Productions in bilinguism, early foreign language learning and monolinguism: a prosodic comparison

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Abstract

The degree of L2 foreign accent is likely to vary, according to the age of the acquisition, the length of contact with L2 and the possible interaction between L1 and L2. This study examined how children who master French and English at different levels pronounce disyllabic words in both languages. Acoustic analysis (F0, duration and amplitude) of syllables in disyllabic words were compared between 8 bilingual children (French-English, aged between 3;6 and 6;1 years) and 16 monolingual children (8 French children and 8 English children of the same age) and confronted to the analysis of 20 (7 years aged) early French Learners of English (FLE) children. Results showed that the bilingual children acquired prosodic patterns in both languages. However, the accent of their disyllabic words differed from those of the monolingual children. French 7 years old-aged learners of English, after only two years of acquisition, produced the native-like accent. Our findings modulate the "critical age" hypothesis and bring some new elements in favour of the L1 and L2 obligatory interaction hypothesis.

Index Terms: bilinguism, early language learning English, acquisition of prosody, English, French

1. Introduction

The acquisition of prosody has rarely been studied, especially in children acquiring more than one language either at birth or later in childhood. In this paper, we compare the production of disyllabic words by monolingual French and English, bilingual French-English and French children learning English as foreign language. Confrontation between the French and English languages is particularly interesting as these languages are rhythmically and accentually distinct [1], [2]. On a continuum, English is said to be more rhythmically "stress-timed" language, and French is described as more "syllable-timed" [3]. In English disyllabic words, primary stress is preferentially on first syllable S1 (trochaic pattern). On the contrary, in French disyllabic words, stress is on the second syllable S2 (iambic pattern) because of the final position of the primary stress (final lengthening, FL). These differences in stress pattern between French and English are especially marked by pitch, duration and amplitude parameters [4]. Thus, stressed syllables are much more salient compare to non stressed syllables. Moreover, stressed syllables are pronounced on a different pitch level, which create a tonal shift (pitch accent). In the learning of English as a foreign language, French learners will have a tendency to stress final syllable in disyllabic words, because of the FL. They will also have some difficulties to use pitch and amplitude in the production of stressed syllables. In fact, the trochaic pattern will be very difficult to master especially because of a "prosodic surdity" phenomenon in the perception level and articulatory automatisms at the production level [5]. For that reason, it's very interesting to investigate the acquisition of stress pattern by comparing the production of disyllabic words by bilingual French/ English children, by monolingual French and monolingual English children and by early French children learning English (FLE). If we accept the position that earlier in life one learns an L2, the better it will be pronounced then children acquiring two languages from birth will develop the specific prosodic structures of each language and separate the two languages at an early stage of production. Based on the same hypothesis, the productions FLE children (at 6-7 years) will be influenced by the prosodic filter of their mother tongue, because the more fully developed the L1 system is when L2 learning begins, the more strongly the L1 will influence the L2. However, an alternative hypothesis could be proposed. Concerning bilinguals' speech performances, we predict that their L1 and L2 phonological systems exist in a "common phonological space" [6] and can not be separated completely. That, the developing systems influence one another, and the prosodic properties of one language dominate the early productions in both languages due to the fact that some of its parameters match the biological tendencies of the child's articulatory system or are more perceptually salient [7]. For the FLE children, we expect native-like pronunciation in L2 according to the critical period (CP) hypothesis that predicts that children who began learning an L2 before the end of the CP (before 7-8 years) would have better pronunciation than would individuals first exposed to an L2 after this period [8]. Moreover, at this age, children show some excellent abilities to restitute a foreign language's prosody [9] [10] as their capacities to imitate are at their height between 4-8 years.

2. Methodology and acoustic analyses

2.1. Speakers

- 8 bilingual children regularly exposed to French and English from birth. The mother's language was English and the father's French. Most of the children attended a French nursery school. They were aged from 3;6-6;1 years (mean age = 4;8 years).
- 8 French monolingual children from 3;5-6;1 years (mean age=4;3) recorded in Poitiers (France) and 8 English

monolingual children from 3;11-5;10 years (mean age=4;2) recorded in Bangor, (Wales). They all had monolingual parents. French children were recorded at school or at home and English children, at University of Wales, Bangor.

- 20 French children Learning English (FLE) from 3 different schools (located in Dijon and Dole, France). They were 7 years old and began the learning of English when they were 6 years old.

All the children knew the words they needed to pronounce in order to describe the pictures in the book.

2.2. Recording and procedures

Bilingual and monolingual children were video-audiotaped (Sony PD 120 DVCAM camcorder). Bilingual children were recorded over two sessions. A single language was spoken in each recording session. Monolingual and FLE children were recorded during one session. For bilingual and monolingual children, the data were elicited by means of a story-telling task in which the child was asked to comment a colour picture book. Because the English level of FLE children was not sufficient compared to monolingual and bilingual children, they had just to produce the name of colours, objects, numbers and animals in a picture book. They were recorded in interaction with always the same native English speaker who was not the usual English teacher. In this way, the experimental conditions were the same for all children. The experimenter's task was to elicit production of words by showing the pictures.

2.3. Linguistic material

For bilingual and monolingual children, there were 40 disyllabic words in French and 33 in English. The pictures presented a familiar context to encourage the child to produce short, descriptive sentences including the target words. For FLE children, they were 10 dissyllabic words in English. This list of word was based on words learned in English class. For all groups, the majority (80%) of disyllabic words was produced in isolation and was extracted from the original audio or audio-visual recording.

2.4. Acoustic analyses

Words and sentences were sampled at 22 kHz, 16 bits in mono. For bilingual and monolingual children's production, acoustic analyses were made with the CSL software system and for FLE children, with the Winsnoori and Praat softwares. Syllables were segmented and markers were placed manually, based on the amplitude curve and/or pitch contour. The acoustic analyses concerned the syllable duration, the mean fundamental frequency (F0 in Hz) and the mean amplitude of the first syllable (S1) and the second syllable (S2) for each disyllabic word.

2.5. Statistical analyses

The data were subjected to separate ANOVAs for each of the three acoustic cues (duration, F0 and amplitude). Each of the analyses consisted of 3 steps:

(1) Comparison between languages (French vs. English) in bilingual children.
(2) French language: comparison between groups of children (mono vs. bilingual children)
(3) English language: comparison between children (mono vs. bilingual children)
(4) English language: comparison intra-FLE group.

3. Results

3.1. Bilingual children: French vs. English

S2 was longer than S1 in both languages ($F(1.7)=41.25$, $p<.000$), but this difference was greater in French than in English (Language x Syllable interaction ($F(1,7)=6,55$,$p<.04$). With regard to S2/S1 duration ratios, in French the ratio was 1.93 – significantly greater than in English (1.51, $t(7)=3.51$,$p<.01$) for this group. The F0 value was higher for S1 than for S2, but this difference was not significant at the threshold of .05 ($F(1.7)=4.61$, $p=.069$). Moreover, pitch was overall higher in French than in English ($F(1.7)=6.64$, $p<.04$). Amplitude was overall higher in S1 than in S2 ($F(1.7)=11.14$, $p<.01$). These phenomena are shown in Figure 1.

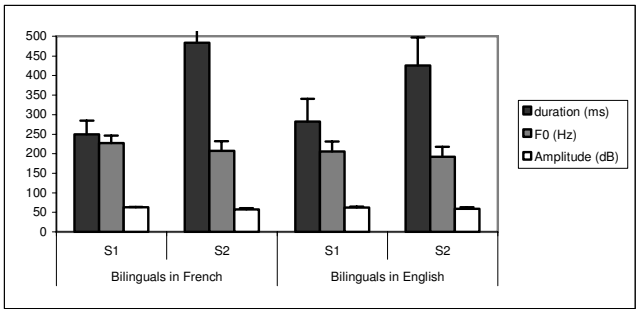

Figure n°1 Values for duration, F0 and amplitude for S1 and S2 in French and English for bilingual children

3.2. French language: monolinguals vs. bilinguals

In both groups, S2 was longer than S1 ($F(1.14)=103.5$, $p<.0001$). There was no difference in the S2/S1 duration ratios of the two groups ($t(7)=0.29$), and the values were similar to those observed in adult speech (1.89 and 1.93 vs. 1.8 in adults). There was no overall difference between the two groups of children in F0 values: a main effect of Syllable ($F(1.14)=7.41$, $p<.01$) revealed the higher values of. pitch for S1 than for S2. The Group x Syllable interaction effect close to the threshold of significance ($F(1.14)=3.96$, $p=.066$), showed a difference in F0 between the two groups of children for S1. The decrease in F0 in S2 was significant for the bilingual children ($F(1.14)=11.10$, $p<.005$) but not for the monolinguals (Figure 2). Amplitude was

higher overall in S1 than in S2 in both groups (1.14)=22.26, p<.0002).

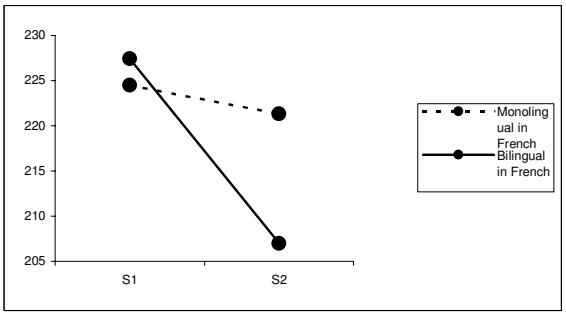

Figure n°2 Group vs. Syllable interaction for F0 in French for monolingual and bilingual children

3.3. English language: monolinguals vs. bilinguals

S2 was longer than S1 in the both groups (Figure 3) and the S2/S1 ratios were similar (1.46 in the monolingual group and 1.51 in the bilingual group). Overall, the F0 values were higher for the monolinguals than for the bilinguals (F 1.14)=67.64, p<.0001), possibly due to the differences in voice placement at a given moment or to the nature of the subjects' voices. However, both groups displayed the same pattern of development: higher values on S1 than on S2, (F(1.14)=6.60, p<.02). A main effect of Syllable (F(1.14)=9.15, p<.009) was also observed, with higher values in S1 than in S2. Also, we observed the higher amplitude in monolingual than in bilingual children. This difference could be due to the timing of the observation, or to the subjects, as we observed for F0, and is not relevant to this study.

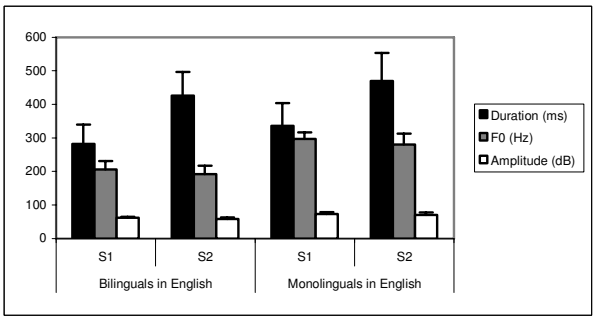

Figure n°3 Values for duration, F0 and amplitude for S1 and S2 in English for monolingual and bilingual children

3.4. English language: comparison intra FLE group

S2 was significantly longer than S1 (t(19)=11.97, p<.000) and the ratio S2/S1 was from 1.42. These results are very similar to those of monolingual and bilingual children in English. The F0 values were significantly higher in S1 than in S2 (t(19)=8,85, p.<.000) as in monolinguals and bilinguals (Figure 4). Amplitude was significantly higher in S1 than in S2, (t (19)=11.22, p<.000) as in monolinguals and bilinguals.

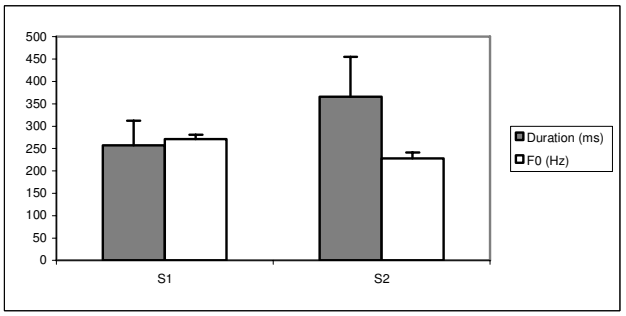

Figure n°4 Values for duration and F0 for S1 and S2 in English for French Learners of English (FLE)

4. Discussion

In order to test the hypothesis that children who are bilingual from birth develop original phono-prosodic systems, we analyzed disyllabic word production by one group of French-English bilingual children, two groups of monolingual children aged between 3;6 and 6;1 years and one group of French learning English children (FLE) aged 7 years on the basis of three prosodic cues: duration, F0 and the amplitude of the syllabic segments. Comparisons were made in each language for a set of similar words produced by all children. We observed a lengthening of the second syllable by all children, monolingual, FLE and bilingual. These results are consistent with the hypothesis that young children tend to lengthen the ends of multisyllabic words [11], [12] and [13]. Nevertheless, we did observe some differences between the languages on this dimension. In French, the S2/S1 duration ratios for French monolinguals (1.88) as well as for bilinguals (1.934) were relatively stable and adult-like, whereas in English, the duration ratios for monolingual children (1.395) were smaller than in French and different from the adult ones. Furthermore, in the bilingual children, the significant difference between duration ratios for each language (French=1.934; English=1.508) could reflect the tendency of this group to adjust the segmental duration in English by lengthening the first syllable and reducing the second one. For FLE children, the S2/S1 duration ratio was shorter (1.42) than for monolinguals (1.46) and bilinguals (1.51). This could be explained by a tendency to a prosodic exaggeration by FLE children [14]. In English, disyllabic words are stressed on their first syllable. In 85 % of words, FLE children produce stress on S1. In 15 % of words, they produce stress on S2 because of the prosodic filter of the French language. With respect to pitch, the higher level on the first syllable in disyllabic words (trochaic pattern) was observed in both groups in English (monolingual and bilingual children), as well as in French in bilingual children. This natural tendency to produce a higher F0 on the first stressed syllable matches the English trochaic pattern, and contrasts with the final-syllable lengthening of French. The most important indicator for stress in English – pitch – would appear to dominate the bilingual production of French disyllabic words. In English, the amplitude contour follows the same course as pitch, and we observed greater amplitude on the first syllable that was stable, as well as higher pitch. In French, there was no correlation between the slight rising pitch pattern [cf. F0 results] and the falling amplitude pattern in either group. Nor were there any

differences between the monolinguals' and bilinguals' amplitude patterns.

5. Conclusions

Everything seems to suggest that bilingual children who learn two rhythmically and prosodically-contrasting languages produce words in which the cues for stress and accent, i.e. duration and pitch are not totally similar to those of monolingual children speaking the relevant languages. The completely native-like performance in pronunciation even in bilingual from birth could not be observed because it seems difficult to them to prevent their L1 and L2 prosodic systems from influencing one another. The absence of influence of the French in the FLE pronunciation of English at age of 7 suggests that this privileged age (inside the critical period) allows an optimal command of stress patterns in L2.

6. References

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