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Comparing French liaison acquisition in L1 children and L2 adults

Methodological issues in exploring differences and similarities

Mylène Harnois-Delpiano¹, Cristelle Cavalla² and
Jean-Pierre Chevrot¹

¹ Université Grenoble-Alpes | ² Université Sorbonne Nouvelle Paris III

In the study of liaison acquisition, a key line of inquiry has focused on potential differences and similarities between L1 and L2 French speakers. However, such a comparison encounters a number of difficulties such as matching learners in terms of language exposure, age, and learning abilities. This study addresses these issues based on the analysis of French liaison in a series of experimental tasks performed by L1 children aged two to six, and by adult Korean learners of French as a foreign language. Results show that, for both groups, acquisition of categorical liaison precedes acquisition of variable liaison. However, when L1 and L2 learners are matched individually based on the results of a production task, they differ in a judgment task involving the perception of liaison. More specifically, the ability to judge the correctness of liaison precedes the ability to produce it in L2 learners, but not in L1 children. The findings provide a strong indication that L2 learners follow a specific process when acquiring liaison.

Keywords: categorical liaison, variable liaison, comparative study, first language acquisition, second language acquisition, French as a Foreign Language, Korean learners, sociolinguistic variation, usage frequency

1. Introduction

In French, the phenomenon of liaison involves the realization of a consonant in oral production between two words, the second of which is vowel-initial. For example, the sequence *trois enfants* ‘three children’ would be pronounced /tʁwazãfã/, with a liaison consonant, /z/ in this case, inserted between the numeral *trois* and the noun *enfants*. In contrast, when *trois* appears before a consonant-

initial noun or in an utterance-final position, the liaison consonant is not realized. In addition to these phonological conditions, the production – or non-production – of a liaison consonant is a multi-factorial phenomenon that is influenced by usage frequency and lies at the intersection of linguistic dimensions and sociolinguistic factors, which combine to create what has been referred to as the “kaleidoscope” of liaison (Harnois-Delpiano, 2016: 22–94).

Some liaisons are categorical, realized in 100% of the cases by L1 French adults (e.g. *mon ami* ‘my friend’: /mɔ̃nami/ with a /n/ liaison consonant), while others are called erratic in the sense that they are added in contexts where no liaison is expected (e.g. *des hamsters* ‘some hamsters’: /deamstɛʁ/ is expected without a /z/ liaison consonant). A third type of liaison is variable (e.g. *un gros éléphant* ‘a big elephant’: /œ̃gʁoɛlefã/ or /œ̃gʁozelefã/) and serves as a sociolinguistic marker. Consequently, French speakers, whether French is their first language (L1) or second language (L2), face difficulties related to “macro-planning [...] which consists of identifying the context – based on phonological, prosodic, lexical, (morpho)syntactic and sociolinguistic factors [...] – in order to determine whether the liaison should – or can – be realized” (Racine & Detey, 2015: 2).¹

This article observes the evolution of liaison acquisition in L1 and L2 speakers in order to show the differences and similarities underlying both acquisition processes. With this aim in mind, we will examine the results of an experiment conducted with children acquiring L1 French ($n=165$, aged two to six, divided into four age groups), and those of a 12-month longitudinal study with beginners learning L2 French (17 Korean adults). We will compare the quantitative results of the two groups in a production task and in a perception task involving categorical and variable liaisons, before providing a qualitative comparison between the L1 and L2 speakers. It is, of course, impossible to directly compare the results of L1 children with those of L2 adults. The environmental conditions and social and cognitive skills of the two populations are very different. It would therefore not be valid to compare their acquisitional development using the same chronological reference points; clearly, two years of acquisition in the family environment by L1 children cannot be compared with two years of acquisition in adults taking language classes. In order to overcome this difficulty, we devised an innovative method for matching L1 and L2 participants based on quantitative data regarding their capacity to produce or judge liaisons. The results of these different methods of comparison of L1 and L2 speakers offer a new perspective on the processes underlying the acquisition of liaison in L2 French (L2F), thus enabling us to draw pedagogical conclusions.

1. Unless otherwise indicated, all translations from French references are our own.

2. Acquisition of liaison in L1 and L2 French

In this section, we draw upon relevant research on L1 and L2 acquisition of French liaison to posit three hypotheses for the present study.

2.1 Acquisition of L1 and L2 French: Different linguistic and sociolinguistic contexts

The phenomenon of French liaison has been used as a test case for most phonological theories. For the last 15 years, it has played a similar role in new interdisciplinary research involving linguistics and psycholinguistics (Harnois-Delpiano, 2016:108). The L1 acquisition of liaison has been thoroughly studied. In contrast, most studies on L2 acquisition relate only to intermediate or advanced learners who speak an Indo-European first language. These studies focus either on the perception or on the production of French liaison, comparing the results to those of native French-speaking adults (for a review of the literature, see Harnois-Delpiano, 2016: 320–321).

If French language acquisition contexts are considered a continuum, pre-literate native French children are at one end of the spectrum. French is their first language and they therefore benefit from massive input and learn implicitly how the language works. Furthermore, they have purely oral contact with the language, which implies varied word forms in the phonetic string. For example, having encountered the sequences /œnuʁs/ (*un ours*, ‘a bear’), /dezʁs/ (*des ours*, ‘some bears’) and /œpətituʁs/ (*un petit ours*, ‘a little bear’), how can they know whether *ours* is actually *nours* or *zours* or *tours*? The primary challenge they face, according to Wauquier (2009), is therefore learning to detach words from each other. From this perspective, appropriating liaison in L1 French depends on repeated encounters with tokens of liaison in the input and is therefore sensitive to frequency effects.

L2F learners in a non-French-speaking environment, with input limited to language classes, could be said to be at the other end of this continuum. They may receive explicit instruction in how the language works and create positive and negative transfers with their first languages. Furthermore, their knowledge of written forms might suggest to them that words have stable forms. *Ours* is /uʁs/ and not /nuʁs/ or /zuʁs/ because it begins with the vowel ‘o’. This is why their main difficulty could be said to reside in “attaching words together” (Wauquier, 2009:125). Acquiring liaison in L2 French might therefore be based on reference to the written form of words or general orthographic principles, for example the existence of regular phonographic correspondences and the use of spaces to separate words.

In relation to these previous findings, our study was designed to test the following linguistic hypothesis (H1), which posits that L2F learners’ liaison

acquisition can be expected to be guided by graphic sequences (Racine, 2015; Thomas, 2004). Unlike L1 speakers, we would expect L2 speakers to frequently produce omissions of categorical liaisons (CL) of the type /œ̃ɑ̃bʁ/ (for *un arbre*, ‘a tree’) due to the space between each written word. Conversely, we would also expect them to produce very few liaison consonant substitutions of the type /tʁɑnavjɔ̃/ (for *trois avions*, ‘three planes’) because the /n/ is not present in the written form. They could also be expected to produce orthoepic errors, mistakes guided by spelling, as in /ilsɔ̃/ (for *ils ont*, ‘they have’) with an /s/ liaison rather than a /z/ liaison because in the written form *ils* ends with the letter ‘s’ and its most probable phonological correspondent is /s/.

Moreover, as long as the French-speaking environment of L2F learners remains limited to their language classes, the influence of frequency of realized variable liaisons (VL) in the input is limited to teachers’ formal usage. Their “experience of French is limited [...] to the French spoken by their professors, who tend to confine themselves to formal speech, either by choice or out of necessity” (Thomas, 2004: 377). Gautier (2016: 299) noted an average of 40% realization of VL by two L2F teachers at university, while Ahmad (1993: 96) noted an average of 10% realization among French speakers in informal conversation with people they knew well. Moreover, Liégeois (2014: 289) noted an average of 8.1% realization in the ALIPE² corpus, measuring the linguistic environment of young L1 speakers.

It should also be noted that French liaison is explicitly taught in the vast majority of L2F textbooks, including books specialized in pronunciation (Racine, 2015); nevertheless, the descriptive classification of “categorical, variable and erratic” liaisons based on the PFC³ corpus (Durand, Laks, Calderone, & Tchobanov, 2011; Mallet, 2008) is not used in these textbooks, which tend to use a normative classification (obligatory, optional and forbidden liaisons) inherited from Delattre (1947). However, certain contexts labeled ‘obligatory’ in traditional terminology are in fact variable in usage (Racine, 2014: 24–26), such as “monosyllabic preposition or adverb + word²” (e.g. *chez un copain* ‘at a friend’s house’: /ʃœ̃kɔpɛ̃/ or /ʃœ̃zœ̃kɔpɛ̃/) or “qualifier adjective + noun” (e.g. *un gros immeuble* ‘a large building’: /œ̃gʁɔimœ̃bl/ or /œ̃gʁɔzimœ̃bl/).⁴ “The input provided by textbooks [...] would therefore encourage learners to adopt a fairly formal style of oral production (journalistic radio speech from the 1960s) when it comes to producing

2. Acquisition de la Liaison et Interactions Parents Enfants – <http://hdl.handle.net/11041/alipe-000853>

3. Phonologie du Français Contemporain – <http://projet-pfc.net>

4. “Categorical liaison” means that liaison is realized in 100% of the cases by L1 French adults. For more details on differences between normative and descriptive classifications of liaisons, see Harnois-Delpiano (2016: 68–78).

optional liaisons, which differs from the style of informal interactions” (Detey, Kawaguchi, & Kondo, 2015:134).

In relation to the above-mentioned findings, we will also test the following sociolinguistic hypothesis (H₂), positing that, in cases of VL, L1 children prefer the non-realized variant (e.g. /œ̃gʁoɛləfã/ for *un gros éléphant*, ‘a big elephant’), which is more frequent in the input they are exposed to, while L2 learners would favor the realized variant (/œ̃gʁoʒelɛfã/), as taught in the language classroom, which is more prestigious according to the normative classification.

2.2 Liaison acquisition models in L1 and L2

The different conditions in which these speakers are exposed to liaison and norms have led authors to model L1 and L2 acquisition processes differently. In L1 children, two contrasting developmental models exist: one offering a phonological process for CL and a lexical process for VL (Wauquier, 2009; Wauquier & Shoemaker, 2013); the second offering a constructionist process for both types (Chabanal & Liégeois, 2014; Chevrot, Dugua, & Fayol, 2009; Chevrot, Dugua, Harnois-Delpiano, Siccardi, & Spinelli, 2013; Nicoladis & Paradis, 2011).

According to Encrevé’s (1988) autosegmental framework, during the first stage of the phonological, then lexical model, children represent sequences from the speech chain as a series of syllabic units and segmental content anchored to a skeleton of ‘neutral positions’, which serves to structure the linear nature of representations. Some of these sequences, memorized and represented in this way, include several adult units that children process globally as a single lexical unit. A ‘global’ unit of this sort could include, for example, a determiner followed by a liaison and a noun. In the second stage, children refine their perception of prosodic units, thus allowing them to parse the speech chain. According to this framework, this change is guided by the phonological maximum onset principle, which favors Consonant-Vowel syllabification. In the case of vowel-initial words, children consider the liaison consonant as the initial consonant of word₂ (e.g. /nãfã/ from /œ̃nãfã/ *un enfant* ‘a child’), but one which can change its segmental content to any other consonant selected due to frequency in input (/jãfã/ with a default yod, /fãfã/ through consonant harmony, /zãfã/ from /lezãfã/ *les enfants* ‘the children’). In the third stage, children discover the inflected or derived forms of word₁ and become capable of analyzing morphophonological alternations. The reference to *une* ‘one/a’ or *troisième* ‘third’ allows them to infer that /n/ and /z/ are the final consonants of the determiners *un* or *trois*. The liaison consonant is therefore reinterpreted as a word-final auto-segment (Clements & Keyser, 1983). This generalization is said to take place in children’s grammar between ages four and six. Radically different from the first three stages, the fourth stage is solely

reserved for the acquisition of VL, which begins later, around age seven or eight. It is a lexical process in which children learn VL on a case-by-case basis, as their written and sociolinguistic knowledge develops.

The constructionist model (Chevrot et al., 2009, 2013) applies to all types of liaison, and models the acquisition of categorical and variable liaison from the very earliest age. As with the phonological and lexical model, children retrieve global sequences with or without liaisons, such as /bwatɔno/ *bois ton eau* 'drink your water', /œnavjɔ/ *un avion* 'a plane', /pətɪtuksəbɔœ/ *petit ours brun* 'little brown bear', /lezɑbɔ/ *les arbres* 'the trees', and /gɔbɛbe/ *gros bébé* 'big baby'. They then produce these sequences, either treating them as a single lexical unit, or reanalyzing them in the later stages. According to this constructionist model of liaison acquisition, during the first stage, children draw links between these global sequences and reorganize them in the form of constructions. For example, by linking together sequences involving the same determiner (/lezɑbɔ/ *les arbres* 'the trees', /ləlunet/ *les lunettes* 'the glasses', /ləɛrisɔ/ *les hérissons* 'the hedgehogs', etc.) they progressively form a general schema of the type *les + X* around this determiner. 'X' represents a slot in which a variable element can be inserted, such as /zɑbɔ/, /lunet/ or /ɛrisɔ/. The variants segmented in this way begin with a consonant, a liaison consonant, or, more rarely, with an onset vowel. During the second stage, children generate specific schemas indicating which variant of the noun follows a particular word. For example, by linking the variants /zʊks/, /zami/, /zɑfɑ/, etc. to the general schema *les + X*, they create the specific schema *les + zX*. According to this model, in the third stage, which is currently under-documented, they generate more abstract, generic schemas linking together the specific schemas. For example, by drawing links between the specific schemas *les + zX*, *des + zX* and *mes + zX*, they devise a pattern that associates the /z/ liaison with a series of determiners in a plural context. The role played by usage in the creation of these schemas is twofold, working not only through the frequency of the same global sequences or the same variant but also through the frequency of each construction itself, in the linguistic environment and in children's production, hence the reference to usage and not just input. Drawing on construction grammars (Tomasello, 2003) and usage-based theories (Bybee, 2001, 2010), the constructionist model is part of the trend of 'Construction and Usage-based Theories' (Leroy, Parisse, & Maillart, 2009).

As for L2 learners, they could be said to favor a lexical model, in which liaison consonants are added on a case-by-case basis, before then moving onto a phonological model (Wauquier & Shoemaker, 2013) or a constructionist model (Barreca, 2015) thanks to oral and written usage. The influence of usage frequency could

also account for the acquisition of diamesic variation (Racine, 2015) and diaphasic variation (Howard, 2013).⁵

Considering the different theoretical models presented above, a third, psycholinguistic hypothesis (H₃) will be tested in this study, positing that the process of acquisition of liaison is not the same for L1 and L2 French speakers. While native French-speaking children are engaged in a process taking them from concrete knowledge – memorized sequences – towards increasingly abstract schemas, adult L2F learners are guided along a proceduralization process (Anderson, 1983) in which “knowledge of a general and descriptive order (declarative knowledge) is transformed into executable knowledge (the actions to be realized and the order in which to execute them) which is automatized in particular contexts (procedural knowledge)” (Véronique, Carlo, Granget, Kim, & Prodeau, 2009: 25). For example, the knowledge of a grammatical rule does not always imply its use by L2 learners (Ellis, 2005), and the development of their sociolinguistic awareness precedes their proper use of the different variants (van Compernelle, 2013). More specifically, L2F learners could build their usage of liaison from explicit knowledge of how the language works (the specificities of its orthoepic, phonological, morphosyntactic, lexical, and sociolinguistic contexts), which is provided to them in language classes. This declarative knowledge would allow them to first analyze and judge liaisons they perceive in the speech chain and then to plan production (executable knowledge), both at the level of micro-planning (procedural knowledge of graphophonic correspondence) and at the level of macro-planning (procedural knowledge of realization contexts).⁶

2.3 The current study

In order to complement the current literature on the acquisition of liaison in French, this study presents a comparison of the acquisition of French liaison in L1 children and L2 adults. It includes L2F learners whose first language is Korean, a non-Indo-European language. It focuses both on the perception of liaison in French and on the production of this phenomenon. We assume that firstly, based on our linguistic hypothesis (H₁), L2 literate learners are guided by the written

5. Sociolinguistic variation can be divided into five types of variations (Gadet, 2007). Diamesic variation refers to the influence of written language on oral language and vice versa. Diaphasic variation concerns the influence of levels of language, ranged from least to the most formal. For more details on sociolinguistic variation and variable liaison in French, see Harnois-Delpiano (2016: 78–94).

6. ‘Micro-planning’ and ‘macro-planning’ are terms borrowed from Racine and Detey (2015: 10).

form in their appropriation of French liaison. Secondly, stemming from our sociolinguistic hypothesis (H2), native French-speaking children will favor the non-realized variant of VLs (e.g. /œ̃gʁozœ̃dinatœʁ/ for *un gros ordinateur* ‘a big computer’), more in line with usage, while L2F learners will favor the realized variant (e.g. /œ̃gʁozœ̃dinatœʁ/), more in line with the norm. Thirdly, following our psycholinguistic hypothesis (H3), the acquisition process for French liaison is different for L1 speakers (abstraction process) and L2 speakers (proceduralization process).

3. Method

3.1 Participants

The participants chosen for this study were French beginners. The L1 participants were 165 native French-speaking children of non-reading age, between 28 and 75 months, living in the Rhône-Alpes region in France. The method used in the case of our L1 participants is based on a cross-sectional study and the L1 speakers were therefore separated into four age groups: 40 children aged 2;4 to 3;3 years (AG1), 44 children aged 3;4 to 4;3 years (AG2), 40 children aged 4;4 to 5;3 years (AG3), and 41 children aged 5;4 to 6;3 years (AG4).

The L2 participants were 17 Korean beginner level students, A1.2 in the Common European Framework of Reference for Languages, hereafter CEFR (Council of Europe, 2001). They were all enrolled at the same Korean university and following the same French language and literature course in the same year. Their curriculum consisted of French grammar, literature, history, culture, and society; topics which were mostly taught in Korean. However, students had three weekly hours of French language for 15 weeks each semester, taught by a French native speaker. At the end of the recordings, participants were asked to fill out a questionnaire about the written and oral input to which they had been exposed (Harnois-Delpiano, 2016: 322–325). This allowed us to confirm that they had very little contact with a French-speaking environment. For example, none had stayed nor travelled in a French-speaking country and they had not learnt French prior to university, except for two of them who had learnt French three hours per week during their last year in high school with a teacher who taught in Korean. The method used was a longitudinal study; the L2 speakers were recorded three times

(T1, T2, and T3) at six-month intervals, from the end of their second year at university to the end of their third year.⁷

3.2 The experimental tasks

A picture-naming task was used first, to elicit production of CLs induced by the determiners /œ̃/ *un* ‘one/a’ and /tʁwa/ *trois* ‘three’, and of VLs induced by the qualifier adjectives /pəti/ *petit* ‘small’ and /gʁo/ *gros* ‘big’. These four *word1s* before liaison sites were combined with six masculine nouns beginning with a vowel, *word2s*. All *word2s* were one to four syllables long: /aʁbʁ/ *arbre* ‘tree’, /ɑ̃fɑ̃/ *enfant* ‘child’, /avjɔ̃/ *avion* ‘plane’, /elefɑ̃/ *éléphant* ‘elephant’, /ɛskaʁɡo/ *escargot* ‘snail’ and /ɔʁdinatœʁ/ *ordinateur* ‘computer’. To avoid participants focusing on the topic of the study, 24 distractor sequences were inserted between the 24 target sequences inducing a liaison consonant. They involved the same *word1s*, which, combined with consonant-initial masculine and feminine *word2s*, did not induce a liaison consonant.⁸ Each sequence was represented by a picture that had to be named. To ensure an alternating presentation, the experimenter presented picture-cards following a list created for each participant. These lists were randomly created by computer, with half of the items starting with the CLs and the other half with the VLs. This article examines the 12 CL and 12 VL contexts that each participant, both L1 and L2, had to produce (for the latter, at each longitudinal time point).

The experimental protocol then explored perception of CL and VL through acceptability judgments in the same contexts of potential liaison as those proposed in the production task. The participants had to choose which sequence they judged favorably out of pairs contrasting a realized liaison with a non-realized liaison, for example /œ̃naʁbʁ/ – /œ̃aʁbʁ/ ‘a tree’, /œ̃pətielefɑ̃/ – /œ̃pətitelefɑ̃/ ‘a small elephant’, /tʁwaavjɔ̃/ – /tʁwazavjɔ̃/ ‘three planes’, and un /œ̃gʁozɔʁdinatœʁ/ – /œ̃gʁozɔʁdinatœʁ/ ‘a big computer’. To avoid the task being too long, the *word2s* *enfant* ‘child’ and *escargot* ‘snail’ were not used. Each pair was individually written on cards. The experimenter randomly picked them up, starting with the CLs for one participant and the VLs for the next one. The L2 participants heard and judged each pair twice, once in the realized-non-realized order and once in the opposite order. The young L1 children only judged the pairs once, half in one order (e.g. one pair /œ̃naʁbʁ/ – /œ̃aʁbʁ/ and another pair /tʁwaʁbʁ/ – /tʁwazʁbʁ/), the other half in the opposite order (e.g. one pair

7. For more information on this point and on the experimental protocol in general, see Harnois-Delpiano (2016: 153–177).

8. These *word2s* are /ʃa/ *chat* ‘cat’, /flœʁ/ *fleur* ‘flower’, /livʁ/ *livre* ‘book’, /bebe/ *bébé* ‘baby’, /mezɔ̃/ *maison* ‘home’, and /banan/ *banane* ‘banana’.

/œɑ̃vɛ/ – /œ̃nɑ̃vɛ/ and another pair /tʁwazɑ̃vɛ/ – /tʁwɑɑ̃vɛ/). Alternating presentation of each pair was ensured by the large number of L1 participants, meaning that each pair was pronounced just as frequently in each order. We examine the eight pairs of CLs and eight pairs of VLs that each L1 participant judged once and each L2 participant judged twice.

Finally, after the production and judgment tasks, a written task was given to the L2F learners. They had to translate (written translation from Korean to French) each word₁ and word₂ involved in this experimental study, to test if they were capable of writing the words in their canonical form.⁹

3.3 Data analysis

As mentioned previously, it is not possible to directly compare a developmental age (a three- or four-year-old child) with a learning period (three or four years in a L2F class). Moreover, direct comparison between the linguistic performance of children and adult learners would mean aligning their cognitive capacities, which is impossible due to their very different biographical situations. Furthermore, the scores in judgment and in production cannot be compared, as they involve two different skills. Our comparisons between native speakers and foreign-language learners were therefore limited to two cases.

In the first part of the results section, we first quantitatively analyzed how each group evolved over time, using statistical tests. Then we qualitatively compared the structure of change in native children with the structure of change in adult learners. We conducted comparisons based on one characteristic defining each group. In each group, separately, we began by observing the general rate of the evolution curve (rising, falling) for a given criterion (e.g. VL realization). Then we conducted a qualitative comparison of patterns of evolution for this criterion in both groups (do the two curves have the same general forms of falling or rising). We also compared patterns of evolution for two criteria within one group (for example, looking at whether progress with VL preceded progress with CL in native children). We then looked at whether the same pattern could be observed for the other group.

In the second part of the results section, we used a method for matching individuals from each group based on one criterion for both types of speakers. In order to do this, we focused on the L2 learners' results from the first longitudinal time point, as this was the first time they had been in contact with the

9. It should be noted that the French native teacher who taught the students from their first year at university also completed the experimental tasks. Results show that he never produces nor judges favorably the liaisons induced by the qualifier adjective *gros* 'big'.

experimental protocol. The situation was therefore comparable to that of the L1 children who were only recorded once, as they were involved in a cross-sectional study. We observed the results for both groups for one criterion (e.g. rate of VL realization) and we matched L1 subjects with L2 subjects who had obtained the same score for that criterion (e.g. the same rate of VL realization). Then, based on this factual data (an identical score for an observed criterion), we compared the subjects' results for a second criterion (e.g. rate of favorable judgments for realized VL). In this context, it was therefore valid to examine whether L2 learners at the same level of production as L1 children had a higher or lower capacity to judge liaisons.

4. Results

4.1 Intra-group quantitative comparisons and inter-group qualitative comparisons

In Figures 1, 2 and 3, we show the distribution and evolution of observed productions in the liaison context, according to longitudinal time points for the Korean L2F learners (on the left side of the graph), and according to age group for the L1 children (on the right side of the graph). The lines represent acceptable productions. The red line shows the rate of CL production after *un* 'one/a' and *trois* 'three', the green line represents the rate of realization of VL after *petit* 'small' and *gros* 'big', and the light blue line indicates the rate of non-realization of VL. The bars represent non-acceptable productions. The green bar shows rates of omission of CL, the purple bar represents rates of substitution of the liaison consonant by another consonant (e.g. /œpətināfā/ with /n/ instead of /t/), the grey bar indicates rates of unexpected consonants after *gros* (e.g. /œgʁosavjɔ̃/ with /s/ instead of /z/), and the blue bars show rates of aphaesis (e.g. /ɔ̃ʁdinatœʁ/ pronounced /inatœʁ/ leading to forms observed among L1 children such as /œ̃ninatœʁ/, /tʁwazinatœʁ/ or /œ̃pətitinatœʁ/). The asterisk indicates a statistically significant difference between two averages (p -value below the 0.05 threshold in a t -test) or more than two averages (p -value below the 0.05 threshold in F -tests resulting from an analysis of variance, followed by a post-hoc test).

4.1.1 General pattern of evolution curves for categorical liaison production

In Figure 1, we can see progression in both groups of speakers for CL production. The data reveal a significant increase in the realization of CL across sampling times both in the L2 group ($F_{(2,29)}=9.4$, $p=.001$; T1 vs. T2 $p=.046$; T2 vs. T3 $p=.021$) and in the L1 group until 5;3 years ($F_{(3,161)}=8.8$, $p\leq.001$; AG1 vs. AG2

$p = .042$; AG2 vs. AG3 $p = .024$; AG3 vs. AG4 $p = .776$). However, the rate of omission among L2 learners was higher than for L1 children. Moreover, between T1 and T2, L2 speakers appropriated CL production by simultaneously reducing their omissions and rare substitutions, the latter being no longer statistically different from zero since the second longitudinal time point (T1 $t_{(16)} = 2.2, p = .044$; T2 $t_{(16)} = 1.5, p = .165$; T3 $t_{(16)} = 1.5, p = .163$). Then, omissions were the only errors that remained to be decreased ($F_{(2,30)} = 8.3, p = .002$; T1 vs. T2 $p = .064$; T2 vs. T3 $p = .033$). Conversely, omissions remained stable among L1 children aged between two and six ($F_{(3,161)} = 0.4, p = .774$). The L1 children then appropriated CL through the progressive disappearance of aphasis ($F_{(3,161)} = 12.8, p \leq .001$; AG1 vs. AG2 $p \leq .001$; AG2 vs. AG3 $p = .085$; AG3 vs. AG4 $p = .438$) and substitutions ($F_{(3,161)} = 12.2, p \leq .001$; AG1 vs. AG2 $p = .019$; AG2 vs. AG3 $p = .004$; AG3 vs. AG4 $p = .964$).

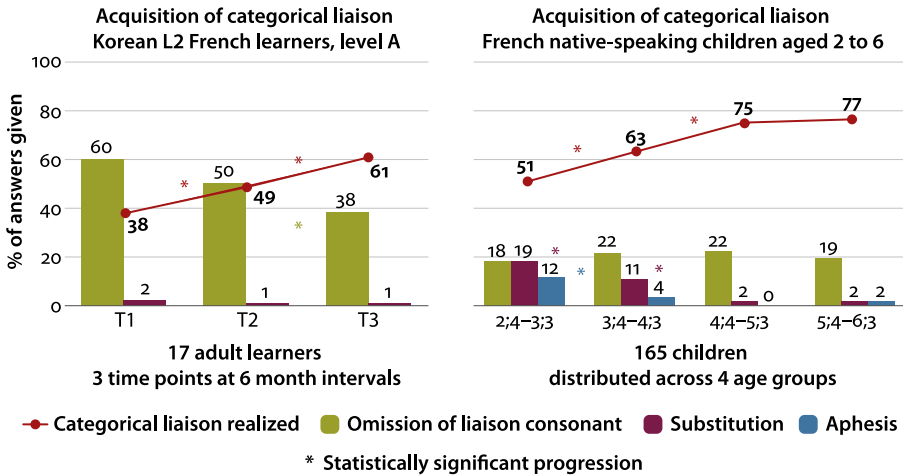


Figure 1. Categorical liaison production by L2 and L1 speakers

However, a substantial similarity can be noted between L2 and L1 speakers. At the end of the period covered by our study, they all only realized two variants, either correctly realized CLs, or omission of CL. The indeterminacy between these two productions was particularly persistent among L1 children because they stopped making progress between the last two age groups.

4.1.2 General pattern of evolution curves for variable liaison production

In Figure 2, different patterns of evolution can be seen for L1 and L2 speakers in VL production. First, liaison consonant substitutions were much higher among L1 children than among L2 learners, at least in the first stages of VL appropriation.

Furthermore, progress in VL realization was followed by a plateau in L1 children ($F_{(3,161)}=7.4$, $p\leq.001$; AG1 vs. AG2 $p=.038$; AG2 vs. AG3 $p=.063$; AG3 vs. AG4 $p=.801$), whereas it was preceded by a plateau in L2 learners ($F_{(1,20)}=5.2$, $p=.027$; T1 vs. T2 $p=.635$; T2 vs. T3 $p=.042$).

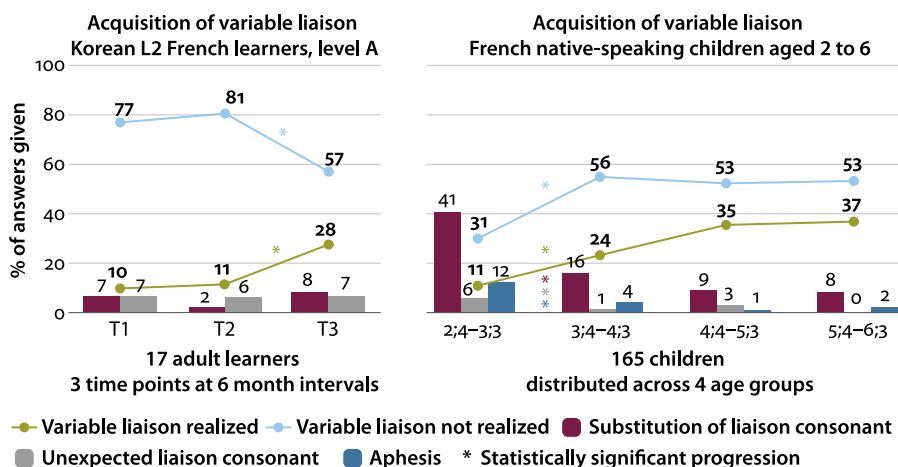


Figure 2. Variable liaison production by L2 and L1 speakers

Moreover, the L2 learners began with massive production of non-realized VLs that decreased in favor of the realized variant ($F_{(1,19)}=4.3$, $p=.027$; T1 vs. T2 $p=.369$; T2 vs. T3 $p=.041$), while unexpected liaison consonants and substitutions remained stable and low ($F_{(1,20)}=0.04$, $p=.892$ and $F_{(1,24)}=3.2$, $p=.072$, respectively). Conversely, L1 speakers showed parallel progress in both variants because non-realization also increased until 4;3 years ($F_{(3,161)}=4.4$, $p=.005$; AG1 vs. AG2 $p=.002$; AG2 vs. AG3 $p=.694$; AG3 vs. AG4 $p=.763$). Indeed, between the two lower age groups of L1 children, substitutions ($F_{(3,161)}=16.7$, $p\leq.001$; AG1 vs. AG2 $p\leq.001$; AG2 vs. AG3 $p=.171$; AG3 vs. AG4 $p=.894$), aphasis ($F_{(3,161)}=8.4$, $p\leq.001$; AG1 vs. AG2 $p=.001$; AG2 vs. AG3 $p=.187$; AG3 vs. AG4 $p=.372$), and unexpected liaison consonants ($F_{(3,161)}=4.0$, $p=.009$; AG1 vs. AG2 $p=.008$; AG2 vs. AG3 $p=.775$; AG3 vs. AG4 $p=1.000$) decreased, whereas non-realizations increased, showing that non-realized VLs are a target in the same way as realized VLs.

4.1.3 Comparison of evolution curves for categorical and variable liaison production

In Figure 3, a general trend can be noted in both L1 and L2 speakers. There is a significant gap between the realization of CL and of VL among the L2F learners at all longitudinal time points (T1, T2 and T3: $t_{(16)} p < .001$), and for all age groups among the native French-speaking children (AG1, AG2, AG3 and AG4: $t_{(39 \text{ to } 43)}$

$p < .001$). This gap shows that L1 and L2 speakers produce more CLs than VLs. In other words, CL appropriation occurs earlier than VL appropriation, including for L2F learners.

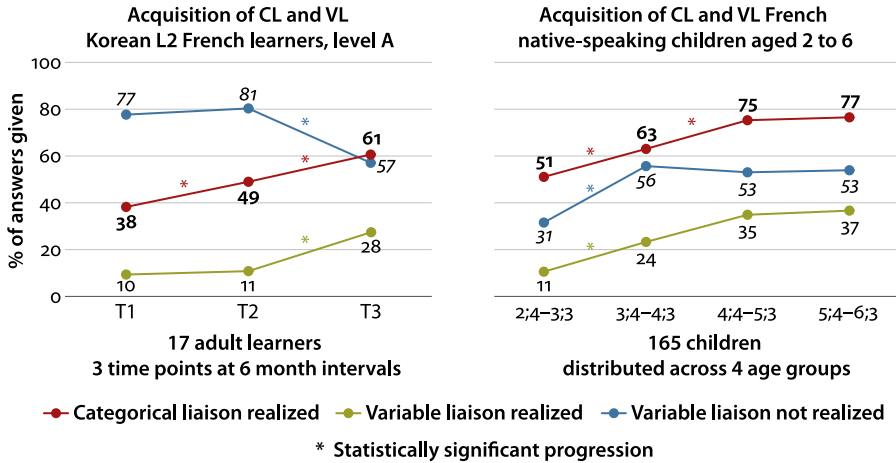


Figure 3. Categorical and variable liaison production by L2 and L1 speakers

4.1.4 Acceptability judgments for categorical and variable liaisons

Regarding judgments by L1 and L2 speakers, Figure 4 shows that preference for realized CLs occurred earlier than preference for realized VLs. This observation was expected, because non-realization of a VL is a possible variant, whereas absence of a CL is an error. On a statistical level, this discrepancy was only significant at the third observation point for the L2 learners, but across all four age groups for the L1 children (AG1: $t_{(39)} p = .046$; AG2: $t_{(43)} p = .005$; AG3: $t_{(39)} p = .001$; AG4: $t_{(40)} p < .001$).

At the beginning of the longitudinal study, the L2 learners judged realized CLs as favorably as realized VLs (T1: $t_{(16)} p = .134$; T2: $t_{(16)} p = .083$). Between the second and third longitudinal time points, they progressed in choosing realized CLs ($F_{(2,28)} = 10.6, p = .001$; T1 vs. T2 $p = .102$; T2 vs. T3 $p = .003$) so that, at the third point, they judged realized CLs over CL omission more favorably than they judged realized VLs over non-realized VLs (T3: $t_{(16)} p = .010$). In other words, at the beginning of their liaison appropriation, L2 learners showed a preference for realized liaisons whatever their morphosyntactic context. They then progressed in their perception of liaisons that should be realized (CLs) versus liaisons that could remain optional (VLs).

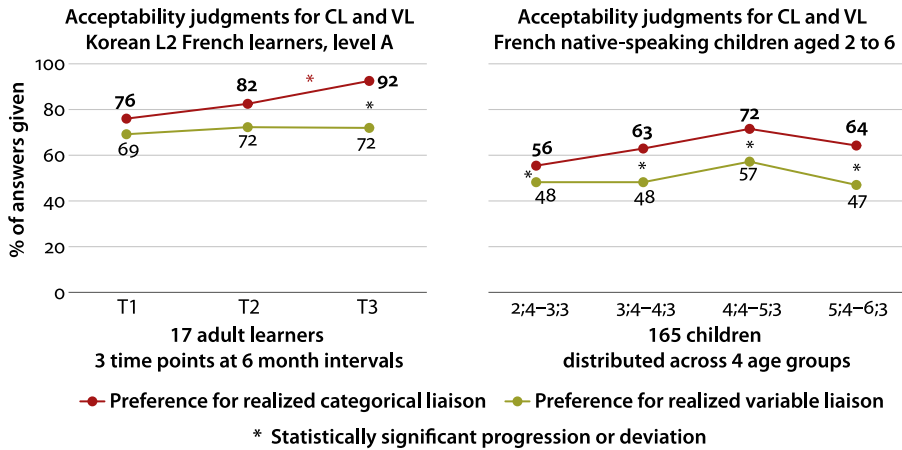


Figure 4. L2 and L1 judgments in favor of realizing categorical liaisons and variable liaisons

4.2 Matches between L1 and L2 speakers

In order to compare the L1 and L2 speakers, we matched each of the 17 L2F learners at the first observation point to the children among the 165 L1 participants who achieved the same score of realized liaisons. This initial stage led to the selection of 68 children in the CL context and 86 children in the VL context (Harnois-Delpiano, 2016:266–269). Each L2 learner had one or several corresponding L1 children with the same score, meaning several matches were observed. 76 matches were therefore carried out for CLs, of which 12 were based on a score of 0% of realized CLs (3 learners \times 4 children). In the VL context, 482 matches were possible, of which 441 were based on a score of 0% of realized VLs (7 learners \times 63 children). Figures 5–8 offer a visual representation of the matches between L1 children and L2F learners. The horizontal axis indicates the L2 learners' codes, presented in ascending order of the liaison realization scores they shared with their L1 matches. These scores are represented by light blue shading. For example, in Figure 5, learners Co2, Co6 and C17 obtained a score of 0% realized CLs, and each of them was matched with the same four children who also produced 0%. The green line indicates the percentage each L2 learner achieved for a second criterion (omission errors), and the red line shows the average score of all the L1 children matched to the learner on the horizontal axis. Together, they represent a 'typical L1' child speaker. For example, in Figure 5, learner Co2, whose production score for realized CL was 0%, obtained an omission score of 90% (green line), and the four children matched with that learner based on a 0% result in production obtained omission scores of 14.3%, 40%, 50% and 100% respectively, giving an average of 51.1% (red line).

4.2.1 *Categorical liaison: Matches based on production and comparison of omissions*

Out of the 76 matches, only four L1 speakers produced a rate of omission that was higher than the L2 speaker when matched according to the same rate of CL production. In Figure 5, the green line representing the L2 speakers' CL omissions is always higher than or equal to the line for the 'typical L1' speakers with whom they were matched based on equal scores for producing realized liaisons.

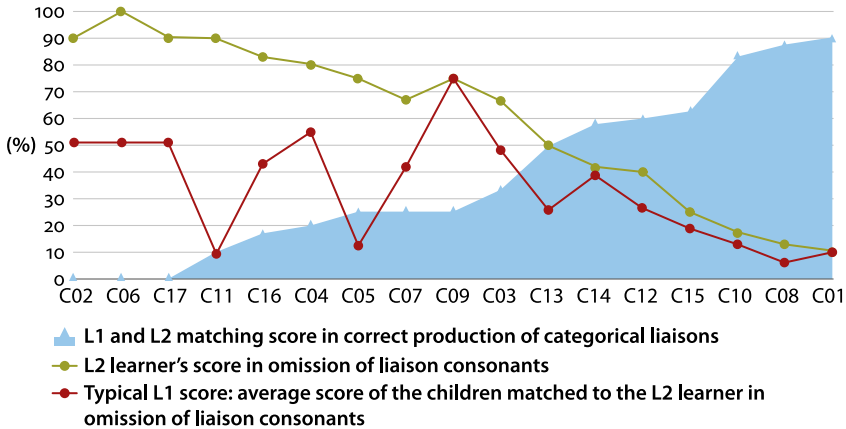


Figure 5. Matches between L2 and L1 speakers' correct production of categorical liaisons and comparison of the percentage of liaison consonant omissions

The L2 line remains fairly linear, as it is almost inversely proportional to the line for realized CLs (light blue shading) as the L2 learners' productions almost never show substitution of liaison consonants (e.g. /tʁwanavjʃ/ with /n/ instead of /z/, see Section 4.1.1). For the 'typical L1' children, the red line shows substantial variations, which can be explained by production of substitutions and aphasis as well as realizations and omissions. However, by the time they reached around 60% correct production of CL, L1 and L2 speakers produced a fairly similar rate of omissions. Therefore, at a certain stage in the acquisition process, when their capacity to produce CLs between a determiner and a noun is identical, L2F learners produce more omissions than native French-speaking children. This difference only decreases when more than half of the L1 children's productions are accurately realized CLs.

4.2.2 Variable liaison: Matches based on production and comparison of substitutions

Figure 6 shows another match based on the same method. L2 learners and L1 children were matched according to their production levels of realized VLs, and we then compared their scores for substitution errors. The red line representing substitutions of the liaison consonant of the ‘typical L1’ speakers shows higher substitutions of CLs than realized VLs (light blue shading) until the latter reach approximately 20% of VL productions (from match C03 onwards). The green line representing the liaison consonant substitutions of each L2 speaker is always below the curve for the ‘typical L1’ speakers.

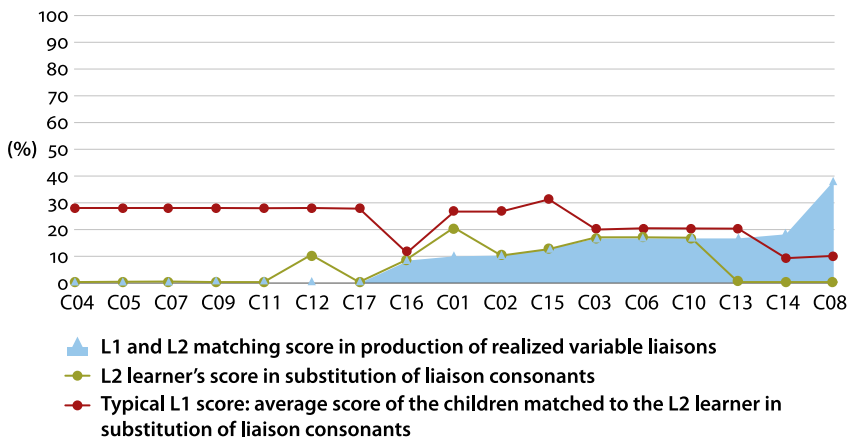


Figure 6. Matches between L2 and L1 speakers’ production of realized variable liaisons and comparison of the percentage of liaison consonant substitutions

More specifically, in 435 of the 482 matches, the L1 child produced more substitutions than the L2 learner with whom they were matched based on the same rate of VL realization. This trend clearly indicates that at equal levels of production, liaison substitutions are more frequent among native French-speaking children than L2F learners.

4.2.3 Categorical liaison: Matches based on production and comparison of judgments

In Figure 7, the two groups are matched based on production of realized CLs, and their acceptability judgments about this liaison are compared. The green line representing each L2 speaker’s favorable judgment for realized CLs is above that of the ‘typical L1’ speaker, except in the matches for C02 and C16. It is always above the rate of CL production (light blue shading), whereas this is not the case for ‘typical L1’ speakers once they reach 60% CL realization.

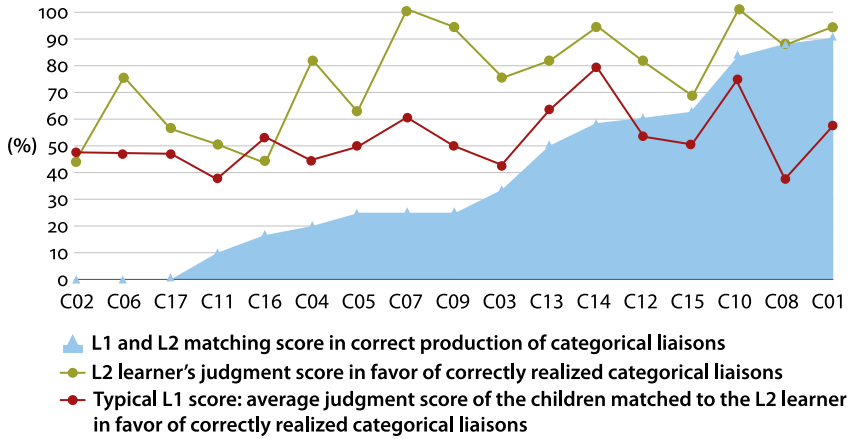


Figure 7. Matches between L2 and L1 speakers' correct production of categorical liaisons and comparison of acceptability judgments in favor of correctly realized categorical liaisons

More precisely, in 66 of the 76 matches, the L1 child obtained a lower rate of acceptability judgments in favor of CLs than the L2 learner with whom they were matched based on production rates. Therefore, when their ability to produce CLs between a determiner and a noun is identical, judgment of CLs is more advanced among L2F learners than L1 children.

4.2.4 Variable liaison: Matches based on production and comparison of judgments

In Figure 8, the two groups are matched based on production of realized VLs, and their acceptability judgments about this liaison are compared. The green line representing the judgment of each L2 speaker in favor of realized VLs is higher than the line for the 'typical L1' speakers, with the exception of two L2 speakers (C5 and C17). More specifically, in 371 of the 482 matches, the L1 child obtained a lower judgment rate than the L2 speaker with whom they were matched based on an identical production rate. As with CLs, at equal levels of production, judgment of realized VLs is more advanced among L2F learners than among native French-speaking children.

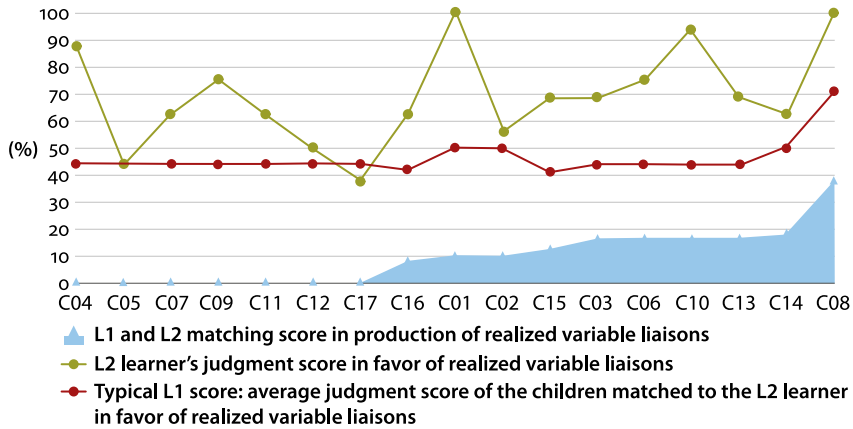


Figure 8. Matches between L2 and L1 speakers' production of realized variable liaisons and comparison of acceptability judgments in favor of these liaisons

5. General discussion

5.1 Summary of results

5.1.1 Linguistic hypothesis

First of all, this study substantiates hypothesis (H₁), that L2 literate speakers are guided by the written form in their appropriation of French liaison. A necessary though not sufficient condition for verifying this hypothesis was ascertaining that the learners participating in the study mastered the written forms of the words used in the protocol. We were able to check that this was the case by using a written task performed by the 17 Korean L2 learners.¹⁰ An indicator of this graphic influence was that they massively produced non-realized liaison consonants such as /œ̃aʁbʁ/ and /œ̃pɾətiavjɔ̃/, which indicate graphic segmentation. Moreover, they produced very few liaison consonant substitutions (/tʁanelefã/ with /n/ instead of /z/) or apheresis (/inatœʁ/ instead of /ɔ̃ʁdinatœʁ/), and tended to produce oral forms mirroring the written forms. Finally, the unexpected liaison consonants they produced were mainly of orthoepic origin, relying on the basic grapho-phonetic value of the letters corresponding to liaison consonants (/œ̃gʁosãfã/ with /s/ instead of /z/). These productions contrasted with those of the L1 children of non-reading age. This linguistic hypothesis is also substantiated by our method for matching speakers: when L1 and L2 speakers had identical scores for realizing

10. For example, out of 306 words that could be preceded by a liaison (17 learners × 3 time points × 6 words) the answers always included an initial vowel. For the details of this task and its results, see Harnois-Delpiano (2016: 253–258).

liaisons, the L2F learners produced more omissions and less substitution errors than the L1 children.

5.1.2 *Sociolinguistic hypothesis*

This study also substantiates hypothesis (H₂), that native French-speaking children will favor the non-realized variant of VLs (e.g. /œ̃gʁoʁʁdinatœʁ/), more in line with usage, while L2F learners will favor the realized variant (e.g. /œ̃gʁoʁʁdinatœʁ/), more in line with the norm. Indeed, at the beginning of appropriation of VL, the L1 children judged realized liaisons more favorably when they were categorical than when they were variable, whereas the L2 learners judged each type of liaison just as favorably. In production, in L1 children, realization and non-realization of the VL seemed to be two target variants, whereas for L2 learners, realized VLs increased to the detriment of the non-realized variant. This sociolinguistic hypothesis is also substantiated by our method of matching speakers. With identical scores for realizing VL, L2F learners judged the realized variable liaison more favorably than L1 children.

5.1.3 *Psycholinguistic hypothesis*

Finally, this study also substantiates hypothesis (H₃), that the acquisition process for French liaison is different for L1 and L2 speakers. Converging results have shown that L1 child speakers are engaged in an abstraction process guided by usage frequency (Chevrot et al., 2009). However, the results on liaison judgement suggest that L2 speakers are engaged in a proceduralization process guided by explicit knowledge of how liaison works in French. Our method for matching speakers showed that with identical scores for realizing liaisons, L2 speakers judged realized liaisons more favorably than L1 speakers. Moreover, among native French-speaking children, production preceded judgment because they realized, for example, two thirds of categorical liaisons without having made any progress in their capacity to judge the acceptability of these liaisons. Broader investigation into acceptability judgments also involving realized liaison contrasted with substitution of the wrong liaison consonant suggests that before 3;4 years, L1 children judge liaison realization randomly when they already produce categorical liaisons at a level above 50% (Harnois-Delpiano, 2016: 225–252).

Furthermore, a correlational study of these results shows that the L1 children who best judged categorical liaisons were not those who produced the most, unlike among L2 learners where the capacity to produce categorical liaisons was concomitant with their ability to perceive them (Harnois-Delpiano, 2016: 258–265). Moreover, the L2 learners who best judged the categorical liaisons

were also the ones who produced the most at the next longitudinal recording.¹¹ Among L2F learners, therefore, the capacity to judge liaison realization as acceptable precedes the capacity to produce them. If we accept that judgment involves more awareness than production, the results strongly suggest that the acquisition process in L2 speakers is at least partially based on the awareness of liaison.

5.2 Appropriation of liaison in L2 French: Toward a model based on learning modes

These elements confirming our psycholinguistic hypothesis (H3) encourage explaining liaison acquisition in L2 French through learning modes rather than through models based solely on forms of linguistic representations. Our suggestions are therefore not intended to defend either a lexical model of liaison appropriation in L2 French, according to which L2F learners add liaison consonant on a case-by-case basis which then evolves towards a phonological model (Wauquier & Shoemaker, 2013), or a constructionist model (Barecca, 2015). However, we do suggest, as seen in Figure 9, a description of the proceduralization process of appropriating liaison in L2 French without losing sight of the influence of usage frequency.

<i>Phonological or constructionist model</i>					
	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Procedural knowledge of variable liaison as a sociolinguistic variable					X
Declarative knowledge of the acceptability of non-realized variable liaison				X	X
Procedural knowledge of variable liaison			X	X	X
Procedural knowledge of categorical liaison		X	X	X	X
Declarative knowledge of the liaison phenomenon	X	X	X	X	X
Procedural knowledge of the written form	X	X	X	X	X
Declarative knowledge of the written form	X	X	X	X	X
<i>Lexical strategy</i>					




Figure 9. The suggested liaison appropriation process in L2 French

11. This is also the case for variable liaisons, but only for comparisons between T2 and T3, which confirm that acquisition of categorical liaison occurs earlier than for variable liaison.

During stage 1, which was already in place at T1 in our longitudinal study, the L2 learners were capable of writing the words in their canonical form, which suggests declarative knowledge of the written form, meaning the ability to explain grapho-phonetic and phonographic correspondences in French. This ability also suggests executable knowledge of the written form, referring to the ability to plan the act of reading and writing. Finally, it suggests procedural knowledge of the written form, which consists of automatizing reading and writing. The learners have given favorable judgments of liaison in both categorical and variable contexts. If we accept that judgment involves more awareness than production, these results suggest declarative knowledge of the liaison phenomenon, meaning the ability to explain the modes on which a liaison consonant is inserted between two words.¹²

In stage 2, which began at T1 of our longitudinal study, the learners started to be able to realize categorical liaisons, suggesting that procedural knowledge was in place, consisting of automatizing realization of liaisons in contexts where they should be realized. In stage 3, observed between T2 and T3 of our longitudinal study, the learners began to realize variable liaisons, suggesting procedural knowledge was in place consisting of automatizing realization of liaison in appropriate contexts. In stage 4, observed at T3 of our longitudinal study, the learners started to show indeterminacy between the realized variant (/œ̃gʁozɔ̃dinatœʁ/, more normative) and the non-realized variant (more in line with usage: /œ̃gʁozɔ̃dinatœʁ/) of variable liaisons, suggesting that declarative knowledge about the acceptability of not realizing variable liaisons was now in place. Moreover, literate speakers realize more CLs than VLs despite explicit teaching of the normative classification of liaisons, indicating that L2 learners are also influenced by usage frequency.

Finally, in stage 5, which we did not observe in our longitudinal study but which we can assume would take place afterwards, the learners should begin to produce both variants in a balanced fashion. Their rates of production would then come close to those of native productions, indicating procedural knowledge of variable liaison consisting of automatizing the realization of liaison while taking into account its sociolinguistic implications. This final stage is supported by other studies on sociolinguistic variables (for an overview, see Gautier, 2016). They show that when learners spend time in a French-speaking environment, this encourages appropriation of less normative forms and leads, for example, to a decrease in the rate at which the negative particle *ne* as a sociolinguistic variable or variable liaisons are realized, corresponding, in the latter case, to the fifth stage of the process we describe.

12. For example, during the judgment task, the experimenter noticed that many subjects helped themselves in their choices using finger gestures (on the table or in the air) representing an inverted bridge, which is traditionally used in teaching to link two words orally or to indicate a liaison in French.

5.3 Pedagogical prospects

This study sheds light on liaison acquisition in L1 and L2 French, offering a way of defining difficulties which may be addressed in teaching in order to give learners the means to improve their acquisition processes. It also underlines the importance of taking source language into account when teaching liaison in L2 French. Unlike Norwegian speakers (Andreassen & Lyche, 2015) or English speakers (Thomas, 2004), who realize many liaisons without *enchaînement* (/œ̃n.a.vjɔ̃/ instead of /œ̃.na.vjɔ̃/, /œ̃.pə.tit.ã.fã/ instead of /œ̃.pə.ti.tã.fã/), Korean L2F learners do not seem to have any difficulty with resyllabification, which exists in their first language.

Conversely, like English speakers (Thomas, 2004) and Spanish speakers (Racine, 2015), Korean learners produce errors that have never been observed in native speakers of French (15% of their productions after the adjective *gros* ‘big/fat’ are of the type /œ̃gʁosɑ̃bʁ/ with /s/ instead of /z/). This tendency cannot be explained by the absence of the phoneme /z/ in Korean phonetics, as Korean L2F learners rely on /s/ to pronounce /ʃ/ and they rely on /z/ to pronounce /ʒ/ (Han, 2011), since the phonemes /ʃ/ and /ʒ/ are not found in Korean phonetics either. Unexpected liaison consonants can be explained by the strong graphic/phonetic correspondence of their alphabet but also by the fact that they had learned to read the Latin alphabet when learning English, and are therefore more inclined to pronounce final consonants. Greater attention should be paid to learners’ capacity to explain graphophonetic correspondences by “specific work focusing on the difficulties related to questions of *micro-planning* [...], such as the nature of the liaison consonant – in relation to the written form and to the question of final graphic consonants – and *enchaînement*” (Racine, 2015: 164). Better declarative knowledge of the written form could be expected to lead to better declarative knowledge of the liaison phenomenon, which would help learners move on to executable and then procedural knowledge of liaison.

Moreover, pedagogical resources would do well to adopt the descriptive classification of liaisons (categorical, variable, and erratic) as this could help learners take into account usage frequency, which is useful at all stages in appropriating L2 liaison. This would reinforce procedural knowledge of the most frequent liaison, the categorical liaison. It could also help engage learners more quickly in declarative knowledge of the acceptability of not realizing variable liaisons. Currently, the sociolinguistic variation created by variable liaisons is only mentioned in general textbooks at the B and C levels of the CEFR (Council of Europe, 2001) and only as a marker of a formal register. Like other sociolinguistic markers, realization of this kind of liaison is correlated with production of syntactic constructions and lexical forms of the same stylistic level, and teachers could highlight these combinations.

For example, at level A (beginner), the alternation between using the formal *vous* form of address and the informal *tu* form of address, and the alternation between the subject clitics *nous* / *on* in the plural, could go hand-in-hand with realized or non-realized variable liaisons. Such an approach has given interesting results where the negative particle *ne* is concerned (van Compernelle, 2013). At a more advanced level, emphasis could also be placed on coordinating realized and non-realized sociolinguistic variants with lexical and syntactic constructions.

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Résumé

Les études de l'acquisition de la liaison en français mettent fréquemment l'accent sur les potentielles différences et similitudes entre les locuteurs L1 et L2. Toutefois, la diversité des conditions environnementales et cognitives de ces deux groupes constitue autant d'obstacles à leur comparaison. Cette étude aborde ces questions au travers de l'analyse de la liaison dans une série de tâches expérimentales réalisées par des enfants L1 âgés de deux à six ans et par des apprenants coréens adultes de français langue étrangère. Les résultats montrent que, pour les deux groupes de participants, l'acquisition de la liaison catégorique précède celle de la liaison variable. Cependant, lorsque les locuteurs L1 et L2 sont appariés individuellement en fonction de leurs scores à la tâche de production, ils diffèrent dans la tâche de jugement impliquant la perception de liaison. Plus précisément, contrairement aux enfants L1, la capacité à juger de l'exactitude de la liaison précède la capacité à la produire chez les apprenants L2. Les résultats fournissent un indice fort que ces derniers suivent un processus spécifique lors de l'acquisition de la liaison en français.

Authors' addresses

Mylène Harnois-Delpiano
Université Grenoble Alpes
France
harnois.delpiano.m@gmail.com

Jean-Pierre Chevrot
Université Grenoble Alpes
France
jean-pierre.chevrot@univ-grenoble-alpes.fr

Cristelle Cavalla
Université Sorbonne-Nouvelle Paris 3
France
cristelle.cavalla@sorbonne-nouvelle.fr