

# **Prosodic Constraints on the Emergence of Grammatical Morphemes: Crosslinguistic Evidence from Germanic and Romance Languages**

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## **1. Introduction**

It has long been noted that grammatical function morphemes, such as determiners, auxiliaries, and tense and agreement morphemes, tend to be missing in children's early speech, giving rise to 'telegraphic speech' (e.g. Brown 1973). This has led some researchers to propose that the early lack of grammatical morphemes might be due to maturational constraints on the linguistic system (e.g. Radford 1990). If this is true, then, all things being equal, we should expect grammatical morphemes to appear at the same time crosslinguistically.

Recent research has begun to show, however, that there appears to be cross-linguistic variation in the appearance of grammatical morphemes such as determiners. For example, there is increasing evidence that determiners begin to emerge very early in Spanish (Gennari & Demuth 1997, Demuth in press, Lleó 1997, 1998, in press), and that this differs considerably from the emergence of determiners in languages like German (Lleó 1997, in press). On the other hand, variation in the appearance of grammatical morphemes within a given language has recently been reported. For example, Gerken (1996) has shown that the variable appearance of determiners in English can be accounted for by examining the rhythmic contexts in which they appear: Those determiners which can be prosodified as part of a Strong-weak (Sw) Foot will tend to surface in children's early speech productions, whereas those that cannot will tend to be omitted. Demuth (1992, 1994) reports similar findings from the Bantu language Sesotho, where prosodic units such as Feet also appear to play an important role in determining the variable appearance of noun class prefixes and nominal agreement morphemes.

In this paper we show that crosslinguistic variation in the emergence of determiners can also be understood in terms of prosodic constraints, where the prosodic organization of children's monomorphemic words, combined with the means by which determiners are prosodified in different languages, provides an understanding of the variable course of determiner acquisition in (at least some) Romance and Germanic languages. The data examined in this study are drawn primarily from longitudinal speech corpora of 3 Spanish-speaking children and 4 German-speaking children between the ages of 1;4-2;3 years<sup>1</sup>. The paper concludes with discussion of the larger implications of these findings, pointing to the need for closer integration between syntactic and phonological research on the course of language development.

## 2. Prosodic Constraints on Early Monomorphemic Words

Previous studies of children's monomorphemic words in English, Dutch, German and Spanish have noted that children pass through several different stages of prosodic word development (Fikkert 1994, Demuth 1995, 1996, in press, Lleó 1996). Prosodic analyses of these early productions have revealed many similarities as well as important differences. A well-attested similarity refers to the deletion of unstressed syllables by all children in their early productions - especially during the second half of their second year. The following German and Spanish data, in which several syllables of the target form have been truncated, are representative of the acquisition of languages with multisyllabic words.

### (1) Production of German target multisyllables

<u>Fasan</u>	'pheasant'	/fa'za:n/	['zân]	Thomas (1;8,2)
<u>kaputt</u>	'broken'	/ka'pʰt/	['pʰth], ['gu:ts]	Britta (1;7,11)
			['puX]	Marion (1;10,5)
<u>Karton</u>	'box'	/kar'tON/	['tON]	Thomas (1;9,0)
<u>Ananas</u>	'pine-apple'	/'?a:nanas/	['?ana], ['hAnA]	Marion (1;8,3)
<u>Banane</u>	'banana'	/ba'na:n'/	['nAnE], ['nAn']	Marion (1;10,5)
			['ba:ne]	Johannes (1;8,1)
<u>Geburtstag</u>	'birthday'	/g'bu:ã8stak/	['budzA], ['budas]	Marion (1;11,25)
<u>Kartoffel</u>	'potato'	/kar'tOfI§/	['tofEI]	Johannes (1;9,21)

### (2) Production of Spanish target multisyllables

<u>conejo</u>	'rabbit'	/ko'nexo/	['DeRo]	Miguel (1;8,23)
<u>pelota</u>	'ball'	/pe'lota/	['bOdA]	Miguel (1;6,7)
<u>mariposa</u>	'butterfly'	/ma'i'posa/	['boza]	Miguel (1;8,23)
<u>ardilla</u>	'square'	/a'DiYa/	['zijâ] ['dihπ]	José (1;7,27)
<u>Alberto</u>	'name'	/al'Be'to/	['mbæto] ['bEtou8]	José (1;9,2)
<u>rastrillo</u>	'rake'	/ras't'iYo/	['?i:ja]	María (1;4,21)

Interestingly, however, the Spanish speaking children soon begin to produce trisyllabic words without syllable truncation. Such forms are rarely attested in Germanic languages during the same developmental period. Thus, although the data in (2) are common in Spanish at the earliest stages, so are the data in (3):

### (3) Production of Spanish target multisyllables

<u>pelota</u>	'ball'	/pe'lota/	[ba'pOta:]	José (1;9,2)
<u>sombrero</u>	'hut'	/som'b'e/o/	[ba'bElo], [ba'BEjo]	José (1;9,2)

<u>zapato</u>	'shoe'	/Qa'pato/	[pa'papa]	José (1;7,27)
			[pA'pAto], [pa'pato]	José (1;9,2)
<u>garganta</u>	'throat'	/ga\`Vanta/	[Ra'Rata]	Miguel (1;10,18)
<u>manzana</u>	'appel'	/man'Qana/	[pâ'sanâ], [pa'Qanâ]	María (1;10,17)
<u>tobogán</u>	'slide'	/toBo'Van/	[hâ'Bo:hâ], [ʔE'BoBâ]	María (2;0,12)
<u>trompeta</u>	'trumpet'	/t\om'peta/	[ha'badâ]	María (1;10,17)

The prosodic structure of the productions in (3) differs crucially from that of (2). To describe this difference, we will refer to the Prosodic Hierarchy (see Selkirk 1984, 1996, Nespor & Vogel 1986):

#### (4) Prosodic Hierarchy

Utt	Utterance
IP	Intonational phrase
PPh	Phonological Phrase
PW	Prosodic Word
Ft	Foot
$\sigma$	Syllable
$\mu$	Mora

According to Selkirk (1996), each level of the Prosodic Hierarchy must be immediately dominated by the next higher level of structure. This is known as the EXHAUSTIVITY constraint:

EXHAUST: No  $C^i$  dominates a constituent  $C^j$ ,  $j < i-1$

The impact of this constraint is that all syllables, for instance, must be immediately dominated by a Foot. Obviously, this constraint is much too strong even for languages like English, where words like 'banana' would violate EXHAUST – the first syllable being unfooted. Interestingly, early words in Germanic languages seem to obey this constraint, multisyllabic words being typically reduced to disyllables, whereas such words are permitted in early Spanish, as shown in (3) above. These crosslinguistic differences can be represented by the prosodic structures in Figure 1 below, where (a), (b) and (c), but not (d), typically appear in early English, German and Dutch, whereas early words in Spanish can soon take the structure of (d).

Thus, (a) and (b) represent the earliest prosodic stages for all children, whereby the PW is represented by a Foot, constituted by one or two syllables. In the Germanic languages, (b) is the most common Foot in the early stages, with PWs generally consisting of a closed syllable, whereas in Spanish the earliest PWs are almost exclusively represented by disyllabic Feet (a). That is, in Spanish early Feet are

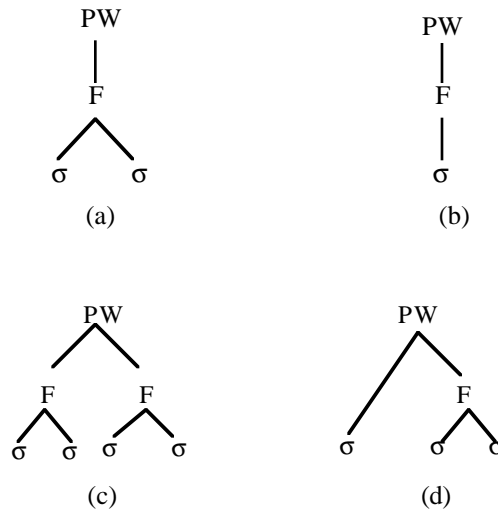


Figure 1. Prosodic Word structures

generally restricted to a syllabic trochee, constituted by two simple syllables. On the other hand, children acquiring Germanic languages use not only the syllabic but also the moraic trochee, involving the production of more complex syllables, with complex rhymes (Lleó, Prinz, Mogharbel & Maldonado 1996). There seems to be a trade-off in development, in the sense that words are made prosodically more complex by 1) adding another syllable, or 2) increasing the complexity of the rhyme. In general, Spanish-speaking children appear to keep their syllable structures simple while they expand the number of syllables in their PWs. In contrast, children learning Germanic languages appear to focus earlier on representing more syllabic structure for those syllables contained within a Foot, even if this means omitting other unfooted syllables.

Spanish speaking children soon advance to a stage of development, where their PWs can contain a Foot plus an unfooted syllable (d). However, the status of this syllable is special. It cannot constitute a Foot (being CV in shape), and must therefore be directly attached to the PW, thus involving a violation of EXHAUSTIVITY. In contrast, access to a prosodic structure larger than a Foot in German is only reached at the two-word stage, by combining two Feet (c).

A possible explanation for these different developments in the two language groups lies in the crosslinguistic differences in the frequency of multisyllabic words in the target language. The structure of PWs varies from language to language, words in some languages being longer. The words children typically try to produce tend to approximate the shapes of most target lexical items. For instance, children's early vocabularies seem to correspond closely to the number of syllables typically found in

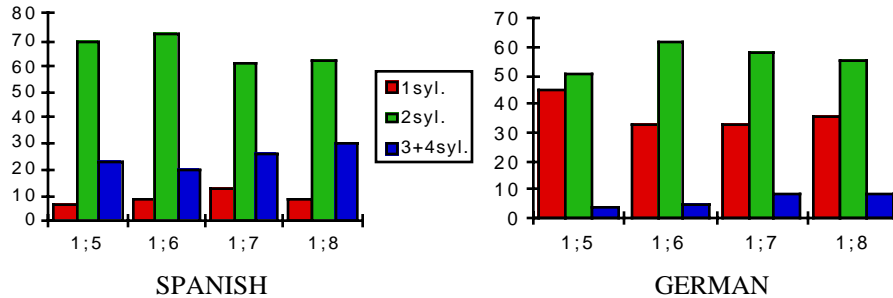


Figure 2. Number of syllables of the early target words in Spanish and German

words of the target language. Figure 2 shows the different proportions of monosyllabic, disyllabic and multisyllabic (trisyllabic and quadrisyllabic) words in the early target vocabularies of German and Spanish.

Clearly at this early stage (1;5 until 1;8) disyllabic forms represent the vast majority of target words in Spanish, monosyllables are in the minority and multisyllables (trisyllables and quadrisyllables) lie between these two. The reverse relationship between monosyllables and multisyllables holds for German, the latter being almost absent until 1;7. The vast majority of target multisyllables in Spanish have penultimate stress, i.e. they contain a trochaic Foot preceded by an unfooted syllable. Figure 3 shows the proportion of trisyllabic and quadrisyllabic Spanish target words with penultimate stress.

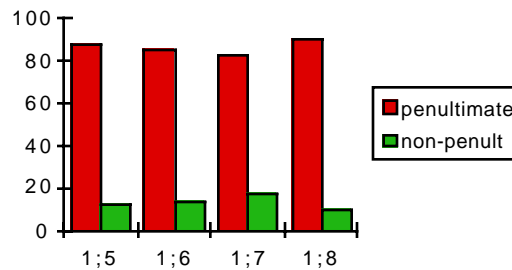


Figure 3. Proportion of multisyllabic words (3- and 4-syllables) with penultimate and non-penultimate stress

Furthermore, most of the *disyllabic* target words in Spanish also have penultimate stress, i.e. they are trochees. Considering disyllabic and trisyllabic forms together, almost all target words in Spanish have a trochaic stress pattern. German also has many syllabic trochaic Feet, but words that take the form of monosyllabic Feet are very frequent, whereas trisyllabic and quadrisyllabic words are almost non-existent in the early stages.

We suggest that the prosodic differences in the early vocabularies of the two language groups and the concomitant truncated vs. non-truncated productions of monomorphemic words might have implications for the acquisition of grammatical function words. It is predicted that Spanish-speaking children might permit early determiners with disyllabic words, whereas children acquiring a Germanic language would not. This prediction appears to be borne out (Demuth in press, Lleó in press).

### 3. Prosodic Constraints on Determiners

We now turn to the acquisition of determiners. It has been argued that the earliest stages of acquisition are a precategorical stage, followed by the lexical stage, functional categories being not yet available until later, after maturation has taken place (Radford 1990). Radford (1990: 84ff) argues that the empirical evidence on the acquisition of English supports the hypothesis that at the stage at which children already distinguish different lexical categories, like nouns and verbs, they "have not yet developed a determiner system", and that "there are no functional categories in early child grammars of English". It is certainly true that at about 1;4 and 1;5, Dutch, English and German children produce bare nouns. On the other hand, it has been shown in Spanish (Lleó 1997 and 1998) and Italian (Bottari, Cipriani & Chilosi 1993/94) that at this same age Spanish and Italian children tend to precede nouns with a "filler" syllable holding the place for the article, or proto-article (Peters & Menn 1993). At about 1;10, children acquiring a Romance language produce a high percentage of articles and proto-articles, whereas children acquiring a Germanic language begin to produce some proto-articles in very restricted contexts. At about 2;3, most children produce full-fledged articles in a target-like manner, independently of the target language being German, English, Spanish or Italian.

Penner & Weissenborn (1996) report that German and Swiss children's first productions of proto-articles and articles appear at about 1;10, and they are generally produced in formulaic expressions. Similar information is to be found in Lleó (1997) and (1998), with (proto-)articles not appearing before 1;10, and then raising in a geometrical way. Figure 4 shows the development of (proto-)articles in the productions of four German children and three Spanish children. The percentage of Det + N productions is shown for the two groups of children comparatively.

The German data show a steep rise in the production of determiners between 1;10 and 2;1, with respect to percentage of use in obligatory contexts, but before that point there are barely any articles in the children's productions. On the other hand, the Spanish children tend to show a more gradual increase in the use of determiners, beginning by about 1;4 with what has been referred to as proto-articles, being phonetically undifferentiated for a few months. Importantly, Spanish children produce more than 50% of determiners in obligatory contexts very early, at about 1;7. For reasons of space, we do not show the individual curves, which are very consistent within each language group. The most important difference that arises from the comparison of the German and Spanish data is the temporal displacement of the

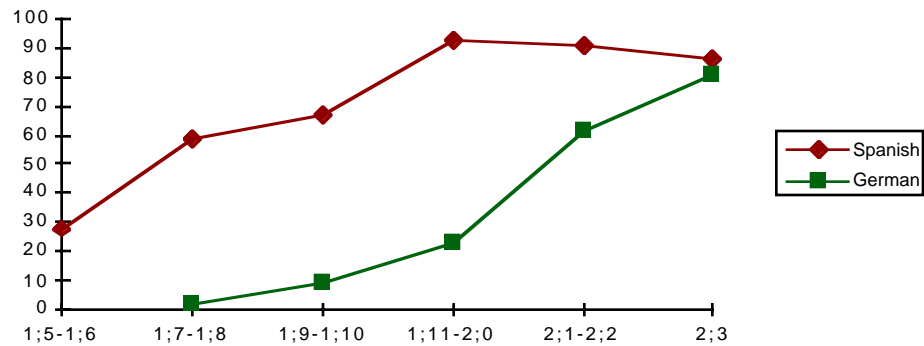


Figure 4. Percentage of Det + N produced by the German and Spanish children from 1;5-2;3 years

two developments, in German always taking place almost half a year later than in Spanish. Some examples of early proto-determiners produced by the Spanish children with disyllabic nouns are given in (5).

(5) Spanish examples of Det + disyllabic noun

María 1;4,21			María 1;6,3		
<u>pala</u>	'shovel'	[ha'bEl'ʔ]	<u>peine</u>	'comb'	[ʔa'pa:lE:h]
		[ʔ'pa, 8lœ <sup>h</sup> ]	<u>globo</u>	'balloon'	[ãw][wOh]
<u>mamá</u>	'mum'	[memE <sup>h</sup> ]	<u>cubo</u>	'bucket'	[hE'kuwO]
<u>cubo</u>	'bucket'	[h'guw˘]	<u>papa</u>	'porridge'	[ʔ'm'bãbã <sup>h</sup> ]
Miguel 1;4,5			Miguel 1;5,1		
<u>vaca</u>	'cow'	[haveva:]	<u>vaca</u>	'cow'	[˘n'vœva]
<u>tic tac</u>	'clock'	[ha'ti'ka]	<u>agua</u>	'water'	[hE'a:va]
<u>boca</u>	'mouth'	[avava]	<u>guau guau</u>	'bow-wow'	[he:vava]

As in the case of the monomorphemic words, the production of Det + disyllabic noun involves a violation of the constraint EXHAUST. Because this constraint is more highly ranked in the grammars of children speaking Germanic languages, these children rarely produce unfooted syllables and therefore do not attempt to produce determiners by means of unfooted syllables.

We furthermore propose that the early appearance of determiners in Spanish is a result of their prosodic status in the target language as proclitics, i.e., they are in general constituted by an unstressed syllable preceding the lexical word and prosodically cliticized to it. The combination of a target disyllable preceded by a determiner is

prosodically equivalent to the trisyllabic words seen above. On the other hand, in German determiners are either full forms, prosodically represented as a Foot, or they are reduced and cliticized to the previous word. The forms and prosodification of determiners in Spanish and German are given in (7) and (8), respectively.

(7) Articles in Spanish: forms and prosodification

	DEFINITE		INDEFINITE	
	SING.	PL.	SING.	PL.
MASC.	el	los	un	unos
FEM.	la	las	una	unas

Prosodification:  $_{PW}[el [{}_F'pero]]$        $_{PW}[la [{}_F'pala]]$

(8) Articles in German: forms and prosodification (see Wiese 1996: 250)

	DEFINITE			INDEFINITE		
	FULL FORMS					
<u>Sg.</u>	MASC.	FEM.	NEUT.	MASC.	FEM.	NEUT.
NOM.	der	die	das	ein	eine	ein
ACC.	den	die	das	einen	eine	ein
DAT.	dem	der	dem	einem	einer	einem
GEN.	des	der	des	eines	einer	eines
<u>Pl.</u>						
NOM.	die					
ACC.	die					
DAT.	den					
GEN.	der					
	REDUCED FORMS					
ACC.	auf $\underline{s}$	(auf das)	NOM./ ACC.	[ $\eta$ ]		(ein)
ACC.	an $\underline{s}$	(an das)	NOM./ ACC.	[ $n\grave{a}$ ]		(eine)
ACC.	in $\underline{s}$	(in das)	ACC.	[ $n\grave{a}n$ ]/[ $\eta$ ]		(einen)
DAT.	im	(in dem)	DAT.	[ $n\grave{a}m$ ]/[ $m$ ]		(einem)
DAT.	vom	(von dem)				
DAT.	beim	(bei dem)				
DAT.	zum	(zu dem)				
DAT.	zur	(zu der)				

Prosodification  $PW[F[der]]$   $PW[F[Mann]]$   $PW[F[die]]$   $PW[F[Klappe]]$  ]  
 $PPH[PW[F[noch]]$   $PW[F[ein]]$   $PW[F[Kipper]]$  ]]  
 $PPH[PW[F[noch]$   $\eta$ ]  $PW[F[Kipper]]$  ]]

It might be argued that German determiners are more complex in their variety of forms than the Spanish determiners, and that this results in earlier acquisition in Spanish than in German. That one of the crucial factors in these two courses of acquisition is the prosodic structure of determiners in the target language rather than their variety of forms, can be confirmed by looking at the acquisition of determiners in English. An analysis of Adam's, Eve's and Sara's productions (Brown 1973) show very different patterns of proto-article production. Whereas Eve's percentage of proto-article production reaches more than 20% at 1;6 and increases rapidly thereafter, Adam and Sara reach the 20% mark much later. The developmental curves for the three children are shown in Figure 7<sup>2</sup>. The form and prosodification of the target determiners are given in (9).

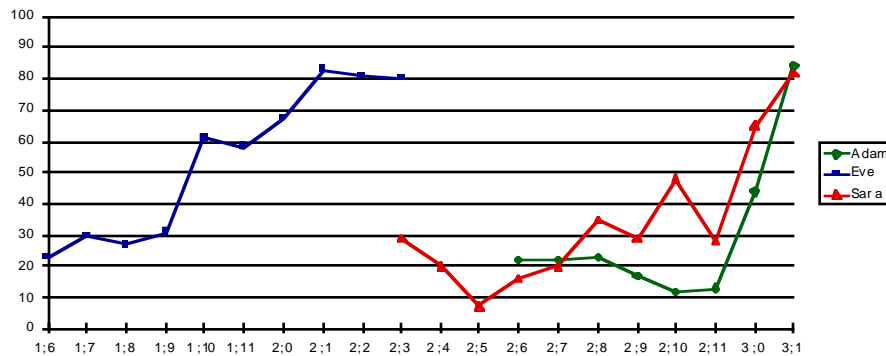


Figure 7. Percentage of Det + N produced by Adam, Eve and Sara

(9) Articles in English: forms and prosodification

DEFINITE	INDEFINITE
the	a

Prosodification:  $PW[the_F[dog]]$   $PPH[PW[F[feed\ the]]$   $PW[F[dog]]$  ]]

Clearly, English determiners are extremely simple in their form, and nevertheless, two out of three children acquire them even later than in German. The crucial factor for this dual pattern of acquisition, Eve's vs. Adam's and Sara's, lies in their dual

prosodification, either as proclitics or as enclitics. The proclitic prosodic character of the determiner, especially shown when the Det + noun appears in isolation, may lead some children to early acquisition. On the other hand, its enclitic status within larger utterances, especially when preceded by a monosyllabic Foot, may lead other children to not produce determiners before the two-word stage. Further investigation of English-speaking children's early prosodic and morphological development is needed to explore these issues more fully.

#### 4. Conclusion

In this paper we have shown that grammatical function morphemes such as determiners exhibit crosslinguistic differences in the timing of their appearance in children's early speech productions. Interestingly, determiners begin to appear much early in Romance languages such as Spanish and Italian than they do in Germanic languages such as German and English. That is, the timing in the appearance of grammatical function morphemes such as determiners is not universal, as predicted by maturationalist approaches to grammatical function morphology (e.g. Radford 1990). Rather, the relative timing of their appearance is determined in part by how they are prosodified in a given language. Specifically, grammatical morphemes will appear so long as they meet the prosodic constraints of the child's grammar at a given point in development. This means that children may have a grammatical awareness of determiners in Germanic languages long before they actually produce them. This is consistent with Demuth's (1994) proposal that certain grammatical function morphemes are 'phonologically underspecified' - that is, available to the syntax, but not yet phonologically realized. We therefore propose that the omission of certain grammatical morphemes in children's early grammars is subject to prosodic constraints similar to those that are operative on monomorphemic words.

If our notion of prosodic constraints on morphological development is correct, we should then be able to make predictions regarding the appearance of grammatical morphemes in a variety of languages. As a prerequisite we need to know about 1) the prosodic constraints operating on children's monomorphemic words, and 2) how grammatical function morphemes are prosodified in a particular language. Once both of these are known, we can begin to investigate the development of grammatical morphology more systematically, and to explore the phonological and syntactic constraints on how they begin to develop. In this paper we have shown how that development differs for the Germanic and Romance languages investigated here. However, given the different prosodic structures of Romance languages such as Portuguese, French, Catalan or Romanian, and of Germanic languages such as German, English, Dutch, Swedish or Icelandic, we might expect somewhat different courses of development. Interestingly, Santlemann (1998) shows that children acquiring Swedish, with both prefixal and suffixal determiners, acquire the latter much earlier than the former, providing further evidence for prosodic constraints on the emergence of early grammatical morphemes.

## Notes

<sup>1</sup>These data stem from the projects on phonological acquisition, BIDS and PAIDUS, conducted in Hamburg by the first author with the support of the DFG. They consisted of nine longitudinal studies of German (5 children from Hamburg) and Spanish (4 children from Madrid), from babbling to about 3 years of age.

<sup>2</sup>We thank Jim Morgan for kindly providing the statistics for this graph.

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