Input characteristics and impact on the acquisition of phonological variables in French

Loïc Liégeois¹, Inès Saddour², Damien Chabanal¹ and Thierry Chanier¹

¹Clermont Université - LRL
²Université de Toulouse Le Mirail - Octogone

Child Language Seminar, 24th-25th June 2013, Manchester
Context of the study (1)

- ALIPE project (Acquisition de la Liaison et Interactions Parents-Enfant / Acquisition of the Liaison and Parents-Child Interactions).

- Four main objectives:
  - collect and structure a corpus of acquisitional data,
  - describe the characteristics of the Child Directed Speech (CDS) concerning liaison and elision,
  - observe the construction of alternative phonological patterns,
  - propose a scenario for schwa acquisition.
Liaison:

The liaison is the phenomenon of producing a **consonant** that is **graphically present and normally mute** at the end of a word (Word 1) preceding a second one (Word 2) **beginning with a vowel**. For example:

- “Trois -Z- ours” (**three bears**) but “trois” (**three**) and “ours” (**bear**)

Two types of liaison can be distinguished:

- **categorical** liaisons like “un -N- ours” (**a bear)**,
- **variable** liaisons like “il est -T- arrivé” (**he arrived**).
Schwa elision:

The schwa is a vowel with a particular status: it can be produced or not, depending on several criteria e.g. communication situation, speaker’s geographical origin etc. For example:

“J’ai pris le bus pour venir à la conférence” or “J’ai pris l(e) bus pour v(e)nir à la conférence” (I took the bus to come to the conference)

Four main contexts can be distinguished. In this study we will only observe the variable elision of the schwa in monosyllabic contexts, when the latter precedes a word starting with a consonant.

We do not deal with contexts such “l’ami” (the friend) where the schwa elision is obligatory in the article “le”.

Context of the study (3)
Outline of this presentation

- Child Directed Speech and the acquisition of phonological variables liaison and schwa elision
- ALIPE project: data collection methodology and data structuration
- The acquisition of schwa elision in French L1: what do we learn from Child Directed Speech?
Child Directed Speech and the acquisition of phonological variables liaison and elision
CDS: main characteristics when compared with Adult Directed Speech (ADS)

- **Structural**: CDS is more associative, repetitive and consistent (Hills, 2013).

- **Syntactic** and **lexical**: shorter and simpler utterances (less complex sentences), more limited lexicon (Snow & Ferguson, 1977; Fletcher & MacWhinney, 1995).

- **Phonetic/Phonological**: lower rate of speech, higher pitch, exaggerated intonation and hyper-articulated vowels (Jisa & Richaud, 1994; Uther et al., 2007).
CDS: phonological characteristics when compared with ADS

- Phonological characteristics:
  - less vernacular variants (Foulkes et al., 2005; Dilley et al., 2013),
  - most frequent variable liaisons (Liégeois et al., 2011),
  - less schwa elisions in the nouns than verbs (Andreassen, 2011).
CDS: effects on the acquisition of phonological variation

- Liaison and elision: phenomena with problems of overlap in first language acquisition:
  - Syllables boundaries Vs. lexical boundaries

<table>
<thead>
<tr>
<th>un</th>
<th>ours</th>
<th>l(e)</th>
<th>chat</th>
<th>le</th>
<th>chat</th>
</tr>
</thead>
<tbody>
<tr>
<td>[œ ə n u r s]</td>
<td></td>
<td>[l e ʃ a]</td>
<td></td>
<td>[l e ʃ a]</td>
<td></td>
</tr>
</tbody>
</table>

- Production variability:
  - variable liaisons,
  - variability in use of liaison consonants,
  - variability in schwa production.
CDS: effects on the acquisition of phonological variation

- **Usage-based conception** (Tomasello, 2003) of categorical liaison acquisition (Chevrot et al., 2009):
  - Step 1: memorisation of a **chunk**
  - Step 2: memorisation of **several exemplars**
  - Step 3: construction and memorization of more **general patterns**

<table>
<thead>
<tr>
<th>Step</th>
<th>Input</th>
<th>Memorisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>un ours</td>
<td>[un n – ours]</td>
</tr>
<tr>
<td>Step 2</td>
<td>un ours, des ours, petit ours</td>
<td>[n – ours] [z – ours] [t – ours]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Example of error: un –z– ours</td>
</tr>
<tr>
<td>Step 3</td>
<td>un ours, un âne (a donkey), un enfant (a child)</td>
<td>[un – n+X ]</td>
</tr>
</tbody>
</table>
To maximise speech segmentation, comprehension and lexical acquisition, parents tend to respect the Consonant-Vowel schema recurrent in French:

- **variable liaisons** are produced more frequently in CDS than in ADS (Liégeois et al., 2011),
- the schwa in nouns is more often produced in CDS than in ADS (Andreassen, 2011).

In this study, we focus on **schwa elision in monosyllabic words** (ce, de, je, le, me, ne, que, se and te) in order to determine:

- what are the characteristics of CDS concerning schwa elision,
- if the schwa elision frequency in CDS influences schwa acquisition.
ALIPE project: data collection methodology and data structuration
Data collection

- Audio corpora recorded during *everyday situations* e.g. bath time, meals, playtime...

- **Two recording periods** – eight-month interval between them.

- Recordings **managed by the parents:**
  - unobtrusive method,
  - few parental interventions: they just had to start and stop the recorder.
## Corpora

<table>
<thead>
<tr>
<th></th>
<th>Salomé</th>
<th>Baptiste</th>
<th>Prune</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age at stage 1 (S1)</td>
<td>28 months</td>
<td>36 months</td>
<td>40 months</td>
</tr>
<tr>
<td>Age at stage 2 (S2)</td>
<td>36 months</td>
<td>44 months</td>
<td>48 months</td>
</tr>
<tr>
<td>Coverage: length of recordings</td>
<td>14h (liaison)</td>
<td>10h (liaison + schwa)</td>
<td>14h (liaison)</td>
</tr>
<tr>
<td></td>
<td>10h (schwa)</td>
<td>11h (schwa)</td>
<td></td>
</tr>
<tr>
<td>Coverage: number of liaisons contexts</td>
<td>2347</td>
<td>1555</td>
<td>3363</td>
</tr>
<tr>
<td>Coverage: number of monosyllabic schwas contexts</td>
<td>6126</td>
<td>2667</td>
<td>6007</td>
</tr>
</tbody>
</table>
Two standard formats used:
- CHAT format
- XML-TEI format

These standards enable:
- data exchange,
- analyses' replication and results' verification,
- corpora databases’ enrichment.
• Streaming playback.
• Possibility to download transcription and recordings.

Transcription overview:
• orthographic transcription,
• liaison annotation.

http://lrl-diffusion.univ-bpclermont.fr/alipe/
Acquisition of elision: what do we learn from CDS?
Elision rates in ADS and CDS (monosyllabic words grouped together)

<table>
<thead>
<tr>
<th>Parents</th>
<th>Stage of recording and age</th>
<th>Rate of elision in ADS</th>
<th>Rate of elision in CDS</th>
<th>( \chi^2 )</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salomé's parents</td>
<td>T1 : 2;4 ans</td>
<td>62,10%</td>
<td>37,00%</td>
<td>Chi2=95.0865</td>
<td>p&lt;0,0001</td>
</tr>
<tr>
<td></td>
<td>T2 : 3;0 ans</td>
<td>58,20%</td>
<td>56,10%</td>
<td>Chi2=0</td>
<td>p&gt;0,05</td>
</tr>
<tr>
<td>Baptiste's parents</td>
<td>T1 : 3;0 ans</td>
<td>65,1%</td>
<td>31,7%</td>
<td>Chi2=75.9812</td>
<td>p&lt;0,0001</td>
</tr>
<tr>
<td></td>
<td>T2 : 3;7 ans</td>
<td>57,5%</td>
<td>35,9%</td>
<td>Chi2=40.7326</td>
<td>p&lt;0,0001</td>
</tr>
<tr>
<td>Prune's parents</td>
<td>T1 : 3;4 ans</td>
<td>67,8%</td>
<td>31,6%</td>
<td>Chi2=95.0865</td>
<td>p&lt;0,0001</td>
</tr>
<tr>
<td></td>
<td>T2 : 4;0 ans</td>
<td>50,0%</td>
<td>51,2%</td>
<td>Chi2=0</td>
<td>p&gt;0,05</td>
</tr>
</tbody>
</table>
Elision rates in the children’s productions (monosyllabic words grouped together)

<table>
<thead>
<tr>
<th>Child</th>
<th>Stage of recording and age</th>
<th>Rate of elision</th>
<th>$\chi^2$</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salomé</td>
<td>T1 : 2;4 ans</td>
<td>10,81%</td>
<td>$\chi^2 = 216.0006$</td>
<td>P&lt;0,0001</td>
</tr>
<tr>
<td></td>
<td>T2 : 3;0 ans</td>
<td>44,91%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baptist</td>
<td>T1 : 3;0 ans</td>
<td>9,2%</td>
<td>$\chi^2 = 0.0527$</td>
<td>P&gt;0,05</td>
</tr>
<tr>
<td></td>
<td>T2 : 3;7 ans</td>
<td>10,4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prune</td>
<td>T1 : 3;4 ans</td>
<td>44,19%</td>
<td>$\chi^2 = 7.3637$</td>
<td>P&lt;0,01</td>
</tr>
<tr>
<td></td>
<td>T2 : 4;0 ans</td>
<td>51,9%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What are the characteristics of CDS concerning schwa elision?

- At stage 1, parents tend to maintain the schwa more frequently when they address their child.

- At stage 2, the difference in elision rates between CDS and ADS is no longer statistically significant when the child produces comparable rates of elision to the parents' (Salomé and Prune).

→ The parents tend to adapt their discourse to the linguistic abilities of their child.
Schwa elision: focus on two particular monosyllabic words

Focus on “le” (the) and “je” (I), the most frequent monosyllabic words in our corpora.

Particular status of “le”: it can precede a verb (pronoun) or a noun phrase (article). In this study we only consider “le” when it precedes a noun phrase.

Focus on the constructions [le + X] and [je + X] to determine whether the phonological variation in these contexts is modulated in CDS and its effect on elision acquisition.
Elision rate in the constructions [le + X]

For each particular construction, categorisation based on whether there is variation (3) or not (1 & 2):

1. Retention ➔ The schwa is always maintained: “le ballon”, “le ballon” (the ball)
2. Elision ➔ The schwa is always elided: “l(e) ballon”, “l(e) ballon”
3. Variation ➔ The schwa is maintained and elided: “le ballon”, “l(e) ballon”

<table>
<thead>
<tr>
<th>Child</th>
<th>Number of constructions (S1 + S2)</th>
<th>Parents</th>
<th>Number of constructions (S1 + S2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salomé</td>
<td>117</td>
<td>Salomé’s parents</td>
<td>180</td>
</tr>
<tr>
<td>Baptiste</td>
<td>81</td>
<td>Baptiste’s parents</td>
<td>126</td>
</tr>
<tr>
<td>Prune</td>
<td>117</td>
<td>Prune’s parents</td>
<td>96</td>
</tr>
</tbody>
</table>
Productions of Salomé and her parents

- Retention in CDS
- Retention in child's production
- Elision in CDS
- Elision in child's production
- Variation in CDS
- Variation in child's production
Productions of Baptiste and his parents
Productions of Prune and her parents

- Retention in CDS
- Retention in child's production
- Elision in CDS
- Elision in child's production
- Variation in CDS
- Variation in child's production
Elision rate in the constructions [le + X]

- At S1, for the two youngest children (Salomé & Baptiste):
  - schwa elision is marginal,
  - variable contexts do not exist.

- Between S1 and S2, parents tend to adapt their productions to these characteristics.

- We postulate that at an early stage, the article is not memorised with a variable schwa.

- We suggest that the non-schwa variant of the article is memorized as a chunk with the noun, like liaison variants.
Focus on “je”: the monosyllabic word with the highest elision rate at S2 for all three children.

Comparison of the elision rate in the CDS at S1 and in the children’s productions at S2 in a selection of constructions.

<table>
<thead>
<tr>
<th>Selected constructions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Salomé and her parents</td>
<td><strong>je + sais, suis, te, crois, vais, peux, veux</strong>&lt;br&gt;Salomé: 112 contexts / Parents: 183 contexts</td>
</tr>
<tr>
<td>Prune and her parents</td>
<td><strong>je + sais, suis, te, crois, vais</strong>&lt;br&gt;Prune: 212 contexts / Parents: 99 contexts</td>
</tr>
</tbody>
</table>
Productions of Salomé and her parents

Child at S2: elision rates for each construction

Linéaire (Child at S2: elision rates for each construction)

<table>
<thead>
<tr>
<th>Rho</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.7857143</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Productions of Prune and her parents

<table>
<thead>
<tr>
<th>CDS at S1: elision rates</th>
<th>Child at S2: elision rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,00%</td>
<td>0,00%</td>
</tr>
<tr>
<td>10,00%</td>
<td>20,00%</td>
</tr>
<tr>
<td>20,00%</td>
<td>40,00%</td>
</tr>
<tr>
<td>30,00%</td>
<td>60,00%</td>
</tr>
<tr>
<td>40,00%</td>
<td>80,00%</td>
</tr>
<tr>
<td>50,00%</td>
<td>100,00%</td>
</tr>
</tbody>
</table>

**Rho**

<table>
<thead>
<tr>
<th>Rho</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rho = 1</td>
<td>P &lt; 0.05</td>
</tr>
</tbody>
</table>
Concerning phonological variation, CDS is adjusted: parents tend to adapt their productions to the linguistic abilities of their children. This modulation is not correlated with speech rate variation.

We propose that CDS specificities influence the acquisition of schwa variation:

In particular constructions [je + X], elision rates in parental CDS at S1 and children's productions at S2 are correlated
For the particular constructions [$le +\text{ NOUN GROUP}$]:

- At an early stage, elision contexts in children’s productions are marginal and variable contexts are absent. We postulate that the child memorize two types of constructions:

  - a exemplar containing the non schwa variant of the article with the substantive, e.g. [l-chat]
  - a more general pattern whose permit her to insert a noun or an adjective beginning with a consonant after “le”: [le + X]
Discussion

For the particular constructions \([le + \text{NOUN GROUP}]\):

- Later, the child is exposed to a more variable input and is able to construct and memorise a more abstract pattern allowing him to vary her production, in the same context, between the schwa variant and the non-schwa variant.

- We can also postulate that the two patterns stay in competition. So, both the schwa and the non-schwa variants of the article would be stored as lexical entries, like Bürki et al. (2010; 2011) propose for nouns.

- These findings need to be deepened and confirmed by studying other corpora or through experimental tests.
Merci !

Contact: loic.liegeois@univ-bpclermont.fr

Publications: http://hal.archives-ouvertes.fr/LRL/