

Phonologically-conditioned Gestural Overlap
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One of the controversial issues in coarticulation is whether it belongs to language particular phonetic implementation component (Keating 1990) or it is governed by phonological rules (Kent 1997, Benus 2005). This paper presents interesting evidence from ultrasound and acoustic experiments that coarticulation is highly conditioned by phonological rules in case of English. Previous research suggested that intergestural timing between palatalized consonant and its neighboring /i/ is more overlapped than between underlying palatals and the following /i/ (e.g. [ci] /kath+i/ 'together' vs. [ci] /kaci/ 'value' in Korean, Cho 1998), and it is different between lexically-derived [ʃ] in 'expression' and postlexically-derived [ʃ] in 'express#your' with [ə] in English (Zsiga 1995). However, our study reports vowel-to-vowel coarticulation which is directly affected both by palatalization and by its lexical status.

First, an ultrasound experiment showed that V2 in V₁CV₂ sequences was articulated further front after derived palatals than after underlying palatals because of stronger carryover coarticulatory effect from V1s such as /ɪ, ε/ (e.g. [iʃə] in 'hozit+ious' vs. [iʃə] in 'position'; F(1, 8) = 29.10, p.<0.001) as in (2a). To make sure that palatalization occurs across morpheme boundary, V2s in pseudo-words (1a) were compared with those in real words (1b). Further, acoustic experiments revealed that mean F2 values at medial and offset points of V2 /ə/ were significantly higher after lexically derived alveopalatals (i.e. 'homit+ious') than after underlying alveopalatals (i.e. 'initial'), confirming articulatory results as in (2b) (F(1, 8) = 84.82, p.<0.001; 1812 Hz vs. 1636 Hz). These findings indicate that V2 underwent stronger carryover coarticulation from V1 in the words which underwent palatalization than in the words which did not. Thus, this provides another evidence that palatalization caused greater gestural overlap between vowels across lexically-derived alveopalatals than across underlying alveopalatals.

Second, an ultrasound experiment revealed that V2 in sequences of V₁CV₂ was articulated further front after postlexically-derived alveopalatals (e.g. /ə/ in 'express#your') than after lexically-derived alveopalatals (e.g. /ə/ in 'expression') as in (4a) (F(1, 2) = 46.41, p.<0.05). Further, mean F2 of V2 was significantly higher after postlexically-derived alveopalatals than after lexically-derived alveopalatals during the whole production of V2, confirming articulatory results (F(1, 8) = 33.84, p.<0.001; 1654 Hz vs. 1901 Hz) as in (4b). That is, backness of V1 such as /ɪ, ε/ influenced the backness of V2 during its whole production. These results revealed that there was a stronger carryover coarticulatory effect from V1s in words which undergo postlexical palatalization than in words which undergo lexical palatalization. Such findings indicate that postlexical palatalization caused greater gestural overlap between V1 and V2 across word boundary than lexical palatalization across morpheme boundary.

A consequence of these results is that vowel-to-vowel coarticulation is conditioned both by (non)application of palatalization and by lexical status of palatalization. These findings are intriguing by indicating that presence of palatalization and postlexical palatalization contributed to increasing gestural overlap between vowels across the intervening alveopalatals in English. Interestingly, even though V₁CV₂ sequences were identical in surface phonemic strings, the degree of intergestural timing relations were different. They also provide implication that high-level phonological rules such as palatalization directly affect low-level phonetic fine details such as coarticulation and intergestural timing relations can be incorporated into a unified grammar of phonology and phonetics in order to formally capture such effects.

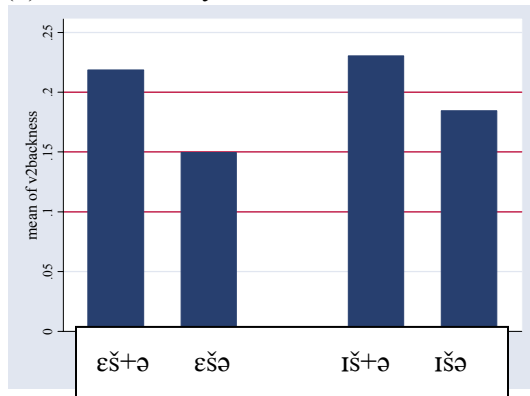
Second, it is suggested that the degree of gestural overlap in the lexicon varies according to boundary strength. If that is on the right track, abstract intergestural timing relations are least variable within morphemes (e.g. "echelon"), less variable within words (e.g. "express+ion"), and most variable across word boundaries with respect to input representations (e.g. "express#your")

Finally, it is suggested that both patterns can be formally captured within gestural OT grammar (Cho 1998; Benus 2005). Feature-and-gesture models explain the interaction between palatalization and coarticulation by ranking a featural phonological constraint like PAL(atalization) as high as a gestural constraint VV-COORDINATION in the domains of VC+V or VC#V. For example, VV-COORDINATION 1 in the domain of VC+V (demanding that strengthened gestural overlap between V1 and V2) can be combined with PAL, forcing the effect of phonological enhancement in (1) and (2). Further, the effect of lexical strata conditioned coarticulation in (3) and (4) can also be in couched by PAL and VV-COORDINATION 2)_{VC#V}, which demands that gestural overlap between V1 and V2 should be maximal in the environment of postlexical palatalization.

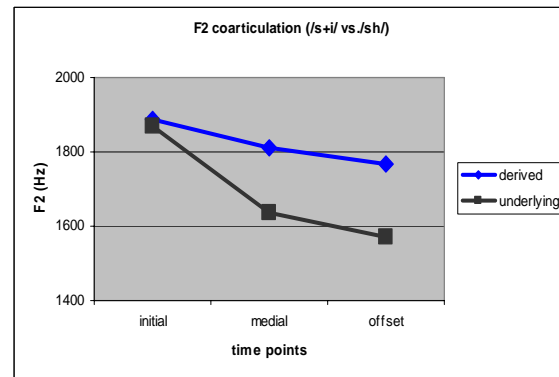
(1) “Phonological Enhancement of Coarticulation”

a. Lexically-derived alveopalatals	b. Underlying alveopalatals	VV sequences
homit+ious hofit+ious hozit+ious	initial tradition position	ɪ-ə
homess+ion hopess+ion hokess+ion	echelon session accession	ɛ-ə

(2) a. Articulatory results



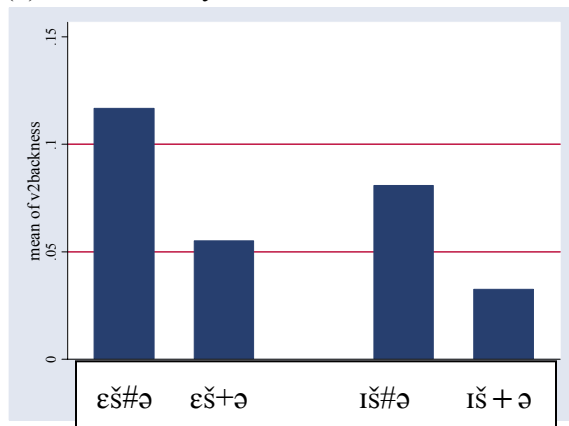
b. Acoustic Results



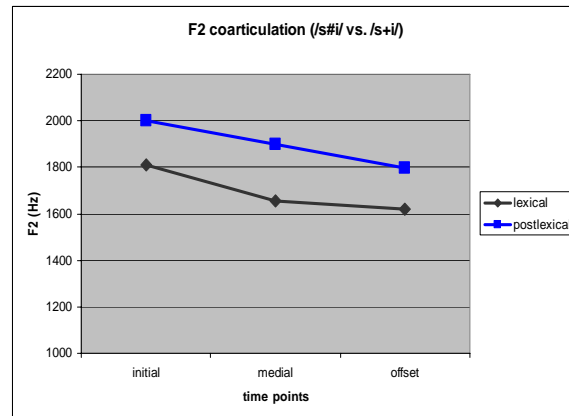
(3) “Lexical Strata Conditioned Coarticulation”

a. Postlexical palatalization	b. Lexical palatalization	VV sequences
miss your kiss your hiss your	official edition definition	ɪ-ə
oppress your obsess your express your	oppression obsession expression	ɛ-ə

(4) a. Articulatory results



b. Acoustic Results



References

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Kent, R.D. 1997. *The Speech Sciences*. San Diego, CA: Singular Publishing Group.