

# Deriving the gradient behavior of French liaison through constraint interaction

Benjamin Storme (University of Lausanne)

**1. Introduction.** In French, some words ending in a vowel have a consonant-final variant before vowel-initial words (e.g. *grand* [gʁã] ~ [gʁãt] ‘little-MASC’). The consonants occurring at the end of consonant-final variants are called *liaison consonants*. Liaison consonants are challenging for phonological theory because of evidence that they pattern ambiguously between stable word-final consonants (e.g. *trente* [tʁãt] ‘word-final’) and word-initial consonants (e.g. *timide* [timid]). For instance, in Quebec French, before [i], the liaison consonant [t] has a rate of affrication (66%) that is intermediary between stable word-final [t] (36.5%) and word-initial [t] (99.2%; Côté 2014).

**2. Goals.** This paper has two main goals. First, it provides additional evidence for the gradient behavior of liaison consonants, through an experimental study of *liaison enchaînée* in Swiss French. Second, it shows that this gradient behavior can be derived through constraint interaction, using independently motivated output-output faithfulness constraints (i.e. output-variant (OV) faithfulness; Kawahara 2002). Crucially, the account does not require different underlying representations for liaison C and other consonants (contra Smolensky & Goldrick 2016). All that is required is that liaison and non-liaison words have different underlying representations.

### 3. Study with *liaison enchaînée*.

Adjective-noun (Adj-N) sequences belonging to four different conditions were built: (i) Adj ends with a stable word-final consonant and N is vowel-initial (=Final C condition), (ii) Adj ends with a liaison consonant, N is vowel-initial, and the liaison form corresponds to the masculine form with

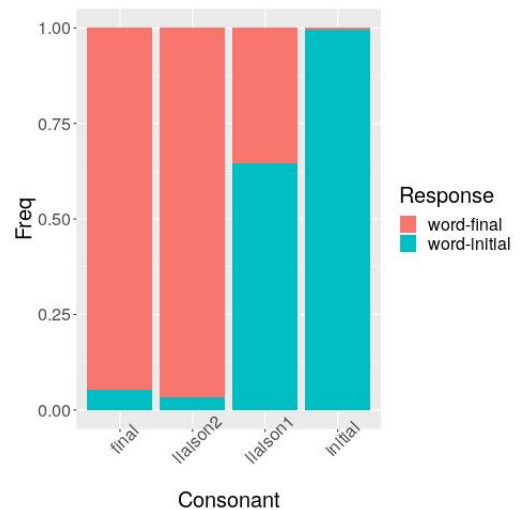
an epenthetic consonant (e.g. *grand*[t] *hommage*, where [gʁãt]=[gʁã]+[t]; =Liaison1 C condition), (iii) Adj ends with a liaison consonant, N is vowel-initial, and the liaison form is suppletive (e.g. *bel appartement*, where *bel* [bɛl] is identical to the adjective’s feminine form; =Liaison2 C condition), and (iv) Adj ends with a vowel and N is consonant-initial (=Initial C condition). Examples of Adj-N sequences are shown in Table 1 for each condition (the relevant consonant is bolded in each case).

A French native speaker produced these sequences with a hesitation (*eah* [ø]) between Adj and N. For each sequence, two pronunciations were produced: (i) one where final/liaison1/liaison2/initial C was located between word 1 and the hesitation, i.e. the consonant was produced as word-final (in the liaison conditions, this corresponds to a *liaison non-enchaînée*) and (ii) one where C was located between the hesitation and word 2, i.e. the consonant was produced as word-initial (in the liaison conditions, this corresponds to a *liaison enchaînée*). For instance, for Liaison1 C *grand hommage*, the two pronunciations were [gʁãt#ø#omaʒ] and [gʁã#ø#tomaʒ]. 21 French native speakers were asked to choose the pronunciation that sounded more natural to them (i.e. that they would be more likely to pronounce).

**4. Results.** The results (see Figures 1 and 2) confirm the intermediary status of liaison consonants, but only for liaison1: stable final Cs and liaison2 Cs showed a clear preference for being attached to word 1, word-initial Cs showed a clear preference for being attached to word 2 while liaison1 Cs showed a

Condition	Example
Final C	<i>magnifique hôtel</i> [maɲifik#otɛl]
Liaison1 C	<i>grand hommage</i> [gʁãt#omaʒ]
Liaison2 C	<i>bel appartement</i> [bɛl#apaʁtɛmã]
Initial C	<i>joli sourire</i> [ʒoli#suʁiʁ]

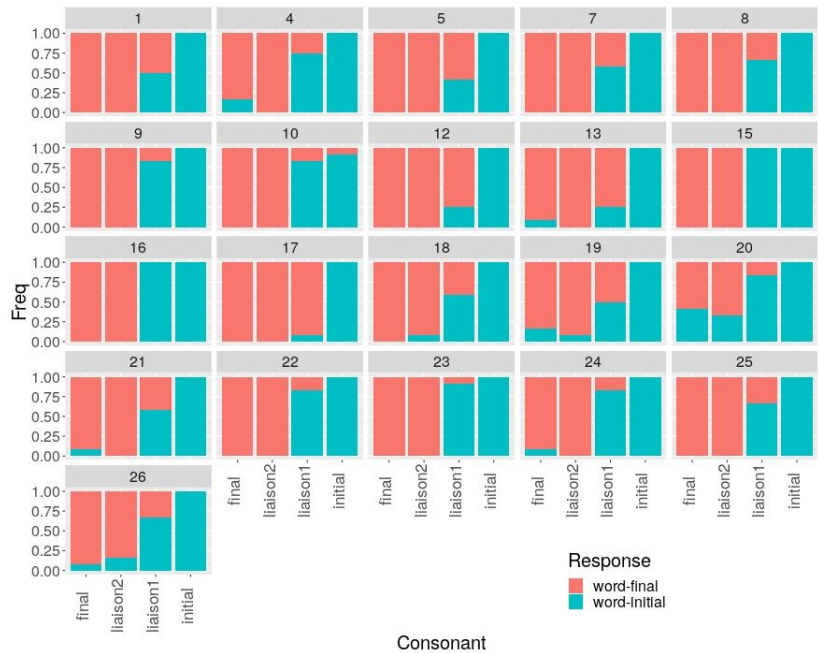
**Table 1:** Examples of Adj-N sequences for each experimental condition



**Figure 1:** Results across participants

more gradient pattern of response. The intermediary status of liaison1 C also holds at the individual level, as shown in Figure 2: although some participants treated liaison1 consonants like word-final consonants (cf. participant 17) or like word-initial consonants (cf. participant 15), no participant showed a greater rate of attachment of C to word 1 for liaison1 than for final C and no participant showed a greater rate of C-attachment to word 2 for liaison1 than for initial C.

**5. Analysis.** This paper proposes that correspondence with the citation form (i.e. Kawahara’s 2002 OV faithfulness) plays a key role in explaining the gradient behavior of French liaison (see also Plénat 2008). The citation form of a word corresponds to the word uttered in isolation, with no word preceding or following it (e.g. the citation form of *grand* ‘little-MASC’ is [gʁɑ̃]). The key insight in the analysis is the observation that the liaison consonant is absent in the citation form of liaison1 words (e.g. liaison [t] is present in the liaison1 form of *grand* [gʁɑ̃t] but absent in the citation form [gʁɑ̃]). As a consequence, liaison1 consonants are not protected by OV faithfulness and can be attached to word 2. But attachment of liaison1 C



**Figure 2:** Results by participant

to word 2 is also penalized by the OV faithfulness constraint that protects word 2. These conflicting requirements of OV-faithfulness for word 1 and word 2 give rise to the intermediary status of liaison1 C. For the other consonants (word-final C, word-initial C, and liaison2 C), the situation is very different. These consonants are all present in the citation forms of the corresponding adjectives (e.g. the [l] in *bel* is present in the citation form of feminine *belle* [bɛl]). Faithfulness to the citation form of word 1 and word 2 will both penalize the same candidate. The converging requirements of OV-faithfulness for word 1 and for word 2 give rise to almost categorical behaviors for the relevant consonants.

The paper shows how the analysis can be implemented in a constraint-based framework with OV-faithfulness constraints and how the specific rates of attachment to word 1 and word 2 in Figure 1 can be derived using MaxEnt (Hayes & Wilson 2008). The different behaviors of different participants illustrated in Figure 2 can be obtained by varying the weights on the different OV-faithfulness constraints used in the analysis (an OV-faithfulness constraint penalizing epenthesis at the end of words vs. an OV-faithfulness constraint penalizing epenthesis at the beginning of words). For instance, participant 15 attributes a greater weight to the former constraint. This explains why she almost categorically treats liaison1 C as word-initial. By contrast, participant 17 attributes a greater weight to the latter constraint. This explains why she almost categorically treats liaison1 C as word-final.

**6. Conclusion.** The paper shows that it is possible to derive the intermediary behavior of liaison consonants without positing different underlying phonological representations for liaison and non-liaison consonants. The different behaviors of liaison and non-liaison consonants follow from the fact that liaison and non-liaison words have different representations (presence vs. absence of sandhi variants) and from independently motivated principles of correspondence among word variants.