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From phonological typology to the development of receptive and productive phonological competence: Applications of minimal violation

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Introduction

Much of the appeal of Optimality Theory (Prince and Smolensky 1993) for the typological study of phonology lies in its principle of minimal constraint violation; that a constraint can be violated if and only if its satisfaction would result in the violation of a higher ranked constraint. In comparison with a theory that demands full satisfaction of its constraints, minimal violation allows a relatively small number of constraints to derive a relatively wide range of typological phenomena. In addition, when faced with the violation of a posited universal principle in a particular language, the possibility of minimal violation encourages the typologist to seek explanations for that violation in other properties of the language, rather than simply give up on the principle.

In Pater (1997), it is argued that the study of phonological development also benefits from the adoption of minimally violable constraints. If development is formalized as constraint reranking, rather than constraint elimination, then a child language constraint that is overcome can continue to have subtle effects in successive developmental stages, through to the final adult state. Much like an OT typologist, upon encountering counter-evidence for a constraint, the child limits its effects by invoking a higher ranked constraint, instead of giving up on it entirely. As Gnanadesikan (1995) also points out, the study of a particular stage in development will often show evidence that a constraint is satisfied only in a particular phonological context (AKA "The Emergence of the Unmarked"; McCarthy and Prince 1994a). In both child and adult language, this type of nonuniform constraint application is dealt with straightforwardly under minimal violation, but is often only awkwardly handled under full satisfaction (on adult phonology see Prince 1993, McCarthy and Prince 1993, and Pater 1995, amongst others). Here, I propose a further extension of minimal violation to child phonology, to address a long-standing problem in this domain: the gap between a child's receptive and productive knowledge of language.

It is generally accepted that a child's phonologically simplified productions are usually accompanied by relatively advanced receptive abilities (see §2 below for a review of some evidence). To the extent that this disparity is dealt with at all in accounts of child phonology, there are two approaches that are traditionally taken. One is to ascribe to the child separate lexicons for perception and production, which are governed by separate principles (see Menn and Matthei 1992 for a review of such dual-lexicon proposals). The other is to claim that receptive knowledge reflects a child's phonological competence, while production is due to performance

factors of a usually unspecified nature (a tack more common in syntactic than phonological acquisition, but see Hale and Reiss 1997). Smolensky (1996a), however, suggests that a single Optimality Theoretic grammar can accommodate both child production and comprehension.

In what follows, I outline Smolensky's proposal, and then review some results from the study of infant speech perception that appear to be inconsistent with it. A series of recent studies point to the conclusion that at the outset of phonological development, a child's receptive phonology is reduced in ways that are quite parallel to the later simplifications evidenced in production (as well as in typology). Such apparent similarities between constraints on early comprehension and production are problematic for the dual-lexicon and the competence-performance proposals, which treat the two domains as independent. However, they are even more problematic for Smolensky's alternative, which makes comprehension flawless by keeping lexical forms immune from the effects of structural constraints (AKA markedness, or well-formedness). To explain the parallels between early comprehension and production, I suggest that we simply allow structural constraints to apply to lexical as well as surface forms. By then introducing separately rankable faithfulness constraints for the input-to-output production mapping and the output-to-input comprehension mapping, grammars can be created that deal with comprehension-production disparities through constraint ranking. The ranking of structural constraints above production faithfulness constraints generates simplified productions, while relatively advanced comprehension is accounted for by the domination of those structural constraints by comprehension faithfulness constraints.

1. Smolensky's unified comprehension/production grammar

Several studies have pointed out that many of the observed simplifications in early child phonology can be characterized in terms of a ranking of structural constraints above faithfulness constraints, that is, of constraints demanding maximally well-formed structures above constraints demanding a match between the lexical input and the surface output (e.g. Demuth 1995, Gnanadesikan 1995, Levelt 1995, Pater and Paradis 1996, Barlow 1997, Goad 1997, Pater 1997, Bernhardt and Stemberger 1998). Smolensky (1996b) argues that an initial ranking of this sort can be derived from learnability considerations, while Hayes 1998 and McCarthy 1998 present an interesting extension of this proposal to the acquisition of morphophonology.

A tableau exemplifying one of the effects of the early domination of faithfulness by a structural constraint is provided in (1). The leftmost column shows the lexical form, or input, labeled as L, and candidate surface forms, or outputs, labeled as S_1, S_2, S_3. Constraints are listed in order of ranking from left to right in the top row of the following columns, and asterisks indicate violations of those constraints that are incurred by particular candidates. Evaluation of the candidates starts from the highest ranked constraint, and proceeds through the constraints until all but one candidate is ruled out. Candidates are ruled out when they violate a constraint that another one satisfies; this fatal violation is noted by an exclamation mark. The remaining candidate is the optimal, grammatical one, and is highlighted by a pointing finger (☞).

(1) NoCoda >> Faith

L: /kæt/	NoCoda	Faith
S_1: ☞ [kæ]		*
S_2: [kæt]	* !	
S_3: [æ]		** !

In this example, the structural constraint is NoCoda, which is violated by any closed syllable. Faith is a cover term for the set of faithfulness constraints, but the one at issue here is Max, which requires all input segments to have output correspondents, and is violated by any instance of deletion (McCarthy and Prince 1995). Candidate S_2, [kæt], is ruled out because of its violation of NoCoda, which is satisfied by the other two candidates. A violation of Faith incurred by S_1 and S_3, is thus compelled by the higher rank of NoCoda. The principle of minimal violation is illustrated by the failure of candidate S_3, which contains second violation of Faith in the deletion of the initial consonant, which is not compelled by any higher ranked constraint. Even though Faith can be violated, violations must be minimal.

It should be emphasized that this is an illustration of, rather than an argument for minimal violation, since this last candidate would of course be ruled out the well-motivated Onset constraint that demands syllable-initial consonants. However, this simplified example does make the general point that minimal violation allows a violated constraint to continue to apply where it does not contravene a dominating constraint. This is why a minimally violable constraint can

have a broader range of effects than if it could only be "on" or "off", fully satisfied or freely violated.

The question that Smolensky (1996a) addresses is how the child's grammar could permit a lexical form like /kæt/, if it prohibits final consonants. More generally, how could the same grammar "simultaneously yield impoverished productions and relatively rich comprehension"? His proposal is that differences in candidate sets yield differences in optimality for lexical and surface forms. In generating a surface form, or in "production", candidates that share a given lexical form compete. In generating a lexical form, or in "comprehension", candidates that share a given surface form compete (Smolensky 1996a, and I, use scare quotes to highlight the fact that this is not a processing model, but rather a formal model of linguistic knowledge). The comprehension mapping is illustrated in (2). Here lexical forms L_1, L_2, and L_3 compete to represent a fixed surface form S.

(2) NoCoda >> Faith

S: [kæt]	NoCoda	Faith
L_1: ☞ /kæt/	*	
L_2: /kæ/	*	* !
L_3: /æ/	*	** !

The single violation of NoCoda shown for each of the candidates is the one incurred by the surface form [kæt]. Smolensky takes the standard Optimality Theoretic position that structural constraints target only surface, not lexical structures (Prince and Smolensky 1993). Since the surface form is fixed, violations of structural constraints are equivalent for all output–to–input mappings, and only faithfulness determines the outcome. Loss of the final consonant in the lexical form is not compelled by the need to satisfy NoCoda, so the single violation of Faith is fatal (Faith here would be Dep: 'every output segment must have an input correspondent' McCarthy and Prince 1995).

2. The development of phonological "comprehension"

Since structural constraints are not at issue in Smolensky's output–to–input mapping, the lexical form will exactly match the perceived surface form, even if all structural constraints dominate all faithfulness constraints. In arguing against Smolensky's model on other grounds, Hale and Reiss (1997) note with approval its perfect comprehension, and propose an alternative that shares this attribute. In support of their model, they point to the well-known precocious phonetic discrimination abilities of infants (Eimas, Siqueland, Jusczyk, and Vigorito 1971, inter alia) and equate these abilities with grammatical competence (and dismiss production as performance). However, as Werker (1995) and Jusczyk (1997) discuss at length, it is inappropriate to draw this sort of a connection between phonological acquisition and infant speech perception. Response to a change in a repeated auditory stimulus, which is what the early infant perception studies measure, does not implicate a lexical representation that perfectly encodes the phonological makeup of a word. A fundamental tenet of generative linguistics is that levels of representation can differ structurally. Evidence of perceptual discrimination might imply the presence of the relevant features in a surface phonetic representation, but it says nothing conclusive about the lexicon.

To demonstrate lexical acquisition of phonological structure, one would need to additionally provide evidence that it can be stored in long-term memory (Jusczyk 1997), and that it can be paired with meaning (Werker 1995). Of course, tasks that tap the ability of 6– to 18–month–old infants to use language in this way are difficult to develop and implement, especially given infants' limited ability and/or inclination to produce meaningful speech, or even to respond to it gesturally. However, Jusczyk and Werker, as well as Werker and Stager (1998), review an impressive body of recent research that has come a long way to determining when these capacities emerge. Since both the models of Smolensky (1996a) and Hale and Reiss (1997) yield perfect comprehension, they cannot formalize this receptive development. Of course, one might claim that the observed receptive failures reflect a performance, rather than a competence problem (if there is a principled way of making such distinctions in this area; cf. Bernhardt and Stemberger 1998). In that respect, parallels between phonological reductions in early comprehension, early production, and language typology are particularly interesting. To the extent that these domains are governed by similar principles, the goal of reductionism, and arguably explanation, is best met by handling them with a single system.

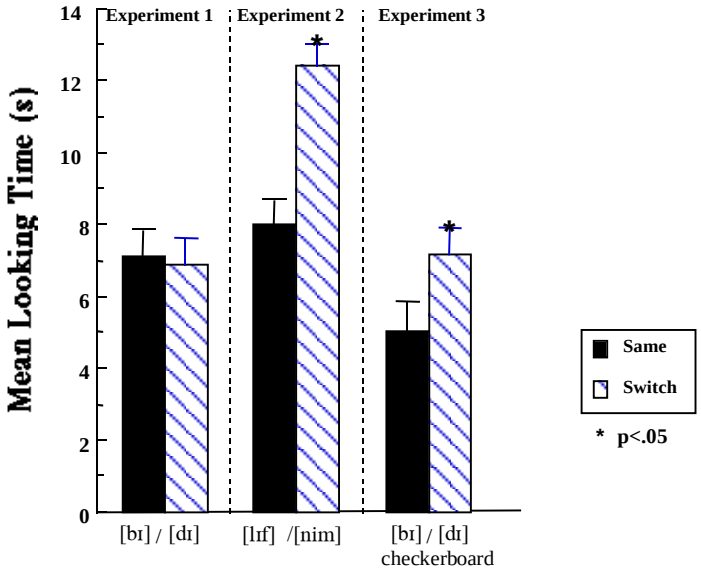
In segmental phonology, a number of studies have suggested that place and manner distinctions between consonants are collapsed in early lexical representations, much as they are neutralized in early production, as well as in adult languages (especially in 'weak' prosodic or morphological positions; see Steriade 1995, Beckman 1998). The evidence for lexical neutralization comes from the failure of very young children to distinguish between minimal pairs of words when they are engaged in tasks that involve the recognition of meaning (e.g., Brown and Matthews 1997, Stager and Werker 1997, Pater, Stager and Werker 1998, Werker and Stager 1998; see also Hallé and Boysson-Bardies 1996, but cf. Jusczyk and Aslin 1995).

A compelling demonstration of the influence of word meaning on infants' behaviour in a perceptual task is provided by research presented in Stager and Werker (1997). These experiments employ a version of the habituation/dishabituation procedure developed by Werker, Cohen, Lloyd, Casasola and Stager (in press), which uses looking time as a dependent variable. Infants are presented with a novel brightly colored moving object on a video screen, while simultaneously hearing a novel syllable being spoken by a recorded female voice over a loudspeaker. A nonce sound/meaning pairing is used to control for possible effects of familiarity (Barton 1976, Werker and Stager 1998). Each trial lasts 14 seconds, and includes 7 repetitions of the syllable. Trials are repeated until habituation, which is reached when the mean looking time across two sequential trials falls below 65% of the mean of the first four trials. Following habituation, the first test trial presents the moving object paired with a different syllable, which is then followed by another trial in which the pairing reverts to the same as in the habituation phase. The order of these two test trials is counterbalanced across subjects. Mean looking time is compared between the trials in which the sound/meaning pairing is switched from the habituation phase, and those in which it is the same.

Results from this procedure with 14-month-olds are presented in Figure 1. When the syllables differ only in the place of articulation of the initial consonant (i.e. [bɪ] vs. [dɪ]), looking time in the same and switch trials does not differ significantly (Experiment 1). When the syllables differ in a number of ways ([lɪf] vs. [nim]), looking time in the switch trials is significantly higher (Experiment 2). To control for the possibility that the infants simply did not perceive the consonantal place distinction in Experiment 1, a further experiment was run in which the moving object on the video monitor was replaced by a checkerboard pattern. Since an unbounded display of this type is not likely to be perceived as a nameable object at this stage of

development, this removes meaning from the task, and turns it into a pure test of perception. In this case, the infants did respond to a switch in the aural stimulus, as shown by the significantly higher looking time in switch than same trials in Experiment 3 (overall lower looking time in this experiment is likely due to the difference in visual displays).

Figure 1: Results from Stager and Werker (1997)



A reasonable interpretation of the infants' failure to respond to the switch in place of articulation in Experiment 1 is that at this stage of development, the place distinction is not encoded in lexical representations, so that words differing only in this respect are treated as identical in tasks involving meaning. Pater, Stager and Werker (1998) also show that a voice switch ([bɪn] vs. [pɪn]) as well as a combined place and voice switch ([dɪn] vs. [pɪn]) are ignored by 14-month-olds in this task, suggesting that the voice distinction is also absent from their lexical representations. This replication also demonstrates that the sub-minimal status of the ([bɪ]/[dɪ]) pair in Stager and Werker (1997) is not at issue.

One might accept these results as indicating a developmental difference between what is perceived, and what is lexically encoded, and question whether there is in fact any later difference between what is lexically encoded and what is produced (that is, question the existence of the Smolensky's comprehension/production dilemma on empirical, rather than theoretical grounds; cf. Hale and Reiss to appear). As far as I know, there have been no successful direct experimental investigations of the discrepancy between segmental comprehension and production; this is likely due to two factors. First, there is a great deal of anecdotal evidence that supports the view that when children reduce many segmental distinctions, they respond appropriately to minimal pairs containing such distinctions (see e.g. Smith 1973, Menn and Matthei 1992). Most child language researchers probably see the existence of a comprehension-production gap as not requiring experimental validation. Second, there are a number of methodological hurdles to setting up perceptual experiments with children in the 18-month to 30-month age range (see Barton 1976, Polka, Jusczyk and Rvachew 1995). However, in his judicious review of the experimental evidence on "phonemic" perception that existed at the time (see now also Brown and Matthews 1997), Barton (1976) concludes that by the time children begin to speak, lexical segmental representations are relatively complete.

In the domain of prosody, Jusczyk (1997: 186) notes a striking similarity between prosodic restrictions on word shape evidenced in word recognition (@7-9 months) and in early production (@18-30 months). Jusczyk, Newsome and Houston (in prep., cited in Jusczyk 1997) show that when 71/2–month–olds are familiarized with a pair of bisyllabic words with initial stress (e.g. doctor), they listen longer to a set of sentences containing those words than they do to sentences containing another pair of bisyllabic words. However, when the words in the familiarization phase are finally stressed, (e.g. guitar), 71/2–month–olds do not listen longer to the lists containing the familiarized words. Furthermore, Jusczyk, Cutler, and Redanz (1993) show that 9-month-old English infants prefer to listen to lists of initially stressed bisyllables over ones containing finally stressed bisyllables. The data from these studies suggest that children receptively acquire initially stressed bisyllables before finally stressed ones.

The acquisition of initially stressed bisyllables before finally stressed ones is clearly paralleled in production. In an early stage of acquisition, English and Dutch children truncate intial unstressed syllables (Smith 1973, Ingram 1974, Allen and Hawkins 1978, Echols and Newport 1992, Fee 1992, Fikkert 1994, Gerken 1994, Wijnen, Krikhaar, and den Os 1994,

Demuth 1995). The difference between the two word types is illustrated by the following near minimal pairs of adult targets produced by Trevor (Compton and Streeter 1977, Pater 1997):

(3)	a. [ga:bɛdʒ]	garbage (1;10.5)		[wæ:dɪt]	rabbit (1;9.2)
	b. [ga:dʒ]	garage (1;10.5)		[wæ:f]	giraffe (1;9.1)

The initially stressed bisyllables in (3a) were produced intact, while the finally stressed ones in (3b) were truncated (Trevor was learning American English, which has retained gallic final stress in *garage*).

The application of truncation can be accounted for in terms of the canonical left-headed foot structure of English and Dutch, if children's words are at this point limited to a single foot (Fee 1992, Fikkert 1994, Gerken 1994, Wijnen, Krikhaar and Den Os 1994, Demuth 1995, Pater 1997). Thus (4a) and (4b) are well-formed, while the presence of either a right-headed foot (4c), or a syllable outside foot structure (4d) renders a word ill-formed.

(4)	a.	W		b.	W		c.	W		d.	W	⇦	**Prosodic Word**
		|			|			|			/ |		
		F			F			F			| F	⇦	**Foot**
		| \			|			/ |			| |		
		'σ σ			'σ			σ 'σ			σ 'σ	⇦	**Syllable**

Although Echols and Newport (1992) propose that these child truncations are due to the initial syllable being unparsed in perception, considerable evidence supports the position that children do lexically encode the initial unstressed syllable (Fikkert 1994, Gerken 1994, Paradis, Petitclerc and Genesee 1996, Jusczyk 1997: 186). It does seem that there is a genuine comprehension-production gap when children are producing these truncated words.

All of this suggests that what is needed is a model that accounts for the parallels between early receptive and productive development, but allows comprehension to proceed ahead of production. Neither attributing receptive and productive knowledge to separate subsystems, nor having flawless comprehension, can succeed on these counts. In the next section, I propose a modified version Smolensky's model that uses minimal violation to account for these broad similarities and differences between receptive and productive development. This is illustrated in an account of the role of prosodic word shape constraints in comprehension and production.

3. An integrated model of receptive and productive development

In Pater (1997), it is shown that the interaction of constraints that are well-motivated by typological studies (McCarthy and Prince 1994a), and are active in the phonology of the language being acquired (i.e. English; Pater 1995) can be used to account for the one foot maximum of early words. To illustrate the present proposal, I will use a single WORDSIZE constraint that encapsulates the three structural constraints employed by Pater (1997): ALIGNLEFT, PARSE–σ and FOOTBINARITY, along with the effects of a constraint demanding left-headed feet. The encapsulated constraint is given in (5).

(5) WORDSIZE
'Every syllable must be parsed into a maximally binary left-headed foot that stands at the left edge of the prosodic word'

Truncation results from the satisfaction of this constraint, at the expense of FAITH, as in (6):

(6) WORDSIZE >> FAITH

L: garáge	WORDSIZE	FAITH
S_1: ☞ $[[\text{ráge}]_{Ft}]_{PrWd}$		**
S_2: $[\text{ga}[\text{ráge}]_{Ft}]_{PrWd}$	* !	

Failed candidate S_2 with an initial syllable outside of foot structure corresponds to the adult prosodification (Kager 1989, Pater 1995). It violates two of the stipulations of the WORDSIZE constraint, and is thus marked with a violation. Candidate S_1, however, violates none of the structural conditions encoded in WORDSIZE, and is optimal due to WORDSIZE being ranked above FAITH.

Since the perfect comprehension of Smolensky's model rests on the assumption that lexical representations are not assessed by structural constraints, one way of capturing the imperfect comprehension evidenced in the developmental speech perception literature reviewed above is to simply drop that assumption. This will lead to early lexical development being treated just like early production, with the dominance of stuctural constraints forcing phonologically reduced structures. The stage of development that Jusczyk (1997) documents for children between 71/2 and 9 months would be formalized as in (7):

(7) WORDSIZE >> FAITH

S: [ga[[rágeᵢ]$_{Ft}$]$_{PrWd}$	WORDSIZE	FAITH
L_1: ☞ [[rágeᵢ]$_{Ft}$]$_{PrWd}$	*	**
L_2: [ga[rágeᵢ]$_{Ft}$]$_{PrWd}$	** !	

L_1 satisfies WORDSIZE, but since it is paired with a surface form containing an initial unparsed syllable, one violation of the constraint is incurred. It is the second violation in L_2 that is fatal, and thus rules it out. Here I follow Smolensky (1996a) in attributing prosodic structure to the perceived surface form, but this is not crucial to the account; one could simply remove the prosodic structure from the surface form, along with the shared violation of WORDSIZE. This would require, however, a proposal about how the perceived surface form should be exempted from the effects of structural constraints, and about whether it should be immune to all of them.

One might also wonder how lexical representations could be endowed with prosodic structure, since in the generative tradition lexical representations are usually assumed to consist of bare segmental representations, reflecting the generally predictable nature of prosodic structure (cf. Burzio 1996). However, this follows straightforwardly from the assumption that structural constraints apply to the lexicon, since prosodification will be required by the same constraints that force segments to be parsed in surface structure, including those encoded in the WORDSIZE constraint (see the conclusion for further discussion).

To account for the subsequent development of receptive competence, and the accompanying comprehension–production gap, we can draw on the large body of results in the OT literature that shows the necessity of positing domain–specific faithfulness constraints, including ones restricted to reduplication (e.g. McCarthy and Prince 1995, Urbanczyk 1996), paradigmatic relations (Benua 1995, 1997, Burzio 1996, Kenstowicz 1996, McCarthy 1998), specific morpheme classes (McCarthy and Prince 1994b, Urbanczyk 1996, Pater to appear, Beckman 1998, Struijke 1998) and specific sets of lexemes (Pater 1995, Itô and Mester 1998). This approach can be extended by positing separately rankable faithfulness constraints for the input–to–output production and output–to–input comprehension mappings, which I will refer to as P-FAITH and C-FAITH respectively.

When initial unstressed syllables begin to be represented in comprehension, this indicates the promotion of C-FAITH above WORDSIZE:

(8) C-FAITH >> WORDSIZE >> P-FAITH

S: [ga[ráge]$_{Ft}$]$_{PrWd}$	C-FAITH	WORDSIZE	P-FAITH
L_1: [[ráge]$_{Ft}$]$_{PrWd}$	* !	*	
L_2: : ☞[ga[ráge]$_{Ft}$]$_{PrWd}$		**	

Here the ranking of C-FAITH above WORDSIZE compels the extra violation of the structural constraint, besides the one incurred by the immutable surface form. In the production mapping, however, the lower rank of the relevant faithfulness constraints means that the second violation of the structural constraint becomes fatal:

(9) C-FAITH >> WORDSIZE >> P-FAITH

L: [ga[ráge]$_{Ft}$]$_{PrWd}$	C-FAITH	WORDSIZE	P-FAITH
S_1: ☞ [[ráge]$_{Ft}$]$_{PrWd}$		*	*
S_2: : [ga[ráge]$_{Ft}$]$_{PrWd}$		** !	

The pair of tableaux in (8) and (9) represent the stage of development in which children lexically represent initial unstressed syllables, but fail to produce them. The WORDSIZE constraint is violated in comprehension to satisfy higher ranked C-FAITH, but continues to force truncation in production where C-FAITH fails to apply. The comprehension–production gap is thus dealt with as an instance of minimal constraint violation.

The adult state would be characterized by the reranking of P-FAITH above WORDSIZE, as illustrated by (10):

(10) C-FAITH, P-FAITH >> WORDSIZE

L: [ga[ráge]$_{Ft}$]$_{PrWd}$	C-FAITH	P-FAITH	WORDSIZE
S_1: [[ráge]$_{Ft}$]$_{PrWd}$		*!	*
S_2: ☞ [ga[ráge]$_{Ft}$]$_{PrWd}$			**

This of course abstracts from the rich interactions between faithfulness and the structural constraints contained in WORDSIZE evident in the adult grammar (Pater 1995).

Conclusions

This proposal follows Smolensky (1996a) in using Optimality Theory to model developing receptive and productive phonology with a single grammar. Where it differs is in that the grammar constrains early comprehension as well as early production, instead of simply mapping perceived surface forms to identical lexical forms and thus making receptive phonology flawless from the outset of acquisition. While it might seem obvious that comprehension does in fact develop, current evidence from developmental speech perception further suggests that receptive competence unfolds in a manner parallel to the later development of productive competence, with similar initial unmarked segmental and prosodic structures in the two domains. These parallels can be captured in a minimally redundant fashion with a single set of structural constraints that applies to both the produced surface form as well as the receptively created and accessed lexical form. By having these constraints ranked over faithfulness constraints, the initial state of the grammar admits only structurally unmarked representations. Receptive competence develops by the promotion of comprehension specific faithfulness constraints above the structural constraints, as well as the establishment of rankings between the structural constraints. Productive competence is allowed to lag behind, however, by the lower rank of the production specific faithfulness constraints, whose later promotion is indicated by the evidence that relatively complete lexical representations underly simplified productions.

From the perspective of phonological theory, one might be wary of allowing structural constraints to apply to the lexicon, since this seems to contradict a basic tenet of the framework in which this proposal is cast (Prince and Smolensky 1993). However, as Smolensky (1996a) has emphasized, the lexical form is fixed in the Input-to-Output mapping. As such, the violations incurred lexically have no effect at all in phonology; all candidate surface forms share the same set of lexical violations. Since these shared violations will be removed by Prince and Smolensky's Cancellation Lemma, phonological analysis, which is based on production data, can simply continue to ignore lexical violations, unless phonology is extended to comprehension/production gaps that might exist in fully mature grammars (see Menn and Matthei 1992).

From the perspective of phonological acquisition, one might question whether receptive development is in fact subject to all and only the constraints that are later seen in production. Indeed, a strong version of this proposal would hold exactly that, and it is worth maintaining that

position in the absence of evidence to the contrary. It is likely that some structural constraints are comprehension or production specific, but at this point, the extent to which receptive and productive development converge on the same constraints remains an empirical question, which seems independently interesting. If further investigation does show that a weaker version of this model is required, then this could be achieved by indexing a subset of the constraints as applying only to lexical, or surface forms, as the case may be.

This research strategy is similar to that used in the typological study of phonology in Optimality Theory, in which a given language is analyzed with constraints motivated in other languages, unless a language specific constraint is absolutely required, at which point it is simply posited, and allowed to interact with the universal constraints (Prince and Smolensky 1993: 101; cf. Blevins 1997). It would seem reasonable to take the same line of attack in accounting for similarities and differences between the domains of receptive and productive phonological development, as well as between these domains and the phonologies of the world's languages. In the latter, we end up moving to a weak version of the Jakobsonian and Stampean approach to typology and language acquisition, one that accounts for child phonology not only with principles derived from typology, but also with child specific constraints. This appears to be necessitated by child specific phenomena in production, such as consonant harmony, which Pater (1997) analyzes in this weakly generalist fashion. This sort of approach to the relation between typology and receptive and productive development is perhaps impossible to falsify (cf. Drachman 1976 vs. Stampe), but it will surely die its own death if interesting parallels do not continue to be found. Furthermore, the payoff, I believe, will be in the forging of a deeper understanding of what the shared grammatical core is between domains, as well as where they diverge.

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