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A Note on the English Palatalization Process

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The TIMIT database of American English speech was used to examine across word sequences likely to undergo palatalization in American English. For an introduction to the use of TIMIT to examine linguistic characteristics of English see Byrd (this volume) and Keating (this volume). One allophonic rule which has long been noted in English is the rule states that alveolar obstruents become palatalized before palatals (see, eg. Oshika, et al., 1975) This rule often occurs across word and morpheme boundaries, but may be bounded by a clitic group boundary (Hayes, 1989). However, the details and productivity of this rule are not clear. In this note, all sequences of <z#sh>, <sh#s>, <s#sh>, and <sh#z> (where # denotes a word boundary) from the TIMIT orthographic corpus were examined for their phonetic realization as indicated by the TIMIT transcription.

Table 1 shows the number of tokens spoken in the TIMIT corpus for each underlying sequence type.

Table 1

underlying sequence	number	percent of total
z#sh	76	49%
sh#s	22	14%
s#sh	50	32%
sh#z	7	5%

A total of 155 tokens.

The results obtained from the transcriptions can be considered in several ways. Both consonants were produced in 30.3% of the utterances, while assimilation (or deletion) yielding a single consonant occurred in 69.7% of the utterances. The post-alveolar fricative was produced in all but two tokens; an alveolar fricative was produced in 49 tokens (31.6%). The following table shows how often assimilation yielding a single consonant occurred in each of the underlying sequences.

Table 2

underlying sequence	% realized as [ʃ]
z#sh	78.9% (note: also two tokens realized as [z] only)
sh#s	31.8%
s#sh	78%
sh#z	0%

The effect of the underlying sequence on whether both consonants were produced was significant as determined by a contingency table analysis (χ=37.744, p=.0001)

When [ʃ] was the first consonant of the sequence it was always produced, but when an alveolar fricative is C1, it was produced only 22% of the time. When C2 was the post-alveolar fricative, there were only two tokens in which it was not produced, but when [s] was C2 it was not produced 32% of the time. However, [z] was always produced when it occurred in the C2 position. The underlying sequence did have a significant effect on whether an alveolar consonant was produced in the sequence as determined by a contingency table analysis (χ=34.809, p=.001). The frequency with which an alveolar consonant was produced is shown in Table 3.

Table 3

underlying sequence	alveolar fricative present
z#sh	21.1%
sh#s	68.2%
s#sh	22%
sh#z	100%

A pause occurred in 12 (7.7%) of the utterances. A contingency table analysis showed no significant effect of the underlying sequence on whether a pause occurred, although seven of the 12 pauses occurred in /z#sh/ sequences. There were three cases where a [z] was devoiced, all occurring in the phrase "redwoods shimmered."

The syntactic environment was also considered. 60% of the tokens occurred in modifier-noun sequences, 37.4% in verb-noun sequences, and 2.6% in other types of syntactic environments. These syntactic groupings had no effect on whether assimilation occurred or whether a pause occurred as determined by a contingency table analysis. Likewise, the speaker's sex and dialect region had no effect on the frequency of assimilation or pausing.

These results generally support the formulation of the palatalization rule specifying a potential palatalization site as occurring when a post-alveolar fricative follows an alveolar fricative, but the 31.8% occurrence of palatalization when the context is reverse, ie. the alveolar after the post-alveolar, suggests that such a rule needs refinement so as to include this context as a possible, if less likely, palatalization site. (See the discussion of variable rules in Labov, 1972) Oshika et al. (1975) note that "it is possible that preceding palatals may also influence [s] and [z]" (p.108). The asymmetrical nature of the result can be considered further evidence for the preference for anticipatory coarticulation as against carryover coarticulation (Ohala, 1990, 1991; Javkin, 1979; Lindblom, 1983 and others). Note particularly that the post-alveolar fricative is realized as an alveolar in only two out of 155 tokens.

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