Liaison and the locality of production planning

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This paper compares two accounts of frequency and predictability effects in phonological processes across word boundaries. The '**Probabilistic Reduction account**' holds that reductive phonological processes should be more likely when the two words involved are more frequent and more likely given the other (as in tapping in English, cf. Gregory et al. 1999). This is because speakers will 'conserve cost when message predictability is high' (Turnbull et al., 2018). The second account attributes effects of frequency and predictability to the locality of production planning ('**Production Planning Hypothesis**', or PPH): phonological processes can only apply when their triggering environment has been planned in time, which will not always be true for information in upcoming words (Wagner, 2011, 2012; MacKenzie, 2016; Tanner et al., 2017; Kilbourn-Ceron, 2017; Tamminga, 2018, i.a.).

Non-Reductive processes. The two accounts make similar predictions for **reductive** processes like tapping, but diverge for **non-reductive** ones. Liaison in French involves the insertion of a segment, but also depends on whether an upcoming word begins with a vowel, just like tapping. The PPH predicts that higher predictability of the following word should facilitate liaison. The Probabilistic Reduction Hypothesis either makes no prediction or predicts the opposite, since 'additional material increasing signal specificity and redundancy is more likely to be invested when message predictability is low' (Turnbull et al., 2018).

Methods. In our production experiment we manipulated (i) the **syntactic relation** between word1 and word2; (ii) the **length** in syllables of word1 and word2; (iii) the **frequency** of word1 and word2; (iii) the conditional probability of word2 given word1 (**'predictability'**); (iv) **speech rate**; (v) **repetition**. Example sentences are given in (1–2). Predictability was balanced across other manipulations. A total of 20 speakers were recorded on all 80 sentences plus 80 repetitions. The data was hand-annotated for liaison (acoustic analyses and tests for prosodic effects were also conducted but are not reported in this abstract).

Results. A logistic mixed effects model shows that liaison is significantly more likely when the following word is (i) not separated by a major syntactic juncture, (ii) more frequent, (iii) more predictable given the prior word. This replicates parallel findings from a corpus study on liaison reported in (Kilbourn-Ceron, 2016). In addition, we found significantly more liaison when the first word was short, an effect that has not been previously reported. Moreover, there was a three-way interaction between length, predictability, and syntax: Fig. 1 shows that in the adjective-noun word order, the slope is flatter for *short* first words, where liaison is almost at ceiling level, and the first word is so easy to plan that the difficulty of the second word is less relevant; in the noun-adjective order, the long first words are so long that liaison is close to floor, and hence the difficulty of the second word has less of an effect.

Discussion. The results are as expected by the PPH, and unexpected for the Probabilistic Reduction Account, as well as for Turnbull et al. (2018), who would predict that liaison (and flapping) rate should decrease with next-word-predictability, since it encodes information about the upcoming word. The account in Bybee (2001) and Côté (2013) at-

tributes frequency effects in liaison to the storage of larger sized units. This interpretation could explain why we did not find a speech rate effect (cf. Kaisse 1985) or repetition effects. We will discuss additional analyses to disentangle these accounts.

(1) Adjective-Noun ('obligatory' liaision context)

a. Low conditional probability; short word 1; short word 2:

Elle discute avec les **derniers élèves**.
she discusses with the last students
'She is talking with the latest students.'

b. High conditional probability, short word1; short word2:

Vous regrettez vos **dernières années**.
you regret your last years
'You regret the previous years.'

(2) Noun-Adjective ('optional' liaision context')

a. Low conditional probability; short word 1; long word 2:

Ils construisent des **douches intérieures**.
they construct of douches interior
'They are constructing interior showers.'

b. High conditional probability; short word 1; long word 2:

Mathilde regarde ses **dessins animés**.
Mathilde watches her drawing animated
'Mathilde is watching her cartoons.'

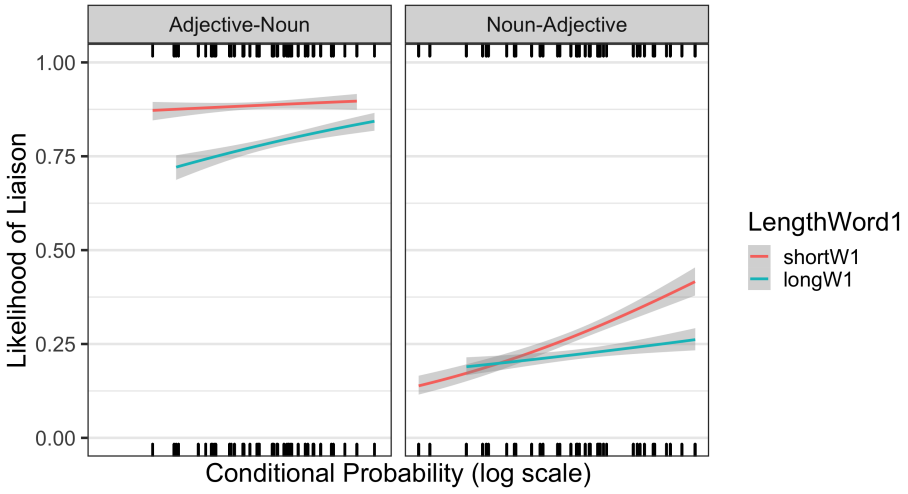

Figure 1: Liaison plotted by conditional probability depending on the length of word1 and the syntactic relation between word1 and word2