In A. Greenhill, M. Hughes, H. Littlefield and H. Walsh (ed.) (1998), *Proceedings of the 22nd annual Boston University Conference on Language Development* (pp. 598-609). Somerville, MA: Cascadilla Press.

Phonological Constraints and Word Truncation in Early Language Acquisition

Mitsuhiko Ota
Georgetown University

1 Introduction

Recent research on children's word production has recognized that early word truncation is not a random process but an operation with a predictable pattern. A well-known example in child English and child Dutch is a stage of development during which long target words are systematically reduced to disyllabic or heavy monosyllabic forms (Demuth & Fee 1995; Echols & Newport, 1992; Fikkert, 1994; Gerken, 1994; among others). This size restriction has been attributed to either production templates or the unmarked prosodic word structure which characterizes the earliest stage of prosodic development (Demuth, 1995a, 1995b, 1996; Demuth & Fee, 1995; Fee, 1995; Gerken, 1994; Pater & Paradis, 1996; Salidis & Johnson, 1997; Wijnen, Krikhaar & den Os, 1994). Although differing in the details of the explanation, these accounts share a common notion that early word truncation is caused by an output condition on children's production.

A challenge is posed to this conceptualization of early truncation by another aspect of children's word production — namely, the presence of variation in surface forms. A particular type of variation noted in child English is the intra-speaker alternation between truncated and non-truncated forms for the same target word, as illustrated below:

(1) a. tomato [dəˈmaːdo] ~ [ˈmaːdo] (Amahl, 2;3)
(Smith, 1973, discussed in Demuth, 1995b)
b banana [mənamə] (Kyle, 1;0), [bi] (1;2), [mɛnə](1;5)
(Salidis & Johnson, 1997)

If truncation is due to a production limitation, these data raise the question of why the same target is at times truncated when the child is capable of producing the prosodically target-like form. One way out of this dilemma is to treat the type of data in (1) as a reflection of a transitional stage of development in which the child is gradually being released from the production limitation. The output condition affects the production of long targets only occasionally, causing the production to fluctuate. An alternative approach to this is to seek a representational account for the variable surface forms, considering both the truncated and non-truncated forms of a given target to be independent well-formed outputs of the grammar (See Demuth, 1995a, 1997).

In this paper, I will present evidence from child Japanese in support of the latter approach. The truncation data of Japanese-speaking children around the age of 2 years exhibit phonological attributes that cannot be reduced solely to production limitation. Instead, the data demonstrate that truncated words constitute, by themselves, a class of output forms regulated by their own prosodic requirements. For this reason, I will propose that it is necessary to provide a grammatical model of early prosodic structure which encompasses the mechanisms of truncation and surface variability. This goal can be achieved by adopting the perspective of Optimality Theory (Prince & Smolensky, 1993).

The paper is organized as follows: Section 2 gives a description of the prosodic structures of early words produced by two Japanese-speaking children, and explains why the data cannot be handled by a model of production limitation. Section 3 then presents an analysis of the data based on Optimality Theory. Section 4 concludes the paper with a discussion of the implications of the data and the analysis for the theory of phonological development.

2 Word truncation in child Japanese

2.1 The data

The child Japanese data used in this study are taken from two previously published studies as summarized in (2).

(2) Summary of data sources

Child's name	Age analyzed	MLU	Method	Source
Aki (A)	2;0-2;4	1.05-1.60	recording	Miyata (1995)[1]
Sumihare (S)	1;9-2;1	1.43-1.87	diary	Noji (1974-77)

For the purpose of this study, the five-month period during which word productions exhibit noticeable variability was selected for each child. Every prosodically distinct form of the lexical item recorded during this period was extracted from the data, except non-lexical items, such as interjections, particles, and onomatopoeic expressions. In order to avoid inclusion of non-spontaneous imitation, a production was not included in the analysis if its target was found in the immediately preceding adult utterance. A truncated word was operationalized as a production with fewer mora counts than that of the adult target.

2.2 Surface variability and the structure of truncated words

The examples in (3) and (4) illustrate that the type of intra-speaker variation in question found in the Japanese data. Both truncated and non-truncated forms for the same target word co-occur in the production.

(3) Truncated and non-truncated counterparts co-occurred on the same day (Aki)

Adult target	Child production: Truncated	Non-truncated	Meaning	Age
ip.pai	pai	ip.pai	'lots'	2;1.24
to.ɾak.kɯ	tak.kɯ	to.wak.kɯ	'truck'	2;1.24
poŋ.ki.ki	poŋ.ki	poŋ.ke.ki	'(TV show)'	2;3.11
çi.koː.ki	koː.ki	çi.koː.ki	'airplane'	2;3.18
ʃɯp.pa.tˢu	paː.tʃu \ ʃɯp.pa	ʃɯp.pa.tˢu	'all aboard'	2;3.18
dʒi.doː.ʃa	doː.ʃa	ʒə.doː.ʃa \ ʃi.doː.ʃa	'car'	2;4.4

(4) Truncated and non-truncated counterparts co-occurred in the same month (Sumihare)

Adult target	Child production: Truncated	Non-truncated	Meaning	Age
ka.tai	tai	ka.tai	'hard'	1;9
o.toː.ɸɯ	toː	o.toː.ɸɯ	'tofu'	1;9
ra.dʒi.o	ra.dʒi	ra.dʒi.o	'radio'	1;9-2;1
kom.peː.toː	peː.to	tam.pet.toː	'confetti'	1;10
go.han	gjon	go.han	'rice/meal'	1;11
ha.jai	jai	ha.jai	'fast'	2;0

The pattern observed here may be argued to result from variable application of some output condition. Such a mechanism would affect the production nonuniformly, hence causing the alternation between truncated and non-truncated surface forms. However, a closer inspection of the data leads us to believe that this is not the correct interpretation.

The tables in (5) and (6) show the distribution of truncated forms classified in terms of their prosodic structure. 'L' stands for a light syllable (a syllable with one short vowel), and 'H' stands for a heavy syllable (a syllable with a long vowel, a diphthong, or a coda consonant).

(5) Aki's truncated words (type counts of prosodically distinct forms)

	L	H	LL	HL	LH	HH	LLL	LHL	
2;0	2	3	5	4			1		
2;1	1	4	2	11		1			
2;2		1	4	10					
2;3		4	9	20		2		1	
2;4		2	4	12	1		2		
Total	3	14	24	57	1	3	3	1	106
%	2.8	**13.2**	**22.6**	**53.8**	0.9	2.8	2.8	0.9	100.0

(6) Sumihare's truncated words

	L	H	LL	HL	LH	HH	LLL	
1;9		2		3	1			
1;10			1	6		1		
1;11		2	3	11			1	
2;0		3	1	6				
2;1			4	6		1		
Total	0	7	9	32	1	2	1	52
%	0	**13.5**	**17.3**	**61.5**	1.9	3.8	1.9	100.0

Three types of prosodic structure are conspicuously infrequent among these truncated words: 1) structures longer than two syllables, 2) monomoraic forms, and 3) sequences of a light syllable and a heavy syllable (LH). The restriction on the first of these is consistent with the production limitation account. Although the majority of the target words with three or more syllables (79.3% of Aki's, and 82.5% of Sumihare's) are not truncated, that almost all truncated words are disyllabic or shorter can be explained if a disyllabic maximal bound is seen to variably regulate the production.[2] However, the two other properties of the prosodic structure of truncated words require a different type of explanation.

First, the extremely limited occurrences of monomoraic forms indicate a bimoraic minimal size bound on truncated words. This has an important implication in the phonology of Japanese. Unlike many other languages that uniformly enforce a bimoraic minimality condition on lexical items, Japanese allows monomoraic lexical words in underived contexts (Itô, 1990). In fact, as shown in (7), a number of such monomoraic items appear in the data as non-truncated forms.

(7) Monomoraic words (all target-like production)

Word	Meaning	Age (Child)	Word	Meaning	Age (Child)
me	'eye'	2;1- (A), 1;9- (S)	e	'picture'	2;1- (A)
te	'hand'	1;10- (A), 2;1- (S)	ki	'tree'	2;2- (A)
ni	'two'	1;11- (A)	çi	'sun'	2;2- (A)
ʃi	'four'	1;11- (A)	to	'door'	2;0- (S)
go	'five'	1;11- (A)	tʃi	'blood'	2;1- (S)

Note that all of these words are produced with adult-like (i.e. monomoraic) prosodic structure. If the paucity of monomoraic forms among the truncated words is a consequence of an output condition that regulates the overall word production of the child, the same condition should militate against target-like production of underlyingly monomoraic words. This account predicts that target-like production of monomoraic words should be avoided more than that of other target words. On the contrary, the production of monomoraic lexical items is always target-like, while other structures are often truncated or altered.

The bimoraic minimality effect therefore cannot be attributed to a condition on the production system as a whole. Rather, it is due to a structural restriction which is specific to truncated words (see Ota, in press, for further discussion).

Second, the rarity of LH as truncated words cannot be a consequence of production limitation. Again, if an overall restriction against LH is responsible for the avoidance of this structure, the surface realization of LH targets should be affected more often than that of other target types. A comparison of the prosodically target-like productions between LH targets and other disyllabic targets (LL, HL, HH) demonstrates that this prediction is not borne out.

(8) Number and percentage of prosodically target-like production: LH vs. other disyllabic targets

Aki

Age	2;0	2;1	2;2	2;3	2;4	Mean
LH	3/4	7/7	11/13	20/24	26/28	
	(75.0)	(100.0)	(84.6)	(83.3)	(92.9)	(87.2)
LL+HL+HH	56/72	114/129	111/130	188/216	179/191	
	(77.8)	(88.4)	(85.4)	(87.0)	(93.7)	(86.5)

df = 4, t = 0.252, p = 0.814 (n.s.)

Sumihare

Age	1;9	1;10	1;11	2;0	2;1	Mean
LH	4/4	8/8	17/19	11/13	26/26	
	(100.0)	(100.0)	(89.5)	(84.6)	(100.0)	(94.8)
LL+HL+HH	43/45	54/57	96/102	123/127	153/158	
	(95.6)	(94.7)	(94.1)	(96.9)	(96.8)	(95.6)

df = 4, t = -0.237, p = 0.824 (n.s.)

As shown in (8), no significant difference can be found between LH targets and other disyllabic targets in their percentage of prosodically adult-like production. Thus, as in the case of monomoraic structure, the avoidance of LH forms is a restriction only relevant to truncated words.

In sum, the restrictions on the size and shape of truncated words in the data under consideration cannot be ascribed to production limitation. The ban on monomoraic forms and LH sequences is not applicable outside the context of truncation and thus should be regarded as unique structural requirements of truncated words. The emerging picture, then, is that the truncated words produced by these children are independent surface forms that have their own criteria of well-formedness. Any account of the data therefore must satisfy two goals. On one hand, the model must provide an account for the fairly rigid restrictions on the prosodic structure of truncated words. On the other hand, the model must also be flexible enough to allow for the variability observed in the alternating pairs of productions. In the following section, I adopt the framework of Optimality Theory to show that a constraint-based theory of phonology can handle these properties of the data in a straightforward manner.

3 A constraint-based analysis of variable truncation

3.1 Optimality Theory

Optimality Theory (OT) assumes that grammars consist of universal constraints whose rankings differ from language to language. Constraints are minimally violable; that is to say they can be violated if and only if a higher ranked constraint is better satisfied by the violation. Output candidates are evaluated with respect to a given constraint hierarchy, and the candidate that best satisfies, or minimally violates the constraint ranking becomes the 'optimal,' or the actual output.

One of the few OT attempts to explain variation in early child grammar has been made by Demuth (1996b, 1997). Demuth allows for multiple candidates to be optimal in child grammars by proposing that several constraints can be equally ranked with one another. This account is dependent upon two stipulations regarding the evaluation mechanism of the child's grammar: violations among equally ranked constraints are evaluated categorically, and extremely low-ranked constraints are not evaluated. I will however adhere to a more conservative view; that is that the basic mechanisms of constraint evaluation in child grammars are the same as those in adult grammars. I therefore assume that violations are always evaluated gradiently and that all constraints participate in the evaluation, regardless of their position in the ranking hierarchy.

The alternative analysis of early word truncation presented here builds on the idea that morphologically-related words stand in a correspondence relation which is mediated by output-output constraints (McCarthy, 1995; Kenstowicz, 1996). Benua (1995) argues that such mechanisms are involved in word truncation in adult languages, as schematized in (9).

(9) A Correspondence model of morphological truncation (Benua, 1995)

BT-Identity
Base ←→ **T**runcated Form
↑
IO-Faith ↓
Input

The relation between the input (or the underlying representation) and the base (or the source word for the truncated form) is regulated by input-output correspondence constraints (*IO-Faith*). The base and the truncated form are in an output-output relation, which is governed by a constraint type called *BT-Identity*.

In principle, BT-Identity can be ranked in any way with respect to IO-Faith. One possible ranking is of the type illustrated in (10) where IO-Faith dominates some markedness constraint $\mathbb{C}$, which in turn dominates BT-Identity.

(10) 'The emergence of the unmarked' ranking in truncation

IO-Faith >> ℂ >> BT-Identity

The ranking in (10) gives rise to the state known as *the emergence of the unmarked* (McCarthy & Prince, 1994, 1995). Being dominated by IO-Faith, the effects of ℂ are not felt in the normal input-output relation between the input and the base. However, ℂ will show effects on the truncated forms, since the markedness constraint is satisfied in this context at the expense of the identity between the base and the truncated form. As a result, structures unmarked with respect to ℂ emerge in the truncated outputs.

3.2 OT analysis of truncation in early Japanese

This analysis of truncation can be extended to the pattern of truncation in early Japanese by making a few assumptions about child phonology. First, following most work in OT-based phonological development, I take the 'input' to be roughly equivalent to the adult surface form. The non-truncated form and the truncated form here are seen as independent outputs which stand in output-to-output correspondence. Second, following Demuth and Fee (1995), I assume that children have access to the prosodic hierarchy in (11).

(11) The prosodic hierarchy (Selkirk, 1980; McCarthy & Prince, 1986)

PrWd Prosodic word
|
Ft Foot
|
σ Syllable
|
μ Mora

The next step in the analysis is to identify the constraints that are involved in the ranking schema in (10). Research in adult hypocoristic formation (Benua, 1995) and child truncation (Pater & Paradis, 1996) has shown that the size restriction in truncation phenomena can be seen as the effects of the three basic markedness constraints listed in (12).

(12) ALIGN-FT-L Align (Ft, L, PrWd, L); Align the left edge of every foot with the left edge of the Prosodic Word
✓(σσ); *(σσ)(σσ)

FTBIN Feet must be binary on moras or syllables
✓ (σσ);✓ ($\sigma_{\mu\mu}$); *(σσσ); *(σ_{μ})

PARSE-σ Every syllable must belong to a foot
✓ (σσ); *(σσ)σ

ALIGN-FT-LEFT is fully satisfied when a prosodic word consists of a single foot. FTBIN only allows bimoraic or disyllabic feet. And PARSE-σ forces all syllables to be part of a foot. Taken together, these constraints demand that a word consist of a single binary foot.

In addition to these constraints that derive the size effect, a constraint that makes LH a marked structure as a truncated output is required. I take this to be a type of alignment constraint in (13) that demands feet to be trochaic. Assuming the Weight-to-Stress Principle (Prince, 1990) which states that all heavy syllables are heads, LH violates this constraint.

(13) TROCH Align (Ft, L, H(Ft), L); Feet are left headed

Finally, the relevant IO-Faith and BT-Identity constraints are of the MAX-type. MAX constraints ensure that each element in the input or base has a correspondent in the corresponding output. Violations of these MAX constraints are assessed here in terms of the number of moras deleted.

(14) MAX-IO
Every element in the Input has a correspondent in the Output

(15) MAX-BT
Every element in the Base has a correspondent in the Truncated output

How do these constraints reach the ranking schema of the emergence of the unmarked? I propose that the process takes place in two steps. It has been argued by several researchers that markedness constraints, in general, are ranked above IO-Faith at the initial state (Demuth, 1995a; Gnanadesikan, 1995; Pater & Paradis, 1996; Smolensky, 1996). Applied to the constraints at hand, this will predict the initial ranking in (16). As demonstrated by Pater & Paradis (1996), this ranking can explain why early words can be characterized as binary feet in many child languages.[3]

(16) ALIGN-FT-L, FTBIN, PARSE-σ, TROCH >> IO-FAITH

In the course of development, these structural constraints will be re-ranked below IO-Faith if the effects of these constraints are not visible in the overall phonology of the target adult grammar. If the newly demoted markedness constraints then dominate BT-Identity, the ranking in (17) will be obtained.

(17) IO-FAITH (MAX-IO) >> ALIGN-FT-L, FTBIN, PARSE-σ, TROCH
>> BT-IDENTITY (MAX-BT)

The hierarchy in (17), a ranking of emergent unmarkedness, means that when BT-Identity is relevant — in other words, in the context of truncation — the markedness constraints become active and demand that the truncated output satisfy their requirements. Otherwise, the effects of these constraints remain invisible.

As an example, let us take the target word /dʒidoːʃa/ 'car.' In the regular input-output relation between the input and the base, the evaluation of candidates is made with respect to IO-Faith. The structural constraints do not show any effects because they are dominated by IO-Faith, as shown in Tableau (18).[4]

(18) MAX-IO >> ALIGN-FT-L, FTBIN, PARSE-σ, TROCHEE >> (MAXBT)

Input: dʒidoːʃa	MAX-IO	ALIGN-FT-L	FTBIN	PARSE-σ	TROCH	MAX-BT
a. (dʒi)	*!**		*			
b. (doː)	*!*					
c. (do.ʃa)	*!*					
d. (doː.ʃa)	*!					
e. (dʒi.doː)	*!				*	
f. ☞dʒi(doː.ʃa)		*		*		

Candidate (f), the non-truncated form, is the winner despite its violation of ALIGN-FT-L and PARSE-σ because the decision is made by the highest ranking MaxIO. Note that MAXBT is irrelevant in this case since the input-base pair does not involve output-output correspondence.

However, when the base word participates in an output-output relation, the constraint relevant to the evaluation shifts from MAX-IO to MAX-BT.

(19) (MAX-IO) >> ALIGN-FT-L, FTBIN, PARSE-σ, TROCHEE >> MAX-BT

Base: dʒi.doː.ʃa	MAX-IO	ALIGN-FT-L	FTBIN	PARSE-σ	TROCH	MAX-BT
a. (dʒi)			*!			***
b. (doː)						**!
c. (do.ʃa)						**!
d. ☞ (doː.ʃa)						*
e. (dʒi.doː)					*!	*
f. dʒi.(doː)		*!		*(!)		*
g. dʒi(doː.ʃa)		*!		*(!)		

As Tableau (19) shows, candidate (d) is now the optimal candidate because among the candidates which incur no violations of the markedness constraints, (d) is the one that commits the fewest violations of MAX-BT.

Thus the ranking in (17) gives two optimal outputs for the input /dʒidoːʃa/: [dʒidoː.ʃa] and [doː.ʃa]. Only the truncated output is subject to the structural requirements enforced by the markedness constraints.

4 Conclusion

The analysis presented above demonstrates how the interaction of basic prosodic constraints in a single ranking can explain the systematic pattern of truncated outputs and the alternation between truncated and non-truncated outputs. A further advantage of this analysis is that it provides an account for the truncation phenomenon using the same constraints and mechanisms which have been shown to be operative in the prosodic morphology of adult Japanese (See Benua, 1995; Itô & Mester, 1992; Prince, 1990).

The differences between child Japanese and adult Japanese, then, can be attributed to the different rankings of these prosodic constraints and the different associations of the identity constraint and morphological operations. In adult Japanese, BT-Identity is linked with adult prosodic morphology, such as hypocoristic formation and loanword truncation. These aspects of the target morphology have not yet been acquired by these young children. Research on early child grammar does however shows that children of this age and younger have access to primitive morphological operations, although these are not necessarily target-like (Dressler, 1994; Fee & Ingram, 1982; MacWhinney, 1978). Given the assumption then that all constraints are universally available in their general form, it can be argued that children link BT-Identity to a primitive operation of word truncation. Under this view, the task of the child is seen to be one of learning the relevant grammatical operation in the target language which is associated with a particular constraint, in addition to the language particular ranking of all the constraints.

In conclusion, the word production data in child Japanese analyzed in this study show that certain types of early truncation cannot be explained by an overall limitation on word production. Truncated words of this sort exhibit restricted prosodic structure and freely appear with adult-like surface forms of the same target words. A model of word truncation based on OT captures these characteristics with the basic mechanisms and constraints independently motivated for adult grammars.

Endnotes

* I gratefully acknowledge helpful discussions with and comments from Katherine Demuth, Renée Jourdenais, Thomas Klein, Donna Lardiere, Paul Portner, Takae Tsujioka, and Lisa Zsiga, although of course I am solely responsible for any errors.

1. The version of data analyzed were made available through the CHILDES database (MacWhinney & Snow, 1985).
2. Even targets with 4 or more syllables tend to be disyllabic when truncated. Note however that Kehoe & Stoel-Gammon (1997) find most truncated forms of 4-syllable targets to be trisyllabic, and those of 5-syllable targets to be quadrisyllabic in child English (ages 1;10-2;10). Further research is needed to see if this is a systematic cross-linguistic difference.
3. Pater & Paradis' analysis does not include TROCH, but other studies suggest that early words in child English and Dutch can be characterized as trochaic binary feet (Demuth, 1996; Gerken, 1994; Wijnen et al., 1994)
4. Brackets indicate foot parsing. '!' denotes fatal violation.

References

Benua, L. (1995). Identity effects in morphological truncation. In J. Beckman, L. Walsh Dickey & S. Urbanczyk (Eds.), *Massachusetts Occasional Papers in Linguistics [UMOP] 18: Papers in optimality theory* (pp. 77-136). Amherst, MA: GLSA.

Demuth, K. (1995a). Markedness and the development of prosodic structure. In J. Beckman (Ed.), *Proceedings of the 25th meeting of NELS* (pp. 13-25). Amherst, MA: GLSA

Demuth, K. (1995b). Stages in the development of prosodic words. In E. Clark (Ed.), *Proceedings of the 27th Annual Child Language Research Forum* (pp. 39-48). Stanford, CA: CSLI.

Demuth, K. (1996). The prosodic structure of early words. In J. L. Morgan & K. Demuth (Eds.), *Signal to syntax: Bootstrapping from speech to grammar in early acquisition* (pp. 171-184). Mahwah, NJ: Lawrence Erlbaum.

Demuth, K. (1997). Multiple optimal outputs in acquisition. *University of Maryland Working Papers in Linguistics, 5*, 53-71.

Demuth, K., & Fee, E. J. (1995). Minimal words in early phonological development. Manuscript. Brown University, Providence, RI and Dalhousie University, Halifax, Nova Scotia.

Dressler, W. U. (1994). Evidence from the first stages of morphology acquisition for linguistic theory: Extragrammatic morphology and diminutives. *Acta Linguistica Hafniensia, 27*, 91-108.

Echols, C., & Newport, E. (1992). The role of stress and position in determining first words. *Language Acquisition*, *2*, 189-220.

Fee, E. J. (1995). Two strategies in the acquisition of syllable and word structure. In E. Clark (Ed.), *Proceedings of the 27th Annual Child Language Research Forum* (pp. 29-38). Stanford, CA: CSLI.

Fee, E. J., & Ingram, D. (1982). Reduplication as a strategy of phonological development. *Journal of Child Language*, 9, 41-54.

Fikkert, P. (1994). *On the acquisition of prosodic structure*. Dordrecht: Holland Institute of Generative Linguistics.

Gerken, L. (1994). A metrical template account of children's weak syllable omissions from multisyllabic words. *Journal of Child Language*, *21*, 565-584.

Gnanadesikan, A. (1995). Markedness and faithfulness constraints in child phonology. Manuscript. University of Massachusetts, Amherst.

Itô, J. (1990). Prosodic minimality in Japanese. In M. Ziolkowski, M. Noske & K. Deaton (Eds.), *Papers from the 26th annual regional meeting of the Chicago Linguistic Society* (pp. 213-239). Chicago, IL: CLS.

Itô, J., & Mester, A. (1992). Weak layering and word binarity. Manuscript. UC Santa Cruz

Kehoe, M., & Stoel-Gammon, C. (1997). The acquisition of prosodic structure: An investigation of current accounts of children's prosodic development. *Language, 73*, 113-144.

Kenstowicz, M. (1996). Base identity and uniform exponence: Alternatives to cyclicity. In J. Durand & B. Laks (Eds.), *Current trends in phonology: Models and methods* (pp. 363-393). CNRS, Paris and University of Salford Publications.

MacWhinney, B. (1978). *The acquisition of morphophonology*. Chicago: University of Chicago Press.

MacWhinney, B., & Snow, C. (1985). The Child Language Data Exchange System. *Journal of Child Language, 12*, 271-296.

McCarthy J. (1995). Faithfulness in prosodic morphology and phonology: Rotuman revisited. Manuscript. University of Massachusetts, Amherst.

McCarthy, J., & Prince, A. (1986). Prosodic morphology. Manuscript. University of Massachusetts, Amherst, MA and Brandeis University, Waltham, MA.

McCarthy, J., & Prince, A. (1994). The emergence of the unmarked: Optimality in prosodic morphology. In M. Gonzàlez (Ed.), *Proceedings of the 24th meeting of NELS* (pp. 333-379). Amherst, MA: GLSA.

McCarthy, J., & Prince, A. (1995). Faithfulness and reduplicative identity. In J. Beckman, L. Walsh Dickey & S. Urbanczyk (Eds.), *Massachusetts Occasional Papers in Linguistics [UMOP] 18: Papers in optimality theory* (pp. 249-384). Amherst, MA: GLSA.

Miyata, S. (1995). The Aki corpus: longitudinal speech data of a Japanese boy aged 1;6 to 2;12. *Bulletin of Aichi Shutoku Junior College, 34*, 183-191.

Noji, J. (1974-77). *Yojiki no gengo-seikatsu no jittai*. Hiroshima: Bunka Hyoronsha.

Ota, M. (in press). Minimality constraints and the prosodic structure of child Japanese. In D. Silva (Ed.), *Japanese/Korean Linguistics, 8*. Stanford, CA: CSLI.

Pater, J., & Paradis, J. (1996). Truncation without templates in child phonology. In A. Stringfellow, D. Cahana-Amitay, E. Hughes & A. Zukowski (Eds.), *Proceedings of the 20th annual Boston University Conference on Language Development* (pp. 540-551). Somerville, MA: Cascadilla Press.

Prince, A. (1990). Quantitative consequences of rhythmic organization. In *Proceedings from the 26th meeting of Chicago Linguistic Society* (pp. 355-398). Chicago, IL: CLS.

Prince, A., & Smolensky, P. (1993). Optimality theory: Constraint interaction in generative grammar. Manuscript. Rutgers University, New Brunswick, NJ and University of Colorado, Boulder, CO.

Salidis, J., & Johnson, S. J. (1997). The production of minimal words: A longitudinal case study of phonological development. *Language Acquisition, 6*, 1-36.

Selkirk, E. (1980). The role of prosodic categories in English word stress. *Linguistic Inquiry, 11*, 563-605.

Smolensky, P. (1996). On the comprehension/production dilemma in child language. *Linguistic Inquiry, 27*, 720-731.

Wijnen, F., Krikhaar, E., & den Os, E. (1994). The (non)realization of unstressed elements in children's utterances: A rhythmic constraint? *Journal of Child Language, 21*, 59-83.