

## Phonological constraints, prosodic position and speaker sex in coarticulatory vowel nasalization in French and Korean

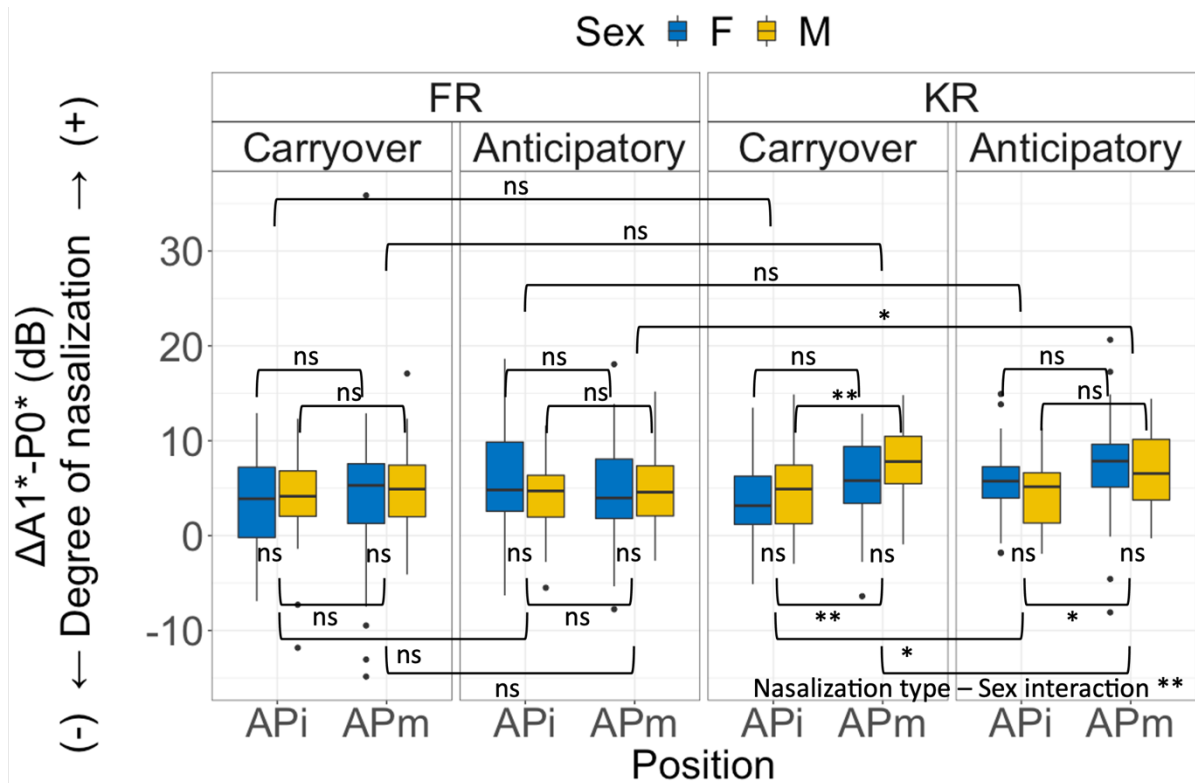
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Coarticulatory vowel nasalization depends on language-specific constraints, so that French speakers, for instance, minimize anticipatory nasalization to preserve the oral-nasal vowel contrast while English speakers, lacking this contrast, exhibit extensive nasalization [1]. However, in Spanish [2] and German [3], limited anticipatory nasalization is also observed despite lacking oral-nasal vowel contrast. Moreover, in a language like French, more or less coarticulatory nasalization is found according to linguistic material [4], vowel height [5], or lexical competition [6]. Phonemic contrast is thus not the sole predictor of coarticulatory vowel nasalization. This study investigates further factors influencing nasal coarticulation in a comparison of French with another language lacking an oral-nasal vowel contrast but where nasalization is affected by linguistic and sociophonetic factors: Korean. Korean is known for a denasalization process of consonants in the initial position of prosodic domains [7, 8]. Moreover, sex differences have been reported in Korean, with female speakers exhibiting more contextual nasalization than males [9], possibly reflecting cultural preferences for greater nasalization in women's speech in Asian countries [10]. These two factors are therefore predicted to constrain the coarticulatory nasalization of vowels adjacent to nasals in Korean, as does a preservation of the oral-nasal vowel contrast in French.

Seventy speakers (FR: 16M & 17F, KR: 17M & 20F) read sentences in Korean and French with either /mam/ or /pap/ in a sequence of three fake first names, each of which constitutes an Accentual Phrase, embedded in comparable contexts (KR: /onil ohue, 'mama/papa'<sub>(W1)</sub>, 'mamama/papapa'<sub>(W2)</sub>, 'mamamama/papapapa'<sub>(W3)</sub>, seei koŋwʌne kagiŋo hetta/ & FR: /set apʁɛmidi, 'mama/papa'<sub>(W1)</sub>, 'mamama/papapa'<sub>(W2)</sub>, e 'mamamama/papapapa'<sub>(W3)</sub>, nuz iʁɔ̃ o paʁk də lil sɛt ida/, "This afternoon, 'mama/papa'<sub>(W1)</sub>, 'mamama/papapa'<sub>(W2)</sub> and 'mamamama/papapapa'<sub>(W3)</sub>, we will go to the park/ ...to the park île Sainte-Ida."). The degree of nasal coarticulation in the vowel /a/ was assessed using the difference of corrected A1-P0 values ( $\Delta A1^* - P0^*$ ) between each of the /pap/ sequences and its corresponding /mam/ sequence in the other sentence. To assess the impact of preceding and following consonants,  $\Delta A1^* - P0^*$  is measured at two time points during the vowel: at 25% where the carryover influence of the preceding nasal is expected to be high, and at 75% where the anticipation of the following /m/ is expected to be better captured. Given the potential effect of prosodic position, the analysis was conducted separately for the /a/ following AP-initial consonants (/a/<sub>APi</sub> = /a/ in the first syllables of W1 and W2) and AP-medial consonants (/a/<sub>APm</sub> = /a/ in the second or third syllables of each fake name, excluding the /a/s in the final open CV syllable in each name).

Results, illustrated in Figure 1, show that contextual nasalization is indeed constrained in Korean: speakers show less contextual nasalization after an AP-initial /m/ (/a/<sub>APi</sub>) than after an AP-medial /m/ (/a/<sub>APm</sub>), confirming Jang et al. (2018)'s results. However, the reduction of carryover nasalization after a denasalized AP-initial nasal in Korean is found only for male speakers, supporting the assumption that AP-initial denasalization is led by male speakers (Lee et al., 2023). Also, Korean females exhibit more anticipatory than carryover nasalization in /a/<sub>APm</sub> while males show the opposite, confirming more nasalization in females, which might contribute to the observed male-led denasalization. Conversely, French speakers display no differences between nasalization types and positions or sex, although a reduction of coarticulation could have also been expected for /a/<sub>APi</sub> since AP-initial nasals also exhibit reduced nasal airflow [11]. Regarding the comparison between languages, by position and by nasalization type, carryover nasalization is similar between Korean and French for both /a/<sub>APi</sub> and /a/<sub>APm</sub>. A reduced contextual nasalisation in French compared to Korean is observed only for anticipatory nasalization of /a/<sub>APm</sub>. All together, these results show that cross-language comparisons of coarticulatory vowel nasalization need to account for factors affecting nasalization in the consonant trigger, be it determined by prosody or sociophonetic factors.



**Fig. 1.** Degree of nasalization (greater  $\Delta A1^*-P0^*$  indicating more coarticulatory nasalization) in male and female French and Korean speakers according to coarticulation types (Carryover @25% & Anticipatory @75%) and position (APi & APm) (\* $p < .05$ , \*\* $p < .01$ , ns: not significant)

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