Help or hindrance: how violation of different assimilation rules affects spoken-language processing

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nt studies have shown that violation of obligatory e of articulation or voicing assimilation makes eme detection more difficult [1,2,3]. The first riment was designed to replicate this effect with the man fricative assimilation rule.

ogressive fricative assimilation, monosyllabic

nature of the fricative is determined by the nature of *eceding* vowel. Within syllables the velar fricative [x] s after back vowels and the palatal fricative [ç] after vowels.

rteen monosyllabic German nonwords contained a vowel followed by the velar fricative [x] in timate word position (e.g., [bɔxt]). They were correct ations in standard German. Fourteen nonwords ed the German fricative assimilation, in that a front was followed by [x] (e.g., [bɪxt]). Twenty four ers had to detect the target fricative [x].

ead of detecting [x] more slowly, as was expected, ers detected [x] *faster* when the progressive fricative ilation was violated than when no violation occurred igure 1). The difference in the reaction times was icant by subjects (F1(1,23) = 9.6, p = 0.005) but not ms (F2(1,13) = 2.9, p = 0.1).

earlier experiments tested assimilation across able boundaries. Is the discrepancy with the earlier lts due to the assimilation applying within syllables?

ogressive fricative assimilation, bisyllabic

same assimilation rule was investigated again, this across a syllable boundary. The rule only applies s a syllable boundary if the first syllable ends in a . If the first syllable ends in a consonant, the second le has to begin with the palatal fricative [ç].

urteen bisyllabic German nonwords were correct ations in standard German (e.g., [bluːxən]), fourteen ords contained a violation of the German fricative ilation rule (e.g., [blɪnxən]). Twenty four listeners had ect the target fricative [x].

Progressive and regressive assimilation:

Progressive fricative assimilation in German obligatorily requires the fricative following a back vowel to be velar (e.g., [naxt] 'night') and the fricative following a front vowel to be palatal (e.g., [lɪçt] 'light'). The rule applies within syllables.

Across a syllable boundary the rule only applies if the first syllable is open (e.g., [kriːçən] 'crawl', [raʊxən] 'smoke'); if the first syllable is closed the second syllable has to begin with a palatal fricative (e.g., [hɔrçən] 'listen').

Regressive nasal assimilation in German is obligatory within syllables. A velar stop specifies the place for a nasal preceding it (e.g., [baŋk] 'bank').

Do people process violations of different types of assimilation differently?

• Again, listeners detected [x] *faster* when the progressive fricative assimilation was violated than when no violation occurred (see figure 2). This time the difference in the reaction times was significant by subjects and by items (F1(1,23) = 11.4, p = 0.003; F2(1,13) = 7.0, p = 0.02). Thus reactions to monosyllabic and bisyllabic nonwords both showed the same counterintuitive pattern.

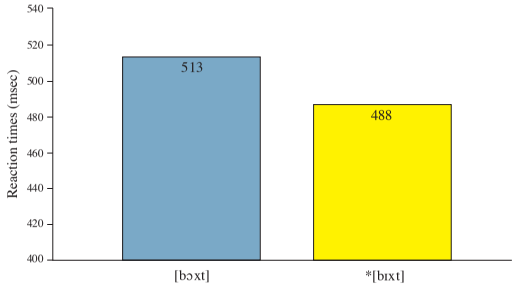

Figure 1: Mean reaction times for progressive fricative assimilation, monosyllabic

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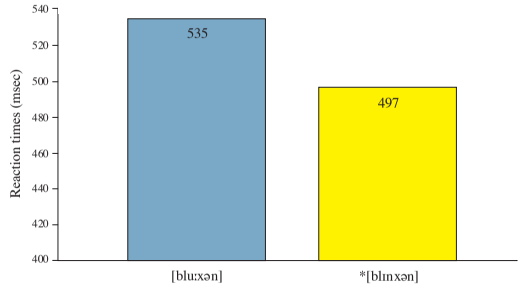

Figure 2: Mean reaction times for progressive fricative assimilation, bisyllabic

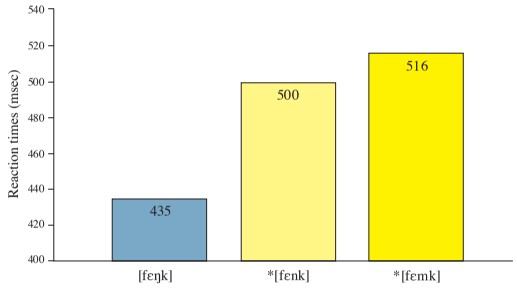

Figure 3: Mean reaction times for regressive nasal assimilation, monosyllabic

The earlier experiments tested regressive assimilatio rules. Is the difference with the earlier results due to t German fricative assilmilation being progressive?

3. Regressive nasal assimilation, monosyllabic

• Regressive nasal assimilation in German is obligat within syllables. The following velar stop /k/ specifies place velar for the preceding nasal /ŋ/.
• Fourteen monosyllabic German nonwords ending with legal phoneme string /ŋk/ were created (e.g., /feŋ Fourteen nonwords violated the German nasal assimilat ending with the phoneme string /nk/ (e.g., /fɛnk/). Fourte nonwords, also containing violation, ended with /mk/ (e. /fɛmk/). Twenty four listeners had to detect the tar stop /k/.
• This time listeners did detect the target phoneme /k/ *m slowly* when the regressive nasal assimilation was viola than when no violation occurred (see figure 3). T difference in reaction times was significant by subjects a by items (F1(1,46) = 21.8, p < 0.001, F2(1,26) = 15 p < 0.001). T-tests showed that reactions to /k/ after /n/ a after /m/ were both significantly slower than reactions to after /ŋ/ (after /n/: t1(23) = 4.5, p < 0.001; t2(13) = 4. p = 0.001; after /m/: t1(23) = 7.4, p < 0.001; t2(13) = 5 p < 0.001). The difference in reaction times to the two ty of violation /nk/ and /mk/ was not significant (t1(23) = 1 p > 0.1; t2(13) = 1.0, p > 0.2).

Conclusion

People process violations of different types o assimilation differently.

Violation of a German **progressive** assimilation ru speeded up detection of the violated phoneme, withi and across syllable boundaries.
Violation of a German **regressive** assimilation ru slowed down detection of the violated phoneme.

Violation of assimilation rules does not necessaril make processing more difficult.