Ota, M. (1998). Minimality constrains and the prosodic structure of child Japanese. In D. Silva (Ed.), Japanese/Korean Linguistics, vol. 8 (pp. 331-344). Stanford, CA: CSLI Publication

Minimality Constraints and the Prosodic Structure of Child Japanese

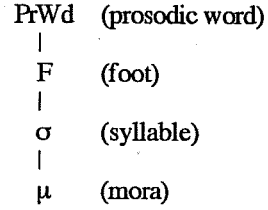
MITSUHIKO OTA
Georgetown University

1. Introduction

In a number of recent studies on early phonological development, it has been claimed that the principles of prosodic representation that govern mature phonology are also evident in the shape of early words produced by young children (Demuth 1995, 1996, Demuth and Fee 1995, Fee 1995, Johnson and Salidis 1996, Salidis and Johnson 1997, Pater and Paradis 1996). Demuth and Fee (1995, Demuth 1996, Fee 1995) propose that children's early words are composed of well-formed units of the Prosodic Hierarchy and constrained by the principle of Foot Binarity. The Prosodic Hierarchy determines the basic domination relationship of prosodic constituents as schematized in (1), and Foot Binarity, defined in (2), enforces a binarity condition on the structure of feet.

* I would like to thank Katherine Demuth, Renée Jourdenais, Thomas Klein, Donna Lardiere, Mary Rose, Takae Tsujioka, and Lisa Zsiga for their valuable comments, advice and support. I am deeply grateful to both Dee Cain and Naoki's parents for their assistance and cooperation in collecting data. Needless to say, all opinions and errors are mine.

(1) Prosodic Hierarchy (Selkirk 1980, McCarthy and Prince 1986)



(2) Foot binarity (Prince 1980):

Feet must be binary on moras or syllables

Evidence for these representational properties can be found in the size and shape of early words of various languages, including English, Dutch, Hungarian and Sesotho. It has been reported that children acquiring these languages go through a stage during which their production of words is minimally bimoraic and maximally disyllabic, and in which longer target words tend to be truncated (Allen and Hawkins 1978, Demuth 1996, Echols and Newport 1992, Fee 1995, Fikkert 1994, Wijnen, Krikhaar and den Os 1994). Several researchers have argued that these early words can be characterized as *minimal words* (Demuth 1995, 1996, Demuth and Fee 1995, Pater and Paradis 1996). A minimal word is a prosodic word that minimally satisfies the demands of the Prosodic Hierarchy and Foot Binarity (McCarthy and Prince 1986). That is, a prosodic word must contain at least one foot in accordance with the requirement that a constituent must dominate a prosodic constituent of the next level down in the hierarchy (*Proper Headedness*; Itô and Mester 1989, Selkirk 1996). A foot, in turn, must be bimoraic or disyllabic due to Foot Binarity. Hence, a prosodic word must minimally contain two moras, or syllables (if all syllables are monomoraic). The observation that most early words are bimoraic or disyllabic, therefore, indicates that the phonological grammar of young children at one point licenses only the most unmarked prosodic words which obey these prosodic principles.

Although there is considerable evidence for such a stage of prosodic development (dubbed the "Minimal Word stage" by Demuth and Fee 1995), the claim that it demonstrates the representational properties of the child's phonological system is not unchallenged. As noted by several researchers, there is a possibility that truncation phenomena in languages with a stress system reflect the existence of an intensity-based production template, rather than an adult-like structure of phonological representation (Allen and Hawkins 1979, Gerken 1994, Wijnen et al. 1994). According to this view, children possess a strong-weak rhythmic template, which is matched with the target word, preserving the stressed syllable and one of the subsequent weak syllables. On the surface, this account makes predictions similar to

that of the representational approach described above, since the predicted output forms would consist of two syllables (strong-weak), or one heavy (strong) syllable when there is no subsequent weak syllable to be matched in the target word. What is needed in support of the Prosodic Hierarchy account, then, is evidence from a language without a stress system.[1] Japanese provides a testing ground for this purpose since it lacks lexical stress.

Japanese data are also informative with respect to these issues as, in a number of dialects (including standard Japanese), prosodic minimality is lifted in certain contexts. There are a number of monomoraic lexical words which do not satisfy the requirement that a prosodic word be minimally bimoraic. Many of these are basic lexical items (e.g., *te* 'hand,' *me* 'eye,' *ki* 'tree,' and *hi* 'fire') which are found in child-directed speech and in fact are acquired by young children, as we will see below. Thus, Japanese children are exposed to confounding input data which potentially obliterates the role of prosodic minimality in the language. Since all lexical words respect bimoraic minimality in languages such as English and child Dutch, the absence of subminimal words in child English and Dutch may be due to the attested size of lexical words in the input. On the other hand, because of the non-uniform enforcement of a bimoraic word minimum in Japanese, whatever minimality effects we may find in the early words of Japanese cannot be a mere reflection of the surface pattern of the input data.

Taking these points as key motivations, I will examine the extent to which principles of prosodic representation are evident in the structure of early words produced by young speakers of Japanese. More specifically, the following questions will be addressed: (i) Is there evidence for access to the Prosodic Hierarchy in early child Japanese? (ii) Is there evidence for prosodic minimality in child Japanese? If so, where does it apply?

2. Method

2.1 Data

The spontaneous speech data used in this paper are taken from three sources, including two previous studies: Noji (1974-77) and Miyata (1995). Noji (1974-77) is a diary study of the author's son, Sumihare, from his birth to his sixth birthday. The daily entries I analyzed for this study consist of all the 3,452 utterances collected between 0;11 (when Sumihare's word production begins) and 2;0.[2] The utterances were transcribed manually using

[1] Sesotho is a language without word level stress, and yet child Sesotho shows a Minimal Word stage (Demuth 1994). As Demuth points out, however, the case in Sesotho is complicated by the fact that the language has penultimate lengthening at phrase boundaries, which produces an effect akin to a strong-weak rhythmic pattern in one-word productions.

[2] Child age is given throughout as *years; months*, e.g. '1;2' = one year, two months.'

the kana syllabary with additional phonetic notes.[3] Miyata's (1995) study of her subject Aki consisted of a weekly tape-recording of his speech produced between 1;5 and 3;0.[4] The transcripts were made available through the CHILDES database (MacWhinney and Snow 1985). The portion between 1;8 (when Aki uttered his first word) and 2;4 is used for the analysis. Any non-adult-like production in Aki's production was transcribed phonetically. A third longitudinal study was conducted by this researcher. The subject, Naoki, was in the US at the time of data collection. Naoki's parents spoke Japanese to him, but he was also exposed to English at a daycare center he occasionally attended.[5] The Japanese data were tape-recorded while a native speaker played with the child. Recording sessions were held every 2-3 weeks from 1;7 to 2;9, and all utterances were transcribed phonetically.

2.2 Procedure

For each child, every lexical item and every prosodically distinct form of the lexical item were recorded and entered into a monthly database. An item was not included if the transcription was judged to be questionable by the data collector. Also, in some cases, a child truncated form was adopted and used regularly by the child's parents, and in other cases, the child production was identical to an adult clipped form (e.g. *heri* for *herikoputaa* "helicopter," *toko* for *tokoro* "place" etc.). These productions were not included because it could not be determined whether the target of the seemingly truncated child production was the full lexical item or the already truncated form. Also, to exclude possible non-productive imitation of adult utterances, a child form was not counted if its target word was in the immediately preceding adult utterance. For the truncation data, multimorphemic target words were left out from consideration (unless there was evidence that the target was treated as an unanalyzed single unit), to avoid imposition of arbitrary morphological analysis on the child's production.

3 Data analysis

3.1 Subsyllabic structure

In order to establish the minimal prosodic unit, the analysis proceeds in a bottom-up fashion, beginning with the subsyllabic level of the Prosodic Hierarchy. Unmarked syllables in (adult) Japanese contain one or two moras,

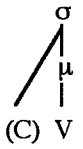
[3] Because of this transcription method, the data are not suitable for detailed phonetic analyses at the segmental level. However, they have been included since our concerns here are prosodic, and the transcripts have a sufficient degree of accuracy at the basic level of syllable structure, place and manner features of the consonants, and vowel length.

[4] Recordings were conducted on a monthly basis between 1;5 and 1;11.

[5] His exposure to English may have influenced his phonology of Japanese. However, there was no noticeable interference in his prosody. See Paradis, Fonte, Peticlerc and Genesee (1997) for evidence for the autonomy of prosodic systems in bilingual children.

although marked syllables have three moras (Poser 1990). The structure of unmarked syllables in Japanese is given in (3) and (4).

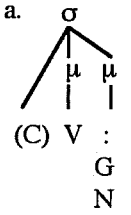
(3) Light syllables (1 mora)



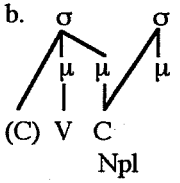
Examples: *i* 'stomach'
ki 'tree'

(4) Heavy syllables (2 moras)

a.



b.



Examples: *koo* 'incense' *kap.pa* 'water imp'
koi 'carp' *kam.pa* 'fund-raising'
kon 'navy blue'

A light syllable has one mora, which is realized as a simple vowel, as in (3). A heavy syllable consists of two moras, which are realized as a long vowel (V:), a diphthong (VG), or a vowel followed by a placeless moraic nasal (N) as shown in (4a). The second mora can also be the first part of a geminate (C) or a nasal with a place feature homorganic with the onset of the following syllable (N_{pl}) as illustrated in (4b).

If the phonological system of child Japanese has a comparable subsyllabic structure, we expect the children to make weight distinctions accordingly. The prediction is that (C)V will be treated differently from (C)V:, (C)VG, (C)VC or (C)VN, and vice versa. A comparison between the weight of syllables produced by the subjects and the weight of the corresponding target syllables are shown in (5), (6) and (7).[6] If a syllable produced by a child was (C)V and its corresponding target syllable was

[6] Due to space constraints, only the data from the first seven months are shown here. The last row shows the total number of target syllables based on type counts.

(C)V, it was called a 'match' in weight (light syllable). If the corresponding target syllable was (C)V:, (C)VG, (C)VC or (C)VN, it was called a 'mismatch.' The weight of the heavy syllables, i.e., (C)V:, (C)VG, (C)VC and (C)VN, was compared in the same manner.

(5) Correspondence in syllable weight (Sumihare)

Age	0;11	1;0	1;1	1;2	1;3	1;4	1;5	1;6
Match (%)	100.0	83.3	100.0	95.7	90.6	91.8	95.5	94.8
Mismatch (%)	0.0	16.7	0.0	4.3	9.4	8.2	4.5	5.2
Total sylls.	3	6	17	23	32	49	67	77

(6) Correspondence in syllable weight (Aki)

Age	1;8	1;9	1;10	1;11	2;0	2;1	2;2	2;3
Match (%)	86.7	100.0	85.7	91.1	88.7	92.6	92.4	93.0
Mismatch (%)	13.3	0.0	14.3	8.9	11.3	7.4	7.6	7.0
Total sylls.	30	9	14	45	168	325	472	839

(7) Correspondence in syllable weight (Naoki)

Age	1;8	1;9	1;10	1;11	2;0	2;1	2;2	2;3
Match (%)	87.5	91.8	95.0	91.1	93.5	98.1	98.5	98.5
Mismatch (%)	12.5	8.2	5.0	4.6	6.5	1.9	1.5	1.5
Total sylls.	8	73	40	153	154	257	270	273

As seen in these tables, children are sensitive to weight distinction from the earliest stage of phonological production. In the majority of cases, (C)V targets are produced as (C)V syllables. Likewise, targets with (C)V:, (C)VG, (C)VC or (C)VN structure are realized as (C)V syllables only infrequently, although they are sometimes substituted with another type of heavy syllable, as shown in (8).

(8) Production of heavy syllables

Target	Production	Gloss	Child (Age)
ɾiŋ.go	ɾi:.ja	apple	S (1;6)
ta:.ta	ta:.ta ~ tat.to	shoes	S (1;8)
ɸɯ:.sen	geŋ.ken ~ ɸɯ:.tʃen	balloon	A (2;0)
to:.kjo:	tat.tʃa:	Tokyo	A (2;3)
çi.ko:.ki	çi.kuk.ki ~ çi.go:.ki	plane	N (1;8)
am.pam.man	am.pam.man ~a:.pa:.man	(cartoon character)	N (1;11)

These observations demonstrate that in the child's phonological system, syllables with a long vowel, a geminate or a nasal coda are treated as being heavy, while a syllable only containing a short vowel is treated as being light. The preservation of weight distinctions can be seen as evidence for moraic conservation within the syllable.

Furthermore, there is evidence for moraic conservation across syllable boundaries. Thus, when a light syllable is deleted in a target word, rearrangement of prosodic structure takes place to compensate for the loss of segments.[7]

(9) Compensatory lengthening in early words

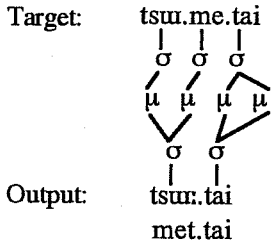
Target	Production	Gloss	Child (Age)
tˢɯ.me.tai	tˢɯ:.tai ~ met.tai	cold	S (1;6)
a.ge.han	ge:.an	(type of food)	S (1;10)
pa.to.ka:	pak.ka:	police car	A (2;1)
ba.na.na	ban.ʒa	banana	A (2;3)
o.me.me	o:.me	eye	N (2;0)
ha.bu.ɾa.ʃi	ha:.ba.ʃi	toothbrush	N (2;0)

For instance, in the first example in (9), each of the two attested outputs is missing segments that correspond to a syllable in the target /tˢɯmetai/. In both cases, the weight of one of the syllables in the output is increased by means of vowel lengthening ([tˢɯ:tai]) or gemination ([mettai]). A moraic analysis (McCarthy and Prince 1986, Hayes 1989) provides a straightforward

[7] This occurs with more than 60 percent of light syllable deletions. The percentage for each child is as follows: Sumihare, 60.6%; Aki, 65.2%; and Naoki, 63.6%.

account of the phenomenon, under the assumption that the total number of moras in the target is conserved in the output, as illustrated in (10).

(10) Moraic conservation in early words



In fact, such a process is difficult to explain without crediting the child's grammar with non-segmental prosodic units below the level of syllables. Compensatory lengthening, as well as syllable weight conservation, therefore, gives support to the hypothesis that children have access to the level of mora in the Prosodic Hierarchy.

3.2 Minimality effects and foot structure

Having shown that syllables in early words are composed of moras, we will now examine the presence of a prosodic constituent above the level of syllables. Does the structure of early words show evidence for feet? Does Foot Binarity play a role in the organization of prosodic words?

Minimality effects are considered an important piece of evidence for the existence of foot structure in many child languages. Since Japanese has bimoraic feet (Poser 1990, Mester 1990), a straightforward application of prosodic minimality would predict that all words be at least bimoraic. However, the scope of the minimality condition in Japanese is restricted to prosodically derived words (Itô 1990, Itô and Mester 1992). For example, truncated hypocoristics and clipped loanwords — which are derived from their base forms— must satisfy bimoraic minimality, but underived lexical words are exempt from this condition, as attested by the existence of monomoraic lexical words (Itô 1990). The question arises, therefore, as to whether early phonology exhibits any minimality effect, and if so, whether the condition takes scope over the entire phonology, or only over some subdomain, as in the target language.

First, let us examine the production of monomoraic lexical words. All the monomoraic targets produced by the three children are listed in (11).

(11) Production of monomoraic lexical words

Target	Production	Gloss	Child (age)
me	me	eye	Sumihare (1;9-), Aki (2;1-), Naoki (2;1-)
te	te	hand	Sumihare (2;1-), Aki (1;10-), Naoki (2;2-)
to	to	door	Sumihare (2;0-)
tʃi	tʃi	blood	Sumihare (2;1-)
ni	ni	two	Aki (1;11-)
ʃi	ʃi	four	Aki (1;11-)
go	go	five	Aki (1;11-)
e	e	picture	Aki (2;1-)
ki	ki	tree	Aki (2;1-)
çi	çi	sun	Aki (2;2-)

The adult-like production of these monomoraic targets shows that there is no bimoraic minimality restriction on underived lexical words, just as in the case of adult Japanese.

Next, we will examine the size of truncated words. If bimoraic minimality holds for all word productions except those of underlyingly monomoraic lexical items, early words in Japanese should not truncate to subminimal sizes. Some examples of the truncated words found in the child data are shown in (12).

(12) Examples of truncated words

Target	Production	Gloss	Child (Age)
ba.su	ba (L)	bus	Aki (1;8-2;0)
do.ra.e.mon	mo: (H)	(cartoon character)	Naoki (1;9)
o:.to.bai	a.ba (LL)	motorbike	Aki (2;0)
he.ri.ko.pu.ta:	hei.ta~he:.ze (HL)	helicopter	Aki (2;3)
to.ma.to	ma.to: (LH)	tomato	Sumihare (1;4)
at.ta.kai	at.tai (HH)	warm	Sumihare (1;10)
o.to.mo.da.tʃi	o.ma.tʃi (LLL)	friend	Naoki (2;2)

The tables in (13), (14) and (15) show the prosodic structure of truncated words produced by each child. 'L' indicates a light syllable, and 'H' a heavy syllable. The figures indicate type counts of prosodically distinct productions.

(13) Prosodic structure of truncated words (Sumihare)

Age	0;11-1;2	1;3-1;5	1;6-1;8	1;9	1;10	1;11	2;0
L			1				
H	3	5	5	2	1	2	3
LL	1	2	1			3	1
HL		5	5	3	7	13	6
LH		1	1				
HH				2	1		
LLL					1	1	2

(14) Prosodic structure of truncated words (Aki)

Age	1;8-1;9	1;10-1;11	2;0	2;1	2;2	2;3	2;4
L	2	3	2	1			
H	3	3	3	4	1	4	2
LL	1		5	2	4	9	4
HL	3	6	4	11	10	20	12
LH	1						1
HH				1		2	
LLL				1		2	2

(15) Prosodic structure of truncated words (Naoki)

Age	1;9	1;10	1;11	2;0	2;1	2;2	2;3
L							
H	1						
LL	1	1	1	1			
HL	3	1	1	2			1
LH			1				
HH			1	2		1	
LLL						1	1

We can see from these tables that two of the three children, Sumihare and Naoki, rarely truncate target words to monomoraic forms.[8] There is only one instance of monomoraic truncated output in Sumihare's data, and none in Naoki's. For these children, then, bimoraic minimality seems to restrict the forms of truncated words. However, the truncation data from the third child, Aki, contains several monomoraic forms:

[8] It is possible that Naoki produced monomoraic truncated forms at one point though, since the data collection started after his first word production. We might have missed such a period (if there was one).

(16) Aki's monomoraic truncation

Target	Production	Gloss	Age
ba.su	ba	bus	1;8-2;1
u.ma	mo	horse	1;8
den.ʃa	ʃa ~ ʒa	train	1;10
pa.to.ka:	pa	police car	1;10
ki.ʃa	tʃa	steam train	1;11

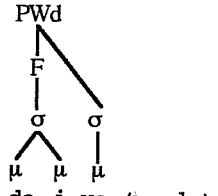
Interestingly, Aki's period of monomoraic truncation coincides with that of the beginning of his monomoraic lexical word production. Between 1;10 and 2;2, he began producing 8 monomoraic lexical words, as shown in (11) above. A possible explanation for the difference in the minimal size of truncated words, then, is that Aki has overgeneralized the exemption of the bimoraic minimality condition. Faced with the monomoraic lexical words in the input data, Aki lifted the ban on subminimal forms and may have overshot its scope to include all word forms.[9] A readjustment takes place around 2;1, though, and monomoraic truncation disappears from Aki's data. The presence of monomoraic lexical words never affects the bimoraic size minimum of Sumihare's and Naoki's truncation. Overall, therefore, the data indicate that at least after the age of 2 years, Japanese-speaking children do not truncate words below the bimoraic size minimum. The indication is that by this age, children are sensitive to the basic prosodic structure of Japanese, which requires that at least one binary foot must be projected in a word unless that word is underlyingly monomoraic.

The truncation data present further evidence for the existence of feet in early words. In adult Japanese, it has been shown that prosodically derived words are subject to an alignment constraint that matches the left edge of the prosodic word with that of a foot (Itô and Mester 1992. Cf. McCarthy and Prince 1993). This constraint is vacuously satisfied in hypocoristic truncation, whose output must take the shape of a bimoraic foot. In loanword clipping, however, the effects are more visible. Thus, LH (light-heavy) is ill-formed as a truncated form (=17b) in contrast to the well-formed HL (heavy-light) (=17a): in (17b), the foot fails to align to the left-edge of the word.

[9] Alternatively, we may consider the possibility that foot structure is left underspecified at the earliest stage of prosodic development (Demuth 1995, Goad 1997). This has been suggested as an explanation for the pre-Minimal Word stage in English — a phase characterized by predominant production of monosyllables, which are reported to be monomoraic in many cases. If this were to account for Aki's monomoraic truncation, however, we would be left with the question of why Aki's overall production during this stage is not limited to monosyllables. There are more disyllabic productions (63.6%) than monosyllabic productions (36.4%) in his data before 2;0.

(17) Left alignment in loanword clipping (Itô and Mester 1992)

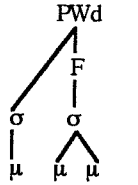
a. Aligned



da i ya (MONDO)
si N po (ziumu)

'diamond'
'symposium'

b. Misaligned



*de mo N (sutoreesyoN)
*ro ke e (syoN)

'demonstration' cf. *demo* (OK)
'location' cf. *roke* (OK)

The same pattern can be observed in the child data. For all three children, the production of LH is very infrequent, especially compared to that of HL.

(18) Truncated words: HL vs. LH (total type-counts and examples)

Child	HL vs. LH	Target	Production	Meaning
Sumihare	HL (39)	ta.ma.go	ta:.ma	egg
	LH (2)	to.ma.to	to.ma:	tomato
Aki	HL (56)	tʃim.pan.dʒi:	ba:.ʒe	chimpanzee
	LH (2)	das.sen	da.ʃen	derailment
Naoki	HL (8)	te:.pu.re.ko:.da:	fe:.da	tape recorder
	LH (1)	mi.do.ri	mi.do:	green

This asymmetry cannot be a simple reflection of the prosodic pattern of the target words. For example, there is nothing inherent in the prosodic structure of LLL, HHH or HH target that would favor HL over LH as a truncated form. Rather, the restriction is on the output form, the most plausible one being the same alignment restriction described in (17).

In short, the truncation data demonstrate that a bimoraic minimality condition holds in early word truncation even though Japanese children produce monomoraic lexical words. This serves as evidence for a binary foot. The avoidance of LH as an output form of truncation can receive a natural account if we assume that this foot is bimoraic and must be aligned with the left edge of the truncated word.

4. Conclusion

In the analysis of the early word production of young Japanese-speaking children presented above, we have identified several properties in the prosodic system of early Japanese. Syllable weight distinction and

compensatory lengthening reveal a sub-syllabic structure. The adult-like sensitivity to syllable weight shows that children have access to the moraic level of prosodic representation. Furthermore, the size and shape of truncated words show the effects of prosodic minimality and alignment of sub-word level constituents. The observed minimality effects and the asymmetry of the output forms in truncation provide evidence for the presence of a foot structure and its bimoraicity.[10] These findings are consistent with the hypothesis that production of early words is regulated by the Prosodic Hierarchy and Foot Binarity.

The data demonstrate that these prosodic properties are evident in early child language even if the target language lacks a stress system, as does Japanese. Therefore, they show that the foot, as a prosodic category, has an important role in early word structure independent of stress, contrary to the strong-weak template hypothesis. In addition, these Japanese data offer compelling evidence for prosodic minimality effects which cannot be reduced to surface restrictions on the input. As such, this study gives further support for the claim that children have early access to principles of prosodic representations.

References

Allen, George, and Sarah Hawkins. 1979. Trochaic rhythm in children's speech, in H. Hollien and P. Hollien, eds., *Current issues in the phonetic sciences.* Amsterdam: John Benjamins.

Demuth, Katherine. 1995. Markedness and the development of prosodic structure. *NELS* 25:13-25.

Demuth, Katherine. 1996. The prosodic structure of early words, in J. L. Morgan and K. Demuth, eds., *Signal to syntax: Bootstrapping from speech to grammar in early acquisition.* Mahwah, NJ: Lawrence Erlbaum.

Demuth, Katherine, and E. Jane Fee. 1995. Minimal words in early phonological development. Ms. Providence, RI and Halifax, Nova Scotia: Brown University and Dalhousie University.

Echols, Catherine, and Elissa Newport. 1992. The role of stress and position in determining first words. *Language Acquisition* 2:189-220.

Fee, E. Jane. 1995. Segments and syllables in early language acquisition, in J. Archibald, ed., *Phonological acquisition and phonological theory.* Hillsdale, NJ: Lawrence Erlbaum.

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

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

[10] A point worthy of notice is that the same prosodic requirements that govern the well-formedness of truncated words in adult Japanese show their effects on the shape of truncated words in child language. For a more extensive discussion of this point, see Ota (in press).

Goad, Heather. 1997. Codas, word-minimality, and empty-headed syllables. *Child Language Research Forum* 28.

Hayes, Bruce. 1989. Compensatory lengthening in moraic phonology. *Linguistic Inquiry* 20:253-306.

Itô, Junko. 1990. Prosodic minimality in Japanese. *CLS* 26:213-239.

Itô, Junko, and Armin Mester. 1992. Weak layering and word binarity. Ms. Santa Cruz, CA: UCSC.

Johnson, Jacqueline S., and Joanna Salidis. 1996. The shape of early words: A prosodic developmental analysis. *Boston University Conference on Language Development* 20:386-396.

MacWhinney, Brian, and Catherine Snow. 1985. The Child Language Data Exchange System. *Journal of Child Language* 12:271-296.

McCarthy, John, and Alan Prince. 1986. Prosodic morphology. Amherst, MA and Waltham, MA: University of Massachusetts and Brandeis University.

McCarthy, John, and Alan Prince. 1993. Generalized alignment. *Yearbook of Morphology* 1993:79-153.

Mester, R. Armin. 1990. Patterns of truncation. *Linguistic Inquiry* 21:478-485.

Miyata, Suzanne. 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, Jun'ya. 1974-1977. *Yojiki no gengo-seikatsu no jittai.* Hiroshima: Bunka Hyoronsha.

Ota, Mitsuhiko. The emergence of the unmarked in early prosodic structure. In press, *NELS* 28.

Paradis, Johanne, Isabel Fonte, Sophie Petitclerc and Fre Genesee. 1997. *Phonological differentiation in bilingual two year olds: Evidence from word truncation.* Paper presented at the 22nd Boston University Conference on Language Development.

Pater, Joe, and Johanne Paradis. 1996. Truncation without templates in child phonology. *Boston University Conference on Language Development* 20:54-551..

Poser, William J. 1990. Evidence for foot structure in Japanese. *Language* 66:78-105.

Prince, Alan. 1980. A metrical theory for Estonain quantity. *Linguistic Inquiry* 11:511-562.

Salidis, Joanne S., and Jacqueline S. Johnson. 1997. The production of minimal words: A longitudinal case study of phonological development. *Language Acquisition* 6:1-37.

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

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