

Special Issue**Crosslinguistic Perspectives
on the Development of Prosodic Words****Katherine Demuth***Brown University*

Researchers have long known that children's early word productions differ from those of adults, both in the segments and syllables produced (e.g., *dog* > [dɑ]; *banana* > ['nænə]). Some have proposed that these early segmental/syllabic truncations are due to early perceptual or articulatory limitations (e.g., Echols, 1992; MacNeilage, 1980). Others have proposed that children's early words are phonologically "unmarked," becoming more marked over time (Demuth, 1995; Gnanadesikan, 2004). However, results from recent crosslinguistic research suggest that children's early word productions are sensitive to language-specific phonologies, showing earlier acquisition of high frequency syllable and prosodic word structures (e.g., Levelt, Schiller, & Levelt, 2000; Roark & Demuth, 2000). This indicates that children's early prosodic words show more systematic language-specific differences in shape than perceptual, articulatory and markedness proposals would predict. To the extent that these findings are robust, we should then be able to make predictions regarding the timing and course of prosodic word development across languages.

The first goal of this special volume is to explore these issues more fully by bringing together recent research on the acquisition of prosodic words (PWs) from a number of languages with different distributions of prosodic structures. The papers in this volume therefore include contributions from the less studied Catalan (Prieto), European Portuguese (Vigário, Freitas & Frota) and Japanese (Ota), as well as the better-known Spanish (Lleó) and English (Demuth, Culbertson & Alter). In most cases newly collected longitudinal corpora, including data from several children between the ages of 1–2 years, now makes it possible to provide a more systematic, quantitative study of PW development.

A second goal of this volume was to test some of the frequency-based predictions, providing a theoretical framework for further investigation of children's developing phonologies. For example, frequency and markedness constraints often co-occur, facilitating the early acquisition of high-frequency, unmarked structures (e.g., core CV syllables, trochaic feet). Occasionally, however, the "unmarked" structure is not the most frequent, raising questions regarding the course of acquisition under such conditions (e.g., Stites, Demuth, & Kirk, 2004; Zamuner, Gerken, & Hammond, 2005). The existence of these new longitudinal acquisition corpora, many of which include extensive samples of early child-directed speech, now make it possible to

more effectively examine the nature of the language input young children hear, and to assess the possible impact this has on children's early word productions.

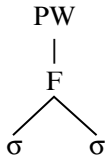
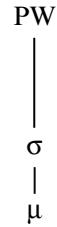
Of course, in dealing with frequency effects there is always the issue of what to count, and whether the language learner and researcher are computing statistics over the same types of structures. To investigate the structure of children's early words and utterances it is therefore useful to appeal to the Prosodic Hierarchy, where Phonological (Prosodic) Words (PWs) are composed of Feet, Syllables, and Moras (subsyllabic units such as coda consonants or long vowels). These PWs may also be embedded in higher-level Phonological Phrases, Phonological Utterances, and Intonational Phrases (McCarthy & Prince, 1994; Nespor & Vogel, 1986; Selkirk, 1984, 1996).

(1) The Prosodic Hierarchy

Utt	(Phonological Utterance)	<i>I saw the man give the kitty the banana</i>
IP	(Intonational Phrase)	<i>I saw the man</i>
PP	(Phonological Phrase)	<i>the man</i>
PW	(Phonological Word)	<i>banana</i>
Ft	(Foot)	<i>man/kitty</i>
σ	(Syllable)	<i>man</i>
μ	(Mora)	<i>ma</i>

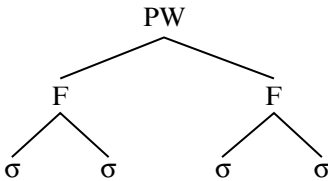
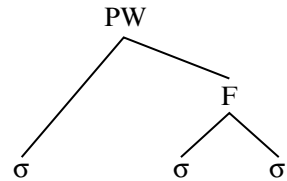
Languages differ in the types of syllable structures, foot structures, and PW structures permitted. Children must therefore learn what types of prosodic structures their target language allows. Moras play an important role in languages such as English and Dutch, where stress assignment is quantity sensitive, stress generally falling on heavy syllables containing two moras of structure—for example, CVC or CVV (cf. Hayes, 1995). Foot structure also differs from language to language. Some languages permit binary feet at the level of the syllable (e.g., English, Dutch), whereas others permit only disyllabic feet (e.g., Sesotho). Languages also differ in the directionality of feet, many exhibiting S(W) trochaic feet (e.g., English, Dutch, Sesotho), but some exhibiting (W)S iambic feet (e.g., K'iche', French). Both (2a) and (2b) (where the syllable is bimoraic, or heavy) represent binary feet—that is, they constitute Minimal Words (McCarthy & Prince, 1994). In contrast, a light (monomoraic) CV syllable immediately dominated by a Prosodic Word constitutes a Subminimal Word. This is shown in (2c). Subminimal Words are generally considered to be marked and dispreferred, though lexical items with this structure are permitted in Romance languages and Japanese.

(2) Prosodic words composed of one foot

a) disyllabic foot (*kitty*)b) bimoraic foot (*dog*)c) monomoraic
subminimal word

The frequency of different PW shapes also varies from language to language: Although both English and Spanish permit quadrasyllabic PWs containing two feet (3a), as well as a foot plus an initial unfooted syllable (3b), both are much more frequent in Spanish. In contrast, English and Dutch contain many PWs like those in (2a) and (2b).

(3) Prosodic words composed of more than foot

a) two feet (e.g., *alligator*)b) initial unfooted syllable
(e.g., *banana*)

Several of the papers in this volume focus on the nature of children's early syllable, foot and PW representations, and the upper and lower bound constraints that these exhibit across development. Since some of the previous literature has suggested that children's word production are composed of unmarked trochaic feet (e.g., Allen & Hawkins, 1980; Demuth & Fee, 1995), the early appearance of marked CV subminimal (monomoric) words and PWs with an initial unfooted syllable (3b) are of particular interest, suggesting that language-specific frequency effects override markedness constraints in children's early grammars.

The issue of subminimal words is raised by *Demuth, Culbertson, and Alter*, who tackle the problem of word-minimality effects in English. Using a new set of longitudinal data, they examine the early speech productions of four children, arguing that the early attempts to produce CVC target words results in CV subminimal truncations. The lack of apparent compensatory lengthening (e.g., CVC > CV:) and good control of vowel quality lead the authors to conclude that English-speaking children show little awareness of word-minimality effects, countering proposals by Demuth and Fee (1995). One of the children in their study also showed a period of vowel epenthesis on word-final voiced stops and aspiration of word-final voiceless stops from 1;2–1;4. Goad and Brannen (2003) propose that such productions provide

evidence that English-speaking children initially produce word-final consonants as onsets. However, the authors argue that this is due to the child's precocious attempts to produce word-final consonants rather than a preference for unmarked CV syllable structures. These findings suggest the need for acoustic analysis to test for possible compensatory lengthening, and to verify the coding of word-final aspiration and epenthesis. The study also raises questions about when learners become sensitive to word-minimality effects, the representational status of word-final consonants as codas or as onsets, and why only some English-speaking children exhibit word-final epenthesis and aspiration.

Vigário, Feitas, and Frota provide the first study of the acquisition of PW structure in European Portuguese (EP). Drawing on Vigário's recent work, they discuss the phonological cues that provide evidence for PW structure in EP. They then examine the frequency of different PW shapes in both adult and child-directed speech. Finally they examine the acquisition of EP PW structure, showing that both subminimal CV words and trisyllabic words appear quite early in these children's productions, similar to reports for Spanish. They also show that prosodic clitics can prefix to all types of PWs, regardless of prosodic shape. Such processes are therefore not used to meet word-minimality requirements. At the same time, trisyllabic words are occasionally truncated to one or two syllables, probably due to the fact that unstressed syllables in EP, like English, contain reduced vowels. When truncation occurs, the stressed syllable is generally preserved, but so is the consonant at the left-edge of the word (contra Pater's, 1997, proposal that the less marked onset [less sonorous consonant] is typically preserved). The authors conclude that the frequency distribution of PW shapes in EP, plus the cues to prosodic constituency (which include the consonant at the left-edge of the PW), help explain the lack of minimality and maximality constraints, as well as the truncation facts. This article provides a welcome new contribution to the acquisition literature, raising questions about when and how language learners become sensitive to prosodic constituency, and if the cues to prosodic structure are evidenced in perception, perhaps as cues to word-segmentation, prior to appearing in production.

Drawing on findings from related previous research, *Lleó* provides a comprehensive discussion of the acquisition of PW structure in Spanish. She shows that Spanish-speaking children's first PWs are disyllabic trochees, the most frequent PW structure in Spanish. Interestingly, some of the stressed syllables are augmented with a coda, showing effects of stress-to-weight constraints. She then shows that the course of acquisition diverges for Spanish monolinguals and Spanish-German bilinguals: Whereas the bilinguals first produce CVC monosyllabic structures, the monolinguals produce disyllabic and trisyllabic PWs containing an unfooted syllable (e.g., WS, WSW). The monolinguals also produce coda consonants later, truncating CVC targets to CV subminimal forms. These patterns reflect frequency effects in the ambient languages, the Spanish-German bilinguals hearing many more coda consonants and CVC PWs, and fewer trisyllabic PWs. Conversely, Spanish-speaking monolinguals hear fewer monosyllabic PWs, fewer coda consonants, and many more trisyllabic words. As might be expected, larger Phonological Phrases of four or more syllables are acquired later by both sets of learners. However, some of the children from both groups show earlier acquisition of quadrasyllabic Phonological Phrases

than of quadrasyllabic PWs, suggesting an upper bound on the shape of PWs. Lleó concludes by showing how these findings can be understood in terms of constraint interactions. This study contributes to the bilingual acquisition literature, showing evidence of prosodic effects on the acquisition of simultaneously acquired languages. The results also call for further research on the acquisition of prosodic clitics, and possible interactions with PW structure.

Prieto offers the first study of PW acquisition in Catalan. In so doing, she focuses on the comparative developmental of initial unfooted syllables in Catalan and Spanish. Since the absolute frequency of iambic Weak-Strong (WS) PWs is similar in the two languages, she suggests that a pure (threshold-like) PW frequency account would predict disyllabic iambs to be acquired at the same point in both languages. However, she then shows that Catalan has many more monosyllabic CVC words than Spanish (i.e., the relative frequency of WS PWs in the two languages differs). *Prieto* finds that Catalan-speaking children acquire coda consonants earlier than their Spanish-speaking peers, often truncating target WS iambic PWs to a CVC monosyllable. In contrast, Spanish learners take much longer to produce coda consonants, and rarely truncate iambs. *Prieto* proposes that the right level of generalization over which language learners are operating is therefore that of metrical foot structure, rather than frequency of surface PW structure. This study provides an insightful comparative examination of two closely related languages where learners take different acquisition paths: Catalan learners show an early preference for the moraic trochee (S(W)), whereas Spanish learners show a preference for disyllabic feet (both SW and WS). This study raises many questions about the units of linguistic generalization over which learners calculate their statistics, an issue that deserves much more attention from the field.

This theme is carried over in *Ota's* examination of word-truncation patterns in early Japanese. He proposes that Japanese-speaking children's individual word truncation patterns are directly related to the frequency with which they hear specific lexical items. Word-truncation is not common in Japanese, probably due to the high frequency of three syllable PWs, constituting 23% of all lexical items. However, when truncation occurs, *Ota* finds that the individual children in his study were more likely to truncate lexical items that occurred less frequently in their mother's speech. As in other languages, the prosodically prominent syllables (i.e., those with a pitch-accent, and those containing bimoraic syllables) tend to be retained. Interestingly, however, truncation appears with both disyllabic and trisyllabic PWs, regardless of the number of moras. Truncation also occurs more frequently as children approach the age of two, probably because more three- and four-syllable words are targeted at this point. This suggests that an experimental study using nonce items, where lexical frequency can be controlled, could provide further support for the lexical frequency proposal presented here. Such a study could also target somewhat younger children to determine if lexical frequency, high-frequency prosodic patterns, the type of syllable prominence, mora count, or even segmental effects might hold at an earlier age. This study therefore raises many issues for further research, for both Japanese and other languages.

Thus, the study of the acquisition of Prosodic Words moves beyond the acquisition of segments to investigate children's early mapping between several different

levels of prosodic structure. The papers in this volume collectively point to the importance of understanding the distributional nature of the input learners hear (syllabic, metrical, PW, lexical) for making predictions about both the language-specific and individual course of development. They also raise many issues for further experimental investigation.

It is hoped that the papers in this volume will stimulate further interdisciplinary discussion between researchers of phonological development from both perception and production perspectives (cf. Special Issue of *Language and Speech* on Phonological Development, 2003), and will expand the study of early phonological development to a wider range of languages, providing a better theoretical understanding for why children produce the word shapes they do.

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