Weigh(t)ing the Evidence: Avoidance and Constraint Interaction in Phonological Development

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Overview This talk considers how one type of learning data can adjudicate between competing phonological theories – in particular, how it can lend support to the view that phonological constraints are weighted, as in Harmonic Grammar (HG), rather than ranked as in classic OT. These data come from lexical *avoidance* (aka selection), whereby early learners systematically avoid even attempting targets with complex or dispreferred phonological structures (e.g. Schwarz and Leonard, 1982; Vihman, 1989; Adam and Bat El, 2009). Much of the literature on avoidance has focused on the very earliest stages of speech, around the 25-75 word stage (e.g. Schwarz et al, 1987). However if avoidance can result from the interaction of grammatical constraints, as analyzed below, it should be observed throughout development -- and its properties should also provide clues as to how such constraints interact. This talk uses three stages from Donahue (1986)'s case study of Sean to argue that weighted constraint interaction are better suited to capture the trajectories of attested, regressed and avoided structures.

Three Stages (Donahue, 1986) The data come from either side of a developmental change in utterance size, as Sean progressed from just single word to multi-word utterances (MWUs). At stage A, Sean produced maximally bisyllabic utterances containing either one or two words; he also successfully produced consonants at different places (*no ball*, *bye daddy*.) At Stage B, he began to apply a typical child pattern of labial Consonant Harmony (CH) (e.g. Rose, 2000; Fikkert & Levelt, 2008); at the same time, MWUs were now consistently avoided. Eventually at Stage C: utterance size expanded, MWUs returned, and CH persisted, now spreading across word boundaries (for further details and discussion, see Donahue, 1986).

(1)	Stage A (up to 1;3)		Stage B (1;3-1;6)		Stage C (starting at 1;6)	
	dog	dɔ	*top*	pap	*bottle mommy*	babəlmami
	ball	bau	*book*	bʊp	*big book*	bɪbʊp
	daddy	dædæ	*bucket*	bʌpəp	*big bird*	bɪbœb
	bye bye	baɪbaɪ	*nipple*	mɪpəl	*all done juice*	adʌndus
	no ball	nobau	*Tommy*	bami	*baby on bike*	bebiʌbaip
	bye daddy	baɪdæ	*no ball, *bye daddy		*all gone cookie*	agankʌki

Tools to Capture Avoidance and Harmony Our starting assumption is that failure to produce any output for a given input means choosing as optimal the 'null parse' candidate [⊙]; this candidate is defined as violating only one constraint, MPARSE (see esp. McCarthy and Wolf, 2007). Our analysis of CH uses Agreement by Correspondence (e.g. Rose and Walker, 2008), whereby CORR-CC constraints want similar surface segments to stand in correspondence (shown with capital letters below) and IDENT-CC constraints compel segments in the CORR-CC relation to be faithful to each other, i.e. to harmonize. I also adopt the constraint labeled WORD-BOUND in tableaux, which penalizes CORR-CC relations across a word boundary (see esp. Bennett, 2013).

Capturing Stages with Weighted Constraints Stage (A) below begins with a grammar in which CORR-CC relations hold among obstruents, but to no surface effect, so that MWUs like *no ball* surfaced faithfully. The fact that Sean's emergent CH caused regression, such that place features became more unfaithful in some outputs at Stage B, is interpreted here as evidence that

the IDENT[PLACE]-CC constraint was *induced* by Sean at the end of stage (A) (cf. Becker and Tessier, 2011). With this induced ID-CC atop the hierarchy, the Stage (B) grammar imposes CH within words, as with *nipple* (B.1). At the same time, this grammar now avoids MWUs like *no ball* (B.2), as the combined weights of WORD-BOUND and ID-IO now crucially gang up on MPARSE. To move past avoidance requires some learning, via a GLA-type algorithm which updates constraint weights on the basis of observed errors like those in (B.1-2) (Boersma, 1997; Jesney and Tessier, 2011) to reach Stage (C). Now MPARSE outweighs the previous' stages gang; *no ball* is once again possible as an output, and undergoes harmony:

(A) *MWU 'no ball' allowed, without harmony*

/nobaʊ/	Corr-CC 6	M-Parse 5	Word Bound 4	ID-IO 2	*H*
nobaʊ	*				-6
☞**NoBaʊ**			*		**-4**
MoBaʊ			*	*	-6
⊙		*			-5

(B.1) *New Ident-CC causes 1WU harmony*

/nɪpəɬ/	**ID-CC** 9	Corr-CC 6	M-Parse 5	Word Bound 4	ID-IO 2	*H*
nɪpəɬ		*				-6
NɪPəɬ	*					-9
☞**MɪPəɬ**					*	**-2**
⊙			*			-5

(B.2) *MWU avoidance: gang effect emerges*

/nobaʊ/	ID-CC -9	Corr-CC 6	M-Parse 5	Word Bound 4	ID-IO 2	*H*
nobaʊ		*				-6
NoBaʊ	*			*		-9
MoBaʊ				*	*	-6
☞⊙			*			**-5**

(C) *Re-ranking causes cross-word harmony*

/nobaʊ/	ID-CC 7	M-Parse 6	Corr-CC 6	ID-IO 3	Word Bound 2	*H*
nobaʊ			*			-6
NoBaʊ	*				*	-9
☞**MoBaʊ**				*	*	**-5**
⊙		*				-6

Assessing the Ranked Alternative Capturing Sean's learning path using ranked constraints runs into several problems when explaining how the learner might move from one ranking to the next. As an example: introducing IDENT-CC at the top of a Stage A ranking does *not* immediately create avoidance of MWUs like *no ball* – compare the winners in weighted (B.2) and ranked (2) below. The talk will similarly demonstrate how error-driven learning from ranked stages B to C is not guaranteed to succeed. More generally, it will summarize and discuss these empirical advantages of HG-style learning for modeling child developmental phonological data.

(2) *Stage (B)'s* ranking *does not choose avoidance; MParse too high-ranked to be violated*

/nobaʊ/	ID-CC	Corr-CC	M-Parse	WordBound	ID-IO
☞**MoBaʊ**				*	*
☹ ⊙			*!		

Selected References Bennett, W. 2013 *Dissimilation, Consonant Harmony and Surface Correspondence.* PhD. thesis, Rutgers. * Donahue, M. 1986. Phonological constraints on the emergence of two-word utterances. *JCL* 13(2): 209-218. * Fikkert, P. & C. Levelt. 2008. How does Place fall into place? In K. Rice et al (eds.) *Contrast in Phonology.* Mouton de Gruyter * Jesney, K. and A.M.Tessier. 2011. Biases in Harmonic Grammar: The road to restrictive learning. *NLLT* 29: 251-90 * McCarthy, J. & M. Wolf. 2007. Less than zero: Correspondence theory and the null output. In C. Rice (ed.) *Modeling Ungrammaticality in OT.* Equinox.