to foot structure, but less important with respect to deletion. We need to be able to re-rank constraints to account for IS, and because HS does not allow constraint re-ranking, it cannot account for Icelandic syncope.

4. Icelandic Syncope in Harmonic Serialism

Before laying out the analysis for syncope in HS, I will briefly explain the assumptions behind the version of Harmonic Serialism that I am considering here. For more thorough discussion, see McCarthy 2007, *et seq.* The main difference between parallel OT and HS is that in HS, forms effectively have the potential to be sent through the constraint ranking more than once, but GEN can only make one change at a time. This is the principal of *gradualness*. At each step, EVAL selects the optimal candidate from the restricted candidate set produced by GEN, and then candidate becomes a new input. Derivations proceed in this way, making one change at a time until the candidate selected by EVAL is identical to the input, and the derivation converges (i.e., it terminates). Crucially different from Stratal OT, the constraint ranking in HS must remain fixed throughout the derivation.

Just as before, since (Icelandic) syncope is sensitive to metrical structure, we must build metrical structure first. The strong claim is that the grammar does not allow it to happen any other way. This is what McCarthy (2008) termed *intrinsic ordering*, which he accomplished by swapping EXH(wd) for PARSE-σ and *V-wk for *V-PLACE$_{\text{unstressed}}$. Since building metrical structure happens first, constraints that lead to proper footing must be given top priority, which is exactly what causes trouble for HS in analyzing Icelandic Syncope.

Recall that forms showing syncope first involve building a disyllabic foot. Building a disyllabic foot necessarily entails a violation of *V-wk, thus we must rank EXH(wd) above

*V-wk if we want to build disyllabic feet at all. In order to allow deletion as a means to remove violations of *V-wk, *V-wk must rank above MAX-V. By transitivity, this means that EXH(wd) must also rank above MAX-V. Because re-ranking is forbidden in HS, we cannot re-rank EXH(wd) below MAX-V after footing is complete, and deletion to reduce violations of EXH(wd) is predicted to occur whenever possible. Recall that this is exactly what led to spurious deletion for forms like *búinna*.

For McCarthy's (2008) account of syncope in Aguaruna, such deletion is never possible due to iterative footing. Building a disyllabic foot will reduce more violations of EXH(wd) than deletion of a single segment will, and thus building another foot is the better option. It is not until building more feet is no longer possible that deletion can proceed, and at that point, there are no more violations of EXH(wd). However, due to the constraints on footing and the relative shortness of inputs showing syncope in Icelandic (only three syllables), deletion to remove violations of EXH(wd) is a possibility in Icelandic.

As we saw, deletion in most of those situations leads to phonologically illicit consonant clusters, e.g., *[ims.sa]. However, for the critical data in (14), e.g., /bu-ɪn-na/, ranking EXH(wd) above MAX-V leads to deletion across the board:

(23) STEP ONE:

/bu-ɪn-na/	WDCON	FTCON	EXH(wd)	*V-wk	MAX-V
a. bu.ɪn.na	*!				
b. ☞ [(ˈbu)ɪn.na]					
c. [(ˈbu.ɪn)na]		*WSP_{ft}!	*	*	

STEP TWO:[6]

[(ˈbu)ɪn.na]	FTCON	EXH(wd)	*V-wk	MAX-V	SWP
a. [(ˈbu)ɪn.na]		**!			*
b. ☹ [(ˈbuː)ɪn.na]		**!			
c. ☞ [(ˈbun)na]		*		*	

In step two, candidate (e) wins because it minimizes violations of highly ranked EXH(wd). EXH(wd) must be highly ranked in order to build disyllabic feet in the first place. Because

[6]In this tableau, I am representing candidate (b) as [(ˈbun)na] instead of [(ˈbut)na] (its ultimate pronunciation) due to the principal of gradualness: GEN will not produce a candidate that both deletes a vowel and changes the identity of a consonant in the same step. Furthermore, candidates that build more feet have been left out for space reasons: such candidates violate the highly ranked

HS does not allow constraints to be re-ordered, we are forced to maintain the ranking of EXH(wd) ≫ *V-wk ≫ MAX-V throughout the derivation, which results in too much deletion.

5. Conclusion

In order to account for IS, I showed that we need to be able to re-rank constraints, which is something that a Stratal OT account allows, but HS explicitly forbids. Specifically, we saw that EXH(wd) must dominate *V-wk for the purposes of foot building, but *V-wk must dominate EXH(wd) (by transitivity) for the purposes of deletion. Since HS does not allow constraint re-ranking, it predicts unattested deletion in a key set of forms.

One of the insights of McCarthy's (2008) account of syncope was the notion that, if syncope is sensitive to metrical structure, then metrical structure should be built before deletion can occur. The Stratal OT analysis proposed here preserves that insight, but only by stipulation: MAX-V is highly ranked in Level One. We could make a stronger claim that there is some sort of containment requirement (i.e., no deletion) imposed in Level One, but I must leave deep investigation of such a possibility to future work. While this work does not claim that we do not need HS at all, it does suggest that HS *alone* is not enough to account for all kinds of derivational phonology, because we need to be able to re-rank constraints (see Thompson (2011) for a similar argument). Beyond the theoretical machinery, the analysis presented here has led us to the following view of syncope: faithfulness to metrical structure, but lack of faithfulness to the segments that comprise it.

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