Correspondence and identity constraints in two-level Optimality Theory

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1. Overview and historical background*

One goal of post-SPE generative phonology has been to constrain possible input-output pairs. While SPE (Chomsky and Halle 1968) permitted any input-output pair to be stipulated, later work in Autosegmental Phonology and Feature Geometry (see Goldsmith 1990 for an overview) restricted rules and representations so as to constrain input-output relations. In particular, a given rule could target only a single node in a feature-geometric representation and was restricted to one of the following operations: spreading, delinking, insertion, or deletion. While it is not clear that these restrictions had any effect on the formal power of the theory, they resulted in a reflection of markedness that many linguists

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found satisfactory: natural (i.e. common) phonological alternations were easy to encode in this formalism, while unnatural ones were less elegant.

The development of nonderivational frameworks has brought a new perspective to this issue. One such theory, Two-Level Phonology (Koskenniemi 1983, Karttunen 1993), is equivalent to SPE in permitting any input-output pairing. For example, Lakoff 1993 (working in a variant of Two-Level Phonology) proposed the following unnatural constraint: 'M(orphophonemic)-level /ʔr/ corresponds to W(ord)-level /h/' (p122).

By contrast, the nonderivational Optimality Theory (OT; Prince and Smolensky 1993) was, in its original formulation, a one-level theory. It avoided the unwanted possibility of arbitrary stipulation of input-output pairs by virtue of Containment, a principle requiring the input string to be contained in the output. However, McCarthy and Prince 1994a have since proposed abandoning Containment. As a two-level theory, OT is thus potentially open to arbitrary input-output correspondence stipulations of the kind Lakoff proposed.

In this paper I address the problem of potential arbitrary input-output pairs in two-level OT by restricting all correspondence constraints to be FAITHFULNESS constraints, i.e. constraints requiring identity (Prince and Smolensky 1993, McCarthy and Prince 1993b). While all the constraints McCarthy and Prince 1994a use are faithfulness constraints, and indeed their theory of correspondence is explicitly intended as a theory of faithfulness, there is as yet no explicit theory of correspondence constraint typology that disallows stipulation of undesirable constraints of Lakoff's kind. It is in this area that I propose to contribute to the general correspondence theory developed by McCarthy and Prince 1994a.

According to the view I propose, any input-output mismatches must be due to constraints on the wellformedness of the output. This approach offers a principled solution within two-level OT to the notorious counterfeeding problem (previously thought to require rule ordering), and solves previously intractable problems in reduplication.

2. Proposal

The basic model assumed is the two-level version of OT proposed by McCarthy and Prince 1994a, in which the optimality system evaluates a pair of strings (input and output).[1] Containment is not part of this version of OT, such that deletion and insertion are interpreted literally (McCarthy and Prince 1994a; cf. Prince and Smolensky 1993). Two kinds of

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[1]The same constraint formalism also handles base-reduplicant relations, as discussed in McCarthy and Prince 1994.

constraints are used: wellformedness constraints, which refer only to the output string, and correspondence constraints, which mention both input and output strings. All correspondence constraints are faithfulness constraints, preventing the arbitrary stipulation of input-output pairs.

I propose two faithfulness constraint families: CORR(espond) and MATCH.[2] The format for the CORR family is shown in (1).

(1) CORR($string_1$, $string_2$, X): X is a constituent with any amount of information (e.g. features) specified. The TOP NODE in every X in $string_1$ has to be coindexed with a node of the same type in $string_2$.

The examples in (2) show how the CORR constraint family replaces PARSE and FILL, the faithfulness constraints of original one-level OT (Prince and Smolensky 1993).[3] Notice that CORR constraints require a correspondent only for the top node in their first argument, rather than identity of ALL the structure specified in X, making it possible to have nonidentical correspondents (e.g. an alveolar input root node that corresponds to a labial output root node (McCarthy and Prince 1994a)).

(2)	a)	CORR(input, output, /a/)	For every input /a/, there is a root node (segment) in the output (replaces PARSE).
	b)	CORR(output, input, C)	For every output C, there is a segment in the input (replaces FILL).

The second constraint family I propose is MATCH, which imposes an inclusion relation on correspondents. The format is shown in (3):

(3) MATCH($string_1$, $string_2$, X) For any pair <$X_i \in string_1$, $Y_i \in string_2$>, Y contains all the information in X. That is, elements of $string_2$ contain all specifications of their $string_1$ correspondents.

The examples in (4) illustrate the use of this constraint family. Note that MATCH constraints do not require correspondents to be identical. Rather,

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[2]These constraints are extensions and revisions of the correspondence constraints proposed in McCarthy and Prince 1994a. The similarities and differences between my constraints and theirs will become clear when I present analyses of actual data. I do not suggest that these constraints are all the ones that are needed. In particular, I do not discuss the contiguity, anchoring, and alignment constraints of McCarthy and Prince 1993b, 1994c.

[3]These structurally defined faithfulness constraints of one-level OT are meaningless in a two-level theory; moreover, even within one-level OT, PARSE obscures the crucial contrast between floating and deleted elements, and therefore should be replaced in any case.

they require the element in $string_2$ to contain AT LEAST all the information in its $string_1$ correspondent, but allow it to contain more.[4]

(4) a) MATCH(input, output, V) Every output correspondent (if any) of an input V contains all specifications of the input V.

b) MATCH(BASE, RED, σ) Every RED correspondent of a BASE σ contains all the segments in the BASE σ.

One result of this definition is that fully specified output correspondents of underspecified input elements do not violate MATCH. It is the job of output wellformedness constraints such as *STRUC (Prince and Smolensky 1993) to regulate insertion.

3. Analyses

3.1 Counterfeeding in a chain alternation

In this section, I demonstrate the utility of the proposed correspondence constraints by using them to analyze counterfeeding, a phenomenon previously handled through the use of rule ordering, no longer a possibility in OT. The data, previously analyzed in one-level OT by McCarthy 1993, 1994, and Kiparsky 1994, come from Bedouin Hijazi Arabic.

The first relevant alternation is the deletion of short [i] in nonfinal open syllables:

(5)	*ʕarif + at*	→	*ʕarfat*	‘she knew’
	kitil	→	*ktil*	‘he was killed’

The second is the raising of short [a] to short [i] in nonfinal open syllables.

(6)	*katab*	→	*kitab*	‘he wrote’	**ktab*
	rafaagah	→	*rifaagah*	‘companions’	**rfaagah*

In contrast to underlying short [i], derived short [i] is not deleted.

McCarthy 1993 proposes the following analysis of this alternation: [a] is a vowel with the feature [low] ([V, low]), and input and output [i] differ in their feature specifications. Input [i] is a vowel with a [high] specification ([V, high]), while output [i] is a placeless vowel ([V]), pronounced [i] by default. The constraints McCarthy uses are given in (7):

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[4] This constraint family subsumes STROLE (McCarthy and Prince 1994a).

(7) No [V, place] Vowels with a place specification are not allowed.
Parse hi The feature [high] must be linked to a root node.
Parse low The feature [low] must be linked to a root node.
Parse V Vowels must be parsed (i.e. pronounced; not deleted)
Ranking: No [V, place] >> Parse hi >> Parse V >> Parse low

The tableaux in (8) and (9) show how these constraints account for the counterfeeding alternation (< > indicates unparsed elements):

(8)

	input: {V, low}	No [V, Pl]	Parse-hi	Parse-V	Parse-low
	[V, low]= *a*	*!			
☞	[V] <low> = *i*				*
	<[V, low]> = ∅			*!	

(9)

	input: {V, high}	No [V, Pl]	Parse-hi	Parse-V	Parse-low
	[V, high]= *i*	*!			
	[V] <high> = *i*		*!		
☞	<[V, high]> = ∅			*	

This analysis crucially assumes that [high] is parsed by a root node that is itself unparsed (9). Even though the vowel itself is deleted, its features must be considered parsed, such that no violation of Parse-hi is incurred.

While this interpretation of ‘parsing’ accounts for the Arabic data, it causes serious problems elsewhere. In particular, it cannot deal with the phenomenon known as stability (Goldsmith 1976) whereby features of a deleted segment are saved by relinking to another anchor. I provide two examples here. The first is the Hausa alternation *mínì~mín* ‘to me’ (Cowan and Schuh 1976: 150), where the L tone of the deleted /i/ is saved by linking to [n]. In the interpretation of Parse adopted by McCarthy, nothing compels such relinking, since linkage to the unparsed [i] already satisfies Parse[L].[5] The second example comes from Rotuman, discussed in Mester 1986 and references cited therein. There is a contrast in Rotuman between complete and incomplete phases,[6] marked formally by the absence of the final stem vowel in the incomplete phase (10).

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[5]An alternative analysis, suggested by G. Buckley and S. Inkelas, would assume that tones are linked to the mora. The mora that bears the L tone is not deleted in this alternation, since coda consonants are moraic in Hausa.

[6]The complete/incomplete phase choice is syntactically determined.

(10) Complete / Incomplete

	Complete	Incomplete	
	futi	*füt*	‘to pull’
	hoti	*höt*	‘to embark’
	mose	*mös*	‘to sleep’

The stem vowel is umlauted in the incomplete because the features of the deleted vowel must be saved. Under McCarthy’s interpretation of PARSE, nothing forces this relinking.[7] In the present formalism, however, stability effects are forced by a CORR(input, output, feature) constraint.

Below, I present an analysis of the Arabic alternation within the framework proposed in this paper. The relevant constraints and their ranking are shown in (11).

(11)

CORR(input, output, /a/)	Every input /a/ has an output correspondent.
No [a], No V[8]	/a/, V not allowed in open syllables.
MATCH(input, output, V)	Output correspondents of input V match it.
CORR(input, output, V)	Input V has an output correspondent.
Ranking:	CORR /a/, No[a]>>No V, MATCH V>>Corr V

The following tableaux show how these constraints derive the counterfeeding interaction. In (12) [i] deletes and in (13), [a] raises.

(12)

/i/	CORR(i, o, /a/)	No [a]	No V	MATCH(i, o, V)
a		*!	*	
i			*!	
☞ ∅				

(13)

/a/	CORR(i, o, /a/)	No [a]	No V	MATCH(i, o, V)
a		*!	*	
☞ *i*			*	*
∅	*!			

The analysis hinges on CORR(input, output, /a/), which requires every input /a/ to have an output correspondent. Since [a] is not allowed in nonfinal open syllables, CORR can be satisfied only through unfaithful parsing of the input [a] as [i] (13). By contrast, parsing an underlying [i]

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[7]Other OT work requiring PARSE to be violated if the anchor is unparsed includes Zoll 1994, Gahl 1994, and Rosenthall 1994a.

[8]I noncrucially use No V rather than No [i], following Kiparsky’s (1994) approach to markedness, in which no constraints refer specifically to the unmarked member of a class.

(CORR(input, output, V)), not shown in (12) and (13), is a relatively low-ranking requirement, making deletion of [i] the preferred option (12).

In (14) I compare my analysis with McCarthy's 1994 reanalysis of the same alternation; 'sponsoring' means, roughly, 'underlyingly linked to'.

(14)

	McCarthy's constraints		My constraints
	PARSE-V[phar]	A [phar] sponsoring vowel must be parsed	CORR (i, o, /a/)
	PARSE-V[hi]	A [high] sponsoring vowel must be parsed	CORR (i, o, V)
	*[PHAR]	No [a]	No [a]
	*[HI]	No [i]	No V

Notice that there is a one-to-one correspondence between McCarthy's constraints and mine, and the insights captured are the same. However, the framework I use is more constrained in that, by definition, CORR constraints apply only to the top node in the structure they refer to, while McCarthy's PARSE constraints could be extended to apply, by stipulation, to any node (for example, nothing would rule out a constraint requiring the parsing of a vowel that happens to be linked to a closed syllable).

Note that McCarthy and Prince 1993b assumed that identity of correspondents was inviolable. By contrast, McCarthy and Prince 1994a argue for the need for nonidentical correspondents. My MATCH constraints provide a formal means of allowing such mismatches while controlling their distribution.

3.2 Inconsistent copying in reduplication

The second problem I address is one of inconsistent copying in Plains West Tarangan reduplication, analyzed by Spaelti 1994 (data from Nivens 1992, 1993). In Tarangan, [k] and [y] are never allowed as codas except word-finally and, in certain circumstances, in reduplication (15). The RED(uplicant)[9] is underlined throughout this paper to aid identification:

(15)	a)	*kɛy*	*<u>kɛy</u>kɛy*	'wood'	
	b)	*borar*	*<u>bor</u>borar*	'small'	
	c)	*bakay*	*<u>ba</u>bakay*	'small'	**<u>bak</u>bakay*

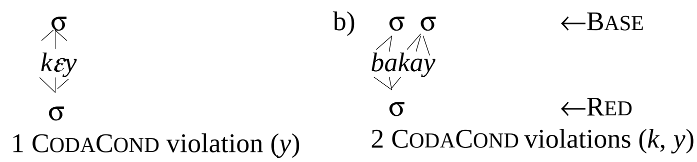
In (15a), a monosyllabic root undergoes total reduplication, even though it ends in a dispreferred coda (which is copied to RED). The canonical shape

[9] McCarthy and Prince 1993b, who develop the OT approach to reduplication assumed here, were the first to use the term "RED" for "reduplicant", a term that they in turn attribute to Spring 1990.

of RED is a heavy syllable, satisfied in (15b) by copying a BASE onset into RED as a coda. In (15c), however, overcopying does not apply, as it would create a dispreferred coda in RED. Only a light syllable is reduplicated.

Spaelti offers an analysis of this inconsistent copying of dispreferred codas ((15a) vs. (c)) in terms of Mester's (1986) single melody reduplication formalism, in which two skeletal structures (representing BASE and RED, respectively) are associated with a single melodic tier. The representations Spaelti proposes for [kɛykɛy] and [babakay] are as in (16):

(16) a) b)



Crucially, CODACOND (Itô and Mester 1994) violations are computed as follows: each segment that is a dispreferred coda incurs one CODACOND violation, even if it is linked to two codas. Thus, CODACOND violations copied from BASE to RED do not add up: [kɛykɛy] (like [kɛy]) violates CODACOND once, allowing the.dispreferred coda to be copied to RED.

When BASE does not contain a dispreferred coda already, however, as in [bakay], it is not possible to create one in RED (**bakbakay*), since this would be an unacceptable CODACOND violation that is avoidable (by reduplicating an open syllable) (16b).

However, this approach causes serious problems. McCarthy and Prince 1994b show that to capture 'Emergence of the Unmarked' effects, it is necessary to interpret copied violations additively. This is demonstrated in (17) with respect to Nootka reduplication (Shaw 1992):

(17)	*čims*	'bear'	(codas allowed generally)
	či-čims …	**čim-čims*, *čims-čims*	(but not in RED)

Nootka allows closed syllables generally, but not in reduplication, an 'Emergence of the Unmarked' effect of the sort described by McCarthy and Prince 1994b, who handle this case by ranking NOCODA above MAX ('all of BASE is copied into RED'). Copied violations crucially add up:

(18)

	Input: /RED-čims … /	NOCODA	MAX
☞	*či-čims*	*	*ms*
	čim-čims	**!	*s*

A similar example comes from Chamorro (McCarthy and Prince 1994b), where alignment is violated in order to avoid creating a heavy syllable in

RED. In (19a) we see simple suffixal reduplication of a base ending in an open syllable. However, in (19b) we see that a root ending in a heavy syllable undergoes infixing, rather than purely suffixing, reduplication:

(19) a) *daŋkolo* *daŋkolo<u>lo</u>* 'big/really big'
b) *metgot* *metgo<u>go</u>t* 'strong/very strong' **metgot<u>got</u>*

McCarthy and Prince 1994b analyze this phenomenon by ranking NOCODA above Alignment (McCarthy and Prince 1993a). Crucially, the second candidate in (20) violates NOCODA more times than the first:

(20)

	input: /metgot-RED/	NOCODA	ALIGN(RED, R, STEM, R)
☞	*metgo<u>go</u>t*	**	*t*
	metgot<u>got</u>	***!	

We thus have a paradox: in Tarangan, copied violations are tolerated, while in Nootka and Chamorro they are not. The solution to this paradox is correspondence constraints. I assume the constraints and ranking in (21) (all but MATCH are versions of constraints proposed in McCarthy and Prince 1993b, Itô and Mester 1994, and Spaelti 1994):

(21) RED = σ — Templatic requirement (Spaelti 1994).
MATCH(BASE, RED, σ) — RED syllables contain all the segments in their BASE correspondents.[10]
CODACOND — [y] and [k] are not allowed in codas.
MAX[11] — All of BASE is copied to RED.
Ranking: RED = σ, MATCH(B, R, σ) >> CODACOND >> MAX

MATCH(BASE, RED, σ) is the crucial constraint. It requires RED syllables to copy all the segments in their BASE correspondents, but allows them to

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[10] This constraint illustrates the similarity and difference between MATCH and McCarthy and Prince's (1994a) STROLE (enforcing identical syllabic positions for correspondent segments): While both MATCH and STROLE would penalize a RED syllable lacking a segment in its BASE correspondent, only MATCH is satisfied by a RED syllable containing an extra segment over its BASE correspondent. This difference is crucial in my analysis.

[11] MAX (McCarthy and Prince 1993b, 1994c) is in fact a constraint of the CORR family (CORR(BASE, RED, ROOTNODE)). MAX has always been evaluated only in terms of segments, which the above formulation makes explicit. However, I predict the need for MAX constraints referring specifically to sub- and suprasegmental elements in more complete analyses of reduplication. The present formalism readily allows for such constraints as well. Note that McCarthy and Prince's (1994a) STROLE is indeed a MAX-like constraint on prosodic structure.

contain more segments. The tableaux in (22) through (24) show how the proposed constraints account for the Tarangan data.

(22)

input: *borar*	RED = σ	MATCH(B, R, σ)	CODACOND	MAX
☞ *borborar*				*ar*
boborar				*r*! *ar*

(23)

input: *kεy*	RED = σ	MATCH(B, R, σ)	CODACOND	MAX
☞ *kεykεy*			**	
kεkεy		*!	*	*y*

(24)

input: *bakay*	RED = σ	MATCH(B, R, σ)	CODACOND	MAX
bakbakay			**!	*ay*
☞ *babakay*			*	*kay*

Note that CODACOND violations copied from BASE to RED ARE evaluated additively, as needed in McCarthy and Prince's (1993b, 1994a,b,c) analyses of reduplication; the full copying that Spaelti observed in [kεykεy] follows, under this analysis, from the high-ranking MATCH constraint requiring the faithful duplication of BASE syllables in RED.[12]

3.3 Overapplication

The formalism I propose also handles overapplication effects in exactly the same manner as McCarthy and Prince 1994a, who of course developed the correspondence framework that I am contributing to. The first example comes from Semitic-style morphology in Hausa, discussed by McCarthy 1986 (data from Gregersen 1967). Masculine singular past passive participles in Hausa are formed by adding a suffix of the form /aCCee/ to the verb root (Cowan and Schuh 1976: 280-81). The unspecified C slots of the suffix are filled by copying the last stem consonant.[13] Hausa has a rule that palatalizes coronal obstruents before front vowels. In the conservative forms in (25), palatalization only applies to coronal obstruents that precede front vowels on the surface, i.e. those the copied suffix consonant. In the innovative dialect, palatalization applies to the stem consonant as well, although this consonant precedes a back vowel.

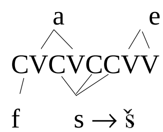
[12]See Spaelti (this volume) for more data and an alternative analysis.
[13]For an OT analysis of how such templates are filled, see Rosenthall 1994b.

(25)

	Conservative	Innovative	
	fàsáššée	*fàšáššée*	'broken'
	màtáččée	*màčáččée*	'dead'
	gùdáǰǰée	*gùǰáǰǰée*	'run away'

McCarthy 1986 analyzes this phenomenon using tier conflation. In conservative forms, palatalization applies after tier conflation; in innovative forms, before. Therefore, in the innovative dialect, palatalization affects all surface copies of the underlying coronal. The application of palatalization in the innovative dialect is shown in (26).[14]

(26)



→ *fàšáššée* (by tier conflation)

I now offer a nonderivational analysis of this phenomenon. The relevant constraints are given in (27).

(27) PAL — Coronal obstruents are palatalized before front vowels.
MATCH(input, output, C) — Output consonants match their input correspondents.
MATCH(output, output, C) — Output consonants match their output correspondents.

The last constraint, MATCH(output, output, C), deserves comment. The reason output consonants have correspondents in the output is the Semitic-style morphology of the Hausa participle, in which an input consonant may have more than one output correspondent. Since the formal encoding of correspondence, namely coindexation, is transitive, it follows that all output copies of a given input consonant are correspondents of one another. This is shown in (28).

(28)

Conservative dialect		Innovative dialect	
input	/fàs-SFX/	input	/fàs-SFX/
output	[fàs$_i$áš$_i$:é:]	output	[fàš$_i$áš$_i$:é:]

MATCH(output, output, C) requires surface correspondents to be identical to each other. It is in potential conflict with the faithfulness constraint

[14]Note that the Linking Condition (Hayes 1986, cf. Mester 1986), which McCarthy assumes in the rest of his paper, should block palatalization before tier conflation. McCarthy does not comment on this problem.

MATCH(input, output, C). These two constraints are ranked differently in the conservative and innovative dialects, while PAL is unviolated in both dialects. Example (29) shows regular application (no overapplication) in the conservative dialect, in which faithful parsing of underlying coronals is more important than identity of output correspondent:

(29) Conservative dialect: PAL >> MATCH(i, o, C) >> MATCH(o, o, C)

	input: /fasa-SFX/	PAL	MATCH(i, o, C)	MATCH(o, o, C)
	fasas:e:	*!		
☞	*fasaš:e:*		*	*
	fašaš:e:		**!	

Reversing the ranking accounts for overapplication in the innovative dialect, as shown in (30).[15]

(30) Innovative dialect: PAL >> MATCH(o, o, C) >> MATCH(i, o, C)

	input: /fasa-SFX/	PAL	MATCH(o, o, C)	MATCH(i, o, C)
	fasas:e:	*!		
	fasaš:e:		*!	*
☞	*fašaš:e:*			**

The second example of overapplication I discuss comes from Luiseño (Munro and Benson 1973, Mester 1986). In Luiseño, [š] is affricated to [č] before continuants (31a).[16] Affrication interacts with vowel deletion (31b):

(31) a) š → č / ___[+cont]
b) V → ∅ / CV́C___CV

Affrication and vowel deletion are illustrated in (32). Sibilants appear as affricates when prevocalic and as fricatives when preconsonantal:

[15]An alternative analysis of the innovative dialect would be to assume coronal harmony. However, this is untenable. First, Hausa allows palatal and alveolar obstruents within a word (e.g. *sa:č-e:* 'steal (pron. obj.)'). Second, while sibilant palatalization harmony is common, long-distance affrication is nonexistent. Finally, even if harmony were the correct solution for Hausa, the following discussion of Luiseño still requires my approach to overapplication. This is because the suffix [š] in (33) does not affricate. It is only sibilants that correspond to the same underlying segment that are subject to the uniformity requirement.

[16]Mester 1986 only shows this rule applying before vowels.

(32)	*kiš*	‘home (acc.)’	*ki:ca*	‘home (abs.)’
	páči	‘wash’	*páš-ku*	‘leach acorn flour’
	móči	‘weave’	*móš-la-t*	‘belt’

As shown in (33), affricates can surface in preconsonantal position as a result of overapplication of the affrication rule in reduplication:

(33)	*čoka*	‘limp’		
	čuka-čka-š	‘limping’	**čukaškaš*	(input /šoka/)[17]

The reason for this overapplication effect is, I propose, a surface uniformity constraint requiring identity of RED elements to their BASE correspondents (recall that McCarthy and Prince 1994a argued for the need for such constraints). The analysis involves the ranked constraints in (34) (the high-ranking vowel deletion constraint is not shown. [č] is standardly assumed to contain the structure in [š], but not vice versa):

(34) MATCH(B, R, sib) RED sibilants match BASE correspondents.
MATCH(i, o, sib) Output sibilants match input correspondents.
SIB-DIST Prevocalic sibilants are affricates
Ranking: SIB-DIST >> MATCH(B, R, sib) >> MATCH(i, o, sib)

The tableau in (35) shows how these constraints account for overapplication of affrication:

(35)	/šoka-RED-š/	SIB-DIST	MATCH(B, R, sib)	MATCH(i, o, sib)
☞	*č$_i$uka-č$_i$ka-š*			**
	č$_i$uka-š$_i$ka-š		*!	*
	š$_i$uka-š$_i$ka-š	*!		
	č$_i$uka-č$_i$ka-č			***!

In summary, overapplication results when a constraint of the type MATCH(output, output, X) or MATCH(BASE, RED, X) is highly ranked.

4. Conclusions

The framework I have proposed uses a single formalism for input-output and BASE-RED correspondences, contributing to the development of the framework of McCarthy and Prince 1994a, where this is argued to be a desired uniformity in phonological theory. The proposal also shows that a two-level conception of OT is superior to the original one-level version on

[17] Mester does not discuss the [o~u] alternation, which may be stress-related.

empirical and theoretical grounds: it offers solutions to parsing and reduplication paradoxes in one-level OT and extends McCarthy and Prince's (1994a) theory of overapplication in reduplication to a general approach to overapplication, including nonreduplicative phonology.

The correspondence constraints used in this paper are the following: CORR(input, output, X) (≈PARSE), CORR(BASE, RED, X), CORR(output, input, X) (≈FILL), CORR(output, output, X), MATCH(input, output, X), MATCH(BASE, RED, X). An interesting area of future research would be to see whether the other permutations of the first two arguments in these constraints are required in phonological theory as well.

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