

Phonological Systems in Conflict: The Acquisition of Stress in Bilingual French-English

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1 Introduction

Bilingual adults often transfer patterns from one language into the other. Despite the existence of transfer, it is generally accepted that bilingual adults have separate linguistic systems (Edwards 2006). One question that remains open is whether bilingual children also have separate systems. Research on bilingual infants has supported opposing views: some scholars propose that there is a single system for each language (e.g., Celce-Murcia 1978, Toribio & Brown 1995), while others defend the position that there are separate systems for each language (e.g., Genesee 1989).

In this paper, we investigate the manners in which language systems interact in early childhood. We hypothesize that, if language separation is not yet complete, children will not only transfer patterns from one language into the other, but will also combine the two, leading to productions where properties of both languages can be identified. To test this hypothesis, we examine the acquisition of stress patterns by a (Québec) French-English bilingual child, Oli. As we discuss below, words in French and English have distinct stress profiles: while French exhibits iambic rhythm, English displays trochaic rhythm. We predict that, if language separation is not yet complete, the positions targeted by stress in each language may both surface as prominent. In other words, a polysyllabic word in either of the languages may be produced with both final and non-final stress. We refer to this phenomenon as *blend*.

A previous analysis focusing on Oli's syntactic representation for negation, finiteness and use of subject pronouns led Genesee *et al.* (1995) to conclude that he had separate syntactic systems for each language. However, syntactic constructions such as these do not provide a context for the potential application of *blend*. The same can be said for segmental phenomena: although transfer at the level of the segment is observed in the early bilingual acquisition of phonology (e.g., Zembrzuski *et al.* 2018), it is not possible for segmental features to be simultaneously activated and deactivated in production. Stress, on the other hand, is the optimal phenomenon for testing *blend*, as it can be manifested in multiple positions within the same word, including in adjacent syllables.

This paper is organized as follows. In section 2, we discuss the algorithms for computing prominence in each of French and English. We then turn, in section 3, to examine previous studies on the acquisition of stress in bilingual children, which will serve to situate the data under analysis. In section 4, we describe how our data were obtained and coded, as well as the linguistic profile of the bilingual child under focus. In section 5, we present our results, which are discussed and interpreted in section 6.

2 Stress in French and English

French and English have considerably different systems of prominence. In this section, we briefly describe how stress operates in the two languages, focusing on those properties that are relevant for the present study.

2.1 Stress in French

Stress in French is only required at the phrasal level (Dell 1984, Jun & Fougeron 2000; see Walker 1984, Thibault & Ouellet 1996 for Québec French). In this way, French contrasts with other Romance languages such as Spanish, Italian and Portuguese, which all exhibit word-level stress. In a phrase with multiple lexical words, stress normally falls on the rightmost syllable that does not contain a schwa, as exemplified in (1a).¹ Stress on phrase-medial lexical words is optional. Single-word phrases also have final stress, as expected; see (1b).

- (1) a. lə pəti ɡaʁ'sɔ̃
 le petit garçon
 ‘the little boy’
- b. pə'ti
 petit
 ‘little’

Given the absence of phonetic evidence for lexical stress, some researchers have assumed that French lacks foot structure (Jun & Fougeron 2000). However, phenomena such as truncation (2a) and stress clash resolution (2b) have led others to argue for the existence of iambic (right-headed) feet in the language (Charette 1991, Scullen 1997). Clash resolution shows that, even though prominence is not obligatory phrase-internally, it can be realized.

- (2) a. si'ne'ma → si'ne
 cinéma
 ‘cinema’
- b. ,maʁi'ʁoz (*ma,ʁi'ʁoz) vs. ma,ʁikʁis'tɛn
 Marie-Rose vs. *Marie-Christine*

As it is not within the scope of this paper to settle the issue of whether or not (Québec) French has foot structure, we describe the language as exhibiting iambic rhythm, and remain agnostic as to how such rhythm is assigned. Regardless of the formal system that French employs, children acquiring this language are primarily exposed to productions where prominence is final, a pattern that, as discussed in the next subsection, is fundamentally different from the one found in English. Furthermore, given that the majority of utterances produced by children at the stage under

¹In Québec French, there is optional stress retraction to the penultimate syllable when it is heavy: 'ɡaʁsɔ̃ ~ ɡaʁ'sɔ̃ (Walker 1984, Thibault & Ouellet 1996, Scullen 1997, Lamontagne & Goad *submitted*).

focus contain only one lexical word, it is not possible to determine the domain in which prominence is assigned.

2.2 Stress in English

In English, the domain in which stress is computed is the word. Consequently, every lexical word in a phrase is stressed, in contrast to what is observed for French. It is generally assumed that, in nouns with three or more syllables, stress falls on the penultimate syllable if it is heavy (3a); otherwise, stress falls on the antepenult. Final syllables are extrametrical (Liberman & Prince 1977, Hayes 1995). These patterns (i) indicate that English is weight-sensitive and (ii) are consistent with the language having foot structure. Unlike what has been proposed for French, feet in English are trochaic (left-headed).

- (3) a. [və(ˈɪæn)_{Ft}<də>]
veranda
b. [(ˈkæ.nə)_{Ft}<də>]
Canada

Consistent with (3), disyllables typically have trochaic rhythm: *'city*, *'pencil*.² Additionally, since many words in the English lexicon are disyllabic, and there are more LLX words than LHX words,³ the language has a bias toward initial stress (Cutler & Carter 1987).

Concerning exposure to different prosodic patterns, it has been shown that English child-directed speech has shorter words (than adult-directed speech; Carlson *et al.* 2011). It is thus possible that children at first assume that English stress is parsed from the left edge of the word. Although we follow no specific claims about whether infants employ foot structure in their productions and the direction from which feet (if present) are parsed, we assume that children acquiring English are mostly exposed to words with trochaic rhythm. As we detail in section 4, all English words produced by the bilingual child under focus have target penultimate stress, which is consistent with exposure favoring trochaic rhythm. In the next section, we discuss previous findings on the acquisition of competing stress systems by bilingual children, to examine the manners in which they deal with grammars that are potentially in conflict.

3 Bilingual Acquisition of Stress

In early monolingual child phonology, segment deletion and word truncation are pervasive. Interestingly, stress is usually immune to such processes: stressed vowels or syllables are not normally deleted, and stress does not normally shift (Fikkert 1994, Kehoe 2000). Thus, given the different stress patterns observed in French and English targets, the monolingual acquisition of these two languages involves distinct productions.

²Final stress in non-verbs, yielding words with an iambic profile such as *ba'lloon* and *gi'raffe*, is constrained by weight (see, e.g., Halle & Vergnaud 1987, Hayes 1995).

³L stands for light syllable, H stands for heavy syllable and X stands for light or heavy.

Monolingual children acquiring French tend to truncate polysyllabic words to 2-syllable outputs with final stress (e.g., [animo] → [ni'mo] *animaux* 'animals'). On the other hand, monolingual children acquiring English tend to truncate polysyllabic targets with antepenult or penult stress to 2-syllable outputs with penult stress (e.g., ['ɛləfənt] → ['ɛfə] *elephant*). These observations hold in both naturalistic productions (see, e.g., Goad & Buckley (2006) for French, and Kehoe (2000) for English) and experimental settings (see, e.g., Paradis (2001) for French and English, and Gerken (1994) for English).

In bilingual acquisition, the extent to which the two stress systems interact is an issue that has drawn considerable attention. On one hand, there is the possibility that children have separate systems. The outcome of this possibility is that productions are faithful to the stress pattern of each of the languages, and transfer is minimal or not observed at all. Even though widespread transfer is not expected under this scenario, this does not require that the productions of the bilingual child necessarily match those produced by children who are monolingual in either language. On the other hand, there is the possibility that bilingual children start off with a single system that accommodates both languages. In the single-system stage, two outcomes are possible: (a) the stress patterns of one language are observed for productions in the other language, and vice-versa, or (b) one stress pattern is employed across the board for productions in the two languages.

Both of these possibilities have been explored in previous research. In a set of experiments focusing on truncation patterns, Paradis (2001) probed the production of nonce words with distinct rhythmic profiles by French-English bilingual children and children who were monolingual in either French or English. All children were aged two to three years old. The nonce words used in the experiment had four syllables. The French words had the following rhythmic profile: WWWS, where W corresponds to weak (or unstressed) and S corresponds to strong (or stressed). The English words had the following profiles: WŚWŚ, WŚWW, ŚŚWW, ŚWŚW. Participants were only exposed to words in the language(s) they knew. The experiment involved introducing the nonce words to the children (which corresponded to unfamiliar toys or animals) and prompting the children to repeat them. In the case of the bilinguals, the French and English tasks were run on separate occasions.

Paradis (2001) observed that, with respect to the French items, bilinguals and monolinguals displayed similar truncation patterns: in 93% of their productions, they were faithful to the final syllable of the word; the second most preserved syllable was the penult (60%). These productions are consistent with children acquiring French being sensitive to the language's iambic rhythm. However, in the English task, bilinguals and monolinguals behaved differently for some word profiles and more similarly for others. For example, for truncations of WŚWŚ words, while monolinguals preserved the two S syllables more frequently, bilinguals preserved the final syllable 87% of the time, and the third and second syllables at similar rates (medial W syllable: 47%; other S syllable: 55%). These patterns suggest that while monolinguals are building two (trochaic) feet, bilinguals are producing an iamb. With regard to ŚWŚW words, both monolinguals and bilinguals preserved the two rightmost syllables more frequently, which indicates that they were building a trochee. Since the focus of the study was on which syllables are retained in

truncation, Paradis (2001) did not specify where the participants realized stress in their productions. Still, these results suggest that, although bilingual children seem to have separate systems, transfer from one system into the other is possible.

In a recent experimental study with a different language pair, namely English and Polish, Zembrzuski *et al.* (2018) also suggest that bilingual children have separate prosodic systems. In Polish, the default position of stress is on the penultimate syllable and the language, unlike English, is not weight-sensitive. The study involved one task in each of the languages where bilingual children were prompted to repeat polysyllabic nonce words. While transfer between the two languages was observed at the segmental level, transfer of stress position was not. Bilinguals were able to produce stress on the target syllable in each of their languages, and they were also able to differentiate between primary and secondary stress in both languages. This suggests that different components of the phonological grammar are not acquired simultaneously. It should be noted, however, that Zembrzuski *et al.*'s study examined productions in older children (aged between 4 and 7 years old), which may explain the lack of interaction between the prosodic systems under focus.

The possibility that bilinguals have a single prosodic system in early childhood is supported by the results of Brulard & Carr (2003), who analyzed the naturalistic productions of a French-English bilingual child at different time points over the course of about one year (from 1;8 to 2;6). The child had a francophone mother and an anglophone father, and lived in England for the first year of his life and in France afterwards. However, there was no consistent 'one parent-one language' input. While in England, the child was exposed to French only at home; while in France, exposure to English was only at home. Regarding the realization of stress, the child regularly produced English words with final stress up to the age of 2;3 (e.g., [ba'bit] *rabbit*). This is an indication that, in the early stages of acquisition, the child in question had a single prominence system based on the grammar of French.

Importantly, none of the studies discussed reported the existence of blend in the children's productions. However, except for Brulard & Carr (2003), the studies used data collected in experimental settings where the children had to repeat words that they had just learned in one of their languages. We conjecture that, in naturalistic settings, the bilingual child is more likely to draw from both languages. This should especially be the case if the setting in which the child is tested is one where both languages are normally used (such as in the child's home where each parent speaks one of the languages). Consequently, influence of one language on the other is more likely to be observed. We return to the significance of this after we provide details on Oli's profile and present the methodology employed to collect and code the data used for this study.

4 Data

To probe the realization of stress in bilingual French and English, we examined the productions of a simultaneous bilingual child, Oli (age 1;11) from Montréal (Québec, Canada). The child has an anglophone mother and a francophone father, and was being raised in a 'one parent-one language' household, where each parent spoke to him only in their native language. Given that Oli had started French lan-

guage daycare prior to the onset of the study, he was dominant in French at the time of data collection.

The child was videotaped for 45 to 60 minutes over three different recording sessions where he interacted with his parents. Each session focused on a particular language: two sessions aimed at monolingual interactions (in French with his father and English with his mother), and one session aimed at a bilingual interaction, following Genesee *et al.* (1995). However, the child used both French and English in both of the monolingual sessions.

Twenty minutes of each of the monolingual sessions were analyzed for this paper. Lexical words with two or more syllables were orthographically and phonetically transcribed and coded for stress placement by three linguists. Items such as onomatopoeia, interjections, monosyllables (e.g., English *car*, French *jus* 'juice'), compounds (e.g., English *Big Bird*), and phrases formed by two monosyllables (e.g., English *all gone*, French *beau bec* 'nice kiss') were discarded. All instances of a given lexical item produced by the child were included in the analysis.

Stress was coded as being *final*, *penult* or as being realized on *both* final and penult syllables. In cases of disagreement among transcribers, the stress pattern of a given word was determined when at least two of the linguists agreed on it. Nine words in the data were assigned a different stress location by each of the linguists (*final*, *penult*, and *both*). This mismatch in coding indicates that such items were ambiguous in the way that they manifest stress, with different linguists likely attending to different cues; they were ultimately coded as *both*. Items coded as *both* were not distinguished based on whether the word was perceived as having one primary and one secondary stress, or two primary stresses.

Stress in the English target items was invariably penultimate (e.g., *daddy*, *neighbour*, *another*, *tractor*). In the child's productions, items with three syllables were generally truncated to disyllables (*another* → [nadə]), consistent with previous observations in the literature on monolingual acquisition (e.g., Kehoe & Stoel-Gammon 1997).

The child's productions were further coded for *language* (whether the word is a French or an English word) and for whether the produced stress pattern matched the expected stress pattern. In the case of French, the expected stress pattern is *final*,⁴ so only items produced with *final* stress were coded as being a *match*; productions labeled as *penult* or *both* were coded as a *mismatch*. In the case of English, the expected stress patterns for all the items produced by the child was *penult*, so only items produced with *penult* stress were considered a *match*; productions coded as *final* or *both* were a *mismatch*.

5 Results

A total of 179 items were included in the analysis, of which 123 (69%) were French. This, and the proportions of *matches* in the data (i.e., productions with the target-like stress pattern), reflect the child's dominance in French: while 82.11% of the

⁴Although, as mentioned earlier, stress in Québec French can optionally shift to the penultimate syllable when it is heavy, we will see shortly that the child overwhelmingly favours final stress in his French productions, which is why we have treated final as the only possible target for French.

French words were produced with final stress, only 17.85% of the English words were produced with penult stress. The difference in production of target-like stress patterns between French and English is confirmed by a logistic regression with a by-item random intercept ($\hat{\beta} = 23.69, p < 0.0001$).

Figure 1 shows the proportions for the three possible stress patterns in the child's productions. The white portion of the English bar exhibits productions with the expected stress pattern for English (*penult*). The light grey portion of the French bar exhibits productions with the expected stress pattern for French (*final*).

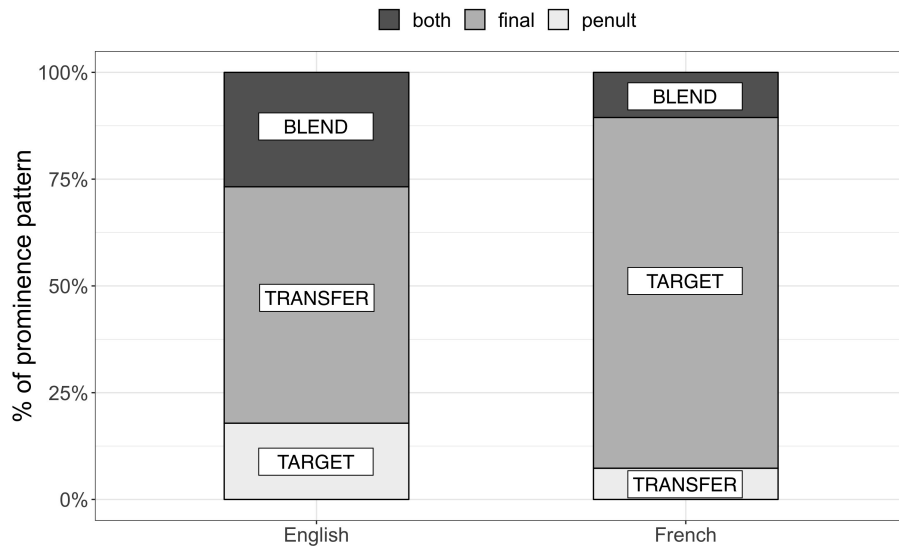


Figure 1: Stress patterns in the French-English bilingual child's productions.

Overall, 58.8% of production mismatches correspond to stress shift: the item has only one stress, but it is not realized on the expected syllable. Stress shift represents 45.8% of all mismatches in French, and 67.4% of all mismatches in English. Stress shift is exemplified for French and English in (4) and (5), respectively.

- (4) a. * .
 tɔ mæt
 target: [tɔ'mat] 'tomato'

- b. * .
 tʁ mi
 target: [fi'ni] 'finished'

- (5) a. . *
 dæ di
 daddy

- b. . *
 e bɛ
neighbour

On the other hand, 41.2% of production mismatches correspond to the addition of another stress: both final and penultimate syllable are prominent. Addition of stress represents 54.2% of all mismatches in French, and 32.6% of all mismatches in English. The examples in (6) and (7) illustrate addition of another stress in French and English productions, respectively. Addition of another stress invariably results in productions with stress clash in the data under analysis.

- (6) a. * *
 vɛ lo
 target: [ve'lo] 'bike'

- b. * *
 ã kɔ
 target: [ã'kɔR] 'still'

- (7) a. * *
 na dʒ
another

- b. * *
 tæk tæ
tractor

The examples in (4)-(7) indicate that syllable weight does not constrain stress assignment. In French [tɔ'mat] 'tomato' (4a), for instance, the final syllable has a coda, which should attract stress to it, but Oli produces the word with penultimate stress. In English *tractor* (7b), the final syllable is light, but this syllable is produced as stressed by Oli.

We propose that these mismatches have different sources: stress shift reflects transfer, but the addition of another stress corresponds to blend. While transfer leads to productions with only one stress, blend leads to productions with two stresses. When transfer occurs, the child applies the rhythmic pattern of one language in the other. Thus, in French productions with penultimate stress, English trochaic rhythm is employed: ['tɔ.mæt]. In English productions with final stress, French domain-final stress applies: [dæ.'di]. Blend, on the other hand, results from a combination of the rhythmic patterns of the two languages. This means that both French domain-final stress and English penult stress are realized: ['vɛ.'lo], ['tæk.'tæ].

As previously mentioned, the child was dominant in French at the time of the recordings. Language dominance seems to play a role in both transfer and blend.

Transfer is more frequent from the dominant to the non-dominant language: there are proportionally more instances of final stress in English productions than instances of penult stress in French productions. In the case of blend, it is also more frequent in English productions than in French productions. However, as pointed out above, blend corresponds to the majority of the mismatches observed in the French productions, while it corresponds to approximately one third of the mismatches in the English productions. The proportions of transfer and blend in the data are in line with the idea that the dominant language is more resistant to the effects of the competing system: (a) the dominant language is the most frequent source of transfer, and (b) it is more impervious to being overridden by the competing system. The consequence of (b) is the overlaying of the non-dominant system on top of the dominant system, which results in productions with two stresses.

Given that most of the bilingual child's French productions match the expected stress pattern, it seems that the child has differentiated systems for stress to a certain extent. The presence of extensive transfer and blend in the data indicates that system separation is not yet complete, and that the two languages influence each other. Since both transfer and blend are constrained by language dominance, it does not appear that blend is the inevitable manifestation of a single system; instead, blend seems to be the result of the direction of influence from one system onto the other. In the next section, we further elaborate on our interpretation of the data as well as consider alternative analyses.

6 Discussion and conclusions

We showed in the previous section that the mismatches in Oli's productions are of two types: stress shift, which corresponds to transfer, and the addition of another stress, which corresponds to blend. It could be argued, however, that such mismatches are in fact speech errors, instead of evidence that the child's systems interact with each other. We contend that this is not the case. Recall that stress errors (such as assigning stress to an unstressed syllable) in monolingual acquisition are rare (Fikkert 1994, Kehoe 2000). Even though it has been shown that bilingual children usually take longer than monolingual children to produce their first words (Meisel 2006), such a delay does not imply a higher likelihood of producing speech errors than monolingual children. Additionally, if non-target-like productions were speech errors, we would expect to find similar proportions of such errors in both of the child's languages. However, the fact that most of the mismatches in our data are observed in productions in the non-dominant language suggests that the non-dominant language is consistently more affected by the dominant language than the other way around.

Another issue that must be addressed is whether blend is characteristic of bilingual acquisition, or whether it is a stage in first language acquisition more generally. It has been proposed, based on data from children acquiring Dutch, that level stress (disyllabic or polysyllabic productions where two stresses are observed) is an intermediate stage in the acquisition of prosodic structure that starts roughly around age 2 (Fikkert 1994). In terms of prosodic development, this is the stage where children start to produce items with two feet.

We argue that the blend data presented here do not correspond to this stage of

monolingual acquisition. It has been shown that productions with two stresses are rare in the monolingual acquisition of English (Kehoe 2000). Most of the English productions that exhibit two stresses are in fact truncated polysyllabic words that already exhibit two stresses in the target forms (e.g., *alligator*, *kangaroo*). Therefore, what such productions reveal is that children are faithful to the position(s) of stress; they do not, however, speak to whether a particular foot type is employed. Additionally, it would be highly surprising to find two stresses in child French productions, since French virtually never exhibits multiple stresses inside a single word.

Thus, Oli's productions exhibiting blend do not seem to be the result of the overapplication of foot structure, i.e., the building of adjacent monosyllabic feet, as proposed in Fikkert (1994). Although we do not make any assumptions about whether or not bilingual children at Oli's stage of development have acquired the prosodic constraints of their target languages, a number of possible explanations for how prosodic structure might be employed in blend productions seem reasonable. One possibility is that constraints on the assignment of prominence have not yet been acquired at this stage. Consequently, stress is not associated with specific domains, which allows for the assignment of multiple stresses to a single item. Another possibility is that the child is more certain about the prosodic constraints of one language but is aware that the two systems differ. This implies that blend is the result of uncertainty with regard to which prosodic constraints are operative. Yet another possibility is that the child has already learned the prosodic constraints associated with stress in each language, but is not able to completely dissociate them. This results in productions where both English trochaic footing and French phrase-final prominence apply: [(vɛ.'lo)_F]_{PPH}, [(tæk.'tæ)_F]_{PPH}. Further research, especially with data from subsequent stages in development when children begin to produce phrases with multiple lexical words, is needed to assess which of these possibilities is operative in bilingual children's grammars.

An additional topic that deserves attention is whether blend remains active in bilingual systems, and consequently whether adult bilinguals exhibit blend in some parts of their phonological grammars, such as in their intonational patterns and segmental representations. With respect to intonation, it might be the case that bilinguals produce intonational contours that combine characteristics of the two systems. Several studies have shown that bilinguals do produce intonational patterns that differ from those produced by monolingual speakers, for example, Elordieta (2003) for Spanish speakers in contact with Basque, O'Rourke (2004) for Spanish speakers in contact with Quechua, and Queen (2012) for German speakers in contact with Turkish. However, the patterns observed are not a blend of both systems, but instead involve novel patterns. Regarding segmental representations, it might be the case that, for a pair of languages that differ with respect to some dimension such as voice onset time (VOT), bilinguals produce VOT values that are intermediate between the two languages. The findings from one study on French-English bilinguals suggest that this is not the case. Caramazza *et al.* (1973) observed that although French-English bilinguals' perception and production of English VOT was not identical to that of monolinguals, their values were not intermediate between the target values for French and English, *contra* what would be expected from blend.

With regard to the second language acquisition of prosodic structure, the existence of blend is elusive. Transfer, on the other hand, has been widely reported in

the literature (e.g., Broselow (1992), Archibald (1998), Goad *et al.* (2003), among many others). It is possible that certain processes branded as transfer, or productions that a transfer approach is unable to account for, actually correspond to blend. Further research is required to determine whether blend is part of second language acquisition.

Finally, our results indicate that language dominance plays a role in both transfer and blend, with transfer being more frequent from the dominant language, and blend affecting the dominant language more frequently than transfer. Based on these results, we assume that the dominant language is more likely to be targeted by blend than transfer because it is more resistant to the competing system: it is less onerous for the dominant language to add a stress than to shift it. A prediction that derives from this assumption is that, for a French-English bilingual child whose dominant language is English, blend should be more frequent than transfer in his/her English productions, and transfer should be more frequent from English into French. We leave investigation of this possibility for future research.

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