A transparent reanalysis of self-destructive feeding

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1 Background on Self-destructive feeding

Self-destructive feeding (SDF) is a type of opacity where “an earlier rule feeds a later rule that in turn crucially changes the string such that the earlier rule’s application is no longer justified” (Baković, 2007, 2011:59). Example (1) shows a case from Turkish. Epenthesis inserts a vowel [i] between two word-final consonants, creating the intervocalic environment for Velar Deletion to happen. But in turn, Velar Deletion removes the velar stop in the consonant cluster which triggered Epenthesis to apply, making the application of Epenthesis unjustified on the surface. So, Epenthesis self-destructively feeds Velar Deletion.

(1) SDF with vowels in Turkish (adapted from Sprouse, 1997)

	UR	a. /bebek+n/	b. /ip+n/	c. /bebek+i/
Epenthesis:	∅ ⟶ i / C_C#	i	i	
Velar Deletion:	k/ɡ ⟶ ∅ / V_+V	∅		∅
	SF	[bebein]	[ipin]	[bebei]

Glosses: (1a) ‘your baby’, (1b) ‘your rope’, (1c) ‘baby (ACC)’

Previous literature has identified four cases of SDF in three languages from diverse language families, namely Turkish (Turkic), Javanese (Austronesian) and Japanese (2-4). In these three cases, the first rule always deletes a segment to create the environment for the second rule to apply, but the application of the second rule removes a crucial part of the structural description of the first. Hence, the application of the first rule is no longer justfied and the two rules are in a SDF relationship.

(2) SDF with consonants in Turkish (adapted from Kenstowicz & Kisseberth, 1979)

	UR	a. /ajak+sɯ/[1]	b. /ʧan+sɯ/	c. /bebek+i/
Elision:	s/j ⟶ ∅ / C_	∅	∅	
Velar Deletion:	k/ɡ ⟶ ∅ / V_V	∅		∅
	SF	[ajaɯ]	[ʧanɯ]	[bebei]

Glosses: (2a) ‘his foot’, (2b) ‘his bell’, (2c) ‘baby (ACC)’

(3) Javanese (Lee, 1999, 2007)

	UR	a. /omah+ne/	b. /kulit̪+ne/	c. /səkolah+an/
n-deletion:	n ⟶ ∅ / C_	∅	∅	
h-deletion:	h ⟶ ∅ / V_V	∅		∅
	SF	[omae]	[kulit̪e]	[səkolaan]

Glosses: (3a) ‘the house’, (3b) ‘the skin’, (3c) ‘school building’

[1] This example was presented as /ajak+sɯ/ in Kenstowicz & Kisseberth (1979) and Baković (2007), but /ajaɡ+sɯ/ in Baković (2011). I have chosen /ajak+sɯ/ based on the data in the Turkish Electronic Living Lexicon (TELL).

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(4) Japanese (Poser, 1988; Hall et al., 2018)

		UR	a. /kaw+ru/	b. /tob+ru/	c. /iw+e+ru/
Continuant Deletion:	[+cont] ⟶ ∅ / C_		∅	∅	
h-deletion:	w ⟶ ∅ / _[−low]		∅		∅
		SF	[kau]	[tobu]	[ieru]

Glosses: (4a) 'to buy', (4b) 'to fly', (4c) 'can say'

2 Observations

Interestingly, all these SDF interactions share two common characteristics. First, all are found at morpheme concatenation boundaries and at least one of the processes is a case of non-derived environment blocking. Second, the first rule of each SDF interaction aims at reducing consonant clusters with a crosslinguistically less common method.

2.1 *Non-derived environment blocking (NDEB)* Non-derived environment blocking (NDEB) refers to cases where a phonological process is blocked unless the structural description is morphologically or phonologically derived (Kiparsky, 1982, 1993). For example, in Finnish, Assibilation takes place only at morpheme concatenation boundaries (5a) or after the application of another phonological process like Vowel Raising (5b). (5c) undergoes neither rule because the environment of neither rule is satisfied. The word-initial /t/ in (5d) does not assibilate, although it also appears before /i/, because it is neither at a morpheme boundary (i.e., a morphologically-derived environment) nor in front of a high vowel derived by other phonological rules (i.e., a phonologically-derived environment).

(5) Finnish Assibilation

		UR	a. /halut+i/	b. /vete/	c. /sata/	d. /tila/
Vowel Raising:	e ⟶ i / _#			i		
Assibilation:	t ⟶ s / _i		s	s		
		SF	[halusi]	[vesi]	[sata]	[tila]

Glosses: (5a) 'wanted', (5b) 'water', (5c) 'hundred', (5d) 'order'

Five out of seven of the processes involved in SDF are NDEB – Elision and Velar Deletion in Turkish, n-deletion and h-deletion in Javanese, and Continuant Deletion in Japanese – and each interaction has at least one NDEB process. Their effects are only observed when a morpheme – in these cases, a suffix – is attached. Example (6) shows that these processes are NDEB because they do not apply morpheme internally[2].

(6) Data illustrating the NDEB nature of ...

A. Elision in Turkish: morpheme-internal post-consonantal /s/ and /j/ are not deleted

	SF	Gloss		SF	Gloss
a. iksir	[iksiɾ]	'potion'	e. sübyan	[sybjan]	'minor'
b. borsa	[boɾsa]	'exchange'	f. madalya	[madalja]	'medal'
c. afsun	[afsun]	'spell'	g. isyan	[isjan]	'rebel'
d. konsa	[konsa]	'council'	h. dünya	[dynja]	'world'

B. Velar Deletion in Turkish: morpheme/root-internal intervocalic velar stops are not deleted

	SF	Gloss		SF	Gloss
a. avukat	[avukat]	'lawyer'	c. vagon	[vagon]	'railway car'
b. hareket	[haɾeket]	'exchange'	d. sigorta	[sigoɾta]	'insurance'

C. n-deletion in Javanese: morpheme-internal post-consonantal /n/'s are not deleted

[2] Unless otherwise stated, the Turkish data used in this paper are cited from the Turkish Electronic Living Lexicon (TELL; http://linguistics.berkeley.edu/TELL/) and the Javanese data come from personal elicitations and the SEAlang Library Javanese Resources (http://sealang.net/java/corpus.htm)

	SF	Gloss
a. sakwèhning	[sak̚wɛhniŋ]	‘all’
b. prayitna	[prajɪt̪̚nɒ]	‘cautious, carefully’
c. ningnang	[niŋnaŋ]	‘no different, exactly the same’
d. pêrnah	[pərnae]	‘the family relationship’
e. rèhné	[rɛhne]	‘seeing that, in view of the fact that’
f. wahné	[wahne]	‘besides’
g. mungguhné	[muŋgʊhne]	‘supposing’

D. h-deletion in Javanese: morpheme-internal intervocalic [h]’s are not deleted

	SF	Gloss
a. dhihin (sic)	[dihin]	‘the first’
b. prihatin	[prɪhatɪn]	‘anxious’
c. bihal	[bihal]	‘mule (smuggler)’ (borrowed from Arabic)
d. trahing	[tra(h)iŋ]	‘being a family member of’
e. mihun	[mihun]	‘rice flour noodle’ (borrowed from Chinese)

E. Continuant Deletion in Japanese: morpheme-internal continuant+continuant sequences exist

	SF	Gloss		SF	Gloss
a. kenri	[kenri]	‘right (n.)’	c. kanren	[kanren]	‘connection’
b. nenrei	[nenrei]	‘age’	d. shinrai	[ʃinrai]	‘trust’

The only two language-general rules are Epenthesis in Turkish and w-deletion in Japanese. Turkish Epenthesis takes place whenever the coda of a word has a flat or rising sonority (Sprouse, 1997), which is banned in Turkish (Clements & Sezer, 1982; van der Hulst & van de Weijer, 1991). [w] + non-low vowel sequences are absent in Japanese in general, except for some loan words (Hall et al., 2018:604).

NDEB can help explain why all these SDF interactions are observed at morpheme edges. Since each interaction includes at least one NDEB process that only takes place at morpheme concatenation sites, and each rule – including the language-general ones – always locally adds or removes a segment, no wonder the resultant interaction can only be seen at morpheme edges.

2.2 *Consonant cluster reduction* In Turkish, Epenthesis takes place whenever there is a “certain disallowed coda consonant cluster” (Sprouse, 1997) at a morpheme boundary. In all three other cases, the first rule (Elision in Turkish, n-deletion in Javanese and Continuant Deletion in Japanese) takes place whenever a suffix beginning with the target consonant (/s/, /j/, /n/ or /r/) is attached to a consonant-ending word. Both inserting a vowel and deleting a consonant are common ways of consonant cluster simplification.

However, besides being NDEB, there is another peculiarity associated with the Turkish Elision, Javanese n-deletion and Japanese Continuant Deletion rules. That is, if one of the consonants in an intervocalic cluster C_1C_2 should be removed, C_1 rather than C_2 is usually removed crosslinguistically because of C_1’s reduced perceptibility (Wilson, 2001). In contrast, it is always C_2 that gets removed in these three rules (7).

(7) Data illustrating the removal of C_2 instead of C_1

A. Turkish removes C_2 after suffixation of /-sI/

	Gloss	Root UR	Suffixation	SF
a. alay	‘regiment’	/alaj/	alaj+sɯ	[alajɯ]
b. karar	‘decision’	/kaɾaɾ/	kaɾaɾ+sɯ	[kaɾaɾɯ]
c. çan	‘bell’	/ʧan/	ʧan+sɯ	[ʧanɯ]
d. gülüş	‘smile’	/gylyʃ/	gylyʃ+sɯ	[gylyʃɯ]
e. top	‘ball’	/top/	top+sɯ	[topu]

B. Javanese removes C_2 after suffixation of /-ne/

	Gloss	Root UR	Suffixation	SF
a. bénér	‘right’	/bener/	bener+ne	[benere]
b. béring	‘unbalanced’	/beriŋ/	beriŋ+ne	[beriŋe]
c. tégés	‘significance’	/teges/	teges+ne	[tegese]
d. kulit̪	‘skin’	/kulit̪/	kulit̪+ne	[kulit̪e]

C. Japanese removes C_2 after suffixation of /-ru/

	Gloss	Root UR	Suffixation	SF
a. shir	'to know'	/ʃir/	ʃir+ru	[ʃiru]
b. shin	'to die'	/ʃin/	ʃin+ru	[ʃinu]
c. hanas	'to speak'	/hanas/	hanas+ru	[hanasu]
d. tob	'to fly'	/tob/	tob+ru	[tobu]

The best explanation probably lies in the suffix status of the deleted segment, which coincides with the "restricted exceptions" of C_2 deletions at root+suffix boundaries described by Wilson (2001). More specifically, when a consonant cluster is formed at the suffixation site, the consonant in the suffix is removed because the root has a special faithfulness requirement (Beckman, 1998; Casali, 1997; Zoll, 1998; McCarthy & Prince, 1995). To satisfy this requirement, C_1 in the root must be protected and C_2 in the suffix is removed. Furthermore, this theory of root faithfulness can help explain the NDEB nature of Turkish Elision, Javanese n-deletion and Japanese Continuant Deletion. If such a C∼∅ pattern is motivated by the relative dominance of the root over the adjacent suffix, it is surely expected at a root-suffix boundary only.

3 Proposal

Last section shows that SDF differs drastically from other types of interactions insofar that SDF is heavily dependent on morpheme edges. It is clear that (i) all SDF cases involve NDEB that happen only at morpheme-concatenation boundaries, and (ii) all these cases try to avoid consonant clusters by making changes to the suffix at such morpheme boundaries. A vital question thus naturally arises: Is the relationship between morpheme boundaries and SDF completely coincidental, or is there any factor causing them to appear together?

To answer this question, I offer a unified Standard OT (Prince & Smolensky, 1993) account for all these SDF cases, which can not only capture the SDF pattern and its related phenomena, but also show that the so-called SDF is a necessary result when certain morphemes are attached to each other. The two theories responsible for showing why these morphemes are special and how they necessarily lead to a SDF pattern are underspecification (Kiparsky, 1993) and contextual faithfulness (Beckman, 1998; Lombardi, 1999, 2001; Steriade, 2009; Wilson, 2001, a.o.).

3.1 *Underspecification* Many theories have been proposed to deal with NDEB, e.g., the Strict Cycle Condition (Mascaró, 1976), Sequential Faithfulness (Burzio, 2000), Coloured Containment (van Oostendorp, 2007), and Optimal Interleaving with Candidate Chains (Wolf, 2008). However, as argued in Rasin (2023), none of these theories can capture the three extended puzzles of NDEB, namely persistent blocking, blocking within suffixes, and non-contrastive trigger (see Rasin, 2023:§3-4 for details). Inkelas (2000:§2.1) also showed that Neighbourhood Protection (Itô & Mester, 1996:8) fails as well because of its inability of disambiguating root-final and suffix-initial segments.

The only theory able to capture NDEB effects while avoiding all the aforementioned problems seems to be Kiparsky's (1993) UNDERSPECIFICATION account, which I will adopt for my analysis. The essence of this theory is that, in the UR, some segments are underspecified (Kiparsky, 1982; Archangeli & Pulleyblank, 1989) while others are fully-specified. Take Finnish Assibilation again for example (8):

(8) Underspecification derivation for Finnish

	UR	a. /haluT+i/	b. /veTe/	c. /saTa/	d. /tila/
Vowel Raising:	e ⟶ i / _#		i		
Assibilation:	T ⟶ s / _i	s	s		
Default:	T ⟶ t			t	
	SF	[halusi]	[vesi]	[sata]	[tila]

The alveolar stop in /halut+i/ and /vete/ are underspecified /T/ with the feature [cont] not specified underlyingly. The /t/ in /tila/ is fully-specified for continuancy with [−cont]. Assibilation is essentially a feature-filling (or structure-filling) rule (Kiparsky, 1982), which fills /T/ with [+cont] and changes the SF to [s] (8a-b). Another default rule taking place after Assibilation fills /T/ with [−cont] and turns all the underspecified /T/ at that point into [t] (8c). The fully-specified /t/ in /tila/ undergoes neither Assibilation nor the default rule (8d), because both processes apply only to underspecified segments and fully-specified segments are protected from such feature-filling rules.

As illustrated by the Finnish example, the key of the underspecification theory is to decide *which* segments and *what feature* should be underspecified. Regarding which segments to underspecify, I adopt the Alternation-sensitive Lexicon Optimisation (A-LO) theory by Inkelas (1995, 2000). Similar to Lexicon Optimisation (Prince & Smolensky, 1993:192), A-LO only underspecifies a feature when a segment alternates, because only then will underspecification aid input-output mapping. Features completely predictable from the context can be underspecified, and “non-alternating features, no matter how predictable, are lexically prespecified” (Inkelas, 1995:290). This applies to NDEB in the sense that, if a segment fails to alternate even when the structural description for alternation is met, the reason must be that this segment is structurally immune because of lexical prespecification of features (Inkelas, 2000). For example, in Finnish, the alveolar stops [t] that alternate with [s] are underlyingly underspecified as /T/, while those [t]’s that never alternate are underlyingly fully-specified as /t/. Under this principle, the URs of the SDF examples in this paper are as follows (9).

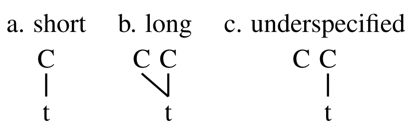
(9) Underspecification representations for all SDF examples

Turkish:	a. /bebeK+In/	Javanese:	c. /omaH+Ne/
	b. /ajaK+Sɯ/	Japanese:	d. /kaW+Ru/

The last problem to solve is to decide what feature to underspecify. Unlike the Finnish case where the surface alternation happens between two segments [t∼s], the alternations in SDF are always between a segment and ∅. When [t] alternates with [s], where the two segments only differ by [cont], it can be easily decided that [cont] should be the feature to be underspecified to accommodate later alternations. But when the alternation is simply between the presence and absence of a segment, and one assumes that the absence of a segment is attributed to whichever feature being unspecified on the surface, the choice of the feature to be underspecified among all features becomes unclear.

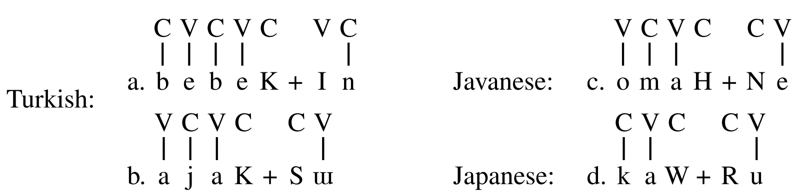
Thus, I choose to adopt the autosegmental underspecification-based account used by Kiparsky (1993) for Finnish Consonant Gradation. Based on Autosegmental Phonology (Goldsmith, 1976), Kiparsky (1993) assumed that the skeletal tier containing C (consonantal) and V (vowel) slots are separated from the melodic tier hosting the segments. Fully-specified short and long consonants are associated with one and two C slots respectively, but underspecified geminates are associated with one C slot and preceded by another unassociated C slot (10). Segments must be fully-specified in order to appear on the surface. In other words, the central tenet is that the linking and delinking between a consonant and a C slot can determine a consonant’s presence or absence, which is suitable for SDF. Thus, I propose that underspecified segments in Turkish, Javanese and Japanese are not linked to C or V slots but fully-specified ones are, as in (11).

(10) Autosegmental underspecification representation for Finnish



(adapted from Rasin, 2023, ex. 48)

(11) Autosegmental underspecification representation for all SDF examples



With the underspecification theory in place and constraints in (12), all SDF cases involving two interacting consonants can be accounted for, along with the majority of NDEB effects and root faithfulness phenomena as showin in (13)[3].

(12) Constraints responsible for SDF (to be completed)

a. SPECIFY: Assign one violation (AOV henceforth) for each segment that is not linked to a C/V slot (cf. SPECIFY[T] in Myers, 1997:861 and Zoll, 2003:241).

b. MAX_{full}: AOV for each underlying fully-specified segment removed[4].

c. *VkV (for Turkish): AOV for each [k] or [g] between two vowels.
*VhV (for Javanese): AOV for each [h] between two vowels.
*w[−low] (for Japanese): AOV for each [w] followed by a non-low vowel.

d. DEPLINK: AOV for each association line added between a segment and a C/V slot (cf. NOLINK[place] in McCarthy, 2008:278).

e. MAX: AOV for each segment removed.

(13) Example: Consonant-SDF cases accounted for in Turkish (to be updated)

a. SDF

/ajaK+Sɯ/			SPECIFY	MAX_{full}	*VkV	DEPLINK	MAX
a.	☞	ajaɯ					∗∗
b.		ajasɯ				∗!	∗
c.		ajaksɯ				∗!∗	
d.		ajakɯ			∗!	∗	∗
e.		ajaKSɯ	∗!∗				

b. Elision (to be refined)

/tʃan+Sɯ/			SPECIFY	MAX_{full}	*VkV	DEPLINK	MAX
a.	☞	tʃanɯ					∗
b.		tʃansɯ				∗!	
c.		tʃasɯ		∗!		∗	∗
d.		tʃaɯ		∗!			∗∗
e.		tʃanSɯ	∗!				

c. Velar Deletion

/sokaK+a/			SPECIFY	MAX_{full}	*VkV	DEPLINK	MAX
a.	☞	sokaa			∗		∗
b.		sokaka			∗∗!	∗	
c.		sokaKa	∗!		∗		

d. NDEB

/avukat/			SPECIFY	MAX_{full}	*VkV	DEPLINK	MAX
a.	☞	avukat			∗		
b.		avuat		∗!			∗

[3] Since the Turkish consonant-SDF, Javanese and Japanese cases have identical effects, I will only exemplify with Turkish consonant-SDF in what follows. The other two cases can be derived by substituting the language-specific markedness constraint (12c) at the corresponding position.

[4] Note that MAX_{full} and MAX penalise the complete removal of a segment instead of the delinking between a segment and a C/V slot.

/sene+ki/			SPECIFY	MAX$_{full}$	*VkV	DEPLINK	MAX
a.	☞	seneki			∗		
b.		senei		∗!			∗

However, this interim proposal is unable to: (i) keep the root-final underspecified segments when it stands alone (14 A), (ii) Turkish vowel-SDF (14 B) cannot be accounted for, and (iii) when a suffix with an underspecified initial consonant is attached to a vowel-ending root, the underspecified consonant is incorrectly removed (14 C).

(14) Problems of the interim analysis, illustrated with Turkish

A. Root-final underspecified segments are wrongly removed

/bebeK/			SPECIFY	MAX$_{full}$	*VkV	DEPLINK	MAX
a.	☹	bebek				∗!	
b.	💣	bebe					∗
c.		bebeK	∗!				

B. The Turkish vowel-SDF case is not covered

/bebeK+In/			SPECIFY	MAX$_{full}$	*VkV	DEPLINK	MAX
a.	☹	bebein				∗!	∗
b.	💣	beben					∗∗
c.		bebekn				∗!	∗
d.		bebekin			∗!	∗∗	
e.		bebeKIn	∗!∗				

C. Suffix-initial underspecified consonants are not preserved, illustrated with Turkish

/ʃiʃe+Si/			SPECIFY	MAX$_{full}$	*VhV	DEPLINK	MAX
a.	☹	ʃiʃesi				∗!	
b.	💣	ʃiʃei					∗
c.		ʃiʃeSi	∗!				

Although the problem of removing root-final segments can be solved by using constraints that require edge-alignments of words (McCarthy & Prince, 1993, 1995) in (15), the remaining problems suggest that some important characteristics of each language are still overlooked. More specifically, word-internal underspecified segments have not been allowed to alternate on the surface at all at the moment: Their only destiny is to be removed. The next section introduces the last theory needed to correctly predict when these underspecified segments should surface.

(15) a. ANCHOR-W-IO: AOV for each misaligned input-output word edge.

b. Example: Correct SFs derived for Turkish roots (only crucial constraints shown)

/bebeK/			SPECIFY	ANCHOR-W-IO	DEPLINK	MAX
a.	☞	bebek			∗	
b.		bebe		∗!		∗
c.		bebeK	∗!			

3.2 *Contextual faithfulness* The key to understanding the preservation of suffix-initial consonants lies in the strong preference for the CV syllable structure of Turkish, Javanese and Japanese. In general, it is widely acknowledged that CV is the most canonical syllable structure as it is the only structure that is found in all languages (Dryer & Haspelmath, 2013, a.o.). For these languages specifically, van der Hulst & van de Weijer (1991) reports the canonical syllable structure in Turkish to be (C)V(C). Yip (1989:353) directly states that the most common word shape in Javanese is CVCVC. Japanese is famous for only allowing /N/ and the moraic obstruent /Q/ in coda positions (Vance, 2008). The traditional description of allomorphy in these languages (van der Hulst & van de Weijer, 1991; Lee, 1999; Kurisu, 2012, a.o.) and observations of the data confirm this hypothesis: The consonant-initial suffixes [-n], [-sɯ], [-ne] and [-ru] surface when the root ends in a vowel, and the vowel-initial ones [-in], [-ɯ], [-e] and [-u] when the root ends in a consonant. Therefore, the cases above could be the result of avoiding the deletion of the segment already part of the CV-alternating pattern. /I/ is underlyingly between two consonants in /bebeK+In/, and /S/, /N/ and /R/ are underlyingly between two vowels when they are attached to vowel-ending roots, regardless of whether their neighbours are fully-specified. Removing these segments in turn destroys the preferred syllable structure, which is already in place.

A theoretically-supported constraint designed to protect a certain pattern in the UR is contextual faithfulness (Beckman, 1998; Lombardi, 1999, 2001; Wilson, 2001; Steriade, 2009). This paper adopts the kind of constraints with the shape of MAX/_*K* (where *K* stands for the context) employed in the P(erceptibility)-map theory (Steriade, 2009), whose aim is to preserve segments in certain UR environments. The constraint responsible for the Turkish vowel-SDF case is MAX-V/C_C, which penalises the deletion of any consonant between two vowels in UR, and that for the Turkish consonant-SDF, Javanese and Japanese case is MAX-C/V_V. This constraint must be ranked above DEPLINK and ANCHOR-M-IO, so intervocalic consonants in the UR can be preserved. It also needs to be outranked by the markedness constraint to derive the NDEB effects when an underspecified segment appears on a morpheme edge. How these constraints work for SDF is exemplified with the two Turkish cases in (16-17).

(16) Turkish vowel-SDF accounted for

A. SDF case:

/bebeK+In/	SPECIFY	MAX_{full}	*VkV	MAX-V/C_C	DEPLINK	MAX
a. ☞ bebein					∗	∗
b. beben				∗!		∗∗
c. bebekn				∗!	∗	∗
d. bebekin			∗!		∗∗	
e. bebeKIn	∗!∗					

B. Epenthesis: taking place after consonant-ending roots

/ip+In/	SPECIFY	MAX_{full}	*VkV	MAX-V/C_C	DEPLINK	MAX
a. ☞ ipin					∗	
b. ipn				∗!		∗
c. ipIn	∗!					

/anne+In/	SPECIFY	MAX_{full}	*VkV	MAX-V/C_C	DEPLINK	MAX
a. ☞ annen						∗
b. annein					∗!	
c. annin		∗!				∗
d. anneIn	∗!					

(17) Turkish consonant-SDF accounted for

A. SDF case:

/ajaG+Sɯ/		Specify	Max_{full}	*VkV	Max-C/V_V	DepLink	Max
a. ☞	ajaɯ						**
b.	ajasɯ					*!	*
c.	ajaksɯ					*!*	
d.	ajakɯ			*!		*	*
e.	ajaKSɯ	*!*					

B. Elision: taking place only after consonant-ending roots

/ʧan+Sɯ/		Specify	Max_{full}	*VkV	Max-C/V_V	DepLink	Max
a. ☞	ʧanɯ						*
b.	ʧansɯ					*!	
c.	ʧasɯ		*!			*	*
d.	ʧaɯ		*!				**
e.	ʧanSɯ	*!					

/ʃiʃe+Si/		Specify	Max_{full}	*VkV	Max-C/V_V	DepLink	Max
a. ☞	ʃiʃesi					*	
b.	ʃiʃei				*!		*
c.	ʃiʃeSi	*!					

C. Velar Deletion: removes underspecified velar stops

/sokaK+a/		Specify	Max_{full}	*VkV	Max-C/V_V	DepLink	Max
a. ☞	sokaa			*	*		*
b.	sokaka			**!		*	
c.	sokaKa	*!		*			

D. NDEB: fully-specified /k/ and /s/ are preserved

/avukat/		Specify	Max_{full}	*VkV	Max-C/V_V	DepLink	Max
a. ☞	avukat			*			
b.	avuat		*!		*		*

/sene+ki/		Specify	Max_{full}	*VkV	Max-C/V_V	DepLink	Max
a. ☞	seneki			*			
b.	senei		*!		*		*

4 Discussion

The past section proposed a new analysis using underspecification and contextual faithfulness constraints in Standard OT to account for the SDF cases in Turkish, Javanese and Japanese, as well as other co-occurring effects. I argue that this proposal has three implications on the study of SDF and opacity.

First and most obviously, the current analysis shows that, with appropriate assumptions and understanding of the UR, certain types of overapplication opacity may no longer pose problems for Standard OT. OT solutions to opacity, including SDF, have not been very neat. For example, Lee (1999) used Sympathy (McCarthy, 1999) to account for Javanese SDF and Lee (2007) modified Lee's (1999) solution using OT with

Candidate Chains (OT-CC, McCarthy, 2006). But both solutions were forced to recognise some intermediate stages or their corresponding candidates in a derivation like rule-based serialism, which is against the gist of OT and led to their obsolescence. Baković (2007:225-230) used the TURBIDITY theory (Goldrick, 2000), whose key is that some segments or morae might be hidden (i.e., projected but not pronounced). However, the deletion of /k/ is independently motivated without any reference to hidden structures (Baković, 2007). In contrast, the analysis in this section uses widely-adopted frameworks and independently-justified constraints (cf. the constraints used in Hauser & Hughto, 2020), each of which serves the function of capturing a critical phenomenon related to SDF.

Second, the central tenets of the current theory are compatible with multiple frameworks and can lead to more compelling conclusions in rule-based serialism. That is, the three key points my proposal entails (18) can be implemented in not only OT but also rule-based serialism.

(18) Key points responsible for the accomplishment of the current analysis:

a. NDEB effects are the result of the contrast between fully- and underspecified segments;

b. The atypical resolution to consonant cluster is the result of the root-suffix asymmetry;

c. Underspecified segments only surface when they contribute to a more harmonic phonological pattern – in this case, syllable structure and word-edge alignment.

Under these principles, (18c) in particular, the patterns in (1-4) are no longer the result of SDF between certain segment-deletion/insertion rules, but the result of the rules in (19) determining the appearance of underspecified segments.

(19) Rewriting the rules under the new analysis

	Old	**New**
Turkish vowel-SDF:	∅ ⟶ i / C_C#	I ⟶ i / C_C
	k/g ⟶ ∅ / V_V	K ⟶ k /_#
Turkish consonant-SDF:	s/j ⟶ ∅ / C_	S/J ⟶ s/j / V_V
	k/g ⟶ ∅ / V_V	K ⟶ k /_#
Javanese:	n ⟶ ∅ / C_	N ⟶ n / V_V
	h ⟶ ∅ / V_V	H ⟶ h /_#
Japanese:	r ⟶ ∅ / C_	R ⟶ r / V_V
	w ⟶ ∅ / _[−low]	W ⟶ w /_#

On the one hand, these new rules can be organised into one family with the same function, namely to determine the presence of underspecified segments, whereas the old ones look more like separate rules removing or inserting segments in certain contexts. On the other hand, each pair of rules no longer need to be crucially ordered to yield the desired SF. That is, with the assumptions introduced by the current proposal, SDF might no longer be needed, as exemplified in (20) with Javanese.

(20) Ordering is not needed for the new rules, exemplified in Javanese

a.

UR	/omaH+Ne/
N ⟶ n / V_V	
H ⟶ h /_#	
N ⟶ ∅	∅
H ⟶ ∅	∅
SF	[omae]

b.

UR	/omaH+Ne/
H ⟶ h / V_V	
N ⟶ n /_#	
H ⟶ ∅	∅
N ⟶ ∅	∅
SF	[omae]

These two derivations indicate that, although the default rules (N → ∅, H → ∅) need to be ordered after those applying in more specific environments and deciding the appearance of underspecified segments, the relative order between the two more specific rules or that between the two default rules no longer matters for the successful derivation of the correct SF. The SDF relation also disappears because the earlier rule does not create environments for the later rule to apply and in turn gets deleted. In other words, the so-called SDF patterns reanalysed with the new rules may be not in SDF – or any interaction – relationship, and SDF is no longer needed as a separate type of rule interaction or even a case of overapplication opacity.

Finally, the current proposal provides a fresh angle to view the nature of the patterns in (1-4). The central conclusions made by this analysis illustrate that what has been identified as SDF is in fact an epiphenomenon of phonologically-conditioned allomorph optimisation instead of a genuine kind of rule interaction. Under the old analysis with self-destructively feeding rules, SDF was peculiarly different from other rule interactions in the sense that SDF always happens at morpheme edges, and always ahieves a single goal – consonant cluster avoidance – with an atypical solution. The co-occurrence of these phenomena are just coincidental. Under the new analysis, the SFs of these SDF cases are essentially the optimal choice for realisation when two morphemes – each with an underspecified segment on one edge – are adjacent. The two peculiarities are also explained. These patterns are NDEB because the segments with alternating potential only appear at morpheme-concatenation boundaries. The atypical choice of the deleted consonant in a cluster falls out from the asymmetry between the fully-specified segment at the end of a root and the suffix-initial underspecified segment. The surface pattern involving SDF is simply the optimal way of realising the UR with the most harmonic phonological structure, regardless whether one chooses to think in rule-based serialism or OT terms. In brief, the current proposal has not only the descriptive ability but also explanatory power for the so-called SDF pattern and all its relating characteristics.

If the current theory is correct, it is predicted that SDF may not be learnable, at least in experiment settings. Since SDF is not the result of two interacting rules, but determined by the distributions of underspecified segments and the preferred phonotactic structures – both decided by the individual language – it might be difficult for learners in an experiment to grasp these points. Turkish, Javanese and Japanese speakers are able to produce SDF patterns because they are equipped with the underspecification details in their implicit knowledge, but participants invited to artificial grammar learning experiments are not. In fact, some research along this line has been done and this prediction seems to be borne out. Yang (2023) designed an artificial grammar learning experiment based on the vowel-SDF pattern in Turkish to test if SDF is learnable, and the results indicated that "participants are learning something, though not what was intended". Further research on more patterns (e.g., those involving consonant deletions) could be pursued down this line to reinforce the conclusion.

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