

**A Test Case for Markedness:
The Acquisition of Québec French Stress**

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Abstract:

This paper examines the arguments for and against final prominence in French as reflecting an iambic stress system versus phrase-final intonational prominence. The stress analysis is shown to be challenged, as French is not typical of iambic languages on any dimension, while the intonation analysis requires the postulation of a cross-linguistically marked prosodic hierarchy, one without foot and prosodic word. Although it is argued that the data slightly favor the stress analysis, it is proposed that they are sufficiently confounding for first language learners to converge on this grammar without a strong role assigned to Universal Grammar and markedness. All languages are assumed to have feet and prosodic words. If learners presume the existence of the foot, they should analyze the consistent part of the French system, final prominence, in terms of this constituent: as a right-aligned iambic foot. Markedness is then hypothesized to influence learners' decisions about the type of stress system to build: the domain in which stress is computed should be the prosodic word; the system should be quantity-sensitive; and footing should be iterative. Finally, word minimality should be respected. These predictions are tested against data from one learner of Québec French at ages 2;2,29 and 2;4,04. It is shown that this child's outputs largely support the position that, even in the face of uncertain evidence from the ambient language, markedness strongly influences early grammars on the prosodic dimension.

1. Introduction

It is generally agreed that the rightmost vowel in the phrase is prominent in French (Dell 1984). The formal status of this prominence, however, is disputed. Some have argued that prominence reflects stress: a foot is built at the right edge of the stress domain (e.g., Charette 1991). Others have argued that prominence is part of the intonation system (e.g., Jun & Fougeron 2000); unlike the vast majority of languages, French is a language without a foot and, thus, one without lexical stress.

Both analyses face obstacles. From a cross-linguistic perspective, the stress-based analysis is appealing; however, assuming that the French foot is iambic (see below), it is challenged by the observation that French does not appear to be typical of iambic languages on any dimension. The intonational prominence analysis also suffers in that it requires the postulation of a marked prosodic hierarchy for French, one without a foot (the domain in which stress is realized) and a prosodic word (the domain in which stress is computed). Under both interpretations of French prominence, the data are often puzzling, with the analysis suggested by one set of forms seemingly undermined by another set.

One can reasonably conclude, then, that first language learners are confronted with a challenging task in trying to sort out the formal properties of the French system of prominence. Although the input to which learners are exposed robustly evidences final prominence, it is no easy matter to arrive at an analysis that accounts for this pattern. In view of this, we test the hypothesis that early grammars are largely shaped by markedness considerations (e.g., Jakobson 1968, Gnanadesikan 2004); specifically, that in the face of uncertain data from the ambient language, early grammars reflect cross-linguistically favored properties. French final prominence poses a good test case for this hypothesis since the picture it paints for the child is no less complex than for the linguist.

Contra the work of Jun & Fougeron (2000) and others for French, as well as Özçelik (2011) for Turkish, we take the strong position that all languages have feet and prosodic words. We also assume that these constituents are available, as part of Universal Grammar (UG), from the onset of acquisition. We thus expect learners to presume the existence of the foot and to thereby analyze the *consistent* part of the French system – final prominence – in terms of this constituent, specifically, as an iambic foot right-aligned with some higher prosodic domain. Once an iambic foot has been posited, we expect markedness to influence children’s decisions about the type of stress system to be built, even in the face of puzzling data from the ambient language. We predict that the domain in which stress is computed will be the prosodic word rather than the phrase; and if it is an iambic foot that has been hypothesized by the child, we expect it to be quantity-sensitive, such that heavy syllables attract stress regardless of their position in the word, and we anticipate that footing will be iterative. Finally, we expect word minimality to be respected, such that prosodic words are minimally one binary foot in size.

In the interest of clearly identifying the predictions that our position makes, we contrast the nativist view that we adopt with an alternative at the other end of the theoretical spectrum, emergentism, that children’s grammars are solely shaped by the frequency of patterns in the input to which they are exposed. There is a growing literature on prosodic development arguing that frequency trumps markedness (e.g., Demuth & Johnson 2003, Zamuner, Gerken & Hammond 2005, Vigário, Freitas & Frota 2006). Whether the nature of the input is the sole factor responsible for the shapes of early grammars is typically not addressed in this literature; nevertheless, in the interest of having two theories that differ in strong and measurable ways, we will compare the markedness-driven nativist position with the input-driven emergentist position. As we will argue, under the emergentist view, it is not evident what type of prosodic system the French-exposed child would build because the evidence for one analysis over the other – final prominence as stress versus intonation – is largely inconclusive. Indeed, although we will ultimately see that some of the evidence available tips the balance in favor of a stress-based analysis for adult French, it may well be the case that the ambient data are sufficiently confounding for the learner to converge on this grammar without being bootstrapped into the analysis by UG and markedness.

We focus on data from one child learner of Québec French, Charlex, at ages 2;2,29 and 2;4,04. We argue that this child's patterns of behavior largely support the view that, even in the face of uncertain evidence from the ambient language, markedness influences the shape of early grammars on the prosodic dimension.

We begin, in section 2, by briefly comparing the two approaches to final prominence in French, the stress-based (i.e., foot-based) approach and the intonation-based approach. As we will ultimately conclude that the analysis of prominence as stress is best supported by the data, we focus on the evidence and challenges for this approach in section 3. In light of the complexity and extensive variability observed in the adult language, we then turn, in section 4, to present the predictions of the markedness-driven approach to child language that we adopt, with a focus on the specific predictions that this approach makes for the learner of French prominence. In section 5, we provide an exposition and analysis of the data from Charlex, which we argue largely support the hypothesis that markedness considerations play a significant role in shaping developing grammars.

2. Formal Approaches to French Final Prominence

In the following lines, we briefly compare the two main competing proposals for the analysis of final prominence in French, the intonation- and stress-based approaches. The first proposal we present characterizes French phrase-final prominence as part of the intonation system (Verluyten 1982, Mertens 1987, Delais 1994, Jun & Fougeron 2000, Féry 2001). Here, we focus principally on the analysis of Jun & Fougeron (2000). Jun & Fougeron's data come from Parisian French but it is evident from Thibault & Ouellet (1996) that their findings hold for Québec French as well. As shown in (1), Jun & Fougeron adopt the position of Prosodic Phonology that the utterance is hierarchically organized into a set of nested prosodic units.

- (1) Prosodic Hierarchy for French (Jun & Fougeron 2000):
- ```

Intonational Phrase
 |
Accentual Phrase
 |
Syllable

```

For Jun & Fougeron, the lowest prosodic unit in French (aside from the syllable) is the Accentual Phrase (AP) which can essentially be equated with the Phonological Phrase (PPh) in the more standardly-accepted hierarchy in (2) (research motivating all or part of the hierarchy in (2) includes Selkirk 1980, 1984, 1986, McCarthy & Prince 1986, Nespor & Vogel 1986, Hayes 1989, Peperkamp 1997). Comparing the two hierarchies reveals that there are no constituents in (1) that correspond to the prosodic word (PWd) or foot (Ft) in (2); that is, the claim is that French lacks both of these constituents, unlike true stress languages. This captures the observation that prominence in French seems not to be delimited by the word domain, in contrast to how it is realized in the typical stress system.

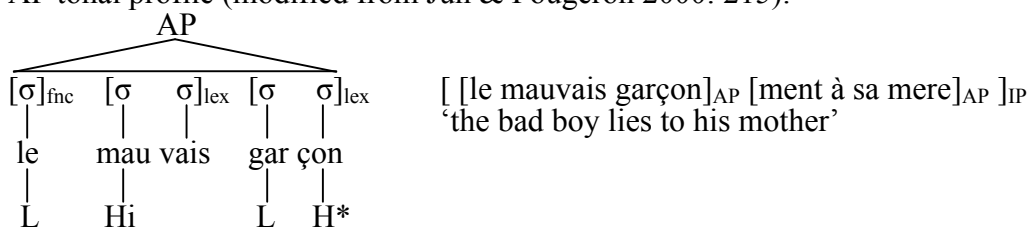
- (2) Standard Prosodic Hierarchy:
- ```

Intonational Phrase
  |
Phonological Phrase
  |
Prosodic Word
  |
Foot
  |
Syllable

```

Jun & Fougeron analyze French AP-level intonation as a sequence of two rising pitch movements: /LHiLH*/, as shown in the example of *le mauvais garçon* ‘the bad boy’ in (3).¹ Each high tone (H, Hi) is associated with a syllable that falls at or near the boundary of a morpho-syntactic unit. The primary accent, H*, has a demarcative function; it is linked with the final (non-schwa) vowel of the last lexical word in an AP. The initial Hi is generally realized on the first syllable of the first lexical word in an AP (Hirst & Di Cristo 1984, Delais 1994, Jun & Fougeron 2000), but it is optional; whether or not it is realized depends on a variety of factors including rhythm and speech style. The low tone (L) immediately preceding H* is usually located on the syllable before H* while initial L occurs on the syllable immediately preceding Hi, thus often falling on functional material. In a relatively long AP, like the one illustrated, the tone of unspecified syllables will be interpolated based on adjacent tones.

(3) AP tonal profile (modified from Jun & Fougeron 2000: 215):



Jun & Fougeron’s analysis elegantly captures the observation that prominence is generally not delimited by the word domain in French,² in contrast to how it is realized in typical stress systems. The principal problem is that, without a PWD and Ft, French has a highly unusual prosodic hierarchy, when viewed from a cross-linguistic perspective. The hierarchy in (2), by contrast, is deemed to be universal (Selkirk 1996: 189). In view of this, we turn to an alternative that is consistent with (2), that phrase-final prominence in French is formally stress.

The most commonly accepted view among researchers who have argued for a stress-based analysis of French final prominence is that an iambic foot is built at the right edge of the stress domain (e.g., Charette 1991, Weeda 1992, Scullen 1997, Armstrong 1999); see (4a).³ The only regular exception to this is when final schwa is realized in formal speech, (4b).⁴ (All transcriptions reflect Québec French.)

- (4) a. de(li'ka)_{Ft} *délicat* ‘subtle’
 ræ(mə'ne)_{Ft} *ramonais/ramonais* ‘sweep-IMP.SG’
 (fi'li)_{Fpə} *Philippe* ‘Philip’ (formal speech)

In the following sections, we will examine several types of evidence which bear on the question of whether French final prominence is formally intonational prominence or stress. As we will conclude that the analysis best supported by the data involves stress, we will discuss the evidence in these terms. This is also, of course, consistent with our starting position that the foot

¹ The example illustrates the tonal profile for an AP that is not final in the IP, as H* is not realized under certain conditions when an AP is final in an IP.

² We say ‘generally’ because we will demonstrate below, in sections 3.5 and 3.6, that there is some evidence for word-level prominence in French.

³ The position that French is trochaic has also been put forth in the literature, to capture the behavior of schwa in some contexts (e.g., Selkirk 1978, Montreuil 2002). In the interest of space, this proposal will not be addressed here. The most significant problem for a trochaic analysis is that it requires degenerate feet for CV-final words, e.g., [ramə(ne)]. In multisyllabic strings, this parse violates Hayes’s (1995) Priority Clause: “If at any stage in foot parsing the portion of the string being scanned would yield a degenerate foot, the parse scans further along the string to construct a proper foot where possible” (p. 95). Respecting the Priority Clause with trochaic feet would lead to incorrect selection of *[ra(məne)] over [ramə(ne)].

⁴ The reference to regular is made because stress retraction to the penult optionally occurs in Québec French under certain conditions. We discuss this in section 3.2.

and PWd are universally present in every language. It will be evident, nonetheless, that the case for a stress-based analysis is not easy to make. There is considerable complexity and variability in the adult language which presents a significant challenge for the linguist and thus presumably for the child, especially, we contend, one who is not guided by UG and considerations of markedness.

3. French Prominence as Stress?

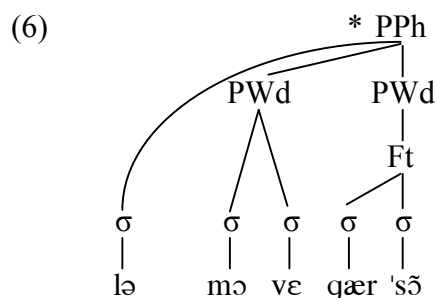
We begin this section with a set of puzzles: we show that French does not seem to resemble a typical stress system on any dimension (sections 3.1-3.4). We will observe, for example, that there is conflicting evidence concerning the domain in which stress is computed, as well as conflicting evidence about the role of syllable weight and the status of iterativity, both unexpected in an iambic language. In the latter half of the section, however, we turn to examine more compelling evidence in favor of French as a stress system, one in which stress is assigned, as expected, at the level of the PWd (sections 3.5-3.6).

3.1. Domain of stress

The first problem we address concerns the domain in which stress is computed. As mentioned above, the domain appears to be the PPh, not the PWd. The examples in (5) show that in phrases where optional secondary stress is not realized (see section 3.4), a perfectly common situation in French (experimentally confirmed by Post 2003), only the final word in a PPh receives stress; indeed, stress/pitch accent is obligatory only in this position (Verluyten 1982, Post 2000). Non-final lexical words can thus remain unstressed. A comparison of the examples in the first and second columns in (5) reveals that the situation is actually more complex than this. Although only one phrasing is possible for DPs with pre-nominal adjectives (see (5a)) (Nespor & Vogel 1986, Selkirk 1986, Verluyten 1982, Post 2000), for other constructions, including DPs with post-nominal adjectives (5b), more than one phrasing is possible. Phrasing varies depending on a number of factors including speech rate and style (Verluyten 1982, Post 2000, 2003),⁵ and the child must figure out that the source of the variation in (5) lies in the size and number of PPhs constructed rather than in whether or not each PWd in a PPh receives stress.

- (5) a. [lə mɔvɛ gær'sɔ̃]_{PPh} * [lə mɔ've]_{PPh} [gær'sɔ̃]_{PPh} *le mauvais garçon* 'the bad boy'
 b. [lə gær'sɔ̃ æʒi'te]_{PPh} [lə gær'sɔ̃]_{PPh} [æʒi'te]_{PPh} *le garçon agité* 'the fidgety boy'

Leaving aside the variation observed in the data, the presence of only one obligatory position of prominence in the PPh suggests the representation in (6) for *le mauvais garçon* in (5a). That is, it would appear that the PWd for *mauvais* contains no foot.⁶



⁵ Differences in phrasing can also reflect subtle differences in interpretation (e.g., Riegel, Pellat & Rioul 1994).

⁶ Foot headedness in representations is indicated by a vertical line from σ to Ft; an oblique line marks the dependent.

The problem is that this structure does not respect the principle of Headedness. The definition of Headedness in (7) is taken from Selkirk (1996: 190).

- (7) Headedness:
Any C^i must dominate a C^{i-1} (except if $C^i = \sigma$)

In the present context, Headedness ensures that every PWd contain at least one Ft, a requirement that *mauvais*, as represented in (6), clearly does not meet.

In short, examples that contain more than one PWd but only one position of prominence could lead the child whose grammar is shaped solely by the ambient input to conclude that French is not a stress language and that the foot and possibly PWd play no role in the language. We revisit the question of the domain in which stress applies shortly.

3.2. Quantity sensitivity

Another set of problems for the analysis of French prominence as stress is that the language does not resemble a typical iambic system on any dimension. The canonical iambic system builds quantity sensitive feet iteratively from the left edge (Hayes 1995). French, by contrast, typically builds a single foot at the right edge, as the examples in (8) show.

- (8) $[la [termin\sigma(1\sigma^3i)_{Ft}]_{PWd}]_{PPH}$ *la terminologie* ‘the terminology’
 $[3\sigma [tele(f\sigma^2n\epsilon)_{Ft}]_{PWd}]_{PPH}$ *je téléphonais* ‘I telephone-IMP’

In this section, we focus on quantity sensitivity. French is often analyzed as a language without a weight contrast (e.g., Charette 1991, Bullock 1993) and, thus, for those who consider French to be iambic, as a language with even iambs, as the examples in (8) suggest. As we will see, however, there is evidence for a weight contrast in French. Thus, if French truly does have heavy syllables and if it is iambic, it must respect quantity sensitivity (Hayes 1995): when heavy syllables are present, they must attract stress; critically, they cannot appear in foot dependent position (but see footnote 12).

Québec French (and other dialects as well) does have long vowels and these syllables do attract stress (e.g., Walker 1984, Thibault & Ouellet 1996), as do closed syllables (Paradis & Deshaies 1990, Scullen 1997), suggesting that it is indeed quantity sensitive (Armstrong 1999). Assuming that it is (although we will return to this below), a significant challenge for the learner is that vowel length is variable and codas are variably moraic. This variability may suggest that heavy syllables can appear in foot dependent position which, in turn, may lead the child to question whether French is truly a stress language.

Although there is general agreement that Québec French has long vowels, there is no consensus on whether length is derived or underlying (which is presumably why all vowels are typically transcribed as short in the literature, a tradition that we follow). Most researchers accept that one vowel, /ɛ:/, is underlyingly long, given the existence of minimal pairs (e.g., [fɛ:t] *fête* ‘birthday’ vs. [fɛt] *faite* ‘done’).⁷ Disagreement on the status of length in the class of ‘intrinsically long’ vowels, the non-high tense vowels and nasal vowels in (9a), is due to the fact that, in some contexts, length is observed only variably. Length is assumed to be derived for some researchers (Walker 1984), underlying for others (Déchaine 1990, Paradis & Deshaies 1990; also Plénat 1987 on Standard European French), or derived for the oral vowels but underlying for the nasal vowels (Montreuil 1995, Armstrong 1999). The division between the intrinsically long and short vowels in (9) is most clearly seen in final closed syllables where the non-high tense vowels and nasal vowels are obligatorily realized as long (e.g., [tɑ:f] *tâche* ‘task’, [ʒɑ:t] *honte* ‘shame’; cf. [tæf] *tache* ‘stain’, [ɔt] *hotte* ‘basket’).^{8,9} Intrinsically long vowels

⁷ Note, though, that /ɛ:/ is virtually always realized as the diphthong [ai]; [ɛ:] is limited to highly formal registers.

⁸ Schwa is not included in the class of short vowels in (9b) because it is defective, either weightless (e.g., Hyman 1985, Scullen 1997) or featureless (e.g., Anderson 1982, van Oostendorp 1995).

(including /ɛ:/) do not appear as long in final open syllables, which will be returned to in section 3.3.1.

(9) a. Intrinsically long:

e	ø	o
		ɑ
ē	œ	ō
		ã

b. Short:

i	y	u
ɛ	œ	ɔ
æ~a		

Critical for the issue of quantity sensitivity, the vowels in (9a) are optionally long in non-final position (Walker 1984), especially in penultimate position (Thibault & Ouellet 1996) (e.g., [me:zɔ̃] ~ [mezɔ̃] *maison* ‘house’). High tense vowels also occasionally appear as long in this position (e.g., [by:ro] ~ [byro] *bureau* ‘office’), leading some researchers to include them in the class of intrinsically long (or lengthened) vowels (e.g., Déchaine 1990, Scullen 1997).¹⁰

What is critical for quantity sensitivity is that there should always a relationship between stress and length in non-final syllables: when the penult is long, (10a), stress should appear on that syllable; when the penult is short, (10b), stress should appear in final position.¹¹ (The reason why the final vowels in (10b) are transcribed as short is discussed below.) This is the position taken by Walker (1984) and Scullen (1997). On their view, the parses in (10c) with long vowels in penultimate position are ill-formed.

(10)	a.	[me:zɔ̃]	b.	[me'zɔ̃]	c.	?[me:zɔ̃]	<i>maison</i>	‘house’
		[zø:d̥zi]		[zø'd̥zi]		?[zø:d̥zi]	<i>jeudi</i>	‘Thursday’
		[kɔ̃:prɑ̃]		[kɔ̃'prɑ̃]		?[kɔ̃:prɑ̃]	<i>comprend(s)</i>	‘understand-SG’

Two parses could, a priori, yield the type of output observed in (10c). The first involves a right-aligned degenerate foot, [me:(zɔ̃)_{FT}]; this, however, violates Hayes’s (1995) Priority Clause (see footnote 3). The second would reveal that French is quantity insensitive, [(me:zɔ̃)_{FT}], where a heavy syllable appears in foot-dependent position. This is permissible in some trochaic languages but not, according to Hayes (1995), in iambic languages.¹² Problematically, parses like those in (10c) are considered by Thibault & Ouellet (1996) to be well-formed, perhaps even the norm. In their introduction to the phenomenon of pretonic lengthening, they state: “Generally, this lengthening does not provoke the perception of stress on the penultimate; most of the time, stress stays on the final syllable of the accent group” (p. 638).

If parses like (10c) truly exist, this is highly problematic for the child who is trying to build a stress-based analysis French final prominence. Even if such parses are absent, revealing that French truly is quantity sensitive, the challenge for learners is the variable input to which they

⁹ The short vowels in (9b) can be realized as long. Specifically, all vowels, aside from schwa, surface as long in word-final syllables closed by a lengthening consonant [v, z, ʒ, r] (e.g., [pir] *pire* ‘worse’). High tense vowels can sometimes appear long in other contexts as well; see below in the text.

¹⁰ However, these vowels do not surface as long in final closed syllables; instead they are realized as lax in this context (except before a lengthening consonant): e.g., [li] *lit* ‘bed’ vs. [lis] *lisse* ‘smooth’.

¹¹ Variation is also observed in words containing closed syllables in penultimate position leading Scullen (1997) and Armstrong (1999) to propose that codas are moraic in French. This is consistent with the finding of Paradis & Deshaies (1990) that the presence of a coda in non-final position enhances the perception of the syllable as stressed (e.g., [parti] *parti* ‘gone’).

¹² This position has been challenged by Altshuler (2009) with data from Osage. However, languages where iambs are quantity-insensitive seem to be few and far between.

will no doubt be exposed. If the child were *robustly* exposed to data where stress shifts according to syllable weight as in (10a), this would be a good cue that French is a stress language.¹³ In the presence of variation, however, the evidence for stress is significantly weaker.

One further process that could bolster the stress-based analysis of French prominence is phrase-final lengthening, on the assumption that it formally involves iambic lengthening, that is: $\dots(\sigma_{\mu}'\sigma_{\mu})_{\text{Fi}}]_{\text{PPH}} \rightarrow \dots(\sigma_{\mu}'\sigma_{\mu\mu})_{\text{Fi}}]_{\text{PPH}}$. We suggest, though, that this is not the correct analysis and that phrase-final lengthening is a phonetic effect only. This is why the vowels in (10b) are transcribed as short. If this process involved the addition of a mora to short vowels, the presence of stress shift to the penult in (10a) would be entirely unexpected as the last syllable would form a binary foot on its own; that is, $[(\text{me}'z\tilde{\sigma})_{\text{Fi}}]_{\text{PPH}}$ should always be selected as optimal (cf. $*[(\text{me}')_{\text{Fi}}z\tilde{\sigma}]_{\text{PPH}}$).

A comparison of the results from Delattre's (1966) phonetic study on European French and English provide further evidence that French phrase-final lengthening does not formally involve the addition of a mora. In English, where final stressed syllables are indisputably phonologically bimoraic, final stressed open syllables are considerably longer than they are in French (mean ratio French to English: 1:1.36); further, the within language ratio for final stressed open syllables to non-final unstressed open syllables is 1:2.78 in English, whereas, in French, it is only 1:1.79.¹⁴ Delattre's results are consistent with what is reported in Beckman (1986) and Ladd (1996) as well, that duration is not an important cue to phrase-final position in French. Assuming that Québec French parallels European French in this respect, we conclude from this that, although both French and English evidence phonetic final lengthening, strong support for final stressed syllables as bimoraic is only present in English. We touch on this issue again in the following section.

3.3. *Minimality conditions*

In the preceding section, we observed that stress shift triggered by weight would, in principle, be a good cue for the learner that French final prominence formally involves stress. Aside from the questionable data in (10c), the problem is that heavy syllables are only variably present, thereby making the evidence for the foot less reliable. In this section, we turn to other issues tied to weight, specifically minimality conditions which, if satisfied, would reveal evidence for a binary foot. As we will see, however, word minimality is not respected in Québec French. There is some evidence for a minimality condition holding at the level of the phrase, but it does not operate exactly as would be expected.

3.3.1. *Word minimality*

If final prominence reflects stress, then French must, of course, contain a foot, as per the prosodic hierarchy in (2). As (11) indicates, the well-formed foot is binary and we expect this constraint to be observed across languages, except in certain clearly defined environments.

- (11) Foot Binariness (e.g., Hayes 1981, 1995, Prince & Smolensky 2004):
Feet are binary at some level of analysis ($\sigma\sigma$ or $\mu\mu$).

One context where Foot Binariness should be relevant is in circumscribing the minimal word. If, in the unmarked case, every lexical word is a prosodic word (McCarthy & Prince 1993), then lexical words must be organized as per the hierarchy in (2). Since they must thereby contain a foot to satisfy Headedness in (7) and since feet must be binary as per (11), the minimal lexical word in a language should be one well-formed (i.e., binary) foot:

¹³ It should be pointed out, however, that penultimate 'stress' can also be accommodated within an analysis of French as having phrase-bound intonational prominence; see Thibault & Ouellet (1996).

¹⁴ Similar results are observed for closed syllables (see Delattre 1966: 186).

- (12) Word minimality:
The smallest lexical word in a language is one binary foot.

There are languages that permit no subminimal lexical words (e.g., English) and others that permit a handful of words with this profile (e.g., Spanish). What makes French stand out is that there is a considerable number of high frequency subminimal words, many of which are likely to be common in child-directed speech. French is not alone in this regard (see the discussion in Ota (2003) on Japanese), but in combination with the domain of prominence seemingly being the phrase, this could lead the child whose grammar is shaped only by the input to question whether French is truly a language with a stress foot. In other words, if the child were to assume that French is a language without a foot and that final prominence is part of the intonational system (as in the prosodic hierarchy in (1)), the child would have no expectations one way or the other about word minimality, since it applies to a constituent, the foot, that is absent from his or her grammar.

Surprisingly, vowels in final open syllables are short in (Québec) French (e.g., Walker 1984, Montreuil 1995; but cf. Déchaine 1990, Scullen 1997). Thus, although we saw that non-high tense vowels, as well as /ɛ:/, are obligatorily realized as long in final closed syllables, these vowels do not surface as long in final open syllables, contra the expectations of word minimality. For example, although [ɛ:] and [ɑ:] are clearly long in CVC words (compare [fɛ:t] *fête* ‘birthday’ vs. [fɛt] *faite* ‘done’; [pɑ:t] *pâte* ‘pastry’ vs. [pat] *patte* ‘paw’), these same vowels surface as short in word-final open syllables (e.g., [arɛ:te] *arrêter* ‘to stop’ vs. [arɛ], *[arɛ:] *arrêt* ‘stop’), critically even in monosyllabic words (e.g., [ɛ:t(r)] *être* ‘be-INF’ vs. [ɛ], *[ɛ:] *est* ‘be-3SG’; [ma] *ma* ‘my-FEM’ vs. [mɑ], *[mɑ:] *mât* ‘mast’) (Walker 1984).

In short, although the distribution of long vowels in Québec French is largely variable, what is significant is that final open syllables always contain short vowels, whether or not the vowels appear as long or short in other contexts. If an open syllable is the only syllable in a word, then the word will be subminimal. Indeed, the examples in (13) of high-frequency words reveal that subminimal words are likely rampant in the ambient language to which children are exposed. Even if learners assume that the vowels in (13a) or (13a-b) are long in final position, the examples in (13c) show that clearly subminimal words are still common.¹⁵

- (13) a. Intrinsically long vowels:
- | | | | | | |
|------|-------------|----------|------|------------|----------|
| [ne] | <i>nez</i> | ‘nose’ | [pø] | <i>peu</i> | ‘little’ |
| [so] | <i>seau</i> | ‘bucket’ | [ba] | <i>bas</i> | ‘low’ |
- b. High tense vowels:
- | | | | | | |
|------|-------------|--------|------|------------|---------|
| [li] | <i>lit</i> | ‘bed’ | [ʒy] | <i>jus</i> | ‘juice’ |
| [du] | <i>doux</i> | ‘soft’ | | | |
- c. Lax vowels:
- | | | | | | |
|------|-------------|--------|-------|-------------|--------|
| [lɛ] | <i>lait</i> | ‘milk’ | [fɛ] | <i>fait</i> | ‘done’ |
| [a] | <i>chat</i> | ‘cat’ | [bra] | <i>bras</i> | ‘arm’ |

In sum, there is ample evidence available to the child that word minimality is not respected in French.¹⁶ Since this, in turn, means that Foot Binarity need not be respected, along with the other

¹⁵ The absence of Cœ and Cɔ words in (13c) is somewhat surprising on the view espoused here. Indeed, /œ, ɔ/ raise to [ø, o] in final position: [vœl] *veulent* ‘want-3PL’, [vø], *[vœ] *veut* ‘want-3SG’ (example from Anderson 1982). Cœ does occur in stressed function words: [dɔnlœ] *Donne-le!* ‘Give it!’. (Although Scullen (1997:30, fn22) states that [œ] often surfaces as [ø] in this context, this is not the case in Charlex’s dialect.) Concerning Cɔ, the words that we have transcribed with [a] may be produced with [ɔ] in informal registers in Québec French.

¹⁶ The syntactic properties of French may seem to provide a solution to the word minimality problem. If NPs are predicates in Romance and cannot surface as arguments unless the category Det is projected (Chierchia 1998), the obligatory determiner could be organized internal to the foot and Foot Binarity would be satisfied: (dzy le)_{F1} *du lait*

evidence so far examined, the child whose grammar is solely shaped by the input may question whether French is truly a language with a stress foot.

3.3.2. *Phrase minimality*

Before leaving the subject behind, it is worthwhile to consider that perhaps word minimality is not relevant for French because the PWd is not the domain in which stress is computed. Indeed, Côté (2007) argues that variable schwa deletion in French is, in part, tied to *phrase* minimality: schwa deletion is near-impossible when a phrase contains only one other vowel, as phrases must be minimally bisyllabic; compare (14a-b).

- (14) a. [dəlo]_{PPH}, ??[dlo]_{PPH} *de l'eau* ‘some water’
 b. [d(ə)lodas]_{PPH} *de l'audace* ‘some audacity’

If the phrase is the domain of stress assignment, an effect of this sort is presumably not unexpected. However, we have seen that one-syllable utterances, including monomoraic utterances (see footnote 16), are perfectly well-formed in French. Further, we must question why phrase minimality is sensitive to syllable count rather than to mora count. That is, although we have seen that vowels in final open syllables are short, if schwa is weightless in French (e.g., Hyman 1985, Scullen 1997), the well-formedness of bisyllabic [dəlo] is being determined as if the language were building even iambs, (σσ)_{Ft}, in contrast to the evidence provided for quantity sensitive feet in section 3.2.

In short, it is not clear what the child is to conclude from data of the sort in (14), in combination with the word minimality data in (13) on one hand and the quantity sensitivity data in (10) on the other. Minimally, the learner should be confused about the status and shape of the stress foot in French.

3.4. *Iterativity*

If the domain in which French stress is computed is truly the PPh, we do not expect footing to be iterative. As foot boundaries cannot cross word boundaries, *[[(σσ)_{Ft} (σ)_{PWd} [(σ)_{Ft} (σσ)_{Ft}]_{PWd}]_{PPH}, iterative footing would in effect remove all evidence for a domain distinction between the PWd and PPh as a new foot would be constructed at the right edge of every non-final PWd: [[(σσ)_{Ft}]_{PWd} [(σ)_{Ft} (σσ)_{Ft}]_{PWd}]_{PPH}. Perhaps not surprisingly, then, traditional views of French stress state that footing is not iterative (e.g., Fouché 1952). This position is adopted in more recent work as well (e.g., Charette 1991: 146 explicitly states that only one foot is built in the stress domain). This is presumably because parses such as those in (8), repeated below in (15), are perfectly well-formed.

- (15) [la [terminɔ(1ɔ'zi)_{Ft}]_{PWd}]_{PPH} *la terminologie* ‘the terminology’
 [ʒə [tele(fɔ'nɛ)_{Ft}]_{PWd}]_{PPH} *je téléphonais* ‘I telephone-IMP’

However, secondary stress is attested in (Québec) French although, like weight, it is variable; further, footing is not iterative in the conventional sense. Consider the examples in (16) (from Scullen 1997: 17, drawing on Déchaine's (1990) synthesis of Fónagy (1979) and Dell (1984)). The examples in (16a) look like right-to-left iterative footing. Those in (16b) show that not all

as in *Je dois acheter (*du) lait* ‘I need to buy (some) milk’. Some French child data are compatible with this view (see Veneziano & Sinclair 2000 and Demuth & Tremblay 2008). In the adult language, however, this solution can only hold for a subset of cases: even if the foot internal analysis of determiners is extended to other clitics (e.g., pronominal subjects followed by monosyllabic verbs: (tsy 'ri)_{Ft} *tu ris* ‘you-SG laugh’), it will not help when the determiner and subminimal noun are interrupted by an adjective (e.g., [lə pətʃi ('fa)_{Ft}] *le petit chat* ‘the small cat’), nor will it help explain the fact that monomoraic utterances are perfectly well-formed in conversational French, e.g., Speaker 1: *Vrai ou faux?* ‘True or false?’ Speaker 2: *Vrai.* [vrɛ] ‘True.’

tense vowels receive stress, which Scullen (1997) notes to be a problem for her view that these vowels are underlyingly bimoraic; we will return to these examples shortly. The four syllable examples in (16c) are consistent with an analysis of right-to-left iterative footing. However, the native speakers of middle-class Montréal French we consulted (individuals who speak the same dialect as Charlex) rejected these in favor of the forms in (17) where the first and last syllables are stressed, the same pattern observed in (16d). Fónagy (1979) refers to this pattern of prominence as an ‘accentual arc’.

- | | | | | |
|------|----|-------------------------------|--|-----------------------------------|
| (16) | a. | [deplɛ'zɑ̃t]
[kɔrdɔ'let] | <i>déplaisante</i>
<i>cordelette</i> | ‘unpleasant-FEM’
‘rope-DIM’ |
| | b. | [ɑ̃pli'tyd]
[opɛ'ra] | <i>amplitudes</i>
<i>opéra</i> | ‘amplitude-PL’
‘opera’ |
| | c. | [inɛspe're]
[sɑ̃timɑ̃'to] | <i>inespérée</i>
<i>sentimentaux</i> | ‘unhoped for’
‘sentimental-PL’ |
| | d. | [pɛrmisjɔ'ner]
[deodɔ'rɑ̃] | <i>permissionnaire</i>
<i>déodorant</i> | ‘soldier on leave’
‘deodorant’ |
| (17) | | [inɛspe're]
[sɑ̃timɑ̃'to] | <i>inespérée</i>
<i>sentimentaux</i> | |

The accentual arc pattern and right-to-left iterative footing make different predictions for longer words as well. The accentual arc pattern correctly predicts that there are never more than two positions of prominence in the stress domain. Thus, examples such as those in (18) cannot have the stress pattern predicted from iterative footing, (18b). Only the accentual arc pattern in (18a) is possible, that is, two positions of stress at the peripheries.

- | | | | | | | |
|------|----|--|----|---|---|-------------------------------------|
| (18) | a. | Accentual arc:
[kɔ̃presibili'te]
[aristɔteli'sjɛ̃] | b. | Iterative footing:
*[kɔ̃presi'bili'te]
*[a,ristɔ,teli'sjɛ̃] | <i>compressibilité</i>
<i>aristotélicien</i> | ‘compressibility’
‘Aristotelian’ |
|------|----|--|----|---|---|-------------------------------------|

Further, if secondary stress in French follows the accentual arc pattern, rather than having the properties of true iterative footing, then the inability of the medial tense vowels in (16b) to appear as stressed is as expected. The final element suggesting that French does not exhibit true secondary stress is that if the words in (16) are embedded in a longer phrase, they can no longer bear two stresses; see (19).¹⁷

- | | | | | |
|------|--|--|---|---|
| (19) | [kɔrdɔlet o'rɑ̃ʒ]pph
[deodɔrɑ̃ flɔ'ræ̃l]pph | *[kɔrdɔ'let o'rɑ̃ʒ]pph
*[deodɔ'rɑ̃ flɔ'ræ̃l]pph | <i>cordelette orange</i>
<i>déodorant floral</i> | ‘orange rope-DIM’
‘floral deodorant’ |
|------|--|--|---|---|

In short, French does not seem to exhibit true secondary stress, that is, iterative footing, counter to what is cross-linguistically favored for iambic systems. Instead, it (variably) opts for an accentual arc: stress at the peripheries. If the learner assumes that French prominence formally involves stress, the accentual arc pattern (thus excluding the pattern in (16c)) can be captured along the lines of Goad & Buckley (2006): an iambic foot is aligned with the right edge of the PPh; an optional trochaic foot is aligned with the left edge of the first PWd in the PPh.¹⁸

¹⁷ The parses with two word-final stresses, [kɔrdɔlet o'rɑ̃ʒ]pph and [deodɔrɑ̃ flɔ'ræ̃l]pph, are also well-formed (see, e.g., Post 2003).

¹⁸ This will not, however, capture the word-final stress pattern mentioned in footnote 17. Clearly, this must involve a different (competing) grammar, one where secondary stress involves a right-aligned iamb. As our point here is to show that the accentual arc pattern can indeed be expressed as stress, it is this pattern that we focus on.

Assuming that the left-aligned trochaic foot is a syllabic trochee, this yields the footings in (20). (Following Goad & Buckley, we assume that in three-syllable words containing light syllables like *opéra*, it is the obligatory iambic foot that satisfies Foot Binarity over the optional trochee.)

- (20) $[[(\text{o})(\text{pe}'\text{ra})]_{\text{PWd}}]_{\text{PPh}}$ *opéra*
 $[[(\text{ines})(\text{pe}'\text{re})]_{\text{PWd}}]_{\text{PPh}}$ *inespérée*
 $[\text{la} [(\text{k}\ddot{\text{o}}\text{pre})\text{sibi}(\text{li}'\text{te})]_{\text{PWd}}]_{\text{PPh}}$ *la compressibilité* ‘the compressibility’
 $[\text{yn} [(\text{k}\ddot{\text{o}}\text{rd}\ddot{\text{e}})\text{let}]_{\text{PWd}} [(\text{o}'\text{r}\ddot{\text{u}}\text{z})]_{\text{PWd}}]_{\text{PPh}}$ *une cordelette orange* ‘an orange rope-DIM’

Critically, the data examined in this section reveal that French stress is not iterative, counter to what is typically observed in iambic languages. Further, a foot-based analysis seems to require two different types of feet. Although similar situations have been observed for other languages (McCarthy & Prince 1990, van de Vijver 1998, Gordon 2002), it is important to point out that the profile of secondary stress exhibited in French is entirely consistent with Jun & Fougeron’s (2000) characterization of French prominence as intonation, a sequence of two rising pitch movements within the domain of the phrase, the first Hi of which is optional (see section 2). This should lead the child to further question the analysis of French prominence as foot-level stress.

3.5. Resolution of stress clash

Thus far, we have seen that the evidence for French prominence as stress is largely inconclusive. This should present a significant challenge for the learner. We turn now to examine two stronger pieces of evidence in favor of French as a stress system, with stress assigned at the level of the PWd, as expected from the prosodic hierarchy in (2).

The first involves the resolution of stress clash in compounds and DPs with attributive adjectives (see, e.g., Mazzola 1992, 1993, Hoskins 1993, Post 2000, 2003). When each element in the construction bears its own stress and the second element is monosyllabic, the normal pattern of final stress is interrupted as stress clash would otherwise result. Compare the compounded names *Marie-Christine* in (21a), where final stress on each constituent is perfectly well-formed, with *Marie-Rose* in (21b), where clash is resolved through leftward displacement of the initial stress (examples adapted from Mazzola 1993).¹⁹

- (21) Compounds:
 a. $[\text{ma},\text{rikris}'\text{tn}]$ *Marie-Christine*
 b. $[\text{mari}'\text{roz}], *[\text{ma},\text{ri}'\text{roz}]$ *Marie-Rose*

As each constituent in a compound forms a separate PWd (see (22)) and each constitutes a separate domain for stress assignment, the resolution of stress clash motivates the presence of word-level stress in French.

- (22) $[(\text{ma}'\text{ri})_{\text{Ft}}]_{\text{PWd}} + [(\text{'roz})_{\text{Ft}}]_{\text{PWd}} \rightarrow [[(\text{ma})_{\text{Ft}} \text{ri}]_{\text{PWd}} [(\text{'roz})_{\text{Ft}}]_{\text{PWd}}]_{\text{PWd}}$

The evidence is only variably present in the ambient input, however, as compounds can also contain only a single position of prominence (i.e., $[\text{marikris}'\text{tn}]$, $[\text{mari}'\text{roz}]$).

The evidence from DPs containing attributive adjectives is also revealing of PWd-level stress but it is presumably more difficult for the child to sort out because two phrasings are possible for DPs with post-nominal adjectives (see section 3.1). Consider first DPs with pre-nominal adjectives for which only one phrasing is possible (examples in (23) adapted from Post (2003)). As discussed earlier, only the final stress in a PPh is obligatory; all others are optional. Since DPs with pre-nominal adjectives are obligatorily parsed as one PPh, when each PWd bears

¹⁹ The discussion of the accentual arc pattern of secondary stress in section 3.4 predicts that $[\text{marikris}'\text{tn}]$ is also well-formed. Forms of this shape are indeed possible. Our point here, as well as in (23) below, is to show that, alongside $[\text{ma},\text{rikris}'\text{tn}]$, $*[\text{ma},\text{ri}'\text{roz}]$ is ill-formed.

stress, clash must be resolved; compare (23a) and (23b). Clash must similarly be resolved in DPs with post-nominal adjectives, but adjacent stresses are tolerated when DPs of this shape are parsed as two PPhs; compare (23c) and (23d).

- (23) DPs with pre-nominal adjectives:
- | | | | | |
|----|----------------------------------|---------------------------------|---------------------------|------------------|
| a. | [de 'ʒɔli 'ɛ:r] _{PPh} | *[de ʒɔ'li 'ɛ:r] _{PPh} | <i>des jolis airs</i> | ‘pretty tunes’ |
| b. | [de pø'tsit ã'fã] _{PPh} | | <i>des petits enfants</i> | ‘small children’ |
- DPs with post-nominal adjectives:
- | | | | | |
|----|--|---------------------------------|-----------------------|-------------------|
| c. | [ð 'vɛrʒe 'vɛ:r] _{PPh} | *[ð vɛrʒe 'vɛ:r] _{PPh} | <i>un verger vert</i> | ‘a green orchard’ |
| d. | [ð vɛrʒe] _{PPh} [vɛ:r] _{PPh} | | | |

The data in (23) provide evidence of PWD-level stress where the domain of clash resolution is the PPh. But aside from the child having to sort out why clash appears to be tolerated in (23d), the evidence for clash resolution will be present only variably in the input (similar to the case of the compounds in (22)), as single stress parses like [de ʒɔli 'ɛ:r]_{PPh} and [ð vɛrʒe 'vɛ:r]_{PPh} are perfectly well-formed. In fact, Post (2003) experimentally demonstrates that clash is often resolved through producing no secondary stress at all.

In sum, clash resolution in compounds and DPs with attributive adjectives provides sound evidence for PWD-level stress in French. Yet again, though, the evidence is present only variably in the input and the alternative phrasings for DPs with post-nominal adjectives pose an additional challenge.

3.6. *Schwa realization in compounds*

Returning to compounds, constraints governing schwa realization at the end of the first constituent provide further evidence for PWD-level stress in French. In addition, they reveal that Foot Binariness (bisyllabic) is satisfied whenever possible.

As Charette (1991) points out, orthographic schwa (*e*) is overtly realized when the second constituent in a compound is monosyllabic and when *e* is preceded by a cluster; compare (24d) with (24a-c). When neither of these conditions is satisfied, (24a), or when only one is satisfied, (24b) and (24c), schwa is not realized (*ø*). This difference, Charette convincingly argues, is tied to foot shape, specifically, to whether or not the syllable containing *e* is incorporated into the dependent position of the foot in the second constituent.

In view of the evidence discussed in the preceding section, one might be tempted to conclude that schwa is realized in order to avoid stress clash (see Mazzola 1992): schwa surfaces in [pørtø'kle] because, with the second constituent monosyllabic, the two stresses would otherwise be adjacent across the compound boundary: *[pørt'kle]. This, however, will not account for the pattern in (24c): [kup'fø] is perfectly well-formed, indicating that the presence of the cluster preceding *e* is indeed the critical element.

- (24) a. Orthographic schwa preceded by C; second constituent bisyllabic:
- | | | |
|---------------|-------------|---------------|
| coupe-papier | [kuppə'pje] | ‘paper knife’ |
| passø-partout | [paspar'tu] | ‘master key’ |
- b. Orthographic schwa preceded by CC; second constituent bisyllabic:
- | | | |
|-----------------|---------------|-----------------|
| portø-manteau | [pørtmã'to] | ‘coat rack’ |
| ouvre-bouteille | [uv(r)bu'tɛj] | ‘bottle opener’ |
- c. Orthographic schwa preceded by C; second constituent monosyllabic:
- | | | |
|---------------|------------|-------------|
| coupe-feu | [kup'fø] | ‘firebreak’ |
| cassø-crouste | [kas'krut] | ‘snack’ |

d. Orthographic schwa preceded by CC; second constituent monosyllabic:

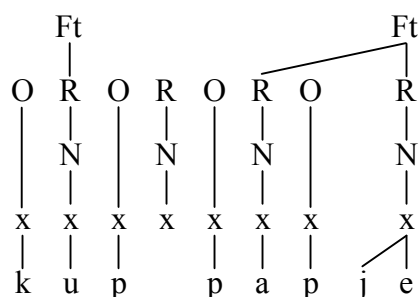
porte-clés	[pɔrtə'kle]	'key ring'
ouvre-boîte	[uvrə'bwat]	'can opener'

The key aspects of Charette's analysis are sketched as follows. Working within Government Phonology, she proposes that schwa is formally represented as an empty nucleus.²⁰ The empty position is not pronounced when it is properly governed, that is, when it is followed by a phonetically-realized nucleus or when it is in word-final position. When one of these conditions is not satisfied, the empty position surfaces as schwa.

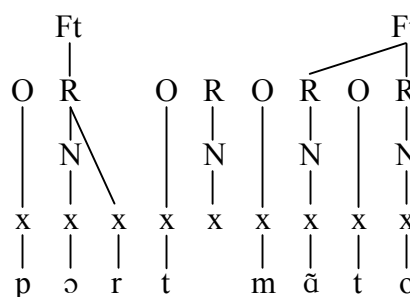
In Charette's view, French stress involves construction of a maximally binary right-headed foot with the head projected from the rightmost syllable dominating a phonetically-realized vowel. As is evident from (24), compounds form two stress domains.²¹ When the second constituent contains two (or more) phonetically-realized vowels, (24a-b), a binary branching foot can be constructed; see (25a-b). In this case, there is no effect on the empty nucleus at the end of the preceding constituent. It is properly governed by virtue of its word-final position and so is not phonetically realized. (The structures in (25) and (26) are slightly modified from those given in Charette.)

(25) Second constituent bisyllabic:

a. [kuppə'pje] (=24a)



b. [pɔrtmã'to] (=24b))



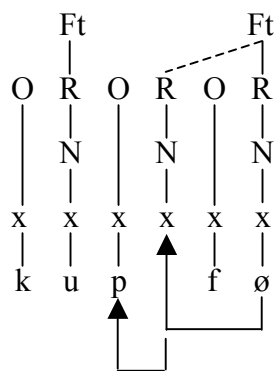
By contrast, we observed in (24c-d) that schwa is sometimes realized when the second constituent contains only one phonetically-realized vowel. In this case, the foot in the second constituent is non-branching. As feet are optimally binary, the empty position at the end of the first constituent is incorporated into the foot of the second constituent, as shown by the dashed lines in (26). In effect, this erases the compound-internal word boundary and so the empty nucleus is no longer licensed by virtue of its domain-final position. In (24c), however, schwa is not realized because the phonetically-overt vowel in the head of the second foot can govern the empty position, shown in (26a) by the arrow from [ø] to this position.

²⁰ Côté's analysis of [dlo] as near-impossible on grounds that phrases are optimally bisyllabic (section 3.3.2) would translate into Government Phonology as follows: the representation of [dlo] would contain an empty nucleus, [dØlo], and the constraint on bisyllabicity would hold over phonetically realized vowels.

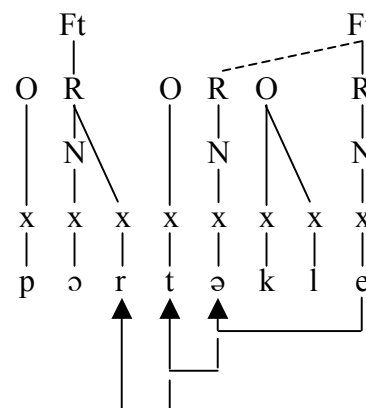
²¹ Although, as we have seen earlier, both stresses do not need to be realized; secondary stress is only variably present in the output.

(26) Second constituent monosyllabic:

a. [kup'fø] (=24c)



b. [pɔrtə'kle] (=24d))



The representation in (26b) shows that the forms in (24d) also involve incorporation of the empty position into the non-branching foot of the second constituent and, thus, as in (26a), the empty position is no longer protected because of its word-final position. In contrast to (26a), however, the cluster preceding the empty nucleus forces this position to be phonetically realized. This is because of independent constraints on governing relations, outlined as follows. Both (26a-b) show that the empty nucleus governs the preceding onset, indicated by the arrow from this position to [p] and [t] respectively. In (26b), however, the onset must itself govern the preceding coda, as shown by the additional arrow from [t] to [r]. The problem is that in word-internal position, an empty nucleus, even if properly governed, cannot license a consonant that is itself a governing consonant. In effect, then, the empty position must be phonetically realized as schwa.²²

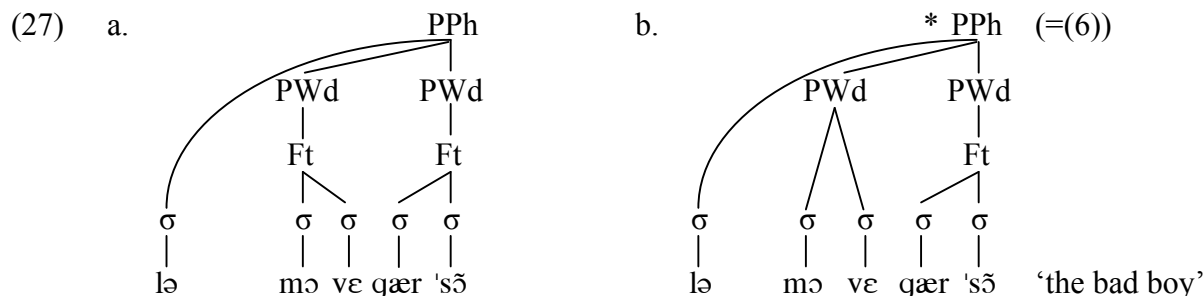
In sum, the evidence from compounding provides evidence for the foot, for the PWd as the domain in which stress is computed, and for Foot Binarity to be satisfied when possible, the latter evidenced by the cross-compound incorporation of the empty position into foot dependent position. Yet again, though, the strength of the evidence is compromised by the fact that both stresses in a compound need not be overtly realized.

3.7. *Stress or no stress?*

Our review of final prominence in French has revealed a tangled web of data with no single analysis emerging that will satisfactorily capture every pattern observed in the language. The presence of only one obligatory position of prominence in the phrase, the disregard for word minimality and the existence of an accentual arc pattern of secondary stress suggest an intonational analysis. The data on clash resolution and schwa realization in compounds support a stress-based analysis. The data from quantity sensitivity could go either way, depending, in part, on the status of the quantity-insensitive parses in (10c). Although the evidence from clash resolution and schwa realization in compounds is no doubt difficult for the learner to sort out, we consider this evidence to tip the balance in favor of a foot-based analysis: there can be no resolution of stress clash without a formal expression of stress requiring the foot and PWd, two constituents whose existence is further supported through constraints on the realization of schwa in compounds. Indeed, it is not at all evident (to us) how an intonational approach to prominence could formally express these patterns in the data.

²² Note that the head of a branching onset must also govern the onset dependent which is why schwa is overt in the case of *ouvre-boîte* in (24d). That is, regardless of the profile of the cluster, schwa must be overt, as in both cases, it must govern a consonant which must itself govern its dependent (preceding coda or dependent in a branching onset).

If evidence from the latter patterns requires that prominence be formally represented as PWd-level stress, the absence of obligatory stress on non-final lexical words must be accounted for. In order for phrases with multiple PWds and only one position of prominence to satisfy Headedness (7), it must be the case that non-final PWds contain a foot but one which has no phonetic correlates; compare (27a) with (6), repeated below as (27b).²³



We will assume that (27a) is the correct analysis for French. What, then, is the motivation for phonetic destressing of feet in non-final PWds? We believe that it is the imposition of Jun & Fougeron's (2000) LHiLH* pitch pattern onto the foot structure assigned within phrases: (i) heads of feet are overtly stressed only if they are in an appropriate position to receive a high tone, and (ii) only demarcative H* is obligatory (see section 2). (ii) leads to optional overt stress on the initial PWd in phrases containing two PWds, e.g. *le mauvais/mauvais garçon*. A maximum of two pitch peaks (Hi and H*) combined with (i) leads to phonetically stressless medial PWds when phrases contain three or more PWds, e.g. *le vraiment/vraiment mauvais garçon* 'the really bad boy'.

In view of the fact that only the final stress in a phrase is obligatorily overt, the question that must be addressed is how the child is to arrive at a grammar that yields phrases with multiple feet as in (27a), that is, at a grammar which satisfies Headedness. We address this question in the next section.

4. Predictions for Acquisition

One might be tempted to conclude that the evidence available will *eventually* lead children to a stress-based analysis of French prominence and to representations consistent with (27a) where every PWd contains a foot, in spite of the lack of consistent phonetic support for this. We expect that this will not be the case. Instead, we hypothesize that the ambient data are sufficiently confounding for the learner to converge on a grammar like (27a) without being bootstrapped into the analysis by UG and markedness.

Concerning UG, we take the strong position that all languages have feet and prosodic words. We assume further that these constituents are available from the onset of acquisition. That is, children do not begin acquisition with an impoverished prosodic hierarchy; all effects to the contrary should arise from high-ranking markedness constraints that target particular prosodic constituents (Demuth 1995).

Following from this, we predict that children learning French will presume the existence of the foot and analyze the consistent part of the French system, final prominence, in terms of this constituent, as an iambic foot right-aligned with some higher prosodic domain. In short, final prominence should be analyzed as stress, not as intonational prominence. Further, if feet are universally organized by PWds and PWds are present from the outset, then the relevant domain in which stress is computed will be the prosodic word, not the phonological phrase, even though the evidence for this in French is weak.

²³ We have structured the initial foot in (27a) as a trochee, as per the accentual arc pattern of secondary stress discussed in section 3.4 ([lə mɔvɛ gær'sɔ̃]). Recall, though, that it can also correspond to an iamb, to capture the alternative pattern of PWd-final secondary stress discussed in footnote 17 and section 3.5 ([lə mɔvɛ gær'sɔ̃]).

Concerning markedness, we expect markedness to influence children's decisions about the types of systems to be built, such that early grammars evidence cross-linguistically favored properties, at least when faced with puzzling data from the ambient language.²⁴ For the case at hand, once an iambic foot has been posited, we predict that this foot will be quantity-sensitive. We also anticipate that footing will be iterative throughout the PWd. Finally, we predict that feet will be binary and, if the domain in which stress is computed is indeed the PWd, that word minimality will be respected.

In the following sections, we provide data from one learner of Québec French, Charlex, which largely support the predictions spelled out above.

5. Case Study on Charlex

5.1. Method

Charlex is a normally-developing learner of middle-class Montréal French. Production data were collected by the second author through audio recordings. The data involve semi-structured play; Charlex was mostly looking at picture books with his father and the second author.

Data were collected at two time points, Charlex 1 at age 2;2.29 and Charlex 2 at age 2;4.04.²⁵ The data were digitized and uploaded to computer for transcription, coding and phonetic analysis. The first 266 utterances (366 phrases) from age 2;2.29 and the first 177 utterances (238 phrases) from age 2;4.04 were phonetically transcribed. The data were narrowly transcribed by the second author, a native speaker of the same dialect of Montréal French. The transcriptions for roughly half of the data were then checked by a second transcriber using Praat (Boersma & Weenink 2009) and disagreements were resolved. Duration and intensity values for 141 vowels (all in open syllables) were measured by two phonologists using Praat; the second author then verified all measurements.

As there were no robust differences in the data collected at 2;2.29 and 2;4.04 for the patterns under focus, data from the two time points have been collapsed in the discussion and analysis that follows. Any differences that arise that are of note are mentioned.

5.2. Phrase-final iambic foot

As pointed out earlier, the evidence for phrase-final prominence in the input to which learners of French are exposed is robust. If Charlex analyzes final prominence as stress, consistent with the predictions set out in section 4, he should posit an iambic foot, right-aligned with the edge of the stress domain. We begin by observing that, aside from a handful of cases, Charlex respects phrase-final stress.²⁶ Representative examples, from Charlex 1 (C1) and Charlex 2 (C2), are provided in (28).²⁷ Except where noted, spaces mark phrase boundaries in all examples.

²⁴ We do not consider that learners are blindly guided by what markedness theory regards as optimal. Specifically concerning prosodic development, learners should not necessarily follow a universal rhythmic path when the evidence against this is overwhelmingly present in the data to which learners are exposed. For example, evidence for syllabic trochees, the least marked foot type, is altogether absent from the literature on the acquisition of French (contra the proposal of Allen & Hawkins 1978 for a trochaic bias; see e.g. Vihman, DePaolis & Davis 1998, Paradis 2001, Goad & Buckley 2006, Rose & Champdoizeau 2007, Demuth & Tremblay 2008).

²⁵ Charlex was recorded at a third point, at age 4;8.08. By this point, all of the non-target-like patterns that we discuss below were gone from his productions.

²⁶ We discuss the domain in which stress is computed, PPh or PWd, in section 5.3.

²⁷ In all examples, an arrow separates the target form from Charlex's output; this is not meant to imply that the target form directly corresponds to his underlying form.

- (28) Phrase-final stress:
- | | | | | | |
|---------------------|---|--------------------|------|------------------------------|-------------------------|
| [tɛ̃'tɛ̃ a'pœr] | → | [tɛ̃'tɛ̃ i'pœ] | (C1) | <i>Tintin a peur</i> | 'Tintin is afraid' |
| [pæ'pæ abkɑ̃'ʃe] | → | [pæ'pæ abax'çi] | (C1) | <i>Papa a branché</i> | 'Daddy plugged (it) in' |
| [pa'se læspiræ'tœr] | → | [pa'çe jape.a'tœʁ] | (C2) | <i>passer l'aspirateur</i> | 'to vacuum' |
| [læ'tɑ̃t ɛdeʃ'ire] | → | [æ'tawc i:diʃ'iri] | (C2) | <i>la tente est déchirée</i> | 'the tent is torn' |

There are only 37 cases (6%) of 'missing stress', that is, phrase-final syllables that lack stress, out of a total of 604 phrases analyzed. Of these, nearly half (15/37) are one-syllable phrases in longer utterances that, in fast speech, could reasonably get incorporated into the following phrase; see (29a) for examples. Nearly half (14/37), all at Charlex 1, are cases that undergo stress shift to the penult which, as discussed in section 3.2, is attested in the target language; see (29b) for examples. The remaining 8 cases include 3 loanwords from English and 5 cases (<1%) are unexplained.

- (29) Missing stress:
- a. One-syllable phrases:
- | | | | | | |
|---------------|---|--------------|------|---------------------------|---------------------|
| [wi se'ʃær] | → | [wiʔe'çal] | (C1) | <i>oui, c'est Charles</i> | 'yes, it's Charles' |
| [sa ʒəkɑ̃'nɛ] | → | [çaç.kɑ̃'nɛ] | (C2) | <i>ça je connais</i> | 'that I know' |
- b. Stress shift:
- | | | | | | |
|--------------|---|-------------|------|--------------------|-----------|
| [tɑ̃'bur] | → | [tɑ̃mbux] | (C1) | <i>tambour</i> | 'drum' |
| [œnɛskær'go] | → | [œne'sæ:gu] | (C1) | <i>un escargot</i> | 'a snail' |

Although we can conclude that Charlex's productions are target-like as concerns phrase-final prominence, we have not shown that he has analyzed final prominence as stress. Two observations support such an analysis: one, prominence appears in positions other than phrase-finally; and two, the phonetic cues for final prominence are consistent with a stress-based analysis. We elaborate on these points below.

As we will see in section 5.4, acoustic analysis undertaken in Praat reveals that non-phrase-final stress in Charlex's productions is marked by both increased duration and greater intensity relative to non-phrase-final unstressed vowels. The former, in particular, is consistent with an analysis whereby stressed vowels are bimoraic.

If final prominence is analyzed by Charlex as stress, we expect to observe somewhat greater values for duration and intensity in this position than for stressed syllables in non-final position. This would indicate the presence of a bimoraic syllable in foot head position, with additional lengthening caused by virtue of the syllable's phrase-final position. If, by contrast, final prominence is analyzed as a phrase-final effect only, we expect to observe less duration on these syllables than is observed for stressed syllables in non-final position. (We do expect some increase in intensity, corresponding to Jun & Fougeron's finding that this syllable is aligned with H*.) Critically, phrase-final prominence does not reflect the presence of a bimoraic syllable in foot head position under this analysis and, thus, any lengthening that is observed will only be present because of the syllable's phrase-final position.

Measurements undertaken in Praat are consistent with the analysis of final prominence as stress. If we compare Charlex's 'stressed' vowels in phrase-final and non-phrase-final positions, paired-sample t-tests reveal that those in final position are both significantly longer ($p=0.017$) and more intense ($p<0.001$) than those in non-final position.

In sum, Charlex has built an iambic foot, right-aligned with the phrase edge. This is consistent with the predictions in section 4. In response to the robustly-attested pattern of phrase-final prominence in the ambient data, Charlex builds a grammar that respects markedness: he opts for a stress-based analysis of final prominence, consistent with the prosodic hierarchy in (2) that contains a foot.

5.3. Domain in which stress is computed

If Charlex's grammar truly respects the prosodic hierarchy in (2), where the foot is organized directly by the PWd, we expect the domain in which stress is computed to be the PWd, not the PPh. Should his grammar regularly manifest word-level stress, this would be an example of a markedness effect beyond what is observed in the ambient data (see predictions in section 4).

The evidence for PWd-level versus PPh-level stress is not easy to sort out. First, the set of relevant contexts is small, as a prospective PPh must contain at least two lexical (i.e., stressable) words to bear on this question. Like many early learners, most of Charlex's phrases are either single lexical words or they are composed of a function word followed by a lexical word. (Note that Charlex never stresses function words.) Further, recall from section 3.1 that, for many constructions in French, for example DPs with post-nominal adjectives, more than one phrasing is possible; see (30a). Compare (30b), DPs with pre-nominal adjectives, for which only one phrasing is possible. Although we have concluded, based on the evidence in sections 3.5 and 3.6, that the domain for adult French must actually be the PWd, for ease of exposition, we have described the domain in (30) as the PPh; that is, the PPh is the domain in which obligatory stress is realized.

- (30) Domain for target French – PPh:
- a. $[l\text{ə} [g\text{æ}r's\text{ɔ̃}]_{PWd} [æ\text{ʒ}i'te]_{PWd}]_{PPh} \sim [[l\text{ə} [g\text{æ}r's\text{ɔ̃}]_{PWd}]_{PPh} [[æ\text{ʒ}i'te]_{PWd}]_{PPh}]_{PPh}$
le garçon agité 'the fidgety boy'
- b. $[l\text{ə} [m\text{ɔ}v\text{ɛ}]_{PWd} [g\text{æ}r's\text{ɔ̃}]_{PWd}]_{PPh}, *[[l\text{ə} [m\text{ɔ}v\text{ɛ}]_{PWd}]_{PPh} [[g\text{æ}r's\text{ɔ̃}]_{PWd}]_{PPh}]_{PPh}$
le mauvais garçon 'the bad boy'

To determine the domain in which Charlex computes stress, we examined the two types of constructions in (31):

- (31) Type A: Prospective PPhs containing two lexical words that could be parsed as one or two PPhs in the adult grammar;
- Type B: Prospective PPhs containing two lexical words that can only be parsed as one PPh in the adult grammar.

Several scenarios for these two types of constructions arise as follows.

If the child reliably produces both types of constructions with one stress, this would clearly indicate that the domain in which stress is computed is the PPh; see (32). Since Type A constructions can also be parsed as two phrases, as shown in (30a), in the situation in (32), the child would be building the largest possible PPh for this type of construction. This type of phrasing is most commonly observed for adult French speakers in fast speech.

- (32) Domain for child – largest possible PPh:
- a. Type A (1 stress): $[l\text{ə} [g\text{æ}r's\text{ɔ̃}]_{PWd} [æ\text{ʒ}i'te]_{PWd}]_{PPh}$
- b. Type B (1 stress): $[l\text{ə} [m\text{ɔ}v\text{ɛ}]_{PWd} [g\text{æ}r's\text{ɔ̃}]_{PWd}]_{PPh}$

Alternatively, if the child were instead to build the smallest possible PPh for Type A constructions, the result would be two stresses, as shown in (33a). Type B constructions will still have only one position of prominence, as only one phrasing is possible; see (33b). This type of phrasing is more common for adult French speakers in slower speech.

- (33) Domain for child – smallest possible PPh:
- a. Type A (2 stresses): $[[l\text{ə} [g\text{æ}r's\text{ɔ̃}]_{PWd}]_{PPh} [[æ\text{ʒ}i'te]_{PWd}]_{PPh}]_{PPh}$
- b. Type B (1 stress): $[l\text{ə} [m\text{ɔ}v\text{ɛ}]_{PWd} [g\text{æ}r's\text{ɔ̃}]_{PWd}]_{PPh}$

Of course, (32) and (33) are not incompatible. Indeed, the child could behave in an adult-like fashion in that Type A constructions are parsed as one phrase or as two, depending on considerations such as speech rate (see also footnote 5). We expect, however, that two-stress outputs of the type in (33a) will be more common than one-stress outputs of the type in (32a) for younger learners.

Finally, if both types of constructions are reliably produced with each lexical element stressed, then the domain in which stress is computed would be the PWD; see (34).

(34) Domain for child – PWD:

- a. Type A (2 stresses): [lə [gær'sɔ̃]_{PWD} [æzi'te]_{PWD}]_{PPH}
 b. Type B (2 stresses): [lə [mɔ̃'ve]_{PWD} [gær'sɔ̃]_{PWD}]_{PPH}

It is evident from the scenarios sketched above that much rests on the child's treatment of Type B constructions.

Turning now to Charlex's productions, Table 1 shows that there are 46 Type A constructions and 35 Type B constructions.²⁸ A slight majority of Type A constructions are realized with two stresses and a larger majority of Type B constructions with two stresses as well.

Table 1. Stress profile in Charlex's Type A and Type B constructions

Type A constructions		Type B constructions	
1 stress:	2 stresses:	1 stress:	2 stresses:
20/46 (43%)	26/46 (57%)	9/35 (26%)	26/35 (74%)

Representative examples of both stress profiles for each construction type are provided in (35).

(35) Type A constructions:

- a. 1 stress:
 [tu'sœl] ~ [tu 'sœl] → [du'çœw] (C1) *tout seul* 'all alone'
 [tuɫ'pa] ~ [tuɫ 'pa] → [tuɫ'pa:] (C2) *touche pas* 'don't touch (it)'
- b. 2 stresses:
 [ɲngitarklæ'sɪk] ~ [ɲngi'tar klæ'sɪk] → [ɲngi'tæ? klæ'çik] (C1) *une guitare classique*
 'a classical guitar'
 [sekwæ'sa] ~ [se'kwæ 'sa] → ['skɔ 'sa:] (C2) *c'est quoi ça?* 'what's that?'

Type B constructions:

- c. 1 stress:
 [fɛdɔ'do] → [fɛd'dow] (C1) *fait dodo* 'sleeps' (babytalk)
 [dzyzɔdɔ'rɑ̃ʒ] → [diʒidɔ'rɔ̃wç] (C2) *du jus d'orange* 'some orange juice'
- d. 2 stresses:
 [ɲnotpæ'pje] → [œ'nɔwçpə'pih] (C1) *un autre papier* 'another (piece of) paper'
 [rɛgær'de ənot'liv] → [ægæ'di: 'nɔw?'lif] (C2) *regarder un autre livre*
 'look at another book'

The majority of Type A outputs, 57%, are consistent with two types of grammars, one where the smallest possible PPH defines the domain of stress assignment (33), and one where the PWD defines the domain for stress (34). Critically, though, 74% of outputs for Type B constructions

²⁸ Three 1-stress outputs for *tout nu* (target [tu 'ny]) have been removed from the counts for Type B constructions because *tout nu* is much more commonly used than *nu* to mean 'naked', especially among children and in child-directed speech (i.e., *tout nu* does not mean 'totally naked', in contrast to *nu* 'naked'). It is very likely that children do not realize that *tout nu* is composed of two lexical items.

are compatible only with the analysis in (34). Although we might be tempted to conclude from this that stress is computed over PWds in Charlex’s grammar, we must still account for the 43% of outputs for Type A constructions that are only compatible with a PPh analysis of stress. We believe that Charlex is in transition from a grammar where stress is computed over PWds to one where stress is computed over PPhs or, more particularly, to a grammar where PWds in certain positions in the PPh do not have to phonetically bear stress (as per the analysis in section 3.7).

In sum, the data available from Charlex 1 and 2 provide modest support for the prediction in section 4, that if French learners will build a grammar where prominence is formally expressed as stress, the domain in which stress will be computed is the PWd. This result supports the proposal that learners’ early grammars will display markedness effects beyond what is reliably present in the ambient data: in adult French, Type B constructions can – but often do not – bear more than one position of prominence.

5.4. Foot shape

We turn now to consider foot shape. If Charlex analyzes final prominence as a right-aligned iambic foot, this foot should optimally have a bimoraic head (either underlyingly or through iambic lengthening): the preferred iamb is Light-Heavy (Hayes 1995). Further, consistent with the observation that iambic languages are (almost) always quantity-sensitive, heavy syllables in non-final position, if these are attested, should attract stress.

In Charlex’s grammar, the foot virtually always has a bimoraic head, as expected from markedness. We have already motivated this for phrase-final stress (for further detail, see below), but we will observe shortly that heavy syllables in non-final position in lexical words also attract stress; indeed, stress can appear anywhere in the word in Charlex’s outputs. Non-final stressed syllables almost always contain long vowels or coda consonants.

We examine heavy syllables with long vowels first, then turn to syllables with coda consonants. In non-final position, there is a near perfect correlation between vowel length and stress in the phonetic transcriptions: vowels perceived as long are also perceived as stressed; most vowels perceived as short in open syllables are also perceived as unstressed. Measurements undertaken in Praat (Boersma & Weenink 2009) confirm the reliability of the transcriptions: one-way ANOVAs reveal that vowels transcribed as long have significantly greater duration ($p < 0.001$) as well as significantly greater intensity ($p = 0.003$) than those transcribed as short; vowels transcribed as stressed are significantly longer ($p < 0.001$) and more intense ($p = 0.027$) than those transcribed as unstressed. We can conclude, then, that stressed long vowels are indeed bimoraic, and unstressed short vowels, monomoraic.²⁹ Representative examples are provided in (36); the vowels under focus are underlined>.

- (36) a. Long stressed vowels in non-final position:
- | | | | | |
|--------------------|---|----------------------|---------------------------|--------------------|
| [ɥnfur'mi] | → | [ə'fu:'mij] (C1) | <i>une fourmi</i> | ‘an ant’ |
| [wi ɥntelevi'zjɔ̃] | → | [wi œ'te:'ɕjɔ̃] (C2) | <i>oui une télévision</i> | ‘yes a television’ |
| [ənekɥ'rœj] | → | [œnœ'ty:rœj] (C1) | <i>un écureuil</i> | ‘a squirrel’ |
- b. Short unstressed vowels in non-final position:
- | | | | | |
|------------------|---|--------------------|-------------------------------|-------------------|
| [wi setɥnfur'mi] | → | [wi sœʔfu'mi] (C1) | <i>oui c(’est) une fourmi</i> | ‘yes it’s an ant’ |
| [ɥntelevi'zjɔ̃] | → | [œtj.ij'çɔ̃] (C2) | <i>une télévision</i> | ‘a television’ |
| [ənekɥ'rœj] | → | [ɲixə'rœj] (C2) | <i>un écureuil</i> | ‘a squirrel’ |

What is less clear in Charlex’s grammar is whether coda consonants in non-final position pattern with long vowels in adding weight to a syllable and thereby attracting stress. For CVC syllables ending in obstruents, 78% (18/23) fail to attract stress, supporting the position that obstruents are not moraic. Typical examples are given in (37).

²⁹ There is one context where stressed vowels regularly appear as short; this will be discussed in section 5.6.

(37) Obstruent-final CVC syllables in non-final position:

a. 78% fail to attract stress:

[pæ'pæ abkɑ̃'ʃe]	→	[pə'pæ abax'çi]	(C1)	<i>papa a branché</i>	‘daddy plugged it in’
[ənɛskær'go]	→	[œnɛçkæ'guw]	(C2)	<i>un escargot</i>	‘a snail’

b. 22% attract stress:

[ənæspiræ'tœr]	→	[əm'pæʔtœx]	(C1)	<i>un (as)pirateur</i>	‘a vacuum cleaner’
[ən ɛskæ'lje]	→	[œ'nɛçkæ'je]	(C2)	<i>un escalier</i>	‘a staircase’

When all CVC_{son} outputs are examined together, slightly more than half attract stress, 56% (15/27), weakly suggesting that sonorants are moraic. When the contexts where CVC_{son} syllables are examined more carefully, however, it becomes apparent that stress clash is a relevant consideration. At Charlex 1, all non-final CVC_{son} syllables occur immediately before the phrase-final syllable. These CVC_{son} syllables either do not attract stress, as the result would yield adjacent stresses, or stress shifts from the final syllable to this syllable; see the examples in (38a). 83% (10/12) of presence/absence of stress on CVC_{son} syllables can be accounted on this view. At Charlex 2, stress clash is generally tolerated; 80% (12/15) of sonorant-final syllables are stressed, regardless of whether or not the output results in clash, as the examples in (38b) show.

(38) Sonorant-final CVC syllables in non-final position:

a. Charlex 1:

[setɪntrɔ̃'pet]	→	[sœkrām'pet ^h]	<i>c'est) une trompette</i>	‘it’s a trumpet’
[tɑ̃'bur]	→	[tɑ̃mbux]	<i>tambour</i>	‘drum’

b. Charlex 2:

[tɑ̃'bur]	→	[tɑ̃mbux]	<i>tambour</i>	‘drum’
[bæ'lɔ̃]	→	[bæ'lɔ̃w]	<i>ballon</i>	‘ball’

That stress clash is principally a problem for Charlex 1 is supported by the observation that all cases of stress shift in Charlex’s grammar are restricted to this stage and all but one of these (12/13; 92%) arise in cases where the penult ends in a target CVC_{son} or CVV syllable that is stressed (e.g., [tɑ̃'bur] → [tɑ̃mbux] in (38a); [ɔ̃tele'fɔ̃n] → [œ'te:ɸɔ̃n] *un téléphone* ‘a telephone’).

We can conclude from this discussion that sonorant codas are moraic and obstruent codas are not in Charlex’s grammar (see Zec 1995 on adult languages with this profile, e.g., Lithuanian and Tiv). However, coda moraicity in sonorants is obscured by Charlex’s intolerance for stress clash at Charlex 1.

One may question where the evidence for sonorant coda moraicity comes from. It is not obviously a markedness effect as, in the unmarked case, coda consonants of all types are not moraic. Target French is an unlikely source since word-internal coda nasals are forbidden and liquid-final syllables do not regularly attract stress (but see footnote 11), so any evidence as to their behavior is difficult to glean from the ambient data. We speculate that the most likely source is observed length on nasal vowels in the target language (see section 3.2). As we will see in the next section, Charlex does not permit nasal vowels to surface as such in phrase-medial position and a common realization for syllables of this profile is that nasality is preserved as a coda ($CṼ \rightarrow CVN$). The CVN syllable surfaces as stressed, except under conditions of clash at Charlex 1, as discussed immediately above. If CVN syllables are bimoraic, then other sonorant-final syllables will be so as well (notably CVL), as there seem to be no adult languages where only a subset of sonorants behave as moraic (Zec 1995).

Returning finally to the earlier observation that Charlex’s stressed vowels in phrase-final position are both significantly longer ($p=0.017$) and more intense ($p<0.001$) than his stressed vowels in non-final position, we can conclude that Charlex’s grammar prefers iambs with heavy heads: his grammar is quantity-sensitive and phrase-final stressed syllables undergo iambic lengthening. In short, Charlex’s grammar strives to build the optimal iamb, Light-Heavy, in spite of the murky evidence available from the ambient data. This is consistent with the prediction in

section 4 that early grammars should display a variety of markedness effects beyond what is observed in the ambient data.

5.5. *Innovative stress*

In the following sections, we discuss the conditions under which non-final heavy syllables arise in Charlex's grammar. Aside from domain-final syllables, there are three types of heavy syllables in his outputs: syllables with target nasal vowels; syllables ending in sonorants, either derived or underlying; and syllables containing derived long vowels resulting from liquid deletion. The latter arise under two conditions: compensatory lengthening due to liquid deletion in coda, and vowel fusion due to liquid deletion in the onset of target unstressed syllables. As the rhymes in all of these syllables are heavy, the syllables almost always attract stress, thereby implicating a quantity-sensitive foot. We will collectively refer to these patterns as 'innovative stress' since they are unique to Charlex's grammar vis-à-vis target French.³⁰

5.5.1. *Nasal vowels*

The first source of innovative stress we will examine comes from syllables with target nasal vowels. As mentioned in section 3.2, nasal vowels are among the class the inherently long vowels in Québec French. If nasal vowels are bimoraic in Charlex's grammar, we would expect them not to differ in either length or intensity from long oral vowels. This is indeed the case: measurements undertaken in Praat reveal that Charlex's nasal vowels are not significantly different in length ($p=0.777$) or intensity ($p=0.775$) from long oral vowels. However, these measurements are not particularly meaningful because, with one exception, nasal vowels are restricted to phrase-final position, a position where all vowels (when stressed) surface as long. The ban from phrase-medial position is no doubt due to the difficulty in maintaining a nasal gesture without closure when a consonant immediately follows.

In view of this, if nasal vowels are truly bimoraic in Charlex's grammar, their substitutes should – at least on occasion – surface as bimoraic and stressed in phrase-medial position.³¹ Table 2 shows that this is indeed the case. 19% (6/31) of the time, nasal vowels surface as bimoraic and stressed, patterns 1 and 2. Nasal vowels do, however, more commonly surface as monomoraic and unstressed, patterns 3 and 4. This is consistent with a grammar that displays a relationship between weight and stress. However, it is surprising that CV (pattern 3) is preferred over CV: (pattern 1) for CV̆ targets if CV̆ is truly bimoraic. A closer look at the contexts where CV is observed provides an explanation for this finding. 65% (11/17) of the CV outputs are from Charlex 1 and all arise in contexts where 'CV: would yield stress clash which, as discussed in section 5.4, is forbidden in his grammar at this stage. (Indeed, of the remaining six CV outputs at Charlex 2, five arise under conditions where clash would result as well, but clash avoidance does not play as important a role at this stage in Charlex's development.) Concerning pattern 4, recall from section 5.4 that obstruents are not moraic in Charlex's grammar; thus, the second mora from the target nasal vowel cannot be preserved on this syllable without creating a three-position rhyme (VVC_{obs}) which, like most adult languages, Charlex does not permit word-internally.

Turning to CVN outputs, patterns 2 and 5, Table 2 shows that target CV̆ syllables surface with a coda nasal 29% (9/31) of the time, virtually always before a following stop. If nasal vowels are bimoraic, we again must ask why derived CVN syllables do not always surface with stress. As expected, stress is observed (pattern 2) except when the result would yield a stress clash at Charlex 1 (pattern 5).

³⁰ In considering Charlex's innovative stress patterns, all functional material has been excluded, notably the articles [ə] *un* 'a (masc)' and [lə/la/le] *le/la/les* 'the (masc/fem/plur)'.

³¹ Interestingly, aside from the nasal-oral distinction, Charlex shows no differential treatment of vowels based on quality, in contrast to the adult language where, as discussed in section 3.2, (non-high) tense vowels fall into the class of intrinsically long vowels.

Truly unexpected outputs for nasal vowels, patterns 6 and 7, are only observed 6% of the time (hence the -6 under the ‘% expected’ column). Here, bimoraic syllables fail to attract stress when clash is not a factor.

Table 2. Nasal vowel patterns for phrase-medial position (n=31)

Expected	Pattern type	Pattern	N ^o	%	% expected	
✓	Bimoraic & stressed	1. $C\tilde{V} \rightarrow 'CV:$	1	3	94	
		2. $C\tilde{V} \rightarrow 'CVN$	5	16		
✓	Monomoraic & unstressed	3. $C\tilde{V} \rightarrow CV$	17	55		
		4. $C\tilde{V} \rightarrow CVC_{\text{obs}}$	2	7		
✓	Bimoraic & unstressed (clash avoidance at C1)	5. $C\tilde{V} \rightarrow CVN$	4	13		
✗	Bimoraic & unstressed	6. $C\tilde{V} \rightarrow CVC_{\text{son}}$	1	3		-6
		7. $C\tilde{V} \rightarrow C\tilde{V}G$	1	3		

Representative examples of the three most common patterns which, together, account for 84% of the data, are provided in (39). Segments under focus in the target forms are underlined.

(39) Nasal vowels:

a. Bimoraic & stressed:

Pattern 2: $C\tilde{V} \rightarrow 'CVN$

[ətrɔ̃bɔ̃n] → [œ'krɔ̃m'bɔ̃n] (C2) *un trombone* ‘a trombone’
 [sɛtɔ̃tɑ̃'bur] → [çɛ'tambu] (C1) *c'est (un) tambour* ‘it’s (a) drum’

b. Monomoraic & unstressed:

Pattern 3: $C\tilde{V} \rightarrow CV$

[rɑ̃vɛrse dz'y'lɛ] → [avæ'çi 'dʔɛ] (C2) *renversé du lait* ‘spilt some milk’
 [bɔ̃'zur] → [mæ'çur] (C1) *bonjour* → ‘hello’

c. Bimoraic & unstressed:

Pattern 5: $C\tilde{V} \rightarrow CVN$

[œkæ'mjɔ̃ dɔ̃pɔ̃'pje] → [œtɑ̃'joɔ̃ pɑ̃m'fi] (C1) *un camion (de) pompiers* ‘a firetruck’
 [sɛtyntrɔ̃'pɛt] → [sɛkrɔ̃m'pɛc] (C1) *c'est (une) trompette* ‘it’s a trumpet’

In sum, both the bimoraic & stressed and monomoraic & unstressed patterns in Table 2 are expected from a grammar that displays a relationship between weight and stress: heavy syllables attract stress and light syllables repel it. Once clash avoidance at Charlex 1 is factored in, an explanation emerges for the bimoraic & unstressed CVN syllables (pattern 5). Charlex thus treats French as quantity-sensitive. Outside of clash contexts at Charlex 1, all heavy syllables, regardless of their source, attract stress. To capture this, Charlex’s grammar must contain a quantity-sensitive iambic foot, the optimal iamb observed across languages (Hayes 1995).

5.5.2. Coda liquids

We turn now to the second source of innovative stress in Charlex’s grammar: syllables with target coda liquids. Table 3 summarizes the patterns under focus. Typical of children learning a variety of languages, Charlex usually deletes or substitutes another consonant for liquids, regardless of position. In the few instances when coda liquids are produced intact or are realized as another sonorant consonant, the resulting syllable is stressed (patterns 1 and 2). This suggests that coda sonorants are moraic for Charlex, as alluded to above (none of the examples results in

stress clash). Another pattern of liquid preservation involves resyllabifying the liquid as syllabic, pattern 4. Although this represents 16% of the data, all examples are of the name *Alèle-Elise* at Charlex 1. The resulting syllable is monomoraic and, as expected, it is unstressed.

When an obstruent substitutes for the liquid, patterns 5 and 8, there is variation in whether the syllable is stressed. As discussed in section 5.4, obstruent codas are not moraic, revealing that pattern 5 is expected and pattern 8, unexpected.

When coda liquids are outright deleted, which accounts for 74% of the data, the preceding vowel may or may not undergo compensatory lengthening. Importantly, when the vowel is lengthened, the resulting CV: syllable is always produced as stressed (pattern 3). When the vowel is not lengthened, the resulting CV syllable, as expected, is almost never produced as stressed (pattern 6; pattern 7 shows that there is one exception).

As was the case with nasal vowels, we again see that that the most common pattern involves deletion of the liquid with no compensatory lengthening. If coda liquids are moraic, we must question why CVL → CV (pattern 6) is more common than CVL → 'CV: (pattern 3). A closer look at the contexts where CV outputs are found provides the answer: 28% (13/46) of the CV outputs are from Charlex 1 and all are in contexts where 'CV: would result in stress clash. Indeed, 30 of the remaining 33 CV outputs at Charlex 2, also arise under conditions where clash would result.

Table 3. Liquid patterns for phrase-medial coda position (n=76)

Expected	Pattern type	Pattern	N ^o	%	% expected
✓	Bimoraic & stressed	1. CVL → 'CVL	2	3	96
		2. CVL → 'CVC _{son}	1	1	
		3. CVL → 'CV:	10	13	
✓	Monomoraic & unstressed	4. CVL → CL _r	12	16	
		5. CVL → CVC _{obs}	2	3	
		6. CVL → CV	46	60	
✗	Monomoraic & stressed	7. CVL → 'CV	1	1	-4
		8. CVL → 'CVC _{obs}	2	3	

Representative examples of the three most common patterns which, together, account for 89% of the data, are provided in (40).

(40) Coda liquids:

a. Bimoraic & stressed:

Pattern 3: CVL → 'CV:

[ɥnfur_r'mi] → [Λ'fu:'mi] (C2) *une fourmi* 'an ant'
 [sekəmɛl'vɪs] → [çiqəm'e:'viç] (C1) *c'est comme Elvis* 'it's like Elvis'

b. Monomoraic & unstressed:

Pattern 4: CVL → CL_r

[ædɛl̩.e'liz æ'ʃɑ̃t] → [ædɛl̩'liz i'çɑ̃t^h] (C1) *Adèle-Elise elle chante*
 'Adèle-Elise she is singing'
 [ædɛl̩.e'liz æ'ʃɑ̃t] → [adɛ'is i'çɑ̃tç] (C1) *Adèle-Elise elle chante*
 'Adèle-Elise she is singing'

Pattern 6: CVL → CV

[rægær'de ə'not] → [ægæ'di n'owc] (C2) *regarder un autre* 'look at another'
 [ɥnsɛr'vjɛt] → [œʃe'jetç] (C1) *une serviette* 'a napkin'

In sum, as with nasal vowels, these data support the observation that Charlex's grammar is quantity sensitive: heavy syllables attract stress; light syllables do not.

5.5.3. Onset liquids

We turn finally to liquids in onset position. Innovative stress is observed when Charlex deletes target liquids from phrase-medial onsets. Before examining this context in detail, we first briefly mention the onset contexts where Charlex does not exhibit innovative stress. One of these is phrase-initial onset position. There are 26 examples of target liquids in this position (leaving aside function words). Charlex never produces liquids in this context: in 5/26 (19%) of cases, he substitutes another consonant for the liquid (e.g., [rægær'de ə'not] → [wægæ'di n'ɔwc] (C2) *regarder un autre* 'look at another (one)'); more commonly, 21/26 (81%), he deletes the liquid altogether (e.g., [rǔvər'se dzy'lɛ] → [avæ'çi 'dɛ] (C2) *renversé du lait* 'spilt some milk'). As expected, deletion does not trigger any compensatory effects. The second context is phrase-final onset position, that is, the onset of a target stressed syllable. The liquid here is usually realized intact (68/84; 81%) (e.g., [dzy'lɛ] → [t^hu'lɛ] (C1) *du lait* 'some milk') or another consonant substitutes for it (10/84; 12%) (e.g., [nym'e'rɪk] → [nme'jik] (C1) *numérique* 'digital'). 6 cases (7%) involve outright deletion, but all of these are in the name *Adèle-Elise* which Charlex clearly struggles with (e.g., [ædele'liz] ~ [ædele'liz] → [adɛ'is] (C1)).

When the target liquid is in phrase-medial onset position, that is, onset of a target *unstressed* syllable, innovative stress is produced by Charlex when the liquid is deleted; there are 44 such examples. (In the 9 remaining examples of target liquids in this position, another consonant substitutes for the liquid (e.g., [ele'fũ] → [e'jɔe'fowc] (C2) *éléphant* 'elephant').

Table 4 details the patterns for the 44 cases of deletion. The first two patterns (which total 61% of the data) are entirely as expected. When the vowels fuse after the liquid deletes, as in pattern 1, a bimoraic syllable is created which, in turn, attracts stress. When the vowels surface in hiatus, pattern 2, no heavy syllable should result and there is no expectation for stress, as observed in three forms. Pattern 3, where the vowels surface in hiatus and the first vowel is lengthened and stressed, is not surprising given the relationship between heavy and stress in Charlex's grammar. We do not understand, however, why lengthening takes place, as the onset liquid bears no mora to transfer to the initial vowel. And as will become evident in the section on iterative footing, lengthening cannot be attributed to the need to satisfy Foot Binarity.

Taken together, the patterns in Table 4 show that there are no examples of derived long vowels that are not stressed (VLV → *V:). The patterns thus reveal a close relationship between bimoraic syllables and stress, even if pattern 3 appears to be rather puzzling.

Table 4. Liquid patterns for phrase-medial onset position (n=44)

Expected	Pattern type	Pattern	N ^o	%	% expected
✓	Bimoraic (fusion) & stressed	1. VLV → 'V:	24	54	61
✓	Monomoraic (hiatus) & unstressed	2. VLV → V.V	3	7	
✓?	Bimoraic (hiatus) & stressed	3. VLV → 'V:V	17	39	39?

Representative examples of all three patterns are provided in (41).

- (41) Phrase-medial onset liquids:
- a. Bimoraic (fusion) & stressed:

Pattern 1: VLV → 'V:

[ənele'fũ]	→	[y'ni:'fæ] (C2)	<i>un éléphant</i>	'an elephant'
[ənæspɪræ'tœr]	→	[əm'pæ:tyx] (C1)	<i>un (as)pirateur</i>	'a vacuum cleaner'
 - b. Monomoraic (hiatus) & unstressed:

Pattern 2: VLV → V.V

[yntele'vi'zjɔ̃]	→	[œti.ij'çõ] (C2)	<i>une télé(vi)sion</i>	'a television'
[pɑ'se læspɪræ'tœr]	→	[pa'çe jape.a'tœy] (C2)	<i>passer l'aspirateur</i>	'to vacuum'

- c. Bimoraic (hiatus) & stressed:
- | | | | | |
|----------------|---|--------------------|-------------------------|----------------|
| [ʒtele'fɔ̃n] | → | [œ'te:œfɔ̃n] (C1) | <i>un téléphone</i> | 'a telephone' |
| [demærjɔ̃'net] | → | [di'mæ:æ'nɛc] (C2) | <i>des marionnettes</i> | 'some puppets' |

In sum, we have observed three contexts for innovative phrase-medial stress in Charlex's grammar: nasal vowels, coda liquids and onset liquids. The findings reveal a close relationship between syllable weight and stress. The foot strives to have a bimoraic head. This is a markedness effect beyond the ambient data (see section 4), because the evidence that adult French respects quantity sensitivity is murky at best. Because heavy syllables attract stress throughout the word, and because Charlex almost always displays final stress, the result is multiple stresses, often adjacent, in a PWd. This is surprising from the perspective of adult French, but not from the perspective of other iambic languages.

5.6. Iterativity

Recall from section 3.4 that, in contrast to prototypical iambic systems, stress in French is non-iterative, although there is optional secondary stress which (typically) follows an accentual arc pattern. If footing in Charlex's grammar is iterative, this would be another case of his grammar displaying a markedness effect beyond the evidence available in the ambient data.

In the preceding section on innovative stress, we observed that heavy syllables can appear anywhere in the word in Charlex's grammar, leading to multiple stresses in this domain. This observation, in and of itself, does not indicate that footing is iterative. Indeed, in the discussion of innovative stress, we saw that heavy syllables attract stress while light syllables repel it; the latter is suggestive of a grammar without iterative footing. In this section, we take a closer look at iterativity. Specifically, we examine cases of extra stress, that is, stress falling in contexts other than those identified in the preceding section. We will see that light syllables in positions where they could get stress due to iterative foot construction do indeed variably receive stress.

As iterativity is confined to languages where the PWd is the domain in which stress is computed, we consider three types of contexts here: (i) data where the domain in which stress is computed has clearly been identified as the PWd, as per section 5.3; (ii) data where the phrase is exactly one lexical word in length, so the domain in which stress is computed could be the PWd; and (iii) data where the phrase contains one lexical word preceded by one or more function words; since function words are unstressed and, thus, are organized outside (i.e., are cliticized onto) the PWd in French, the domain could be the PWd in this case as well.³² Further, we limit the examination to target words with three and four syllables, that is, to contexts where iterative footing could be displayed without concern of how it interacts with stress clash. Table 5 provides the results.

³² There is no evidence that Charlex's grammar differs from target French, in placing function words inside the PWd. For one, although proclitics are productively produced by Charlex, these elements never appear with stress. Two, there are no asymmetries in the contexts where proclitics are produced, in contrast to what was observed in Veneziano & Sinclair (2000) and Demuth & Tremblay (2008); these authors find that proclitics and fillers are produced more often before one-syllable lexical words than before longer words, suggesting that, for the children under examination, these elements are organized internal to the foot and thus PWd to satisfy word minimality (see further footnote 16).

Table 5. Iterativity in three- and four-syllable lexical targets

Three-syllable targets (n=59)		Four-syllable targets (n=4)	
(σσ)	9	(σ)(σσ)	1
(σ'σ)σ	2	(σ'σ)(σ'σ)	1
ə(σ'σ)/Ç(σ'σ)	9	σσ(σ'σ)	2
(σ)(σ'σ)	14	(σ'σ)(σ'σ)	0
σ(σ'σ)	25		

We begin with three-syllable targets for which there are 59 relevant words, aside from those that have already been discussed in the section on innovative stress. The first three patterns which, together, comprise 21 words, do not speak to whether or not Charlex's grammar is iterative, as only one foot would be expected for outputs of this shape: cases where three syllable targets are truncated to (σ'σ), exactly one foot; cases where stress has shifted to the penult, (σ'σ)σ, which, as discussed earlier, is quite common at Charlex 1; and cases where the first syllable contains a schwa or syllabic consonant, ə(σ'σ)/Ç(σ'σ), and so is, by definition, unstressable. Of the remaining 39 cases, 14 show evidence of iterative footing, (σ)(σ'σ), and 25 do not, σ(σ'σ). Representative examples of these two patterns are provided in (42), with PWd and foot structure assigned to the relevant part of the child's outputs.

(42) Three-syllable lexical targets:

- a. (σ)(σ'σ)
 [ɥnklæri'net] → œl[('kli)_{Ft}(ɥl,net)_{Ft}]_{PWd} (C2) *une clarinette* 'a clarinet'
 [ənɛskæ'lje] → œl[('nɛç)_{Ft}(kæ'je)_{Ft}]_{PWd} (C2) *un escalier* 'a staircase'
- b. σ(σ'σ)
 [pæpi'jɔ̃] → [ba(pi.'ð)_{Ft}]_{PWd} (C2) *papillon* 'butterfly'
 [læ'tât ede'jire] → æ'tawc i:[di('iɾi)_{Ft}]_{PWd} (C1) *la tente est déchirée*
 'the tent is torn'

If all of Charlex's three-syllable outputs were of the shape σ(σ'σ), as in (42b), this would not speak against his grammar being iterative. Because the initial syllable is monomoraic, this could simply indicate that Foot Binarity must be satisfied at the expense of iterative footing. The fact that the rhyme in the initial footed syllable in the examples in (42a) is not augmented to VV reveals that this explanation for the lack of iterative footing in (42b) cannot hold. Indeed, iteratively-footed outputs for σσσ targets is the only context where non-binary feet are regularly found in Charlex's outputs. Similarly, then, the need to satisfy Foot Binarity cannot, unfortunately, explain the augmentation observed in section 5.5.3, where we saw that when liquids delete, yielding vowels in hiatus, the first vowel is typically lengthened and stressed (e.g., [ʒtele'fɔ̃n] → [œ'te:œfɔ̃n] (from (41c)). Finally, if the non-iterative pattern, σ(σ'σ), were due to a high importance being attributed to Foot Binarity, this problem would not arise with four-syllable lexical words which should, then, be realized with iterative footing, (σ'σ)(σ'σ). Although Table 5 shows that the number of four-syllable words attempted by Charlex is extremely small (outside of the liquid contexts already discussed), we observe both iterative parses, (σ'σ)(σ'σ) and (σ)(σ'σ), and non-iterative parses, σσ(σ'σ). Examples are provided in (43).

(43) Four-syllable lexical targets:

- a. (σ)(σ'σ)
 [dezipɔpɔ'tæm] → [de('puɾ)_{Ft}(ɱ'tæ̃m)_{Ft}]_{PWd} (C2) *des hippopotammes*
 'some hippopotamuses'

- b. $(\sigma\sigma)(\sigma\sigma)$
 [dezɪpɔpɔ'tæm] → [ti(tœ'pu)_{Ft}(tɛ'tæm)_{Ft}]_{PWd} (C2) *des hippopotammes*
 'some hippopotamuses'
- c. $\sigma\sigma(\sigma\sigma)$
 [pɔ'se læspiræ'tœr] → [pa'ʒe [japɛ(a'tœʏ)_{Ft}]_{PWd} (C2) *passer l'aspirateur*
 'to vacuum'
 [æspiræ'tœr] → [æpɪ(ə'tœx)_{Ft}]_{PWd} (C2) *aspirateur* 'vacuum'

It would appear, then, from Table 5 that Charlex's grammar is optionally iterative. However, before we can definitely conclude this, we must consider the possibility that what we are seeing is, instead, evidence of an accentual arc pattern of secondary stress, as in the target language. Specifically, could words with the profile [$\sigma\sigma\sigma$] be analyzed as reflecting an accentual arc, with prominence at the peripheries, rather than true iterative footing? The answer appears to be no. First, although the number of four-syllable lexical targets is low, the pattern that is critically missing is [$\sigma\sigma\sigma\sigma$] where we instead observe [$\sigma\sigma\sigma\sigma$] (43b). Further, we find no evidence of an accentual arc in Type B constructions. Recall from section 5.3 that Type B constructions are prospective PPhs containing two lexical words that can only be parsed as one PPh in the adult grammar. When we examine the cases where the initial word has more than one syllable realized in Charlex's outputs and where the location of stress cannot be attributed to innovative stress, we observe final stress on each PWd in the phrase and no evidence of an accentual arc, that is, no secondary stress on the initial syllable of the leftmost PWd. Examples are provided in (44). (Spaces in (44) and (45) divide words, both lexical and functional.)

- (44) [ə kæmjð də pɔpjɛ] → [œ ta'joũ pam'fi:], *[œ 'tajoũ pam'fi:] (C1)
un camion (de) pompiers 'a firetruck'
 [ædɛl eliz] → [ɪjɛ: 'ji:ç], *[ɪjɛ: 'ji:ç] (C1) *Adèle-(E)lise* 'Adèle-Elise'
 [lə kæp'tɛn ædɔk] → [œ kœp'itɛn æ'dʊç^h], *[œ 'kœpiten æ'dʊç^h] (C2)
le Capitaine Haddock 'the Captain Haddock'

Finally, when each PWd bears stress in Type A constructions (prospective PPhs containing two lexical words that could be parsed as one or two PPhs in the adult grammar), the same pattern observed in (44) is always found. Of course, some of these constructions may be parsed as two phrases but it is highly likely that at least some are parsed as single phrases, as in (44). Representative examples appear in (45).

- (45) [ɥn gɪtar klæsɪk] → [ɲ gi'tæʏ klæ'çik] (C1) *une guitare classique* 'a classical guitar'
 [de butɛj də vɛ̃] → [de bu'tɛj dɛ 'bæj] (C1) *des bouteilles de vin*
 'some bottles of wine'
 [se dez epi də mæis] → [ʔ e'p^{hi} ɔ me'is] (C2) *c'est (des) épis de maïs*
 'it's some ears of corn'

In sum, we can conclude that Charlex's grammar is optionally iterative, thus providing moderate support for the observation that unmarked iambic systems display iterative footing. One might be tempted to conclude that Charlex is in transition from a grammar where iterative footing was required to one where it is not but, of course, data from an earlier stage would be needed to confirm this.

5.7. Word minimality

If Charlex's grammar is truly foot-based and if, in addition, his grammar reveals evidence of markedness effects beyond what is observed in the ambient data, we would expect his outputs to respect word minimality; that is, lexical words should be no smaller than one binary foot. We observed earlier in section 3.3.1 that the adult French grammar freely tolerates subminimal words and they are likely widely attested in the data to which children are exposed.

Recall that lexical words are not always footed in Charlex's grammar; one-syllable words that form phrases in the target grammar occasionally lack stress (section 5.2) and in cases where the domain in which stress is computed is the PPh, non-final lexical words lack stress (section 5.3). When lexical words do bear stress, however, they always respect word minimality: word-final stressed syllables are heavy, whether words are monosyllabic or longer, and in cases where stress shifts back to the penult, this syllable is inevitably heavy. Although word minimality is respected in Charlex's grammar, feet do not always need to be binary: we observed that monomoraic feet are commonly attested in non-final position in words that display iterative footing (section 5.6). In sum, although we have seen that not every foot is binary nor does every lexical word bear stress, Charlex's outputs do comply with word minimality: footed lexical words are minimally bimoraic. This is consistent with what is predicted if early grammars respect markedness considerations.

6. Conclusion

We began this paper by questioning whether the data on French prominence motivate a foot/stress-based analysis or an account based on intonational prominence. Although we concluded that the data available tip the balance ever so slightly in favor of the foot-based analysis, we suggested that the patterns to which learners are exposed are sufficiently perplexing for them to converge on this grammar without UG principles and the strong guiding hand of markedness. Concerning UG, we proposed that all languages have a prosodic hierarchy which contains the foot and, further, that this constituent is available to children's grammars from the onset of acquisition. Following from this, we argued that learners should analyze the consistent part of the French system, final prominence, in terms of this constituent: as a right-aligned iambic foot. Markedness was then hypothesized to shape the system to be built with the following effects: the domain in which stress is computed should be the prosodic word, not the phonological phrase; as iambic, the system should be quantity-sensitive and footing should be iterative; and, finally, word minimality should be respected. Importantly, none of these predictions follows from an emergentist view of language acquisition where what is frequently attested in the ambient data determines the shapes of early grammars as, aside from phrase-final prominence, none of the expected behaviors are commonly observed in adult French.

We showed that these predictions are largely supported in the grammar of Charlex. In three areas, the predictions were robustly upheld: (i) concerning the analysis of prominence as foot-based, Charlex's outputs clearly evidence an iambic foot; (ii) footing is quantity sensitive; and (iii) Charlex's outputs respect word minimality. In the two remaining areas, the predictions were moderately supported: (iv) as expected for an iambic system, footing was iterative, but only variably; and (v) the domain in which stress is computed or, to be precise, obligatorily realized, was the PWd but, again, only variably.

We can conclude, therefore, that markedness shapes children's early grammars. Concerning the role that it plays in determining the course of development at later stages, we assume that the variability observed for (iv) and (v) reflects some tension between optimal (unmarked) patterns and the language-specific effects that are starting to mould Charlex's productions on the prosodic dimension. Indeed, recall from footnote 25 that when Charlex was tested again, at age 4;8,08, all of the non-target-like patterns that we have discussed were gone from his productions. Clearly, the pressures of markedness must succumb to patterns in the ambient data, even if the latter greatly diverge from what would be considered optimal in cross-linguistic terms. As learners ultimately do arrive at the target grammar, we must question why markedness has such an influential role to play early on in development. We suggest that markedness is critical to help children structure the input data, thereby facilitating the construction of a grammar, particularly at early stages when the cognitive resources available to learners are limited.

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