PRODUCTION AND PERCEPTION OF LIAISON BY ANGLOPHONE LEARNERS OF FRENCH

BY

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THESIS

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ABSTRACT

This thesis investigates the production and perception of optional liaison consonants by Anglophone learners of French. While second/foreign language (L2) phonology has long been recognized as an area of learner difficulty, there have been few studies on the acquisition of liaison by L2 learners of French. The two studies contained in this thesis hope to expand our understanding of liaison as it is acquired by L2 learners.

Study 1 is a production study that determines the morphosyntactic, phonemic, and prosodic contexts in which native and non-native French speakers produced optional liaison. Both groups were found that to produce liaison more frequently between a noun and its adjective than between two verbs, and only native speakers demonstrated a prosodic effect of the syllable count of the word triggering liaison. Interestingly, the results also show that L2 learners had a tendency to mark nominal plurality with /t/ in liaison contexts, indicating awareness of plural morphology and liaison, but difficulties with phonemic choice.

Study 2 aimed to determine if L2 learners of French are able to make use of acoustic-phonetic cues in order to resolve syllable-misaligned words involving true or potential liaison consonants. The participants were asked to differentiate between liaison- and consonant-initial words in ambiguous contexts. The results indicate that L2 learners were more sensitive than native speakers to these acoustic-phonetic cues when disambiguating resyllabified words. These learners also tended to over-anticipate liaison in ambiguous contexts, whereas native speakers did the opposite—they preferred a consonant-initial interpretation of the second word.

The implications of these findings for L2 acquisition theories will be discussed.

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CHAPTER 1: INTRODUCTION

Second/foreign language (L2) phonology has long been recognized as a potentially life-long area of learner difficulty in both production and perception. There have been several explanations proposed for what Flege (1995) calls the "complexity of the phenomenon of foreign accent," including problems of neural plasticity, sensorimotor control, inaccurate perception, and deficient phonetic input. Whatever combination of the above may affect individual learners, in the realm of phonological production, L2 learners are notorious for sound modification and consonant cluster reduction in the interlanguage, often due to the influence of the native language, although these have also been shown to vary according to non-phonological factors such as word frequency and morphosyntactic importance (Abrahamsson, 2003; Carlisle, 1998). Similar findings hold true for perception, more specifically word segmentation: two studies of English-French adult bilinguals have demonstrated that learners implement different speech segmentation strategies depending on their dominant language and the frequency of the syllable structures found in their linguistic input (Cutler, Mehler, Norris, Segui, 1992; Golato, 2002). The generic difficulties faced by L2 learners have been well documented, but little research has yet been done on the specific difficulties encountered by Anglophone learners of French acquiring a phonological system that is not entirely rule-governed and thus option to greater variation and greater influence by non-phonological factors—liaison.

This thesis examines the production and perception of liaison consonants by Anglophone L2 learners of French. Liaison is a complex linguistic phenomenon that lies in the interface of phonetics, phonology, syntax, and the lexicon. Specifically, it is a process whereby an otherwise latent word-final consonant is realized as the onset of the following vowel- (or

glide-) initial word in certain syntactic and lexical environments (e.g., *petit ami* 'small/short friend' or 'boyfriend,' pronounced as [pə.ti.ta.mi]; *petit oiseau* 'small bird,' pronounced as [pə.ti.twa.zo]). Given the complexity and multifacetedness of liaison, examining its acquisition among L2 learners of French can help specify how different domains of generalizations interact in the acquisition process and whether some take precedence over others, thus enhancing our understanding of the ways in which L2 acquisition is constrained,

This thesis consists of two studies: the first study elicits optional liaison production from non-native learners of French, whereas the second study investigates the ability of such learners to differentiate between liaison consonants and their word-initial counterparts in ambiguous contexts. By pairing both production and perception studies, this investigation hopes to contribute to the understanding of how non-native speakers of French (in this case with English as their native language (L1)) not only acquire but also use their phonological knowledge of French, as well as how both their acquisition and use of this knowledge change with increasing proficiency. This understanding will also have important pedagogical implications for the teaching of French as a foreign language, and, at the university level, for the teaching of French phonetics to non-native learners.

We begin with a literature review comprising the canon of current research concerning the phonetic/phonological properties of liaison consonants, including: (i) how both native and non-native speakers acquire mental representations of such consonants; (ii) how native and non-native speakers produce liaison consonants in various contexts; and (iii) how these consonants are perceived by L1 and L2 listeners. This literature review will be followed by a first study investigating the production of optional liaison consonants by Anglophone learners of French, and a second study in which a similar group of participants is tested on the

perception of liaison consonants and their word-initial counterparts in phonemically ambiguous contexts. Finally, in the discussions and conclusions of these two complementing studies, we shall try to answer the following questions: What new information do these studies bring to the fields of liaison acquisition and of L2 acquisition in general? Are these results compatible with previous research? What are their practical implications? What questions remain to be addressed in future research?

CHAPTER 2: LIAISON

2.1 Liaison: Factors Influencing its Occurrence and Proposed Representations

As mentioned in Chapter 1, French liaison is a phenomenon by which a normally latent, word-final consonant is pronounced at the beginning of the following word if this word is vowel-initial. For example, in the phrase *les amis* 'the-pl friends,' pronounced [le.za.mi] (where the periods represent syllable boundaries), the consonant at the end of the word *les* 'the plural' becomes the consonant pronounced as the onset of the word *amis* 'friends'. Native French speakers have an unconscious knowledge of the rules that govern the use of liaison, including which phonemes can act as liaison consonants (e.g., /z, n, t, ʀ , p, g/), the role of phonological factors in determining their occurrence (e.g. the number of syllables in the first word), their morphological status, if any (e.g., plurality), the word classes between which they can appear (e.g., between a determiner and a noun), and lexical factors (the presence of otherwise syntactically forbidden liaisons in frequent, fixed expressions).

As common as this phenomenon is in speech, there are a relatively small number such consonants—only six liaison consonants exist in French (/z, n, t, ʀ, p, g/), and only three of them occur frequently (/z, n, t/, listed in order of frequency; Durand & Lyche, 2008). As for the others, [ʀ] only occurs after the adjectives *léger* 'light,' *premier* 'first,' and *dernier* 'last'; [p] appears after *trop* 'too much' and *beaucoup* 'much/a lot'; and [g] is only produced after the adjective *long* 'long' (Tranel, 1987). All of these liaison consonants share the characteristics of being realized as syllable onsets, and they are more likely to be pronounced within smaller phonological domains, for example after monosyllabic words rather than after trisyllabic words (Encrevé, 1988).

Based on the syntactic context in which it occurs, the production of liaison in French has traditionally been considered as obligatory, optional, or forbidden. For example, liaison must obligatorily be produced before a noun or an adjective within a noun phrase (e.g., *les autres amis* [le.zo.tχə.za.mi] 'the other friends'), between a subject or object pronoun and a verb (e.g., *nous arrivons* [nu.za.ʁi.vɔ̃] 'we are arriving'; *nous les avons* [nu.le.za.vɔ̃] 'we have them'; *allez-y* [a.le.zi] 'go ahead'), and between two pronouns (e.g., *on nous en donne* [ɔ̃.nu.zɑ̃.dɔn] 'we are given some'). Liaison is also obligatory after a preposition (e.g., *chez eux* [ʃe.zø] 'at their place') or after a one-syllable adverb (e.g., *très heureux* [tχɛ.zø.ʁø] 'very happy'), after the verb in inverted questions (e.g., *arrivent-ils* [a.ʁiv.til] 'are they arriving'), and after the relative pronoun *dont* (e.g., *dont on parle* [dɔ̃.tɔ̃.paʁl] 'about which one speaks') (Tranel, 1987). More recently, however, Durand and Lyche (2008) have proposed, based on corpus data, that three of the so-called obligatory liaison contexts are in fact optional. These contexts include after monosyllabic prepositions, after preposed adjectives in spontaneous speech, and with *c'est* 'it is' (Durand and Lyche, 2008). In their analysis of the BREF corpus, Boula de Mareüil, Adda-Decker, and Gendner (2003) further show that adjective-noun sequences and constructions containing *pas* 'not' are no longer compulsory contexts for liaison in spontaneous speech.

Moreover, there are six syntactic contexts that prohibit the production of liaison, exemplified by Boula de Mareüil et al. (2003): after a subject pronoun in inverted questions (e.g., *sommes-nous/allés* [sɔm.nu.ale] 'did we go'), after a subject noun phrase in declarative sentences (e.g., *les enfants/arrivent* [le.zɑ̃.fɑ̃.a.ʁiv] 'the children are arriving'), after the main verb in declarative sentences (e.g., *il prend/un café* [il.pχɑ̃.œ̃.ka.fe] 'he is drinking a coffee'), after an adverb, conjunction, or polysyllabic preposition (e.g., *tantôt/on partira* [tɑ̃.to.ɔ̃.paʁ.ti.ʁa]

'soon we will leave'), after the conjunction *et* 'and' (e.g., *vingt-et/-un* [vɛ̃.te.œ̃] 'twenty-one'), and between an adjective and a preposition (e.g., *bon/à rien* [bɔ̃.a.ʀjɛ̃] 'good for nothing'). In contrast with Tranel's (1987) traditional analysis of liaison and Durand and Lyche's (2008) recent corpus study of liaison, Boula de Mareüil et al. report that liaison can in fact optionally occur between a singular noun and an adjective (e.g., *étudiant intelligent* 'intelligent student'). This is perhaps due to the fact that their liaison data came from elicited read speech rather than spontaneous speech. As for optional liaisons, their production depends, among other things, on the length the word triggering liaison and on the style of discourse: the production of optional liaisons increases when Word 1 is monosyllabic rather than multisyllabic (Encrevé, 1988), and it increases with the degree of formality of the discourse chosen by the speaker (Tranel, 1987).

Since liaison is produced between words that share "a strong syntactic cohesion," it is subject to effects of co-occurrence frequency (Bybee, 2005). According to its frequency of usage, a pair of words—including the liaison consonant contained therein—can be memorized in the speaker's mental lexicon. This process is evidenced by syntactic contexts where liaison should be forbidden but is, in fact, obligatory. Such cases of liaison occur in fixed phrases such as *de temps en temps* [də.tɑ̃.zɑ̃.tɑ̃] 'from time to time,' *petit à petit* [pə.ti.ta.pə.ti] 'little by little,' *de plus en plus* [də.ply.zɑ̃.ply] 'more and more,' and *tout à coup* [tu.ta.ku] 'all of a sudden' (Tranel, 1987). This is also the case for the proper nouns *Champs Elysées* and *Nations Unies* 'United Nations,' where liaison would otherwise not be obligatory but where it has become lexicalized. If the word ending in a latent consonant has a heightened frequency, this can also contribute to the production of optional liaisons by native speakers. For example, the verb *être* 'to be' is almost always accompanied by a liaison consonant when followed by a vowel-initial word (e.g., *il est à Paris* [i.le.ta.pa.ʀi] 'he is in Paris'). According to Bybee

(2005), "the more frequently a construction is used, the greater the chance that its form will be maintained rather than replaced by a more productive construction" (p. 30).

As for sociolinguistic factors affecting liaison production, using data drawn from the IDAP French Polyphone corpus collected from Francophone citizens of Switzerland (Chollet, Cochard, Jaboulet, & Langlais, 1996), Bergen (2001) determined that not only does age correlate with liaison use, but also the younger the speaker, the more liaison consonants they omit for verbs relative to adverbs. It can be assumed that the author is referring to the decrease in production of liaison with verbs such as conjugations of *être* 'to be' (one of the few verbs that can elicit liaison), but maintenance of liaison with adverbs such as *très* 'very' and *trop* 'too much,' to name a few. This may be indicative of a decrease in the morphological use of liaison and an increase in its lexical use.

Overall, there are two main explanatory approaches to the phenomenon of liaison—that which takes liaison to be a phonological phenomenon and that which takes liaison to be a lexical phenomenon. From the phonological view point, liaison has been seen as both an exception to the French Truncation Rules of final consonant deletion (e.g., *petit* 'small/short' pronounced as [pə.ti] (masculine) and not [pə.tit] (feminine)) as well as a process of epenthesis. For example, Encrevé (1988) proposed that liaison consonants are floating segments associated with both the segmental and syllabic tiers and are only realized under certain conditions such as before vowel-initial words. Those who assume a phonological view of liaison have attempted to determine whether or not liaison consonants belong to the first or second word of the pair or, conversely, to neither (Côté, 2005). For native adult French speakers, the answer to this question depends on whether liaison is lexical or morphological and whether it precedes clitic pronouns. Lexical liaison consonants refer to those consonants found in fixed expressions as

well as parts of the underlying representation of Word 1 since there is no other explanation for liaison production in such contexts (e.g., after *petit* 'small/short,' *très* 'very,' and *trop* 'too much'). Conversely, morphological liaison consonants are affixes that carry morphosyntactic information such as person and number (e.g., *les petits enfants* [le.pə.ti.zɑ̃.fɑ̃] 'the small children'). Whereas lexical liaisons have been analyzed as belonging to Word 1, morphological liaisons have been treated as epenthetic segments that can belong to either Word 1 or Word 2 (Côté, 2005). Morphological consonants that are assumed to belong to Word 1 include prenominal adjectives that precede right-dislocated vowel-initial nouns (e.g., *j'en ai un petit, ami* [ʒɑ̃.ne.oẽ.pə.ti.ta.mi] 'I've got a short one, a friend') (Côté, 2005). Among cases where liaison is analyzed as belonging to Word 2 are the enclitics *y* 'there' and *en* 'some' in imperative constructions (e.g., *vas-y* [va.zi] 'go (ahead)') as well as the subject clitics *il(s)* 'he/they,' *elle(s)* 'she/they,' and *on* 'one' in inverted constructions (e.g., *va-t-il* [va.til] 'does he go'). In such cases, the production of the liaison consonant depends more on the syllabic representation of the right-hand word (as vowel-initial) than on the left-hand word, and so these consonants may in fact be mentally represented as the onset of Word 2 (Côté, 2005).

In contrast to the phonological view of liaison, the exemplar-based lexical perspective claims that words ending in potential liaison consonants have two allomorphic forms in the lexicon. Thus, *petit* would be stored as /pəti/ and /pətit/, and fixed expressions would be stored as such (e.g., *petit à petit* /pə.ti.ta.pə.ti/ 'little by little'). There is also the construction-based model of liaison stating that liaison consonants appear in specific syntactic constructions derived from the lexicon that vary in their abstractness. In this theory, a phrase such as *bons enfants* /bɔ̃.zɑ̃.fɑ̃/ 'good children' would have the form [Adj-z- [vowel]-Noun]$_{plural}$ and would elicit a less frequent liaison than a fixed phrase such as *c'est-à-dire* 'that is' (Bybee, 2005).

The present thesis remains neutral as to my view of the status of liaison consonants. Instead, it focuses in part on their representation in L2 French, specifically the phonemic, phonological, and syntactic representations that L2 learners develop and use for producing liaison in French. Now that the phonological, morphosyntactic, and lexical constraints on the occurrence of liaison have been established, let us turn to how these consonants are treated by the perceptive and productive systems of both native and non-native speakers of French.

CHAPTER 3: RECOGNITION OF RESYLLABIFIED WORDS

3.1 Native French Speakers

Psycholinguistic research in French and Dutch has shown that syllable onsets play an important role for recognizing words in continuous speech (e.g., for French: Content, Kearns, & Frauenfelder, 2001; Dumay, Frauenfelder, & Content, 2002; for Dutch: McQueen, 1998; Vroomen & de Gelder, 1997, 1999). Although syllable onsets are strong cues to word onsets, there are instances in which word and syllable boundaries are misaligned. This would then predict a processing cost and delayed recognition for the perception of syllable-misaligned words.

A large number of studies have been performed to test this prediction in Dutch. For example, Vroomen and de Gelder (1997) conducted a cross-modal semantic priming experiment with native speakers of Dutch in which they found that embedded words are activated only when their onsets are aligned with syllable onsets. For example, *boos* 'angry' is activated in *fram.boos* 'raspberry,' whereas there is no activation of *wijn* 'wine' in *zwijn* 'swine'. McQueen (1998) confirmed these findings with a word-spotting/detection task in which nonsense words containing a real Dutch word were presented to participants, who were to identify the embedded target word. Once again, the target words were detected more easily when their initial boundary aligned with a syllable onset, as the target *rok* 'skirt' in *fim.rok* but not in *fi.drok*. Other evidence that resyllabification carries processing costs in continuous speech come from experiments such as Vroomen and de Gelder's (1999), in which native Dutch participants were asked to monitor individual phonemes such as /t/ in the speech stream. It was found that in sentences such as *de boo.t is gezonken* 'the boat sank' and *de boot die*

gezonken is 'the boat that sank,' participants were faster to recognize the final /t/ in *boot* when it was not resyllabified with the following vowel-initial word.

Similar findings have also been reported for English and French (e.g., Content et al., 2001; Dumay et al., 2002). To illustrate, Dumay et al. found that the French word *lac* 'lake' is detected more easily in the nonsense word *zunlac*, where its onset aligns with a syllable onset, than in the nonsense word *zuglac*, where its onset does not align with a syllable onset. To explain such findings, Dumay et al. proposed the Syllable Onset Segmentation Heuristic (SOSH) in French, according to which syllable onsets are points in the speech stream that trigger lexical access. This heuristic is consistent with the language universal Possible Word Constraint (PWC) proposed by Norris, McQueen, Cutler, and Butterfield (1997), according to which lexical hypotheses are penalized in activation if they do not coincide with syllable boundaries and thus segmentations that strand a consonant sequence between a known and unknown word boundary are generally disfavored (for discussion, see also Gaskell, Spinelli, & Meunier, 2002). We will see later, however, that there is evidence that, for native French speakers, other cues can take precedence overt SOSH and PWC in certain contexts.

There are a greater number of syllable misalignment contexts in French than in Dutch. The contexts in which a word-final consonant becomes resyllabified as the onset of a following vowel-initial word are as follow (Spinelli, Cutler, & McQueen, 2002, p. 85):

1. Elision: the final phoneme (a vowel) of a clitic is dropped before a vowel-initial word in order to avoid hiatus.

   e.g.: *le ami* → *l'ami* [la.mi] 'the friend'

2. *Enchaînement* (linking): a non-latent word-final consonant is resyllabified with the initial vowel of the following word.

   e.g.: *chaque ami* → [ʃa.ka.mi] 'each friend'

3. Liaison: a normally latent word-final consonant is resyllabified as the onset of the following vowel-initial word.

   e.g.: *les amis* → [le.za.mi] 'the friends'

Although liaison creates a misalignment of the syllable and word boundaries, acoustic differences exist between words liaison- and consonant-initial words. Studies have shown that liaison consonants tend to be shorter than corresponding word-onset consonants. For example, Spinelli et al. (2003) state that a liaison consonant is in fact 15% shorter than its word-initial counterpart (for plosives such as /t/, this includes both the closure time and VOT). Tremblay (2009, to appear) has also found significant differences in the duration of /z/ in such contexts.

Note, however, that not all studies report acoustic differences between liaison consonants and word onsets. For example, Wauquier-Gravelines (1996) found that /t/ had a significantly shorter closure and burst in liaison contexts as compared to word-initial contexts, but for /n/, there was no variation in duration between these two contexts. Likewise, in Nguyen, Wauquier-Gravelines, Lancia, and Tuller (2007), the fricative /z/ was found to be longer in syllable-initial onset positions when compared to word-final coda positions, but it did not vary from liaison contexts to word-initial contexts. Nevertheless, in their experimental manipulation (discussed further below), this study does report an effect of cross-splicing, which suggests that there was, in fact, some acoustic information present in the signal that was not captured by their acoustic analysis. Similarly, Bannert (1998), who measured the relative

durations of /z, n, t, ʁ, p/ in both liaison and word-initial contexts, found no significant difference between the two. This lack of significant findings may, however, be an artifact of the study's methodology. Namely, this study only sampled from two subjects who produced a total of 30 utterances each. These sentences, per consonant context, were identical in syntactic structure in order to control for prosodic differences, but they were different in the words they contained. Although liaison and consonant-initial words in acoustic analyses do not have to be minimal pairs, they should at least share similar initial syllables and word lengths, which was not the case. Moreover, across consonant conditions, the word pairs were not of the same parts of speech (for example article + noun vs. adverb + past participle). All in all, it is prudent to accept these results with hesitation until a more carefully constructed and controlled experiment can replicate similar results.

If liaison consonants are indeed acoustically different from word-onset consonants, we might predict that listeners use this information in word recognition. Wauquier-Gravelines (1996) (described in Nguyen et al., 2007) used an auditory phoneme detection task to investigate how native French listeners process liaison and word-initial consonants. Stimuli such as *son avion* 'his/her plane' and *son navire* 'his/her ship' were used, as the first syllable of the noun makes the sequence temporarily ambiguous at the phonemic level. She found that the participants detected liaison consonants less accurately than word-initial consonants (for both /t/ and /n/). Wauquier-Gravelines concludes that this is evidence that different processing strategies are used for detecting liaison and word-initial consonants. This may also serve as evidence that liaison consonants are not anchored to a single structural slot within the syllable (Nguyen et al., 2007). In addition, these results support the view that liaison consonants are

perceptually less salient than word onset consonants. This may be due to the fact that the pivotal consonant is shorter in liaison contexts than in word-onset contexts.

Nguyen et al. (2007) also investigated French listeners' processing of liaison consonants. In their experiment, a target consonant such as /z/ or /n/ was placed in four different sentence positions:

1. Word 2-initial: *Il y a des z̲éros partout dans le tableau* 'There are zeros all over the chart'.
2. Word 1-final: *On a eu seiz̲e élèves qui ont réussi au bac.* 'We had sixteen students who passed the baccalaureate exam.'
3. Word-medial: *J'ai rapporté du rais̲in du marché ce matin.* 'I brought back grapes from the market this morning'
4. Liaison: *J'ai remis des̲ écrous en haut du radiateur.* 'I replaced some nuts on the top of the radiator.'

Two versions of each sentence were created, including an identity-spliced version in which the target consonant came from a different repetition of the same phrase, and a cross-spliced version in which, for Type 1 and Type 4 sentences, the target consonant came from the Type 4 and Type 1 sentences, respectively. Recall that the researchers had not found any difference between liaison and word-initial consonants in their acoustic analyses.

These sentences were presented in a phoneme detection task in which the participants' reaction times and accuracy rates were measured. The results showed that the detection accuracy scores were lower and reaction times were longer for liaison consonants as compared

to their word-initial counterparts, thus replicating Wauquier-Gravelines's (1996) finding. In the cross-spliced conditions, the differences in the reaction times between the Type 1 and Type 4 sentences were neutralized, despite the fact that no differences had been found between liaison consonants and word-onset consonants in either the acoustic analyses or the participants' accuracy rates. Finally, accuracy and response times were slower for the conditions containing /n/ as the target consonant than for those containing /z/. On the basis of these results, Nguyen et al. concluded that the detection of liaison consonants in the speech signal is difficult, suggesting that liaison consonants are represented differently from word-final and word-initial consonants in French listeners' mental grammar. It should be noted, however, that the tokens used in the liaison condition are less comparable to those used in the other conditions, in that the liaison consonant heard by the participants was morphological rather than lexical and it occurred between a function word and a content word instead of between two content words. These potential confounds may contribute to the participants' lower accuracy scores and longer reaction times for liaison consonants. There is also a general limitation to phoneme-monitoring tasks: difficulty detecting liaison consonants does not indicate that liaison-initial words are inherently challenging to process.

The numerous contexts in French in which word and syllable boundaries do not align have led to the prediction that such circumstances would entail heightened processing costs for native French speakers when trying to parse the speech stream, contrary to fact. In a set of three cross-modal priming and word monitoring tasks, Gaskell et al. (2002) sought to determine whether or not resyllabification indeed causes processing difficulties for native French speakers. Thirty-nine native speakers of French completed a word-monitoring task and a cross-modal task. The experimental stimuli were sentences containing a liaison (e.g., *un généreux*

Italien 'a generous Italian'), an *enchaînement* (e.g., *un virtuose italien* 'a Italian virtuoso'), or a syllable-aligned condition without a pivotal consonant (e.g., *un chapeau italien* 'an Italian hat). In each trial of the word-monitoring task, the participants saw a target word (e.g., "italien"), heard a stimulus (e.g., *un généreux Italien*), and pressed a button if they heard the target word in the stimulus; if the target word was not present, they did not take any action. In each trial of the cross-modal task, the participants heard a stimulus (e.g., *un généreux Italien*), saw the target word (e.g., *italien*), and decided whether the target word was a real French word. In this paradigm, the filler items included nonsense words. These conditions were compared to a control condition in which the target was a consonant-initial word.

Surprisingly, faster recognition times were found for the target words preceded by liaison and *enchaînement* consonants than for the syllable-aligned targets. This finding suggests that syllable misalignment may actually facilitate speech processing in French. To explain these results, Gaskell et al. indicated that both lexical and acoustic information may be used to recognize vowel-initial words in syllable-misaligned contexts. For example, in the *enchaînement* condition above, the word *virtuose* will be recognized by listeners before the final consonant is heard, which means that the final /z/ is immediately recognized as word-final instead of word-initial, thereby facilitating the recognition of the following word as being vowel-initial. This is a much more viable strategy for *enchaînement* conditions than for liaison conditions in which the final consonant is not always pronounced and therefore does not provide as good of a cue to the end of a word. Gaskell et al. further suggest that acoustic differences between resyllabified consonants and word-initial consonants may help French listeners recognize liaison-initial words. Surprisingly, there even seems to be an advantage for the misaligned conditions in the recognition of a vowel-initial word. This may be due to both

lexical and acoustic cues as discussed above, but the absence of pivotal consonants may also slow participants' reactions due to the more gradual transition between two vowels than between a consonant and a vowel.

Similarly, Spinelli et al. (2003) investigated how Francophone listeners identify vowel-initial words that occur in the context of liaison. Native speakers of French completed a cross-modal priming lexical decision task in which they were presented with ambiguous stimuli such as *le dernier oignon* 'the last onion' and *le dernier rognon* 'the last kidney,' which are phonemically ambiguous but can be distinguished with acoustic-phonetic information, and unambiguous stimuli such as *le demi oignon* 'the half-onion' and *le demi rognon* 'the half-kidney,' which are not phonemically ambiguous. The results showed that vowel-initial words such as *oignon* were activated in unambiguous sentences if the speaker that produced the sentence intended the liaison context (e.g., *le demi oignon*), but not in cases when the speaker intended to produce the consonant-initial word (e.g., *le demi rognon*). The results also showed that the activation of consonant-initial words is weaker, but not entirely blocked, when a speaker intends to produce a vowel-initial word in an ambiguous sentence (e.g., *le dernier oignon*). This means that although speakers have ways of signaling their intended words, this information does not suffice in ruling out unintended words for the listener. However, in both contexts, it was the target word and not the competitor that had the greater activation. This indicates that acoustic cues can therefore facilitate the recognition of the target word. The speech recognition system can use these acoustic differences in continuous speech in order to determine relative activations for competing vowel-initial and consonant-initial words. Spinelli et al. concludes that there is enough of a difference in the acoustic properties between liaison

and non-liaison contexts that misaligned vowel-initial words are activated in liaison contexts, but lexical ambiguities caused by liaison still remain.

Overall, we have seen that the perception of liaison consonants is more difficult than the perception of analogous word-initial consonants. Yet, syllable misalignment does not adversely affect the speech comprehension abilities of native speakers. This leads to the conclusion that resyllabified words are not necessarily more difficult to process. Explanations for this phenomenon include access by the listeners to both acoustic and lexical information present in the speech signal, which may help them to distinguish among liaison and word-initial contexts. Let us now turn to the treatment of liaison by L2 learners of French and see whether the same factors influence their production and perception of these consonants.

3.2 Non-Native French Speakers

Adult L2 learners of French are faced with a unique learning problem: they first learn the spelling of words, and then must learn the appropriate grapheme-sound correspondences; subsequently, they must navigate the misalignment of liaison consonants in the speech signal, but not in the spelling. Transfer from the native language (e.g., English, in which there is no phonological resyllabification across word boundaries) can further complicate L2 learners' target-like production and perception of liaison-initial words. Surprisingly, as of 2004, "no study ha[d] yet described a range of linguistic variables (phonologic [sic], syntactic and/or semantic), sociolinguistic and discourse features" in the process of liaison acquisition in L2 French (Thomas, 2004, p. 365).

This study by Thomas is, in fact, one of the first studies to investigate the effects of exposure to native input on the acquisition of French phonology, including liaison consonants,

by Anglophone learners. The purpose of this study was to analyze the differences in usage of three morphophonemic variables (liaison, schwa, and the negative particle *ne*) by students who had and had not spent time immersed in a Francophone environment. The participants were Canadian students in Ontario who had spent one academic year in France (experimental group), and Canadian students also in Ontario who had not been immersed in a French-speaking environment (control group). According to Thomas, all of the participants were third-year students with at least 4 semesters of formal study in French. The learners were compared to the native French speakers from Paris in Ågren's (1973) study on liaison. Thomas's results are shown in Table 1.

Table 1. "Maintenance of optional and forbidden liaisons in FL1 and FL2" (adapted from Thomas, 2004, pp. 369-370)

Category		Ågren (L1)		Thomas (L2)	
		N	%	N	%
Obligatory		2667	97	7395	91
Optional	*est*	2569	97	1297	66
	sont	279	86	164	51
	suis	139	47	211	73
	était	364	75	104	6
	ont	381	75	27	30
Forbidden				9	

As far as obligatory contexts are concerned, the results show that the learners who had been immersed in a French-speaking environment produced 91% of all liaisons, compared to the 97% produced by Parisians. Yet, Thomas reports that these same participants encountered difficulties in producing the appropriate liaison consonant when it differed from the written grapheme (e.g., *grand* in *grand ami* 'great friend,' which contains the grapheme *d* but is pronounced as [t] in liaison contexts). This suggests that these Anglophone learners of French knew when to produce a liaison consonant, but were greatly influenced in their choice of consonant by orthography. The results also indicate that these Anglophone speakers produced fewer optional liaisons than Parisians. Thomas suggests that when "faced with the daunting task of acquiring the complex set of linguistic and sociolinguistic constraints of optional liaisons, they [the L2 learners] simply choose the easier and more natural solution, i.e. the absence of liaison" (p. 370). Interestingly, the word *suis* shows the opposite pattern with non-native speakers producing a greater percentage of liaison that native speakers. The overall higher frequency of /z/ (Durand & Lyche, 2008) may be responsible for these results. Additionally, within a classroom context in which learners are often encouraged to talk about themselves, there may be more overall exposure to *suis* + vowel constructions (I will return to these potential explanations in Study 1). Finally, the results show that L2 learners made more mistakes than native speakers when it comes to the syntactic contexts in which liaisons are forbidden.

While revealing, Thomas's study did not consider the target liaison consonant, the words between which the students produced liaison, or the effect of the length of Word 1 on production. Overall, it only shows that there exist differences between native and non-native

liaison productions in French, without trying to find the causative factors. Study 1, an extension of Garrison (2008), attempts to identify these factors.

Research on the perception of liaison by L2 learners is also rather scarce. Working with native Swedish speakers learning French as a foreign language, Strifeldt (2003) conducted a listening task in which participants were asked to write down French sentences they heard that contained either a vowel-initial or a consonant-initial nonsense word preceded by a word that could elicit a liaison with /z/, /t/, /n/, or /ʁ/. The test items were as follows (Strifeldt, 2003, p. 170):

/n/: *un avas - un navas* [œ̃navas] (*un* 'a/an/one')

/z/: *des avas - des zavas* [dezavas] (*des* 'some')

/ʁ/ : *un premier uveur - un premier ruveur* [œ̃pχəmjeʁyvœːʁ] (*un premier* 'a first')

/t/ : *un petit uveur - un petit tuveur* [œ̃pətityvœːʁ] (*un petit* 'a small/short')

Strifeldt found that for all contexts, the L2 learners of French had a clear preference for a vowel-initial (i.e., liaison) interpretation when the stimuli contained either a vowel-initial or a consonant-initial word. This was not the case for /t/, however: when the stimuli contained a vowel-initial word, the L2 learners interpreted it as such only 60% of the time; yet, when the stimuli contained a /t/-initial word, the listeners performed at chance. The results of Strifeldt's study also demonstrate the inability of Swedish L2 learners of French to distinguish between minimally contrasting liaison and non-liaison contexts except in specific cases involving /t/. Yet, there was no control group of native French speakers in this study, so it remains unclear as to whether native speakers are able to make this distinction. Another limitation of this study is

that, by using content words such as *premier* and *petit* and function words such as *un*, *des*, *mon*, and *ses*, there was no control for the syntactic category of word 1, which may differ in the frequency of student exposure to sequences, with function words eliciting more frequent liaisons than content words in the classroom. The present Study 2 remedies these limitations by controlling for the lexical category of Word 1 in the liaison-eliciting word pairs.

As shown in this section, very few studies have investigated the production and perception of liaisons, and thus many questions have yet to be answered. As far as production is concerned, little is known about the morphosyntactic, phonemic, and prosodic generalizations that L2 learners have made for optional liaison. This is precisely what Study 1 investigates.

CHAPTER 4: STUDY 1

4.1 Research Questions

The purpose of this study is to investigate the generalizations that exist within the developmental systems of non-native speakers of French. In order to do so, the morphosyntactic, phonemic, and prosodic contexts in which L2 learners produce optional liaison are examined. Unlike rule-governed obligatory liaison, optional liaison allows us to investigate the relative contributions of each of the above factors to the generalizations that L2 learners have made with respect to liaison. This information may reveal developmental patterns in the acquisition of this knowledge in L2 learners and, as such, will aid in the teaching of pronunciation to non-native speakers at the university of level. The three variables examined by this experiment are as follow:

i. At the morphosyntactic level: type of words

Will the Anglophone learners of French produce optional liaison consonants more often between a noun and its following adjective than between a conjugated verb and its following infinitive? Recall that despite recent evidence that liaison no longer occurs between a singular noun and its adjective in spontaneous speech (Durand & Lyche, 2008), it has been demonstrated that such liaison does indeed occur in read speech (Boula de Mareüil et al., 2003). However, these observations only apply to native speakers of French and have not yet been attested in the L2 population. Therefore, a read speech task can still be expected to elicit liaisons between both singular and plural nouns and their adjectives by non-native French speakers and will offer evidence for comparison with verbs.

ii. At the phonemic level: type of liaison consonant

Within morphosyntactic contexts, will Anglophone learners prefer liaison with /z/ as a plural marker for nouns and as a marker of first person singular for verbs over liaison with /t/ as part of the lexical representation of nouns and as a marker of third person singular for verbs? A difference may be expected due to the heightened frequency of /z/, which might lead learners to produce it more often. If such a difference is found, verb contexts will perhaps provide more conclusive evidence for the learners' preference of one phoneme over another than noun contexts, given Durand and Lyche's (2008) recent finding that liaison is not produced between singular nouns and adjectives in spontaneous speech (although the task at hand involves read speech; cf., Boula de Mareüil et al., 2003). Alternatively, given that nouns can be marked with plural morphology in English, the learners may produce the majority of their liaisons with plural nouns.

iii. At the prosodic level: number of syllables in Word 1

Will the Anglophone learners restrict their production of optional liaison to contexts in which Word 1 (noun or verb) contains only one syllable instead of those contexts where Word 1 contains three syllables? Given that native speakers are more likely to produce liaison within a smaller prosodic domain (Encrevé, 1988), it may be predicted that Anglophone learners will produce liaisons more often after nouns or verbs of one syllable than after nouns or verbs of three syllables.

4.2 Method

4.2.1 Participants

Twenty Anglophone students at the University of Illinois at Urbana-Champaign who studied or had studied French as a foreign language (experimental group) as well as five native speakers of French (control group) participated in this study. All of the native Francophone participants in the control group came from France. In exchange for their time, each participant received $5.

Before beginning the experimental session, the participants filled out a language background questionnaire. For L2 learners, this questionnaire included questions regarding the participants' native language, age, age and context of first exposure to French, years of instruction in/on French, and months of immersion in a French-speaking environment, as well as their knowledge of other languages and the courses they have taken at the university level (see Appendix A). After the main experiment (discussed below), each participant completed a cloze (i.e., fill-in-the-blank) test of French language proficiency (see Appendix B). This particular test was found to be a valid and reliable measure of L2 learners' global morphosyntactic, lexical, and discourse competence in French (for discussion, see Tremblay and Garrison, to appear). The biographical information and cloze test scores are presented in Table 2 (for the individual results, see Appendix C). It should be noted that while the participants represented a wide range of proficiencies, the subject pool was not large enough to form groups, and so the results were collapsed but will be examined individually where appropriate.

Table 2. Participants' Biographical Information and L2 Learners' Cloze Test Scores

Group		Age	Age of First Exposure to French	Years of Instruction in/on French	Months of French Immersion	Cloze Test Scores (/45)
Non-native	M	20.6	12.0	7.1	3.6	21.4
(n = 20)	SD	1.6	3.8	3.1	4.7	6.7
	MIN	18	5	1	0	8
	MAX	24	18	13	12	31
Native	M	26.0	From birth	N/A	N/A	38.4
(n = 5)	SD	4.5	0	N/A	N/A	2.1
	MIN	22	0	N/A	N/A	35
	MAX	32	0	N/A	N/A	40

4.2.2 Materials

In order to solicit the production of optional liaisons, a text was created containing 48 pairs of words between which liaison is neither obligatory nor forbidden. These word pairs correspond to the following 8 conditions (6 pairs for each condition; see Appendix D for a complete list of the target pairs):

A. noun (1 syllable, singular) + adjective (/t/; e.g., *fait étrange* 'strange fact')

B. noun (1 syllable, plural) + adjective (/z/; e.g., *faits étranges* 'strange facts')

C. noun (3 syllables, singular) + adjective (/t/; e.g., *accident affreux* 'terrible accident')

D. noun (3 syllables, plural) + adjective (/z/; e.g., *accidents affreux* 'terrible accidents)

E. verb (1 syllable, 1st person singular) + infinitive (/z/; e.g., *sais écrire* '(I) know how to write')

F. verb (1 syllable, 3rd person singular) + infinitive (/t/; e.g., *sait écrire* '(s/he) knows how to write)

G. verb (3 syllables, 1st person singular) + infinitive (/z/; e.g., *détestais écrire* '(I) detest writing')

H. verb (3 syllables, 3rd person singular) + infinitive (/t/; e.g., *détestait écrire* '(s/he) detests writing')

The words contained in each pair were chosen according to their final consonant, the number of syllables they contain, and their grammatical class. The pairs in conditions A-D and E-H will determine if participants demonstrate a preference for optional liaison in nominal contexts or in verbal contexts (respectively). Within these two contexts, the pairs in conditions B and D will be compared with those in conditions A and C, and F and H will be compared to E and G, in order to determine if participants produce more occurrences of optional liaison as a mark of noun plurality and of first-person singular verbs (/z/) than as part of the lexical representation of singular nouns and as a mark of third-person singular verbs (/t/). Finally, the pairs of words in conditions A, C, E, and G will be compared to those in conditions B, D, F, and H in order to determine if participants restrict their production of optional liaison to smaller phonological domains (e.g., with monosyllabic words).

It is important to note the relative frequencies of the first word in the target sequences, as they can influence the production of optional liaison consonants. These frequencies,

provided in Appendix E, come from *Lexique* (New, Pallier, Ferrand, & Matos, 2001), an online French corpus in which it is possible to find both the oral and the written frequency of words (i.e., the words' lemma frequency in films and in books, respectively). While interpreting the results of this experiment, it will be useful to return to these frequency values in order to determine if they influence the L2 learners' production of liaison in these specific contexts, even though we do not know with certainty whether these frequency values apply to the French input to which the learners have been exposed (e.g., mainly in the classroom). Words of high frequency were not included in this experiment, as liaison may have become lexicalized with these words.

These sequences were incorporated into a text that tells the story of an exchange student in France. In order to facilitate the L2 learners' comprehension of the text and make their experience more authentic, the text was written in first person and both a feminine and a masculine version of the story were created and administered according to the gender of the participant (see Appendices F and G). Given that native French speakers produce a greater number of optional liaisons in formal contexts, all participant received instructions that helped simulate a formal rather than conversational reading of the text (see Appendix H)

4.2.3 Procedures

After having completed the language background questionnaire, but before being administered the cloze test, each participant read aloud the experimental text. First, the researcher read aloud the instructions in order to underline the formality of the context. These instructions indicate that the participant will be recording an oral comprehension exercise for a second-year French class. It is suggested that the reader take their time and articulate clearly

so that the text would be understood by second-year French students. The participants then received their version of the text according to gender and were recorded. The recordings were made in the Phonetics and Phonology Laboratory at the University of Illinois at Urbana-Champaign using a Grace 101 preamplifier and a Marantz PMD570 solid-state recorder.

4.2.4 Data Analysis and Predictions

The data from this experiment were analyzed using SPSS software. The within-subject variables were word class (between an adjective and noun, between two verbs), length of the first word (1 syllable, 3 syllables), and phoneme type (/z/, /t/), and the between-subject variable was group (native speakers, L2 learners). Due to the uneven number of native and non-native speaker participants, however, the between-group effects should be interpreted with caution.

It was predicted that L2 learners of French would produce overall fewer instances of optional liaison consonants than native speakers due to their unfamiliarity with the sociolinguistic factors governing their occurrence (e.g., formality of the register). For those liaison consonants that were produced, it was predicted that L2 learners would favor /z/ over /t/ liaisons, because /z/ is the most frequent liaison consonant in the input and it is linked to plurality in French. Similarly, it was predicted that learners would favor /z/ over /t/ liaisons in nominal contexts, and they would produce more liaisons in nominal than in verbal contexts, because plurality is expressed on nouns in English (i.e., native language transfer). Finally, it was predicted that the learner group has received sufficient exposure to native French input, they may demonstrate target-like knowledge of the prosodic constraints of spoken French that govern the occurrence of liaison production after words of varying syllable lengths.

4.3 Results

When the participants' productions are analyzed according to the eight liaison contexts outlined above, the percentage of liaison produced by the participants in each context (i.e., the number of liaisons they produced out of 6 possible instances of optional liaisons) reveals certain generalizations, which are organized in Tables 3 and 4 (the individual results are provided in Appendix I).

Table 3. Percentage of Possible Liaisons Produced (L2 Learners)

	1-syll. Noun /t/	1-syll. Noun /z/	3-syll. Noun /t/	3-syll. Noun /z/	1-syll. Verb /z/	1-syll. Verb /t/	3-syll. Verb /z/	3-syll. Verb /t/
M	11.7	21.7	13.3	20.0	1.7	3.3	0.0	0.0
SD	13.4	26.0	15.9	26.8	5.1	6.8	0.0	0.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAX	50.0	66.7	66.7	83.3	16.7	16.7	0.0	0.0

Table 4. Percentage of Possible Liaisons Produced (Native Speakers)

	1-syll. Noun /t/	1-syll. Noun /z/	3-syll. Noun /t/	3-syll. Noun /z/	1-syll. Verb /z/	1-syll. Verb /t/	3-syll. Verb /z/	3-syll. Verb /t/
M	5.6	36.1	2.8	16.7	11.1	16.7	2.8	0.0
SD	8.6	44.0	6.8	27.9	13.6	21.1	6.8	0.0
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MAX	16.7	100.0	16.7	66.7	33.3	50.0	16.7	0.0

Repeated-measures analyses of variance (ANOVAs) on the subject ($F1$) and item ($F2$) means, with word class (noun vs. verb), word length (one vs. three syllables), and target phoneme (/z/ vs. /t/) as within-subject factors and with group (native vs. non-native) as between-subject factor revealed significant effects of word class ($F1(1,23) = 7.34$, $p < .012$; $F2(1,10) = 38.58$, $p < .001$), word length ($F1(1,23) = 12.93$, $p < .002$; $F2(1,10) = 10.07$, $p < .01$), and phoneme ($F1(1,23) = 14.87$, $p < .001$; $F2(1,10) = 29.57$, $p < .001$), as well as significant interactions between word class and phoneme ($F1(1,23) = 15.33$, $p < .001$; $F2(1,10) = 33.99$, $p < .001$), word length and group ($F1(1,23) = 9.08$, $p < .006$; $F2(1,10) = 7.07$, $p < .024$), phoneme and group ($F1(1,23) = 4.51$, $p < .045$; $F2(1,10) = 8.98$, $p < .013$), and a significant interaction among word class, phoneme, and group ($F1(1,23) = 5.18$, $p < .032$; $F2(1,10) = 11.49$, $p < .007$). The first two-way interaction indicates that the effect of phoneme varies as a function of word class, whereas the second and third two-way interactions show that the effects of word length

and of phoneme vary as a function of the group. Finally, the three way interaction indicates that the phoneme-by-word-class interaction is not the same for both groups.

Subsequent repeated-measures ANOVAs were conducted separately on the native and non-native speakers' results. For L2 learners, these analyses revealed significant effects of word class ($F1(1,19) = 16.05$, $p < .001$; $F2(1,5) = 41.74$, $p < .001$) and phoneme in the subject analysis ($F1(1,19) = 6.59$, $p < .019$), as well as a significant interaction between word class and phoneme in the subject analysis ($F1(1,19) = 5.72$, $p < .027$). These results indicate that learners are most influenced by the syntactic environment in which a potential liaison consonant is present (between a noun and an adjective or between two verbs). They also tend to produce certain liaison consonants over others (/z/ more often than /t/), and this production tends to vary according to word class (the difference between /z/ and /t/ is greater in a noun-adjective environment than in a verb-verb environment). For native speakers, the statistical analyses revealed significant effects of word class in the item analysis ($F2(1,5) = 7.12$, $p < .045$), word length ($F1(1,4) = 7.92$, $p < .048$; $F2(1,5) = 22.23$, $p < .005$), phoneme in the item analysis ($F2(1,5) = 27.77$, $p < .003$), and an interaction between word class and phoneme in the item analysis ($F2(1,5) = 35.24$, $p < .002$). From these results, it can be seen that when native speakers are faced with the choice of producing optional liaisons, like non-native speakers, they are differentially affected by the syntactic context and liaison phoneme of Word 1, but also by the number of syllables contained in Word 1.

The consonants that the L2 learners and native speakers produced in each condition were analyzed. Table 5 presents the percentage of accurate liaison phonemes out of all liaisons (a maximum of 6 liaisons per condition) that L2 learners produced. As the native speakers' accuracy was 100% in all the conditions, their results are not included in the table.

Table 5. Percent Phoneme Accuracy (L2 Learners)

	1-syll. Noun /t/	1-syll. Noun /z/	3-syll. Noun /t/	3-syll. Noun /z/	1-syll. Verb /z/	1-syll. Verb /t/	3-syll. Verb /z/	3-syll. Verb /t/
M	92.9	7.4	93.8	22.2	100	100	N/A	N/A
SD	30.2	37.6	28.9	38.9	0	0	N/A	N/A
MIN	0	0	0	0	100	100	N/A	N/A
MAX	100	100	100	100	100	100	N/A	N/A

As can be seen from the results in nominal contexts, L2 learners vary considerably in their phoneme accuracy (evidenced in the high standard deviations), indicating that some L2 learners were much less target-like than others in the consonants they produced in optional liaison contexts. Their errors included substituting /s/, /t/, /ts/, and /d/ for /z/ in plural and first-person contexts. While the phoneme /z/ should be produced at the beginning of plural adjectives, many learners often produce a /t/ instead, with this substitution being the most frequent one in the production data. This result is important, because it shows that the learners know that a plural marker should be inserted in these plural contexts, but they are not able to choose the proper phoneme when they do so, perhaps because the /z/ of plurality is not part of their internal lexical representations, unlike the latent consonant /t/ in these words (recall that plural nominal forms also contained a latent /t/ in the lexical representation, e.g., *faits étranges* 'strange facts'). These same learners did not produce as many /t/'s in the corresponding

singular contexts (e.g., *fait étrange* 'strange fact'), which further suggests that they were in fact using /t/ as a mark of plurality.

An analysis of the target nouns also shows that there is no effect of frequency on the production of optional liaisons in this experiment, at least, as documented from the database *Lexique* (New et al., 2001). Table 6 presents the percentage of liaisons produced out of all possible instances of optional liaison for the three words that received the highest productions of liaison by native and non-native speakers.

Table 6. Liaison Frequencies Per Noun

	Singular		Plural	
	Word	**Number of Liaison**	**Word**	**Number of Liaison**
Non-Native Speakers	dent	7 (35%)	dents	3 (15%)
	fait	1 (5%)	faits	6 (30%)
	gant	3 (15%)	gants	7 (35%)
	mot	1 (5%)	mots	1 (5%)
	pont	2 (10%)	ponts	3 (15%)
	vent	0 (0%)	vents	6 (30%)
	accident	1 (5%)	accidents	2 (10%)
	argument	2 (10%)	arguments	5 (25%)
	bâtiment	0 (0%)	bâtiments	1 (5%)
	compliment	2 (10%)	compliments	4 (20%)
	intérêt	4 (20%)	intérêts	5 (25%)

Table 6. cont.

	président	7 (35%)	présidents	7 (35%)
Native Speakers	dent	0 (0%)	dents	3 (60%)
	fait	1 (17%)	faits	3 (60%)
	gant	0 (0%)	gants	2 (40%)
	mot	0 (0%)	mots	1 (20%)
	pont	0 (0%)	ponts	2 (40%)
	vent	0 (0%)	vents	2 (40%)
	accident	0 (0%)	accidents	0 (0%)
	argument	0 (0%)	arguments	1 (20%)
	bâtiment	0 (0%)	bâtiments	2 (40%)
	compliment	0 (0%)	compliments	2 (40%)
	intérêt	0 (0%)	intérêts	1 (20%)
	président	0 (0%)	présidents	0 (0%)

The nouns with the highest native speaker frequencies are *fait* 'fact,' *mot* 'word,', and *vent* 'wind' in the singular, and *mots* 'words,' *dents* 'teeth,' and *faits* 'facts' in the plural (see Appendix E). Yet, as can be seen in Table 6, with the exception of *faits*, liaison is produced more frequently with other words. Regression analyses were conducted to determine if the oral and written frequency of the above words was a significant predictor of the native and non-

native speakers' production of liaison in optional contexts. These analyses did not approach significance for either the native or the non-native speakers.

Finally, an examination of the individual results of L2 learners in Appendix I shows that the overall production of liaison does not appear to be related to the participants' proficiency level as identified by the cloze test.

It is clear from these results that the participants produced more liaisons after a noun than after a verb. Moreover, in nominal contexts, they produced more liaisons when the target noun was plural, whereas in verbal contexts, they produced more liaisons when the verb was in the 3rd person singular form. We now turn to a discussion of these results and their implications for L2 acquisition theory.

4.4 Discussion

The results of Study 1 indicate that both native and non-native speakers produced liaison more frequently between an adjective and noun than between two verbs, and they tended to produce liaison more frequently when the target phoneme was /z/ than when the target phoneme was /t/. Furthermore, the effect of phoneme was larger in adjective-noun sequences than in verb-verb sequences, with the participants producing more liaisons in plural contexts than in singular ones. The learners' greater production of liaison in plural nominal contexts is perhaps an effect of transfer from their native language, in which plural nouns are marked by a plural morpheme. This would mean that in the context of liaison, morphological transfer from the native language can in fact help learners acquire L2 phonology—in this case the rule system that governs optional liaison. The learners' results are also consistent with

Durand and Lyche's (2008) observation that liaison is typically not produced in singular adjective-noun contexts.

Yet, the two groups of participants differed in that only the native speakers showed a prosodic effect: the number of syllables in the first word had an effect on the native speaker group but not on the learner group. For native speakers, then, while the effect of phoneme appears to be the most important factor in liaison production, another constraint on their production of liaison lies in the segmentation of sentences into smaller prosodic domains, with liaison typically occurring within but not across the boundaries of such domains. These findings thus indicate that the L2 learners of French have not yet learned the prosodic constraints on liaison production.

The results also show that only the L2 learners made phonemic mistakes in their productions of liaison. For example, they often produced the pair *faits étranges* 'strange facts' with a /t/ liaison. It therefore seems that the learners have acquired some plural mark in their mental grammar of French, but because of the consistent presence of the phoneme /t/ in the orthography and thus in the lexical representations of these words, they produce /t/ as this plural marker. Recall that the learners did not produce as many liaisons with singular nouns (e.g., *fait étrange*), indicating that the production of liaison is in fact tied to the plural morphology of the noun. Several other studies have found that L2 learners have difficulty in producing morphemes marking agreement (for example, Lardiere, 1998, and White, 2000). The above results may confirm this tendency, as the learners produce the consonant that is part of their pre-existing lexical representation (/t/) rather than inserting the proper plural morpheme (/z/). It appears that the learner's inner competence is aware of the need to produce liaison in a plural context while their productive output still struggles with the phoneme choice.

Finally, the results indicate that the relative frequency of individual words containing the liaison consonant, at least as documented on the basis of native French input (New et al., 2001), and proficiency in French do not in themselves explain the overall number of liaison produced. It becomes apparent that the type of liaison consonant produced and the morphosyntactic context in which it is produced are the most determining factors for these L2 learners. Let us now turn to an investigation of the ability of L2 learners of French to disambiguate optional liaison consonants from their word-initial counterparts in a perceptual task.

CHAPTER 5: STUDY 2

5.1 Research Question

As discussed in Chapter 2, the syllable plays an important role in the parsing of the continuous speech stream in languages such as English, French, and Dutch. However, although the syllable is a strong cue to word onsets, there are instances in which word onsets do not match syllable boundaries—these include both *enchaînement* and liaison contexts. This would then predict a processing cost and delayed recognition for the perception of syllable-misaligned words in French (Spinelli et al., 2003). However, to date, there is no evidence that this misalignment in any way causes difficulties for native French speakers in these conditions. It has been proposed that this is because both lexical and acoustic information may be used to facilitate the recognition of vowel-initial words in syllable misaligned contexts. Recall that in liaison contexts, where a normally latent word-final consonant is realized as the onset of a following vowel-initial word, this acoustic information includes a durational difference of 15% between liaison consonants and their longer word-initial counterparts.

This experiment investigates whether non-native speakers of French can make use of such durational differences to distinguish the liaison consonants from their word-initial counterparts. Because resyllabification is not phonological in English, strong acoustic-phonetic cues tend to signal word boundaries. Therefore, if English learners of French are sensitive to these cues in their native languages, they may be able to transfer the use of these cues in French and distinguish liaison-initial words from consonant-initial ones. However, since French liaison is a phonological process, such acoustic cues may in fact be more subtle in French, and thus English speakers may react differently to them. This study will determine which of these two scenarios is correct, and whether L2 learners' ability varies as a function of

the pivotal consonant—namely /n/, /z/, /ʀ/. These consonants, which differ from those investigated in Study 1, were chosen due to the variety of acoustic cues that exist for each in intervocalic and liaison contexts—namely duration for /z/; duration and nasalization of the preceding vowel for /n/; and duration and place of articulation for /ʀ/.

5.2 Method

5.2.1 Participants

Anglophone learners of L2 French and native speakers of French recruited from the University of Illinois participated in this second study. Biographical and proficiency information was collected from each participant through the completion of the same language background questionnaire and cloze test as in Study 1 (see Appendices A and B). Each participant also received $5 for their cooperation. Their biographical data are shown in Table 7 (for the individual results, see Appendix J). Note that two native speakers and five non-native speakers completed both Study 1 and Study 2.

Table 7. Participants' Biographical Information and L2 Learners' Cloze Test Scores

Group		Age	Age of First Exposure to French	Years of Instruction in/on French	Months of French Immersion	Cloze Test Scores (/45)
Non-native (n = 13)	M	20.5	11.8	6.7	2.1	20.9
	SD	1.6	4.5	3.3	3.6	6.5
	MIN	18	7	1	0	11
	MAX	24	18	11	10	28
Native (n = 5)	M	24.2	From birth	N/A	N/A	37.2
	SD	5.0	0	N/A	N/A	3.0
	MIN	19	0	N/A	N/A	33
	MAX	32	0	N/A	N/A	40

5.2.2 Materials

The participants heard sentences that included an adjective + noun sequence, and all nouns in both the target and non-target utterances were nonsense words. The experiment included the following conditions:

A. /z/ word-initial (e.g., *Nous avons perdu le coûteux zappème dans l'aéroport* 'we lost the expensive *zappème* in the airport')

B. /z/ liaison (e.g., *Il a entendu le fâcheux appème pendant la réunion* 'he heard the annoying *appème* during the meeting')

C. /n/ word-initial (e.g., *Ils ont réparé l'ancien ninvèle sans aucun frais* 'they repaired the old *ninvèle* without any charge')

D. /n/ liaison (e.g., *Elles ont retrouvé l'ancien invèle dans les décombres* 'they found the old *invèle* in the rubble')

E. /ʀ/ word-initial (e.g., *Nous avons préparé le dernier rémine dans la cuisine* 'we prepared the last *rémine* in the kitchen')

F. /ʀ/ liaison (e.g., *Il a dessiné le dernier émine pendant l'après midi* 'he drew the last *émine* during the afternoon')

These nonsense words were generated by the *Lexique Toolbox* (New et al., 2001). Some of the nonsense words involving the pivotal consonant in /z/ came from Tremblay (2009, to appear), in which case they had previously been normed by a native French speaker to ensure that they are plausible masculine singular nouns that are not overly phonologically similar to actual French words (see Appendix K for the complete list of experimental items). Nonsense words were chosen in order to neutralize the confounding factors of lexical frequency, collocation frequency, and lexical knowledge on the part of the individual participants. Each experimental condition (i.e. liaison and word-onset /z/, /n/, /ʀ/) included 28 nonsense words and thus 28 sentences per experimental condition, for a total of 84 experimental sentences and 168 filler items. Half of the target nonsense words were vowel-initial so as to elicit liaison with their preceding adjectives. The other half of the target words were consonant-initial beginning with the same consonants as the target liaison consonants. The two words were identical except in that the consonant-initial word began with the same consonant as the potential liaison consonant that would be elicited by the vowel-initial word and the preceding adjective. The

participants heard the same nonsense words in both liaison and onset context, but these words were embedded in different sentences.

The filler/distracter sentences were similar to the target sentences, in that they also contained nonsense words preceded by an adjective. However, none of the filler sentences included liaison contexts. These sentences masked the true purpose of the experiment, leading the participants to believe that they took part in a nonsense-word-identification task instead of a task focusing on disambiguation in potential liaison contexts.

A female native speaker of French from France recorded the sentences in a sound-proofed booth. The clearest repetition containing a liaison consonant and in which the prosody was continuous and neutral was chosen for the experimental items, and excessive pauses were manually excised from the recordings. If the speaker failed to produce a liaison consonant, she was explicitly asked to do so.

Acoustic analyses of the stimuli were performed in PRAAT (Boersma & Weenink, 2007). For each of the conditions, the duration of the pivotal consonant was measured. The results of these acoustic analyses are provided in Table 8.

Table 8. Duration of the Pivotal Consonant in the Stimuli

	word-initial /z/	liaison /z/	word-initial /n/	liaison /n/	word-initial /ʁ/	liaison /ʁ/
M	131.97	85.09	89.64	68.25	97.82	59.30
SD	46.69	21.02	28.98	13.44	29.42	15.94
MIN	79.57	44.98	69.16	35.69	67.40	34.52
MAX	198.88	125.43	170.71	85.18	148.84	88.26

The differences between liaison and word-onset consonants in this study appear larger than what has thus far been reported in the literature. As can be seen from Table 8, liaison /z/ is 36% shorter than word-onset /z/; liaison /n/ is 24% shorter than word-onset /n/; and liaison /ʁ/ is 39% shorter than word-onset /ʁ/. One-way ANOVAs with onset type (liaison, word-initial) as between-item variable reveals significant effects of onset for /z/ ($F(1,26) = 11.734$, $p < .002$), /n/ ($F(1,26) = 6.28$, $p < .019$), and /ʁ/ ($F(1,26) = 18.56$, $p < .001$). The stimuli therefore contained acoustic information, minimally the duration of the pivotal consonant, that could potentially disambiguate between vowel-initial words in the context of liaison and consonant-initial words, and this durational difference was largest for /z/ and /ʁ/ and smallest for /n/.

5.2.3 Procedures

After filling out the language background questionnaire but before completing the cloze test, the participants completed the perception experiment. The experiment was administered with the E-Prime software. In each trial, the participants saw two words on a computer screen

(a vowel-initial and a consonant-initial nonsense word, e.g., *ingaut/zingaut, apanne/napanne, anore/ranore*) and heard the auditory stimulus over headphones, which contained one of the two nonsense words. Filler items were identical in procedure to the target items, but contained nonsense words in unambiguous context that differed in one or more letter (e.g., *borin/bordin; lamor/ramor; gartif/gartaf*). All target words were plausible masculine singular nouns in direct object position. The participant selected the word they heard by pressing the corresponding key on the keyboard. They were instructed to respond as quickly as possible, without waiting for the end of the sentence. There was only one pseudo-randomized list of stimuli such that the sentences containing target words did not occur too closely together, and all participants heard all items. Both reaction times (measured from the onset of the target consonant) and accuracy rates were collected.

5.2.4 Data Analysis and Predictions

No outliers were excluded in the reaction times, but one item was excluded due to the fact that the screen display was not consistent with the spoken prompt. The statistical analyses were performed using SPSS software. The consonant (/z/, /n/, /ʀ/) and onset type (liaison, word onset) were the two within-subject variables, and group (native speakers, L2 learners) was the between-subject variable. Since the three levels of the consonant variable are not on a continuous scale, only the significant linear interactions will be presented in the results.

It was predicted that English learners of French would either: (i) be able to transfer their knowledge of acoustic-phonetic cues from English to French and use this information to segment vowel-initial words in liaison context; (ii.) not be sensitive to these cues in French because resyllabification in French is a phonological process that may make these cues more

subtle; or (iii) "over-hear" liaison, just as they did in Stridfelt (2003), as a result of its frequent occurrence in French, and thus interpret more words as being vowel-initial rather than consonant-initial.

5.3 Results

Tables 9 and 10 present the L2 learners' and native speakers' percentage of perceived consonant-initial words for each of the conditions.

Table 9. Percent Perceived Consonant-Initial Words (L2 Learners)

L2	word-initial /z/	liaison /z/	word-initial /n/	liaison /n/	word-initial /ʁ/	liaison /ʁ/
M	57.7	35.1	50.0	34.6	65.5	22.0
SD	17.1	22.7	26.4	28.1	27.7	16.5
MIN	42.86	7.14	14.29	0	7.14	0
MAX	92.86	85.71	92.86	100	100	57.14

Table 10. Percent Perceived Consonant-Initial Words (Native Speakers)

L1	word-initial /z/	liaison /z/	word-initial /n/	liaison /n/	word-initial /ʁ/	liaison /ʁ/
M	76.2	60.7	84.5	82.1	54.8	14.3
SD	22.4	29.2	21.4	15.1	17.3	4.5

Table 10. cont.

MIN	42.86	21.43	57.14	53.85	35.71	7.14
MAX	100	92.86	100	92.31	78.57	21.43

By-subject ($F1$) and by-item ($F2$) repeated-measures ANOVAs conducted on the percent perceived consonant-initial words revealed significant effects of onset type ($F1(1,16) = 73.2$, $p < .001$; $F2(1,26) = 49.36$, $p < .001$), and consonant ($F1(2,15) = 22.89$, $p < 0.001$; $F2(2,25) = 24.39$, $p < .001$), and a significant interaction between onset type and consonant ($F1(2,15) = 10.52$, $p < 0.001$; $F2(2,25) = 14.88$, $p < .001$), indicating that the effect of onset type varies as a function of the pivotal consonant. The analyses also revealed a significant effect of group in the item analysis ($F2(1,26) = 21.018$, $p < .001$) and a significant interaction between consonant and group ($F1(2,15) = 16.68$, $p < .001$; $F2(2,15) = 12.69$, $p < .001$), suggesting that the two language groups differed in their perception of consonant-initial words as a function of the pivotal consonant. Paired-samples t-tests were therefore conducted on each of the consonant conditions separately for L2 learners and native speakers, and the alpha level was adjusted with Bonferroni correction (3 comparisons, $\alpha = .017$). For L2 learners, the t-tests revealed significant effects of onset type for /z/ ($t1(11) = 4.13$, $p < .002$; $t2(13) = 2.76$, $p < .016$), /ʀ/ ($t1(11) = 8.30$, $p < .001$; $t2(13) = 8.33$, $p < .001$), and /n/ in the subject analysis ($t1(11) = 3.20$, $p < .008$). For native speakers, the t-tests revealed a significant effect of onset only for /ʀ/ ($t1(5) = 5.22$, $p < .003$; $t2(13) = 4.86$, $p < .001$).

These results indicate that although the L2 learners perform near chance on consonant-initial words, their performance is above chance on vowel-initial words in liaison contexts, and they differentiate between vowel- and consonant-initial words for all three consonants. By

contrast, native speakers tend to perceive the nonsense words as consonant-initial, and they show an effect of onset only for /ʁ/ conditions.

Tables 11 and 12 report the participants' reaction times for each of the consonant conditions.

Table 11. Reaction Times in Milliseconds (L2 Learners)

	word-initial /z/	liaison /z/	word-initial /n/	liaison /n/	word-initial /ʁ/	liaison /ʁ/
M	1391	1603	1611	1693	1502	1398
SD	371	524	416	595	641	585
MIN	894	938	1036	1043	704	762
MAX	2144	2527	2332	2952	2949	2450

Table 12. Reaction Times in Milliseconds (Native Speakers)

	word-initial /z/	liaison /z/	word-initial /n/	liaison /n/	word-initial /ʁ/	liaison /ʁ/
M	1549	1625	1738	1611	1698	1538
SD	318	400	593	763	499	568
MIN	1098	1143	1085	738	1041	974
MAX	1932	2039	2694	2769	2342	2505

Similar by-subject and by-item repeated-measures ANOVAs were conducted on the participants' reaction times. They revealed only a significant interaction between onset and consonant ($F1(2,15) = 5.561$, $p < 0.016$; $F2(2,25) = 3.436$, $p < .046$), indicating that the effect of onset was not the same for all the consonants. However, subsequent *t*-tests conducted on each of the consonants, using the Bonferroni-corrected alpha level ($\alpha = .017$), do not reveal a significant effect of onset in any of the consonant conditions. These results suggest that the pivotal consonant may have some effect on the speed with which the participants recognize liaison- and consonant-initial words.

5.4. Discussion

The above results showed that although learners perform near chance in the consonant-initial conditions, their performance is above chance in the liaison-initial conditions, as evidenced by the fact that fewer of these tokens are perceived as consonant-initial. This holds true for all three consonant conditions. This suggests that L2 learners are aware of liaison in French and even over-anticipate such contexts while listening to words in phonemically ambiguous contexts. These results are thus similar to those reported by Stridfeldt (2003), in that both studies found that for /n/, /z/, and /ʀ/ conditions, non-words tended to be perceived as vowel-initial regardless of the actual word onset. These learners also appear to be sensitive to the acoustic-phonetic cues present in the stimuli, minimally the shorter duration of liaison consonants relative to word-onset ones, as they differentiate between liaison- and consonant-initial conditions.

Conversely, native speakers of French show an overall word-initial interpretation of the stimuli and do not distinguish between the two word types when the pivotal consonant is /z/ or

/n/. However, for the /ʁ/ conditions, they demonstrate the ability to perceive the two word types differently, as they perform above chance on both vowel- and consonant-initial words. This may be explained by the fact that, combined with the acoustic differences present in duration, /ʁ/ perhaps undergoes an alteration in its manner of articulation (trill vs. fricative) depending on its syllable-initial or syllable-final state (respectively), and that this difference is articulated by the speaker when producing the sequences and therefore present in the stimuli used in this experiment (for discussion, see Fagyal, Kibbee, & Jenkins, 2006). In other words, native speakers of French may be more sensitive to this articulatory difference than to the durational one. The fact that both groups showed a tendency to recognize vowel-initial words more rapidly than consonant-initial words in ambiguous contexts when the pivotal consonant was /ʁ/ suggests that the articulatory difference also helps these second language learners and results in earlier recognition of vowel-initial words.

One might then wonder why native speakers would perform more poorly than L2 learners for distinguishing liaison-initial words from consonant-initial words in ambiguous contexts containing /z/ and /n/. It may be that in order to compensate for the misalignment of the syllable and word boundaries that liaison creates, L2 learners tend to rely on the acoustic-phonetic information present in the speech stream to detect liaison consonants in French. This parsing method may be transferred from English, which has several acoustic-phonetic cues that signal word-initial boundaries (e.g., aspiration; for a review, see Altenberg, 2005). The finding that native speakers are not as reliant on this fine-grained acoustic-phonetic information when making their interpretation perhaps suggests that they are simply used to recognizing misaligned words and do not experience any parsing or processing difficulties from it, irrespective of the durational cues in the signal. Overall, we see that while learners of French

behave differently from native speakers, they demonstrate a surprising perceptual sensitivity to the acoustic information in their linguistic environment. These findings, combined with those in Study 1, enrich our portrait of the acquisition of French phonology by speakers of English. How this new knowledge adds to our understanding of the competencies involved in adult second language acquisition as well as its application to a classroom setting will be discussed next.

CHAPTER 6: CONCLUSION

Overall, this study has attempted to delve deeper into the linguistic competence of L2 learners of French as far as their productive and perceptive abilities for the phenomenon of liaison. This is, as yet, a little-explored area of research that promises to provide much information about the ways in which second language acquisition is constrained, including the acquisition of phonology in the target language and differences between production and perception.

Study 1 investigated whether the production of liaison consonants in optional contexts would be influenced by morphosyntactic, phonemic, and prosodic factors. The results of a narrative production task demonstrated that both the morphosyntactic and phonemic contexts (namely the word type and liaison consonant) affect L2 productions. Learners produced more liaisons after nouns than after verbs, and within the noun conditions, they produced more liaisons with /z/ than with /t/, thereby demonstrating an overall preference for using /z/ as a marker of plurality instead of person.

Often, participants replaced /z/ by /t/ in contexts containing plural nouns ending orthographically with *–ts* such as *les presidents* (the presidents), indicating that learners may rely on the consonant that they treat as part of the word's lexical representation (due to its presence in the orthography) rather than on the plural morpheme. Unlike native speakers, L2 learners did not appear to be affected by prosodic factors, as they did not show sensitivity to word length when producing optional liaisons, a finding that is likely due to their lack of internalized prosodic generalizations relating to liaison production in optional contexts.

In light of the surprising observation that non-native speakers of French sometimes produce an incorrect liaison consonant, a question that remains to be investigated in future

research is whether L2 learners produce the liaison and plural morpheme /z/ with words that do not contain a /t/ or any word-final consonant in their lexical representation. Given the findings of the present study, French phonetics courses taught at the post-secondary level should identify the aspects of liaison rules and conventions, and the orthographic-phonemic correspondences with which L2 learners of French struggle and provide additional explicit instruction. For example, instructors should focus on teaching students about inflectional morphology and the realization of the plural morpheme /z/ in liaison contexts. Providing students with ample opportunity to hear and produce these consonants after first encountering /z/ as an inflectional morpheme might help remedy such pronunciation errors. Additionally, instructors should focus on the prosodic domains in which liaison consonants are more likely to be produced in optional contexts (e.g., after monosyllabic words).

On the other hand, Study 2 investigated whether non-native speakers demonstrate perception preferences and/or make use of durational acoustic differences of /n/, /z/, and /ʀ/ in order to distinguish liaison contexts from consonant-initial words. The general answer as shown by the results is that they do, but there are some additional qualifications. The group of L2 participants in this study showed a liaison-initial interpretation preference in /n, /z/, and /ʀ/ contexts, which indicates that these L2 learners of French are well aware that liaison is a common phonological process in French and perceive phonemically ambiguous French words accordingly. As the target items in this experiment did not always have aligned syllable and word boundaries, and liaison consonants are linked to the onset of a following syllable by the process of *enchaînement*, learners over-hear liaison consonants as part of their normal learning process and use this internalized knowledge to segment both aligned and mis-aligned words.

Given these results, one might think that pedagogical treatment might be necessary to correct L2 learners' bias for perceiving words as liaison-initial. However, it is also possible that these same learners will eventually no longer over-hear liaison as their proficiency in French increases, in which case treatment would not be necessary. Further research should determine whether this is indeed what happens. As for their perception of acoustic-phonetic cues, it may be ludicrous to try to train learners to "hear" differences between liaison- and consonant-initial words, first because these learners already seem to do this (at least, to some extent) given their skills in their native language, and second because native French speakers do not appear to use such cues to distinguish liaison-initial words from consonant-initial ones. L2 learners' use of acoustic-phonetic cues does not eliminate their tendency to over-hear liaison, however. Providing pedagogical treatment could potentially help them use the speech signal more efficiently and reduce their bias for hearing liaison-initial words in the input, although it is not clear at this point whether this apparent over-generalization is a coping mechanism that beginning learners need to use in order to segment French speech into words and recognize them successfully. The learner tendencies observed in these experiments raise important questions, and research addressing these questions could potentially help develop an integrated curriculum in which instructors can explicitly address phonological learning and areas of difficulty.

Although these two studies are certainly not the flip-sides of the same experimental paradigm, they are complementary in their tasks and in their goals. In the first study, we find that learners and native speakers differ in their production quite markedly not only in the sheer quantity of liaison produced, but also in the nature of the consonants produced. However, once we begin to examine the receptive abilities of the two learner groups, it becomes obvious that

neither group has complete ability to differentiate liaisons from their word-initial counterparts, and that the two groups are employing different strategies to cope with this ambiguity. Despite these differences, both studies do show influence of English as the learners' native language. In the production study, this was evidenced by the learners' attempting to produce plural morphology as in English, whereas in the perception study, the influence of native language transfer manifested itself in the learners' sensitivity to acoustic-phonetic information, which is most likely due to the important role that this information carries for segmentation purposes in English. This idea of transfer affecting language learning is indeed well attested in the field of L2 speech perception and production (Flege, 1995).

Yet, both studies demonstrate that learners are aware that liaison is a common phenomenon in French and that they are internalizing this process even if their productive and perceptive capabilities differ from native speakers'. Both studies thus show that students process the input received in the classroom context and implicitly build their phonological rules for production from it, but that they tend to focus more on syntactic than prosodic information in production, and they over-apply their learning of liaison in perception. Further research in this field will bring to light what developmental stages Anglophone learners of French experience as they solidify their internalized phonological rules and as they refine their use of perceptual cues in order to cope with ambiguous contexts containing true or potential liaison consonants.

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APPENDIX A:

LANGUAGE BACKGROUND QUESTIONNAIRE

A. General Information

1. Participant #: _____
2. Gender: F [ ] M [ ]
3. Age: _____
4. Do you have any vision or hearing problems? _____
5. University Level: Undergraduate [ ] Graduate [ ]
6. Major: _____

B. Language Background

1. Mother tongue: _____
2. Mother's dominant language: _____
3. Father's dominant language: _____
4. Language(s) spoken at home as a child: _____
5. Language(s) you spoke during the first five years of your life: _____
6. Language(s) of instruction in elementary school:_____ in high school:_____
7. Language(s) studied:

   Second language: _____

   Level of proficiency: Beginner [ ] Intermediate [ ] Advanced [ ] Near-native [ ]

   Third language: _____

   Level of proficiency: Beginner [ ] Intermediate [ ] Advanced [ ] Near-native [ ]

   Fourth language: _____

   Level of proficiency: Beginner [ ] Intermediate [ ] Advanced [ ] Near-native [ ]

Fifth language: _____

Level of proficiency: Beginner [ ] Intermediate [ ] Advanced [ ] Near-native [ ]

8. Daily use of French and other languages:

   At Home: _____ % use: _____

   At School: _____ % use: _____

   At Work: _____ % use: _____

9. What language do you feel most comfortable with at this time? _____

C. Knowledge of French

1. Age of first exposure to French: _____
2. Context of first exposure to French: At school [ ] Outside school [ ] Both [ ]
3. Total number of years of instruction on/in French: _____
4. List the specific course(s) you have taken on/in French (code + name) and year taken: ____

   _____

   _____

5. List the specific course(s) you are currently taking on/in French (code + name): ___

   _____

6. Age of first immersion in a French environment (write N/A if not applicable): _____
7. Total duration of immersion in a French environment (write N/A if not applicable): _

APPENDIX B: CLOZE TEST

DIRECTIVES

1. Lisez le passage au complet pour avoir une idée du sens du texte.

2. Écrivez le mot qui correspond à chaque espace blanc. ATTENTION : il n'y a qu'un mot par espace blanc.

EXEMPLE: Il est tombé mais ne s'est pas ***fait*** mal.

_____

"Le taux de CO2 dans l'atmosphère augmente plus vite que prévu"

La croissance économique mondiale _(1)___ provoqué un accroissement de _(2)___ teneur en dioxyde de _(3)___ (CO2) dans l'atmosphère beaucoup _(4)___ rapidement que prévu, selon une étude _(5)___ lundi dans les comptes rendus de l'Académie _(6)___ des sciences des États-Unis. Cette étude _(7)___ que la concentration des émissions _(8)___ gaz carbonique dans l'atmosphère a _(9)___ de 35 % en 2006, entre le début _(10)___ années 1990 et les _(11)___ 2000-2006, passant de 7 à 10 milliards de tonnes _(12)___ an, alors que le protocole de Kyoto prévoyait _(13)___ en 2012, ces émissions responsables _(14)___ réchauffement climatique devaient _(15)___ baissé de 5 % par _(16)____ à 1990. « Les améliorations dans l'intensité carbonique de l'économie _(17)____ stagnent depuis 2000, après trente _(18)____ de progrès, ce qui a provoqué cette _(19)____ inattendue de la concentration de CO2 _(20)____ l'atmosphère », indique dans _(21)____ communiqué le British Antarctic Survey, _(22)___ a participé à cette étude. _(23)___ les chercheurs, les carburants polluants _(24)___ responsables de 17 % de cette augmentation, _(25)___ que les 18 % restant sont _(26)___ à un déclin de la capacité des « puits » naturels comme _(27)___ forêts ou les océans _(28)___ absorber le gaz carbonique. « _(29)___ y a cinquante ans, pour chaque tonne de CO2 émise, 600 kg _(30)____ absorbés par les puits

naturels. _(31)____2006, seulement 550 kg par tonne ont été _(32)____, et cette quantité continue à baisser », explique _(33)__auteur principal de l'étude, Pep Canadell, du Global Carbon Project. « La baisse de l'efficacité _(34)____puits mondiaux laisse _(35)___que la stabilisation de cette _(36)___sera encore plus _(37)___à obtenir que ce que l'on pensait jusqu'à _(38)__», indique pour sa _(39)___le British Antarctic Survey.

Ces _(40)___obligent à une révision à la hausse _(41)___prévisions du Groupe intergouvernemental d'experts _(42)___l'évolution du climat qui, dans son _(43)___de février, tablait sur l'augmentation de la température _(44)___de la terre de 1,8 ˚C à 4 ˚C _(45)___ l'horizon 2100.

APPENDIX C:

LIAISON PRODUCTION AND CLOZE INFORMATION PER PARTICIPANT (STUDY 1)

Participant #	French L1/L2	Age	Age of First Exposure to French	Years of French	Months of Immersion	Cloze Score
1	L2	20	11	9.0	3.0	26
2	L2	21	8	8.0	0.3	17
4	L2	21	7	7.0	N/A	21
5	L2	22	10	12.0	12.0	26
6	L2	21	14	7.0	12.0	N/A
7	L2	21	10	9.0	5.0	31
8	L2	23	17	6.0	9.0	32
9	L2	18	10	5.0	0.5	26
10	L2	20	17	1.5	N /A	8
11	L2	21	14	7.0	N/A	20
13	L2	19	14	7.0	N/A	20
14	L2	20	14	6.5	N/A	20
15	L2	19	5	7.0	0.8	19
16	L2	22	5	13.0	12.0	31
501	L2	20	11	9.0	1.0	17
508	L2	24	14	10.0	10.0	28

509	L2	18	10	1.0	0	10
510	L2	18	14	4.5	0.6	19
511	L2	21	15	3.0	0.1	15
12	L1	22	N/A	N/A	N/A	38
17	L1	29	N/A	N/A	N/A	39
18	L1	28	N/A	N/A	N/A	40
502	L1	22	N/A	N/A	N/A	35
506	L1	32	N/A	N/A	N/A	40

APPENDIX D: EXPERIMENTAL WORD PAIRS (NOUNS)

Target Liaison Consonant	1-syll. Noun	Adjective	3-syll. Noun	Adjective
/t/	dent	absente	accident	affreux
	fait	étrange	argument	extrême
	gant	affreux	bâtiment	urbain
	mot	anglais	compliment	étrange
	pont	urbain	intérêt	absent
	vent	extrême	président	anglais
/z/	dents	absentes	accidents	affreux
	faits	étranges	arguments	extrêmes
	gants	affreux	bâtiments	urbains
	mots	anglais	compliments	étranges
	ponts	urbains	intérêts	absents
	vents	extrêmes	présidents	anglais

(VERBS)

Target Liaison Consonant	1-syll. Verb	Infinitive Verb	3-syll. Verb	Infinitive Verb
/t/	croit	aimer	désirait	aider
	doit	aider	détestait	écrire
	fait	entrer	entendait	ouvrir
	peut	agir	espérait	aimer
	sait	écrire	préférait	agir
	voit	ouvrir	regardait	entrer
/z/	crois	aimer	désirais	aider
	dois	aider	détestais	écrire
	fais	entrer	entendais	ouvrir
	peux	agir	espérais	aimer
	sais	écrire	préférais	agir
	vois	ouvrir	regardais	entrer

APPENDIX E:

FREQUENCY TABLES

(NUMBER PRODUCED PER MILLION WORDS)

	1-syll. Singular Noun	Oral Frequency	Written Frequency	Mean
/t/	dent	14.10	11.15	12.80
	fait	375.66	325.34	350.50
	gant	12.11	7.97	10.04
	mot	175.42	260.54	217.98
	pont	57.71	74.59	66.15
	vent	76.63	207.64	142.135

	1-syll. Plural Noun	Oral Frequency	Written Frequency	Mean
/z/	dents	60.94	114.53	87.74
	faits	27.36	30.27	28.82
	gants	15.16	28.04	21.60
	mots	104.72	293.31	199.02
	ponts	5.97	16.22	11.10
	vents	5.84	12.64	9.24

	3-syll. Singular Noun	Oral Frequency	Written Frequency	Mean
/t/	accident	99.22	36.62	67.92
	argument	4.40	8.24	6.32
	bâtiment	22.73	19.93	21.33
	compliment	7.89	5.54	6.72
	intérêt	70.12	75.00	72.56
	président	176.45	76.28	126.37

	3-syll. Plural Noun	Oral Frequency	Written Frequency	Mean
/z/	accidents	8.10	8.18	8.14
	arguments	4.51	9.93	7.22
	bâtiments	4.85	16.89	10.87
	compliments	8.89	9.46	9.18
	intérêts	17.46	22.36	19.91
	présidents	2.48	2.30	2.39

	1-syll., 1st Person Singular Verb	Oral Frequency	Written Frequency	Mean
/z/	crois	918.98	305.54	612.26
	dois	899.16	102.03	500.60
	fais	1379.82	224.26	802.04
	peux	1712.41	245.47	978.94
	sais	2376.57	615.41	1495.99
	vois	634.64	253.78	444.21

	1-syll., 3rd Person Singular Verb	Oral Frequency	Written Frequency	Mean
/t/	croit	74.16	60.00	67.08
	doit	657.65	224.59	441.12
	fait	2678.98	1460.00	2069.49
	peut	1169.34	509.05	839.03
	sait	384.10	245.07	314.59
	voit	158.07	159.92	158.50

	3-syll.,1st Person Singular Verb	Oral Frequency	Written Frequency	Mean
/z/	désirais	1.88	4.66	3.27
	détestais	5.48	3.65	4.57
	entendais	4.82	29.93	17.38
	espérais	28.07	12.64	20.36
	préférais	2.95	9.19	6.07
	regardais	17.71	36.01	26.86

	3-syll., 3rd Person Singular Verb	Oral Frequency	Written Frequency	Mean
/t/	désirait	1.04	14.05	7.55
	détestait	4.25	15.47	9.86
	entendait	6.63	80.27	43.45
	espérait	4.52	18.58	11.55
	préférait	2,65	21.55	12.08
	regardait	14.40	160.81	87.61

APPENDIX F:
EXPERIMENTAL TEXT: FEMININE VERSION

(the experimental word pairs are underlined for the reader)

Je m'appelle Marie, et je suis étudiante à l'Université d'Illinois. Je me spécialise en français, quoique je crois aimer toute langue étrangère. Afin de mieux parler français, l'an passé, j'ai participé à un programme d'échange à la Sorbonne. Avant de m'y rendre, il est clair que j'espérais aimer la France, et, en y réfléchissant aujourd'hui, j'avoue que cela a été la meilleure année de ma vie. Étant donné cette expérience positive, ce semestre, je dois aider d'autres étudiants qui désirent participer à des programmes d'échange semblables. Par exemple, mon meilleur ami français Pierre, fait ses études en Angleterre cette année. Récemment, je lui ai demandé pourquoi avoir choisi le programme d'échange auquel il participe. Dans sa réponse, il indique qu'il doit aider la Sorbonne à créer des liens solides avec l'université anglaise où il étudie. Pierre parle assez bien anglais, et croit aimer la vie à Londres, même s'il trouve que les Londoniennes lui font occasionnellement des compliments étranges. Il étudie la science politique et admire beaucoup le président anglais—et tous les présidents anglais des siècles passés, d'ailleurs.

Lorsque je pars en voyage, je fais entrer ma famille dans ma chambre pour leur dire au revoir. Il est toujours difficile de les quitter, mais chaque fois que je vois ouvrir la porte d'un avion ou d'un train, j'oublie cette mélancolie et je ressens à nouveau un sentiment de joie. On dit de moi que je sais écrire des lettres passionnantes, donc j'ai vivement l'intention un jour de mettre ce talent a l'épreuve et de rédiger un récit sur mes expériences à travers le monde. Mes aventures, y compris le petit nombre d'accidents affreux qu'il m'est arrivés à Paris et les faits

étranges que j'ai appris au sujet de la ville lumière, ont été tellement intéressantes, que les lecteurs n'y porteraient sûrement pas d'intérêts absents. Quant à Pierre, il m'a dit qu'il détestait écrire des cartes postales, mais qu'il m'enverrait des courriers électroniques. Dès son départ, il m'est devenu évident qu'il sait écrire des histoires très intéressantes ! Lui qui espérait aimer l'Angleterre, il m'a confirmé dans son message le plus récent qu'il n'est pas du tout déçu jusqu'à présent.

Aussitôt arrivée à Paris, j'ai aménagé dans un petit appartement au huitième arrondissement. Pierre, lui, habitait un immeuble près du Pont Notre Dame—un pont urbain sur la Seine parmi de nombreux ponts urbains pittoresques à Paris. Pendant ma première semaine à la Sorbonne, j'avais un peu peur de ne pas être à la hauteur ou de subir un accident affreux dans le métro, mais malgré ces craintes je préférerais agir avec confiance. J'avais entre autres très hâte de rencontrer mes nouveaux camarades de classe. Le premier jour du semestre, je les regardais entrer en classe en me demandant avec qui je nouerais des liens profonds d'amitié. Pierre a vécu une expérience semblable. Lors de son premier jour à Londres, les orages et le vent extrême qui se déchainaient sur la ville ont donné à Pierre le mal du pays, mais il préférait agir avec optimisme. En très peu de temps, il a pu se trouver un logement dans un grand bâtiment urbain au centre-ville. Pendant les jours suivants, chaque fois qu'il entendait ouvrir la porte de son appartement et que de nouveaux colocataires arrivaient, il les regardait entrer avec curiosité. Pierre, qui désirait aider ses nouveaux copains à apprendre un peu de français, était content de constater qu'ils venaient tous de pays différents.

La Sorbonne se trouve sur le Boulevard Saint-Michel, entourée d'anciens bâtiments urbains aux bords de la Seine. Mon cours préféré à la Sorbonne était la littérature francophone, même si je détestais écrire des analyses de texte. L'enseignant, Monsieur Rodin, était un

homme très grand avec un sourire aimable, mais il avait l'air un peu excentrique avec sa dent absente et le gant affreux qu'il portait à la main gauche. Je dois admettre que je n'avais jamais eu d'enseignant avec des dents absentes ou qui portait des gants affreux. En dépit de ce fait étrange, Monsieur Rodin m'a tout de suite plu. Il était extrêmement intelligent et très intéressant. D'ailleurs, j'étais toujours surprise de constater que le cours était déjà terminé lorsque j'entendais ouvrir la porte de la salle. De temps à autre, Monsieur Rodin employait un argument extrême pour provoquer une réaction certaine chez ses étudiants. Grâce à ses méthodes d'enseignement, j'ai moi-même appris à employer toute sorte d'arguments extrêmes, m'exerçant ainsi à l'art du débat. Je portais une attention particulière à ses discours, lesquels savaient stimuler grandement mon intellect, mais hélas, il y avait toujours quelques étudiants paresseux qui ne manifestaient qu'un intérêt absent—quel dommage !

Tout au long du semestre, je désirais aider mes camarades de classe, donc lorsqu'un texte contenait un mot anglais, je le traduisais pour eux. Un jour, après avoir traduit plusieurs mots anglais dans un texte, j'ai reçu un compliment étrange d'un de mes camarades de classe que j'avais aidé. Il m'a dit que j'avais un accent charmant. J'ai pensée « j'essaie de parler français sans accent, mais, si j'ai un accent si charmant, peut-être aussi que je peux agir comme une américaine ! » À ce moment-là, j'avoue avoir ressenti un peu de jalousie envers Pierre : en Angleterre ce semestre, il est un touriste comme les autres, mais à Paris—la plus belle ville du monde—il peut agir comme chez lui !

Mes aventures ont pris fin en juin avec mon retour à Chicago, lequel fut un peu retardé à cause des vents extrêmes qui secouent trop souvent la ville. En revenant d'un long voyage, il est toujours agréable de retrouver sa famille à l'aéroport, surtout lorsque celle-ci voit ouvrir la

porte de la douane par laquelle on passe, et fait entrer dans ses bras le voyageur plutôt fatigué mais avide de partager ses aventures les plus remarquables !

APPENDIX G:
EXPERIMENTAL TEXT: MASCULINE VERSION

(the experimental word pairs are underlined for the reader)

Je m'appelle Pierre, et je suis étudiant à l'Université d'Illinois. Je me spécialise en français, quoique je crois aimer toute langue étrangère. Afin de mieux parler français, l'an passé, j'ai participé à un programme d'échange à la Sorbonne. Avant de m'y rendre, il est clair que j'espérais aimer la France, et, en y réfléchissant aujourd'hui, j'avoue que cela a été la meilleure année de ma vie. Étant donné cette expérience positive, ce semestre, je dois aider d'autres étudiants qui désirent participer à des programmes d'échange semblables. Par exemple, ma meilleure amie française Marie, fait ses études en Angleterre cette année. Récemment, je lui ai demandé pourquoi avoir choisi le programme d'échange auquel elle participe. Dans sa réponse, elle indique qu'elle doit aider la Sorbonne à créer des liens solides avec l'université anglaise où elle étudie. Marie parle assez bien anglais, et croit aimer la vie à Londres, même si elle trouve que les Londoniens lui font occasionnellement des compliments étranges. Elle étudie la science politique et admire beaucoup le président anglais—et tous les présidents anglais des siècles passés, d'ailleurs.

Lorsque je pars en voyage, je fais entrer ma famille dans ma chambre pour leur dire au revoir. Il est toujours difficile de les quitter, mais chaque fois que je vois ouvrir la porte d'un avion ou d'un train, j'oublie cette mélancolie et je ressens à nouveau un sentiment de joie. On dit de moi que je sais écrire des lettres passionnantes, donc j'ai vivement l'intention un jour de mettre ce talent à l'épreuve et de rédiger un récit sur mes expériences à travers le monde. Mes aventures, y compris le petit nombre d'accidents affreux qu'il m'est arrivés à Paris et les faits

étranges que j'ai appris au sujet de la ville lumière, ont été tellement intéressantes, que les lecteurs n'y porteraient sûrement pas d'intérêts absents. Quant à Marie, elle m'a dit qu'elle détestait écrire des cartes postales, mais qu'elle m'enverrait des courriers électroniques. Dès son départ, il m'est devenu évident qu'elle sait écrire des histoires très intéressantes ! Elle qui espérait aimer l'Angleterre, elle m'a confirmé dans son message le plus récent qu'elle n'est pas du tout déçue jusqu'à présent.

Aussitôt arrivé à Paris, j'ai aménagé dans un petit appartement au huitième arrondissement. Marie, elle, habitait un immeuble près du Pont Notre Dame—un pont urbain sur la Seine parmi de nombreux ponts urbains pittoresques à Paris. Pendant ma première semaine à la Sorbonne, j'avais un peu peur de ne pas être à la hauteur ou de subir un accident affreux dans le métro, mais malgré ces craintes je préférerais agir avec confiance. J'avais entre autres très hâte de rencontrer mes nouveaux camarades de classe. Le premier jour du semestre, je les regardais entrer en classe en me demandant avec qui je nouerais des liens profonds d'amitié. Marie a vécu une expérience semblable. Lors de son premier jour à Londres, les orages et le vent extrême qui se déchainaient sur la ville ont donné à Marie le mal du pays, mais elle préférait agir avec optimisme. En très peu de temps, elle a pu se trouver un logement dans un grand bâtiment urbain au centre-ville. Pendant les jours suivants, chaque fois qu'elle entendait ouvrir la porte de son appartement et que de nouvelles colocataires arrivaient, elle les regardait entrer avec curiosité. Marie, qui désirait aider ses nouvelles copines à apprendre un peu de français, était contente de constater qu'elles venaient toutes de pays différents.

La Sorbonne se trouve sur le Boulevard Saint-Michel, entourée d'anciens bâtiments urbains aux bords de la Seine. Mon cours préféré à la Sorbonne était la littérature francophone,

même si je détestais écrire des analyses de texte. L'enseignant, Monsieur Rodin, était un homme très grand avec un sourire aimable, mais il avait l'air un peu excentrique avec sa dent absente et le gant affreux qu'il portait à la main gauche. Je dois admettre que je n'avais jamais eu d'enseignant avec des dents absentes ou qui portait des gants affreux. En dépit de ce fait étrange, Monsieur Rodin m'a tout de suite plu. Il était extrêmement intelligent et très intéressant. D'ailleurs, j'étais toujours surpris de constater que le cours était déjà terminé lorsque j'entendais ouvrir la porte de la salle. De temps à autre, Monsieur Rodin employait un argument extrême pour provoquer une réaction certaine chez ses étudiants. Grâce à ses méthodes d'enseignement, j'ai moi-même appris à employer toute sorte d'arguments extrêmes, m'exerçant ainsi à l'art du débat. Je portais une attention particulière à ses discours, lesquels savaient stimuler grandement mon intellect, mais hélas, il y avait toujours quelques étudiants paresseux qui ne manifestaient qu'un intérêt absent—quel dommage !

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Mes aventures ont pris fin en juin avec mon retour à Chicago, lequel fut un peu retardé à cause des vents extrêmes qui secouent trop souvent la ville. En revenant d'un long voyage, il est toujours agréable de retrouver sa famille à l'aéroport, surtout lorsque celle-ci voit ouvrir la

porte de la douane par laquelle on passe, et fait entrer dans ses bras le voyageur plutôt fatigué mais avide de partager ses aventures les plus remarquables !

APPENDIX H: INSTRUCTIONS

In this task, you will be asked to read aloud a text written in French and will be audio recorded while doing so. Before you begin, please take a few minutes to read over the text and to make sure that you understand its content, but don't worry about understanding every word. If you have any questions, please ask me before beginning to read aloud. Please remember to speak clearly and not to rush. Imagine that you are being recorded for the creation of a listening comprehension exercise for second year students of French, and that you should remember to enunciate well so that the students understand the text. Feel free to correct yourself if you feel you did not produce a word correctly. Do you have any questions before we begin?

APPENDIX I:

LEVEL OF FRENCH AND NUMBER OF LIAISONS PRODUCED (EXPERIMENTAL GROUP)

Participant Number	Cloze Test	# of Liaisons Produced
1	26	1
2	17	2
3	20	6
4	21	6
5	26	2
6	N/A	15
7	31	3
8	32	1
9	26	7
10	8	3
11	20	13
13	20	2
14	20	10
15	19	2
16	31	2
501	17	6
508	28	1

509	10	1
510	19	3
511	15	2

APPENDIX J:

LIAISON PRODUCTION AND CLOZE TEST INFORMATION PER PARTICIPANT (STUDY 2)

Participant #	French L1/L2	Age	Age of First Exposure to French	Years of French	Months of Immersion	Cloze Score
101	L2	21	10	11.0	0	23
102	L2	20	13	7.0	1.5	27
103	L2	21	0	4.0	0	34
104	L2	21	12	9.0	0	24
105	L2	22	7	9.0	0	27
106	L2	19	15	3.0	0	11
107	L2	21	14	7.0	9.0	22
501	L2	20	11	9.0	1.5	17
503	L2	20	10	10.0	10.0	28
508	L2	24	14	10.0	0	28
509	L2	18	18	1.0	0.6	10
510	L2	18	14	4.5	0	19
511	L2	21	15	3.0	0.1	15
108	L1	19	N/A	N/A	N/A	39
109	L1	22	N/A	N/A	N/A	39

110	L1	29	N/A	N/A	N/A	39
502	L1	22	N/A	N/A	N/A	35
506	L1	32	N/A	N/A	N/A	40
507	L1	26	N/A	N/A	N/A	33

APPENDIX K:

LIST OF EXPERIMENTAL ITEMS
(TARGET NONSENSE WORDS)

/n/ Context		/r/ Context		/z/ Context	
V-initial	**C-initial**	**V-initial**	**C-initial**	**V-initial**	**C-initial**
invèle	ninvèle	émine	rémine	appème	zappème
apanne	napanne	écomme	récomme	azal	zazal
asige	nasige	anore	ranore	ébage	zébage
arone	narone	abrès	rabrès	ébil	zébil
attit	nattit	arcin	rarcin	élin	zélin
aron	naron	orcin	rorcin	élaume	zélaume
abrer	nabrer	attis	rattis	asin	zasin
émmet	némmet	appan	rappan	éphlat	zéphlat
arman	narman	appard	rapard	éritre	zéritre
écite	nécite	idard	ridard	ingaut	zingaut
asin	nasin	élète	rélète	omblot	zomblot
aponne	naponne	énurbe	rénurbe	anage	zanage
amète	namète	ablin	rablin	ature	zature
apard	napard	ébite	rébite	évine	zévin