A Non-Derivational Approach to Winnebago Stress

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Proceedings of the Twenty-First Annual Meeting of the Berkeley Linguistics Society: General Session and Parasession on Historical Issues in Sociolinguistics/Social Issues in Historical Linguistics (1995), pp. 152-161

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1. Introduction

The interaction of stress and epenthesis in Winnebago has long posed a challenge to metrical theory. From a derivational perspective, it seems that Winnebago epenthetic vowels (called 'Dorsey's Law vowels') in certain positions are inserted *before* stress rules apply, but in other positions, they are inserted *after* stress rules apply.

Derivational theories have proposed extra processes and conditions to handle the Winnebago paradox, including rightward accent shift (Miner 1979, 1981, 1990, Hayes 1995), repair of ill-formed metrical structure (Hale and White Eagle 1980, Hale 1985), the Domino Condition (Halle and Vergnaud 1987), insertion of foot boundaries for epenthetic vowels (Idsardi 1992), and relativized extrametricality (Hammond 1995).

The Optimality Theory (McCarthy and Prince 1993a,b, Prince and Smolensky 1993) account offered here avoids the derivational paradox by considering only surface generalizations about stress and Dorsey's Law vowels. The odd behavior of Dorsey's Law vowels is explained through a violable constraint which prohibits a phonetically prominent Dorsey's Law vowel from occupying the weak position of a foot. Other researchers have simply noted the prominence of Dorsey's Law vowels but have not incorporated it into their accounts (Susman 1943, Miner 1979), or have overlooked it entirely (Halle and Vergnaud 1987, Idsardi 1992, Hammond 1995). Hence, this study makes both theoretical and empirical contributions to an emerging non-derivational theory of language.

2. General stress pattern

A stressed syllable in Winnebago has higher tone and greater loudness than surrounding syllables (Susman 1943, Miner 1979, White Eagle 1988). There are no monomoraic words (Susman 1943); bimoraic monosyllabic words are realized with a falling tone contour (Susman 1943, Hale and White Eagle 1980 (henceforth HWE)). Stress falls on the second mora of other bimoraic words.

(1)		číi	'house' HWE, Susman 1943
		wą́ąk	'man' HWE, Miner 1979, Susman 1943
(2)	(μ $\acute{\mu}$)	hapé	'he waited for him' Susman 1943
		hįnį́k	'son' Susman 1943
		rugás	'to tear' Miner 1990
		wažók	'mash (potatoes)' HWE

In trimoraic and longer words, primary stress falls on the third mora and secondary stresses fall on every other mora thereafter. The following assumptions are made about the general stress pattern: (i) Right-headed binary feet are built on moras; (ii) The leftmost mora is not footed in words of three or more moras; (iii) A foot may 'split' a syllable (i.e. the two moras of a long syllable may belong to different feet, or in the case of an initial long syllable, the leftmost mora may be unfooted while the rightmost mora belongs to a foot).

(3)	μ (μ μ́)	harapé	'you waited for him' Susman 1943
		hinįgrá	'the son' Susman 1943
		hokit'é	'he speaks to' HWE
		boošíp	'he shot it down' Susman 1943
		čiirá	'the house' Susman 1943
		mąąnį́	'to walk' Susman 1943
(4)	μ (μ μ́) μ	harapége	'because you waited for him' Susman 1943
		horakít'e	'you speak to' HWE
		boošį́pke	'he shot it down often' Susman 1943
		mąąnį́ke	'he often walks' Susman 1943
(5)	μ (μ μ́) (μ μ̀)	hirawáhazrà	'the license' Miner 1979
		waborášipkè	'you shot them down often' Susman 1943
		haakítujìk	'I pull it taut' HWE
(6)	μ (μ μ́) (μ μ̀) μ	hakirújikgàją	'after he pulls taut' Miner 1990
(7)	μ (μ μ́) (μ μ̀) (μ μ̀)	haakítujìkgają̀	'after I pull taut' Miner 1990

The foot binarity requirement is formally captured with the constraint FTBIN (Prince and Smolensky 1993). PARSE (Prince and Smolensky 1993) insures that as many moras as possible are footed.

(8) FTBIN: Feet must be binary under syllabic or moraic analysis.

(9) PARSE: All moras must be parsed by feet.

FTBIN is ranked over PARSE, disallowing degenerate feet. In tableau (14) below, compare the optimal candidate (14d), which has no degenerate feet, to the non-optimal candidates (14b) and (14c), each of which has a degenerate foot.

NONINITIALITY (NONI), the logical counterpart of NONFINALITY (Prince and Smolensky 1993), prevents a word-initial mora from being footed. A member of the ALIGN family of constraints (McCarthy and Prince 1993a) requires that all feet be left-aligned to the prosodic word as much as possible (compare optimal (14d) to (14e)).

(10) NONFINALITY: No head of PrWd is final in PrWd.

(11) NONI (NONINITIALITY): No head of PrWd is initial in PrWd.

(12) ALIGN(Ft, L, PrWd ,L): The left edge of every foot is aligned with the left edge of a prosodic word.

NONI is ranked above PARSE: candidate (14d), since it does not violate NONI, is chosen over the more completely footed (14a). PARSE is ranked above ALIGN: even though candidate (14f) has fewer ALIGN violations than (14d), the optimal (14d) has fewer PARSE violations. The ranking of NONI and FTBIN is indeterminate. If NONI is ranked above FTBIN, then bimoraic forms have an unfooted initial mora followed by a single degenerate foot (see (15)). If FTBIN is ranked above NONI, then bimoraic forms have a single binary foot (see (16)). The total ranking of the four constraints is given in (13).

(13) Total ranking: { FTBIN / NONI } » PARSE » ALIGN

(14) *hakirújikgàją* 'after he pulls taut'

Input: μ μ μ μ μ μ	FTBIN	NONI	PARSE	ALIGN
a. (μ μ́) (μ μ̀) (μ μ̀)		*!		******
b. μ (μ μ́) (μ μ̀) (μ̀)	*!		*	*********
c. μ (μ́) (μ μ̀) (μ μ̀)	*!		*	*******
☞ d. μ (μ μ́) (μ μ̀) μ			**	****
e. μ (μ μ́) μ (μ μ̀)			**	*****!
f. μ (μ μ́) μ μ μ			***!*	*

(15) NONI » FTBIN for *hapé* 'he waited for him'

Input: μ μ	NONI	FTBIN
a. (μ μ́)	*!	
☞ b. μ (μ́)		*

(16) FTBIN » NONI for *hapé* 'he waited for him'

Input: μ μ	FTBIN	NONI
☞ a. (μ μ́)		*
b. μ (μ́)	*!	

3. Stress patterns of words with Dorsey's Law vowels

The distribution of epenthetic vowels in Winnebago is governed by what has been called Dorsey's Law. A tautomorphemic cluster of a voiceless obstruent and a sonorant is split by an epenthetic vowel that is identical to the following vowel (Miner 1990). Dorsey's Law vowels (henceforth 'DL vowels') are typographically marked here by underlining. A DL vowel is always high-toned (Susman 1943, Miner 1979, 1981):

(17)

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           H
           |
ke̲re = kere
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If a DL vowel falls on what would be the weak position of a foot under the normal footing pattern and there are at least two moras following the DL vowel, the footing pattern is 'shifted' one mora to the right (as in (20c), (21a,b), (22a,d), (23a), and (24)). If a DL vowel falls on what would be the weak position of a foot but there are *less* than two moras following the DL vowel, the normal footing pattern obtains (see (18), (19b), (21d), (22a), and (23c)). If a DL vowel falls on what would *not* be the weak position of a foot under the normal footing pattern (i.e. the strong position of a foot or the initial mora), the normal footing pattern obtains (see (19a), (20a,b,d), (21c), (22b,c,e), and (23b)).

(18)		(μ̲ μ́)	pa̲rás	'flat' Susman 1943, Miner 1990
			po̲ró	'spherical' Susman 1943
(19)	a.	μ̲ (μ μ́)	ša̲wažók	'you mash (potatoes)' HWE, Miner 1990
			šu̲rugás	'you tear' Miner 1990
	b.	μ (μ̲ μ́)	ruxu̲rúk	'to earn' Susman 1943
			waki̲rí	'small animals, insects' Susman 1943
(20)	a.	μ̲ (μ μ́) μ	ša̲wažókjį	'you mash hard' Miner 1990
			ke̲rejų́sep	'Black Hawk' Miner 1990
	b.	μ̲ (μ μ̲́) μ	po̲ropó̲ro	'spherical' Miner 1990
			šu̲ruxú̲ruk	'you earn' Miner 1990
	c.	μ μ̲ (μ μ́)	hiko̲rohó	'he prepares' HWE, Miner 1990, Susman 1943
			ruxu̲ruké	'he often earns it' Susman 1943
	d.	μ (μ μ̲́) μ	hiraká̲ra	'he took care of it' Susman 1943
			rooké̲we	'he dressed him' Susman 1943

(21) a. μ μ̲ (μ μ́) μ — hake̲wehášge — 'six times perhaps' Susman 1943
hok'a̲wanége — 'so that he could come in' Lipkind 1945

b. μ μ̲ (μ μ̲́) μ — gika̲nąká̲nąp — 'shiny' Miner 1990
waki̲ripá̲ras — 'flat bug' HWE, Miner 1990

c. μ (μ μ̲́) (μ μ̀) — haraké̲wegì — 'if you enter' Susman 1943
hirakó̲rohò — 'you prepare' HWE

d. μ (μ μ́) (μ̲ μ̀) — rooráke̲wè — 'you dressed him' Susman 1943
wiiráka̲rà — 'he took care of them' Susman 1943

(22) a. μ μ̲ (μ μ́) (μ̲ μ̀) — hake̲weákša̲ną̀ — 'he is entering (moving)' Miner 1979

b. μ (μ μ̲́) (μ μ̀) μ — hirakó̲rohòni̲ — 'you don't dress' Halle and Vergnaud 1987

c. μ (μ μ̲́) (μ μ̲̀) μ — waapó̲ropò̲ro — 'snowball' Miner 1979

d. μ (μ μ́) μ̲ (μ μ̀) — booní̲ka̲rašip — 'I shot you (my own) down' Susman 1943

e. μ (μ μ́) (μ μ̲̀) μ — hakirújikšà̲ną — 'he pulls taut' HWE, Miner 1990

(23) a. μ μ̲ (μ μ̲́) (μ μ̲̀) μ — gika̲nąká̲nąpšà̲ną — 'it is shiny' Miner 1990
waki̲ripó̲ropò̲ro — 'spherical bug' HWE, Miner 1990

b. μ (μ μ̲́) (μ μ̀) (μ μ̀) — hirakó̲rohònirà — 'the fact that you do not dress' Halle 1990

c. μ (μ μ́) (μ μ̀) (μ̲ μ̀) — haakítujìkšà̲ną̀ — 'I pull it taut' HWE, Miner 1990

(24) μ (μ μ́) μ̲ (μ μ̀) (μ μ̀) — harakíšu̲rujìkšà̲ną̀ — 'you pull it taut' HWE

I propose that the general strategy for footing DL vowels is to avoid putting them in the weak position of a foot. Recall that high tone is a primary correlate of stress in Winnebago: the strong position of a foot is realized as high-toned. Since a DL vowel is always high-toned, it makes a poor weak member of a foot.

Winnebago, then, is a prominence system. A syllable with a DL vowel is the analog of a heavy syllable in a stress system that respects syllable weight. However, it is not *length* that makes DL vowels phonetically prominent; rather, it is their high tone.

The Weight-to-Stress Principle (WSP) (Hayes 1980, Prince 1990, Prince and Smolensky 1993) has been used to account for the behavior of heavy syllables in prominence systems:

(25) WSP (Weight-to-Stress Principle): Heavy syllables are prominent in foot structure and on the grid.

WSP may be restated as, 'If *x* is phonetically prominent, then *x* falls on the strong position of a foot. (If *x* does not fall on the strong position of a foot, then *x* is not phonetically prominent)' (see Prince and Smolensky 1993). The problem for Winnebago is that WSP assigns the same penalty to a phonetically prominent light syllable that is not footed (as in the attested but non-optimal (26c)) and a phonetically prominent light syllable that falls on the weak position of a foot (as in the unattested but optimal (26b)). Note that there is no possible ranking of WSP within the established hierarchy {FtBin, NonI} » Parse » Align that would select (26c) over the other candidates.

(26) Marks assigned by WSP to *hikoͅrohó* 'he prepares'

Input: $\mu\ \underline{\mu}\ \mu\ \mu$	FtBin	NonI	WSP	Parse	Align
a. $(\mu\ \acute{\underline{\mu}})\ (\mu\ \acute{\mu})$		*!			**
! b. $\mu\ (\underline{\mu}\ \acute{\mu})\ \mu$			*	**	*
(☞)c. $\mu\ \underline{\mu}\ (\mu\ \acute{\mu})$			*	**	**!
d. $\mu\ (\acute{\underline{\mu}})\ (\mu\ \grave{\mu})$	*!			*	***
e. $\mu\ (\underline{\mu}\ \acute{\mu})\ (\grave{\mu})$	*!		*	*	****

The proposed solution to this problem is to restate WSP so that it does *not* penalize an unfooted phonetically prominent syllable. Rather, it penalizes only those phonetically prominent syllables which fall on the weak position of a foot. This restatement of WSP is referred to as the Prominence-to-Headship Principle (PHP):

(27) PHP (Prominence-to-Headship Principle)
If *x* is phonetically prominent, then *x* does not fall on the weak position of a foot. (If *x* falls on the weak position of a foot, then *x* is not phonetically prominent.)

PHP crucially does *not* assign a mark to the attested candidate (28c):

(28) Marks assigned by PHP to *hikoͅrohó* 'he prepares'

Input: $\mu\ \underline{\mu}\ \mu\ \mu$	FtBin	NonI	PHP	Parse	Align
a. $(\mu\ \acute{\underline{\mu}})\ (\mu\ \acute{\mu})$		*!			**
b. $\mu\ (\underline{\mu}\ \acute{\mu})\ \mu$			*!	**	*
☞ c. $\mu\ \underline{\mu}\ (\mu\ \acute{\mu})$				**	**
d. $\mu\ (\acute{\underline{\mu}})\ (\mu\ \grave{\mu})$	*!			*	***
e. $\mu\ (\underline{\mu}\ \acute{\mu})\ (\grave{\mu})$	*!		*	*	****

NonI is ranked above PHP in Winnebago, since it is not the case that an initial mora may be footed in order to satisfy PHP (compare optimal (30b) to (30c)). FtBin is also ranked above PHP: a DL vowel may not form a degenerate foot in order to satisfy PHP (compare (30b) to (30d,e)). Finally, PHP is ranked above PARSE, since moras may go unfooted in order to satisfy PHP (compare (30b) to (30a)).

(29) Total ranking: { FTBIN / NONI } » PHP » PARSE » ALIGN

(30) *hakewehášge* 'six times perhaps'

Input: μ μ̲ μ μ μ	FTBIN	NONI	PHP	PARSE	ALIGN
a. μ (μ̲ μ́) (μ μ̀)			*!	*	****
☞ b. μ μ̲ (μ μ́) μ				***	**
c. (μ μ̲́) (μ μ̀) μ		*!		*	**
d. μ (μ̲́) (μ μ̀) (μ̀)	*!*			*	*******
e. μ (μ̲́) (μ μ̀) μ	*!			**	***

How does PHP account for systems that treat heavy syllables as prominent? It seems that PHP incorrectly allows heavy syllables to go unfooted. However, a heavy syllable can be footed by itself without violating FTBIN (unlike a syllable with a DL vowel, which violates FTBIN when footed by itself). Imagine a system identical to Winnebago except that in place of DL vowels there are heavy syllables. The (d) candidate in tableaux (31) and (32) is optimal regardless of whether PHP or WSP is the constraint in question, since the closest competitor of (d), candidate (c), incurs more PARSE violations than (d).

(31) Marks assigned by PHP to a system with prominent heavy syllables

Input: μ μμ μ μ	FTBIN	NONI	PHP	PARSE	ALIGN
a. (μ μμ́) (μ μ̀)		*!			***
b. μ (μμ μ́) μ			*!	**	*
c. μ μμ (μ μ́)				**!*	***
☞ d. μ (μμ́) (μ μ̀)				*	****
e. μ (μμ μ́) (μ̀)	*!		*	*	*****

(32) Marks assigned by WSP to a system with prominent heavy syllables

Input: μ μμ μ μ	FTBIN	NONI	WSP	PARSE	ALIGN
a. (μ μμ́) (μ μ̀)		*!			***
b. μ (μμ μ́) μ			*!	**	*
c. μ μμ (μ μ́)			*!	***	***
☞ d. μ (μμ́) (μ μ̀)				*	****
e. μ (μμ μ́) (μ̀)	*!		*	*	*****

The only situation in which failing to foot a phonetically prominent syllable is optimal is when the syllable is light and would therefore violate FTBIN if footed alone; this is the case for Winnebago.

3.1 Violations of PHP

PHP is violable in Winnebago under certain circumstances: (i) The head foot of the prosodic word may violate PHP in order to avoid violating NONI or FTBIN (e.g. *(p<u>o</u>ró)* 'spherical', *ru(x<u>u</u>rúk)* 'to earn'); (ii) A non-head foot may violate PHP when a DL vowel is followed by a single mora (e.g. *ro(orá)(k<u>e</u>wè)* 'you dressed him'). PHP is split into two constraints, PHP(Head-of-PrWd) and PHP(Foot). PHP(Head-of-PrWd) is ranked above PARSE, as argued above. PHP(Foot) is ranked below PARSE, since moras may not go unparsed in order to satisfy PHP for non-head feet (compare optimal (34a) to (34d,e)). PHP(Foot) is ranked above ALIGN, since a word-medial prominent syllable may be 'skipped' in order to satisfy PHP(Foot) (compare (35b) to (35c)). These subrankings give the final total ranking in (33).

(33) Final total ranking:

{ FTBIN, NONI } » PHP(Head) » PARSE » PHP(Foot) » ALIGN

(34) *roorák<u>e</u>wè* 'you dressed him'

Input: μ μ μ μ̲ μ	FTBIN	NONI	PHP (Head)	PARSE	PHP (Foot)	ALIGN
☞ a. μ (μ μ́) (μ̲ μ̀)				*	*	****
b. μ (μ μ́) μ̲ (μ̀)	*!			**		*****
c. μ (μ μ́) (μ̲́) μ	*!			**		****
d. μ (μ μ́) μ̲ μ				***!		*
e. μ μ (μ μ̲́) μ				***!		**

(35) *harakíšu̲rujìkšą̲ną̀* 'you pull it taut'

Input: $\mu\ \mu\ \mu\ \underline{\mu}\ \mu\ \mu\ \mu\ \mu$	PHP (Head)	PARSE	PHP (Foot)	ALIGN
a. $\mu\ (\mu\ \acute{\mu})\ (\underline{\mu}\ \grave{\mu})\ (\mu\ \grave{\mu})\ \mu$		**	*!	*********
☞ b. $\mu\ (\mu\ \acute{\mu})\ \underline{\mu}\ (\mu\ \grave{\mu})\ (\mu\ \grave{\mu})$		**		***********
c. $\mu\ \mu\ (\mu\ \underline{\acute{\mu}})\ (\mu\ \grave{\mu})\ (\mu\ \grave{\mu})$		**		************!

4. Conclusion

The Optimality Theoretic analysis presented here offers empirical and theoretical advantages to previous analyses of the patterns of Winnebago stress. The often-overlooked phonetic prominence of DL vowels is crucial to the analysis: characterizing DL vowels as prominent provides an explanation for their seemingly odd interaction with stress. The 'derivational paradox' presented by Winnebago disappears when only surface patterns about stress are considered; Optimality Theory, with its violable constraints, provides the venue for analyzing complex interactions of surface generalizations.

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Many thanks to Mike Hammond, Colleen Fitzgerald, Amy Fountain, Diane Ohala, Chang-Kook Suh, and Keiichiro Suzuki for their comments on previous versions of this analysis.

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