

Prosodic Licensing of Determiners in Children's Early French

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1. Introduction

It is well known that children's production of grammatical morphemes is variable. This variability has been attributed (for example) to children's limited processing capacity (e.g., Bloom, 1990), to the maturation of syntactic representations (e.g., Radford, 1990; Rizzi, 1993/1994; Wexler, 1994), to constraints on the interpretation of grammatical morphemes (e.g., Pérez-Leroux & Roeper, 1999; Schafer & de Villiers, 2000), and to prosodic constraints on children's early outputs (e.g., Demuth, 1992, 1994; Gerken, 1994, 1996; Lleó & Demuth, 1999). The latter is the focus of the present study.

Previous research has shown that early grammatical morphemes are prosodically licensed as part of the foot (for a review, see Demuth, this volume). For example, using an elicited-production task, Gerken (1996) found that early English determiners are produced more often when following monosyllabic verbs than when following multisyllabic verbs, as illustrated in (1) (from Gerken, 1996: 688). Similar findings were recently reported by Demuth, McCullough, and Adamo (in press) in their longitudinal study of four children acquiring English.

- (1) a. He [kicks the]_{Ft} [pig]_{Ft}.
b. He [catches]_{Ft} (the) [pig]_{Ft}.

Since English has a trochaic (i.e., strong-weak) foot (e.g., Halle & Vergnaud, 1987; Hayes, 1995), early English determiners cannot occupy the first syllable of the foot headed by the noun (e.g., *pig*). However, they can occupy the second syllable of the preceding foot when it is monosyllabic (e.g., *kicks*). The asymmetry found in the production of determiners following mono- and multisyllabic verbs then suggests that determiners are subject to prosodic constraints which license their presence inside but not outside the foot.

The analysis of early determiners as foot-internal makes one crucial prediction: their occurrence should vary in accordance with the foot shape of the language being acquired. Thus, in languages with an iambic (i.e., weak-strong) foot such as French (e.g., Charette, 1991; Scullen, 1997), early determiners should be realized as the first syllable of the foot headed by the noun. As a result, determiners preceding monosyllabic nouns should be produced earlier and to a greater extent than determiners preceding multisyllabic nouns, as illustrated in (2).

- (2) a. Il attrape [le chat]_{Ft}.
'He catches the cat.'
b. Il attrape (le) [chapeau]_{Ft}.
'He catches the hat.'

The present study tests this prediction: it examines the development of early French determiners with the aim of providing cross-linguistic evidence for the prosodic licensing of early grammatical morphemes inside but not outside the foot. Prosodic constraints, we will demonstrate, not only account for a large percentage of the variability in determiner production (hence, suggesting that syntactic competence may come earlier than previously thought), they also provide a framework for explaining individual variation.

The paper is organized as follows: in Section 2, we review some of the literature on the acquisition of French determiners and propose a prosodic analysis of early French determiners; in Section 3, we outline the methodology of the study; in Section 4, we present its results; in Section 5, we discuss the implications of our findings; and in Section 6, we conclude the paper.

2. French Determiners

2.1 Previous Research

Much of the previous research on early French has shown a word-shape effect on children's production of determiners. For example, Veneziano and Sinclair (2000), who investigated the nature of filler syllables in the longitudinal data of a French-acquiring child from Geneva (age 1;3–1;10, 2;2), found that the child produced many more prenominal fillers with monosyllabic nouns than with multisyllabic nouns. Similarly, Bassano and Maillachon (2005), who conducted a cross-sectional study with French-acquiring children from Paris (ages 1;6, 2;6, and 3;3), found that 1;6-year-old children produced significantly more determiners with monosyllabic nouns than with multisyllabic nouns. In her study of a French Canadian child, Max (age 1;9–2;3) (Plunkett, 2002), Tremblay (2006) also found that determiners were produced earlier and to a greater extent with monosyllabic words than with multisyllabic words. Similar findings were reported for late-acquiring children who received cochlear implants (Hilaire, Régol, & Jisa, 2002). These findings provide support for the claim that early determiners are prosodically licensed inside but not outside the foot.

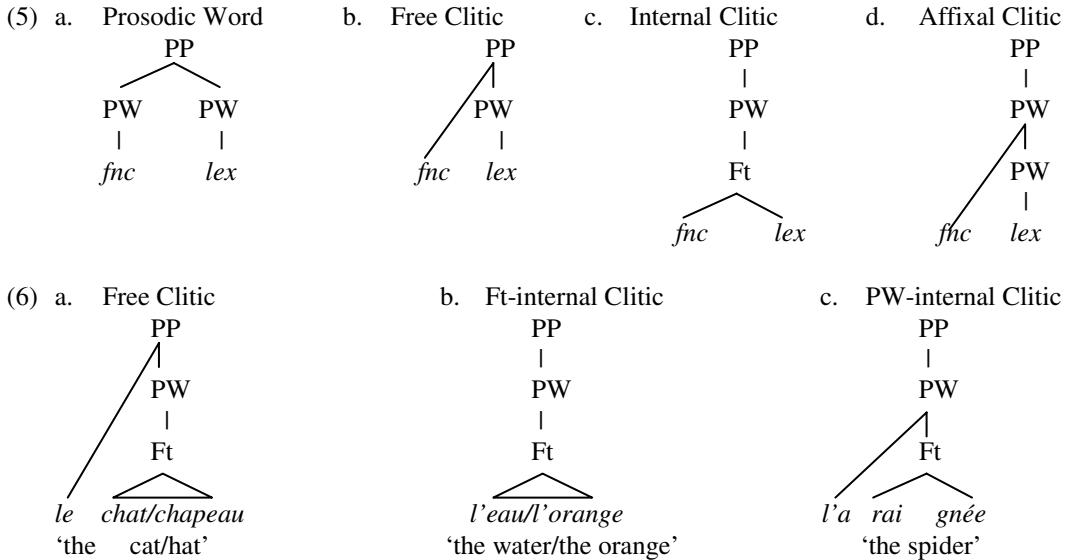
2.2 Analysis of (Early) French Determiners

In order to explain the word-shape effect found in children's production of French determiners, we refer to the Prosodic Hierarchy partially represented in (3) (McCarthy & Prince, 1986; Nespor & Vogel, 1986). For the purpose of this study, we assume that French has an iambic foot (4) (Charette, 1991; Scullen, 1997), where *w* represents weak (or unstressed) and *S* strong (or stressed) syllables.

(3)	Phonological Phrase (PP)	<i>the old banana</i>
	Prosodic Word (PW)	<i>banana</i>
	Foot (FT)	<i>nana</i>
	Syllable (σ)	<i>na</i>

(4)	Ft	
	\swarrow \searrow σ σ	
	<i>w</i> <i>S</i>	
	<i>ʃa</i> <i>'po</i>	<i>chapeau</i> 'hat'

According to Selkirk's (1996) typology, function words can be prosodified as prosodic words, free clitics, internal clitics, or affixal clitics, presented schematically in (5), where *func* represents function words and *lex* lexical words. Target-like (i.e., adult) French determiners are typically assumed to be free clitics (5b) (Goat & Buckley, 2006): the determiner is prosodified outside the PW and attached directly to the PP. This representation, however, can only apply to determiners preceding consonant-initial nouns. Determiners preceding mono- and disyllabic vowel-initial nouns should be represented as foot-internal, and those preceding larger vowel-initial words as PW-internal, because in both cases the determiner must be syllabified with the following vowel. This gives rise to the representations in (6) for target-like French determiners.



We hypothesize that early French determiners are not represented as free clitics (5b, 6a), but as internal clitics (5c, 6b–c). This hypothesis is based on two facts: (i) there is considerable cross-linguistic evidence that early grammatical morphemes are licensed first as part of the foot (see also Demuth, this volume), and (ii) foot-internal clitics are present in the adult input that French-acquiring children hear (6b). Given the presence of PW-internal clitics in the adult input (6c), we also anticipate that children might go through an intermediate stage in which they prosodify determiners PW-internally. Eventually, as prosodic structure becomes more complex, French determiners should take the representation of free clitics (5b, 6a).

Goad and Buckley (2006) explored word-minimality effects in the data of a French Canadian child, Clara (Rose, 2000). They claim that Clara's early monomoraic words exhibit compensatory lengthening, thus forming a binary foot (e.g., [ne:], [lɔni] (*le nez* 'the nose')). As a result, they argue that Clara's early determiners are prosodified as free clitics rather than as internal clitics. If this analysis is correct, then there should be no difference between Clara's production of determiners with mono- and disyllabic words. It is clear from their results, however, that Clara's determiners appear earlier and to a greater extent with monosyllabic words than with disyllabic words. The observed asymmetry therefore remains unexplained.

The present study explores possible prosodic explanations for the variable production of determiners by two French-speaking children from Lyon. To our knowledge, no longitudinal study has yet examined the development of determiners by children acquiring European French. We present longitudinal data from two children in order to distinguish general developmental path from individual variation, with the aim of determining if prosodic constraints can account for both.

3. Method

3.1 Participants

The participants in this study are two normally-developing children from the Lyon corpus (<http://childevs.psy.cmu.edu/data/Romance>): Tim (1;5–2;3) and Marie (1;6–2;5). The children had no diagnosed neurological, motor control, language, or hearing deficits at the time of the recordings, and French was the only language they heard in their environment. Their ages and corresponding word-based Mean Lengths of Utterance (MLUs) are provided in Table 1.

Table 1. Participants' Ages and MLUs

Age	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0	2;1	2;2	2;3	2;5	
MLU	Tim	1.24	1.45	1.35	1.30	1.71	1.80	2.16	2.13	1.93	--	2.61	--
	Marie	--	1.44	1.37	1.78	1.41	2.06	2.03	2.20	2.34	2.34	--	3.13

3.2 Data Collection and Transcription

The data were collected by members of the Dynamique du Langage at the University of Lyon 2 in Lyon, France. The children and their parents (usually the mother) were video-recorded in their homes in Lyon for approximately one hour every two weeks. The research assistant normally left after setting up the recording equipment to ensure that child-parent speech interactions would be natural.

The video recordings were then downloaded onto a computer, and both child and parent utterances were orthographically transcribed by trained transcribers of the Dynamique du Langage at Lyon 2 using CHILDES conventions (MacWhinney, 2000). The child speech was also phonetically transcribed using broad phonemic transcription. A combination of linguistic context, phonetic match, and visual information from the video were used to identify the child's target words. Only the target words for which the transcriber had at least a 95% confidence level were included in the analyses. A second transcriber phonetically recoded 10% of each child's utterances for each 1-hour session. The average between-coder reliability was 91.42% for Tim and 89.3% for Marie.

3.3 Coding Procedures

We identified and extracted from the data all instances of nouns (e.g., *le chat* 'the cat') and nominal adjectives (e.g., *le gros* 'the big one') that required a determiner in the adult grammar. Excluded from the analyses were nouns and nominal adjectives that did not require a determiner, noun phrases in which the noun or nominal adjective was unclear, and instances in which it was not clear if what preceded the noun or nominal adjective was a determiner. Repetitions were counted once for every different phonetic realization. All French determiners (e.g., definite, indefinite, possessive, etc.) were included in the study.

Determiners were coded as target-like if their segments were phonologically accurate. Prenominal vowels which cliticized onto the noun (i.e., weak vowels not separated from the noun by a pause), including CV determiners whose consonant had been dropped and the nasal consonants [n] and [m], were classified as determiner fillers if the context provided clear evidence that they were instances of determiners (e.g., [ə'pul] for /yn'pul/ *une poule* 'a-fem.sg. hen' (Tim, 1;8); [a'liv] for /œ'liv_R/ *un livre* 'a-masc.sg. book' (Marie, 2;2)). All other CV(C) determiners with one (or more) inaccurate segment(s) were coded as non-target-like determiners (e.g., [lɔ'li] for /lɔ'li/ *le lit* 'the-masc.sg. bed' (Tim, 1;10); [do'le] for /dy'lɛ/ *du lait* 'some-masc.sg. milk' (Marie, 2;2)). Target-like, non-target-like, and filler determiners are collapsed in the analyses below, because they behave in the same way.

French has a process of *liaison* in which the final latent consonant of function words is realized when the initial segment of the following content word is a vowel (e.g., *les années* /leza'ne/ 'the-pl. years'). This can cause segmentation problems with children acquiring the language. For example, a few nouns and nominal adjectives in Tim's and Marie's data consistently showed *liaison* despite the absence of a determiner (e.g., [not] for /œ'notr/ *un autre* 'another one' (Tim, 1;10; Marie, 1;11)). Because these words appeared to have been lexicalized with the word-initial consonant, they were not counted as instances of determiners unless they alternated with the vowel-initial form. Similarly, determiners preceding vowel-initial nouns and nominal adjectives (e.g., *l'eau* [lo] 'the-sg. water' (Tim, 1;6); *d'autres* [dot] 'some more' (Marie, 1;9)) were excluded from the analyses unless they alternated with bare vowel-initial nouns or nominal adjectives, or with another determiner.

4. Results

4.1 General Developmental Path

In this section, we investigate whether prosodic constraints can explain the general developmental path that French-acquiring children follow in their determiner production. Figure 1 shows Tim's and Marie's percent realization of determiners in obligatory contexts. The denominators on which the percentages are based (i.e., the numbers of nominals requiring a determiner) are provided in Appendix I. As can be seen from the results, Tim's determiner production hovers around 20% between 1;5 and 1;9, but it increases gradually thereafter and reaches 81% by 2;3. Marie's determiner production is initially much higher, reaching 70% at 1;8 and 89% by 2;5. However, she also exhibits a U-shaped

development, producing only 35% of all required determiners at 1;11. We return to this U-shaped development in Section 5.

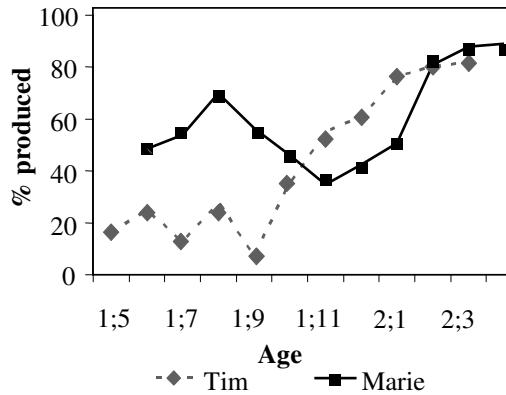


Figure 1. Percent realization of determiners

To establish if early French determiners are prosodified as part of the foot, we examined the percent realization of children’s syllabic determiners (i.e., determiners containing a vowel) with mono-, di-, and trisyllabic (non-truncated) nominals. Figures 2 and 3 show Tim’s and Marie’s percent realization of determiners by word shape, respectively. The denominators on which the percentages are based (i.e., the numbers of consonant-initial nominals requiring a determiner) are provided in Appendix II. Tim’s results show a significant asymmetry between the total number of determiners produced with monosyllabic versus disyllabic words ($\chi^2=129.28, df=1, p<.001$), monosyllabic versus trisyllabic words ($\chi^2=91.33, df=1, p<.001$), and disyllabic versus trisyllabic words ($\chi^2=11.97, df=1, p<.001$). Marie’s determiner production is very similar, also showing a significant asymmetry between the total number of determiners produced with monosyllabic versus disyllabic words ($\chi^2=196.70, df=1, p<.001$), monosyllabic versus trisyllabic words ($\chi^2=117.16, df=1, p<.001$), and disyllabic versus trisyllabic words ($\chi^2=10.08, df=1, p<.001$). These asymmetries are exemplified in (7)–(8).

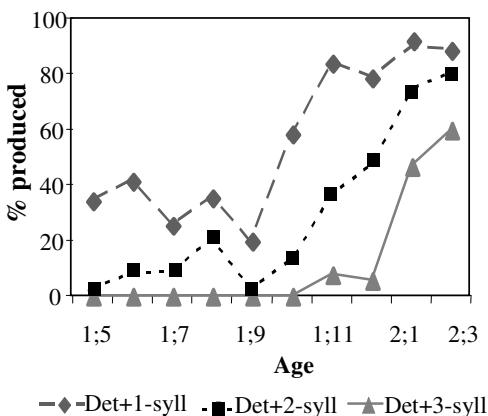


Figure 2. Tim’s determiners by word shape

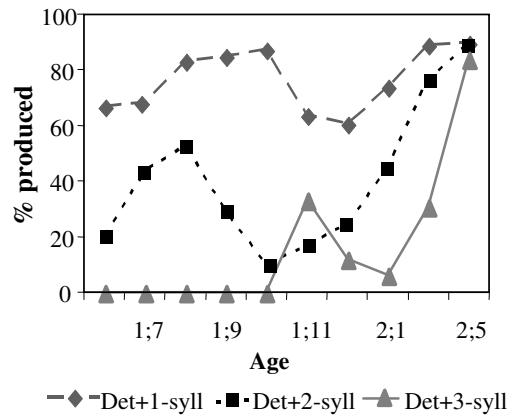


Figure 3. Marie’s determiners by word shape

	<i>Noun Phrase</i>	<i>Target</i>	<i>Output</i>	<i>Gloss</i>	<i>Child</i>	<i>Age</i>
(7) a.	le chien	/lə'ʃjɛ̃/	[e'ʃjɛ̃]	'the dog'	Tim	1;5
b.	(le) micro	/ləmi'kʁo/	[i'kʁo]	'the microphone'	Tim	1;5
c.	les souris	/lesu'ʁi/	[lesu'ʁi:]	'the mice'	Tim	2;1
d.	(la) coccinelle	/lakɔksi'nɛl/	[kusi'nɛl]	'the ladybug'	Tim	2;1
(8) a.	la pomme	/la'pɔm/	[a'pa:]	'the apple'	Marie	1;6
b.	(le) bateau	/ləba'to/	[ba'to]	'the boat'	Marie	1;6
c.	les bébés	/ləbe'be/	[ləbe'be]	'the babies'	Marie	1;10
d.	(la) mandarine	/lamãnda'ʁin/	[male'zin]	'the mandarin'	Marie	1;10

These findings confirm the previously-reported word-shape effects on early French determiners used with mono- versus multisyllabic words, suggesting that early grammatical morphemes are prosodically licensed first as part of the foot. Furthermore, they reveal an asymmetry between di- and trisyllabic words, suggesting an intermediate developmental stage during which French determiners are prosodically licensed outside the foot but not yet at the level of the PPh. Crucially, these findings indicate that despite initial differences in rates of determiner production, both children follow a very similar developmental path in which determiners are produced first with monosyllabic words, next with disyllabic words, and finally with trisyllabic words.

4.2 Individual Differences

In this section, we investigate whether prosodic constraints can explain the individual differences found in determiner production between Tim and Marie. As shown in Figure 1, between 1;5 and 1;11, Tim produces fewer determiners than Marie. We hypothesize that this difference is due to Tim's initial focus on a lower level of the Prosodic Hierarchy than Marie. If this hypothesis is correct, the following patterns should arise: (i) Tim should truncate more nouns than Marie, because his focus on lower-level prosodic structures should also constrain his noun production; but (ii) he should produce more coda consonants than Marie, because his focusing on a lower level of the Prosodic Hierarchy should result in a more reliable production of syllable structure. In other words, we predict that there should be a tight connection between the development of determiners and of lexical words for both children.

Beginning with our first prediction, Figure 4 shows Tim's and Marie's percent truncation of di- and trisyllabic nouns between 1;5 and 1;11, and Figure 5 shows their truncation rates thereafter. The denominators on which these percentages are based (i.e., the numbers of di- and trisyllabic nouns in the data) are reported in Appendix III. The results indicate that Tim truncates significantly more di- and trisyllabic nouns than Marie between 1;5 and 1;11 (disyllabic: $\chi^2=34.1$, $df=1$, $p<.001$; trisyllabic: $\chi^2=5.07$, $df=1$, $p<.02$), but not between 2;0 and 2;5. Examples of these truncations are provided in (9)–(10).

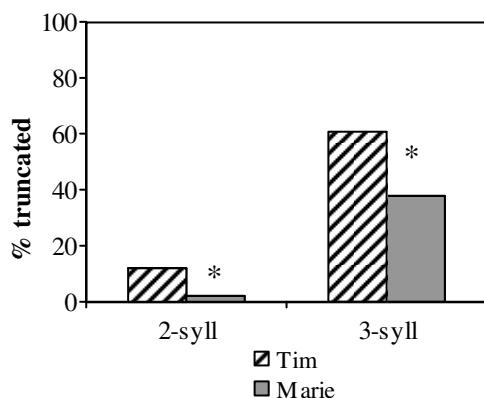


Figure 4. Percent noun truncation (1;5–1;11)

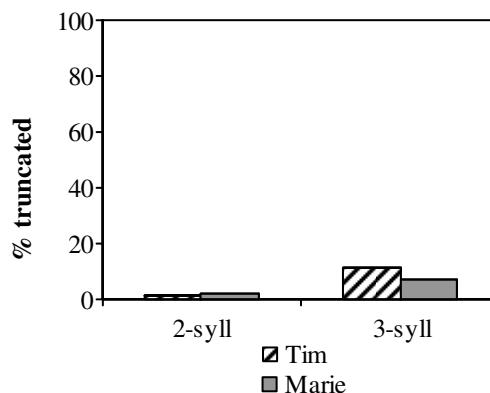


Figure 5. Percent noun truncation (2;0–2;5)

	<i>Noun</i>	<i>Target</i>	<i>Output</i>	<i>Gloss</i>	<i>Child</i>	<i>Age</i>
(9) a.	(cou)ronne	/ku'rɔn/	[rɔn]	'crown'	Tim	1;7
b.	(éti)quette	/eti'kɛt/	[kɛt]	'label'	Tim	1;7
c.	(cho)colat	/ʃoko'la/	[ko'la]	'chocolate'	Tim	1;7
(10) a.	(bou)ton	/bu'tɔ̃/	[tɔ̃]	'button'	Marie	1;10
b.	(papill)on	/papi'jɔ̃/	[jɔ̃]	'butterfly'	Marie	1;10
c.	(ca)cao	/kaka'o/	[ka'o]	'cocoa'	Marie	1;10

Turning now to our second prediction, Figure 6 shows Tim's and Marie's percent realization of coda for target words requiring a coda between 1;5 and 1;11, and Marie's coda production between 2;0 and 2;2 (Demuth, McCullough, & Kehoe, 2005). Tim's coda production was not analyzed after 1;11, because it was largely accurate by then. The denominators on which the percentages are based (i.e., the number of words requiring a coda in the data) are provided in Appendix IV. As predicted, the results indicate that Tim produces significantly more coda than Marie between 1;5 and 1;11 ($\chi^2=113$, $df=1$, $p<.001$), but not between 2;0 and 2;2, as the two children's coda production is largely accurate by then. Examples of words produced without a coda are provided in (11)–(12).

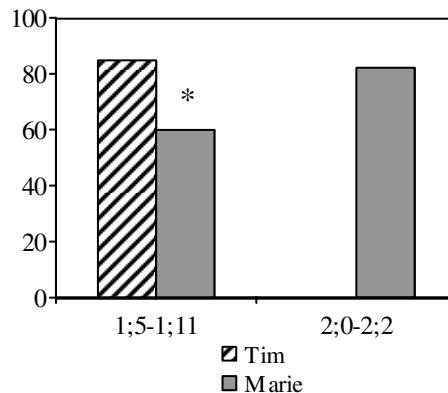


Figure 6. Percent coda realization (Demuth et al., 2005)

	<i>Word</i>	<i>Target</i>	<i>Output</i>	<i>Gloss</i>	<i>Child</i>	<i>Age</i>
(11) a.	crocodile	/kʁoko'dil/	[ʁɔ'wi]	'crocodile'	Tim	1;7
b.	canard	/ka'naʁ/	[a'na:]	'duck'	Tim	1;8
(12) a.	livres	/livʁ/	[li:]	'books'	Marie	1;9
b.	fleur	/flœʁ/	[blo:]	'flower'	Marie	1;11

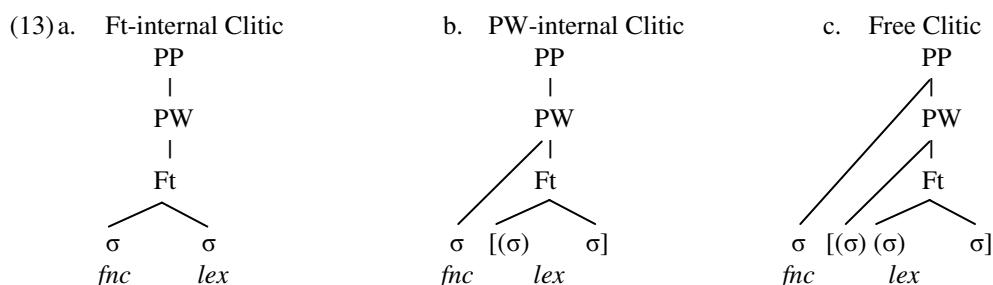
Hence, the above results indicate that Tim truncates significantly more nouns than Marie, but his production of syllable structure is more accurate than hers. These findings confirm our two predictions, suggesting a tight connection between the development of determiners and of lexical words.

5. Discussion

The results show that Tim and Marie follow the same general developmental path in which they produce determiners first with monosyllabic words, next with disyllabic words, and finally with trisyllabic words. This development can be captured in prosodic terms. We propose that the children's first determiners are foot-internal clitics (13a): they are prosodically licensed as part of the foot, resulting in determiner production with monosyllabic words, but determiner omission with di- and trisyllabic words. This is consistent with the cross-linguistic findings that early determiners are first licensed as part of the foot (see Demuth, this volume), and it is not very surprising given that

determiners preceding vowel-initial mono- and disyllabic words in French are prosodified as internal clitics in the adult input. The children then go through a second developmental stage in which determiners become PW-internal clitics (13b). This results in determiner production with mono- and disyllabic words, but determiner omission with trisyllabic words. This is also not surprising, given that determiners are prosodified as PW-internal clitics when preceding vowel-initial trisyllabic words in the adult input. Finally, determiners are prosodified as free clitics (13c) and attach directly to the PP, just like determiners preceding consonant-initial words in the adult grammar.

Recall that Marie also exhibits a U-shaped development in which her determiner production reaches its lowest rate at 1;11. A closer look at the results indicates that it is her determiner omissions with disyllabic words that largely result in the U-shaped development, suggesting that determiners are no longer prosodically licensed with disyllables. This means that in contrast to Tim, Marie appears to return to the analysis in (13a) after having adopted that in (13b). She eventually takes up the analysis in (13b) again as her determiners with disyllabic words increase at 2;1, and by 2;5 she adopts the target-like representation in (13c).



The results also reveal individual differences between the children's rates of determiner production, with Marie initially producing many more determiners than Tim. We propose that these differences are due to the two children focusing on different levels of the Prosodic Hierarchy, with Tim focusing on the foot and Marie focusing on the PW. For Tim, focusing on the foot results in determiner omission with words containing more than one syllable. It also results in the truncation of a large percentage of trisyllabic nouns, but in more accurate production of syllable structure. For Marie, focusing on the PW results in higher determiner production with mono- and disyllabic words. It also results in fewer truncations of trisyllabic nouns, but in less accurate production of syllable structure.

Given Marie's focus on the PW, one might wonder why she produces more determiners with monosyllabic words than with disyllabic words if she indeed has access to higher-level prosodic structure. The answer to this question lies partially in her U-shaped development. A closer look at the results indicates that Marie's decrease in determiner production with disyllables coincides with her increase in coda production (Demuth et al., 2005). We suggest that at 1;11, Marie has shifted her focus from the PW to the foot, resulting in more accurate production of syllable structure but higher rates of determiner omission with disyllabic words. The asymmetry between determiners produced with mono- and disyllabic words after 1;11 is the result of this prosodic shift. As for the corresponding asymmetry between 1;5 and 1;11, we suggest that Marie's representation of determiners before disyllabic words is less stable than her representation of determiners before monosyllabic words, resulting in higher omission of the former.

Finally, one could argue that the reported asymmetries between determiners produced with mono-, di-, and trisyllabic words are merely 'length effects' limiting the children's outputs to a number of syllables. Several arguments guard us against such an analysis, however. First, both children can produce determiner + disyllabic word sequences earlier than they can produce trisyllabic lexical words. This difference should not arise if the children's outputs were limited to a given number of syllables. Second, Marie's prosodic shift from longer to shorter determiner + lexical word sequences suggests that it is prosodic reorganization, rather than length effects per se, that drives the observed acquisition pattern. Finally, cross-linguistic evidence suggests that length effects cannot explain children's variable production of determiners. Specifically, Demuth et al. (in press) found that the contexts in which English-speaking children spontaneously produce determiners are longer than the contexts in

which they omit them. This is due in part to the fact that footed determiners in English prosodify with the preceding word (see Section 1). Hence, length effects are inadequate to explain the patterns found in children's early production of grammatical morphemes.

6. Conclusion

This study examined the development of early French determiners with the aim of providing cross-linguistic evidence for the licensing of early grammatical morphemes inside but not outside the foot. The results showed that French-speaking children produce determiners first with monosyllabic words, next with disyllabic words, and finally with trisyllabic words, suggesting that early determiners are prosodically licensed first as part of a binary foot, and only later as part of the PW and the PPh. The results also showed that the individual differences in determiner production between the two children could be accounted for in terms of differential access to the Prosodic Hierarchy. Our findings suggest a tight connection between the development of determiners and of function words, with determiners being produced with larger words as the prosodic structure of lexical representations becomes more complex. Prosodic constraints thus provide a model for exploring interactions at the prosody-morphology interface, and a principled explanation for some of the variable production of early grammatical morphemes.

Appendices

Appendix I. Number of nominals requiring a determiner

Age	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0	2;1	2;2	2;3	2;5
Tim	74	73	157	151	241	324	267	119	270	--	339	--
Marie	--	74	52	50	131	285	236	288	162	202	--	413

Appendix II. Number of consonant-initial nominals requiring a determiner by word shape

Age	1;5	1;6	1;7	1;8	1;9	1;10	1;11	2;0	2;1	2;2	2;3	2;5
1-syll	32	29	47	59	71	152	112	52	88	--	98	--
Tim 2-syll	40	39	91	79	143	144	133	36	135	--	164	--
3-syll	1	2	19	7	25	18	13	18	30	--	30	--
1-syll	--	45	22	30	66	121	77	137	42	64	--	158
Marie 2-syll	--	29	30	19	61	132	139	129	87	95	--	205
3-syll	--	--	--	1	4	19	9	25	16	13	--	25

Appendix III. Number of di- and trisyllabic nouns

Age	1;5–1;11	2;0–2;5
Tim 2-syll	676	356
3-syll	87	91
Marie 2-syll	427	544
3-syll	34	81

Appendix IV. Number of words requiring a coda

Age	1;5–1;11	2;0–2;2
Tim	838	--
Marie	570	584

Note

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