THE PROCESSING OF PHONOLOGICAL INFORMATION BY BILINGUAL SUBJECT : EXAMPLE OF THE ACQUISITION OF LIAISON IN FRENCH

Sandrine Ferré & Sophie Wauquier-Gravelines
AAI - JE 2220, Université de Nantes, France

ABSTRACT
Any native or learner speaker of French is confronted to the problems posed by liaison. The floating parameter doesn’t appear in every language. If this parameter is set up at about three years old by French children, it is interesting to observe how bilingual children, who are confronted to two discrinctive phonological systems, manage to set up such a parameter. An experiment conducted with thirteen bilingual children brought out that the language of the mother is determiner. If the bilingualism bring a cognitive advantage, a mainly english input impede the phonological structuration of French. The differences between the two groups of children allow us to determine the phonological values which are required during the acquisition of liaison.

1. INTRODUCTION
The liaison in French concerns every learners of French whatever his age or his linguistic experience. This phenomenon makes a segment appear on word boundary under some conditions. This segment or liaison consonant (CL) is highly variable. Indeed, his phonetic nature is determined by the word to which it belongs. Moreover, this segment only appears under conditions : it doesn’t sound in an isolated word, or before a consonantic initial. For example, the indefinite determiner « un » [œ̃] before a vowel. For example, “un enfant” (a child) : “un” [œ̃] and “enfant” [a̞nit], but “un enfant” [œ̃n̩a̞]. The variability of the CL leads to some problems of recognition for learners of French, adults or children, native or not. The studies led with monolingual children [3, 6] have placed the acquisition of liaison between determiner and substantive between two and four years old. But, the floating notion which characterizes the liaison in French isn’t set up in every language. So, a child, who grows up in an English-French environment, has to face to opposite values in the phonological structure of his languages. The study of trial and errors made by bilingual children, from three to four years old, can inform us about the different stages of the acquisition of the liaison.

2. LIAISON IN DECLARATIVE PHONOLOGY
The declarative phonology is a system based on association constraints, and on a single level of representation. There is no hierarchy between the constraints and none of the constraint can be violated. Moreover, the fundamental constraints belong to the Universal Grammar (GU). And the setting of the constraint in the Principles and Parameters theory (PP) allows to restrain the framework’s power in order to give a true representation of the language.

Two main concepts occur in the declarative analysis : the theory of elements [1, 4, 5], and the theory of the syllable [1]. In this theory, any segment will be determined by three specifications : its representation in phonological elements (SEG), its rythmic position in the syllable (POS), and its prosodic position (PC). The declarative phonology explains the liaison in French by the unification of the lexical representation and the constraints which cause the realisation of the floating segment. Thus, this framework is able to describe precisely the different notions which occur in liaison.

The floating is interpreted by the underspecification of the values POS and PC (e.g. rythmic and prosodic positions) for the CL whereas its attribute SEG is determined, that is that the phonetic nature is given for the CL. A child has to acquire the phonological competence which is required to the setting of all the notions needed for the acquisition of the liaison in French. A child who never makes any liaison wouldn’t know the possibility to unify the liaison constraint with the lexical representations : he will not be able to give some values to the various types SEG, POS, PC. And, studies have shown that there is a delay in parameter setting for French children [3, 6].

Our aim is a) to understand how and when the parameter is set up by bilingual children, b) to observe if the parameter setting be impede for bilingual children who receive two linguistic inputs in a same time., and c) to determine the phonological values which have to be set up during the acquisition of liaison.

3. METHOD

3.1. Corpus
The material was composed of twenty-four pictures of mono, bi, tri and quadrisyllabic items which present a liaison context between the indefinite determiner and a vocalic initial substantive : “un éléphant” (an elephant). Thirty-six control pictures was inserted to avoid that the material’s characteristics was found : twenty-four distractors have an initial consonantic substantive between determiner and substantive between two and four years old. But, the floating notion which characterizes the liaison in French isn’t set up in every language. So, a child, who grows up in an English-French environment, has to face to opposite values in the phonological structure of his languages. The study of trial and errors made by bilingual children, from three to four years old, can inform us about the different stages of the acquisition of the liaison.

<table>
<thead>
<tr>
<th>Liaison context Sgi</th>
<th>Liaison context Pli</th>
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</thead>
<tbody>
<tr>
<td>1 syll</td>
<td>un ours (a bear) [œ̃œ̃s]</td>
</tr>
<tr>
<td>2 syll</td>
<td>un avion (a plane) [dœ̃avjœ̃]</td>
</tr>
<tr>
<td>3 syll</td>
<td>un écureuil (a squirrel) [œ̃œ̃kyœ̃œ̃]</td>
</tr>
<tr>
<td>4 syll</td>
<td>un hippopotame (an hippopotamus) [œ̃œ̃hippopotam]</td>
</tr>
</tbody>
</table>

Our aim is to understand how and when the parameter is set up by bilingual children, to observe if the parameter setting be impede for bilingual children who receive two linguistic inputs in a same time., and to determine the phonological values which have to be set up during the acquisition of liaison.
3.2. Task
The experimental task was picture denomination. The pictures were presented to the children and they had to say what they see on the pictures. The experiment began with three training pictures. The children did not show broad difficulties in general to understand and perform the task. We noticed the children production of liaisons.

3.3. Subjects
We test thirteen English-French bilingual children from tree to four years old, who attend three bilingual schools of Paris, and whom parents don’t speak the same language.

4. RESULTS
The first results divide the children in two distinctive groups according to the language of the mother : the group F (figure 1) is composed by seven children whom mother speaks French, and the group A (figure 2) by 6 children whom mother speaks English. As we can see, it seems that the language of the mother is determinant for the setting of the floating parameter in French. The figures present the results of the Sgi experiment. Figures for Pli are quite similar.

These figures show that the children who receive a french input from their mother (group F) realize the CL much more than the children who receive an english input from their mother : 56 % of good liaisons (LE) for the group F vs 9 % of LE for the group A. On the contrary, the children of the group A avoided to produce liaison as we can see through the rate of non-liaisons (NL) : 39 % of NL for the group A vs 17 % for the group F. The English-mother children have produced also much more errors : 16 % of answers without any determiner (no det) (vs 5 % for group A), 5 % of wrong CL (?) (vs only 1 % for group F), and an important rate of lexical errors (FL) : 31 % vs 22 % for the group F. These results allow us to think that the children who have a french mother have already set up the liaison constraint, as the children who have an english mother do not.

An analysis of the faults’ productions (e.g. wrong CL, lexical errors or answers without determiner) has confirmed those conclusions. Indeed, the nature of wrong CL can be easily explained : the children, French and English-mothered, have only produced a segment which can be a liaison consonant on the boundary. These wrong CL are [n], [l], and [z]. So, the segments [n] and [z] are the liaison consonants of the determiner in singular and plural items in French : the children failed to associate the right segment for each form. The segment [l] is also a segment arised from a sandhi phenomenon in French : the elision. We can conclude that the children know the type of the segment which has to be produced on the boundary, but they failed to find out his right phonetic nature.

The children produced two types of lexicals errors : errors that do not transform the boundary, and then permit a realisation of liaison, and errors that change the bondary and make the realisation of the CL impossible. The figures 3 and 4 present the lexical errors’ productions according to the CL realisation : FLLE is the lexical error produced with a good liaison consonant (for example, [ênapiaiter] instead of [énapaspirater]), FLNL is a lexical error produced with a non-liaison (for example, [ñapiaiter] instead of [ñapaspirater]), and FL is a lexical error which filled the boundary and, by this way, impeded the possibility of CL realisation (for example, [ëpiater] instead of [ënaspirater]). These figures show that a lexical error don’t impede the possibility of liaison : 28 % of LE for the group F and 18 % of LE for the group A.
The lexical errors inform us on the difficulty for a young child to treat a complex structure. So these wrong answers seem to be due more to a problem of processing the lexical information than to the presence of a sandhi phenomenon on the boundary. The children tend to simplify the structure in a simpler one as CVCV. Moreover, as lexical errors have been produced with liaison or non-liaison: the lexical errors are not made to palliate the floating structure.

4.2. Discussion

The few errors on CL for the group F would show that the children are able to find out the good CL: the setting of the parameter seems to be in an advanced stage. In a phonological way, it means that, for most of the items, the values are well-specified. The non-liaisons seem to be due to an unification problem between the liaison constraint and the lexical representations.

The children of the group A have a problem to recognize the variability of the boundary, as we can see through the CL errors rate. This means that, whether they don’t yet acquire the notion of floating segment, whether they have some problems with the notion of empty onset.

Moreover, an English-mother child allowed us to precise our thought. If S. has produced some equivalent data to his group’s ones for Pli experiment, on the contrary, for Sgi, he quite ever used the feminine determiner, instead of the masculine one: for example, he said "une-z-oiseau" [ynz azo] instead of "un oiseau" [ên azo] (a bird). By this way, he impeded any possibility of the liaison segment realisation. But, he preserved a segment on the boundary. So, it seems that S. fill the empty onset: he always gave a permanent consonant to all substantive, even if the substantive had a vocalic initial. S. didn’t acquired the possibility of filling the empty onset by a floating segment yet. About the other English-mother children, the high rates of non-liaisons can’t allow us to say that they have some problem to recognize the empty onset. But, the liaison constraint is not set up yet. So, they haven’t acquired the floating notion: the values of the floating segment are never specified.

5. PHONOLOGICAL REPRESENTATION

The data obtained during the experiments with bilingual children have led us to make various suppositions about the setting of the liaison in French. It seems that the floating parameter could be split in several stages. Indeed, we have shown that the French-mother bilingual have reached a more advanced stage than the English-mother bilingual. So, we wondered about what they have set up. A representation in a features structure will precise the values which are required.

The sequence [ênami] will be represented like in figure 5. Apart from a liaison context, the sequence [è / ami] will present values, but underspecified: POS et PC take the variables Pos and Pc for the floating segment in [è], and the onset will be empty in [ami], that is that SEG and PC take the variables Seg and Pc.

5.1. The French-mother children

The children who receive a french input from their mother have quite acquired the liaison between determiner and substantive, even if some consonant errors subsist. These children well produce the sequence [ênami], or with a wrong liaison consonant [è?ami]. We can analyse this as: the type SEG (e.g. the phonetic nature of the segment) could be well specified as [n], or it could take some wrong values which will be either [l], or [z], or [r]:

\[\text{seg} = \text{n} \lor \text{l} \lor \text{z} \lor \text{r}\]

In this case, all the features of the onset are specified by the unification of the lexical representations and the liaison constraint.

5.2. The English-mother children

The children who receive an english input from their mother produce few liaisons, and even, few wrong CL. It seems that they have not yet set up the required values for the realisation of the liaison. They underspecify all the values of the CL: the CL is floating and is not realised there, and, they only specify the
rythmic position of the empty onset, this is the interpretation for an empty onset:

\[
\begin{align*}
\text{CL} : & \quad \text{init seg } = \text{Seg} \\
& \quad \text{pos } = 1 \\
& \quad \text{pc } = \text{Pc} \\
\text{Onset} : & \quad \text{init seg } = \text{Seg} \\
& \quad \text{pos } = 1 \\
& \quad \text{pc } = \text{Pc} \\
\text{som} : & \quad \text{seg } = \text{tete } = \text{A} \\
& \quad \text{op } = \text{I, U, N[1]} \\
& \quad \text{pos } = 2 \\
& \quad \text{pc } = \text{s} \\
\text{mod[3]} : & \quad \text{...}
\end{align*}
\]

In this case, the determiner and the substantive are distinctive, and their representations are equivalent to a context of non liaison.

5.3. The case of S.

S. has neither the unification notion nor the floating segment and the empty onset specifications. He doesn’t have the ability to dissociate the values’ specification of a type yet. His representations don’t integrate the possibility of floating. On the other hand, the empty onset’s values are always specified by a segment which is various:

\[
\text{Onset} : \; \text{seg } = \text{ (var (Seg))}
\]

In this case, the onset isn’t empty: it take the characteristics of a permanent consonant which can take various phonetic values.

6. CONCLUSION

When we compare the bilingual children’s production to monolingual one’s, we conclude that an English input received from the mother impede the phonological structuration of French. So, the bilingualism has an important effect on the setting of phonological information: in French, that is the mother language which favours or complexifies the setting of liaison. Moreover, this study allowed us to underline several necessary stages in the setting of this phenomenon: the dissociation of values’ specification of a type, the ability to specify the values which are underspecified, and to unify the various lexical representations and to select the good liaison consonant.

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REFERENCES